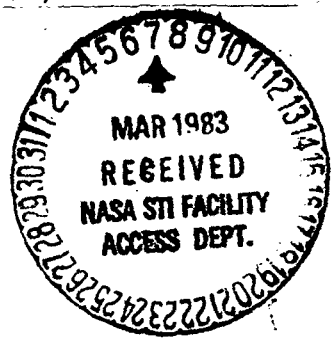
NASA

Earth Resources
A Continuing Bibliography with Indexes

NASA SP-7041(36)
January 1983

National Aeronautics and Space Administration



es Earth Resourc
s Earth Resource
Earth Resources
th Resources Ea
Resources Earth
Resources Earth
sources Earth Re

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)	N82-28243 - N82-34341
IAA (A-10000 Series)	A82-38103 - A82-48267

This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

NASA SP-7041(36)

EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

Issue 36

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between October 1 and December 31, 1982 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1983
National Aeronautics and Space Administration
Washington, DC

This supplement is available as NTISUB/038/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $12.50 domestic; $25.00 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the Earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the Earth's lands and waters, by sensing instrumention on orbiting spacecraft or on aircraft.

This literature survey lists 576 reports, articles, and other documents announced between October 1 and December 31, 1982 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

IAA entries identified by accession number series A82-10,000 in ascending accession number order;

STAR entries identified by accession number series N82-10,000 in ascending accession number order.

After the abstract section, there are six indexes:

subject, personal author, corporate source, contract number, report/accession number, and accession number.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A82-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies of accessions are available at $8.00 per document. Microfiche[1] of documents announced in *IAA* are available at the rate of $4.00 per microfiche on demand, and at the rate of $1.35 per microfiche for standing orders for all *IAA* microfiche.

Minimum air-mail postage to foreign countries is $2.50 and all foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to AIAA Technical Information Service. Please refer to the accession number when requesting publications.

STAR ENTRIES (N82-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page viii.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Document Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26.1 reduction).

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of 50 cents each, postage free.

Other availabilities: If the publication is available from a source other than the above, the publisher and his address will be displayed entirely on the availability line or in combination with the corporate author line.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Fachinformationszentrum Energie, Physik, Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 8757
B.W.I. Airport, Maryland 21240

National Aeronautics and Space Administration
Scientific and Technical Information Branch (NST-41)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1983)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 4.50	$ 9.00
A02	001-025	7.00	14.00
A03	026-050	8.50	17.00
A04	051-075	10.00	20.00
A05	076-100	11.50	23.00
A06	101-125	13.00	26.00
A07	126-150	14.50	29.00
A08	151-175	16.00	32.00
A09	176-200	17.50	35.00
A10	201-225	19.00	38.00
A11	226-250	20.50	41.00
A12	251-275	22.00	44.00
A13	276-300	23.50	47.00
A14	301-325	25.00	50.00
A15	326-350	26.50	53.00
A16	351-375	28.00	56.00
A17	376-400	29.50	59.00
A18	401-425	31.00	62.00
A19	426-450	32.50	65.00
A20	451-475	34.00	68.00
A21	476-500	35.50	71.00
A22	501-525	37.00	74.00
A23	526-550	38.50	77.00
A24	551-575	40.00	80.00
A25	576-600	41.50	83.00
A99	601-up	-- 1	-- 2

1/ Add $1.50 for each additional 25 page increment or portion thereof for 601 pages up.

2/ Add $3.00 for each additional 25 page increment or portion thereof for 601 pages and more.

Schedule E

EXCEPTION PRICE SCHEDULE

Paper Copy & Microfiche

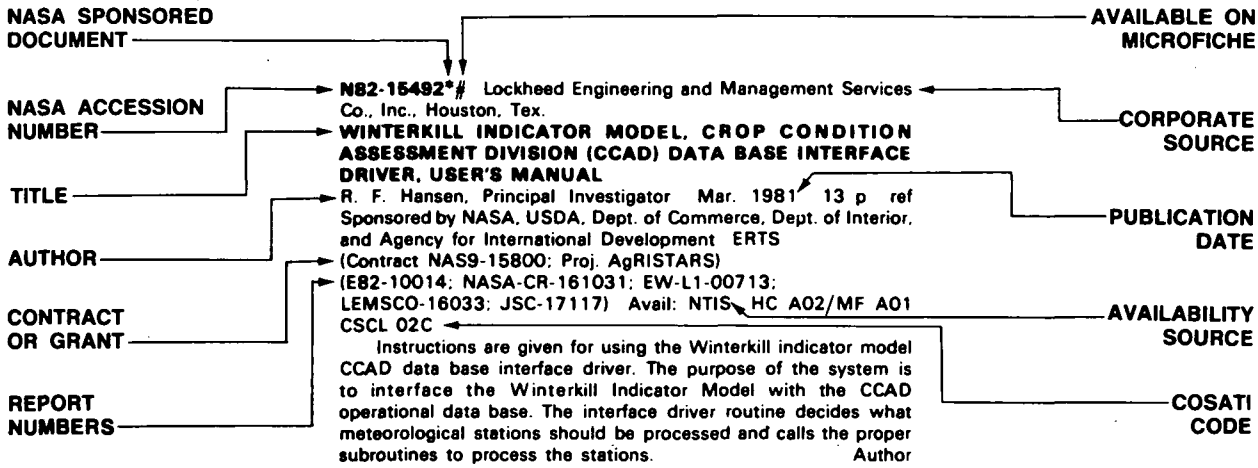
Price Code	North American Price	Foreign Price
E01	$ 6.50	$ 13.50
E02	7.50	15.50
E03	9.50	19.50
E04	11.50	23.50
E05	13.50	27.50
E06	15.50	31.50
E07	17.50	35.50
E08	19.50	39.50
E09	21.50	43.50
E10	23.50	47.50
E11	25.50	51.50
E12	28.50	57.50
E13	31.50	63.50
E14	34.50	69.50
E15	37.50	75.50
E16	40.50	81.50
E17	43.50	88.50
E18	46.50	93.50
E19	51.50	102.50
E20	61.50	123.50

E-99 - Write for quote

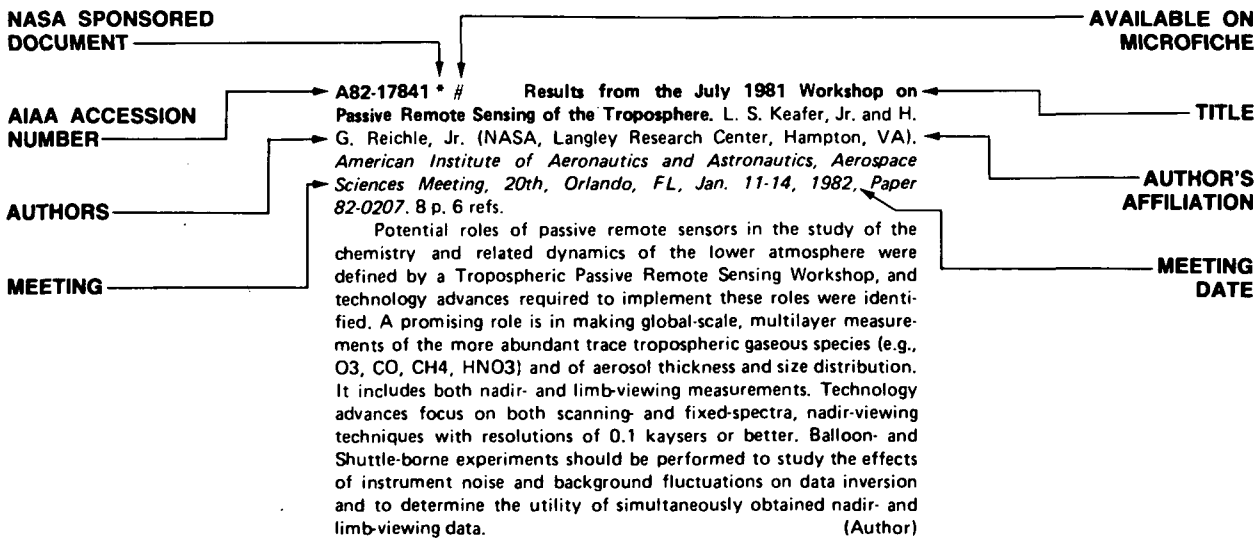
N01	35.00	45.00

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM *STAR*



TYPICAL CITATION AND ABSTRACT FROM *IAA*



EARTH RESOURCES

A Continuing Bibliography (Issue 36)

JANUARY 1983

01

AGRICULTURE AND FORESTRY

Includes crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventry, forest fire detection, and wildlife migration patterns.

A82-38202
COMPARISON OF IRRIGATED AGRICULTURAL LANDSCAPES IN DESERT AREAS ON THE BASIS OF SPACE PHOTOGRAPHY DATA [OPYT SOPOSTAVLENIIA LANDSHAFTOV OROSHAEMOGO ZEMLEDELIIA PUSTYNNYKH ZON PO MATERIALAM KOSMICHESKOI S'EMKI]
E. V. GLUSHKO and T. I. KONDRATEVA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 13-23. In Russian. refs

A comparative interpretation of analogous agricultural landscapes in the Golodnaia steppe and in Arizona was performed on the basis of remote-sensing imagery obtained during May to July 1975 by Salyut-4 in the USSR and during May to October 1973 by Landsat-1 in the USA. The comparison indicates that landscape features and adverse changes of the environment in such irrigated areas can be studied on the basis of remote sensing data without recourse to cumbersome and costly ground checking of the interpretation results. B.J.

A82-38204
EVALUATION OF THE INTERPRETABILITY OF STRUCTURE-ZONAL IMAGES [OPYT OTSENKI DESHIFRIRUEMOSTI STRUKTUROZONAL'NYKH SNIMKOV]
V. I. KRAVTSOVA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 34-42. In Russian.

The paper examines the processing of structure-zonal images obtained in several zones of the spatial-frequency spectrum. Structure-zonal images of a region in central Yakutiia are compared with maps of forest vegetation compiled by the interpretation of aerial photographs. It is shown that structure-zonal photography, when combined with multispectral techniques, can be an effective tool for the remote sensing of forests, particularly in remote regions. B.J.

A82-38208
DETERMINATION OF THE DEGREE OF WEED INFESTATION OF GRAIN CROPS ON THE BASIS OF SPECTRAL MEASUREMENTS [OPREDELENIE STEPENI ZASORENNOSTI ZLAKOVYKH KUL'TUR PO DANNYM SPEKTRAL'NYKH IZMERENII]
K. IA. KONDRATEV (Glavnaia Geofizicheskaia Observatoriia, Leningrad, USSR) and P. P. FEDCHENKO (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sel'skokhoziaistvennoi Meteorologii, Obninsk, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 59-68. In Russian. refs

The paper considers the use of the spectral-reflectance method of remote sensing to study the degree of weed infestation of gain crops during various stages of crop growth. Maps of weed infestation are compiled for various agricultural lands in the Kaluga region. B.J.

A82-38899* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADAR SCATTERING FROM A DIFFUSE VEGETATION LAYER OVER A SMOOTH SURFACE
N. ENGHETA (California Institut of Technology, Jet Propulsion Laboratory, Pasadena, CA) and C. ELACHI (California Institute of Technology, Pasadena, CA) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, Apr. 1982, p. 212-216. refs
(Contract NAS7-100)

A simple model is presented for the oblique backscatter and bistatic scatter from a smooth surface overlain by a diffuse layer. Only single scattering in the diffuse layer is taken into account. The model analysis shows that the combination of volume scattering and oblique reflection at the surface may increase appreciably the waves scattering. The scattering strongly depends on the properties of the smooth surface. These results support some of the observations made with the Seasat spaceborne imaging radar over flooded regions with heavy vegetation cover. (Author)

A82-39027* National Aeronautics and Space Administration. Goddard Space Flight Center. Greenbelt, Md.
A PARAMETERIZATION OF EFFECTIVE SOIL TEMPERATURE FOR MICROWAVE EMISSION
B. J. CHOUDHURY, T. J. SCHMUGGE (NASA, Goddard Space Flight Center, Hydrological Sciences Branch, Greenbelt, MD), and T. MO (Computer Sciences Corp., Silver Spring, MD) Journal of Geophysical Research, vol. 86, Feb. 20, 1982, p. 1301-1304. refs
(Previously announced in STAR as N81-24494)

A82-39206* Lincoln Lab., Mass. Inst. of Tech., Lexington.
EFFECTS OF VARYING SOIL MOISTURE CONTENTS AND VEGETATION CANOPIES ON MICROWAVE EMISSIONS
H.-H. K. BURKE (MIT, Lincoln Laboratory, Lexington, MA) and T. J. SCHMUGGE (NASA, Goddard Space Flight Center, Hydrospheric Sciences Branch, Greenbelt, MD) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 268-274. refs
(Contract NAS5-25529)

Results of NASA airborne passive microwave scans of bare and vegetated fields for comparison with ground truth tests are discussed and a model for atmospheric scattering of radiation by vegetation is detailed. On-board radiometers obtained data at 21, 2.8, and 1.67 cm during three passes over each of 46 fields, 28 of which were bare and the others having wheat or alfalfa. Ground-based sampling included moisture in five layers down to 15 cm in addition to soil temperature. The relationships among the brightness temperature and soil moisture, as well as the surface roughness and the vegetation canopy were examined. A model was developed for the dielectric coefficient and volume scattering for a vegetation medium. L- to C-band data were found useful for retrieving soil information directly. A surface moisture content of 5-35% yielded an emissivity of 0.9-0.7. The data agreed well with

a combined multilayer radiative transfer model with simple roughness correction. M.S.K.

A82-39207
SOIL MOISTURE INFORMATION AND THERMAL MICROWAVE EMISSION
R. W. NEWTON, A. J. BLANCHARD, B. R. JEAN (Texas A & M University, College Station, TX), Q. R. BLACK (Southwest Research Institute, San Antonio, TX), and S. MAKANVAND (Eaton Corp., Electronic Instrumentation Div., Los Angeles, CA) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 275-281. refs

The state of the art for soil penetration by microwave remote sensing methods is assessed and experimental results for the effect of uniform surface roughness on the thermal microwave response to soil moisture are presented. Soil penetration sensing involves determining the depth from which the microwave data originates. The EQSM parameter is numerically defined as a function of the moisture profile and radiative contribution profile, and demonstrated to express the average soil moisture over the EQSM sampling depth. Tests made of remote sensing and soil sampling have indicated that the EQSM parameter showed a close correspondence to the 0-20 cm moisture average under certain conditions. Surface roughness has been demonstrated to increase the brightness temperature and decrease the sensitivity to soil moisture. Shorter wavelengths depict greater surface roughness. Finally, it is shown that passive microwave scanning at 1.4 GHz will reliably detect soil moisture down to 2 cm. M.S.K.

A82-39208#
SOIL MOISTURE INFERENCES FROM THERMAL-INFRARED MEASUREMENTS OF VEGETATION TEMPERATURES
R. D. JACKSON (U.S. Department of Agriculture, Agricultural Research Service, Phoenix, AZ) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 282-286. refs

(Previously announced in STAR as N81-29500)

A82-39209#
ESTIMATION OF REGIONAL SCALE EVAPOTRANSPIRATION THROUGH ANALYSIS OF SATELLITE THERMAL-INFRARED DATA
J. C. PRICE (U.S. Department of Agriculture, Hydrology Laboratory, Beltsville, MD) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 286-292. refs

An analysis of a data set from the Heat Capacity Mapping Mission (HCMM) is presented to show methods for discerning irrigated and nonirrigated regions and making estimates of evaporation rates. The behavior of the surface temperature is shown to vary as a function of the evaporation rate and the diurnal heat capacity of a shallow soil layer. The surface temperature is demonstrated to decrease in proportion to the increase in the evaporation rate. HCMM IR data for eastern Washington state are discussed to show that contrast differences are apparent in irrigated and nonirrigated areas, with nonirrigated areas having larger brightness temperatures. A numerical model is developed for the evapotranspiration rate for comparison with the HCMM data, which was found to be acceptable for large area surveys. M.S.K.

A82-40847
AERIAL PHOTOGRAPHIC ASSESSMENT OF TRANSMISSION LINE STRUCTURE IMPACT ON AGRICULTURAL CROP PRODUCTION
P. D. GRUMSTRUP, M. P. MEYER, R. J. GUSTAFSON, and E. R. HENDRICKSON (Minnesota, University, St. Paul, MN) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1313-1317. Research sponsored by the Mid-Continent Area Power Pool and University of Minnesota.

A82-40848* California Univ., Davis.
VARIABILITY OF SURFACE TEMPERATURE IN AGRICULTURAL FIELDS OF CENTRAL CALIFORNIA
J. L. HATFIELD (California, University, Davis, CA), J. P. MILLARD (NASA, Ames Research Center, Moffett Field, CA), and R. C. GOETTELMAN (LFE Corp., Richmond, CA) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1319-1325. Research supported by the University of California refs
(Contract NCA2-OR-180-901)

In an attempt to evaluate the relationship between hand-held infrared thermometers and aircraft thermal scanners in near-level terrain and to quantify the variability of surface temperatures within individual fields, ground-based and aircraft thermal sensor measurements were made along a 50-km transect on 3 May 1979 and a 20-km transect on 7 August 1980. These comparisons were made on fields near Davis, California. Agreement was within 1 C for fields covered with vegetation and 3.6 C for bare, dry fields. The variability within fields was larger for bare, dry fields than for vegetatively covered fields. In 1980, with improvements in the collection of ground truth data, the agreement was within 1 C for a variety of fields. (Author)

A82-40849
BARRIER ISLAND VEGETATION MAPPING USING DIGITIZED AERIAL PHOTOGRAPHY
B. J. TURNER and D. N. THOMPSON (Pennsylvania State University, University Park, PA) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1327-1335. refs

A vegetation map of the Assateague Island National Seashore has been constructed from computer analysis of three-band digitized color IR photographs using the ORSER digital data processing system. Because the raw data were not calibrated and corrected for density variation across the photographs, a large number of spectral signatures had to be developed for each vegetation class. Classification accuracy was measured against existing vegetation maps of small sections of the island and against a sample of points ocularly interpreted on the photographs. Area estimates were adjusted for the difference between photointerpreted and computer-generated vegetation types. A high degree of classification success was achieved for the photograph on which signature development had occurred, and moderate success on other frames. (Author)

A82-40850* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIGITAL OVERLAY OF CARTOGRAPHIC INFORMATION ON LANDSAT MSS DATA FOR SOIL SURVEYS
M. L. IMHOFF, J. R. IRONS (NASA, Goddard Space Flight Center, Greenbelt, MD), G. W. PETERSEN (Pennsylvania State University, University Park, PA), and S. G. SYKES (ABT Computer Graphics Corp., Cambridge, MA) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1337-1342. refs
(Contract NAS5-25667)

Cartographic soils data were digitized, spatially registered, and merged with processed Landsat image data. The Landsat Multispectral Scanner Subsystem (MSS) image data were used to generate a thematic map representing different soil surface characteristics and an enhanced image. The thematic map was generated using supervised and unsupervised classification procedures. The enhanced image was generated by performing a linear contrast stretch on data altered by a principal components transformation. Although both procedures yielded images useful for soil unit delineation, image enhancement was determined to

be more suitable because it was more expedient and inexpensive. Enhanced images cost $0.06 per hectare, spectral classifications cost $0.08 per hectare. The overlay of cartographic data on Landsat data facilitates comparisons between the various processing methods used for soil unit boundary determination, delineation, and verification. This technique also provides for accurate and expedient spatial referencing for field observations and cartographic correlation. (Author)

A82-41076* New York State Univ., Syracuse.
EFFECT OF SUBPIXEL-SIZED CLOUD ON TARGET DISCRIMINATION FROM SATELLITE DATA
M. J. DUGGIN, L. SCHOCH (New York, State University, Syracuse, NY), and T. I. GRAY (NOAA, National Earth Satellite Service, Houston, TX) Applied Optics, vol. 21, Aug. 1, 1982, p. 2649, 2650. refs
(Contract NAS9-16514)

The paper reports results of a study of the effects of subpixel-sized clouds on remotely sensed radiance; the NOAA-7 Advanced Very High Resolution Radiometer was used in the study. It is noted that it is quite possible that clouds could exist with dimensions of less than 1 x 1 km, which will not be resolvable as discrete pixels filled only by cloud, but which will be recorded as pixels with radiance values not characteristic of the ground target. It is shown that for a clear atmosphere the presence of even 20% cloud produces a fivefold decrease or worse in vegetative index at all scan angles for both pure and mixed targets. These effects are large and show that undetected cloud can produce drastic changes in combinations of recorded radiance used for vegetative assessment. B.J.

A82-42068
FORESTRY APPLICATIONS OF AERIAL PHOTOGRAPHY AND AVIATION [LESNAIA AEROFOTOS'EMKEI I AVIATSIIA]
I. D. DMITRIEV, E. S. MURAKHTANOV, and V. I. SUKHIKH Moscow, Izdatel'stvo Lesnaia Promyshlennost', 1981. 352 p. In Russian. refs

The principles of aerial and spaceborne photography are reviewed, with attention given to equipment specifications, the natural conditions of remote sensing, the geometrical characteristics of aerial photographs and methods of photointerpretation. The use of remote sensing for purposes of forest inventory is examined, and attention is given to the application of aviation tools to forest mapping, the fighting of forest fires, and the monitoring of blight. B.J.

A82-43280
SOME EXPERIMENTAL RESULTS FROM THE ACTIVE MICROWAVE REMOTE SENSING OF FORESTS [NEKOTORYE EKSPERIMENTAL'NYE REZUL'TATY AKTIVNOGO DISTANTSIONNOGO ZONDIROVANIIA LESOV V SVCH DIAPAZONE]
V. P. PERSHIKOV, V. G. GORN, and E. IA. NAGIMOV (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 24-30. In Russian.

Consideration is given to the active microwave sensing of forests in the Sverdlovsk region of the USSR carried out in August 1979 and August 1980. Results of the statistical analysis of the remote sensing data are presented. It is concluded that active microwave sensing has been shown to be an effective technique for obtaining information on forest parameters and for investigating the spatial structure of forests. B.J.

A82-43282
AERIAL AND SPACE METHODS FOR THE REMOTE SENSING OF EARTH RESOURCES IN A SYSTEM FOR THE TRAINING OF FORESTRY ENGINEERS [AEROKOSMICHESKIE METODY ISSLEDOVANIIA PRIRODNYKH RESURSOV V SISTEME PODGOTOVKI INZHENEROV LESNOGO KHOZIAISTVA]
A. V. LIUBIMOV, S. V. VAVILOV, and I. D. DMITRIEV (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 37-41. In Russian.

A82-43420
REMOTE SENSING OF AREAS COVERED BY DAMAGED OR RUINED WINTER CROPS [DISTANTSIONNOE OPREDELENIE PLOSHCHADEI S POVREZHDENNYMI I POGIBSHIMI POSEVAMI OZIMYKH KUL'TUR]
K. IA. KONDRATEV (Glavnaia Geofizicheskaia Observatoriia, Leningrad, USSR) and P. P. FEDCHENKO (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sel'skokhoziaistvennoi Meteorologii, Obninsk, USSR) Meteorologiia i Gidrologiia, Aug. 1982, p. 102-108. In Russian. refs

A refinement of colorimetric methods is described which permits the use of these methods in determining quantitatively the color of farm fields whose crops exhibit different degrees of damage. It is shown that the chromaticity coordinates of healthy and ruined crops are sufficiently distinct to warrant their use in monitoring crops. C.R.

A82-43430* California Univ., Berkeley.
ESTIMATION OF IRRIGATED LAND USING LANDSAT DIGITAL DATA
C. E. BROWN, S. L. WALL, R. W. THOMAS, and M. ERIKKSON (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 49-56.
(Contract NAS5-20969; NCC2-54; NSG-2207)

Techniques developed by the University of California and NASA for the utilization of multitemporal Landsat digital data in estimating and mapping irrigated land are presented. Three dates of Landsat were registered to each other and to a USGS 7.5 minute quadrangle map base for approximately 1.9 million acres of land. Other data registered include county boundaries, land use stratification, and digitized ground data. To identify irrigated land, an indicator was used which consisted of the ratio of MSS Band 7 to MSS Band 5 (the 7/5 ratio). A threshod 7/5 irrigated land value was determined for each date, as actively growing land generally has a higher 7/5 ratio than other cover classes. An estimate of irrigated land was determined by Landsat classification with ground data, at a relative standard error of + or - 7.98% at the 95% confidence interval. Mapping evaluation reveals a 94% accuracy, a 7.4% omission rate, and a 6.3% commission rate. In addition, a sample unit size evaluation recommends a 1-1 1/2 square mile sample range. R.K.R.

A82-43435* Humboldt State Univ., Arcata, Calif.
USING ECOLOGICAL ZONES TO INCREASE THE DETAIL OF LANDSAT CLASSIFICATIONS
L. FOX, III and K. E. MAYER (Humboldt State University, Arcata, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 113-124. Research supported by the California Department of Forestry
(Contract NSG-2341)

Changes in classification detail of forest species descriptions were made for Landsat data on 2.2 million acres in northwestern California. Because basic forest canopy structures may exhibit very similar E-M energy reflectance patterns in different environmental

regions, classification labels based on Landsat spectral signatures alone become very generalized when mapping large heterogeneous ecological regions. By adding a seven ecological zone stratification, a 167% improvement in classification detail was made over the results achieved without it. The seven zone stratification is a less costly alternative to the inclusion of complex collateral information, such as terrain data and soil type, into the Landsat data base when making inventories of areas greater than 500,000 acres. A.B.

A82-43437* California Univ., Berkeley.
DEVELOPMENT OF A DIGITAL GEOGRAPHIC DATA BASE FOR RESOURCE PLANNING IN A WILDLAND ENVIRONMENT
P. R. RITTER, A. S. BENSON, and N. E. NEDEFF (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 137-146. Research supported by the California Department of Parks and Recreation
(Contract NSG-7220)

Multiple resource planning requires the ability to access information for several parameters in a coordinated way. Attempts to do this manually, through the use of multiple transparent overlays or similar techniques can become awkward if there are more than a few parameters under consideration. One solution to this problem is to use a computer system to collect and organize the information into a data base that will make access and analysis easier, even for large numbers of parameters. The increase in the types and forms of remote sensing data and the decrease in costs for computer systems in the last decade has made this approach more popular than in the past. This paper describes the development of one such data base for the Big Basin Redwoods State Park in the Santa Cruz Mountains in California. The data base contains information for satellite spectral data, soil type, vegetation type, and hypsographic data and was developed for use in a cooperative project being conducted by personnel from the Remote Sensing Research Program and the California Department of Parks and Recreation (Author)

A82-43440* Arkansas Univ., Fayetteville.
SEASAT RADAR GEOMORPHIC APPLICATIONS IN COASTAL AND WETLAND ENVIRONMENTS, SOUTHEASTERN U.S
H. C. MACDONALD W. P. Waite, and J. S. Demarcke . In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. (A82-43426 22-43) Falls Church VA, American Society of Photogrammetry, 1981, p. 181-190. refs
(Contract CIT-954940)

The application of Seasat Synthetic Aperture Radar (SAR) to the assessment of terrain conditions in coastal environments is considered. Drainage patterns and plant community spatial relationships can be adequately mapped as is shown by Seasat L-band imagery of the southeastern Gulf Coast and Atlantic Coastal Plain. Anomalously bright radar signatures are identified as characteristic of mangrove and cypress swamps. Marshes have a low radar return, less than that from non-marsh areas and open water in tidal channels. Drainage patterns for coastal plain transition zones can also be determined. Spaceborne imaging radar provides information which complements geomorphic analyses presently obtained with optical sensors. A.B.

A82-43441
SLAR IMAGERY INTERPRETATION OF EASTERN NIGER DELTA FOR SOIL SURVEY PURPOSES
A. FAGBAMI (Ibadan, University, Ibadan, Nigeria) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 191-202. Research supported by the Bayorant Agricultural (Nigeria), Ltd. refs

The availability of SLAR mosaics at a scale of 1:250,000 is thought to make the interpretation of the imageries the most practical approach in the cloud-covered tropical rainforest zone. The imageries are interpreted and five morphological units are demarcated. Particle size distribution is used in evaluating the image analysis, and a reasonable uniformity is found within the geomorphic units. Near all the profiles show clay illuviation. Both longitudinal and lateral textural gradients of deltaic material are observed. It is clear that the sediments being deposited by the Niger in the delta are principally fine sand, silt, and clay. Whereas these particle size fractions may aid the pattern analysis, the morphology of the landforms provides the clearest distinctions between them. C.R.

A82-43445
EVALUATION OF THE RIPARIAN VEGETATION RESOURCE IN THE GREAT CENTRAL VALLEY OF CALIFORNIA USING REMOTE SENSING TECHNIQUES
E. F. KATIBAH, K. J. DUMMER, and N. NEDEFF (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 234-246. Research supported by the California Department of Fish and Game.

A82-43446* California Univ., Berkeley.
CROP TYPE ANALYSIS USING LANDSAT DIGITAL DATA
C. E. BROWN, R. W. THOMAS, and S. L. WALL (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 247-253.
(Contract NAS5-20969; NCC2-54; NSG-2207)

Classification and statistical sampling techniques for crop type discrimination using Landsat digital data have been developed by the University of California in cooperation with NASA and the California Department of Water Resources. Ratioed bands (MSS 7/5 and 5/4) and a sun-angle corrected Euclidean albedo band were prepared from data for the Sacramento Valley for five different dates. The test area was stratified into general crop groupings based on the particular patterns of irrigation timing for each crop. Data classified within each stratum were used to produce a crop type map. Comparison with ground data indicates that certain crops and crop groups are discernable. Small grains and rice are easily identifiable, as are deciduous fruit varieties as a group. However, it is not feasible to separate various fruit and nut varieties, or separate vegetable crops with these techniques at present. A.B.

A82-43447
YIELD PREDICTION IN SO2 AND ACID RAIN DAMAGED SOYBEAN FIELD USING AERIAL IMAGERY
T. MACE and F. L. SCARPACE (Wisconsin, University, Madison, WI) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 254-262.

A82-43450
REMOTE SENSING INVENTORY OF ROCKY MOUNTAIN ELK HABITAT IN THE BLUE MOUNTAINS
D. L. ISAACSON (Oregon State University, Corvallis, OR) and D. A. LECKENBY (Oregon, Dept. of Fish and Wildlife, LaGrande, OR) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 282-291.

Integration of satellite data with aerial photography resulted in the inventory of a 390,000 acre Rocky Mountain Elk habitat in Oregon's Blue Mountains. Fifty-three spectral classes were derived for Landsat multispectral scanner digital data. A photo-interpretation legend covering vegetation species, layers, crown cover, and disturbance type was developed and applied to large scale color infrared aerial photography of the region, supplemented by 35 mm color photography. Positive associations of spectral and resource classes permitted the plotting of spectral data and identification of the distribution of thermal and thermal hiding, mixed forage and hiding, and forage habitats. When coupled with detailed data on forage and cover utilization, a comprehensive view of habitat requirements needed in the management of Rocky Mountain Elk can be obtained. A.B.

A82-43464
DOUBLE MODEL ORTHOPHOTOS USED FOR FOREST INVENTORY MAPPING
B. R. MACKENZIE (Alberta Energy and Natural Resources, Edmonton, Canada) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 465-476.

The technique of using orthophoto base maps, at a scale of 1:15,000, for producing a provincial forest inventory program is reviewed. The orthophoto maps are formed from township centered aerial photographs at 1:60,000 scale by using double model orthophotos produced in the Wild OR1. This process lowers the base mapping costs, and the resulting double model orthophotos do not have to be subjected to further photo reproduction generations, drawbacks of the technique and possible future applications are discussed. N.B.

A82-43472* California Univ., Berkeley.
LANDSAT-BASED ESTIMATION OF CALIFORNIA'S IRRIGATED LAND
S. L. WALL, C. E. BROWN, R. W. THOMAS, and M. ERIKKSON (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 578-583.
(Contract NAS5-20969; NCC2-54; NSG-2207)

The procedure developed uses two-phase sampling, stratification and multidate Landsat imagery to produce the estimate. Maximizing the advantages of both spectral data and field patterns available from Landsat, three dates of Landsat imagery are interpreted to provide county-wide estimates of the proportion of land irrigated. Ground data, collected on a subset of the area interpreted on Landsat, are used to calibrate the satellite estimate. The satellite and ground measurements are reduced to proportion data and linked using a regression estimator to produce the estimate of irrigated land. It is estimated that 3.99 million hectares were irrigated with a relative standard error of + or - 1.18% at the 99% confidence level. Acreage tabulations provided by the Department of Water Resources show that the Landsat-based estimate differed by less than 0.4% at the state level. C.R.

A82-43473
ACCURACY ASSESSMENT OF REMOTE SENSING DERIVED INFORMATION IN WILDLAND ENVIRONMENTS
A. S. BENSON, K. J. DUMMER, and J. T. HARDIN (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 584-590. U.S. Department of Agriculture
(Contract USDA-USFS53-31870-0-70)

Seven interpretation tests were given to a pool of 28 photo interpreters. The objective of these tests was to measure the relative interpretability of seven aero-space image types with respect to point sampling for wildland management planning applications. Based on the test results, it was concluded that conventional scale aerial photography was more interpretable in point tests than was high altitude aerial photography and Landsat imagery. (Author)

A82-43475
MAPPING RIPARIAN VEGETATION IN CALIFORNIA WITH SMALL SCALE AERIAL PHOTOGRAPHY
K. G. BONNER and E. F. KATIBAH (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 608-618. refs

A mapping program undertaken by the University of California at Berkeley at the behest of the California Department of Fish and Game is described. The program seeks to document the current location and areal extent of riparian vegetation. Descriptions are given of the classification system design and of the techniques used in interpreting and mapping riparian vegetation from both 1:30,000 and 1:120,000 scale aerial photography. An account is also given of the preparation of low-cost planimetric maps based on U.S.G.S. Orthophoto Quadrangle Maps and of the techniques used in assessing final map accuracy. The results of the riparian vegetation mapping program for the Great Central Valley are presented, including mapping coverage and areal and linear extent measurements. C.R.

A82-43598* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC MEASUREMENTS OVER BARE AND VEGETATED FIELDS AT 1.4-GHZ AND 5-GHZ FREQUENCIES
J. W. WANG, T. J. SCHMUGGE, W. I. GOULD, J. E. FUCHS, W. S. GLAZAR (NASA, Goddard Space Flight Center, Greenbelt, MD), J. E. MCMURTREY, III, E. T. ENGMAN, and T. J. JACKSON (U.S. Department of Agriculture, Agricultural Research Center, Beltsville, MD) Remote Sensing of Environment, vol. 12, Sept. 1982, p. 295-311. refs
(Previously announced in STAR as N82-22587)

A82-45402
THE CCRS VISIBLE - INFRARED SPECTROSCOPY LABORATORY - SIGNIFICANT RESULTS FROM THE THREE YEARS' OPERATION
F. J. AHERN, R. J. BROWN, K. P. B. THOMSON (Canada Centre for Remote Sensing, Ottawa, Canada), and K. STAENZ (Zuerich, Universitaet, Zurich, Switzerland) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 25-40. refs

The results of three years of investigations of reflectances of grains, potatoes, beans, alfalfa, rapeseed, soils, and rangeland vegetation at the Canada Center for Remote Sensing are reported. The Center was established to test ground-based visible and IR spectroscopic techniques in comparison with Landsat and airborne multispectral scanner data. A field spectrometer was fitted on a truck boom capable of extending the instrument 10 m above the ground. Two black bodies, one at ambient temperature and one

15 K warmer, were employed to calibrate the spectrometer, which operated from 0.3-14 microns. Measurements taken during the 1978-80 growing season are presented for various crops, noting that results compared well with Landsat MSS data. An opal glass diffuser was tested as a reference target in 1979 and perfected in 1980. Three seasons of measurements were completed and led to the conclusion that large numbers of measurements of randomly chosen sites in target areas are necessary for accuracy. M.S.K.

A82-45405
RADIOMETRIC SIMULATION OF SPOT - RESULTS OF EXPERIMENTS ON VEGETATION AND SOIL [SIMULATION RADIOMETRIQUE DE SPOT - RESULTATS D'EXPERIMENTATION SUR LA VEGETATION ET LES SOLS]
G. SAINT, A. PODAIRE (Centre National d'Etudes Spatiales, Toulouse, France), and I. ANGLADE (Toulouse II, Universite, Toulouse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 73-83. In French.

To simulate the radiometric measurements that will be acquired by the High Resolution Visible Instrument of SPOT, a method was developed to obtain these data from airborne scanner measurements. Data were acquired at several dates on an agricultural region (in the South West of France) to begin the definition of simple interpretation method of SPOT data, crops and bare soils were studied. As the correlation between the green and red channel is always strong, a bidimensional analysis was performed using only the red and infrared bands, leading to the use of a vegetation index for the study of crops and of a brightness index for soils. (Author)

A82-45417
LABORATORY-DETERMINED SPECTRAL SIGNATURES OF LEAVES OF HEALTHY AND RIZOMANIA-DISEASED SUGAR BEETS AND DISEASE INTERPRETABILITY FROM AERIAL IRC PHOTOGRAPHS. E. F. SANWALD [STUTTGART, UNIVERSITAET, STUTTGART, WEST GERMANY]
Institut National de la Recherche Agronomique, 1981, p. 201-208. Research supported by the Deutsche Forschungsgemeinschaft. refs

The results of airborne IR color film photography of sugar beet crops planted along the Rhine river banks to test the effectiveness of remote sensing in the detection of the spread of rizomania disease are discussed. The survey was taken in the 500-2500 nm wavelength interval, at the scale of 1:5000, and was used in comparisons with ground truth sampling for nematode damage, yellow virus, weeds, nutrient deficiency, etc. Additionally, laboratory spectral reflectance measurements were performed specifically on healthy and rizomania-diseased leaves. Up to 100% increases in reflectance were observed in the 500-700 nm band with leaves of diseased plants. Peaks were prominent at 500, 550, 590, and 680 nm. Good correlations were also found between optical density in microdensitometer measurements and crop yield from areas sprayed with an experimental soil fumigant. M.S.K.

A82-45421
REVIEW OF A WORKSHOP ON PLANT CANOPY STRUCTURE
L. K. BALICK (U.S. Army, Environmental Laboratory, Vicksburg, MS) and B. A. HUTCHISON (NOAA, Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, TN) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 251-259.

A workshop on plant canopy structure that was held in April 1981 under the sponsorship of the US Army Research Office, the U.S. Department of Energy, and the U.S. Army Engineer Waterways Experiment Station is discussed. The goals of the workshop were to define the needs and applications for quantitative canopy structure information, to develop a statement of the state-of-the-art of canopy structure measurement techniques, and to define and access needs for future research. An overview is given of the discussions by the participants of current needs for canopy structure information in remote sensing and methods to obtain that information. Concepts and techniques presented at the workshop but not yet published are given. C.R.

A82-45422
INFLUENCE OF CROP GEOMETRY ON MULTISPECTRAL REFLECTANCE DETERMINED BY THE USE OF CANOPY REFLECTANCE MODELS
W. VERHOEF and N. J. J. BUNNIK (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 273-290. refs

The influence of canopy geometry on the reflectance of incident radiation by agricultural crops and natural vegetation is of vital importance for proper processing and interpretation of multispectral image data acquired by earth resources satellites and aircraft. A review is given on descriptions of canopy geometry and on different models for predicting canopy reflectance. Some of these models can be applied to study the non-Lambertian character of canopy reflectance for various crop geometries. Furthermore they may provide the keys to a more quantitative interpretation of multispectral images of vegetated areas. A new model called SAIL has been applied to generate examples of the relations that can be studied by canopy reflectance modelling. It is an extension of Suits' model (1972) to include scattering by obliquely oriented leaves. (Author)

A82-45423
INTERACTIONS BETWEEN CANOPY GEOMETRY AND THERMAL INFRARED MEASUREMENTS
R. D. JACKSON (U.S. Department of Agriculture, Water Conservation Laboratory, Phoenix, AZ) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 291-302. refs

The effect of canopy geometry on the measurement of canopy temperature is examined for the use of hand-held infrared thermometers and for airborne infrared scanners. It is noted that with incomplete canopies it is frequently possible to obtain reasonable estimates of the plant temperatures by viewing the canopy from a large angle from a nadir. Airborne scanners are able to see a wide range of view angles. Since the 'radiometric' plant cover increases with increasing view angle, it is thought possible to model this relationship to aid in extracting the plant temperature. A complicating factor here involves variations in soil moisture across the scan. C.R.

A82-45427
INFLUENCE OF VEGETATIVE COVER ON THE RELATIONSHIPS BETWEEN INCIDENT SOLAR RADIATION, SOIL TEMPERATURE, AND THERMAL RADIATIVE EMISSION IN THE 9.5-11.5 MICRON WINDOW [INFLUENCE DE LA COUVERTURE VEGETALE SUR LES RELATIONS ENTRE RAYONNEMENT SOLAIRE INCIDENT, TEMPERATURES DU SOL ET RADIATION THERMIQUE EMISE DANS LA FENETRE 9.5-11.5 MICRONS]
R. BROCHU and F. BONN (Sherbrooke, Universite, Sherbrooke, Quebec, Canada) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 331-338. In French. refs

A82-45428
CORRELATION BETWEEN MULTISPECTRAL SURFACE REFLECTANCE CHARACTERISTICS /EXOTECH/ AND SOIL PROPERTIES - APPLICATION TO THE MAPPING OF MAJOR BELGIAN SOIL CATEGORIES THROUGH DIGITAL ANALYSIS OF LANDSAT MSS DATA
A. M. CEUSTERS (Instituut tot Aanmoediging van het Wetenschappelijk Onderzoek in Nijverheid en Landbouw, Louvain, Belgium) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 339-349. refs

A82-45432
ANALYSIS OF THE PHYSICAL AND BIOLOGICAL SIGNIFICANCE OF THE RADIATIVE TEMPERATURE OF VEGETABLE AND CEREAL COVER [ANALYSE DE LA SIGNIFICATION PHYSIQUE ET BIOLOGIQUE DE LA TEMPERATURE RADIATIVE D'UN COUVERT VEGETAL DE CEREALES]
G. GUYOT and E. CHASSERAY (Institut National de la Recherche Agronomique, Montfavet, Vaucluse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 379-389. In French. refs

A82-45434
DETECTION OF WATER STRESS IN WHEAT BY MEASUREMENT OF REFLECTED SOLAR AND EMITTED THERMAL IR RADIATION
R. D. JACKSON and P. J. PINTER, JR. (U.S. Department of Agriculture, Water Conservation Laboratory, Phoenix, AZ) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 399-406. refs

A82-45435
RADAR SIGNATURE OF CROPS - THE EFFECT OF WEATHER CONDITIONS AND THE POSSIBILITIES OF CROP DISCRIMINATION WITH RADAR
H. W. J. VAN KASTEREN (Centre for Agrobiological Research, Wageningen, Netherlands) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 407-415.

Data collected by the Dutch research team ROVE (radar observation of vegetation) on the radar backscatter of crops in the years 1975-1981 are analyzed. Particular attention is given to wheat. Physically, the distribution of water in space is found to be the most important factor in explaining the radar backscatter of crops. It is also found that differences in the morphology of the plants (shape, size and orientation of the leaves) and in the structure of the crops (plant density) cause differences in radar return of the crops. Reflection often reveals a crop specific dependence on the look angle. In some crops, wind causes a temporary clustering of the leaves in the top layer and a preferred direction of the leaf orientation. For wind sensitive crops (cereals) and at low grazing angles, the radar reflection is found to fluctuate widely as a function of time. C.R.

A82-45436
SPECTRAL SIGNATURE MEASUREMENTS OF BARLEY CROPS - THE INFLUENCE OF IRRIGATION AND FERTILIZATION
J. KLEMAN and E. FAGERLUND (Stockholm, Universitet, Stockholm, Sweden) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 417-424. refs

A82-45440
A RELATION BETWEEN THE TYPES OF MARITIME PINE FOREST AND RADAR BACKSCATTERING IN THE L-BAND IN HH POLARIZATION [RELATION ENTRE DES TYPES DE FORETS DE PIN MARITIME ET LA RETRODIFFUSION RADAR EN BANDE L EN POLARISATION HH]
J. RIOM (Institut National de la Recherche Agronomique, Cestas, Gironde, France) and T. LE TOAN (Centre d'Etude Spatiale des Rayonnements, Toulouse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 455-465. In French. refs

Airborne radar measurements in the 25 cm L-band were performed to establish relationships between the intensity of the backscattered signal and the characteristics of maritime pine forests. The flights were performed over the southwest coast of France with an SAR apparatus at a frequency of 1.215 GHz. A resolution of 10 m was obtained from an altitude of 11,000 m. Ground truth measurements were performed in selected areas for the age of the tree population, density, canopy coverage, average height, and specific species distribution, including ground cover by seasonal plants. The radar data were imprinted on film for densitometric examination, and an analysis was made of the effects of the viewing angle on the backscatter. An algorithm was developed for the correction necessary for viewing angle, and it was found that backscatter varied as a function of the age and height of the pine trees. M.S.K.

A82-45443* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECT OF SUN AND SENSOR GEOMETRY, CANOPY STRUCTURE AND DENSITY, AND ATMOSPHERIC CONDITION ON THE SPECTRAL RESPONSE OF VEGETATION, WITH PARTICULAR EMPHASIS ON ACROSS-TRACK POINTING
C. C. SCHNETZLER (NASA, Goddard Space Flight Center, Earth Survey Applications Div., Greenbelt, MD) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 509-520. refs

A computer modeling and simulation study carried out to assess the effects of various sun and sensor geometries and atmospheric conditions on the directional reflected radiance of several vegetated targets is described. Spectral responses at two wavelengths, 0.68 micron and 0.80 micron, are simulated at nine sensor zenith angles, five sensor azimuths, and nine solar zenith angles for six vegetation canopies under three atmspheric conditions. The six canopies comprise two different geometries of grass canopies at low, medium, and high leaf density. The results suggest that off-nadir viewing effects are more pronounced in the red than in the IR. However, the use of such transformations as the normalized difference index is found to reduce much of the variability seen in the bands. The magnitude of off-nadir viewing effects is found to be a function of canopy geometry. C.R.

A82-45445* Arizona Univ., Tucson.
TRANSFORMING GROUND-MEASURED REFLECTANCES TO RADIANCES MEASURED BY VARIOUS SPACE SENSORS THROUGH CLEAR AND TURBID ATMOSPHERES
P. N. SLATER (Arizona, University, Tucson, AZ) and R. D. JACKSON (U.S. Department of Agriculture, Water Conservation Laboratory, Phoenix, AZ) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 531-542. U.S. Department of Agriculture refs
(Contract USDA-12-14-5001-38; NAG5-196)

The influence on the ratios of the ground measured reflectances in the range 0.8-1.1 microns to those in the range 0.6-0.7 microns of the intervening atmosphere and the sensor response are investigated over a typical range of remote sensing conditions. A simulation of the influences of clear and turbid atmospheres is developed, and their effects on Landsat MSS band 7 to band 5

ratios are determined for Avondale loam and stressed and unstressed vegetation. Results show that for dry loam the differences between the band 7 to band 5 ratios as determined from space and ground level measurements is 2.3% for clear and 5.6% for turbid atmospheric conditions, while for wet loams the differences are 10.4% and 29.5%. It is concluded that the effect of the atmosphere on band ratios for vegetation indicates that atmospheric conditions may delay the discrimination of stressed from unstressed vegetation by 3 to 7 days. The influence of the atmosphere is found to increase for oblique angle observations, and the path radiance and the change in path radiance are greater in the 0/180 degree azimuth than in the 90/270 azimuth. N.B.

A82-45447
THERMOGRAPHY OF PLANT CANOPIES FROM A SHORT DISTANCE [THERMOGRAPHIE DE COUVERTS VEGETAUX A COURTE DISTANCE]
P. BOISSARD, J. M. BERTOLINI, P. VALERY, and D. RENARD (Institut National de la Recherche Agronomique, Versailles, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 559-568. In French. refs

Thermography of plant canopies was performed using contact thermocouples, a portable radiometer, and an IR camera from a 10 m platform over maize and sugar beet crops. The measurements were made at 8-14 micron wavelengths, with data proceeding through analog-digital conversion for on-line filtered false color stored digital imagery. The camera was inserted into the canopies by means of a hydraulic arm, and calibration of temperatures was realized by means of a portable radiothermometer and a differential radiothermometer. Energy balances were measured in three locations, with 10 sec viewing at each, with averages calculated every 15 min. Histograms were constructed of day and night data from the crops and from bare soil. Maximum temperatues at night were located at the closest distance of leaf to soil, while in the daytime contiguous areas in beets were observed to have 0.8 C differences, a level twice that observed for corn. M.S.K.

A82-45450
DIURNAL AND SEASONAL KINETICS OF THE SPECTRAL FACTORS IN THE DIRECTIONAL REFLECTANCE OF A SOYA CULTURE, AND THE IMPLICATIONS FOR THE UTILIZATION OF DATA FROM THE SPOT SATELLITE [CINETIQUES JOURNALIERE ET SAISONNIERE DES FACTEURS SPECTRAUX DE REFLECTANCE DIRECTIONNELLE D'UNE CULTURE DE SOJA, ET IMPLICATIONS POUR L'UTILISATION DES DONNEES DU SATELLITE SPOT]
M. METHY, B. LACAZE, and J. DAUZAT (CNRS, Centre d'Etudes Phytosociologiques et Ecologiques, Montpellier, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 591-599. In French. refs

A82-46161
THE USE OF SPACE REMOTE SENSING DATA FOR THE STUDY AND MAPPING OF THE VEGETATION COVER OF THE UZBEKISTAN DESERT REGION [ISPOL'ZOVANIE MATERIALOV KOSMICHESKOI FOTOS'EMKI DLIA IZUCHENIIA I KARTOGRAFIROVANIIA RASTITEL'NOGO POKROVA PUSTYNNOI ZONY UZBEKISTANA]
U. ALLANAZAROVA and V. I. URAGANOV (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentr Priroda, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 53-58. In Russian. refs

A82-46544* Oregon State Univ., Corvallis.
THE USE OF LARGE-SCALE AERIAL PHOTOGRAPHY FOR INTERPRETING LANDSAT DIGITAL DATA IN AN ELK HABITAT-ANALYSIS PROJECT
D. L. ISAACSON, C. J. ALEXANDER (Oregon State University, Corvallis, OR), and D. A. LECKENBY (Oregon, Dept. of Fish and Wildlife, La Grande, OR) Journal of Applied Photographic Engineering, vol. 8, Feb. 1982, p. 51-57.
(Contract NGL-38-002-053)

Large-scale aerial photography was used to interpret Landsat multispectral scanner data processed through an unsupervised classifier. After scale adjustment and interpretation by application of an elk-habitat photointerpretation legend, the photographs were registered with the spectral classification, and the co-occurrence of spectral picture elements with photointerpreted habitat classes was tabulated. Analysis of the resulting table of data permitted the description of spectral classes in terms meaningful and useful to elk research and management unit in the Blue Mountains of northeastern Oregon. (Author)

A82-46726
MACHINE PROCESSING OF REMOTELY SENSED DATA WITH SPECIAL EMPHASIS ON RANGE, FOREST, AND WETLANDS ASSESSMENT; PROCEEDINGS OF THE SEVENTH INTERNATIONAL SYMPOSIUM, PURDUE UNIVERSITY, WEST LAFAYETTE, IN, JUNE 23-26, 1981
P. G. BURROFF, (ED.) and D. B. MORRISON (Purdue University, West Lafayette, IN) Symposium sponsored by the American Society of Agronomy, Crop Science Society of America, IEEE, et al. West Lafayette, IN, Purdue University, 1981. 742 p.
MEMBERS, $30.; NONMEMBERS, $40

Approaches for meeting forest information needs through remote sensing are considered, taking into account the role of remote sensing in meeting information needs, applications of remote sensing techniques to update the forest inventory data base in British Columbia, and resource information needs in industry and the role of remote sensing. Effective techniques for classifying forest cover are discussed along with agronomic applications of remote sensing, classification accuracy assessment procedures, geologic applications of remote sensing, preprocessing and systems, special reports focused on two recent national workshops, wetlands and water resources assessment, and image data modeling and analysis. Attention is also given to understanding and characterizing the forest scene, rangeland and land use applications of remote sensing, remote sensing and georeference information systems, and forest resource information through remote sensing. G.R.

A82-46727
AN EVALUATION OF ISOCLS AND CLASSY CLUSTERING ALGORITHMS FOR FOREST CLASSIFICATION IN NORTHERN IDAHO
L. F. WERTH (Lockheed Engineering and Management Services, Co., Inc., Houston, TX) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 11-18. refs

ISOCLS (Interactive Self-Organizing Clustering System) in a pure unsupervised mode is an ad hoc algorithm that requires many trial and error runs to find the proper parameters, such as STDMAX (maximum standard deviation), to separate the desired information class. CLASSY, on the other hand, is a more refined algorithm that tells the analyst more in a single run concerning the classes that can be separated. The main drawbacks to CLASSY are that important forest and range classes that are smaller than a minimum cluster size will be combined with other classes and that the algorithm requires so much computer storage that only data sets as small as a quad can be done at one time. CLASSY, however, is seen as holding more promise for forest stratification than ISOCLS and more promise for consistency. The study described here however, is not considered conclusive. C.R.

A82-46728* Purdue Univ., Lafayette, Ind.
EVALUATION OF A SEGMENT-BASED LANDSAT FULL-FRAME APPROACH TO CROP AREA ESTIMATION
M. M. HIXON, S. M. DAVIS, and M. E. BAUER (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 36-44. refs
(Contract NAS9-15466)
(Previously announced in STAR as N82-20590)

A82-46729
SPECTRALLY DERIVED INPUTS TO CROP YIELD MODELS
K. P. GALLO and C. S. T. DAUGHTRY (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 52-65. refs

The use of spectral data as input for crop yield models is evaluated using Landsat spectral data and agronomic data obtained for corn crops at an agricultural experiment station. The spectral data sets consist of reflectance measurements made in two years at the experiment station in four wavelength bands with the aid of a Landsat band radiometer and Landsat MSS data acquired over commercial corn fields. Measured leaf area index (LAI) and calculated total solar radiation intercepted (SRI) by the corn canopy are regressed on the spectral data. For the reflectance data, it is found that: (1) for both years, SRI is better predicted than LAI by the greenness transformation; (2) spectrally estimated SRI is positively correlated with final grain yield; and (3) measured LAI performs better than spectrally predicted SRI in two crop yield models. For the MSS data, spectrally estimated SRI is found to be positively correlated with final grain yield. F.G.M.

A82-46730
A TECHNIQUE TO DETERMINE WHICH CROP DEVELOPMENT STAGES CAN BE ESTIMATED FROM SPECTRAL DATA
V. J. POLLARA, V. C. VANDERBILT, and C. S. T. DAUGHTRY (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 66-75. refs

The application of discriminant analysis for identifying crop development stages using multispectral data is evaluated. Exotech 100 measurements in four wavelength bands (0.5-0.6, 0.6-0.7, 0.7-0.8, and 0.8-1.1 micron) over field plots of soybeans and corn in West Lafayette, Indiana, were analyzed. The generality of the data set was increased by using different row spacings, soils, plant populations, planting dates, soybean cultavars, and crop years (1978, 1979, 1980). Results show that the development stage classes at the beginning and end of the growing season have relatively high classification accuracy, while midseason classes have only moderate to low classification accuracies. However, overall accuracy increases as development stages are pooled to form fewer classes per growing season. In addition, the application of discriminant analysis to a subset of development stages in a season increases classification accuracy. N.B.

A82-46731
CROP MONITORING IN AUSTRALIA USING DIGITAL ANALYSIS OF LANDSAT DATA
K. W. DAWBIN (New South Wales Department of Agriculture, Sydney, Australia) and D. W. BEACH (IBM Australia, Ltd., Sydney, Australia) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 76-79. refs

A82-46746
PINTAILS AND PIXELS - A POTENTIAL APPLICATION OF LANDSAT TECHNOLOGY TO WATERFOWL HABITAT INVENTORY
T. G. NERAASEN, A. J MACAULAY (Ducks Unlimited /Canada/, Winnipeg, Canada), and R. P. MROCZYNSKI (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 214-219. refs

A82-46747
LANDSAT DIGITAL ANALYSIS - IMPLICATIONS FOR WETLAND MANAGEMENT
V. CARTER (U.S. Geological Survey, Reston, VA) and K. A. RICHARDSON (Massachusetts, University, Amherst, MA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 220-229. refs

Wetland management needs and considerations are discussed in the context of information that might be supplied by Landsat digital data. The accuracy of recent Landsat wetland classification analyses is examined and shown to be often less than 70%. Some reasons for the limitations of the Landsat data are identified, such as systematic errors due to sensor characteristics, inadequate resolution elements, spatial and spectral heterogeneity of wetlands and wetland vegetation, spectral overlap with nonwetlands, and MSS band misregistration. Techniques that may make Landsat digital data more useful to wetland managers are suggested, including prestratification of data, better use of temporal data, the use of disparate data sets, and the development of realistic classification categories that can be duplicated. F.G.M.

A82-46748
STRATEGIES FOR INFORMATION - DIRECTED WETLANDS
N. E. G. ROLLER (Michigan, Environmental Research Institute, Ann Arbor, MI) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 230-239. refs

Protection and effective management of wetlands requires information describing their type, distribution, and condition. Inventories are carried out to obtain such information. The efficiency of inventories that produce statistical information can be improved by the use of remote sensing because the synoptic observation capabilities of remote sensors, particularly Landsat, make it possible to nearly eliminate sampling error. The information furnished by inventories designed to produce maps can be extended through the use of digital data manipulation techniques to include (1) quantitative measures of the spatial arrangement of a resource and (2) detection of changes in a resource over time. (Author)

A82-46749* National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
A DETERMINATION OF MARSH DETRITAL EXPORT FROM LANDSAT MSS DATA - A FUNCTION OF TRANSPORT DISTANCE AND WATER BODY CHARACTERIZATION
M. K. BUTERA and B. R. SEYFARTH (NASA, National Space Technology Laboratory, Bay St. Louis, MS) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 240-253. refs

A82-46750
HISTORIC WETLANDS ASSESSMENT USING COMPUTERIZED MICRODENSITOMETERIC ANALYSIS OF AERIAL PHOTOGRAPHS
D. J. LEU (New Jersey, Dept. of Environmental Protection, Trenton, NJ) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 255-261.

A82-46760
ANOTHER LOOK AT DUTCH ELM DISEASE VIA DIGITIZED AERIAL PHOTOGRAPHY
T. M. LILLESAND, D. E. MEISNER, D. W. FRENCH, and W. L. JOHNSON (Minnesota, University, St. Paul, MN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 342-350. Research supported by the University of Minnesota. refs

A82-46761* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTEGRATION OF DIGITAL ELEVATION MODEL DATA AND LANDSAT MSS DATA TO QUANTIFY THE EFFECTS OF SLOPE ORIENTATION ON THE CLASSIFICATION OF FOREST CANOPY CONDITION
D. L. WILLIAMS (NASA, Goddard Space Flight Center, Greenbelt, MD) and K. J. INGRAM (Computer Sciences Corp., Silver Spring, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 352-362. refs

A82-46763* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECT OF FOREST CANOPY CLOSURE ON INCOMING SOLAR RADIANCE
C. L. DOTTAVIO (NASA, Goddard Space Flight Center, Greenbelt, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 375-383. refs
(Previously announced in STAR as N81-28499)

A82-46765
A METHODOLOGY FOR UPDATING AGRICULTURAL FOREST AND RANGE RESOURCE INVENTORY IN MEXICO
A. CAMARA R. (Direction General de Geografia del Territorio Nacional, Mexico) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 396-403. refs

A research and development project for updating land use/land cover maps of Mexico through digital processing of Landsat MSS data is discussed. Several classification approaches for updating a map of a region covered by two adjacent Landsat images are evaluated, including supervised classification, guided clustering, modified supervised classification, and unsupervised classification. Problems with a strategy of environmental stratification before classification are outlined, and a tentative classification system to be used at the national level is defined. A procedure for evaluating the accuracy of the classifications is described. It is concluded that the use of computer-aided analysis techniques in conjunction with the broad expertise of human interpreters is the best approach to an operational methodology for updating Mexico's agricultural, forest, and range resource inventory. F.G.M.

A82-46767
REINDEER RANGE INVENTORY - USE OF WINTER LANDSAT IMAGERY FOR STRATIFICATION OF DIGITAL CLASSIFICATION
T. H. GEORGE (Alaska, University, Fairbanks, AK) and P. C. SCORUP (Alaska, University, Palmer, AK) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 416-427. U.S. Department of Agriculture
(Contract USDA-53-0436-0-13)

A82-46771
APPLICATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM TECHNIQUES TO EVALUATE AGRICULTURAL PRODUCTION POTENTIAL IN DEVELOPING COUNTRIES
G. SCHULTINK, W. LODWICK (Michigan State University, East Lansing, MI), and J. B. JOHNSON (U.S. Department of Agriculture, East Lansing, MI). In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 466-477. U.S. Department of Agriculture
(Contract USDA-12-17-07-8-1955)

A82-46772
CROPCAST - A SPECIAL PURPOSE, GEOGRAPHICALLY REFERENCED, INFORMATION SYSTEM FOR CROP INVENTORY APPLICATIONS
E. S. MERRITT, J. M. MENEELY, L. HEITKEMPER, and D. HLAVKA (Earth Satellite Corp., Chevy Chase, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 478-490.

The CROPCAST Agricultural Information System is briefly described. The system is designed to incorporate remote sensing data from resource satellites with plant environmental information and other ground-based data to produce daily, past, current, and future views of global crop conditions. Attention is given to the system's hardware, grid structure, data bases, diagnostic and forecast models, yield accuracy, and research and interactive capabilities. Recent applications of the system are reviewed, and future plans are considered. It is noted that raw yield-model results for selected states in the USA average a state-level standard error of prediction ranging from 6.6% for corn to 13% for spring wheat and that adjusted forecasts suggest an average error of 5% at mid-growth and 3% at harvest. F.G.M.

A82-46776
MECHANICS OF MONITORING FOREST CLEARCUTS AND THEIR REGENERATION
M. S. GREGORY, S. J. WALSH, and J. D. VITEK (Oklahoma State University, Stillwater, OK) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 520-528. refs

A framework for the identification and monitoring of forest clearcuts and their regeneration is presented. Landsat digital data are classified to detect clearcuts and their major regeneration components, including brush, grass, bare soil, and conifer. Historical Landsat digital data are used to provide a change-detection analysis of forest conditions. Area summaries of land cover are obtained for the entire study area or for subunits. A graphic digitizer is used to provide an overlay to the Landsat digital land cover classification in order to summarize land cover area by physical and/or political boundaries. Individual clearcuts are analyzed within each summary unit for the size of the clearcut, the type of regenerated land cover, and other site-specific accounting information. Output products include tabular summaries of the area

of each land cover, and black and white or color maps of geographically referenced land cover data. (Author)

A82-46777
BROAD AREA FOREST FUELS AND TOPOGRAPHY MAPPING USING DIGITAL LANDSAT AND TERRAIN DATA
M. B. SHASBY (Technicolor Graphic Services, Inc,. Sioux Falls, SD), R. R. BURGAN (U.S. Forest Service, Missoula, MT), and G. R. JOHNSON (Technicolor Graphics, Inc., Denver, CO) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 529-538. refs

A spatially registered digital data base of fuels and terrain information was generated for a test site on the Lolo National Forest in Montana. The data base was developed specifically for providing spatially relevant data to a mathematical fire behavior model developed by the Forest Service which integrates this information along with current weather data to produce realistic estimates of probable fire behavior. Methodologies for the processing and analysis of Landsat MSS and digital terrain data for the mapping of U.S. Forest Service fuel types were developed and demonstrated. Key elements in the mapping process were the development of a fuels-terrain distribution model which provided a statistical description of the topographic distribution patterns of fuels within spectral classes, and secondly, the application of a layered classifier which incorporated the spectral and terrain data in a two-stage maximum likelihood classification framework for the mapping of fuels. (Author)

A82-46778
PROBLEMS RELATED TO THE USE OF REMOTE SENSING FOR INVENTORY AND MAPPING OF LOWER COASTAL PLAIN FORESTS
J. R. HELMS and W. A. SHAIN (Clemson University, Clemson, SC) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 540-542. refs

A82-46779
COMPARISON OF SATELLITE IMAGERY AND CONVENTIONAL AERIAL PHOTOGRAPHY IN EVALUATING A LARGE FOREST FIRE
G. R. MINICK (South Carolina, University, Columbia, SC) and W. A. SHAIN (Clemson University, Clemson, SC) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 544-546.

A82-46782
FORESTRY AS A TECHNOLOGY DRIVER
A. PARK (General Electric Co., Lanham, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 576-586.

Past, present, and future technology demands of forestry with respect to hardware for satellite remote sensing are discussed. Attention is given to such hardware innovations as multistage sampling, advanced scanners and imaging systems, integrated remote sensing systems, stereo systems, digital terrain tapes, and pointable remote sensing systems. System concepts are outlined for Landsat H, Earthwatch, GEOS, Texturometer, the Thermal Inertia Mapper, Microsat, Sweep Frequency Radar, and Geosynchronous SAR. F.G.M.

A82-46783
WHAT'S HAPPENING TO THE WORLD'S FOREST RESOURCES
J. J. TALBOT (National Research Council, Washington, DC) . In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 587-592. refs

This paper discusses the current information base available on global forest resources. The focus includes: the extent of forest cover based on the most widely-used data base; the accuracy of this data base; other estimates of forest resources; the special case of tropical forests; the extent to which deforestation in the tropics is factored into the global forest resource estimates; and emerging patterns of demand and utilization of forests. The paper concludes with a brief discussion of what information is needed to obtain a more comprehensive assessment of forest resource status. (Author)

A82-46787*
MAPPING DEER YARD HABITATS USING LANDSAT - A PRACTICAL APPLICATION
K. D. DORAN (New Hampshire, University, Woodsville, NH) In: *Machine processing of remotely sensed data with special emphasis* on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 617-620.
(Contract NSG-5014)

A82-46789* *Purdue Univ., Lafayette, Ind.*
RADAR IMAGERY FOR FOREST COVER MAPPING
D. J. KNOWLTON and R. M. HOFFER (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 626-632.
(Contract NAS9-15889)

Dual-polarized, X-band Synthetic Aperture Radar (SAR) imagery was obtained from an altitude of 60,000 feet over a test area near Camden, SC on June 30, 1980. The objective of this study was to determine, qualitatively, the value of the SAR imagery for identifying various forest cover types. In analyzing the HH and HV polarization images, particular attention was given to the tonal and textural characteristics of the cover types involved. The analysis of the dual-polarized SAR imagery has shown that certain forest cover features are more easily identified in one polarization than the other, while some features look very similar in both polarizations. In general, the results for this data set have shown that the overall tonal contrast between features was greater on the HH image. Neither polarization was consistently better for identifying the various forest cover types examined. These results suggest the usefulness of a dual-polarized SAR system for mapping forest cover. (Author)

A82-46792
IDENTIFICATION OF AGRICULTURAL CROPS BY COMPUTER PROCESSING IN THE PROVINCES OF CORDOBA AND LA PAMPA - ARGENTINA
M. A. RAED and C. ESPOZ (Comision Nacional de Investigaciones Espaciales, Vincente Lopez, Argentina) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 668-675. refs

A82-46793
USE OF LANDSAT-2 DATA TECHNIQUE TO ESTIMATE SILVERLEAF SUNFLOWER INFESTATION
A. J. RICHARDSON, D. E. ESCOBAR, H. W. GAUSMAN, and J. H. EVERITT (U.S. Department of Agriculture, Weslaco, TX) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 676-683. refs
(Previously announced in STAR as N82-24547)

A82-46954#
ECONOMIC EFFECTS OF REMOTE SENSING - BENEFITS OF A EUROPEAN LAND OBSERVATIONS SATELLITE SYSTEM FOR AGRICULTURAL APPLICATIONS
G. NIEDERAU (ESA, Paris, France) and J. BODECHTEL (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich, West Germany) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 7 p. Research supported by the European Space Agency.
(IAF PAPER 82-112)
The results of a study to assess the economic benefits of a future European land observation satellite system for the improvement of crop information for wheat, maize, and other cereals, excluding rice, are presented. The costs of such a system are derived form existing engineering studies, and the benefits to Europe of improved crop information are assessed by using an economic model of crop production and distribution information. It is concluded that the economic benefits to Europe of improved crop information have an estimated benefits/cost ratio that lies within the range of 4.1 to 8.2. In addition, other applications of the same satellite system are anticipated which will tend to increase the benefits/cost ratio. N.B.

A82-47597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIATION OF DIRECTIONAL REFLECTANCE FACTORS WITH STRUCTURAL CHANGES OF A DEVELOPING ALFALFA CANOPY
J. A. KIRCHNER, D. S. KIMES (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, MD), and J. E. MCMURTREY, III (U.S. Department of Agriculture, Field Crops Laboratory, Beltsville, MD) Applied Optics, vol. 21, Oct. 15, 1982, p. 3766-3774. refs
Directional reflectance factors of an alfalfa canopy were determined and related to canopy structure, agronomic variables, and irradiance conditions at four periods during a cutting cycle. Nadir and off-nadir reflectance factors decreased with increasing biomass in Thematic Mapper band 3(0.63-0.69 micrometer) and increased with increasing biomass in band 4(0.76-0.90 micrometer). The sensor view angle had less impact on perceived reflectance as the alfalfa progressed from an erectophile canopy of stems after harvest to a near planophile canopy of leaves at maturity. Studies of directional reflectance are needed for testing and upgrading vegetation canopy models and to aid in the complex interpretation problems presented by aircraft scanners and pointable satellites where illumination and viewing geometries may vary widely. Distinct changes in the patterns of radiance observed by a sensor as structural and biomass changes occur are keys to monitoring the growth and condition of crops. (Author)

A82-47996* Texas A&M Univ., College Station.
MICROWAVE EMISSIONS FROM SOILS WITH ROUGH SURFACES
L. TSANG (Texas A & M University, College Station, TX) and R. W. NEWTON (Texas A & M University, Texas Engineering Experiment Station, College Station, TX) Journal of Geophysical Research, vol. 87, Oct. 20, 1982, p. 9017-9024. refs
(Contract NSF ECS-80-14579; NAG5-31)
The effect of surface roughness on the thermal microwave emission of soils has been studied with the Kirchoff approach. A model is presented that includes both the coherent and incoherent reflectivities of the rough surface. It is demonstrated that both the coherent and incoherent terms must be included in order for theoretical computations to provide good agreement with the experimental data, especially for wet soil, where surface roughness causes a dramatic increase in brightness temperature. In addition, the model including both the coherent and incoherent terms allows one to use the physically measured surface height deviations of the rough surface in the model. Previous models have required that an effective height, not equal to the actual surface height measurements, be used in order for theoretical computations to match measurements. (Author)

N82-28708*# Department of Agriculture, Washington, D.C. Statistical Reporting Service.
USDA REGISTRATION AND RECTIFICATION REQUIREMENTS
R. ALLEN *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 69-76 1 Jul. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B
Some of the requirements of the United States Department of Agriculture for accuracy of aerospace acquired data, and specifically, requirements for registration and rectification of remotely sensed data are discussed. Particular attention is given to foreign and domestic crop estimation and forecasting, forestry information applications, and rangeland condition evaluations.
M.G.

N82-28731*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
MISREGISTRATION'S EFFECTS ON CLASSIFICATION AND PROPORTION ESTIMATION ACCURACY
R. D. JUDAY and F. HALL *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 393-400 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B
The estimates of crop type and acreage are undertaken in the AgRISTARS program by registering multiple date acquisitions of small subareas of LANDSAT scenes (termed segments), and applying multispectral analysis to them. An important contribution to errors in classification and acreage estimates is misregistration between multiple acquisitions. The formula used to express this relationship is given and the operations applied are so shown in diagrams. The taking of a LANDSAT feature vector and the derivation of the brightness and greeness are illustrated. It is shown that for any given sensor IFOV geometry, typical populations of fields can be derived and histograms can be plotted of the number of fields against field size according to ground truth. As a function of the resolution element, the IFOV of the sensor can draw the proportion of pure pixels in a given crop. Because the thematic mapper has a smaller resolution, the proportion of pixels that are pure in any given area will be larger. A.R.H.

N82-30603*# California Univ., Santa Barbara. Geography Remote Sensing Unit.
FOCIS: A FOREST CLASSIFICATION AND INVENTORY SYSTEM USING LANDSAT AND DIGITAL TERRAIN DATA Final Report
A. H. STRAHLER, J. FRANKLIN, C. E. WOODCOOK, and T. L. LOGAN (JPL, Pasadena, Calif.) Dec. 1981 68 p refs Sponsored in part by C.I.T.
(Contract NAS9-15509; NAS7-100; USFS-53-9158-0-6362)
(NASA-CR-168719; NAS 1.26:168719; PB82-164492; NFAP-255)
Avail: NTIS HC A04/MF A01 CSCL 02F
Accurate, cost-effective stratification of forest vegetation and timber inventory is the primary goal of a Forest Classifcation and Inventory System (FOCIS). Conventional timber stratification using photointerpretation can be time-consuming, costly, and inconsistent from analyst to analyst. FOCIS was designed to overcome these problems by using machine processing techniques to extract and process tonal, textural, and terrain information from registered LANDSAT multispectral and digital terrain data. Comparison of samples from timber strata identified by conventional procedures showed that both have about the same potential to reduce the

variance of timber volume estimates over simple random sampling. DOE

N82-30604# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Office of Advanced Photographic Technology Development and Applications Support.
OPERATIONAL TEST OF PANORAMIC AERIAL PHOTOGRAPHY FOR ESTIMATING ANNUAL MORTALITY OF PONDEROSA PINE CAUSED BY MOUNTAIN PINE BEETLE
R. D. DILLMAN, S. S. SHEN, B. B. EAV, and W. B. WHITE (Forest Service, Houston) Sep. 1981 37 p refs
(Contract USDA/FS-53-3187-0-29)
(PB82-164484; LEMSCO-16377; NFAP-274) Avail: NTIS HC A03/MF A01 CSCL 02F

The results and conclusions of an operational test of the procedures used in a mortality survey designed to provide timely data are given. The Front Range of Colorado, an area of approximately 12 million acres, was the study area. The survey design is based on three-stage sampling with selection according to probability proportional to size. Information from each stage is combined to estimate the number of trees killed and the associated volume loss from mountain pine beetle infestation. DOE

N82-30606# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Office of Remote Sensing Technology Implementation.
PHOTOINTERPRETATION KEY FOR PINE REGENERATION ANALYSIS USING HIGH-ALTITUDE COLOR INFRARED PANORAMIC PHOTOGRAPHY Final Report
B. B. EAV, C. A. CLARK, R. E. KINKLE, and J. C. PRILL Aug. 1981 38 p refs
(Contract USDA/FS-53-3187-0-29)
(PB82-164450; LEMSCO-16379; NFAP-247) Avail: NTIS HC A03/MF A01 CSCL 02F

A photointerpretation key for analysis of pine regeneration was developed during the second of the three phases of a timber inventory project. The procedures used in developing the photointerpretation key are presented, and the resulting selective photointerpretation key with color illustrations (stereopairs) is presented This photointerpretation key represents a model application of high-altitude color infrared panoramic photography to timber inventory and should pave the way for more imaginative applications of optical bar technoloy to resource inventories. DOE

N82-30607# Earth Satellite Corp., Washington, D. C.
MULTIRESOURCE INVENTORY METHODS PILOT TEST. PHASE 1: PHOTOINTERPRETATION KEY FOR USE IN THE IDENTIFICATION OF WILDLAND RESOURCE FEATURES THROUGH THE DIRECT VISUAL ANALYSIS OF LANDSAT MULTISPECTRAL SCANNER IMAGERY
R. R. COLWELL, P. G. LANGLEY, M. ARMIJO, and R. N. COLWELL Nov. 1981 132 p refs
(Contract USDA/FS-53-3187-9-45)
(PB82-164021; NFAP-203B; LEMSCO-16934) Avail: NTIS HC A07/MF A01 CSCL 02F

Conventional color and color infrared stereograms of low-altitude aerial photographs and matching conventional color and color infrared stereograms of ground photographs are compared for the purpose of identifying features on olor composite imagery derived from digital data acquired by the LANDSAT multispectral scanner system. Keys were develoed based on intensive studies of selected test sites in three geographic regions: the Sierra Nevada Mountains of California, the Bitterroot Mountains of Idaho, and the Uplands Region of South Carolina. Author (GRA)

N82-31729*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIREX MISSION REQUIREMENTS DOCUMENT FOR RENEWABLE RESOURCES
F. CARSEY and T. DIXON 15 Jun. 1982 175 p refs
(Contract NAS7-100)
(NASA-CR-169288; JPL-PUB-82-47; NAS 1.26:169288) Avail: NTIS HC A08/MF A01 CSCL 22A

The initial experimental program and mission requirements for a satellite synthetic aperture radar (SAR) system FIREX (Free-Flying Imaging Radar Experiment) for renewable resources is described. The spacecraft SAR is a C-band and L-band VV polarized system operating at two angles of incidence which is designated as a research instrument for crop identification, crop canopy condition assesements, soil moisture condition estimation, forestry type and condition assessments, snow water equivalent and snow wetness assessments, wetland and coastal land type identification and mapping, flood extent mapping, and assessment of drainage characteristics of watersheds for water resources applications. Specific mission design issues such as the preferred incidence angles for vegetation canopy measurements and the utility of a dual frequency (L and C-band) or dual polarization system as compared to the baseline system are addressed. E.A.K.

N82-32787*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
ANALYSIS OF THEMATIC MAPPER SIMULATOR DATA COLLECTED OVER EASTERN NORTH DAKOTA
J. E. ANDERSON, Principal Investigator Apr. 1982 27 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color illustrations ERTS
(Contract PROJ. AGRISTARS)
(E82-10365; NASA-TM-84838; DC-Y1-04232; NSTL/ERL-204; NAS 1.15:84838) Avail: NTIS HC A03/MF A01 CSCL 02C

The results of the analysis of aircraft-acquired thematic mapper simulator (TMS) data, collected to investigate the utility of thematic mapper data in crop area and land cover estimates, are discussed. Results of the analysis indicate that the seven-channel TMS data are capable of delineating the 13 crop types included in the study to an overall pixel classification accuracy of 80.97% correct, with relative efficiencies for four crop types examined between 1.62 and 26.61. Both supervised and unsupervised spectral signature development techniques were evaluated. The unsupervised methods proved to be inferior (based on analysis of variance) for the majority of crop types considered. Given the ground truth data set used for spectral signature development as well as evaluation of performance, it is possible to demonstrate which signature development technique would produce the highest percent correct classification for each crop type. M.G.

N82-32789*# Agricultural Research Service, Mississippi State, Miss.
WINTER WHEAT: A MODEL FOR THE SIMULATION OF GROWTH AND YIELD IN WINTER WHEAT
D. N. BAKER, D. E. SMIKA, A. L. BLACK, W. O. WILLIS, and A. BAUER, Principal Investigators 24 Aug. 1981 165 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract PROJ. AGRISTARS)
(E82-10367; NASA-CR-169164; YM-U2-04281; JSC-18229; NAS 1.26:169164) Avail: NTIS HC A08/MF A01 CSCL 02C

The basic ideas and constructs for a general physical/physiological process level winter wheat simulation model are documented. It is a materials balance model which calculates daily increments of photosynthate production and respiratory losses in the crop canopy. The partitioning of the resulting dry matter to the active growing tissues in the plant each day, transpiration and the uptake of nitrogen from the soil profile are simulated. It incorporates the RHIZOS model which simulates, in two dimensions, the movement of water, roots, and soluble nutrients through the soil profile. It records the time of initiation of each of the plant organs. These phenological events are calculated from

temperature functions with delays resulting from physiological stress. Stress is defined mathematically as an imbalance in the metabolite supply; demand ratio. Physiological stress is also the basis for the calculation of rates of tiller and floret abortion. Thus, tillering and head differentiation are modeled as the resulants of the two processes, morphogenesis and abortion, which may be occurring simultaneously. Author

N82-32790*# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.

DATA BASE MANIPULATION FOR ASSESSMENT OF MULTIRESOURCE SUITABILITY AND LAND CHANGE Final Report, Feb. - Sep. 1981

J. COLWELL, P. SANDERS, G. DAVIS, and F. THOMSON, Principal Investigators 30 Sep. 1981 130 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract PROJ. AGRISTARS)

(E82-10368; NASA-CR-167645; RR-E2-04293; NAS 1.26:167645; ERIM-15400-1-F; NFAP-234) Avail: NTIS HC A07/MF A01 CSCL 02C

Progress is reported in three tasks which support the overall objectives of renewable resources inventory task of the AgRISTARS program. In the first task, the geometric correction algorithms of the Master Data Processor were investigated to determine the utility of data corrected by this processor for U.S. Forest Service uses. The second task involved investigation of logic to form blobs as a precursor step to automatic change detection involving two dates of LANDSAT data. Some routine procedures for selecting BLOB (spatial averaging) parameters were developed. In the third task, a major effort was made to develop land suitability modeling approches for timber, grazing, and wildlife habitat in support of resource planning efforts on the San Juan National Forest. M.G.

N82-32792*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

A COMPARISON OF SOIL MOISTURE CHARACTERISTICS PREDICTED BY THE ARYA-PARIS MODEL WITH LABORATORY-MEASURED DATA

L. M. ARYA, J. C. RICHTER, and S. A. DAVIDSON, Principal Investigators Mar. 1982 398 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; PROJ. AGRISTARS)

(E82-10370; NASA-CR-167617; SM-L2-04247; JSC-17820; NAS 1.26:167617; LEMSCO-17817) Avail: NTIS HC A17/MF A01 CSCL 02C

Soil moisture characteristics predicted by the Arya-Paris model were compared with the laboratory measured data for 181 New Jersey soil horizons. For a number of soil horizons, the predicted and the measured moisture characteristic curves are almost coincident; for a large number of other horizons, despite some disparity, their shapes are strikingly similar. Uncertainties in the model input and laboratory measurement of the moisture characteristic are indicated, and recommendations for additional experimentation and testing are made. M.G.

N82-32793*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

RESEARCH IN SATELLITE-AIDED CROP INVENTORY AND MONITORING

J. D. ERICKSON, J. L. DRAGG, R. M. BIZZELL, and M. C. TRICHEL, Principal Investigators Jul. 1982 11 p refs Presented at the 8th Intern. Symp. on Machine Process. of Remotely Sensed Data, West Lafayette, Ind., 7-9 Jul. 1982 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract PROJ. AGRISTARS)

(E82-10371; NASA-TM-84839; IT-J2-04282; JSC-18231; NAS 1.15:84839) Avail: NTIS HC A02/MF A01 CSCL 02C

Automated information extraction procedures for analysis of multitemporal LANDSAT data in non-U.S. crop inventory and monitoring are reviewed. Experiments to develope and evaluate crop area estimation technologies for spring small grains, summer crops, corn, and soybeans are discussed. M.G.

N82-32794*# Elogic, Inc., Houston, Tex.

AGRISTARS. SUPPORTING RESEARCH: ALGORITHMS FOR SCENE MODELLING

M. E. RASSBACH, Principal Investigator 30 Mar. 1982 55 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and agency for International Development ERTS

(Contract NAS9-16446; PROJ. AGRISTARS)

(E82-10372; NASA-CR-167618; SR-X2-04260; NAS 1.26:167618; NAS-811) Avail: NTIS HC A04/MF A01 CSCL 02C

The requirements for a comprehensive analysis of LANDSAT or other visual data scenes are defined. The development of a general model of a scene and a computer algorithm for finding the particular model for a given scene is discussed. The modelling system includes a boundary analysis subsystem, which detects all the boundaries and lines in the image and builds a boundary graph; a continuous variation analysis subsystem, which finds gradual variations not well approximated by a boundary structure; and a miscellaneous features analysis, which includes texture, line parallelism, etc. The noise reduction capabilities of this method and its use in image rectification and registration are discussed. M.G.

N82-32796*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

COMPUTER SIMULATION OF A SPACE SAR USING A RANGE-SEQUENTIAL PROCESSOR FOR SOIL MOISTURE MAPPING

M. FUJITA and F. ULABY, Principal Investigators Apr. 1982 109 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-16419; PROJ. AGRISTARS)

(E82-10374; NASA-CR-167619; SM-K2-04284; NAS 1.26:167619; RSL-TR-551-1) Avail: NTIS HC A06/MF A01 CSCL 02C

The ability of a spaceborne synthetic aperture radar (SAR) to detect soil moisture was evaluated by means of a computer simulation technique. The computer simulation package includes coherent processin of the SAR data using a range-sequential processor, which can be set up through hardware implementations, thereby reducing the amount of telemetry involved. With such a processing approach, it is possible to monitor the earth's surface on a continuous basis, since data storage requirements can be easily met through the use of currently available technology. The Development of the simulation package is described, followed by an examination of the application of the technique to actual environments. The results indicate that in estimating soil moisture content with a four-look processor, the difference between the assumed and estimated values of soil moisture is within + or - 20% of field capacity for 62% of the pixels for agricultural terrain and for 53% of the pixels for hilly terrain. The estimation accuracy for soil moisture may be improved by reducing the effect of fading through non-coherent averaging. M.G.

N82-32797*# Texas A&M Univ., College Station. Inst. of Statistics.
INCORPORATING PARTIALLY IDENTIFIED SAMPLE SEGMENTS INTO ACREAGE ESTIMATION PROCEDURES: ESTIMATES USING ONLY OBSERVATIONS FROM THE CURRENT YEAR
R. L. SIELKEN, JR., Principal Investigator Dec. 1981 77 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract PROJ. AGRISTARS)
(E82-10375; NASA-CR-169169; FC-T2-04254; NAS 1.26:169169; TR-21) Avail: NTIS HC A05/MF A01 CSCL 02C

Several methods of estimating individual crop acreages using a mixture of completely identified and partially identified (generic) segments from a single growing year are derived and discussed. A small Monte Carlo study of eight estimators is presented. The relative empirical behavior of these estimators is discussed as are the effects of segment sample size and amount of partial identification. The principle recommendations are (1) to not exclude, but rather incorporate partially identified sample segments into the estimation procedure, (2) try to avoid having a large percentage (say 80%) of only partially identified segments, in the sample, and (3) use the maximum likelihood estimator although the weighted least squares estimator and least squares ratio estimator both perform almost as well. Sets of spring small grains (North Dakota) data were used. M.G.

N82-32798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A PARAMETRIC STUDY OF TILLAGE EFFECTS ON RADAR BACKSCATTER
R. G. FENNER, G. F. PELS, and S. C. REID, Principal Investigators Oct. 1980 34 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for Internationl Development Prepared in cooperation with Lockheed Engineering and Management Services Co., Inc., Houston, Tex. ERTS
(Contract NAS9-15800; PROJ. AGRISTARS)
(E82-10376; NASA-TM-84852; SM-J0-00470; JSC-16372; NAS 1.15:84852) Avail: NTIS HC A03/MF A01 CSCL 20N

Radar backscatter data for different field configurations and modulation function curves for angular and frequency variations are presented. A simplistic approach to modeling this effect is presented. It is concluded that: (1) row direction is a significant contributor to radar backscatter from cropland and must be considered when making radar measurements over bare or sparsely vegetated fields; (2) while the effect decrease with increasing frequency, it is still large (5 dB) at 13.3 GHz; (3) row effects are independent of linear polarization; (4) there is a strong aspect angle sensitivity which is a function of the scene and radar system parameters. M.G.

N82-32799*# Science and Education Administration, College Station, Tex. Pest Congrol Equipment and Methods Research Unit.
PREDICTING THE TIMING AND POTENTIAL OF THE SPRING EMERGENCE OF OVERWINTERED POPULATIONS OF HELIOTHIS SPP Final Report, 1 Oct. 1980 - 31 Mar. 1981
A. W. HARTSTACK, J. A. WITZ, and J. D. LOPEZ, Principal Investigators 31 Mar. 1981 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NASA ORDER T-4629-H; PROJ. AGRISTARS)
(E82-10377; NASA-CR-167444; EW-U1-04185; NAS 1.26:167444) Avail: NTIS HC A03/MF A01 CSCL 02B

The current state of knowledge dealing with the prediction of the overwintering population and spring emergence of Heliothis spp., a serious pest of numerous crops is surveyed. Current literature is reviewed in detail. Temperature and day length are the primary factors which program H. spp. larva for possible diapause. Although studies on the interaction of temperature and day length are reported, the complete diapause induction process is not identified sufficiently to allow accurate prediction of diapause timing. Mortality during diapause is reported as highly variable. The factors causing mortality are identified, but only a few are quantified. The spring emergence of overwintering H. spp. adults and mathematical models which predict the timing of emergence are reviewed. Timing predictions compare favorably to observed field data; however, prediction of actual numbers of emerging moths is not possible. The potential for use of spring emergence predictions in pest management applications, as an early warning of potential crop damage, are excellent. Research requirements to develop such an early warning system are discussed. J.D.

N82-32800*# Columbia Univ., New York. Dept. of Geography.
APPLICATION OF DIGITAL ANALYSIS OF MSS DATA TO AGRO-ENVIRONMENTAL STUDIES Semiannual Progress Report, 1 Jan. - 31 Dec. 1981
R. A. LEWIS and S. N. GOWARD, Principal Investigators 31 Dec. 1981 99 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NCC5-20)
(E82-10378; NASA-CR-169170; NAS 1.26:169170) Avail: NTIS HC A05/MF A01 CSCL 02C

Progress in the application of digital analysis of multispectral scanner data to agro-environmental studies is described. Simulation of LANDSAT D thematic mapper (TM) observations from aircraft multispectral scanner data and field spectrometer data collected over a corn-soybean agricultural region in Webster County, Iowa during the 1979 growing season in support of the NASA/AgRISTARS program is described. The simulations were analyzed to evaluate the potential utility of the TM (1.55-1.75 micron) mid-infrared observations in corn-soybean discrimination. Current LANDSAT data was analyzed to study snow cover in northern New England and wetlands in Nebraska and Vermont. The application of satellite remote sensor data in additional environmental research areas is described. J.D.

N82-32802*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING AND POTENTIAL APPLICATION OF LANDSAT IMAGERY TO AGRICULTURAL RESOURCES
N. DEJESUSPARADA, Principal Investigator and I. NDAY Feb. 1982 72 p refs Sponsored by NASA ERTS
(E82-10380; NASA-CR-169321; NAS 1.26:169321; INPE-2324-RPE/403) Avail: NTIS HC A04/MF A01 CSCL 02C

The theory and application of remose sensing is reviewed with particular emphasis on the LANDSAT system. Main topics refer to the physical principles of remote sensing and visual/automatic analysis of LANDSAT data applied to natural resources surveying and monitoring. Case studies regarding remote sensing applications in forestry, soil mapping, land use, morphometric analysis, geomorphology, range management and assessment are discussed. Conclusive remarks appoint LANDSAT as a improving tool to overcome the lack of basic information related to natural resources inventory. M.G.

N82-32803*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LARSPEC SPECTRORADIOMETER-MULTIBAND RADIOMETER DATA FORMATS
L. L. BIEHL May 1982 53 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-16528; NAS9-15466; PROJ. AGRISTARS)
(E82-10381; NASA-CR-167647; SR-P2-04277; NAS 1.26:167647; LARS-050182) Avail: NTIS HC A04/MF A01 CSCL 02C

The data base software system, LARSPEC, is discussed and the data base format for agronomic, meteorological, spectroradiometer, and multiband radiometer data is described. In addition, the contents and formats of each record of data and the wavelength tables are listed and the codes used for some of the parameters are described. M.G.

N82-32806*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
PRELIMINARY STUDY FOR CORRELATION OF METEOROLOGICAL SATELLITE (METSAT) DATA WITH LANDSAT DATA
J. L. AMERY-RYLAND, Principal Investigator Mar. 1982 39 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; PROJ. AGRISTARS)
(E82-10384; NASA-CR-167621; EW-L2-04248; JSC-17821; NAS 1.26:167621; LEMSCO-17307) Avail: NTIS HC A03/MF A01 CSCL 02C

A data set covering multiyear LANDSAT data correlated with meteorological satellite global area coverage (GAC) is defined. Procedures developed for viewing the METSAT GAS imagery and for geographically locating a Large Area Crop Inventory Experiment segment defined on LANDSAT imagery are described. M.G.

N82-32807*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ESTIMATING ACREAGE BY DOUBLE SAMPLING USING LANDSAT DATA Technical Report, 15 Nov. 1980 - 14 Nov. 1981
F. PONT, H. HORWITZ, and R. KAUTH, Principal Investigators Jan. 1982 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15476; PROJ. AGRISTARS)
(E82-10385; NASA-CR-167622; IT-E2-04246; NAS 1.26:167622; ERIM-152400-22-T) Avail: NTIS HC A03/MF A01 CSCL 02C

Double sampling techniques employing LANDSAT data for estimating the acreage of corn and soybeans was investigated and evaluated. The evaluation was based on estimated costs and correlations between two existing procedures having differing cost/variance characteristics, and included consideration of their individual merits when coupled with a fictional 'perfect' procedure of zero bias and variance. Two features of the analysis are: (1) the simultaneous estimation of two or more crops; and (2) the imposition of linear cost constraints among two or more types of resource. A reasonably realistic operational scenario was postulated. The costs were estimated from current experience with the measurement procedures involved, and the correlations were estimated from a set of 39 LACIE-type sample segments located in the U.S. Corn Belt. For a fixed variance of the estimate, double sampling with the two existing LANDSAT measurement procedures can result in a 25% or 50% cost reduction. Double sampling which included the fictional perfect procedure results in a more cost effective combination when it is used with the lower cost/higher variance representative of the existing procedures. M.G.

N82-32809*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) DATA EVALUATION FOR USE IN MONITORING VEGETATION. VOLUME 1: CHANNELS 1 AND 2
N. C. HORVATH, T. I. GRAY, and D. G. MCCRARY, Principal Investigators May 1982 89 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with NOAA, Houston, Tex. ERTS
(Contract NAS9-15800; PROJ. AGRISTARS)
(E82-10387; NASA-CR-167640; EW-L2-04303; JSC-18243; NAS 1.26:167640; LEMSCO-17383) Avail: NTIS HC A05/MF A01 CSCL 02C

Data from the National Oceanic and Atmospheric Administration satellite system (NOAA-6 satellite) were analyzed to study their nonmeteorological uses. A file of charts, graphs, and tables was created form the products generated. It was found that the most useful data lie between pixel numbers 400 and 2000 on a given scan line. The analysis of the generated products indicates that the Gray-McCrary Index can discern vegetation and associated daily and seasonal changes. The solar zenith-angle correction used in previous studies was found to be a useful adjustment to the index. The METSAT system seems best suited for providing large-area analyses of surface features on a daily basis. M.G.

N82-32813*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SPATIAL AND SPECTRAL SIMULATION OF LANDSAT IMAGES OF AGRICULTURAL AREAS
W. F. PONT, JR., Principal Investigator Mar. 1982 29 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NAS9-15476; PROJ. AGRISTARS)
(E82-10391; NASA-CR-167639; SR-E1-04206; NAS 1.26:167639; ERIM-152400-18-T) Avail: NTIS HC A03/MF A01 CSCL 02C

A LANDSAT scene simulation capability was developed to study the effects of small fields and misregistration on LANDSAT-based crop proportion estimation procedures. The simulation employs a pattern of ground polygons each with a crop ID, planting date, and scale factor. Historical greenness/brightness crop development profiles generate the mean signal values for each polygon. Historical within-field covariances add texture to pixels in each polygon. The planting dates and scale factors create between-field/within-crop variation. Between field and crop variation is achieved by the above and crop profile differences. The LANDSAT point spread function is used to add correlation between nearby pixels. The next effect of the point spread function is to blur the image. Mixed pixels and misregistration are also simulated. M.G.

N82-32816*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
SOYBEAN CANOPY REFLECTANCE AS A FUNCTION OF VIEW AND ILLUMINATION GEOMETRY
M. E. BAUER, Principal Investigator, K. J. RANSON, V. C. VANDERBILT, L. L. BIEHL, and B. F. ROBINSON Apr. 1982 16 p refs Presented at the 15th Intern. Symp. on Remote Sensing of Environ., Ann Arbor, Mich., May 1981 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; PROJ. AGRISTARS)
(E82-10394; NASA-CR-167644; SR-P2-04278; NAS 1.26:167644; LARS-042182) Avail: NTIS HC A02/MF A01 CSCL 02C

The results of an experiment designed to characterize a soybean field by its reflectance at various view and illumination angles and by its physical and agronomic attributes are presented. Reflectances were calculated from measurements at four wavelength bands through eight view azimuth and seven view zenith directions for various solar zenith and azimuth angles during portions of three days. An ancillary data set consisting of the agronomic and physical characteristics of the soybean field is described. The results indicate that the distribution of reflectance from a soybean field is a function of the solar illumination and viewing geometry, wavelength and row direction, as well as the state of development of the canopy. Shadows between rows greatly affected the reflectance in the visible wavelength bands and to a lesser extent in the near infrared wavelengths. A model is proposed that describes the reflectance variation as a function of projected solar and projected viewing angles. The model appears to approximate the reflectance variations in the visible wavelength bands from a canopy with well defined row structure. M.G.

N82-32819*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Systems and Services Div.
SOFTWARE FOR THE GROUPED OPTIMAL AGGREGATION TECHNIQUE
P. M. BROWN and G. W. SHAW, Principal Investigators Feb. 1982 229 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; PROJ. AGRISTARS)
(E82-10397; NASA-CR-167641; IT-L2-04304; JSC-18244; NAS 1.26:167641; LEMSCO-17755) Avail: NTIS HC A11/MF A01 CSCL 02C

The grouped optimal aggregation technique produces minimum variance, unbiased estimates of acreage and production for countries, zones (states), or any designated collection of acreage strata. It uses yield predictions, historical acreage information, and direct acreage estimate from satellite data. The acreage strata are grouped in such a way that the ratio model over historical acreage provides a smaller variance than if the model were applied to each individual stratum. An optimal weighting matrix based on historical acreages, provides the link between incomplete direct acreage estimates and the total, current acreage estimate.
Author

N82-32820*# Joint Research Centre of the European Communities, Ispra (Italy).
HEAT CAPACITY MAPPING MISSION INVESTIGATION NO. 25 (TELLUS PROJECT) Final Report
S. G. DEPARATESI, Principal Investigator and P. REINIGER, ed. 1982 249 p refs Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(E82-10398; NASA-CR-169187; NAS 1.26:169187) Avail: NTIS HC A11/MF A01 CSCL 08B

The TELLUS pilot project, utilizing 0.5 to 1.1 micron and 10.5 to 12.5 micron day and/or night imagery from the Heat Capacity Mapping Mission, is described. The application of remotely sensed data to synoptic evaluation of evapotranspiration and moisture in agricultural soils was considered. The influence of topography, soils, land use, and meteorology on surface temperature distribution was evaluated. Anthropogenic heat release was investigated. Test areas extended from semi-arid land in southern Italy to polders in the Netherlands, and from vine-growing hills in the Rhineland to grasslands in Buckinghamshire. J.D.

N82-32831# Oecon Raumfahrt Consulting G.m.b.H., Munich (West Germany).
ECONOMIC ASSESSMENT OF A EUROPEAN REMOTE SENSING SATELLITE SYSTEM FOR AGRICULTURAL APPLICATIONS: VOLUME 1: SUMMARY
J. BODECHTEL (Tech. Univ., Munich), E. BODECHTEL, F. JASKOLLA (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung), J. HENKEL (Tech. Univ., Munich), K. P. HEISS (ECON, Princeton, New Jersey), F. SAND (ECON, Princeton, New Jersey), D. FARLEY (Princeton Univ.), D. LAWSON (ECON, Princeton, New Jersey), and E. WEISS (ECON, Princeton, New Jersey) Paris ESA 15 Jan. 1981 40 p refs 2 Vol.
(Contract ESA-4186/79/F(SC))
(ESA-CR(P)-1606-VOL-1) Avail: NTIS HC A03/MF A01

European Economic Community (EEC) benefits from remote sensing of wheat, corn and cereal crops were estimated by a model. Crop area classification accuracy was simulated using a variety of spectral bands, ground resolutions, field sizes, field orientations and spectral contrasts. Model output is the economic value of the difference between the improved and current crop information systems. The estimated net benefit is 166 to 337 million European Accounting Units (MAU) annually. The cost savings to the administration from improved efficiency are 57 to 295 MAU annually. The value of the improved crop information under free trade is 14.7 to 78.2 MAU to the EEC annually. The benefits must not be added, since each assumes a different set of economic conditions. Given 317 MAU nonrecurring development costs over 6 years and 37 MAU recurring annual operational costs, the benefit/cost ratio is 4.1 to 8.2 Author (ESA)

N82-32832# Oecon Raumfahrt Consulting G.m.b.H., Munich (West Germany).
ECONOMIC ASSESSMENT OF A EUROPEAN REMOTE SENSING SATELLITE SYSTEM FOR AGRICULTURAL APPLICATIONS: VOLUME 2: MAIN REPORT
J. BODECHTEL (Tech. Univ., Munich), E. BODECHTEL, F. JASKOLLA (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung), J. HENKEL (Tech. Univ., Munich), K. P. HEISS (ECON, Princeton, New Jersey), F. SAND (ECON, Princeton, New Jersey), D. FARLEY (Princeton Univ.), D. LAWSON (ECON, Princeton, New Jersey), and E. WEISS (ECON, Princeton, New Jersey) Paris ESA 15 Jan. 1981 165 p refs 2 Vol.
(Contract ESA-4186/79/F(SC))
(ESA-CR(P)-1606-VOL-2) Avail: NTIS HC A08/MF A01

European Economic Community (EEC) benefits from remote sensing of wheat, corn and cereal crops were estimated by a model. Crop area classification accuracy was simulated using a variety of spectral bands, ground resolutions, field sizes, field orientations and spectral contrasts. Model output is the economic value of the difference between the improved and current crop information systems. The estimated net benefit is 166 to 337 million European Accounting Units (MAU) annually. The cost savings to the administration from improved efficiency are 57 to 295 MAU annually. The value of the improved crop information under free trade is 14.7 to 78.2 MAU to the EEC annually. The benefits must not be added since each assumes a different set of economic conditions. Given 317 MAU nonrecurring development costs over 6 years and 37 MAU recurring annual operational costs, the benefit/cost ratio is 4.1 to 8.2 Author (ESA)

N82-33792*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF SPATIAL FILTERING ON THE ACCURACY OF WHEAT AREA ESTIMATE
N. DEJESUSPARADA, Principal Investigator, M. A. MOREIRA, S. C. CHEN, and A. M. DELIMA Jun. 1982 10 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E82-10292; NASA-CR-169335; NAS 1.26:169335; INPE-2431-PRE/135) Avail: NTIS HC A02/MF A01 CSCL 02C

A 3 x 3 pixel spatial filter for postclassification was used for wheat classification to evaluate the effects of this procedure on the accuracy of area estimation using LANDSAT digital data obtained from a single pass. Quantitative analyses were carried out in five test sites (approx 40 sq km each) and t tests showed that filtering with threshold values significantly decreased errors of commission and omission. In area estimation filtering improved the overestimate of 4.5% to 2.7% and the root-mean-square error decreased from 126.18 ha to 107.02 ha. Extrapolating the same procedure of automatic classification using spatial filtering for postclassification to the whole study area, the accuracy in area estimate was improved from the overestimate of 10.9% to 9.7%. It is concluded that when single pass LANDSAT data is used for crop identification and area estimation the postclassification procedure using a spatial filter provides a more accurate area estimate by reducing classification errors. Author

02

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metroplitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A82-38299* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLAR STRATOSPHERIC CLOUD SIGHTINGS BY SAM II
M. P. MCCORMICK, W. P. CHU (NASA, Langley Research Center, Hampton, VA), H. M. STEELE, P. HAMILL, and T. J. SWISSLER (Systems and Applied Sciences Corp., Hampton, VA) Journal of the Atmospheric Sciences, vol. 39, June 1982, p. 1387-1397. refs
(Contract NAS1-15077; NAS1-16127)

The functions and data gained regarding stratospheric cloud sightings by the stratospheric aerosol measurement (SAM) II experiment on board the Numbus 7 spacecraft are reported. SAM II comprises a single channel sun photometer centered at 1.0 micron wavelength for measuring the solar intensity when the sun descends below an apparent 300 km altitude until the sun is occulted by clouds or the horizon. Readings are also made during sunrise in an opposite fashion. Transmission profiles are developed from the data and used to construct profiles of aerosol extinction with a 1 km resolution. Polar stratospheric clouds have been observed in more than 90% of the cases when the minimum temperature is 185 K or less, and 45% of the time when the temperature is 193 K or less. The clouds were more prevalent in the Antarctic winter than during the Arctic winter, and cloud height was lower than indicated by previous data. M.S.K.

A82-38350
THE USEFULNESS OF EUCLIDEAN DISTANCE CLASSIFICATION OF LANDSAT DATA FOR SMALL, MIXED LAND USE - INVESTIGATED USING THE EXAMPLE OF THE KUCUK MENDERES VALLEY IN TURKEY [EIGNUNG DER EUKLIDISCHEN-DISTANZ-KLASSIFIKATION VON LANDSAT-DATEN FUER KLEINFLAECHIGE, GEMISCHTE LANDNUTZUNG - UNTERSUCHT AN HAND EINES BEISPIELS AUS DEM TAL VON KUECUEK MENDERES/TUERKEI]
C. OERMECI (Karlsruhe, Universitaet, Karlsruhe, West Germany) Bildmessung und Luftbildwesen, vol. 50, July 1, 1982, p. 131-137. In German.

The suitability of unsupervised minimum-distance classification for small, mixed land use is studied, using a land use classification with Landsat data for the Kucuk Menderes Valley in Turkey. A land use map derived from topographical elevation differences is used as a comparison criterion as well as the results of a controlled classification done with a highest probability procedure. The field sizes are in general smaller than the ground resolution cell of the Landsat multispectral scanner. Since for digital classification spectrally pure pixels are necessary, mixed classes result whose accurate subdivision is not possible despite their relative accuracy taken as a whole. C.D.

A82-39495
SPACE TECHNOLOGY CONTRIBUTIONS TO EMERGENCY AND DISASTER MANAGEMENT
P. B. RICHARDS (U.S. Navy, Naval Research Laboratory, Washington, DC) Advances in Earth Oriented Applications of Space Technology, vol. 1, no. 4, 1982, p. 215-221. refs

Space technology has already assisted in disaster operations in the areas of communications, remote sensing, and data collection. Applications of NASA's experimental Application Technology Series (ATS) include search and rescue operations, postdisaster emergency relief operations, and experimentation in two-way communication via satellite for use in remote areas. Remote sensing systems are useful for aerial photography and ground observations and the U.S. Geological Survey rated Landsat imagery excellent for damage assessment (e.g., the assessment of the regional effects of earthquakes). The GOES system, has considerable potential for warning purposes as well as disaster management as this system gives readings such as river level and temperature. In addition, a study is mentioned concerning the outcome of decisions made during disaster management and their effect on the number of lives saved and the cost of the relief operations. R.K.R.

A82-42146
REMOTE SENSING OF A COMPLEX SURFACE
J. OTTERMAN (Tel Aviv University, Tel Aviv, Israel) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 198-204.

Remote sensing of a complex surface that cannot be represented as a Lambert plane is discussed, with special attention given to semidesert. A nadir reflectivity model of semidesert surface is presented, and spectral reflectivities derived from Landsat images of an ungrazed range in Utah are analyzed and the results shown. The hemispheric reflectivity of the semidesert's complex surface is analyzed, and clump heating is shown to constitute 19 percent of the total absorption by the surface at the equator, 20 percent at 15 deg latitude, and 27 percent at 45 deg latitude. Radiation temperature measurements of the soil and/or clumps done in northern Sinai are described. It is shown that clump temperatures vary pronouncedly with time of day and wind conditions. C.D.

A82-42149
REMOTE SENSING OF POLLUTION
J. OTTERMAN (Tel Aviv University, Tel Aviv, Israel) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 243-248. refs

Pollution observations of water, air and soil performed in the 1972-1974 Israeli program of Landsat are presented. The infrared band MSS 7 is used to detect dark bands, which indicate oil slicks. The mechanical effect of smoothing the surface causes the darkening, and this aspect of pollution detection is considered to be very important. In a second study, two smoke plumes originating from two points 3 km apart, which broaden with downward motion to 2 to 3 km, comprise air pollution detected over the Gulf of Suez. Finally, dark spots detected in the Arava Valley (located near the Timna copper mines) on 15 September 1972 have been concluded by ground observations as being caked polygons whose blue-green tinge is a characteristic of copper oxides. A technique for detecting and measuring the concentration of a specific gaseous constituent has been developed based on correlation spectroscopy, a technique most easily applied to absorption bands with pronounced multiple peaks and troughs, such as the 0.3 micron absorption band of SO2. The use of remote sensing techniques for pollutant measuring is becoming more widespread. R.K.R.

A82-42236
OBSERVATION OF NO2 DIURNAL VARIATION IN THE STRATOSPHERE
J. P. POMMEREAU (CNRS, Service d'Aeronomie, Verrieres-le-Buisson, Essonne, France) Geophysical Research Letters, vol. 9, Aug. 1982, p. 850-853. Research supported by the Centre National d'Etudes Spatiales and Delegation Generale a la Recherche Scientifique et Technique. refs

Spectrometric NO2 measurements were made through balloon-borne observations of sunlight absorption in the visible range, over the course of an entire day in September, 1979, at 43 deg N, zero deg W. The instrument and data processing method employed achieve a detection limit of NO2 along the line of sight of 4 x 10 to the 15th mol/sq cm. The results obtained show an NO2 diurnal variation in the lower stratosphere whose maximum is around noon, a vertical column density above 22 km which varies from 2.4 plus or minus 0.7 x 10 to the 15th mol/sq cm at 06:15 to 10.0 plus or minus 2.8 x 10 to the 15th mol/sq cm at

11:20 and 6.4 plus or minus 1.4 x 10 to the 15th mol/sq cm at 17:00. The means concentration at noon between 22 and 33.5 km corresponds to a mixing ratio of 13.1 plus or minus 4.8 ppbv. Through comparison with the 33 km solar spectrum, ground observations made on the day before the balloon's flight at 13:00 allow a direct measurement of the total atmospheric NO2 column density of 24 plus or minus 3 x 10 to the 15th mol/sq cm. O.C.

A82-42989#
EASTERN NORTH PACIFIC TROPICAL CYCLONES OF 1981
E. B. GUNTHER (NOAA, Eastern Pacific Hurricane Center, Redwood City, CA) Monthly Weather Review, vol. 110, July 1982, p. 839-851.

A82-42990#
ATLANTIC HURRICANE SEASON OF 1981
M. B. LAWRENCE and J. M. PELISSIER (NOAA, National Hurricane Center, Coral Gables, FL) Monthly Weather Review, vol. 110, July 1982, p. 852-866.

A82-43432
LAND COVER MAPPING WITH MERGED LANDSAT RBV AND MSS STEREOSCOPIC IMAGES
D. T. LAUER (U.S. Geological Survey, Sioux Falls, SD) and W. J. TODD (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church VA, American Society of Photogrammetry, 1981, p. 68-89. refs

The interpretation of Landsat data for vegetation resource and urban land use identification was enhanced by processing which produced three-channel color composite images. Multispectral Scanner (MSS) and Return Beam Vidicon (RBC) data were digitally normalized and merged, yielding multispectral data with 40 m resolution, which were then combined with digital topographic data to produce a left-hand stereo conjugate image. The increased resolution dramatically increased the ability to delimit the urban-rural boundary and to map urban land use, with some improvement in residential area differentiation. The location of, and association between, vegetative features as influenced by topography were readily seen, which aided the mapping of vegetation types. Also, the interpreter recognized image characteristics, vegetation types, and the boundaries between types more quickly, with less time spent on interpretation, than when using the MSS or RBV image alone. A.B.

A82-43434
ASSESSING ACCURACY OF DIGITAL LAND USE AND TERRAIN DATA
J. A. STURDEVANT (Technicolor Graphic Services, Inc., Sioux Falls, SD) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 101-112. U.S. Geological Survey refs
(Contract USGS-14-08-0001-16439)

Aerial photographically-derived digital land use data and Defense Mapping Agency (DMA) digital terrain data are assessed for accuracy. Land use accuracy assessment was performed in two parts: overall map classification indicating the reliability of the final computer land use map, and farmstead versus non-farm residential accuracies which enabled a distinction between the two categories. For all tests, a 90% accuracy (+ or - 4%) was found, at the 85% confidence interval. The mapping accuracy of this data, as transferred to the digital data base, was 86% (+ or - 5%). A study of total vertical relief of less than 400 feet reveals that a slope classification derived from the digital data base is representative of the study area. However, measurements from a 1:24,000 scale USGS topographic map show that less than 50% of the sampled digital terrain tape elevations were within 5 vertical feet of actual elevations; 85% were within 20 vertical feet. R.K.R.

A82-43442
EVALUATING THE DYNAMICS OF EROSION AFFECTED BY LAND USE CHANGES, FROM REMOTELY SENSED DATA
M. K. NOSSEIR (Instituto Brasileiro de Geografia e Estatistica, Rio de Janeiro, Brazil) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church VA, American Society of Photogrammetry, 1981, p. 203-214. refs

Based on an evaluation of the effect of land use changes on erosion features, the adequacy of satellite imagery for examining erosion dynamics was determined by comparing Landsat data with detailed aerial photographs. Changes in 16 land use/land cover classes, drainage density, and drainage frequency for an area of southeastern Ohio were traced from 1938 to 1976 using five sets of aerial photographs. Total drainage density decreased continuously during this period as did drainage frequency of all orders. First order drainage frequency and total drainage density were the best indicator of the effect of land use. Autumn images from Landsat show the dynamics of erosion features, with the total drainage density values derived from MSS channel 7 equal to the sum of the second and third order drainage densities obtained from aerial photographs. A.B.

A82-43449
METHODOLOGY FOR COMPILING A BIOGENIC HYDROCARBON EMISSIONS INVENTORY FOR THE SAN FRANCISCO BAY AREA
E. A. FOSNIGHT (Technicolor Graphic Services, Inc., Moffett Field, CA) and R. M. MORELAND (Association of Bay Area Governments, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 273-281. refs

A joint Association of Bay Area Governments-NASA project investigated the feasibility of making an inventory of biogenic hydrocarbons for the San Francisco Bay area using Landsat data. After assembling a landcover-landuse data file compiled from Landsat multispectral scanner imagery, that file was integrated into the Bay Area Spatial Information System (BASIS). Twenty-two information classes were established, and hydrocarbon emission rates were assigned to each class. The accuracy of the data file is currently being assessed. Its subsequent use will be for the determination of the effect of biogenic hydrocarbon emissions on air quality. A.B.

A82-43457
EVALUATION OF 1:40,000 SCALE AERIAL PHOTOGRAPHY FOR LAND USE UPDATING
R. G. TOLLEY (New York, State University, Binghamton, NY) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 355-360. refs

The use of 1:40,000 scale in aerial photography for land use analysis is evaluated in comparison to 1:20,000 scale, and it is shown that the larger scale has greater utility and is easier to employ. Comparing aerial photographs in both scales, the major problem encountered with the interpretation of the smaller scale photographs was the object or area size, so a more generalized land use scheme resulted. Another problem was that the smaller scale photography must be taken under near perfect weather conditions, which occur on average only 30 days of the year in the eastern US. Because of the greater interpretation time for a 1:40,000 survey, the more often it is used, the less economical it becomes. This consideration, and the fact that photo interpretation

is the major expense in completing a land use update, question the change from 1:20,000 to 1:40,000 scale effected in the USDA aerial surveys since 1973 for the purpose of cost reduction. A.B.

A82-43587
TERRESTRIAL ECOLOGY AND SPACE TECHNOLOGY [ERDOEKOLOGIE UND RAUMFAHRTTECHNIK]
H. BARTH (Hermann-Oberth Gesellschaft, Brasov, Rumania; Sofiiski Universitet, Sofia, Bulgaria) (Hermann-Oberth-Gesellschaft, Raumfahrtkongress, 30th, Garmisch-Partenkirchen, West Germany, Oct. 1-4, 1981.) Astronautik, vol. 19, no. 3, 1982, p. 76-78. In German. refs

The conservation of the environmental quality is considered to be one of the five cardinal problems with respect to the future of humanity. In connection with the scientific-technological revolution and its implementation in the economical and social sector, human activities are affecting the natural environment to an extent which already at the present time seriously endangers the ecological equilibrium in certain locations. It is found, however, that space technology can make a substantial contribution to an improvement of the quality of terrestrial ecological systems. Today, space activities provide specific methods for a worldwide control and surveillance of the ecology of the Earth. In the future, space technology will make a direct interference of man in the energy and material balance of the environment feasible. It is expected that only approaches of space technology will make it possible to control and reduce future ecological effects which will exceed present concepts of magnitude and extension. G.R.

A82-43595
POPULATION ESTIMATION FROM LANDSAT IMAGERY
J. IISAKA (IBM Japan, Ltd., Tokyo Scientific Center, Tokyo, Japan) and E. HEGEDUS (Tokyo, University, Tokyo, Japan) Remote Sensing of Environment, vol. 12, Sept. 1982, p. 259-272. refs

The paper introduces a method of population estimation using the Landsat MSS data. The radiance in the four spectral bands, detected by the multi spectral scanner (MSS) depends upon the ground covering materials, albeit the land use of the area. A mathematical model is set up to express the relation between the reflected electromagnetic energy of sample areas and their population distribution. Landsat 1 and Landsat 3 data of the Kanto area (including Tokyo Metropolitan), acquired in 1972 and 1979, are used along with ground-based census data of 1970 and 1975 to monitor the population distribution and its temporal changes. The method provided a reliable assessment of the population density in residential zones, however land-use classification using MSS imagery previous to the modeling is expected to improve the results. (Author)

A82-43599
SURVEY OF EMISSIVITY VARIABILITY IN THERMOGRAPHY OF URBAN AREAS
D. A. ARTIS and W. H. CARNAHAN (Indiana State University, Terre Haute, IN) Remote Sensing of Environment, vol. 12, Sept. 1982, p. 313-329. refs

This study investigates the effects of roof emissivity variation of aerial thermogram images. Thermograms have been used to detect heat loss from residential roofs. Emissivity variation among rooftops, however, can lead to a misrepresentation of the temperatures mapped in a thermogram image. The objectives of this study were (1) to demonstrate the feasibility of a technique to use remotely sensed data to calculate surface emissivities, and (2) to use that technique to determine the extent of emissivity variation in urban surfaces. In the first part of the experimental approach a passive technique is developed to calculate emissivity from two-band thermal infrared radiance data. In the second part of the experimental approach the technique was used to measure the emissivity of 1411 roofs within the city limits of Terre Haute, Indiana. Results of this survey indicated that over 98% of the roofs surveyed were confined to a very narrow range of emissivities. It is concluded that the observed variation in rooftop emissivities has a minimal effect on the temperatures depicted in thermograms. (Author)

A82-43811
DIRECT BROADCAST FROM LOWER POWER SATELLITES
H. A. GRANT (SED Systems, Inc., Saskatoon, Saskatchewan, Canada) In: ICC '81; International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record. Volume 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 26.1.1-26.1.5.

The principle of direct broadcast is to transmit television signals from a satellite with sufficient power to enable reception by small, low cost terminals. Classically systems have been planned using satellites which transmit several hundred watts of power. Recent Canadian experience has shown that much lower power can be used. This paper discusses the trade-offs between satellite power and earth terminal performance. The Canadian experience with a low power satellite is described. The design of a terminal for use with this low power satellite is discussed. Finally, future trends in earth terminal and satellite performance are predicted. (Author)

A82-43853
12 GHZ BROADCASTING-SATELLITE PLANNING METHODOLOGY
K. E. BROWN (Department of Communications, Ottawa, Canada) In: ICC '81; International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record. Volume 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 43.7.1-43.7.4. refs

Methodologies for planning the Canadian 12 GHz broadcasting satellite service must take into consideration a number of factors affecting the utilization of the spectrum and orbit, such as the total bandwidth and arc available, the geographical relation of the service areas, antenna characteristics and propagation effects. Manual planning offers maximum planner control and feedback, but significant error in determining beam and service area separations can be expected, while computer planning is feasible, but computing times would be great. Although a hybrid planning system that combines planner control with computer power and accuracy is conceivable, careful consideration should be given to the man-machine interface and to the allocation of tasks. The status of planning developments in Canada is outlined. A.B.

A82-44059#
AIRCRAFT SURVEY OF PHOTOCHEMICAL SMOG IN TOKYO METROPOLITAN AREA
S. WAKAMATSU, Y. OGAWA, K. MURANO, M. OKUDA (National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan), H. TSURUTA (Yokohama Environmental Institute, Yokohama, Japan), K. GOI (Saitama Institute of Environmental Pollution, Urawa, Japan), and Y. ABURAMOTO (Toyama Environmental Center, Toyama, Japan) Japan Society of Air Pollution, Journal, vol. 16, no. 4, 1981, p. 199-214. In Japanese, with abstract in English. refs

A82-44070#
ULTRASONIC EXTRACTION METHOD - A TECHNIQUE FOR MUTAGENICITY MONITORING OF AIRBORNE PARTICULATES
S. GOTO, A. KAWAI, T. YONEKAWA, and H. MATSUSHITA (Ministry of Health and Welfare, Institute of Public Health, Tokyo, Japan) Japan Society of Air Pollution, Journal, vol. 17, no. 1, 1982, p. 53-57. In Japanese, with abstract in English. refs

An ultrasonic technique is developed for the extraction of mutagens in airborne particulates which overcomes the difficulties present in the soxhlet extraction method. The ultrasonic method allows the extraction of mutagens in many airborne samples at one time for about 15 min. In tests comparing the suitability of 10 organic solvents for use in the ultrasonic extractions, it is found that benzene-ethanol (4:1, v/v) and methanol provide the highest mutagenic activities without the production of artifact mutagens. Since benzene-ethanol ultrasonic extraction has been used in chemical analyses of organic matter such as polynuclear aromatic hydrocarbons in airborne particulates, it is concluded that the ultrasonic extraction method using benzene-ethanol is the most suitable technique for the biological and chemical monitoring of mutagens in airborne particulates. N.B.

A82-45168
LOCATING STRUCTURES IN AERIAL IMAGES
R. NEVATIA and K. E. PRICE (Southern California, University, Los Angeles, CA) IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. PAMI-4, Sept. 1982, p. 476-484. refs
(Contract F33615-76-C-1203; ARPA ORDER 3119)

A technique for locating desired structures in aerial images is described which employs user specified information about the properties of these structures and their relation to other more easily identified objects. On the basis of the user specified information, a scene model is generated that contains information on relations between objects as well as their sizes, distances and spectral properties. Then a symbolic description of the image is produced by means of Nevatia-Babu (1980) edge and line segmentation and by Ohlander-Price-Reddy (1978) region segmentation. Finally, the model is matched to the image and desired structures are located. The technique is illustrated by an analysis of images of the San Francisco Bay area. A.B.

A82-45448
PREDICTION OF URBAN SURFACE REFLECTANCE FROM LANDSAT DATA USING MIXED SURFACE MODELS
B. C. FORSTER (New South Wales, University, Sydney, Australia) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 569-578. refs

Linear models are developed relating the proportions of various surface cover types to the spectral response from a single Landsat pixel area while accounting for the degrading effects of the atmosphere and the integrating effect of the sensor point spread function. These relationships are used to predict the reflectance of selected urban surfaces samples over the Sydney metropolitan area, the coefficients of the linear equations being calculated from the sampled data using multiple linear regression techniques. From these coefficients the reflectance from a surface containing 100 percent of an individual cover is extrapolated. A comparison of the predicted spectral reflectance signatures of each of the urban surface cover types shows that the discrimination of the individual surfaces is greatest in the infrared bands. The reflectances are shown to closely parallel each other, indicating three distinct surface classes with subclasses being differentiated by brightness alone. C.R.

A82-46281#
INTERANNUAL FLUCTUATIONS OF THE TROPICAL EASTERLY JET AND THE SUMMER MONSOON IN THE ASIAN REGION
M. TANAKA (Tsukuba, University, Sakura, Ibaraki, Japan) Meteorological Society of Japan, Journal, vol. 60, June 1982, p. 865-875. refs

Interannual fluctuations of the tropical summer monsoon were analyzed for a 17-year period from 1964 to 1980, June-September. The strength of the tropical easterly jet at ten degrees was used as a measure of the intensity of the summer monsoon. The relationship between the changes in the monsoon and the distribution of precipitation was investigated, along with the relationship to the middle latitude circulation and the Walker circulation. The evidence shows that the interannual fluctuations of the monsoon are under the strong influence of the middle latitude circulation of the Northern Hemisphere. When the monsoon is strong, the circulation near 50 degrees is zonal, but when it is weak, a blocking high develops to the north of the Caspian Sea and a trough develops near 50 deg N, 110-120 deg E. The Walker circulation plays a smaller role compared to the winter monsoon. C.D.

A82-46396
QUANTITATIVE METHODS IN AERIAL THERMOGRAPHY
J. R. SCHOTT (Rochester Institute of Technology, Rochester, NY) and E. P. WILKINSON (Calspan Advanced Technology Center, Buffalo, NY) Optical Engineering, vol. 21, Sept.-Oct. 1982, p. 864-867. Research supported by the U.S. Department of Energy and New York State Energy Research and Development Authority. refs

Quantitative methods for measuring the absolute (kinetic) surface temperatures of roof surfaces from aerial thermal data are discussed. Attention is also given to methods of accounting for atmospheric variation, background reflectance, path radiance, and roof emissivity effects. The test results presented here involve a comparison of concurrent contact and aerial roof temperature measurements on a variety of roof surfaces. The tests suggest that kinetic roof surface temperatures can be measured from wholly airborne data with a standard error of 1.0 C. The implications of these results for the airborne measurement of building heat loss are discussed. C.R.

A82-46502*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EQUATORIAL RESPONSE TO NORTHEASTERLY COLD SURGES AS INFERRED FROM SATELLITE CLOUD IMAGERY
K.-M. LAU (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD) Monthly Weather Review, vol. 110, Sept. 1982, p. 1306-1313. refs
(Contract NSF ATM-80-13153; NSF ATM-79-24010)

Daily convective activity in equatorial regions during Dec.-Jan., 1974-1975 was estimated from NOAA satellite data and composited in relation to the phase of cold surge episodes which then occured. Eastward and westward propagating cloud clusters displayed phase speeds of about 5 and 10 m/sec, respectively, and were generated near southwestern Borneo after a cold surge. Kelvin wave responses were indicated by confinement of the eastward-moving components to the equatorial region. Further, an analysis of symmetric and asymmetric characteristics showed that components symmetric with respect to the equator displayed a larger response amplitude, which was taken to mean that strongly trapped waves were generated from heat sources near the equator. M.S.K.

A82-46732
TECHNIQUES FOR EVALUATION OF AREA ESTIMATES
M. M. HIXSON (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 84-90. refs

Methods for evaluating area estimates based on Landsat data are discussed. Methods of proportion estimation are considered, along with qualitative and quantitative methods for the evaluation of area or proportion estimates. Attention is given to the estimation of classification accuracy, the estimation of proportions from classification results, the comparison of area or proportion estimates with a reference standard, and the comparison of such estimates with results from another analysis. Continued emphasis on results evaluation is recommended. F.G.M.

A82-46766
INVENTORY OF SEMI-ARID RANGELANDS IN SOUTH TEXAS WITH LANDSAT DATA
J. H. EVERITT, A. J. RICHARDSON, and C. L. WIEGAND (U.S. Department of Agriculture, Weslaco, TX) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 404-415. refs

A82-46768* Marshall Univ., Huntington, W. Va.
AN UNSUPERVISED CLASSIFICATION APPROACH FOR ANALYSIS OF LANDSAT DATA TO MONITOR LAND RECLAMATION IN BELMONT COUNTY, OHIO
J. O. BRUMFIELD (Marshall University, Huntington, WV), H. H. L. BLOEMER (Ohio University, Athens, OH), and W. J. CAMPBELL (NASA, Goddard Space Flight Center, Greenbelt, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 428-438. refs

Two unsupervised classification procedures for analyzing Landsat data used to monitor land reclamation in a surface mining area in east central Ohio are compared for agreement with data collected from the corresponding locations on the ground. One procedure is based on a traditional unsupervised-clustering/maximum-likelihood algorithm sequence that assumes spectral groupings in the Landsat data in n-dimensional space; the other is based on a nontraditional unsupervised-clustering/canonical-transformation/clustering hm sequence that not only assumes spectral groupings in n-dimensional space but also includes an additional feature-extraction technique. It is found that the nontraditional procedure provides an appreciable improvement in spectral groupings and apparently increases the level of accuracy in the classification of land cover categories. F.G.M.

A82-46769
REMOTE SENSING DATA APPLIED TO LAND USE SURVEY AT THE PARAIBA VALLEY
M. A. LOMBARDO, E. M. L. DE MORAES NOVO, M. NIERO, and C. FORESTI (Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 439-446. refs
(Previously announced in STAR as N82-16443)

A82-46784
BIOTIC CONTRIBUTIONS TO THE GLOBAL CARBON CYCLE THE ROLE OF REMOTE SENSING
R. A. HOUGHTON and G. M. WOODWELL (Ecosystems Center, Woods Hole, MA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p.593-600. refs

The global CO2 problem is reviewed. Changes in terrestrial vegetation and soils since 1700 are analyzed on the basis of rates of forest harvest and regrowth, rates of land conversion to agriculture, and changes in biomass and soil carbon that accompany such changes in land use. The results show that: (1) changes in land use have caused a net release of carbon into the atmosphere that, until recently, was greater than the release from combustion of fossil fuels and (2) there is still a large uncertainty in the analysis, mainly because of conflicting reports on the current rate of tropical forest destruction. The kinds of information needed to improve the analysis are outlined. It is suggested that remote sensing of forest transformations by a satellite such as Landsat may reduce the range of uncertainty by a factor of two to four. F.G.M.

A82-46899
THE WORLD CLIMATE PROGRAM - CURRENT STATUS, FUTURE PROSPECTS, AND THE ROLE OF SATELLITE OBSERVATION [VSEMIRNAIA ISSLEDOVATEL'SKAIA KLIMATICHESKAIA PROGRAMMA - SOSTOIANIE, PERSPEKTIVY I ROL' KOSMICHESKIKH SREDSTV NABLIUDENII]
K. IA. KONDRATEV Itogi Nauki i Tekhniki, Seriia Meteorologiia i Klimatologiia, vol. 8, 1982, p. 1-275. In Russian. refs

The objectives of the World Climate Program are described in detail, with particular attention given to studies of thermal processes in the ocean surface layer as a climate-forming factor, and investigations of the effect of carbon dioxide on climate. The possibilities and prospects of using satellites for monitoring climate are assessed. Particular consideration is given to the determination of such parameters as ocean surface temperature, quantitative characteristics of cloud cover, and the radiation balance of the system comprising the atmosphere and the underlying surface. B.J.

A82-47002#
OPERATIONAL IMPLEMENTATION OF SPACE TECHNOLOGY FOR DISASTERS
L. S. WALTER (United Nations, Disaster Relief Office, Geneva, Switzerland) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 6 p.
(IAF PAPER 82-243)

The field of disaster management is considered, in an effort to optimize operational implementation of space technology. Technological aspects are: satellite communications, considered in terms of disaster warnings, long-term disaster relief missions, and short-term disaster relief missions; satellite meteorology, considered in terms of severe storm warnings, crop condition assessment, flood warning, and desert locust control; and satellite remote sensing, which is currently being developed in the areas of disaster relief and prevention. Finally, operational capabilities, training procedures, and a requirements analysis are currently being examined to expedite the operational use of space technologies. R.K.R.

N82-28709*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEEDS FOR REGISTRATION AND RECTIFICATION OF SATELLITE IMAGERY FOR LAND USE AND LAND COVER AND HYDROLOGIC APPLICATIONS
L. GAYDOS *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 77-83 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The use of satellite imagery and data for registration of land use, land cover and hydrology was discussed. Maps and aggregations are made from existing the data in concert with other data in a geographic information system. Basic needs for registration and rectification of satellite imagery related to specifying, reformatting, and overlaying the data are noted. It is found that the data are sufficient for users who must expand much effort in registering data. E.A.K.

N82-28711*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA REGISTRATION AND INTEGRATION REQUIREMENTS FOR SEVERE STORMS RESEARCH
J. T. DALTON *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 97-104 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Severe storms research is characterized by temporal scales ranging from minutes (for thunderstorms and tornadoes) to hours (for hurricanes and extra-tropical cyclones). Spatial scales range from tens to hundreds of kilometers. Sources of observational data include a variety of ground based and satellite systems. Requirements for registration and intercomparison of data from these various sources are examined and the potential for operational forecasting application of techniques resulting from the

research is discussed. The sensor characteristics and processing procedures relating to the overlay and integrated analysis of satellite and surface observations for severe storms research are reviewed. E.A.K.

N82-28922# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
ENVIRONMENTAL SATELLITE IMAGERY, JULY 1981
Sep. 1981 69 p refs
(PN82-156894; KMRD-5.4-8107) Avail: NTIS HC A04/MF A01 CSCL 04B

Cloud data obtained by operational environmental satellites is described. Daily global satellite imagery in condensed form is presented as a guide and is designed to help users select data for research and climatological use. GRA

N82-30585*# Environmental Systems Research Inst., Redlands, Calif.
SURVEY OF SPATIAL DATA NEEDS AND LAND USE FORECASTING METHODS IN THE ELECTRIC UTILITY INDUSTRY Final Report
Apr. 1981 346 p refs
(Contract NAS2-10716)
(NASA-CR-166372; NAS 1.26:166372) Avail: NTIS HC A15/MF A01 CSCL 08B

A representative sample of the electric utility industry in the United States was surveyed to determine industry need for spatial data (specifically LANDSAT and other remotely sensed data) and the methods used by the industry to forecast land use changes and future energy demand. Information was acquired through interviews, written questionnaires, and reports (both published and internal). Author

N82-30605# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Office of Advanced Remote Sensing Development and Applications Support.
HIGH-ALTITUDE RADAR ASSESSMENT OF THE VOLCANIC ERUPTION OF MOUNT ST. HELENS
R. D. DILLMAN, R. E. HINKLE, and R. L. KERR Jun. 1981 40 p refs
(Contract USDA/FS-53-3187-0-29)
(PB82-164468; LEMSCO-16238-REV-A; NFAP-241) Avail: NTIS HC A03/MF A01 CSCL 02F

High-altitude side-looking airborne radar imagery of the area surrounding Mount St. Helens was analyzed using only the characteristics of the radar returns in conjunction with pre-eurption high-altitude photography. The analyst was able to establish the areal extent of the changes in lakes, topography, and damage to timber caused by the eruption. GRA

N82-31750# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF ORBITAL IMAGES AS AN ADEQUATE FORM OF CONTROL OF PRESERVED AREAS [UTILIZACAO DE IMAGENS ORBITAIS COMO FORMA ADEQUADA NO CONTROLE DE AREAS DE PRESERVACAO]
J. R. DOSSANTOS Mar. 1982 16 p refs In PORTUGUESE Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Submitted for publication Sponsored in part by the National Council for Scientific and Technical Development and the Brazilian Inst. for Forestry Development
(INPE-2064-RPE/306) Avail: NTIS HC A02/MF A01

The synoptic view and the repetitive acquisition of LANDSAT imagery provide precise information, in real time, for monitoring preserved areas based on spectral, temporal and spatial properties. The systematic annual burning, which causes the degradation of ecosystems in the National Park of Araguaia was monitored. LANDSAT imagery of channel 5 (0.6 to 0.7 microns) and 7 (0.8 to 1.1 microns), at the scale of 1:250.000, were used to identify and delimit vegetation units and burned area, based on photointerpretation parameter of tonality. The results show that the gallery forest can be discriminated from the seasonally flooded 'campo cerrado' and that 4,14% of the study areas was burned. It was concluded that LANDSAT images can be used for the implementation of environmental protection in National Parks. S.L.

N82-32791*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND AT MAGSAT ALTITUDES, PART 3
N. DEJESUSPARADA, Principal Investigator, R. P. KANE, and N. B. TRIVEDI Sep. 1982 54 p refs Sponsored by NASA ERTS
(E82-10369; NASA-CR-169316; NAS 1.26:169316; INPE-2523-RPE/415) Avail: NTIS HC A04/MF A01 CSCL 04A

The latitudinal distributions of delta H, delta X, delta Y, and delta Z were studied for quiet and disturbed periods. For quiet periods, the average patterns showed some variations common to dusk and dawn, thus indicating probable ground anomaly. However, there were significant differences too between dusk and dawn, indicating considerable diurnal variation effects. Particularly in delta Y, these effects were large and were symmetric about the dip equator. For disturbed day passes, the quiet day patterns were considered as base levels and the latter were subtracted from the former. The resulting residual latitudinal patterns were, on the average, symmetric about the geographical equator. However, individual passes showed considerable north-south asymmetries, probably indicating meanderings of the central plane of the magnetospheric ring current. M.G.

N82-33793*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF LANDSAT DATA TO MONITOR THE URBAN GROWTH OF SAO PAULO METROPOLITAN AREA
N. DEJESUSPARADA, Principal Investigator, M. NIERO, M. A. LOMBARDO, and C. FORESTI Jun. 1982 12 p refs Sponsored by NASA ERTS
(E82-10294; NASA-CR-169336; NAS 1.26:169336; INPE-2430-PRE/134) Avail: NTIS HC A02/MF A01 CSCL 08B

Urban growth from 1977 to 1979 of the region between Billings and the Guarapiranga reservoir was mapped and the problematic urban areas identified using several LANDSAT products. Visual and automatic interpretation techniques were applied to the data. Computer compatible tapes of LANDSAT multispectral scanner data were analyzed through the maximum likelihood Gaussian algorithm. The feasibility of monitoring fast urban growth by remote sensing techniques for efficient urban planning and control is demonstrated. J.D.

N82-33794*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY OF ATMOSPHERIC DIFFUSION USING LANDSAT [ESTUDO DA DIFUSAO ATMOSFERICA USANDO IMAGENS DO SATELITE LANDSAT]
J. A. TORSANI and Y. VISWANADHAM Feb. 1982 32 p refs In PORTUGUESE Submitted for publication Sponsored by NASA Original contains color illustrations
(NASA-CR-169325; INPE-2335-PRE/082) Avail: NTIS HC A03/MF A01 CSCL 04A

The parameters of diffusion patterns of atmospheric pollutants under different conditions were investigated for use in the Gaussian model for calculation of pollution concentration. Value for the divergence pattern of concentration distribution along the Y axis were determined using LANDSAT images. Multispectral scanner images of a point source plume having known characteristics, wind and temperature data, and cloud cover and solar elevation data provided by LANDSAT, were analyzed using the 1-100 system for image analysis. These measured values are compared with pollution transport as predicted by the Pasquill-Gifford, Juelich, and Hoegstroem atmospheric models. Transl. by J. D.

N82-33890*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA PARTICIPATION IN THE 1980 PEPE/NEROS PROJECT: DATA ARCHIVE
D. A. BREWER (Systems and Applied Sciences Corp., Hampton, Va.), E. E. REMSBERG, G. R. LOAR, and R. J. BENDURA Jul. 1982 92 p refs
(NASA-TM-83189; NAS 1.15:83189) Avail: NTIS HC A05/MF A01 CSCL 13B

Eight experimental air quality measurement systems were investigated during July and August 1980 as part of the EPA PEPE/NEROS fiel measurement program. Data from those efforts have been entered into an archive that may be accessed by other researchers. The data sets consists of airborne measurements of regional mixed layer heights and aerosol and ozone distributions as well as point measurements of meteorological parameters and ozone obtained during diurnal transitions in the planetary boundary layer. This report gives a discussion of each measurement system, a preliminary assessment of data quality, a description of the archive format for each data set, and a summary of several proposed scientific studies which will utilize these data. B.W.

N82-33891*# INTERA Environmental Consultants Ltd., Ottawa (Ontario).
ANALYSIS OF REMOTE SENSING DATA COLLECTED FOR DETECTION AND MAPPING OF OIL SPILLS: REDUCTION AND ANALYSIS OF MULTI-SENSOR AIRBORNE DATA OF THE NASA WALLOPS OIL SPILL EXERCISE OF NOVEMBER 1978 Final Report
May 1982 241 p refs
(Contract NAS1-16178)
(NASA-CR-165886; NAS 1.26:165886) Avail: NTIS HC A11/MF A01 CSCL 13B

Airborne, remotely sensed data of the NASA Wallops controlled oil spill were corrected, reduced and analysed. Sensor performance comparisons were made by registering data sets from different sensors, which were near-coincident in time and location. Multispectral scanner images were, in turn, overlayed with profiles of correlation between airborne and laboratory-acquired fluorosensor spectra of oil; oil-thickness contours derived (by NASA) from a scanning fluorosensor and also from a two-channel scanning microwave radiometer; and synthetic aperture radar X-HH images. Microwave scatterometer data were correlated with dual-channel (UV and TIR) line scanner images of the oil slick.
Author

03

GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A82-39212* Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
DESCRIPTION OF THE DEDICATED GRAVITATIONAL SATELLITE MISSION /GRAVSAT/
V. L. PISACANE, J. C. RAY, J. L. MACARTHUR (Johns Hopkins University, Applied Physics Laboratory, Laurel, MD), and S. E. BERGESON-WILLIS (NASA, Goddard Space Flight Center, Greenbelt, MD) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 315-321. refs
(Contract N00024-78-C-5384; NASA TASK I)

A description of the dedicated gravitational satellite (Gravsat) mission is presented. Scientific objectives are to substantially improve knowledge of solid earth geophysics and oceanography by determining a more accurate geopotential. The most stringent requirement is determination of mean gravity anomalies over regions 100-km square to an accuracy of 2.5 mgal (1 gal = 1 cm/s squared). Fundamental geodetic data will be satellite-to-satellite measurement of relative range rate. Orbital characteristics are discussed. An error budget is presented which indicates that the requisite measurement precision can be achieved by closed-loop RF doppler measurements. Implicit in the discussion of the error budget is a description of the spacecraft and systems components. (Author)

A82-39558
COMPUTER-ASSISTED CARTOGRAPHY: PRINCIPLES AND PROSPECTS
M. S. MONMONIER (Syracuse University, Syracuse, NY) Englewood Cliffs, NY, Prentice-Hall, Inc., 1982. 223 p. refs
$19

In an introduction to the considered subject, computer hardware for graphic display is considered along with an historical perspective, and aspects of implementation and planning. Attention is given to computers and algorithms, raster symbols and surface mapping, raster-mode measurement and analysis, and vector symbols, taking into account memory and logic, programming languages, mapping on the line printer, advanced developments, overlay analysis, graphic display, analysis of satellite imagery, point transformations, matrix operators, windowing and clipping, and questions of symbol generation. Cartometry and map projections are discussed along with cartographic data structures, and computer-assisted map design. Subjects explored are related to projections and transformations, cartographic data manipulation, networking and information display, topological considerations, map layout, planning color maps, feature selection, line smoothing, feature shifting, and generalization and intelligence. G.R.

A82-39561
THEORY OF THE EARTH'S SHAPE /REVISED AND UPDATED REVISION/
V. C. DRAGOMIR, D. N. GHITAU, M. S. MIHAILESKU, and M. G. ROTARU (Translation of Teoria Figurii Pamintului, Bucharest, Editura Tehnica, 1977.) Amsterdam, Elsevier Scientific Publishing Co. (Developments in Solid Earth Geophysics, No. 13), 1982. 700 p. refs
$121

Aspects of physical geodesy are examined, taking into account origin and structure of the earth, elements of potential theory, reference surfaces and coordinate systems, the perturbing potential, the determination of the geoid by gravity methods, the determination of the geoid by astro-gravimetric methods, and the determination of the earth's physical surface. Questions of ellipsoidal geodesy are discussed, giving attention to the rotation ellipsoid as reference surface in geodesy, curves on the surface of the reference ellipsoid, the reduction of the geodetic observations on the reference ellipsoid's surface, the solution of the geodetic triangles on the reference ellipsoid, and the calculation of the geodetic coordinates on the reference ellipsoid. Other topics considered are related to astro-geodetic triangulation, three-dimensional geodesy, methods for determining the terrestrial ellipsoid and the geoid, and the determination of the recent movements of the earth's crust. G.R.

A82-41561
REFERENCE SYSTEMS FOR EARTH DYNAMICS
R. O. VICENTE (Lisboa, Universidade, Lisbon, Portugal) In: Applications of modern dynamics to celestial mechanics and astrodynamics; Proceedings of the Advanced Study Institute, Cortina d'Ampezzo, Italy, August 2-14, 1981. Dordrecht, D. Reidel Publishing Co., 1982, p. 131-144. refs

A comparison is presented of reference systems employed by classical and modern techniques of observing the earth's rotation. Advantages and disadvantages of the systems so far employed are discussed. The observing campaign of project 'MERIT' emphasizes the need for consistent systems of reference. Any future system of reference for the earth's dynamics should be well defined in order to avoid past ambiguities. The future of the Conventional International Origin and proposals about the

Conventional Terrestrial System to be adopted by international agreement are presented. (Author)

A82-42053#
INVESTIGATIONS REGARDING THE RECTIFICATION OF PLANIMETRY INVOLVING VERTICAL PHOTOGRAPHY OF ROLLING TERRAIN, TAKING INTO ACCOUNT TRIANGLE MESHES [UNTERSUCHUNGEN ZUR GRUNDRISS-ENTZERRUNG VON SENKRECHTAUFNAHMEN BEWEGTEN GELAENDES IN DREIECKSMASHEN]
R. A. M. ISMAIL Berlin, Technische Universitaet, Fachbereich Bauingenieur- und Vermessungswesen, Dr.-Ing. Dissertation, 1980. 116 p. In German. refs

Rectification procedures concerning aerial photography have a wide area of applications, particularly in connection with urgent mapping requirements. Total, partial, and differential rectification methods are employed. The partial rectification method is currently little developed, although it has a potential for the rectification of planimetry in rolling terrain. The present investigation is concerned with the development of a suitable partial rectification procedure for implementing this potential. The basic principle of the developed technique involves the rectification of the surface of rolling terrain with the aid of a triangle pattern. Cartometric studies concerning five different types of terrain provide information regarding triangle characteristics as a function of aspects of triangle selection and size. A practical test of the developed procedure is also provided, and an Ortho-Mosaic is obtained by partial rectification from eleven triangles. G.R.

A82-43200
DETERMINATION OF DEFORMATIONS OF THE EARTH SURFACE BASED ON PHOTOGRAMMETRIC AND GEODETIC DATA [DEFORMATIONSBESTIMMUNG DER ERDOBERFLAECHE AUF GRUND PHOTOGRAMMETRISCHER UND GEODAETISCHER DATEN]
H.-J. HELLMEIER and K. WENDT (Braunschweig, Technische Universitaet, Brunswick, West Germany) Bildmessung und Luftbildwesen, vol. 50, Sept. 1, 1982, p. 173-180. In German. refs

Based on three photo flights with image scales of approximately 1:30,000, the possibilities of photogrammetric deformation analysis are demonstrated in the area of the neovolcanic zone in Northern Ireland. The data are shown along with the point selection and evaluation, and the merits of different analytical methods are contrasted. C.D.

A82-43452
RELIABILITY STRUCTURES OF SMALL BUNDLE SYSTEMS FOR ON-LINE TRIANGULATION
A. GRUEN (Muenchen, Technische Universitaet, Munich, West Germany) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 299-309. refs

The internal reliability structures of small photogrammetric bundle systems, which can be considered as subsystems of larger blocks, are investigated. The results show that a dense image point distribution leads to a significant improvement of the systems' blunder detection properties. For the observation of selected representative points of a nine-photo arrangement, the average diagonal element values of the weight reciprocal matrix of the residuals of the adjustment are improved by factors of 1.3-2.0 in a stereocomparator version, and by factors of 1.4-2.1 in a monocomparator version, if a 5 x 5 image point distribution is used instead of a 3 x 3 distribution. With smaller systems even larger improvement factors are obtained. C.D.

A82-43600
EFFECT OF TERRAIN ORIENTATION AND SOLAR POSITION ON SATELLITE-LEVEL LUMINANCE OBSERVATIONS
J. V. DAVE and R. BERNSTEIN (IBM Corp., Palo Alto Scientific Center, Palo Alto, CA) Remote Sensing of Environment, vol. 12, Sept. 1982, p. 331-348. refs

Changes in the luminance of a terrain along the local nadir direction are studied as a function of terrain slope, and the solar azimuth and elevation angles. The digital terrain data for the Santa Clara valley-Mt. Hamilton region of California, are used for this purpose. The elevation above mean sea-level of this selected region varies between 24 and 1,282 m. Luminance computations are performed by assuming the Lommel-Seeliger law of reflection, and the terrain reflectance to be a constant and independent of its geographic location. The atmospheric effects and contributions due to multiple reflections are neglected. It is shown that the ratio of the actual terrain luminance to that for the corresponding flat surface for 64 equal-size (4 sq km) finite subregions, changes by a very significant amount over the selected region, and also with changes in the solar position. Selected Landsat MSS band 7 data of the same region are presented for validation purposes. (Author)

A82-43698
A SATELLITE ALTIMETRIC GEOID IN THE PHILIPPINE SEA
K.-I. HORAI (Lamont-Doherty Geological Observatory, Palisades, NY) Nature, vol. 299, Sept. 9, 1982, p. 117-121. refs
(Contract N00014-80-C-0098-B)

A detailed geoidal map of the Philippine Sea, constructed from GEOS 3 altimeter data, revealed that the average geoidal height in the basins of the Philippine Sea decreases as the age of the basins increases. The geoidal height-age relationship is comparable with that of mid-oceanic ridges, suggesting that the cooling of the marginal sea basin's lithosphere after its formation is similar to that of the oceanic lithospere created at the mid-oceanic ridges. The data appear to be consistent with the back-arc opening model. However, the corner flow model is also compatible with the smoothly varying geoid over the entire Philippine Sea. (Author)

A82-44581
AN EXPERIMENT ASSESSING THE SUITABILITY OF SATELLITE PHOTOGRAPHS IN CREATING PHOTOGRAMMETRIC MAPS [OPYT ISPOL'ZOVANIIA KOSMICHESKIKH SNIMKOV DLIA SOZDANIIA FOTOPLANOV]
L. FERNANDEZ Geodeziia i Kartografiia, Aug. 1982, p. 39-41. In Russian.

Three methods of using satellite photos in the creation of photogrammetric maps with standard photogrammetric equipment are investigated. The first is optico-analytic, relying on regulating elements and not taking into consideration the curvature of the earth. The second is optico-mechanical, relying on reference points and making an allowance for the curvature of the earth. The third method is differential. Satellite photos covering tens of thousands of square kilometers of the earth's surface are used. C.R.

A82-45182#
POPSAT - A TOOL FOR EARTHQUAKE RESEARCH
C. M. WINTZER and J. N. DE VILLIERS (ESA, Earth Observation Dept., Toulouse, France) ESA Bulletin, no. 31, Aug. 1982, p. 80-85.

A concept for a high-performance geodetic satellite to monitor the motion of the earth's crustal plates is discussed. The principles of satellite geodesy are explained and existing geodetic satellites are briefly described. The influence of gravity and surface forces on Popsat are assessed, and the satellite configuration needed to deal with these forces is examined. The Popsat system configuration is described, and a possible ground-station tracking network with complete global coverage is depicted, showing visibility curves and ground tracks during a single day. The error-causing effects of dry air, atmospheric water vapor, and the ionosphere are assessed, and the role of Popsat in earthquake research is discussed. C.D.

A82-47527
UNDULATIONS IN THE ALTIMETER DERIVED GEOID - GEOPHYSICAL STUDIES
A. CAZENAVE and M. LEFEBVRE (Centre National d'Etudes Spatiales, Groupe de Recherches de Geodesie Spatiale, Toulouse, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 933-939.

Studies of the geophysical signal, detected by satellite altimeters and used to map the geoid, are presented. The study of geoid anomalies is useful in understanding the isostatic state in the upper layers of the earth. In addition, long wavelength (greater than 3,500 km) geoid undulations may be indications of density anomalies occurring at greater depths in the mantle. A strong correlation between local geoid anomalies and shallow areas of the ocean floor is detected, and satellite altimeter data makes it possible to use geoid heights in the determination of the flexural rigidity. Flexure studies can be used to infer the origin and age of volcanic features and seamounts, with the lithospheric age being known. R.K.R.

A82-47776
COINCIDENCE OF SOME MAGNETIC AND GRAVITY FIELD CHARACTERISTICS
G. BARTA (Eotvos Lorand Tudomanyegyetem, Budapest, Hungary) In: Sun and planetary system; Proceedings of the Sixth European Regional Meeting in Astronomy, Dubrovnik, Yugoslavia, October 19-23, 1981. Dordrecht, D. Reidel Publishing Co., 1982, p. 205-208.

An attempt is made to explain why the lines connecting the oceanic anomaly pairs of temperature zones incline northward toward each other rather than being perpendicular to the plane of the equator. Since the influence of the surficial source bodies diminishes with altitude more rapidly than that of global sources, the different types of anomalies were separated by moving away from the earth's surface. This was accomplished by calculating the geoid at various altitudes. During the calculations, a mathematical method was found which determined the axial directions of the two approximating rotation-symmetric figures quite uniquely. A geoid was obtained which was extrapolated back to the earth's surface and the results were subtracted from the measured geoid surface, thus giving the effect of the surficial sources. The residual map is described, and the observed connection between the magnetic and geoidal anomalies suggests that the gravity field may also undergo a secular change. C.D.

N82-28719*# Aerospace Corp., Los Angeles, Calif.
NAVSTAR/GLOBAL POSITIONING SYSTEM
M. ANANDA *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 202-206 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 17G

The Global Positioning System (GPS) was developed to provide highly precise position, velocity, and time information to users anywhere in the area of the Earth and at any time. The GPS, when fully operational, will consist of 18 satellites in six orbital planes. Any GPS user, by receiving and processing the radio signals from the satellite network can instantaneously determine navigation information to an accuracy of about 15 m in position and 0.1 m/s in velocity. The GPS is compared with other systems such as Loran-C, Omega, TACAN and Transit. T.M.

N82-28720*# National Oceanic and Atmospheric Administration, Rockville, Md. Horizontal Network Div.
GEODETIC CONTROL
J. GERGEN *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 208-214 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08E

The U.S. Horizontal Network is described for the years 1900 and 1931, and then compared with the current status of the network. North American Datum for 1946 and 1981 are also described. Relative accuracy between directly connected adjacent points were reviewed along with absolute accuracy. T.M.

N82-28721*# Georgia Univ., Athens.
MAP ACCURACY REQUIREMENTS: THE CARTOGRAPHIC POTENTIAL OF SATELLITE IMAGE DATA
R. WELCH *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 215-223 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Cartographic products fall into a variety of classes: topographic maps that are concerned with planimetric information and elevations or heights; thematic maps, which might be used for geology, vegetation, water, or to display these subjects; digital elevation maps that would be produced from digital terrain data; and finally image maps. In terms of satellite applications, thematic maps and image maps are emphasized. The objectives are to consider, first, if resolution will be adequate for the identification of control and for the compilation of map products. Then, second, to define map accuracy standards and to determine the potential for meeting these standards with image data from the film camera, scanner and linear array systems of the 1980s. T.M.

N82-28722*# Geological Survey, Reston, Va.
MAP PROJECTIONS FOR LARGER-SCALE MAPPING
J. P. SNYDER *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 224-241 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

For the U.S. Geological Survey maps at 1:1,000,000-scale and larger, the most common projections are conformal, such as the Transverse Mercator and Lambert Conformal Conic. Projections for these scales should treat the Earth as an ellipsoid. In addition, the USGS has conceived and designed some new projections, including the Space Oblique Mercator, the first map projection designed to permit low-distortion mapping of the Earth from satellite imagery, continuously following the groundtrack. The USGS has programmed nearly all pertinent projection equations for inverse and forward calculations. These are used to plot maps or to transform coordinates from one projection to another. The projections in current use are described. T.M.

N82-28734*# Geological Survey, Reston, Va.
AN AUTOMATED MAPPING SATELLITE SYSTEM
A. P. COLVOCORESES *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 428-443 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Topographic maps are compiled by manually operated stereoplotters that recreate the geometry of two wide-angle overlapping stereo frame photographs. Continuous imaging systems such as strip cameras, electro-optical scanners, or linear arrays of detectors (push brooms) can also create stereo coverage from which topography can be compiled; however, the instability of an aircraft in the atmosphere makes this approach impractical. The benign environment of space permits a satellite to orbit the Earth with very high stability as long as no local perturbing forces are involved. Solid-state linear-array sensors have no moving parts and create no perturbing force on the satellite. Digital data from highly stabilized stereo linear arrays are amenable to simplified processing to produce both planimetric imagery and elevation data. A proposed satellite, called MAPSAT, could accomplish automated mapping in near real time. Image maps as large as 1:50,000 scale with contours as close as 20-m interval may be produced from MAPSAT data. A.R.H.

N82-30581 Royal Aircraft Establishment, Farnborough (England).
TRANSFORMATION OF DATA INTO A RASTER-SCAN FORMAT AND SOME IMAGE PROCESSING APPLICATIONS
P. A. ROBERTS Dec. 1981 50 p refs
(RAE-TR-81152; RAE-SPACE-610; BR82879) Avail: Issuing Activity

Computer programs used to process and manipulate data that is in the form of either a series of contours, or a set of unconnected points, so that it can be transformed into a digital raster-scan format are described. Deliberate degradation in the spatial resolution of contour maps, and the use of terrain height information in conjunction with LANDSAT imagery, are discussed. As map

spatial resolution degrades, peak intensity decreases for an area of sky mapped at 53 microns, assuming a two-dimensional Gaussian beam shape. With LANDSAT data, a height matrix can be generated from contours or from spot heights. Height, slope, variation in direct solar illumination, and aspect can be displayed as gray tone images. Author (ESA)

N82-32728# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany). Abteilung 1: Theoretische Geodaesie.
ASSESSMENT OF TECHNOLOGY REQUIREMENTS ASSOCIATED WITH SPACEBORNE LASER RANGING. VOLUME 1: MISSION ANALYSIS, IDENTIFICATION OF REPRESENTATIVE POINT POSITIONING EXPERIMENT AND DEFINITION OF ASSOCIATED MISSION CHARACTERISTICS AND INSTRUMENT PERFORMANCE NEEDS Final Report
J. CUNO, H. DREWES, R. KELM, H. MUELLER, C. REIGBER, M. BERGE (GRGS, Toulouse), and F. NOUEL (GRGS, Toulouse) Paris ESA 5 Jun. 1981 113 p refs 2 Vol.
(Contract ESTEC-4405/80/NL-HP(SC))
(MBB-R3700/2558R-VOL-1; DGFI-1/80/SPALT; ESA-CR(P)-1605-VOL-1) Avail: NTIS HC A06/MF A01

An experiment which monitors recent crustal movements along active tectonic faults is discussed. Nearly real time orbit prediction with meter accuracy is required for laser system acquisition and pointing. Orbital fits with decimeter rms deviations are needed over the test area to derive baseline information with centimeter precision from short arcs. Laser measurement accuracy within 3 cm and epoch time precision within 0.0000015 sec are required. Minimum elevation error should be 20 deg. Author (ESA)

N82-32729# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
ASSESSMENT OF TECHNOLOGY REQUIREMENTS ASSOCIATED WITH SPACEBORNE LASER RANGING. VOLUME 2: THEORETICAL CONSIDERATIONS AND ASPECTS OF SYSTEM REALIZATION Final Report
G. BARTHEL, K. DIETRICH, T. HALLDORSSON, W. KRAUSE, G. LEIBOLD, and S. MANHART Paris ESA Mar. 1982 514 p refs 2 Vol.
(Contract ESTEC-4405/80/NL-NP(SC))
(MBB-R3700/2558R-VOL-2; ESA-CR(P)-1605-VOL-2) Avail: NTIS HC A22/MF A01

Long distance space to Earth range measurement systems and ground targets are discussed. Onboard data processing, and pointing subsystem requirements were derived. Range analysis demonstrates that high pulse energies are required if a YAG: Nd laser is used in a one color system. For a two color system, an alexandrite laser, and a distributed feedback dye laser with an excimer laser amplifier are feasible. A streak-tube receiver with a 20 cm telescope is assumed for signal detection. Ground target choice (solid or hollow retroreflector) depends on cost. The laser beams will not damage eyes. Author (ESA)

N82-32808*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
ELECTROMAGNETIC DEEP-PROBING (100-1000 KMS) OF THE EARTH'S INTERIOR FROM ARTIFICIAL SATELLITES: CONSTRAINTS ON THE REGIONAL EMPLACEMENT OF CRUSTAL RESOURCES Quarterly Progress Report, 1 Jan. - 30 Jun. 1982
J. F. HERMANCE, Principal Investigator 30 Jun. 1982 28 p refs ERTS
(Contract NAS5-26138)
(E82-10386; NASA-CR-169175; NAS 1.26:169175; QPR-7; QPR-8) Avail: NTIS HC A03/MF A01 CSCL 08G

The two stages of analysis of MAGSAT magnetic data which are designed to evaluate electromagnetic induction effects are described. The first stage consists of comparison of data from contiguous orbit passes over large scale geologic boundaries, such as ocean-land interfaces, at several levels of magnetic disturbance. The purpose of these comparisons is to separate induction effects from effects of lithospheric magnetization. The procdure for reducing the data includes: (1) identifying and subtracting quiet time effects; (2) modelling and subtracting first order ring current effects; and (3) projecting an orbit track onto a map as a nearly straight line so it can serve as an axis on which to plot the corresponding orbit pass data in the context of geography. The second stage consists of comparison of MAGSAT data with standard hourly observatory data. The purpose is to constrain the time evolution of ionospheric and magnetospheric current systems. Qualitative features of the ground based dataset are discussed. Methods for reducing the ground based data are described. M.G.

N82-32811*# Colorado Univ., Boulder. Dept. of AstroGeophysics.
INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE Quarterly Status Technical Progress Report, 1 Apr. - 30 Jun. 1982
E. R. BENTON, Principal Investigator 1 Jul. 1982 5 p ERTS
(Contract NAS5-25957)
(E82-10389; NASA-CR-169178; NAS 1.26:169178; QSTPR-10)
Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the development, testing, and evaluation of kinematic geomagnetic forecast models and their utility in magnetic prediction of the core-mantle boundary of the Earth and in determination of the core radius is reported. The GFSC 9/80 model, which uses MAGSAT data, was determined to be of high quality. J.D.

N82-32814*# Bern Univ. (Switzerland). Dept. of Geography.
TOPOCLIMATOLOGICAL SURVEY OF SWITZERLAND Final Report
M. WINIGER, Principal Investigator May 1982 39 p refs Sponsored by NASA HCMM
(E82-10392; NASA-CR-169181; NAS 1.26:169181) Avail: NTIS HC A03/MF A01 CSCL 08B

The application of Heat Capacity Mapping Mission data to subsynoptic climate analysis of Switzerland was examined. The data included the surface temperature distributions of urban heat islands and the Swiss Alps. Analog and digital data evaluation procedures are described as well as the ground truth acquisition and comparison program. The dependence of the temperature distributions on topography and surface coverage types is assessed. The results indicate that air temperature inversion zones are detectable. M.G.

N82-32817*# Iowa Univ., Iowa City. Dept. of Geology.
USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 30 Jun. 1982
R. S. CARMICHAEL, Principal Investigator and R. BLACK 22 Jun. 1982 8 p ERTS
(Contract NAS5-26425)
(E82-10395; NASA-CR-169184; NAS 1.26:169184; QR-6) Avail: NTIS HC A02/MF A01 CSCL 08G

Activities concerning the interpretation of processed MAGSAT data and maps are briefly reported. Work involving the identification of long wavelength 'regional' effects that might be associated with varying crustal thickness or Curie temperature depths is processing. M.G.

N82-33795*# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
CARTOGRAPHIC MAPPING STUDY Final Report, 20 Dec. 1981 - 20 Jun. 1982
C. WILSON, R. DYE, and L. REED Jun. 1982 78 p refs
(Contract NAS5-26820)
(NASA-CR-170446; NAS 1.26:170446; ERIM-160700-1-F) Avail: NTIS HC A05/MF A01 CSCL 08B

The errors associated with planimetric mapping of the United States using satellite remote sensing techniques are analyzed. Assumptions concerning the state of the art achievable for satellite mapping systems and platforms in the 1995 time frame are made. An analysis of these performance parameters is made using an interactive cartographic satellite computer model, after first

validating the model using LANDSAT 1 through 3 performance parameters. An investigation of current large scale (1:24,000) US National mapping techniques is made. Using the results of this investigation, and current national mapping accuracy standards, the 1995 satellite mapping system is evaluated for its ability to meet US mapping standards for planimetric and topographic mapping at scales of 1:24,000 and smaller. Author

04

GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

A82-38203
CLASSIFICATION OF THE INTERPRETATION FEATURES OF FAULTS [O KLASSIFIKATSII DESHIFROVOCHNYKH PRIZNAKOV RAZRYVNYKH NARUSHENII]
M. L. KOPP and E. F. RUMIANTSEVA (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 24-33. In Russian. refs

The interpretation features of crustal faults on remote sensing images are divided into three groups: (1) structural-geological features, involving the relationship of faults to displaced or deformed geological objects; (2) landscape features, involving the relationship between faults and later exogenous landscape features; and (3) geometrical features, involving shape and pattern characteristics. Each of the groups is described, and examples of application are condidered. B.J.

A82-38205
ERRORS IN THE GEOLOGICAL INTERPRETATION OF SPACE PHOTOGRAPHS OF WESTERN SIBERIA [OB OSHIBKAKH V GEOLOGICHESKOI INTERPRETATSII KOSMICHESKIKH SNIMKOV ZAPADNOI SIBIRI]
I. L. KUZIN (Vsesoiuznyi Neftianoi Nauchno-Issledovatel'skii Geologorazvedochnyi Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 43-46. In Russian. refs

It is noted that the geological interpretation of remote sensing data can lead to erroneous conclusions if the interpretation is not based on a careful analysis of regional geological data. As an example of such erroneous conclusions, reference is made to Astakhov's structural interpretation of the upper horizons of the sedimentary cover of the western Siberian platform. B.J.

A82-38206
METHODS FOR THE GEOLOGICAL INTERPRETATION OF SPACE PHOTOGRAPHS OF REGIONS WITH PLATFORM COVER [K METODIKE GEOLOGICHESKOI INTERPRETATSII KOSMICHESKIKH SNIMKOV ZAKRYTYKH RAIANOV]
V. I. ASTAKHOV (Vsesiuznoe Aerogeologicheskoe Nauchno-Proizvodstvennoe Ob'edinenie Aerogeologiia, Leningrad, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 47-52. In Russian. refs

The author answers Kuzin's (1982) critique of the author's views concerning the structure of the upper part of the sedimentary cover of the western Siberian platform. The basic principles underlying the geological interpretation of remote sensing images of the western Siberian platform are elucidated in response to Kuzin's critique. The origin of large terrain forms in the glacial region of the western Siberian plain is discussed. B.J.

A82-39214* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADAR IMAGE PROCESSING FOR ROCK-TYPE DISCRIMINATION
R. G. BLOM (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) and M. DAILY (Mobil Oil Corp., Dallas, TX) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 343-351. NASA-supported research. refs

Image processing and enhancement techniques for improving the geologic utility of digital satellite radar images are reviewed. Preprocessing techniques such as mean and variance correction on a range or azimuth line by line basis to provide uniformly illuminated swaths, median value filtering for four-look imagery to eliminate speckle, and geometric rectification using a priori elevation data. Examples are presented of application of preprocessing methods to Seasat and Landsat data, and Seasat SAR imagery was coregistered with Landsat imagery to form composite scenes. A polynomial was developed to distort the radar picture to fit the Landsat image of a 90 x 90 km sq grid, using Landsat color ratios with Seasat intensities. Subsequent linear discrimination analysis was employed to discriminate rock types from known areas. Seasat additions to the Landsat data improved rock identification by 7%. M.S.K.

A82-39287
MATHEMATICAL METHODS IN THE GEOLOGICAL INTERPRETATION OF AERIAL PHOTOGRAPHS [MATEMATICHESKIE METODY V GEOLOGICHESKOM DESHIFRIROVANII AEROFOTOSNIMKOV]
N. F. AFANASEV, K. M. PETROV, A. V. TEOSEV, V. V. GORKIN, V. G. MOZHAEVA, A. A. RUKOIATKIN, V. N. SIBIREV, N. V. RACHEVA, N. K. GRUZDEVA, and A. G. BOGOLIUBOV Moscow, Izdatel'stvo Nedra, 1981. 280 p. In Russian. refs

The work examines theoretical and practical problems in the application of mathematical methods to the geological interpretation of aerial photographs. Attention is given to the formalization of geological interpretation, the processing of half-tone and binary images, and the interpretation of a complex of geological features. Mathematical models and algorithms for the solution of certain typical problems of geological interpretation are presented; these problems include the structural and tectonic interpretation of lineaments and the prediction of local structure on the basis of an analysis of relief and river networks. B.J.

A82-43283
DEVELOPMENT OF AN AERIAL-PHOTOGRAPHY METHOD FOR GEOLOGICAL PURPOSES [RAZVITIE METODA AEROFOTOGRAFII DLIA GEOLOGICHESKIKH TSELEI]
V. A. GORBATOV and A. N. MOISEENKOV (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 41-43. In Russian.

Two directions in the development of aerial photography are considered: high-altitude aerial photography and small-format (or small-scale) aerial photography. The basic features, applications, and advantages of the two techniques are briefly described. B.J.

A82-43443
DESERT VARNISH IN ARIZONA - DISTRIBUTION AND SPECTRAL CHARACTERISTICS
C. D. ELVIDGE (Stanford University, Stanford, CA) and C. J. COLLET (Fribourg, Universite, Fribourg, Switzerland) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 215-222. refs

It is noted that since desert varnish (the dark coat of clay and ferromanganese oxides that forms on exposed rock surfaces in

arid regions) forms by the accretion of material from windblown dust, its composition is not affected by the composition of the underlying rock. The spectrum of the varnish varies little from one rock type to another. The varnish thus tends to obscure rock lithologies in remote sensing. A radiometric examination of varnished surfaces in Arizona reveals that desert varnish has low reflectivities across the four Landsat bands. A comparison of these field spectra and Landsat spectra for pixels inside and surrounding a large rock sar in a heavily varnished range west of Phoenix indicates that the loss of desert varnish contributes significantly to the visibility of the scar. It is pointed out that the distribution of desert varnish has been mapped in Arizona using ground-based observations. C.R.

A82-43444
ANALYSIS OF FRACTURATION FIELD - CONTRIBUTION OF DATA STRUCTURING
D. LEFEBVRE (Paris VI, Universite, Paris, France) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 223-233. refs

A new methodology for the investigation of fracturation field is presented. Using a laser beam as the basic tool, a methodology based on a new topological data base is developed. This data base can be used as a structuration tool and is especially suited to geological problems. In Earth Sciences, it appears that the topological aspect of a phenomenon must be taken into account prior to the metrical one. A case study of the Rhine-Saone transform zone is shown, and the capabilities of the methodology are emphasized. (Author)

A82-43467* Arkansas Univ., Fayetteville.
OPTIMIZATION OF RADAR IMAGING SYSTEM PARAMETERS FOR GEOLOGICAL ANALYSIS
W. P. WAITE, H. C. MACDONALD, and V. H. KAUPP (Arkansas, University, Fayetteville, AR) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 504-512.
(Contract NAG9-3; NAG5-20)

The use of radar image simulation to model terrain variation and determine optimum sensor parameters for geological analysis is described. Optimum incidence angle is determined by the simulation, which evaluates separately the discrimination of surface features possible due to terrain geometry and that due to terrain scattering. Depending on the relative relief, slope, and scattering cross section, optimum incidence angle may vary from 20 to 80 degrees. Large incident angle imagery (more than 60 deg) is best for the widest range of geological applications, but in many cases these large angles cannot be achieved by satellite systems. Low relief regions require low incidence angles (less than 30 deg), so a satellite system serving a broad range of applications should have at least two selectable angles of incidence. A.B.

A82-43471
WASHINGTON STATE'S LARGE SCALE ORTHO PROGRAM
R. A. HARDING (Washington State, Dept. of Natural Resources, Olympia, WA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 558-564.

A plan worked out by the Department of Natural Resources (DNR) of the state of Washington and the U.S. Geological Survey to provide complete coverage of the state in seven years is described, noting that the plan grew out of cooperative efforts during the eruption of Mount St. Helens. The DNR has acquired a photogrammetric mapping system that meets the combined needs for orthophotos, topographic maps, and large-scale engineering maps. The DNR will provide digital terrain profiles to the Geological Survey for the production of the ortho negatives. The standard product that will be distributed by the DNR is a diazo copy at 1:12,000 by quarter township. The Geological Survey will, as required, produce standard 1:24,000 ortho quads. In addition, special order products from the DNR will be available at scales specified by the user. The image remains sharp when enlarged to 1:4800 and can also be used at 1:2400. C.R.

A82-44676#
THE RESEARCH AND DEVELOPMENT PROGRAMME OF THE EUROPEAN COMMUNITIES IN THE FIELD OF REMOTE SENSING APPLIED TO MINERAL EXPLORATION - SOME PRELIMINARY RESULTS
L. VAN WAMBEKE (Commission of the European Communities, Brussels, Belgium) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 10 p. refs
(IAF PAPER 82-117)

Results from recent activities of the European communities in remote sensing applied to mineral exploration are presented. Using Landsat imagery, lineaments and circular features of Greenland indicate a relationship between some sulfide mineralizations and a major lineament in the northern area, and numerous limonitic alteration zones have been delineated. Other remote sensing techniques are presented, implying several conclusions. First, remote sensing can be used to search for certain types of ore deposits, even deep-seated mineralization. Second, ground truth is found to be an essential factor in data interpretation. Third, the data must be computer-processed in order to enhance geological features, assuming that a known test site, located in the same climatic conditions, is examined. Remote sensing can, in most cases, substitute airborne methods, and further mineral prospecting information is expected from the thermal infrared sensor of Landsat D, the stereo coverage of SPOT, and higher resolution sensors. R.K.R.

A82-44881
ELECTROMAGNETIC SCATTERING FROM GEOPHYSICAL TARGETS BY MEANS OF THE T MATRIX APPROACH - A REVIEW OF SOME RECENT RESULTS
G. KRISTENSSON and S. STROM (Institute of Theoretical Physics, Goteborg, Sweden) (International Union of Radio Science, Open Symposium on Mathematical Models in Radio Propagation, Washington, DC, Aug. 10-19, 1981.) Radio Science, vol. 17, Sept.-Oct. 1982, p. 903-912. Research supported by the Styrelsen for Teknisk Utveckling. refs

Recent studies on the scattering of electromagentic waves from various geophysical targets by means of the T matrix approach are reviewed. The basic features of this approach as applied to electromagnetic waves are discussed, and the algebraic structure of the resulting equations for single and multiple scattering situations is examined with special emphasis on the case of an infinite interface and an adjacent finite inhomogeneity in one of the half spaces. Applications of this method for electromagnetic prospecting are considered in detail, in which the bedrock is modeled as a lossy half space and the various configurations of ore bodies in this half space are determiend. The behavior of the field in the vicinity of the inhomogeneity and interference effects are studied. Since actual ore bodies are often rather thin plates, applications which consider the half space as layered are examined in detail, and the inhomogeneity is taken to be a perfectly conducting spheroid or a perfectly conducting disc. N.B.

A82-45212
THE USES OF SPACE-BASED INFORMATION IN PETROLEUM GEOLOGY [ISPOL'ZOVANIE KOSMICHESKOI INFORMATSII V NEFTIANOI GEOLOGII]
L. G. KIRIUKHIN, (ED.) and S. E. PETROV Moscow, Vsesoiuznyi Nauchno-Issledovatel'skii Geologorazvedochnyi Neftianoi Institut (VNIGNI, Trudy, No. 232), 1981. 153 p. In Russian.

Studies are presented concerning the application of remote sensing data to the investigation of territories which are of interest

for petroleum geology. Topics discussed include examinations of the primary geological problems which can be investigated by remote sensing methods, the types of space-based data obtained and the geological information they can provide, basic methods of interpreting satellite pictures, as well as methods for the comprehensive interpretations of geological, geophysical, and space-based data used in compiling specialized maps. In addition, the practical results achieved during investigations of various petroleum-containing regions in the USSR (including the Caspian, North Caucasus, Volga-Ural, Timan-Pechora, and West Siberian regions) are examined. N.B.

A82-45411
AN ANALYSIS OF THE SPECTRAL SIGNATURES OF ROCKY FORMATIONS OF MOUNT LOZERE /FRANCE/ [ANALYSE DES SIGNATURES SPECTRALES DE FORMATIONS ROCHEUSES DU MONT LOZERE /FRANCE/]
P. KUNTZ (Paris VI, Universite, Paris, France), A. SIMONIN (CNRS, Centre d'Etudes et de Recherches Cartographiques Geographiques, Paris, France), G. GUYOT, and M. VERBRUGGHE (Institut National de la Recherche Agronomique, Montfavet, Vaucluse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 147-155. In French. refs

Visible and near-IR spectral monitoring of the rock facies of Mount Lozere were performed at four sites with a spectrometer to detect signature alterations due to weathering, the presence of a water film, and the growth of vegetation. Measurements were also made on the ground and in the laboratory for comparison purposes. The channels used corresponded to the Landsat band between 450-2500 nm. Scans were made to porphyritic granite, metamorphic schists, and limestone. Vegetation was found to diminish the visible reflectance and increase the near-IR. Laboratory calibration was found to be insufficient for characterizing field results, which require additional measurements on-site. Augmenting the radiance data with statistical distributions of the different spectral bands to obtain better identifications is indicated. M.S.K.

A82-46154
TECTONIC MAP OF THE UKRAINIAN SHIELD FROM SPACE DATA [KOSMOTEKTONICHESKAIA KARTA UKRAINSKOGO SHCHITA]
IA. N. BELEVTSEV, S. S. BYSTREVSKAIA, N. P. SEMENIUK, G. A. ZEMSKOV, and E. A. ZYKOV (Akademiia Nauk Ukrainskoi SSSR, Institut Geokhimii i Fiziki Mineralov, Kiev, Ukrainian SSR; Proizvodstvenno-Geologicheskoe Ob'edinenie Kirovgeologiia, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 5-14. In Russian. refs

The first tectonic map of the Ukrainian shield and its slopes obtained on the basis of remote sensing data is presented. The principles underlying the compilation of this 1:1,000,000 scale map are described, and the main features of the map are examined. Particular attention is given to lineaments and areal oval-ring structures, and a discussion of the age and spatial correlations of these features is presented. B.J.

A82-46155
METHOD FOR DETERMINING THE OPTIMAL AREA OF AVERAGING OF THE GEOMETRIC PARAMETERS OF LINEAMENT GRIDS [O SPOSOBE OPREDELENIIA OPTIMAL'NOI PLOSHCHADI OSREDNENIIA GEOMETRICHESKIKH PARAMETROV LINEAMENTNYKH SETEI]
O. G. SHEREMENT, V. M. MORALEV, and V. E. GONIKBERG (Akademiia Nauk SSSR, Institut Litosfery, Moscow, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 15-19. In Russian.

The digital processing of lineament patterns obtained in the interpretation of space remote sensing data requires the determination of grid size for the averaging of geometric parameters. An approach to the estimation of optimal square size is proposed which can be used to forecast the distribution of endogenous ore deposits. An optimal grid size is determined by calculating minimum noise values and minimum signal variations. This procedure makes possible an initial-data compression that is sufficient for practical purposes. B.J.

A82-46156
PAMIR LINEAMENTS AND THEIR ORE-CONTROLLING SIGNIFICANCE [LINEAMENTY PAMIRA I IKH RUDOKONTROLIRUIUSHCHEE ZNACHENIE]
M. M. BEZUGLYI (Gosudarstvennyi Nauchno-Issledovatel'skii i Proizvodstvennyi Tsentr Priroda, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 20-25. In Russian. refs

Space photographs of the Pamir region reveal lineaments that correspond to late alpine faults and fracture zones initiated at different times and active at the neotectonic epoch. Submeridional and sublatitudinal lineaments, transverse to the structural pattern of the region, are dominant. The greatest density of lineaments is found in the southwestern Pamir, where earthquake epicenters and thermal springs are concentrated. Ore-bearing areas with endogenous mineralization of mainly hydrothermal type are located in fields of greatest lineament density. B.J.

A82-46157
STRUCTURAL FEATURES OF THE GREATER CAUCASUS AS REVEALED IN SPACE PHOTOGRAPHS [OSOBENNOSTI STROENIIA BOL'SHOGO KAVKAZA, VYIAVLENNYE PO KOSMICHESKIM SNIMKAM]
G. G. BUNIN (Akademiia Nauk SSSR, Institut Geologii, Makhachkala, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 26-32. In Russian. refs

Recent remote sensing data indicate that the Greater Caucasus can be considered as a sharp-arc archipelago consisting of separate microplates and ancient platform blocks. The eastern part of the Caucasus is found to be separated from the ridge, and an independent tectonic element, the Daghestanian (marginal) block, is identified. B.J.

A82-46159
CONCERNING LINEAMENT INTERPRETATION FOR THE SOUTHERN SLOPE OF THE GREATER CAUCASUS /IN AZERBAIDZHAN/ [K VOPROSU DESHIFRIROVANIIA LINEAMENTOV IUZHNOGO SKLONA BOL'SHOGO KAVKAZA /V PREDELAKH AZERBAIDZHANSKOI SSR/]
B. A. BUDAGOV, A. A. MIKAILOV, and A. S. ALIEV (Akademiia Nauk Azerbaidzhanskoi SSR, Institut Geografii, Baku, Azerbaidzhan SSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 41-44. In Russian. refs

Linear and areal morphostructures of the southern slope of the Greater Caucasus have been identified on the basis of the interpretation of space remote sensing imagery. The lineament scheme for the southern slope is presented, and the characteristic features of major faults are examined. B.J.

A82-46160
RESULTS OF THE STRUCTURAL MAPPING OF THE EASTERN DONETSK COAL BASIN ON THE BASIS OF SPACE IMAGERY [REZUL'TATY STRUKTURNOGO KARTIROVANIIA VOSTOCHNOGO DONBASSA S ISPOL'ZOVANIEM KOSMICHESKIKH SNIMKOV]
N. N. POGREBNOV (Vsesoiuznyi Nauchno-Issledovatel'skii Geologorazvedochnyi Institut Ugol'nykh Mestorozhdenii, Rostov-on-Don, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 45-52. In Russian. refs

Remote sensing data were used to study the Donetsk Coal Basin in order to assess the possibility of employing such data to investigate coal-bearing formations. Fractures of various orders, faults, folded and ring structures in coal sequences, and borders of lithological complexes were identified. Diametrical, diagonal, and ring structures, identified in this region for the first time, were found to be widespread. The effects of fractures and ring structures on coal-deposit formation are discussed. B.J.

A82-46546* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PETROLOGY OF DUNE SAND DERIVED FROM BASALT ON THE KA'U DESERT, HAWAII
J. L. GOODING (NASA, Johnson Space Center, Houston, TX; California Institute of Technology, Pasadena, CA) Journal of Geology, vol. 90, 1982, p. 97-108. NASA-supported research. refs

Dune sand from the Ka'u Desert, southwest flank of Kilauea volcano, Hawaii, is moderately well-sorted (median = 1.60 Phi, deviation = 0.60, skewness = 0.25, kurtosis = 0.68) and composed mostly of frosted subangular particles of basalt glass ('unfractionated' olivine-normative tholeiite), olivine, lithic fragments (subophitic and intersertal basalts; magnetite-ilmenite-rich basalts), reticular basalt glass, magnetite, ilmenite, and plagioclase, in approximately that order of abundance. Quantitative lithological comparison of the dune sand with sand-sized ash from the Keanakakoi Formation supports suggestions that the dune sand was derived largely from Keanakakoi ash. The dune sand is too well sorted to have been emplaced in its present form by base-surge but could have evolved by post-eruption reworking of the ash. (Author)

A82-46733
COMPLETE LINEAMENT EXTRACTION WITH THE AID OF SHADOW-FREE LANDSAT IMAGE
K. FUKUE, H. SHIMODA, and T. SAKATA (Tokai University, Hiratsuka, Kanagawa, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 94-102.

A method is described for generating a virtual Landsat MSS image with illumination at any sun angle. In the method, shadows are eliminated by applying a shadow-free land cover classification to an original Landsat image, a three-dimensional model of the object area is constructed for calculating the shadowed areas, and an artificially shadowed image with a specific sun angle is produced by making a cosine correction and using a three-dimensional reflective model. Virtual images with four different sun angles are generated. The virtual image with the angle perpendicular to that in the original image is combined with the original to extract a complete set of geologic lineaments F.G.M.

A82-46734
A LINEAMENT ENHANCEMENT TECHNIQUE FOR ACTIVE FAULT ANALYSIS
H. TAKAHASHI (IBM Japan, Tokyo, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 103-112.

A powerful but simple lineament enhancement technique is developed as a tool for the detection of active earthquake faults. The technique consists of a first step in which an edge image is made for an original image by running a unique filter that adopts differentiation under increase conditions and an upper limit for large values, and a directional filtering second step in which a thin slit is rotated around every pixel in the differential image and the average value in the slit is calculated. This technique is tested by applying it to Landsat images where many active faults are located. It is found that lineament enhancement shows some linear lines difficult to detect in the original image, and can help exclude subjectivity by analysts. N.B.

A82-46735
EXTRACTION OF GEOLOGICAL LINEAMENTS FROM LANDSAT IMAGERY BY USING LOCAL VARIANCE AND GRADIENT TREND
S. R. XU, C. C. LI, and N. K. FLINT (Pittsburgh, University, Pittsburgh, PA) In: Machine Processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 113-123. refs
(Contract NSF ENG-79-1371; NSF MCS-77-09374)

A82-46736
GEOLOGIC APPLICATION OF LANDSAT IMAGERY ENHANCED BY TOPOGRAPHIC DATA
G. ROCHON (Universite Laval, Sainte-Foy, Quebec, Canada) and M. ROKSANDIC (SOQUIP, Sainte-Foy, Quebec, Canada) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 124-131. refs

For the structural analysis of geologic phenomena, a technique is developed to manipulate Landsat radiances under the control of simulated illumination conditions and viewing geometry. The basic methodology involves the creation of a digital elevation model, the computation of surface orientations and viewing geometry, the integration of geometrically corrected Landsat imagery with topographic data, the transformation of radiances from each MSS band, and the generation of composite images. The application of the technique is demonstrated using examples in which lineaments are identified and mapped and in which the geologic nature of lineaments mapped from Landsat/topographic images is determined. It is shown that, although the technique requires a long computing time to process the data, the interpretation of geologic features is dramatically enhanced. F.G.M.

A82-46737* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF RESOLUTION VERSUS SPECKLE IN SPACEBORNE RADAR IMAGE INTERPRETATION - A GEOLOGIC-USER BASED ANALYSIS
J. P. FORD (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 132-138. NASA-supported research.

A82-46955#
THE EFFICIENCY OF SPACE GEOLOGICAL INVESTIGATIONS IN THE USSR
S. M. BOGORODSKII (Ob'edinenie Aerogeologiia, Moscow, USSR) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 3 p.
(IAF PAPER 82-116)

The uses of various types of space images of earth obtained by the Soviet Union are summarized from the Soviet perspective, and some practical applications of Soviet remote sensing are described. For continental, regional, local, and detailed images, the instruments with which they are obtained, the altitude at which they are made, and their uses are stated. Recent progress in tectonic and mineragenic mapping and geological surveys of the USSR by means of remote sensing are discussed, giving details of findings in the various regions of the country. C.D.

N82-28710*# Geological Survey, Flagstaff, Ariz.
REGISTRATION AND RECTIFICATION NEEDS OF GEOLOGY
P. S. CHAVEZ, JR. *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 84-95 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Geologic applications of remotely sensed imaging encompass five areas of interest. The five areas include: (1) enhancement and analysis of individual images; (2) work with small area mosaics of imagery which have been map projection rectified to individual quadrangles; (3) development of large area mosaics of multiple images for several counties or states; (4) registration of multitemporal images; and (5) data integration from several sensors and map sources. Examples for each of these types of applications are summarized. E.A.K.

N82-28744# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, MITCHELL QUADRANGLE, SOUTH DAKOTA, VOLUME 1 Final Report
Apr. 1981 97 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005544; GJBX-385-81-VOL-1) Avail: NTIS HC A05/MF A01

An airborne high sensitivity gamma-ray spectrometer and magnetometer survey was conducted over eleven 20 x 10 quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 quadrangles in North and South Dakota. The quadrangles located within the North and South Dakota survey area include Devil's Lake, New Rockford, Jamestown, Aberdeen, Huron, Mitchell, and Sioux Falls. The results obtained over the Mitchell map area are discussed. Geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States is given. Traverse lines were flown in an east-west direction at a line spacing of six miles. Tie lines were flown north-south approximately twenty-four miles apart. A total of 21,481 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1479 line were miles are in this quadrangle. DOE

N82-28745# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, MITCHELL QUADRANGLE, SOUTH DAKOTA, VOLUME 2 Final Report
Apr. 1981 124 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005572; GJBX-385-81-VOL-2) Avail: NTIS HC A06/MF A01

The results of a high-sensitivity aerial gamma-ray spectrometer survey of the Mitchell Quadrangle, South Dakota are presented. Geologic information to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the US is given in chart form. DOE

N82-28746# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, NEW ROCKFORD QUADRANGLE, NORTH DAKOTA Final Report
Apr. 1981 98 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005535; GJBX-387-81-VOL-1) Avail: NTIS HC A05/MF A01

An airborne high sensitivity gamma-ray spectrometer and magnetometer survey was conducted over eleven 20 x 10 quadrangles located in the states of Minnesota and Wisconsin and seven (7) 20 x 10 quadrangles in North and South Dakota. The quadrangles located within the North and South Dakota survey area include Devil's Lake, New Rockford, Jamestown, Aberdeen, Huron, Mitchell, and Sioux Falls. The results obtained over the New Rockford map area are discussed. Traverse lines were flown in an east-west direction at a line spacing of six miles. Tie lines were flown north-south approximately twenty-four miles apart. A total of 21,481 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1397 line miles are in this quadrangle. Geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States is given. DOE

N82-28747# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: NEW ROCKFORD QUADRANGLE, NORTH DAKOTA, VOLUME 2 Final Report
Apr. 1981 120 p
(Contract DE-AC13-76GJ-01664)
(DE82-005569; GJBX-387-81-VOL-2) Avail: NTIS HC A06/MF A01

The flight path, radiometric multiparameter staked profiles, magentic and ancillary parameter stacked profiles are presented. Histograms, and anomaly maps for the New Rockford Quadrangle in North Dakota are included. DOE

N82-28748# Oak Ridge Gaseous Diffusion Plant, Tenn. Office of Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR SHERIDAN QUADRANGLE, WYOMING
31 Aug. 1981 175 p refs
(Contract W-7405-ENG-26)
(DE82-002467; GJBX-362-81; K/UR-393) Avail: NTIS HC A08/MF A01

Field and laboratory data are presented for 582 water samples and 526 sediment samples from the Sheridan Quadrangle, Wyoming. The samples were collected and uranium analysis performed. Multielement analysis and data reporting were performed. DOE

N82-28749# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: CRESCENT QUADRANGLE, BURNS QUADRANGLE, CANYON CITY QUADRANGLE, BEND QUADRANGLE, SALEM QUADRANGLE (OREGON) Final Report
1981 84 p Prepared in cooperation with QEB, Inc.
(Contract DE-AC13-79GH-01692)
(DE81-029063; GJBX-240-81-VOL-1) Avail: NTIS HC A05/MF A01

An airborne combining radiometric and magnetic survey was performed over the area covered by the Burns, Crescent, Canyon City, Bend, and Salem, Washington. Data were collected by a helicopter equipped with a gamma-ray spectrometer having a large crystal volume, and a high sensitivity proton precession magnetometer. The radiometric system was calibrated. Data quality was ensured throughout the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, plotted, and contoured to produce anomaly maps based on the radiometric response of individual geological units. These maps were interpreted and an anomaly interpretation map produced. DOE

N82-28750# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY COOS BAY, OREGON, VOLUME 1 Final Report
May 1981 133 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005534; GJBX-408-81-VOL-1) Avail: NTIS HC A07/MF A01

During the months of August, September, and October of 1980 an airborne high sensitivity gamma-ray spectrometer and magnetometer survey over ten (1) areas over northern California and southwestern Oregon was conducted. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 10 x 20 areas of the Coos Bay quandrangle and the Crescent City/Eureka areas combined. The results obtained over the Coos Bay, Oregon, map area are discussed. Line spacing was generally six miles for east-west transverse and eighteen miles for north-south tie lines over the northern one-half of the area. Traverses and tie lines were flown at three miles and twelve miles respectively over the southern one-half of the area. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 863.8 line miles are in this quadrangle. DOE

N82-28753# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluaton Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR OPHIR, ALASKA
31 Jul. 1981 110 p refs
(Contract W-7405-ENG-81)
(DE82-000851; GJBX-323-81; K/UR-362) Avail: NTIS HC A06/MF A01

Field and laboratory data are presented for 727 water samples from the Ophir Quadrangle, Alaska. The samples, laboratory analysis, and data reporting are discussed. DOE

N82-28754# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR CHEYENNE QUADRANGLE, WYOMING
31 Jul. 1981 169 p refs
(Contract W-7405-ENG-26)
(DE82-000786; GJBX-324-81; K/UR-365) Avail: NTIS HC A08/MF A01

Field and laboratory data are presented for 884 water samples and 598 sediment samples from the Cheyenne Quadrangle, Wyoming. Uranium values, laboratory analysis, and data are reported. DOE

N82-28755# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR PRESTON QUADRANGLE, WYOMING; IDAHO
30 Jun. 1981 139 p refs
(Contract W-7405-ENG-26)
(DE82-000783; GJBX-325-81; K/UR-368) Avail: NTIS HC A07/MF A01

Field and laboratory data are presented for 410 water samples and 702 sediment samples. Uranium values, samples, laboratory analysis, and data reporting are discussed. DOE

N82-28756# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR TULAROSA QUADRANGLE, NEW MEXICO
31 Jul. 1981 217 p refs
(Contract W-7405-ENG-26)
(DE82-000787; GJBX-326-81; K-UR-370) Avail: NTIS HC A10/MF A01

Field and laboratory data are presented for 284 water samples and 1847 sediment samples from the Tularosa Quadrangle, New Mexico. Laboratory analysis and data reporting were performed. Data is presented in chart form. DOE

N82-28760# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR AZTEC QUADRANGLE NEW MEXICO
31 Jul. 1981 203 p refs
(Contract W-7405-ENG-26)
(DE82-000853; GJBX-321-81; K/UR-348) Avail: NTIS HC A10/MF A01

Uranium resources for national energy planning were assessed, and areas favorable for uranium resources were identified. Field and laboratory data are presented for 331 water samples and 1693 sediment samples from the Aztec Quadrangle, New Mexico. Uranium values are reported and samples were collected. DOE

N82-28762# Oak Ridge Gaseous Diffusion Plant, Tenn. Office of Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR BROWNFIELD QUADRANGLE, NEW MEXICO; TEXAS
30 Jun. 1981 118 p refs
(Contract W-7405-ENG-26)
(DE82-000855; GJBX-319-81; K/UR-339) Avail: NTIS HC A06/MF A01

Field and labortory data are presented for 452 water samples and 351 sediment samples. Uranium values, samples, laboratory analysis and data are discussed. DOE

N82-28763# Oak Ridge Gaseous Diffusion Plant, Tenn.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR DALLAS NTMS QUADRANGLE, TEXAS
31 Jul. 1981 189 p refs
(Contract W-7405-ENG-26)
(DE82-000856; GJBX-318-81; K/UR-157) Avail: NTIS HC A09/MF A01

A reconnaissance geochemical survey of the Dallas Quadrangle, Texas is reported. Field and labortory data are presented for 284 groundwater and 545 stream sediment samples. Statistical and areal distribution plots of uranium and possible uranium related variables are displayed. A generalized geologic map of the survey area is provided. Groundwater produced from the Navarro Group, Neylandville Formation, Marlbrook Marl, and the Glen Rose and Twin Mountains Formations exhibit anomalous uranium (9.05 ppB) and specific conductance values. The anomalies represent a southern extension of a similar trend observed in the Sherman Quadrangle, K/UR-110. Stream sediments representing the Eagle Ford Group and Woodbine Formation exhibit the highest concentrations of total and hot acid soluble uranium and thorium of samples collected in the Dallas Quadrangle. The U/TU value indicates that 80% of this uranium is present in a soluble form. DOE

N82-28765# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, ROSEBURG QUADRANGLE, OREGON, VOLUME 1 Final Report
Mar. 1981 121 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005536; GJBX-388-81-VOL-1) Avail: NTIS HC A06/MF A01

Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. Tie lines were flown north-south approximately eighteen (18) miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1596 line miles are in this quadrangle. DOE

N82-29678*# Columbia Univ., New York. Lab. of Applied Geophysics.
INFRARED AIRBORNE SPECTRORADIOMETER SURVEY RESULTS IN THE WESTERN NEVADA AREA Final Report
W. COLLINS, S. H. CHANG, and J. T. KUO May 1982 64 p refs
(Contract NAS7-100; JPL-955832)
(NASA-CR-169207; NAS 1.26:169207) Avail: NTIS HC A04/MF A01 CSCL 08B

The Mark II airborne spectroradiometer system was flown over several geologic test sites in western Nevada. The infrared mineral absorption bands were observed and recorded for the first time using an airborne system with high spectral resolution in the 2.0 to 2.5 micron region. The data show that the hydrothermal alteration zone minerals, carbonates, and other minerals are clearly visible in the airborne survey mode. The finer spectral features that distinguish the various minerals with infrared bands are also clearly visible in the airborne survey data. Using specialized computer pattern recognition methods, it is possible to identify mineralogy and map alteration zones and lithologies by airborne spectroradiometer survey techniques. Author

N82-29680# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, JORDON QUADRANGLE, MONTANA Final Report
1981 154 p refs Prepared in cooperation with QEB, Inc., Lakewood, Colo. 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE81-025700; GJBX-180-81-VOL-2C) Avail: NTIS HC A08/MF A01

Thirty-one uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Anomalies No. 1 to No. 3, and No. 10 to No. 12 are over areas underlain by the Tertiary Fort Union formation (Tftr, Tfu, Tft, Tfl). The lignites in this formation are commonly uranium-bearing. Anomaly No. 4 is over an area underlain by late Cretaceous Bearpaw Shale (Kb) and Hell Creek formation (Khc). Anomalies No. 5 and No. 6 are over areas underlain by late Cretaceous Bearpaw Shale (Kb). Anomaly No. 7 is over an area underlain by late Cretaceous Bearpaw Shale (Kb) and Fox Hills Sandstone (Kfh). Anomalies No. 8, No. 14 to No. 16, and No. 23 to No. 30 are over areas underlain by late Cretaceous Bearpaw Shale (Kb). Anomaly No. 9 is over an area underlain by late Cretaceous Fox Hills Sandstone (Kfh). Anomalies No. 13 and No. 20 are over areas underlain by the late Cretaceous Hell Creek formation (Khc) and the Tertiary Fort union formation (Tfl). The lignite seams in both these formations are commonly uranium-bearing. Anomalies No. 17 to No. 18, and No. 21 are over areas underlain by the late Cretaceous Hell Creek formation (Khc). Lignite seams in this formation are commonly uranium-bearing. Anomaly No. 19 is over an area underlain by the Tertiary Fort Union formation (Tft). The lignite seams in this formation are commonly uranium-bearing. Anomaly No. 22 is over an area underlain by late Cretaceous Bearpaw Shale (Kb), Fox Hills Sandstone (Kfh), and the Hell Creek formation (Khc). Anomaly No. 31 is over an area underlain by Recent alluvium (Qal). DOE

N82-29681# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY MEDFORD QUADRANGLE, OREGON Final Report
Apr. 1981 120 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005545; GJBX-384-81-VOL-1) Avail: NTIS HC A06/MF A01

Traverse lines were flown in a east-west direction at a line spacing of three miles. Tie lines were flown north-south approximately twelve miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 2925 line miles are in this quadrangle. These data were acquired to be compiled with and other information in order to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States. DOE

N82-29682# Carson Helicopters, Inc., Perkasie, Pa. Geoscience Div.
NURE AERIAL GAMMA-RAY AND MAGNETIC RECONNAISSANCE SURVEY OF PORTIONS OF NEW MEXICO, ARIZONA AND TEXAS. VOLUME 2: NEW MEXICO-ROSWELL NI 13-8 QUADRANGLE Final Report
Sep. 1981 129 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-006074; GJBX-412-81-VOL-2) Avail: NTIS HC A07/MF A01

The results of a high-sensitivity, aerial gamma-ray spectrometer and magnetometer survey of the Roswell two degree quadrangle, New Mexico are presented. Analysis of this radiometric data yielded 238 statistically significant eU anomalies. Of this number, seventy-four were considered to be of sufficient strength to warrant further investigation. DOE

N82-29685# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: UKIAH QUADRANGLE, CALIFORNIA Final Report
Apr. 1981 144 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005524; GJBX-390-81-VOL-2) Avail: NTIS HC A07/MF A01

The flight path, radiometric multi-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Ukiah Quadrangle in California are presented. DOE

N82-29686# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: WEED QUADRANGLE, CALIFORNIA Final Report
May 1981 188 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005523; GJBX-391-81-VOL-2) Avail: NTIS HC A09/MF A01

The flight path, radiometric multi-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Weed Quadrange in California are presented. DOE

N82-29687# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: HURON QUADRANGLE, SOUTH DAKOTA Final Report
Apr. 1981 102 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005562; GJBX-405-81-VOL-2) Avail: NTIS HC A06/MF A01

Aerial surveys were made in order to locate uranium deposits. The flight path, radiometric multiparameter stacked profiles, and magnetic and ancillary parameter stacked profiles are presented. Histograms, and anomaly maps for the Huron Quadrangle in South Dakota are also included. DOE

N82-29688# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURSVEY: ALTURAS QUADRANGLE, CALIFORNIA Final Report
Apr. 1981 161 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005564; GJBX-406-81-VOL-2) Avail: NTIS HC A08/MF A01

The flight path, radiometric multi-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Alturas Quadragle, California are presented. DOE

N82-29689# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: CHICO QUADRANGLE, CALIFORNIA Final Report
Apr. 1981 241 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005566; GJBX-407-81-VOL-2) Avail: NTIS HC A11/MF A01

The flight path, radiometric multi-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Chico Quadrangle in California are presented. DOE

N82-29690# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SUSANVILLE QUADRANGLE, CALIFORNIA Final Report
Apr. 1981 188 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005573; GJBX-410-81-VOL-2) Avail: NTIS HC A09/MF A01

The flight path, radiometric multi-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Susanville Quadrangle in California are presented. DOE

N82-29691# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: REDDING QUADRANGLE, CALIFORNIA Final Report
Apr. 1981 169 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005563; GJBX-411-81-VOL-2) Avail: NTIS HC A08/MF A01

The flight path, radiometric multi-prameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Redding quadragle in California are presented. DOE

N82-29694# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE CHRISTIAN NTMS QUADRANGLE, ALASKA
D. L. SHETTEL, comp., S. L. LANGFELDT, comp., C. A. YOUNGQUIST, comp., R. F. DANDREA, JR., comp., and R. J. ZINKL, comp. Aug. 1981 95 p refs Prepared in cooperation with Los Alamos National Lab.
(Contract DE-AC13-76GJ-01664)
(DE82-010370; GJBX-205-81) Avail: NTIS HC A05/MF A01

A hydrogeochemical and stream sediment reconnaissance of the Christian NTMS Quadrangle, Alaska was reported. Location data, field analyses, and laboratory analyses of several different sample media are presented. The sample media are described and the analytical results for each medium are summarized. The data are subdivided into groups of stream sediment, lake sediment, stream water, lake water, and ground water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included. Also included are maps showing results of multivariate statistical analyses. DOE

N82-29695# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE NAVRE NTMS QUADRANGLE, MONTANA
Oct. 1981 140 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-010151; GJBX-184-81) Avail: NTIS HC A07/MF A01

Location data, field analyses, and laboratory analyses of several different sample media are presented. The information is divided into groups of stream-sediment, stream-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included. Maps showing results of multivariate statistical analyses are included. DOE

N82-29696# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE TUCUMCARI NTMS QUADRANGLE, NEW MEXICO/TEXAS
Oct. 1981 82 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-010152; GJBX-183-81) Avail: NTIS HC A05/MF A01

Results of a hydrogeochemical and stream sediment reconnaissance (HSSR) of the Tucumcari NTMS quadrangle, New Mexico/Texas are presented. Location data, field analyses, and laboratory analyses of several different sample media are presented. The sample media are described and the analytical results for each medium are summarized. The data were subdivided by a sorting program into groups of stream-sediment and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included. Maps showing results of multivariate statistical analyses are also included. DOE

N82-29697# Carson Helicopters, Inc., Perkasie, Pa. Geoscience Div.
NURE AERIAL GAMMA-RAY AND MAGNETIC DETAIL SURVEY. MIDNITE-SHERWOOD MINES, WASHINGTON AREA Final Report
Jun. 1981 1206 p
(Contract DE-AC13-76GJ-01664)
(DE82-010011; GJBX-182-VOL-2B-MIDNITE) Avail: NTIS HC A99/MF A01

Aerial reconnaissance flights were made in search of mineral deposits. Radiometric multiple parameter stacked profiles, magnetic and ancillary stacked profile data, multivariate histograms, and statistical summaries for uranium, thorium, potassium,

uranium/potassium, uranium/thorium, and uranium/potassium are presented. DOE

N82-29698# Carson Helicopters, Inc., Perkasie, Pa.
NURE AERIAL GAMMA RAY AND MAGNETIC DETAIL SURVEY OF PORTIONS OF NORTHEAST WASHINGTON. VOLUME 1: DATA ACQUISITION, REDUCTION AND INTERPRETATION
Nov. 1981 296 p refs Prepared for Bendix Field Engineering Corp.
(Contract DE-AC13-76GJ-01664)
(DE82-010677; GJBX-1-82-VOL-1) Avail: NTIS HC A13/MF A01

A rotary wing detailed high sensitivity radiometric and magnetic survey was performed which encompassed 8 areas in the northeastern portion of Washington State. The total area surveyed consisted of approximately 9105 line miles. The radiometric data was corrected and normalized to 400 feet terrain clearance and identified as to rock type by correlating each sample with existing geologic map information. A multi-variate analysis was performed, which together with the radiometric and magnetic contour maps was utilized in the geochemical analysis of each area. The survey data is presented in the form of contour maps, stacked profiles, histograms and microfiche copies of the data listings. Author

N82-29699# Carson Helicopters, Inc., Perkasie, Pa. Geoscience Div.
NURE AERIAL GAMMA RAY AND MAGNETIC DETAIL SURVEY PORTIONS OF NORTHEAST WASHINGTON Final Report
Nov. 1981 299 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-007141; GJBX-1-82) Avail: NTIS HC A13/MF A01

The Northeast area of Washington was surveyed. The program is designed to provide radioelement distribution information to assist in assessing the uraniferous material potential of the United States. The radiometric and ancilliary data were recorded and processed digitally. The results are presented in stacked profiles, contour maps, flight path maps, statistical tables and frequency distribution histograms. DOE

N82-29702# Carson Helicopters, Inc., Perkasie, Pa. Geoscience Div.
NURE AERIAL GAMMA-RAY AND MAGNETIC DETAIL SURVEY. MT. LEONA-NANCY CREEK, WASHINGTON AREA Final Report
Jul. 1981 1178 p
(Contract DE-AC13-76GJ-01664)
(DE82-007143; GJBX-182-VOL-2B-MT.LEONA) Avail: NTIS HC A99/MF A01

The radiometric multiple parameter stacked profiles for the Mt. Leona-Nancy Creek, Washington area are examined. DOE

N82-30589# Edgerton, Germeshausen and Grier, Inc., Sunnyvale, Calif.
AERIAL GAMMA-RAY AND MAGNETIC SURVEY, COLUMBUS QUADRANGLE, OHIO Final Report
Jul. 1981 261 p refs
(Contract DE-AC13-76GJ-01664)
(DE81-028625; GJBX-225-81) Avail: NTIS HC A12/MF A01

The Columbus quadrangle covers a 7100 square mile area of south central Ohio which is located within the Midwestern Physiographic Province. Up to 6000 feet of Paleozoic strata overlie the east dipping Precambrian basement. Flat lying Quaternary glacial sediments cover a large part of the surface in the north and west regions of the quadrangle. A search of available literature revealed no known uranium deposits. Ninety-nine uranium anomalies were detected and are discussed briefly. Radiometric data reflect the presence of two zones of higher than average uranium anomaly occurrences. One zone is the northerly continuation of a trend observed in a contiguous quadrangle and occurs over undifferentiated Devonian and Mississippi sediments. Some anomalies appear to be culturally induced such as those in the vicinity of the city of Columbus. The magnetic data indicate more structural complexity in underlying rocks than inferred by the structural interpretation of the area. Author

N82-31730*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIREX MISSION REQUIREMENTS DOCUMENT FOR NONRENEWABLE RESOURCES
T. DIXON and F. CARSEY 15 Jun. 1982 89 p refs
(Contract NAS7-100)
(NASA-CR-169289; JPL-PUB-82-46; NAS 1.26:169289) Avail: NTIS HC A05/MF A01 CSCL 22A

The proposed mission requirements and a proposed experimental program for satellite synthetic aperture radar (SAR) system named FIREX (Free-Flying Imaging Radar Experiment) for nonrenewable resources is described. The recommended spacecraft minimum SAR system is a C-band imager operating in four modes: (1) low look angle HH-polarized; (2) intermediate look angle, HH-polarized; (3) intermediate look angle, HV-polarized; and (4) high look angle HH-polarized. This SAR system is complementary to other future spaceborne imagers such as the Thematic Mapper on LANDSAT-D. A near term aircraft SAR based research program is outlined which addresses specific mission design issues such as preferred incidence angles or polarizations for geologic targets of interest. E.A.K.

N82-32804*# Geological Survey, Denver, Colo.
APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Dec. 1981 - Jun. 1982
K. WATSON, Principal Investigator and S. H. MILLER Jun. 1982 4 p Sponsored by NASA HCMM
(E82-10382; NASA-CR-169173; NAS 1.26:169173) Avail: NTIS HC A02/MF A01 CSCL 08G

Using a thermal-inertia mapping algorithm which provides greater discrimination capability than those in current use, a geologic features was detected in the Cabeza Prieta, Arizona, area. Initially seen on an image formed as a difference of two thermal-inertia images, it was found to be the extension of a bilaterally symmetrical aeromagnetic feature which trends northeast for a distance of at least 1200 km. M.G.

N82-33798# Susquehanna Resources and Environment, Inc., Johnson City, N.Y.
APPLICATIONS OF TEXTURE ANALYSIS FOR ROCK TYPES DISCRIMINATION Final Technical Report, 6 Jul. 1981 - 5 Apr. 1982
S. Y. HSU Jun. 1982 51 p refs
(Contract F49620-81-C-0087; AF PROJ. 2309; ARPA ORDER 4288)
(AD-A117076; AFOSR-82-0549TR) Avail: NTIS HC A04/MF A01 CSCL 14E

Aimed at developing image processing methods for rock types analysis with LANDSAT data, numerous experiments were conducted using supervised and unsupervised classification techniques under the general concept of texture analysis with LANDSAT digital covering two geological quads of Nevada. The results indicate that the supervised classification method is very effective in the extraction of granite regions when: (1) data were in ratio format; (2) feature variables included both tone and texture information; and (3) the classifier is capable of handling non-normally distributed data. Classification errors occurred when there exists pixels of non-granite category whose spectral and textural properties are statistically similar to that of granite pixels. Two cases of errors can be noted: Type 1 pixels located at the periphery of the granite regions, and Type 2 pixels located far away from the core of the granite areas. The final decision regarding the delineation of the granite regions is based on the intersection of two classification maps using a simple map overlay analysis. The result yields a correct classification rate of about 95 percent based on a visual comparision between the composite classification map and the ground truth information given in the U.S.G.S. geological map of the study area. GRA

N82-33805# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: ALTURAS QUADRANGLE, CALIFORNIA Final Report
May 1981 110 p refs Prepared for Bendix Field Engineering Corp., Grand Junction, Colo.
(Contract DE-AC13-76GJ-01664)
(DE82-005539; GJBX-406-81-VOL-1) Avail: NTIS HC A06/MF A01

An airborne high sensitivity gamma-ray spectrometer and magnetometer survey was conducted over ten (10) areas over northern California and south western Oregon. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 10 x 20 areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. This report discusses the results obtained over the Alturas, California, map area. Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. Tie lines were flown north-south approximately eighteen (18) miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1631.6 line miles are in this quadrangle. The purpose of this study is to acquire and compile geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States. DOE

N82-33806# Bendix Field Engineering Corp., Grand Junction, Colo.
GRAND JUNCTION AREA OFFICE, UNITED STATES DEPARTMENT OF ENERGY 1980/1981 ACTIVITIES REPORT
Mar. 1982 70 p
(Contract DE-AC13-76GJ-01664)
(DE82-009638; GJBX-11-82) Avail: NTIS HC A04/MF A01

Geologic, geochemical, geophysical, and other data were acquired which contributed to assessment of the distribution and magnitude of uranium resources of the United States as well as to determination of areas favorable for the occurrence of uranium and to establishment of potential resource estimates. The data collection phase of the NURE program was organized around six major activity elements: quadrangle evaluation, data acquisition, resource assessment, geologic studies, technology applications, and mineral economics. This fifth activities report presents summary results on work performed during the period 1980/1981 in each of these element areas, together with appendices that cite individual project data and resulting reports. By the end of 1981, evaluation of an additional 28 quadrangles had been completed, bringing to 163 the total number covered by the NURE program. DOE

05

OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

A82-38207
CHARACTERISTICS OF THE FORMATION OF CYCLONIC MEANDERS AND EDDIES IN THE SUBARCTIC FRONT ZONE /ACCORDING TO SATELLITE DATA/ [OSOBENNOSTI FORMIROVANIIA TSIKLONICHESKIKH MEANDROV I VIKHREI V ZONE SUBARKTICHESKOGO FRONTA /PO DANNYM ISZ/]
N. V. BULATOV (Tikhookeanskii Nauchno-Issledovatel'skii Institut Rybnogo Khoziaistva i Okeanografii, Vladivostok, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 53-58. In Russian. refs

A comparison of satellite (NOAA-4) infrared photography data and ship data is used to analyze the structure and formation of intrusions of subarctic waters into the Kuroshio-Oyashio frontal zone in the northwest Pacific. It is shown that the tongues of cold waters in the frontal zone can feature cyclonic meanders as well as jets with a single (southerly) direction of the water. It is noted that the meanders and eddies move in a westerly direction while eddy energy is transferred in an easterly direction. B.J.

A82-38272#
THE VARIATION OF SEA SURFACE TEMPERATURE IN 1976 AND 1977. I - THE DATA ANALYSIS
K. MIYAKODA and A. ROSATI (NOAA, Geophysical Fluid Dynamics Laboratory, Princeton, NJ) Journal of Geophysical Research, vol. 87, July 20, 1982, p. 5667-5680. refs

To study the spatial distribution of the sea surface temperature (SST) for the years of 1976 and 1977, ship and satellite data at 1-deg quadrangles were collected. Two points were investigated: (1) the difference of monthly mean SST data between the two sources, and (2) map analyses over the globe. The study shows that without satellite data, an adequate coverage of world ocean is not possible and that there is a large difference in values between the ship and satellite data. The standard deviation of the difference between the satellite and merchant ship SST data for monthly and 1-deg quadrangle mean was + or - 1.49 C, where the sampling errors were not subtracted. Using these data, analyses were created and compared with independent analyses. The comparisons included large-scale analyses and two small-scale analyses. Attention was focused specially on (1) the utility of the satellite SST data and (2) the data quality control. The large-scale analyses agreed well with the independent analyses. However, both of the small-scale analyses did not compare well. (Author)

A82-38274*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC SEA ICE DISTRIBUTION AT END OF SUMMER 1973-1976 FROM SATELLITE MICROWAVE DATA
F. D. CARSEY (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD) Journal of Geophysical Research, vol. 87, July 20, 1982, p. 5809-5835. refs

A82-38275*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTARCTIC SEA ICE CONCENTRATIONS INFERRED FROM NIMBUS 5 ESMR AND LANDSAT IMAGERY
J. C. COMISO and H. J. ZWALLY (NASA, Goddard Space Flight Center, Goddard Laboratory for Atmospheric Sciences, Greenbelt, MD) Journal of Geophysical Research, vol. 87, July 20, 1982, p. 5836-5844. NASA-supported research. refs

Landsat Multispectral Scanner near-infrared band images (MSS-7) are used to calculate Antarctic ice concentration values and these results are quantitatively compared to those derived from Nimbus 5 electrically scanning microwave radiometer (ESMR) brightness temperature data. The set of images includes regions near the ice edge and near the continental boundary during late winter or spring. The percentage of ice cover is derived from the microwave data, using an algorithm that incorporates the brightness temperature emissivity and interpolated climatological physical temperatures and that is not dependent on spatial resolution. Cloud-free Landsat images are used to provide an alternative determination of large-scale ice concentrations, but this method is limited in its ability to resolve individual ice flows, especially near the ice edge. A proportional classification procedure is applied to Landsat data based on observed reflection and the results are correlated with similarly-derived ESMR ice concentration values. The corresponding ice concentration values are found to agree to + or - 15%, with the largest uncertainties occurring in regions of low ice concentration. N.B.

A82-38342* Environmental Research Inst. of Michigan, Ann Arbor.
SYNTHETIC APERTURE RADAR MEASUREMENTS OF OCEAN SURFACE CURRENTS
D. R. LYZENGA, R. A. SHUCHMAN (Michigan Environmental Research Institute, Ann Arbor, MI), and C. L. RUFENACH (NOAA, Wave Propagation Laboratory, Boulder, CO) Geophysical Research Letters, vol. 9, July 1982, p. 747-750. refs
(Contract NOAA-MO-A01-78-00-4322; N0014-81-C-0692; NASA ORDER W-15084)

A82-39222*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PASSIVE MICROWAVE MEASUREMENTS OF TEMPERATURE AND SALINITY IN COASTAL ZONES
H.-J. C. BLUME and B. M. KENDALL (NASA, Langley Research Center, Antenna and Microwave Research Branch, Hampton, VA) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 394-404. refs

Experimental methods and results from the maritime remote sensing (MARSEN) experiments using dual frequency microwave radiometer detecting systems on board aircraft are described. The radiometers were operated at 1.43 and 2.65 GHz and flown above U.S. Atlantic coastal areas, Chesapeake Bay, around Puerto Rico, and over the German Bight. The advanced switched radiometers used were configured to be independent of gain variations and errors originating from front-end losses and determined the absolute brightness temperatures to within a few tenths Kelvin. Corrections to the observed brightness temperature of the ocean are analytically defined, including accounts made for roughness, the cosmic background radiation, and the solar radio source. The coastal flight data for salinity gradients and surface temperatures were compared with sea truth measured from ships and found to be accurate to within 1 C and 1 pph. M.S.K.

A82-39791
DRIFTING ICE AS A TRACER OF HYDROTHERMODYNAMIC PROCESSES /ACCORDING TO SPACE DATA/ [DREIFUIUSHCHIE L'DY KAK TRASSERY GIDROTERMODINAMICHESKIKH PROTSESSOV /PO KOSMICHESKIM DANNYM]
V. V. BOGORODSKII and M. NAZIROV (Gosudarstvennyi komitet SSSR po Gidrometeorologii i Kontroliu Prirodnoi sredy, Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR) Akademiia Nauk SSSR, Doklady, vol. 264, no. 6, 1982, p. 1487-1491. In Russian.

A82-40058* National Aeronautics and Space Administration, Washington, D. C.
AIRCRAFT MEASUREMENT OF SEA SURFACE TEMPERATURE DURING THE WEST COAST EXPERIMENT
J. P. SCHIELDGE (NASA, Washington, DC) and O. H. SHEMDIN (U.S. Navy, Washington, DC) IEEE Journal of Oceanic Engineering, vol. OE-7, July 1982, p. 132-135. refs
(Contract NAS7-100; NOAA-03-7-038-708)

During the West Coast Experiment in March 1977, a test was conducted to ascertain the effectiveness of using remote sensing techniques to estimate sea surface temperature (SST) from infrared (IR) emissions of the sea surface. Aircraft flights were made over three buoys moored in southern California coastal waters, and data was collected of sea surface emissions at thermal IR wavelengths (7.95-13.5 micrometers). SST obtained from the remote sensing measurements were compared with in situ SST measured with thermistors mounted on the buoys. The remotely determined SST were from 1.4-2.9 C lower than the in situ measurements. Several factors are discussed that could account for the differences. (Author)

A82-40059* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EMPIRICAL MICROWAVE EMISSIVITY MODEL FOR A FOAM-COVERED SEA
P. C. PANDEY and R. K. KAKAR (California Institute of Technology, Jet Propulsion Laboratory, Earth and Space Sciences Div., Pasadena, CA) IEEE Journal of Oceanic Engineering, vol. OE-7, July 1982, p. 135-140. Research supported by the National Academy of Sciences refs
(Contract NAS7-100)

A model for computing microwave emissivity of a wind-driven foam-covered sea is presented. The effect of roughness and foam is modeled by combining early measurement results and theoretical analysis. Recent Seasat-SMMR measurements are used to fine tune the model and derive an 'effective' fractional foam coverage expression in terms of frequency and wind speed. The model incorporates polarization characterization and view angle dependence of the foam-cover emissivity. For 48.8 deg incidence angle and wind speed less than 15 m/s, the emissivity values calculated from this model differs by less than 8 percent from those calculated from Wilheit's model. At nadir and at 25 m/s wind speed, the emissivity calculated from the two models differ by approximately 15 percent. (Author)

A82-40798
SATELLITE OBSERVATIONS OF LABRADOR CURRENT UNDULATIONS
P. H. LEBLOND (British Columbia, University, Vancouver, Canada) Atmosphere-Ocean, vol. 20, June 1982, p. 129-142. Natural Sciences and Engineering Research Council refs
(Contract NSERC-A-7470)

Analysis of visual images of the offshore ice margin of the Labrador Coast, taken on four consecutive days from the NOAA-5 satellite, reveals horizontal oscillations with a mean wavelength of 75 km and amplitude of 15 km. The oscillatios travel downstream, with the Labrador Current, at a speed near 0.2 m/sec. Oscillations of similar periods are seen in moored current meter records. An examination of available models of barotropic and baroclinic instability shows that the latter mechanism could account for the generation of the observed oscillations from the shear in the Labrador Current. (Author)

A82-42018
INTERPRETATION OF AIRBORNE OCEANIC LIDAR - EFFECTS OF MULTIPLE SCATTERING
H. R. GORDON (Miami, University, Coral Gables, FL) Applied Optics, vol. 21, Aug. 15, 1982, p. 2996-3001. refs
(Contract N00014-81-0388)

The effects of multiple scattering on the interpretation of the time dependence of elastic backscattering of laser pulses from the ocean (lidar) are investigated through solving the radiative transfer equation by Monte Carlo techniques. In particular, after removal of the geometric loss factors, it is found that the backscattered power is a decaying exponential function of time, over the time interval required for photons to travel four attenuation lengths through the water. The effective attenuation coefficient of this exponential decay is found to be strongly dependent on the parameters of the lidar system and on the optical properties of the water. The significant parameter is the ratio of the radius of the spot on the sea surface viewed by the lidar receiver optics to the mean free path of photons in the water. For values of this parameter near zero, the decay is determined by the beam attenuation coefficient, while for values greater than 5-6, the decay is given by the attenuation coefficient for downwelling irradiance, often referred to as the diffuse attenuation coefficient. (Author)

A82-42148
AIRBORNE REMOTE SENSING EXPERIMENTS WITH A FLUORESCENT TRACER
C. VALERIO (Centre d'Etudes Techniques de l'Equipement, les Milles, Bouches-du-Rhone, France) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 218-242. refs

It is shown how a well-chosen intellectual approach enables airborne remote sensors to be turned into a highly accurate method for the quantitative study of some oceanographic phenomena. As an introduction a brief resume is given of existing means of studying hydrological and oceanographical phenomena, their draw-backs, and the improvements that can be made by remote sensing. The limitations of satellites and aircraft are discussed and the special features of the coastal oceanography field are covered. A practical example is given involving the dispersal of the fluorescent tracer rhodamine B, where information on the development of the rhodamine-quantity maps from the photographs alone was obtained with 95 percent accuracy. Four phases in a quantitative remote sensing study using aircraft are also described. C.D.

A82-42154
SEA SURFACE FRONTS AND TEMPERATURES
J. H. SIMPSON (North Wales, University College, Anglesey, Wales) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 295-311. refs

It is noted that the energy input to the oceans by the tidal forces of the sun and moon is ultimately dissipated in frictional effects in tidal currents. Much of this tidal energy is then consumed in shallow seas where amplification of the tidal wave induces large flow rates which, in turn, produce large inputs of turbulent kinetic energy. Most of this energy is simply transformed to heat, but where there is stratification, a small fraction may be used to work against the stratification and increase the potential energy of the system. In discussing the criterion for stratification, it is noted that tidal stirring competes with the buoyancy flux in determining whether or not stratification will be established. It is shown that, regarding the structure of the front, the density field is not in precise balance with the Coriolis forces and, owing to frictional effects, some convergence in the flow perpendicular to the front seems likely. Attention is also given to traditional oceanographic methods and remote sensing methods. The validation and calibration of IR data are considered, together with the application of IR imagery to determine frontal movements. The way in which IR data are able to provide insights into the instabilities occurring on fronts is discussed. C.R.

A82-42156
THE SEASAT-1 SYNTHETIC APERTURE RADAR - INTRODUCTION, DATA RECEPTION AND PROCESSING
D. W. S. LODGE (Royal Aircraft Establishment, Space Dept., Farnborough, Hants., England) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 335-356. refs

A general introduction to synthetic aperture radar (SAR) is given; in particular, the example carried on Seasat-1 which was intended to demonstrate reliable and useful measurements of ocean wave height, length, and energy spectra, sea surface topography, and surface temperature. Sensors operating at microwave frequencies were used as they are relatively unaffected by atmospheric conditions, and the SAR technique is presented as a means of overcoming simple radar systems limitations. An elevation beamwidth must be large in order to cover the widest possible area of the ground, the transmitted pulse-length should be as short as possible in order to attain the best ground range resolution, and the azimuth beamwidth should be as narrow as possible as it limits resolution. Implementation of this technique is considered by a discussion of raw data optical and digital processing to produce images. The experimental SAR processing facility (ESPF) at the Royal Aircraft Establishment at Farnborough is extremely flexible and offers the only means of obtaining a precise understanding of the image form and its signal data relationship. R.K.R.

A82-42161
FIELD TRIP FT1 - A FIELD ASSESSMENT OF VARIOUS FORMS OF REMOTE SENSING IMAGERY ON THE TAY ESTUARY TIDAL FLATS
J. MCMANUS (Dundee, University, Dundee, Scotland) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 474-478.

A82-42251
ESTIMATION OF SEAMOUNT COMPENSATION USING SATELLITE ALTIMETRY
D. C. SCHWANK and A. R. LAZAREWICZ (Analytic Sciences Corp., Reading, MA) Geophysical Research Letters, vol. 9, Aug. 1982, p. 907-910. refs
(Contract NOAA-NA-79SAC00785)

The degree of seamount compensation can be estimated from satellite radar altimetry and bathymetry data. Seamount signatures in the sea-surface topography are detected, located, and extracted from Seasat radar altimetry data using a matched filtering algorithm. An efficient method has been developed for determining the two-dimensional undulation signature of any axisymmetric seamount with an arbitrary degree of compensation. Given the seamount dimensions as determined from bathymetry, its degree of compensation is varied until the model signature matches the signature extracted from Seasat data. This technique is used to map the relative degrees of local seamount compensation within a region. This technique has been applied to 14 of the Musicians Seamounts. Two of these seamounts have been analyzed using two crossing tracks each and confirm the repeatability of the technique. The results suggest the existence of a chain of low compensation seamounts within the highly compensated Musicians. Independent verification is needed from other geophysical and geochemical analyses to support this hypothesis. (Author)

A82-42523
AIRBORNE RADIOMETRIC MEASUREMENTS OF SEA SURFACE TEMPERATURE
R. F. GASPAROVIC, K. PEACOCK, and L. D. TUBBS (Johns Hopkins University, Laurel, MD) Johns Hopkins APL Technical Digest, vol. 3, Jan.-Mar. 1982, p. 4-11.

Data from survey flights over North Atlantic with an infrared imaging radiometer illustrate the possibilities for remote sensing of sea surface temperature. The spectral bands of 3.6 to 4.1, and of 10.1 to 11.1 microns were measured using a two channel sensor which is described in detail. Survey results show that radiometric temperature varies less than 0.1 C with angles of incidence between 20-45 degrees, but at greater angles the variation increases. The effect of altitude on measured temperatures was a decrease of 0.5 C for altitude increases of 1000 feet noting that cloud reflections can change the radiometric temperature by 0.15-0.3 C. Some general characteristics of surface radiance were also observed. Temperature variation is greater for wave numbers below 0.001 cycle/meter, and in uniform regions closely approaches the Gaussian function. A.B.

A82-43248
THE PRESENT USE OF SATELLITES FOR SEA-STATE OBSERVATIONS AND PREDICTION
T. D. ALLAN Journal of Navigation, vol. 35, Sept. 1982, p. 421-431. refs

In the course of its operation to date, SEASAT has demonstrated that microwave sensors can measure sea states at useful accuracies, and that the quasi-real time use of such data may be integrated into existing meteorological systems to provide improved forecasts. Long term objectives of the program include the development of wind/wave models, and the long term prediction of wave conditions for offshore operations and wave energy programs. Attention is given to the capabilities of SEASAT's synthetic aperture radar (SAR), which has been able to produce a

detailed bottom topography in an image of the English Channel, leading to speculation on the radar emission-sea surface interaction mechanism involved. It has been found that swells must exceed certain limiting values in dominant wavelength and height before they are imaged by SAR. An altimeter, a scatterometer, and a dual polarization passive radiometer are also employed. O.C.

A82-43262*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTE SENSING OF TIDAL WETLANDS - MAPPING AND BEYOND
D. S. BARTLETT (NASA, Langley Research Center, Hampton, VA) Institute of Electrical and Electronics Engineers, Oceans 82 Conference, Washington, DC, Sept. 20-22, 1982, Paper. 7 p. refs

Remote sensing, by means of aerial photography, is an accepted method for the mapping and inventory of tidal wetlands, enjoying considerable advantages in speed, flexibility and cost per area mapped over conventional techniques. Initially employed for the identification of wetlands and their boundaries, new applications concern the effective sensing of functional processes within the wetlands environment, such as plant biomass and the production of biogenic gases. The availability of accurate hand-held radiometers has produced increased efforts to quantitatively relate remote measurements to environmental parameters for these processes, expanding the information derivable from aerial and orbital multispectral scanners. A.B.

A82-43429
REMOTE SENSING OF GULF STREAM DYNAMICS USING VHRR SATELLITE IMAGERY
F. ASKARI and L. J. PIETRAFESA (North Carolina State University, Raleigh, NC) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 39-46. refs

Gulf Stream frontal dynamics in the South Atlantic Bight were observed by combining shipboard hydrographic techniques and moored current-meter data with visible and infrared VHRR imagery from the NOAA-4 satellite. Frontal features, such as meanders and warm core filaments, were observed and tracked using the VHRR imagery. Meanders occurring with 2-12 day periods may be forms of long waves trapped over the steep bottom slope seaward of the shelf break. At times, meanders with 100 km east-west displacements and folded back filaments were observed. VHRR imagery was corrected for the effects of the earth's rotation and curvature, and a histogram equalization technique was applied to the raw infrared data to enhance the boundary of frontal features which were not originally discernable. A.B.

A82-43431
THE UTILIZATION OF COLOR AERIAL PHOTOGRAPHY AND GROUND TRUTHING TO ASSESS SUBTIDAL KELP /LAMINARIA/ RESOURCES IN NOVA SCOTIA, CANADA
G. SHARP, D. L. RODDICK, G. CARMICHAEL (Fisheries and Oceans Canada, Halifax, Nova Scotia, Canada), and J. CARTER (Martec, Ltd., Halifax, Nova Scotia, Canada) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 57-67. refs

A82-44825
SEA SURFACE TEMPERATURE MAPPING WITH THE SEASAT MICROWAVE RADIOMETER
R. L. BERNSTEIN (California, University, La Jolla; Poseidon Research, Del Mar, CA) Journal of Geophysical Research, vol. 87, Sept. 20, 1982, p. 7865-7872. Research supported by the University of California and Poseidon Research refs
(Contract NOAA-MO-A01-78-00-4329)

Sea surface temperature data from the Seasat Scanning Multichannel Microwave Radiometer (SMMR) has been mapped for the period July 7 to August 6, 1978, in the western North Pacific, 20-50 deg N, 140-180 deg E, and compared against similar maps constructed from all available ship observations. The temperature difference between the SMMR and ship maps has a standard deviation of 0.75 C, about a mean bias of 0.22 C, SMMR being warmer. The average standard deviation of all individual observations about the mapped values is 1.51 C and 2.10 C for SMMR and ship, respectively. Both the SMMR and ship maps exhibit the known major climatological features for the region. In addition, both data types yield similar maps of sea surface temperature anomaly (departure from climatology), with large-scale (greater than 500 km) anomaly features of 1-3 C. Aside from having a lower noise level, the SMMR data is superior to the ship data for constructing large-scale maps because it is more uniformly distributed in space and time. (Author)

A82-45573
POLAR MAGNETIC DISTURBANCES AND FIELD-ALIGNED CURRENTS
O. A. TROSHICHEV (Gosudarstvennyi Komitet SSSR po Gidrometeorologii i Kontroliu Prirodnoi Sredy, Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR) Space Science Reviews, vol. 32, no. 3, 1982, p. 275-360. refs

The results of research on the morphology and physics of polar magnetic disturbances and their connection with three-dimensional magnetospheric currents are reviewed. Magnetic disturbance current systems are examined, as well as their relation to solar wind parameters and magnetic activity level and their seasonal dependence. On the basis of numerical model calculations, it is shown that magnetospheric field-aligned currents observed by the TRIAD and ISIS-2 satellites are the main generation mechanism of high-latitude magnetic disturbances. Plasma pressure gradients are examined as a source of energy for driving field-aligned currents in the closed magnetosphere. (Author)

A82-45666* Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
ANALYSIS OF ATMOSPHERE-SEA ICE INTERACTIONS IN THE ARCTIC BASIN USING ESMR MICROWAVE DATA
R. G. CRANE, R. G. BARRY (Cooperative Institute for Research in Environmental Sciences; Colorado, University, Boulder, CO), and H. J. ZWALLY (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Science, Greenbelt, MD) (International Union of Radio Science, Open Symposium on Remote Sensing, Washington, DC, Aug. 11, 12, 1981.) International Journal of Remote Sensing, vol. 3, July-Sept. 1982, p. 259-276. refs
(Contract NSF DPP-79-20853)

Data from the Electrically Scanning Microwave Radiometer (ESMR) on Nimbus-5 are used to determine the spatial and temporal patterns of change in microwave brightness signatures of Arctic sea ice during a full annual cycle (1973/74). Interactions of ice conditions with the atmosphere are examined using grid point data for surface air temperature and atmospheric pressure. Principal components analysis is used to examine the major elements present in the microwave and atmospheric data. Component scores from these analyses are then used in a canonical correlation analysis to determine interassociations present between the ice and atmosphere in the Beaufort Sea and the European sectors on a synoptic time scale. The synoptic weather conditions associated with the pattern of snow melt on the ice in spring 1974 are described, and a clarification of possible

alternative interpretations of features identified as polynyi occurring at 80-85 deg N during the late summer 1974 is presented. (Author)

A82-45668
SOME FEATURES OF RADAR MONITORING OF THE OCEANIC SURFACE FROM AEROSPACE PLATFORMS
A. I. KALMYKOV, A. P. PICHUGIN, IU. A. SINITSYN, and V. P. SHESTOPALOV (Akademiia Nauk Ukrainskoi SSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR) (International Union of Radio Science, Open Symposium on Remote Sensing, Washington, DC, Aug. 11, 12, 1981.) International Journal of Remote Sensing, vol. 3, July-Sept. 1982, p. 311-325. refs

Specifics of oceanic surface remote sensing are studied when the wave pattern is inhomogeneous due to slicks caused by streams, oil films, etc. A model of radar signals scattered by inhomogeneous waves is suggested, based on observations carried out. Statistical characteristics of the response signal are studied. Effect of resolution on reflection contrasts is discussed. (Author)

A82-45701
SYMPOSIUM ON RADIATION TRANSPORT PROBLEMS AND SATELLITE MEASUREMENTS IN METEOROLOGY AND OCEANOGRAPHY, COLOGNE, WEST GERMANY, MARCH 22-26, 1982, REPORTS [SYMPOSIUM UEBER STRAHLUNGSTRANSPORTPROBLEME UND SATELLITENMESSUNGEN IN DER METEOROLOGIE UND DER OZEANOGRAPHIE, COLOGNE, WEST GERMANY, MARCH 22-26, 1982, VORTRAEGE]
Symposium sponsored by the Deutsche Meteorologische Gesellschaft. Annalen der Meteorologie, no. 18, 1982. 195 p. In German and English. (for individual items see A82-45702 to A82-45755)

Radiation transport problems and satellite measurements in meteorology and oceanography are discussed. The general topics considered include: climate research; the radiation budget; oceanography; precipitation; the boundary layer; the middle atmosphere; aerosols; weather forecasting; applied meteorology; cloud physics; Meteosat. The specific topics considered include: photochemistry of the mesosphere; cloud parametrization in circulation models; angular sampling of reflected solar radiation over different earth scenes; determination of chlorophyll from satellite measurements of the ocean color; origins of interstellar molecules; radiative transfer in a zonally averaged climate model; outgoing longwave flux from sounder radiances. C.D.

A82-45713#
ANGULAR SAMPLING OF REFLECTED SOLAR RADIATION OVER DIFFERENT SCENES OF THE EARTH
W. BEHNKE, H.-J. PREUSS, and M. WIEGNER (Koeln, Universitaet, Cologne, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 36-38. refs

Statistical results are presented for the angular dependence of the bidirectional reflectance obtained over cloud-free open ocean surfaces, desert regions, and snow/sea-ice fields. Data is taken from shortwave measurements of the ERB experiment on Nimbus 7 during 19 days in January 1979 and 5 days in June 1979. The angular dependence is used to obtain the total planetary albedo for the three surfaces. C.D.

A82-45716#
THE DETERMINATION OF CHLOROPHYLL FROM SATELLITE MEASUREMENTS OF THE OCEAN COLOR
G. METZIG and E. RASCHKE (Koeln, Universitaet, Cologne, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 45-47. Deutsche Forschungsgemeinschaft refs
(Contract DFG-RA-195/35-4)

The possibility of remote sensing the concentration of plankton is studied with a radiative transfer model that calculates radiances in the atmosphere and radiant flux densities in the ocean at all desired wavelengths between 300 and 1080 nm. It is a combination of a modified two-stream method with an iterative solution scheme. A statistical attempt is made to evaluate the chorophyll content in the water and the atmospheric turbidity from simultaneous multispectral radiance data from the Nimbus-7 CZCS instrument. A multiple linear regression is shown to exist between the chlorophyll content and atmospheric optical thickness on one side and the measured radiance at the top of the atmosphere. A system of four linear equations is given which permits the determination of the chlorophyll content and the optical depth. C.D.

A82-45718#
A COMPARISON OF MICROWAVE AND INFRARED TECHNIQUES FOR MEASUREMENTS OF SEA SURFACE TEMPERATURE /SST/ FROM SPACE
D. T. LLEWELLYN-JONES, D. L. CROOM, and J. E. HARRIES (Science and Engineering Research Council, Rutherford Appleton Laboratory, Didcot, Oxon, England) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 53, 54.

A82-45720#
PERFORMANCE OF THE 'SPLIT WINDOW' AT 11 AND 12 MICRON WAVELENGTH FOR ACCURATE DETERMINATION OF SEA SURFACE TEMPERATURE
P. J. MINNETT, R. W. SAUNDERS, A. M. ZAVODY, and D. T. LLEWELLYN-JONES (Science and Engineering Research Council, Rutherford Appleton Laboratory, Didcot, Oxon, England) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 58-60. refs

Numerical simulations of the performance of AVHRR/2 in determining sea surface temperature (SST) under various atmospheric conditions are presented. A globally representative sample of 59 radiosonde profiles of atmospheric pressure, temperature, and water vapor density are employed with line-by-line absorption calculations. Theoretical accuracy of AVHRR is shown to be 0.33 K in clear air, and 1.8 K for moderate visibility. A comparison of 3.7 micron channel measurements with in situ measurements indicates that an rms discrepancy of about 0.8 K (McClain, 1981) and an accuracy of approximately 0.5 K could be achieved over a limited area and time. In addition, it is shown that use of the 12 micron infrared channel will provide improved SST measurement accuracy, and will allow daytime operation. Finally, it is noted that these theoretical accuracies may be subject to discrepancy such as the skin effect and diurnal thermocline. R.K.R.

A82-46165
SPATIAL CHARACTERISTICS OF RADIO-WAVE BACKSCATTERING BY THE SEA SURFACE [PROSTRANSTVENNYE KHARAKTERISTIKI OBRATNOGO RASSEIANIIA RADIOVOLN MORSKOI POVERKHNOST'IU]
G. G. AVANESOVA, V. S. ETKIN, V. P. BYSTROV, and K. I. VOLIAK (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovanii and Fizicheskii Institut, Moscow, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 85-94. In Russian. refs

The two-scale analysis of almost-Gaussian statistics of sea-surface slopes indicates that the azimuth scattering distribution fits well the angular dependence of the small-scale Bragg wave spectrum, and that the Fourier transformation of sea radar images at vertical polarization represents the spatial characteristics of large waves. SLAR measurements at centimeter wavelengths are found to be in reasonable agreement with the two-scale theory and indicate the limitations of the empirical azimuth scattering model. The optical Fourier analysis of sea images makes it possible to explain different kinds of scattering at the same mean wind velocity in terms of the basic characteristics of sea waves. B.J.

A82-46549* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
O1, P1, N2 MODELS OF THE GLOBAL OCEAN TIDE ON AN ELASTIC EARTH PLUS SURFACE POTENTIAL AND SPHERICAL HARMONIC DECOMPOSITIONS FOR M2, S2, AND K1
M. E. PARKE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Marine Geodesy, vol. 6, 1982, p. 35-81. refs
(Contract NOAA-NA-79AAD00107; NAS7-100)

The models of M2, S2, and K1 presented in Parke and Hendershott (1980) are supplemented with models of O1, P1, and N2. The models satisfy specified elevation boundary conditions and are generated by fighting a small number of test functions to island data. Maps are presented of the geocentric tide, the induced free space potential, the induced vertical component of the solid earth tide, and the induced vertical component of the gravitational field for each new component. Maps of the tidal potential seen by an observer fixed to the surface of the solid earth are also presented for all six constituents. Spherical harmonic coefficients up to order four and the rms magnitude of the coefficients to order fifteen are presented for each constituent. The rms magnitudes of the P1 and K1 coefficients normalized by their respective equilibrium amplitudes are compared to determine the effect of the diurnal core resonance. C.D.

A82-46550
SATELLITE OBSERVATIONS OF THE BRAZIL AND FALKLAND CURRENTS - 1975 TO 1976 AND 1978
R. LEGECKIS (NOAA, Ocean Sciences Branch, Washington, DC) and A. L. GORDON (Lamont-Doherty Geological Observatory, Palisades, NY) Deep-Sea Research, vol. 29, no. 3A, 1982, p. 375-401. refs
(Contract NSF DPP-78-24832)

Satellite infrared observations of the Brazil and Falkland currents were made from September 1975 to April 1976 and from January to July 1978. The warm water associated with the Brazil Current fluctuates southward and northward between 38 and 46 deg S with a time scale of about two months. Warm core eddies are formed during the northward phase at intervals of about one week. These eddies are elliptical with a mean major axis of 180 km and a minor axis of 120 km. The eddies drift southward at speeds of 4 to 35 km/day, and the higher speeds are associated with the more recently formed eddies. Hydrographic surveys during 1978 on the ARA Islas Orcadas revealed the subsurface structure of the warm core eddies and the Brazil Current. The surface thermal patterns detected by satellite were correlated with the subsurface thermal structure and the mixed layer depth. (Author)

A82-46796
RETRIEVAL OF COASTAL WATER INFORMATION FROM LANDSAT MSS DATA
S. UENO (Kanazawa Institute of Technology, Kanazawa, Ishikawa, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 703-709. refs

An initial value solution is developed for the transfer equation in air-water systems which makes use of invariant imbedding and allows for the interaction of radiation at the system interface. Since the Cauchy system of the scattering function requires much computer time, the inverse solution is made tractable by introducing the effective water surface albedo into the Cauchy system of the scattering function for the specular reflection problem and allowing for the multiple scattering effect of radiation in the water. A quasi-linearization approach is then used to provide the least squares estimation of the effective water surface albedo from the noisy measurements of the total spectral radiance of water from space. Several numerical experiments of the successive approximations of the effective water surface albedo are conducted and are found to converge rapidly towards the expected values. N.B.

A82-46956*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OCEANOGRAPHY FROM SPACE
R. H. STEWART (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; California, University, La Jolla, CA) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 14 p. NASA-supported research. refs
(IAF PAPER 82-121)

Active and passive spaceborne instruments that can observe the sea are discussed. Attention is given to satellite observations of ocean surface temperature and heating, wind speed and direction, ocean currents, wave height, ocean color, and sea ice. Specific measurements now being made from space are described, the accuracy of various instruments is considered, and problems associated with the analysis of satellite data are examined. It is concluded that the satellites and techniques used by different nations should be sufficiently standard that data from one satellite can be directly compared with data from another and that accurate calibration and overlap of satellite data are necessary to confirm the continuity and homogeneity of the data. F.G.M.

A82-46957#
JOINT ANALYSIS OF SATELLITE REMOTE SENSING DATA FOR MARINE ENVIRONMENTAL MONITORING
H. OCHIAI (Toba Merchant Marine College, Toba, Japan) and S. TAKEUCHI (Remote Sensing Technology Center of Japan, Tokyo, Japan) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 9 p.
(IAF PAPER 82-122)

This paper describes some results of the combined analysis of Landsat-MSS and NOAA-AVHRR data for the purpose of monitoring and investigating the complexed sea surface phenomena extending over both of an inland sea and an open sea area. The areas of interest are Seto Inland Sea, Ise Bay and their southern open sea area located at the southern coastal region of the Japanese Islands. From the results of analysis, it is found that the sea surface temperature pattern at the boundary region of the inland sea and the open sea is fairly affected by the variation of the axis of the Kuroshio Current and as a result the sea surface environment within the inland sea is also influenced by the motion of the Kuroshio in the open sea area. (Author)

A82-46958#
THE POSEIDON PROJECT - A SPACE OBSERVATORY FOR DYNAMIC OCEANOGRAPHY
N. LANNELONGUE, P. BRUDIEU (Centre National d'Etudes Spatiales, Toulouse, France), J. P. CHASSAING (Centre National d'Exploitation des Oceans, Paris, France), and M. LEFEBVRE (Centre National d'Etudes Spatiales, Groupe de Recherches de Geodesie Spatiale, Toulouse, France) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 7 p.
(IAF PAPER 82-125)

A brief description is given of the Poseidon experiment, which will measure the global oceanic circulation by means of a subdecimetric radar altimeter with an accuracy of 5 to 10 cm and which will be carried aboard the French satellite SPOT 2. The Poseidon equipment, which includes a high-accuracy satellite positioning (HASP) system, can also be used to estimate wave height and surface wind velocity and to identify the type of surface observed. The various missions of the experiment are described, along with the on-board payload, the altimeter, the HASP system, a microwave radiometer for atmospheric sounding, the on-board memory and central processing unit, and the SPOT orbit F.G.M.

A82-46959#
DEVELOPMENT OF MARINE OBSERVATION SATELLITE IN JAPAN
K. MATSUMOTO, S. NIWA, T. DOURA, and S. YAMAMOTO (National Space Development Agency of Japan, Tokyo, Japan) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 5 p. refs
(IAF PAPER 82-127)

An outline of Japan's Marine Observation Satellite-1 (MOS-1), to be launched by an N-II vehicle in 1986, is presented. Satellite mission objectives are to collect ground data, and to develop remote sensing technology. MOS-1 nominal orbit is sun-synchronous at a 909 km altitude and an inclination of 99.1 deg, and the satellite will include three sensors: (1) a multispectral electronic self-scanning radiometer (2) a visible and thermal infrared radiometer, and (3) a microwave scanning radiometer. MOS-1 height is about 300 cm, length is approximately 150 cm, width is approximately 140 cm, and total weight is nearly 750 kg. In addition, ground segment systems are the tracking and control system, the operation control system (the main feature), and the data acquisition and distribution system. The data acquisition system will be installed about 50 km northwest of Tokyo, and the next MOS-1 is being considered, examining the usefulness of ocean phenomena satellite measurements. R.K.R.

A82-47184* National Oceanic and Atmospheric Administration, Rockville, Md.
EARTH ROTATION INFORMATION DERIVED FROM MERIT AND POLARIS VLBI OBSERVATIONS
D. S. ROBERTSON and W. E. CARTER (NOAA, National Geodetic Survey, Rockville, MD) In: High-precision earth rotation and earth-moon dynamics: Lunar distances and related observations; Proceedings of the Sixty-third Colloquium, Grasse, Alpes-Maritimes, France, May 22-27, 1981. Dordrecht, D. Reidel Publishing Co., 1982, p. 97-122; Discussion, p. 122. Research supported by Haystack Observatory and NASA. refs

Advanced methods involving observations of extraterrestrial objects, such as artificial satellites or quasars, may make it possible to monitor geometrical variations in survey networks of regional, continental, and global scale with a spatial resolution of a few centimeters and a temporal resolution of better than one day. However, in connection with a realization of this potential, it is necessary to account for variations in the orientation of the earth in space. The accuracy provided by the conventional approaches for determining the orientation of the earth is not sufficient in this case. However, an appropriate method could be based on the utilization of independent clock radio interferometry (commonly referred to as VLBI) observations of extragalactic radio sources. The project POLARIS (Polar-motion Analysis by Radio Interferometric Sampling) is concerned with an implementation of this method. The MERIT (Monitor Earth Rotation and Intercompare the Techniques of observation and analysis) observations represent an aid to project POLARIS. Attention is given to details regarding these programs and the results obtained thus far. G.R.

A82-47431
OCEANOGRAPHY FROM SPACE; PROCEEDINGS OF THE SYMPOSIUM, VENICE, ITALY, MAY 26-30, 1980
J. F. R. GOWER, (ED.) (Institute of Ocean Sciences, Sidney, British Columbia, Canada) Symposium sponsored by COSPAR, SCOR, IUCRM, et al. New York, Plenum Press (Marine Science. Volume 13), 1981. 997 p
$95

Oceanography from space is discussed. The general topics discussed include: satellite oceanography; satellite sea surface temperature measurements; water color measurements; radar studies of the sea surface; passive microwave observations; remote sensing of ice; satellite altimetry. Individual topics are concerned with the future of oceanography from space; improving accuracy of sea surface temperature measurements; the use of water color measurements to study plankton, chlorophyll levels, and vertical mixing in the ocean; measurement of winds by scatterometer; the findings of SMMR satellites; microwave remote sensing of sea ice properties such as concentration, age, and surface temperature; the determination of ocean circulation and tides by satellites. C.D.

A82-47432* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SURVEY OF THE GOALS AND ACCOMPLISHMENTS OF THE SEASAT MISSION
G. H. BORN, D. B. LAME, and P. J. RYGH (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 3-14.
(Contract NAS7-100)

The objectives of the Seasat mission, which was dedicated to establishing the utility of microwave sensors for the remote sensing of the earth's oceans, and data collected during some three months of orbital operations are briefly reviewed. In particular, consideration is given to the Seasat sensors and measurement goals, surface and in situ observations, evaluation organization, and current status of geophysical evaluation for each sensor (altimeter, Seasat-A scatterometer system, scanning multichannel microwave radiometer, visible and infrared radiometer, and synthetic aperture radar). Finally, future plans related to the Seasat project are discussed. V.L.

A82-47434
OCEANOGRAPHY FROM SPACE - A EUROPEAN CONTRIBUTION
T. D. ALLAN (Institute of Oceanographic Sciences, Wormley, Surrey, England) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 19-27.

The results from microwave sensors flown on Seasat are reviewed, and suggestions are made about the inclusion of the sensors on future satellites. The synthetic aperture radar, altimeter, scatterometer and SMMR findings are very briefly described, and the background of the JASIN program is summarized also. C.D.

A82-47436
SPACE OCEANOGRAPHY - HOPES AND REALITIES
K. N. FEDOROV and V. E. SKLIAROV (Akademiia Nauk SSSR, Institut Okeanologii, Moscow, USSR) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 35-47. refs

The current status of space oceanography is briefly reviewed with emphasis on auxiliary research, the problem of ground truth data, and applications of remotely sensed data. The advantages of combining satellite data and traditional means of measurement are illustrated by an example involving an attempt to construct a three-dimensional picture of the Gulf Stream frontal structure on

the basis of synchronous satellite and ship data. Finally, both direct and indirect applications of oceanographic information from space in fundamental oceanic research are discussed. V.L.

A82-47437
DUNDEE UNIVERSITY METEOROLOGICAL SATELLITE GROUND RECEIVING AND DATA ARCHIVING FACILITY
P. E. BAYLIS (Dundee, University, Dundee, Scotland) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 49-55.

The original station associated with the considered facility became operational in 1966 with APT transmissions from Nimbus 2 and Essa 2. In April 1975 construction of an ITOS/NOAA VHRR receiving station was completed and images were produced from NOAA 4. Later that year the U.K. Natural Environmental Research Council awarded the group funds to staff the station in order to archive Very High Resolution Radiometer (VHRR) data on magnetic tape. The grant was later extended to upgrade the station to receive and archive TIROS-N/NOAA 6 AVHRR (Advanced Very High Resolution Radiometer) data. Data from the VHRR/AVHRR tape archives are supplied to scientists against specific requests, either as hard copy photo-facsimile images or computer compatible tapes. A Meteosat Primary Data and Secondary Data user station was completed prior to Meteosat launch in November 1977. In August 1979 a receiving system for Nimbus 7 Coastal Zone Color Scanner was completed. G.R.

A82-47438
OCEANOGRAPHIC FEATURES REVEALED BY THE FGGE DRIFTING BUOY ARRAY
J. GARRETT (Institute of Ocean Sciences, Sidney, British Columbia, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 61-69. refs

One of the Special Observing Systems established for the First GARP Global Experiment consisted of a network of satellite-tracked drifting buoys measuring barometric pressure and sea temperature. Although this network was designed for meteorological purposes, the resulting observations of buoy motion and sea temperature provide valuable oceanographic information. Some examples of uses of this data are shown. (Author)

A82-47442* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVED ACCURACY OF THE REMOTE SENSING OF SEA SURFACE TEMPERATURE
G. DALU (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD; CNR, Instituto di Fisica dell' Atmosfera, Rome, Italy), C. PRABHAKARA (NASA, Goddard Space Flight Center, Greenbelt, MD), and R. C. LO (Computer Sciences Corp., Silver Spring, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 109-114. refs

A method is described for determining the water vapor content to within + or - 0.4 g/sq cm from remotely sensed radiances in three infrared channels, 11, 13, 18 microns. Using this method, it is possible to significantly improve the accuracy of sea surface temperature (SST) over what is obtainable with the two channel technique. A radiative computational scheme for the radiative transfer equation is used to study the manner in which the equivalent radiative temperature of the atmosphere changes as a function of wave number for different atmospheric conditions. Average climatological conditions are used to simulate the radiative response of the atmosphere. This radiative transfer simulation is used to compute brightness temperatures for radiosonde profiles obtained from oceanographic ships, which temperatures are in turn used to estimate the SST. Nimbus 4 IRIS spectral measurements corresponding to the profiles were used in the same way for purposes of comparison. C.D.

A82-47443
MULTICHANNEL SEA SURFACE TEMPERATURE RETRIEVALS
D. IMBULT, A. CHEDIN, and N. A. SCOTT (Ecole Polytechnique, Palaiseau, Essonne, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 115-122.

A summary of a study done three years ago, at the Laboratoire de Meteorologie Dynamique, of sea surface temperatures (SST) determination for total water vapor amounts varying over a wide range, is presented. This theoretical study, based on synthetic transmissions and brightness temperatures computed under temperature and moisture conditions, examines two pairs of spectral intervals (10.5-12.5 microns and 7.9-9.6 microns) on the Arise radiometer. It is indicated that SST retrieval over humid atmospheres may be improved by using three channels in the 8-12 micron region and one in the 3.7 micron region. Water vapor continnum measurements and ground truth measurements should be improved, and new flights using the Aries radiometer, equipped with two pairs of channels as indicated, are underway in an effort to achieve this goal. Finally, a more sophisticated use of satellite data is suggested. R.K.R.

A82-47446
ON THE ACCURACY OF SATELLITE-OBSERVED SEA SURFACE TEMPERATURES
S. TABATA (Institute of Ocean Sciences, Sidney, British Columbia, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 145-157. refs

A study involving data from NOAA-5, NOAA-6, and TIROS-N satellites has shown that, upon field calibration with reliable shipborne measurements, satellite derived sea surface temperatures are accurate to within plus or minus 0.5 C. This result confirms the conclusion of a previous study based on data from NOAA-3 and NOAA-4. Data from NOAA-5 also indicate that the error can be reduced to plus or minus 0.3 C. Of the five satellites, however, only two, NOAA-3 and NOAA-6, give reasonable estimates of surface sea temperatures upon applying corrections for the mean atmospheric attenuation; values produced by the other three satellites are too high. These errors are thought to be due to errors in shipborne measurements, failure to correct adequately for atmospheric effects, and uncertainty in radiometer calibration. V.L.

A82-47447
A COMPARISON BETWEEN INFRARED SATELLITE IMAGES AND SEA TRUTH MEASUREMENTS
L. PRIEUR, J. P. BETHOUX (CNRS, Laboratoire de Physique et Chimie Marines, Villefranche-sur-Mer, Alpes-Maritimes, France), M. ALBUISSON, L. WALD, and J. M. MONGET (Ecole Nationale Superieure des Mines, Valbonne, Alpes-Maritimes, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 159-167. Centre National de la Recherche Scientifique; Centre National pour l'Exploitation des Oceans
(Contract CNRS-RCP-513; CNEXO-77/1751; CNEXO-79/2084)

A method for processing NOAA-VHRR and TIROS N-VHRR data is outlined. Noise elimination is performed and sea surface temperature maps are produced with a maximum temperature resolution of 0.5 C. A comparison is shown between in situ temperature measurements and VHRR radiometric temperatures along a track intersecting the cyclonic gyre of the Liguro-Provencal basin. The ecologic significance of the observed thermal fronts is demonstrated by stations showing the vertical variations of oceanographic parameters. The satellite image allows apprehension of the two dimensional geometry of these fronts. This information can be used in the evaluation of the primary production of the basin. It is also emphasized that the systematic processing of I.R. images brings a significant contribution to the planning of future oceanographic cruises. (Author)

A82-47448
THE WINTER SURFACE TEMPERATURE PATTERN OF THE YELLOW SEA AND THE EAST CHINA SEA DERIVED FROM METEOROLOGICAL SATELLITE IR IMAGES
Z. QUANAN (National Bureau of Oceanography First Institute of Oceanography, Qingdao, People's Republic of China) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 169-173.

A82-47449
SATELLITE MONITORING OF OCEAN SURFACE TEMPERATURE VARIABILITY IN THE MEDITERRANEAN SEA
J. J. GALLAGHER (U.S. Navy, Naval Underwater Systems Center, New London, CT), M. PHILIPPE (Centre de Meteorologie Spatiale, Lannion, Cotes-du-Nord, France), and B. WANNAMAKER (NATO, Saclant ASW Research Centre, La Spezia, Italy) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 175-182. refs

Satellite monitoring data of ocean surface temperatury variability in the Mediterranean Sea are discussed. Frontal zones, as observed at the Centre de Meteorologie Spatial, agree well with previous observations. The effects of meteorological parameters on the assessment of these systems are examined. For example, data from the Western Alboran Sea suggest that if atmospheric pressure west of the Strait of Gibraltar is greater than that east of the Strait, thermal contrasts intensity between the surface expressions of incoming cool water and the central warm core of the anticyclonic gyre. It is concluded that meteorological, in situ, and synoptic satellite measurements and analyses are necessary considerations to understand time variation measurements, to demonstrate the full value of satellite data for ocean behavior numerical model applications, and to improve temporal and spatial scale selection for future data acquisition programs. R.K.R.

A82-47450
INFRA-RED REMOTE SENSING IN THE GULF OF LIONS
C. MILLOT (Paris, Museum National d'Histoire Naturelle, La Seyne, Var, France) and L. WALD (Paris, Ecole National Superieure des Mines, Valbonne, Alpes-Maritimes, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 183-187.

Spatial and temporal variabilities of the upwelling in the Gulf of Lions and some characteristics of the Ligurian current are studied by thermal infrared satellite imagery. Upwelling develops along straight coastal segments of some ten to twenty kilometers in length. On-offshore jets of cool water driven from major upwelling centers and unexpected circulations are clearly detected from space. Off the coasts of Provence, the Ligurian current is halted by strong westerly winds. When the wind drops, the surfacelayer current flows on to the continental shelf of the Gulf of Lions at speeds up to 30 cm/sec. These results suggest that, during summer at least, the upwelling and the surface-layer circulation mainly depend upon small-and meso-scale features of the coastline. (Author)

A82-47451
APPLICATION OF SATELLITES AND REMOTE SENSING TO STUDIES OF SURFACE CIRCULATION OFF THE NOVA SCOTIAN COAST
R. W. TRITES (Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 189-194. refs

Lagrangian and surface thermal data on the southwest Scotian Shelf area are discussed. Satellites are used to track drifting buoys, and comparisons of the observed movements with maps constructed from available satellite IR imagery and sea surface temperature observations from ships develop a more realistic picture of the oceanographic processes operative in the area. C.D.

A82-47452
SATELLITE STUDIES OF THE SOUTH ATLANTIC UPWELLING SYSTEM
J. R. E. LUTJEHARMS (South African Council for Scientific and Industrial Research, National Research Institute for Oceanology, Stellenbosch, Republic of South Africa) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 195-199. refs

Features of the dynamics of upwelling in the southern Benguela area of the South Atlantic Ocean that have been observed by thermal infrared sensors on satellites are described, and an attempt is made to relate them to existing knowledge. For the Cape upwelling system, an eddy is visible during about 70 percent of the time when a well-developed upwelling plume is visible. This eddy is often accompanied by rapidly decaying eddies further north in the front of the upwelling plume. A correlation coefficient of 0.73 exists between the wind stress of the NNW wind component and the geographical extent of upwelled water as inferred from the infrared satellite images. A corresponding satellite study of the Agulhas Current on the south and east coast of South Africa shows that fragments of warm Agulhas water may at times advect round the Cape of Good Hope to the South Atlantic Ocean. C.D.

A82-47454
WATER COLOUR MEASUREMENTS - AN INTRODUCTION
H. R. GORDON (Miami, University, Coral Gables, FL) and A. Y. MOREL (Paris VI, Universite, Villefranche-sur-Mer, Alpes-Maritimes, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 207-212. refs

An overview of the symposium results is presented with reference to the Coastal Zone Color Scanner (CZCS) imagery, algorithms for deriving phytoplankton concentration and diffuse attenuation, atmospheric effects, and water constituents. Some of the conclusions are that (1) phyloplankton pigment concentrations can be derived from the CZCS measurements to within a factor of two; (2) the pigment and 'K' algorithms seem to be universal (at least to within a factor of two) as long as waters extraordinarily rich in yellow substances are excluded; (3) atmospheric corrections can be effected even for relatively turbid waters in the presence of horizontal inhomogeneities in the atmosphere; and (4) thermal imagery and color imagery are not redundant. V.L.

A82-47460
SHIP AND SATELLITE BIO-OPTICAL RESEARCH IN THE CALIFORNIA BIGHT
R. C. SMITH and W. H. WILSON (California University, La Jolla, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 281-294. refs
(Contract NOAA-NA-80AAD00007; NOAA-NA-79AAD00103)

Complementary ship and satellite (Nimbus-7 - CZCS) bio-optical data from the Southern California Bight are being used to make a quantitative assessment of the chlorophyll concentration in these waters and its spatial and temporal variability. The accuracy of an algorithm for estimating the chlorophyll concentration from these data is dependent upon the accuracy of the Nimbus-7 - DZCS atmospheric correction algorithm. A preliminary assessment of a variation of this atmospheric correction algorithm developed at the Visibility Laboratory is presented. (Author)

A82-47461* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COLOR AND TEMPERATURE SIGNATURES OF OCEAN FRONTS OBSERVED WITH THE NIMBUS-7 CZCS
J. L. MUELLER (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD) and P. E. LAVIOLETTE (NORDA, Bay St. Louis, MS) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 295-302.

The Nimbus-7 Coastal Zone Color Scanner has a unique capability for imaging simultaneously the optical (ocean color) and

surface temperature (thermal infrared) signatures of ocean fronts. Examples of such color and temperature visualizations of some ocean fronts delineate virtually identical morphology. In other cases, however, the two signatures are displaced horizontally by tens of km, and display markedly different morphology and fine structure. For example, an image of the Gulf Stream's north wall over the Grand Banks shows the sharpest color front to occur approximately 50 km away from the sharpest temperature front. Moreover, the fine structure of the color front is qualitatively suggestive of disorganized turbulent diffusion, whereas that of the thermal front shows distinctive shear instabilities. These differences can occur because the infrared temperature image represents the top 0.05 millimeter of the sea surface, whereas the ocean color image represents the upper meters to decameters of the sea. (Author)

A82-47462* Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
PRINCIPAL AREAS OF VERTICAL MIXING IN THE WATERS OF THE GULF OF MAINE, WITH REFERENCE TO THE TOTAL PRODUCTIVITY OF THE AREA
C. S. YENTSCH and N. GARFIELD (Bigelow Laboratory for Ocean Sciences, West Boothbay Harbor, ME) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 303-312. NASA-NSF-supported research.

A82-47464
USE OF THE IN VIVO FLUORESCENCE LINE AT 685 NM FOR REMOTE SENSING SURVEYS OF SURFACE CHLOROPHYLL A
J. F. R. GOWER (Institute of Ocean Sciences, Sidney, British Columbia, Canada) and G. BORSTAD (Seakem Oceanography, Ltd., Sidney, British Columbia, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 329-338. refs

A82-47465
FACTOR ANALYSIS IN OCEAN COLOUR INTERPRETATION
R. DOERFFER (Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt mbH, Geesthacht, West Germany) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 339-345. Research supported by the Deutsche Forschungsgemeinschaft. refs

An aerial survey of the spring plankton distribution in the northern North Sea is evaluated using factor analysis. The eigenvalues of the principal components of spectra were obtained from a multichannel radiometer measuring the upward directed radiance and the downward irradiance in 16 wavelength bands from an altitude of 500 m. After extraction of factors, a negative correlation in the blue part of the spectrum around 470 nm and a positive correlation at 685 nm, the fluorescence peak of chlorophyll, was seen and interpreted as phytoplankton. An increasing positive correlation toward the red part of the spectrum was interpreted as suspended matter. Mapping of the phytoplankton distribution in the research area was done by comparing the factor scores profile with the same profile obtained by using the in vivo fluorescence method. C.D.

A82-47470
A SOUTH AFRICAN OCEAN COLOUR EXPERIMENT
F. P. ANDERSON (South African Council for Scientific and Industrial Research, National Research Institute for Oceanology, Stellenbosch, Republic of South Africa), L. V. SHANNON, S. A. MOSTERT (Sea Fisheries Institute, Sea Point, Republic of South Africa), N. M. WALTERS, and O. G. MALAN (South African Council for Scientific and Industrial Research, National Physical Research Laboratory, Pretoria, Republic of South Africa) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 381-386.

A series of ocean color experiments were carried out in the southern Benguela Current region off South Africa during the austral summer of 1978/79. The objectives of the exeriments were (1) to relate the Coastal Zone Color Scanner (CZCS) measurements from the Nimbus-7 satellite to chlorophyll distribution and phytoplankton densities and pelagic fish distribution in an upwelling system; (2) to relate satellite radiance measurements to organic pollution emanating from fish processing factories; and (3) to relate satellite radiance measurements to the dynamics of fronts associated with the upwelling system. Results indicate that the measurement of chlorophyll in upwelling systems is viable and that serial color imagery could be useful in the study of frontal, mesoscale and macroscale processes and in environmental monitoring for the management of pelagic fisheries. V.L.

A82-47472
DIFFERENTIAL SPECTROSCOPY FOR THE COASTAL WATER QUALITY IDENTIFICATION BY REMOTE SENSING
L. GIANNINI (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 395-402. Research supported by the Consiglio Nazionale delle Ricerche.

In situ and airborne Ocean Color Scanner (OCS) data collected during the North Adriatic Sea expedition in September 1977 were used in a study aimed at measuring and estimating some coastal phenomena by differential spectral analysis. Two approaches were employed: (1) the difference between OCS channels 5 and 7 was used for the correlation of the remote sensing data with in situ chlorophyll measurements, and (2) the difference between the spectra of two pixels was used as an indicator of water quality. Chlorophyll patterns, plume-offshore water transition, and eddies and fluvial waters have been identified. V.L.

A82-47473
LARGE AREA MARINE PRODUCTIVITY-POLLUTION EXPERIMENTS /LAMPEX/ - A SERIES OF STUDIES BEING DEVELOPED TO HASTEN THE OPERATIONAL USE OF REMOTE SENSING FOR LIVING MARINE RESOURCES AND ENVIRONMENTAL QUALITY
J. P. THOMAS (NOAA, Sandy Hook Laboratory, Highlands, NJ) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 403-409.

A82-47474
CIRCULATION MODELING IN THE NORTHERN ADRIATIC SEA AND ITS COMPARISON WITH NIMBUS 7 REMOTELY SENSED DATA
L. ALBEROTANZA, G. ALDIGHIERI, V. BARALE, A. BERGAMASCO, P. M. RIZZOLI (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy), and M. ZICARELLI (California, University, La Jolla, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 413-420.

A multilayer numerical model applicable to basins of different geometries and bottom topographies and capable of describing barotropic and baroclinic, monolayer and multilayer situations has been applied to a test area in the Northern Adriatic covered by sea-truth data and Nimbus 7 imagery. Model derived isotherms as well as predicted temperature values are found to be in general qualitative agreement with both the sea-truth and satellite derived maps. Two possibilities are envisioned to obtain better agreement between model predictions and patterns derived from satellite imagery: (1) if the initial conditions for salinity and temperature distributions are satellite derived maps, the model must be frequently 'tuned' to successive surface images until the time of final prediction is reached; (2) if the initial conditions are obtained through conventional sea-truth measurements, then the satellite image must be smoothed through properly weighted averaging, both in space and time, so as to furnish sea surface conditions representative of a certain time. V.L.

A82-47475
LANDSAT IMAGERY OF THE VENETIAN LAGOON - A MULTITEMPORAL ANALYSIS
L. ALBEROTANZA (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) and A. ZANDONELLA (Telespazio S.p.A., Rome, Italy) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 421-428. refs
(Previously announced in STAR as N82-19612)

A82-47476
TRANSPORT PROCESSES OF SUSPENDED MATTER, INCLUDING PHYTOPLANKTON, STUDIED FROM LANDSAT IMAGES OF THE SOUTHWESTERN BALTIC SEA
U. HORSTMANN and P. G. HARDTKE (Kiel, Neue Universitaet, Kiel, West Germany) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 429-438. refs

A study has been made of a series of overlapping Landsat 1 images from three successive days showing, in bands MSS 4 and 5, distinct patterns of suspended material in the southern Belt Sea, the entrance to the Baltic. The comparatively high resolution of Landsat images permits the detection of visible surface details which can add to the explanation of hydrographical phenomena. Though Landsat scenes of the sea surface allow only limited conclusions as to the identification of suspended material, together with sea-truth data they can be used as indicators of specific biological processes which are bound to the upper few meters of the ocean, such as the accumulation of floating blue-green algae at the surface of the Baltic in summer or the beginning of the phytoplankton spring bloom. V.L.

A82-47478* Stanford Univ., Calif.
REMOTE SENSING OF THE OCEAN WAVEHEIGHT SPECTRUM USING SYNTHETIC-APERTURE-RADAR IMAGES
J. F. VESECKY, H. M. ASSAL (Stanford University, Stanford, CA), and R. H. STEWART (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; California University, La Jolla, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 449-457. refs
(Contract N00014-80-C-4318; NOAA-MO-A01-78-00-4318)

The paper discusses problems in the detection and measurement of ocean waves from their SAR images, in particular the measurement of the wavenumber spectrum of ocean-wave-height fluctuations. Comparisons on a limited set of pitch-roll buoy and SEASAT SAR measurements during the 1978 JASIN experiment reveal that degradation of SAR resolution caused by wave orbital motion is a crucial factor in the detection of waves by SAR images. Thus, waves with small slopes traveling perpendicular to the SAR flight path are more easily detected than waves with large slopes traveling along the flight path. Although the SAR estimates in this comparison were found to contain significant biases, they were in rough agreement with buoy measurements, provided the ocean wavelength was between about 120 and 400 m and the ocean wave direction was not approximately along the SAR flight path. (Author)

A82-47479
SYNTHETIC APERTURE RADAR WAVE OBSERVATIONS DURING GOASEX
F. I. GONZALEZ (NOAA, Pacific Marine Environmental Laboratory, Seattle, WA), R. A. SHUCHMAN (Michigan, Environmental Research Institute, Ann Arbor, MI), D. B. ROSS (NOAA Sea Air Interaction Laboratory, Miami, FL), C. L. RUFENACH (NOAA, Wave Propagation Laboratory, Boulder, CO), and J. F. R. GOWER (Institute of Ocean Sciences, Sydney, British Columbia, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 459-467. Research supported by the Canadian Surveillance Satellite Projects refs
(Contract NOAA-MO-A01-78-00-4322)

The present investigation is concerned with the ocean wave detection capabilities of synthetic aperture radar (SAR). A major field experiment, the September 1978 Gulf of Alaska Seasat Experiment (GOASEX), provided surface wave measurements coincident with aircraft and satellite SAR imagery. A preliminary assessment of the data was reported by Gonzalez et al. (1979). The current investigation quantitifies the correlation among surface and radar estimates for those ocean waves successfully detected by SAR. The data are found to suggest that for the limited environmental conditions encountered dominant wavelength estimates by SAR are at least as accurate as the standard surface observations by buoy. The SAR directional estimates are probably superior. Both Seasat and CV-580 SAR successfully detected waves with significant azimuth components. It is concluded that for range waves, a measure of rms slope and/or orbital velocity may be more appropriate than significant wave height for the characerization of sea state in studies of SAR ocean wave image quality. G.R.

A82-47480
SEASAT SAR OCEAN SURFACE CURRENT AND SHALLOW WATER WAVE REFRACTION
J. G. HAYES (Global Scientific, Inc., Concord, MA) and R. A. SHUCHMAN (Michigan, Environmental Research Institute, Ann Arbor, MI) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 469-476. refs
(Contract NOAA-78-4338)

The propagation of gravity waves and the wave-current interaction phenomenon has been studied with Seasat synthetic aperture radar (SAR) data obtained along the east coast of the United States near Cape Hatteras, NC. Particular attention is focused on Seasat Revolution 974, where the meteorological conditions, wave generation in deep water, and the resulting wave field are discussed and compared to a numerical shallow water wave model. The resulting coastal wave data results show a reasonable representation of the refraction pattern near Cape Hatteras. Optical Fourier transforms and fast Fourier transforms generated in deep and shallow water are compared with the resulting measured and modeled wave field. Results indicate that the SAR is a valuable instrument for current and wave detection and particularly for wave-current interaction studies. Wavelength versus water depth inversion techniques have shown encouraging results for using SAR data in determining bathymetric structures. (Author)

A82-47481
PROCESSING SYNTHETIC APERTURE RADAR DATA OF OCEAN WAVES
R. A. SHUCHMAN (Michigan, Environmental Research Institute, Ann Arbor, MI) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 477-496. refs
(Contract N00014-76-C-1408)

When using a Synthetic Aperture Radar (SAR) system to image moving targets such as ocean waves, unique problems occur when correlating the signal data. The present investigation is concerned with such problems occurring in connection with the processing of radar data of ocean waves, taking into account approaches for

overcoming these problems. Variation of the azimuth and the range focus indicates the insensitivity of the images of wave components traveling in the along-track direction to azimuth focus, and rather low sensitivity to range focus of wave components traveling in the cross track direction. Detectability of azimuth and range traveling waves can be improved by respective adjustment of focal distance and rotation of the cylindrical telescope in the SAR processor. Attention is given to theoretical focusing algorithms, wave motion vs focusing of Seasat SAR data, wave motion vs focusing of aircraft data, SAR processor observed motion of ocean waves, a stationary surface model for ocean waves, and Doppler exploitation and integration time considerations. G.R.

A82-47482
THE MONITORING OF LARGE SCALE SYNOPTIC FEATURES OF THE OCEAN WITH SPACEBORNE SYNTHETIC APERTURE RADAR
R. C. BEAL (Johns Hopkins University, Laurel, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 505-510. refs

Existing operational ocean wave models depend upon a sparse knowledge of the wind magnitude and direction to derive a spatial distribution of directional wave spectra. This approach can result in considerable error. Direct spaceborne measurement of global ocean spectra could eliminate or reduce the need for either wind or bathymetric knowledge. During the limited 100 day lifetime of the Seasat Synthetic Aperture Radar (SAR), a particularly rich data set consisting of about 20 passes was collected just off the U.S. East Coast. The Seasat SAR was able to sense only the spatial distribution of 30 cm to 40 cm short gravity waves on the ocean surface, through a Bragg resonance of the radar emission with the ocean. The distribution of these short waves, however, is correlated with a number of significant larger scale phenomena, including local wind structure, long gravity waves, current shear boundaries, and occasionally the local bathymetry. The ability of the Seasat SAR to monitor large scale processes depends upon modulations of the short gravity waves by the larger scale phenomena. G.R.

A82-47484
NONLINEAR FEATURES OF INTERNAL WAVES AS DERIVED FROM THE SEASAT IMAGING RADAR
J. R. APEL (NOAA, Pacific Marine Environmental Laboratory, Seattle, WA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 525-533. refs

The synthetic aperture radar on Seasat has yielded well defined images of quasi-periodic internal waves in the waters on the west side of Baja California. These waves occur in groupings separated by 10-20 km, each group having two to twenty striations with wavelengths of order 400 m. At the shelf edge, they occur in water approximately 150 m deep, shoreward of several banks at the continental shelf edge whose depths are as shallow as 15 m. The wave surface signatures exhibit clear nonlinear features: higher-than-linear group velocities, and decreases in wavelength, crest length and amplitude toward the rear of the packer. Environmental data for the area have been examined and these show a well-developed mixed layer, low winds and vigorous tidal action. Thus stratification, wind speed, and bottom topography apparently combine to establish proper conditions for tidal generation of internal waves. (Author)

A82-47486* Hofstra Univ., Hempstead, N. Y.
STUDIES OF THE DEPENDENCE OF L-BAND BACKSCATTER ON SEA SURFACE WINDS USING THE SYNTHETIC APERTURE RADAR
D. E. WEISSMAN (Hofstra University, Hempstead, NY), W. E. BROWN, JR. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA), T. W. THOMPSON (Science Applications, Inc., Pasadena, CA), F. I. GONZALEZ (NOAA, Pacific Marine Environmental Laboratory, Seattle, WA), and W. L. JONES (NASA, Langley Research Center, Hampton, VA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 543-551. refs
(Contract NAS7-100)

Airborne and Seasat-1 SAR measurements of over-ocean winds through the use of L-band frequencies is described. A consistent dependence has been found between the wind speeds and the microwave backscattering coefficient. Measurements were obtained for cells a few kilometers across and at an incidence angle of 20 deg from nadir. Surface measurements were included in the analyses whenever possible, including data for surface temperatures and current variations, such as in the Gulf Stream. Higher radar cross-sections have been observed from the Gulf Stream than in nearby continental shelf waters. The eye-wall of Hurricane Gloria in Sept. 1976 displayed the largest backscatter of the storm. Wind speed backscatter exponents of 0.5 for winds below 18 m/sec, and 0.58 for winds above 20 m/sec have been determined for the Seasat L-band backscatter. The same wind speeds hold true for 0.05 and 0.50, respectively, for the wind direction component. M.S.K.

A82-47487* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MICROWAVE SCATTEROMETER MEASUREMENTS OF OCEANIC WIND VECTOR
W. L. JONES, L. C. SCHROEDER (NASA, Langley Research Center, Hampton, VA), and F. J. WENTZ (Remote Sensing Systems, Sausalito, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 553-562. refs

Results from Seasat-A scatterometer (SASS) remote sensing of oceanic wind vectors are reviewed, together with the theory of radar backscattering. The SASS was designed to measure the surface wind stress and neutral stability wind vector at 19.5 m altitude. Requirements included windspeeds from 4-24 m/sec to within 2 m/sec or 10%, a 1000 km swath, directions from 0-360 deg to within 20 deg, a 50 km resolution cell, and cross-track and along-track spacing between resolution cells of 100 km. The method was based on Bragg scattering of microwaves from cm-length capillary ocean waves. The strength of the backscatter is proportional to the capillary wave amplitude, which is in equilibrium with the ocean surface wind speed. The measurement grouping, least-squares estimator, and dB deviation model function table for the SASS geophysical algorithm are discussed. Comparisons of SASS, GOASEX, and ground truth wind data are made, and a 0.92 correlation between SASS and ground truth data is determined from regression analysis. M.S.K.

A82-47488* City Univ. Inst. of Marine and Atmospheric Sciences, New York.
WINDS OVER THE OCEAN AS MEASURED BY THE SCATTEROMETER ON SEASAT
W. J. PIERSON (City College, Institute of Marine and Atmospheric Sciences, New York, NY) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 563-571. refs
(Contract NAS1-15569)

An analysis is presented of the relative accuracy of Seasat scatterometer measurements of the wind speeds and directions at 19.5 m altitude as compared to ground truth measurements taken by surface ships and instrumented buoys. Attention is given to the JASIN, QE II, and GOASEX surface data. The validity of 2-30 min averages taken from surface stations spread out over a

wide area and serving as a basis for defining wind field averages over the 50 km resolution of SASS is examined. Satisfactory wind speeds were found to be available from SASS readings in the wind speed range 6-14 m/sec. The use of 25 SASS readings around a grid point was determined to reduce scatter to 0.25 m/sec when used in numerical weather prediction modeling. Improvements to the SASS techniques by the Seasat successor, NOSS, are discussed, and inclusion of momentum, heat, and water turbulent fluxes by NOSS is noted. M.S.K.

A82-47489
SCATTEROMETER-DERIVED WINDS OVER THE QE II STORM
J. A. ERNST (NOAA, Spacecraft Oceanography Group, Washington, DC) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 573-579.

Seasat scatterometer data of a strong storm wind field over North Atlantic waters on September 12, 1978 are compared with ground truth data to assess the effects of atmosphere/cloud liquid water attenuation on the results obtained from a wind evaluation algorithm. The ground truth data was generated for the ocean region by interpolation of surface measurements to the remotely sensed area, then converting to the 19.5 m height using a boundary layer model and considering neutral stability. The Seasat data was taken from scatterometer (SASS) microwave radar soundings. Regression analyses were carried out on the two sets of 177 measurements, averaged out over all incidence and azimuth angles and 1/2 deg groupings. The accuracy of the SASS readings was found to decrease at wind speeds over 20 m/sec. Adjusting the algorithm to take attenuation into account in processing SASS data is recommended. M.S.K.

A82-47491* Massachusetts Inst. of Tech., Cambridge.
THE POTENTIAL IMPACT OF SCATTEROMETRY ON OCEANOGRAPHY - A WAVE FORECASTING CASE
M. A. CANE (MIT, Cambridge, MA) and V. J. CARDONE (Oceanweather, Inc., White Plains, NY) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 587-595. refs
(Contract NAS2-4498; JPL-95583; NGR-22-009-727)

A series of observing system simulation experiments have been performed in order to assess the potential impact of marine surface wind data on numerical weather prediction. In addition to conventional data, the experiments simulated the time-continuous assimilation of remotely sensed marine surface wind or temperature sounding data. The wind data were fabricated directly for model grid points intercepted by a Seasat-1 scatterometer swath and were assimilated into the lowest active level (945 mb) of the model using a localized successive correction method. It is shown that Seasat wind data can greatly improve numerical weather forecasts due to better definition of specific features. The case of the QE II storm is examined. V.L.

A82-47492
OBSERVATIONAL RESULTS PERTAINING TO SCATTEROMETER INTERPRETATION
K. L. DAVIDSON, G. E. SCHACHER, C. W. FAIRALL (U.S. Naval Postgraduate School, Monterey, CA), and J. D. JARRELL (Science Applications, Inc., Monterey, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 597-605. refs

The status of interpretation of microwave backscatter data and air-sea coupling data are reviewed. Discrepancies between expected and observed results from SASS intercomparisons are considered in view of measurements in the overlying shear flow. An extensive set of overwater momentum transfer results are examined relative to the discrepancies. The conclusion is that airflow measurements are not sufficient to extend the present interpretations. (Author)

A82-47493* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TWO-FREQUENCY /DELTA K/ MICROWAVE SCATTEROMETER MEASUREMENTS OF OCEAN WAVE SPECTRA FROM AN AIRCRAFT
J. W. JOHNSON, W. L. JONES (NASA, Langley Research Center, Hampton, VA), and D. E. WEISSMAN (Hofstra University, Hempstead, N.Y.) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 607-616. refs

A technique for remotely sensing the large-scale gravity wave spectrum on the ocean surface using a two frequency (Delta k) microwave scatterometer has been demonstrated from stationary platforms and proposed from moving platforms. This measurement takes advantage of Bragg type resonance matching between the electromagnetic wavelength at the difference frequency and the length of the large-scale surface waves. A prominent resonance appears in the cross product power spectral density (PSD) of the two backscattered signals. Ku-Band aircraft scatterometer measurements were conducted by NASA in the North Sea during the 1979 Maritime Remote Sensing (MARSEN) experiment. Typical examples of cross product PSD's computed from the MARSEN data are presented. They demonstrate strong resonances whose frequency and bandwidth agree with the surface characteristics and the theory. Directional modulation spectra of the surface reflectivity are compared to the gravity wave spectrum derived from surface truth measurements. (Author)

A82-47494
REMOTE SENSING OF THE SEA USING ONE- AND TWO-FREQUENCY MICROWAVE TECHNIQUES
D. L. SCHULER, W. J. PLANT, and W. P. ENG (U.S. Navy, Naval Research Laboratory, Washington, DC) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 617-623.

The capabilities of one and two-frequency, coherent, pulsed, microwave radars for the remote sensing of the sea surface are theoretically and experimentally investigated. The theory of the dual-frequency microwave backscatter is briefly reviewed, and a technique is proposed which directly measures the orbital velocities associated with large-scale, longer waves. In this technique the linearly detected, backscatter return is hard-limited and passed through a frequency-to-voltage converter to yield a signal proportional to the instantaneous Doppler frequency shift of the return. A double modulation technique is presented which measures modulation transfer functions of small-scale waves whose lengths are on the order of a meter or more. The technique combines dual-frequency measurements with line-of-sight velocity measurements. The application of these techniques to the measurement of ocean surface currents is shown. C.D.

A82-47495* National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
SATELLITE RADAR ALTIMETERS - PRESENT AND FUTURE OCEANOGRAPHIC CAPABILITIES
W. F. TOWNSEND, J. T. MCGOOGAN, and E. J. WALSH (NASA, Wallops Flight Center, Wallops Island, VA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 625-636. refs

Satellite radar altimeters have the ability to provide information related to ocean wave heights, wind speed, and currents. The present investigation has the objective to demonstrate the current capabilities and to indicate ways to increase the information content of the altimeter return through the use of wider bandwidth, higher pulse repetition frequencies (PRF), and multibeam. Altimeters aboard Skylab, Geos-3, and Seasat-1 have provided investigators with valuable experience in translating the radar observables into oceanic parameters. Basically, an altimeter transmits a narrow pulse and measures the time interval until the return energy from the ocean surface is received. That direct measure of the satellite altitude can be interpreted in terms of surface topography. Attention is given to altimeter oceanographic measurements, altimeter return pulse characteristics, satellite pointing and surface slopes, the

adaptive tracker for terrain mapping, and a multibeam altimeter. G.R.

A82-47496
A COMPARISON OF SEASAT-DERIVED WAVE HEIGHT WITH SURFACE DATA
P. QUEFFEULOU (Bretagne Occidentale, Universite, Brest, France), A. BRAUN (COB Antenne Meteo, Brest, France), and C. BROSSIER (Centre National d'Etudes Spatiales, Groupe de Recherches de Geodesie Spatiale, Toulouse, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 637-643.

Seasat data on wave height are compared with shipborne measurements for various wave heights (0-8 m) and about a hundred data points. The agreement is found to be generally good; no bias is observed, and a large part of the standard deviation is due to the visual ship observations of seastate. The Seasat waveheight is also compared with the predictions of DSA 5, a spectral forecasting wave model, and differences between the two sets of data are examined. V.L.

A82-47498
EXTRACTION OF TWO DIRECTIONAL PARAMETERS OF SEA WAVES SPECTRUM FROM HF DOPPLER RADAR SEA-ECHO
P. FORGET and P. BROCHE (Toulon et Var, Universite, Toulon, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 657-661. Research supported by the Centre National de la Recherche Scientifique, Centre National pour l'Exploitation des Oceans, Institut Francais du Petrole, Societe Nationale Elf-Aquitaine, and Compagnie Francaise des Petroles. refs

Two amplitude lines of sea surface observations using HF radar are used to find the direction of the waves in relation to the radar beam direction and the mean parameter s of the LCS model. The amplitudes are divided by the spectral energy derived from data recorded by a wave rider buoy in the scattering area, and propagation losses caused by the sea state are accounted for, being negative at 6 MHz and varying from 0-7 dB at 12 MHz. The angle of the wave direction propagation in relation to the radar beam was found to be similar at both 6 and 12 MHz, except for a divergence after 9/6 at 12 o'clock. Low values of s were correlated with light winds, and higher directional propagation was observed at 0.25 Hz than at 0.35 Hz. M.S.K.

A82-47499* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUMMARY OF THE STATUS OF THE NIMBUS-7 SMMR
P. GLOERSEN (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 665-672.

The present state of calibration of the Nimbus-7 SMMR is described, and its relevance to retrievals of sea surface temperatures is discussed. The asymmetry in the polarization rotation was studied by calibrating the SMMR signals without the polarization rotation correction within a data set consisting of about 300 orbits, and the phase shift was determined by regression analysis. The largest phase shift was observed in the 1.4 cm vertical polarization channel - almost 11 degrees. The in-orbit calibration adjustment scheme is described, and the result of applying it to the 4.6 cm vertical polarization channel is shown. C.D.

A82-47500* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEASAT SMMR OBSERVATIONS OF OCEAN SURFACE TEMPERATURE AND WIND SPEED IN THE NORTH PACIFIC
E. G. NJOKU and R. HOFER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 673-681. refs (Contract NAS7-100)

The Scanning Multichannel Microwave Radiometer (SMMR), aboard both the SEASAT and Nimbus-7 satellites, was designed primarily to determine global sea surface temperatures and wind speeds over an extended range of atmospheric conditions. The Seasat mission lasted approximately three months from July to October 1978, during which time sufficient data was acquired to enable an assessment of SMMR measurement capabilities under a variety of conditions. This paper reports some results of initial Seasat SMMR assessments in the North Pacific area. A brief description is given of retrieval techniques used to derive the geophysical parameters. SMMR-derived sea surface temperatures and winds are compared with surface truth point measurements from XBT's and buoys, and with surface truth fields derived from point measurements. Accuracies of approximately 1.5 C and 2.5 m/s rms are obtained in these comparisons. (Author)

A82-47503* Massachusetts Inst. of Tech., Cambridge.
INFERENCE OF SEA SURFACE TEMPERATURE, NEAR SURFACE WIND, AND ATMOSPHERIC WATER BY FOURIER ANALYSIS OF SCANNING MULTICHANNEL MICROWAVE RADIOMETER DATA
P. W. ROSENKRANZ (MIT, Cambridge, MA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 707-716. refs (Contract NAS5-22929)

The Scanning Multichannel Microwave Radiometer measures thermal microwave emission from the earth in both polarizations at wavelengths of 0.8, 1.4, 1.7, 2.8 and 4.6 cm. Similar instruments were launched on Nimbus 7 and Seasat. Both spatial resolution on the earth and relative sensitivity to different geophysical parameters change with wavelength. Therefore, spatial Fourier components of geophysical parameters are inferred from the corresponding Fourier components of the radiometer measurements, taking into account the different dependence of signal-to-noise ratio on spatial frequency for each radiometer wavelength. The geophysical parameters are sea surface temperature, near-surface wind speed, integrated water vapor mass, integrated liquid water mass, and the product of rainfall rate with height of the rain layer. The capabilities and limitations of the inversion method are illustrated by means of data from the North Atlantic and from tropical storms. (Author)

A82-47504* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION OF NIMBUS 7 SMMR SENSOR WITH AIRBORNE RADIOMETERS AND SURFACE OBSERVATIONS IN THE NORWEGIAN SEA
P. GLOERSEN, D. CAVALIERI, J. CRAWFORD (NASA, Goddard Space Flight Center, Greenbelt, MD), W. J. CAMPBELL (Puget Sound, University, Tacoma, WA), B. FARRELLY, J. JOHANNESSEN, O. M. JOHANNESSEN, E. SVENDSEN (Bergen, Universitetet, Bergen, Norway), and K. KLOSTER (Christian Michelsens Institutt, Bergen, Norway) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 717-726.

Measurements made by the Nimbus 7 SMMR are compared with near simultaneous observations using the airborne SMMR simulator and with surface observations. The area of the test is in the Norwegian Sea between Bear Island and Northern Norway. It is noted that during the observation period two low-pressure systems were located in the test area, giving a spatial wind variation from 3-20 m/s. It is shown that the use of the currently available brightness temperatures and algorithms for SMMR does not give universally satisfactory results for SST and wind speed under

extreme weather conditions. In addition, the SMMR simulator results are seen as indicating the need for more work on calibration. C.R.

A82-47505
INFORMATION CONTENT OF THE SEASAT SMMR BRIGHTNESS TEMPERATURES FOR SEA SURFACE TEMPERATURE RETRIEVAL
C. GAUTIER (Wisconsin, University, Madison, WI) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 727-734. refs

The corrections that must be made in the data from the 6.6 GHz channel are discussed, showing that in order to obtain sea surface temperatures with reasonable accuracy (less than 2 K rms error) it is necessary to edit and process the 6.6 GHz data very carefully. Analyses of selected brightness temperatures show that at present the algorithm analyzed still has problems in certain circumstances in discriminating surface temperature gradients from other geophysical gradients. However, a statistical structure function analysis shows that the 6.6 GHz field might contain the information necessary for retrieving the temperature gradient using an appropriate algorithm. C.R.

A82-47506
REMOTE SENSING OF THE OCEAN AND ATMOSPHERE WITH PASSIVE MICROWAVE MEASUREMENTS
A. M. SHUTKO and A. G. GRANKOV (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 735-740.

The effectiveness of sea surface and atmospheric parameter determination with the spectral method of microwave radiometry is analyzed. The wavelength ranges which provide the best accuracy in sea surface temperature, salinity, wind speed over the surface, integral water vapor content of the atmosphere, and total liquid water content in clouds are determined for certain meteorological conditions. The accuracy of retrieved parameters is examined. (Author)

A82-47507* Remote Sensing Systems, Sausalito, Calif.
DEPENDENCE OF SEA-SURFACE MICROWAVE EMISSIVITY ON FRICTION VELOCITY AS DERIVED FROM SMMR/SASS
F. J. WENTZ, E. J. CHRISTENSEN, and K. A. RICHARDSON (Remote Sensing Systems, Sausalito, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 741-749. NASA-sponsored research. refs

The sea-surface microwave emissivity is derived using SMMR brightness temperatures and SASS inferred friction velocities for three North Pacific Seasat passes. The results show the emissivity increasing linearly with friction velocity with no obvious break between the foam-free and foam regimes up to a friction velocity of about 70 cm/sec (15 m/sec wind speed). For horizontal polarization the sensitivity of emissivity to friction velocity greatly increases with frequency, while for vertical polarization the sensitivity is much less and is independent of frequency. This behavior is consistent with two-scale scattering theory. A limited amount of high friction velocity data above 70 cm/sec suggests an additional increase in emissivity due to whitecapping. (Author)

A82-47509* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUBMARINE FRESH WATER OUTFLOW DETECTION WITH A DUAL-FREQUENCY MICROWAVE AND AN INFRARED RADIOMETER SYSTEM
H.-J. C. BLUME, B. M. KENDALL, and J. C. FEDORS (NASA, Langley Research Center, Hampton, VA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 757-761.

Since infrared measurements are only very slightly affected by whitecap and banking angle influences, the combined multifrequency radiometric signatures of the L-band, the S-band, and an infrared radiometer are used in identifying freshwater outflows (submerged and superficial). To separate the river and lagoon outflows from the submarine outflows, geographical maps with a scale of 1:100,000 are used. In all, 44 submarine freshwater springs are identified. This is seen as indicating that the submarine freshwater outflow locations are more numerous around the island than had earlier been estimated. Most of the submarine springs are located at the northwest and southeast portion of the Puerto Rican coastline; the success in detecting the submarine springs during both missions at the northwest portion of the island is 39%. Salinity and temperature distribution plots along the flight path in longitude and latitude coordinates reveal that runoff direction can be determined. C.R.

A82-47510
USE OF A SATELLITE MULTIFREQUENCY RADIOMETER TO DETERMINE ATTENUATION SUFFERED BY A SATELLITE RADAR
G. J. DOME, R. K. MOORE, I. J. BIRRER, and K. VAN SICKLE (University of Kansas Center for Research, Inc., Lawrence, KS) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 763-770. refs
(Previously announced in STAR as N81-10279)

A82-47512
MICROWAVE REMOTE SENSING OF SEA ICE
A. L. GRAY (Canada Centre for Remote Sensing, Ottawa, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 785-800. refs

Recent results from the microwave remote sensing of sea ice are reviewed. Particular attention is given to results obtained since the comprehensive articles of Campbell et al. (1978) and Glorsen et al. (1978). Reference is often made here to aircraft work rather than to Seasat in order to extrapolate to the capabilities of spaceborne microwave systems for ice reconnaissance. Some of the results discussed are from the recent Canadian Sursat program. The basic problem of differentiating sea ice from open water is discussed for both active (radar) and passive (radiometer) microwave remote sensors, with attention given to the implications of the radar geometry for the satellite case. It is believed that satellite systems alone will not satisfy all the requirements for ice and cold ocean information. C.R.

A82-47513
MICROWAVE SIGNATURES OF SEA ICE BASED ON AIRBORNE RADIOMETER MEASUREMENTS
N. SKOU (Danmarks Tekniske Hojskole, Lingby, Denmark) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 801-812. refs

Airborne measurements carried out with a radiometer system at 5, 17, and 34 GHz in the Greenland area are used to derive sea ice signatures. A fixed, profiling antenna system, having equal, overlapping footprints, was used on some flights, while a scanning antenna producing high resolution imagery was used on others. A variety of sea ice conditions were studied, including different ice concentrations, large single floes of first-year ice and multiyear ice, thin new ice and combinations of these types. The profiled data were used to extract signatures of ice types and to investigate

the degree of correlation between the different radiometer channels. The imagery, which represents a much more efficient data collection method as compared to profiling, largely confirms the signatures found from the profiles and clearly demonstrates the capability of the radiometer system to classify sea ice. C.D.

A82-47514
CLASSIFICATION OF BEAUFORT SEA ICE USING ACTIVE AND PASSIVE MICROWAVE SENSORS
C. E. LIVINGSTONE, R. K. HAWKINS, A. L. GRAY (Canada Centre for Remote Sensing, Ottawa, Canada), K. OKAMOTO (Ministry of Posts and Telecommunications, Radio Research Laboratories, Tokyo, Japan), T. L. WILKINSON, S. YOUNG (Waterloo, University, Waterloo, Ontario, Canada), L. D. ARSENAULT (Cold Regions Remote Sensing, Stittsville, Ontario, Canada), and D. PEARSON (Intera Environmental Consultants, Ltd., Ottawa, Canada) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 813-821. refs

A82-47516* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WINTERTIME MICROWAVE OBSERVATIONS OF THE NORTH WATER POLYNYA
J. P. CRAWFORD and C. L. PARKINSON (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 839-844.

Electronically Scanning Microwave Radiometer data from Nimbus 5 have been used to examine variations in the area of the North Water polynya, i.e., an area of reduced ice concentration in a region of predominantly ice-covered water, during the winter periods 1973-74, 1974-75, and 1975-76. It is found that the North Water polynya opens and closes repeatedly during the winter season, being open roughly 30% of the time between October and May. No strong correlations are found between this opening and limited atmospheric data available from three surrounding stations. V.L.

A82-47517
SOME RESULTS FROM ONR/NAVY RESEARCH EFFORTS ON REMOTE SENSING OF SEA ICE WITH AN OVERVIEW OF FUTURE RESEARCH DIRECTIONS
C. A. LUTHER (U.S. Navy, Office of Naval Research, Arlington, VA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 845-851.

This paper presents some results of ONR/Navy sponsored research on remote sensing of sea ice. Progress in determining radar backscatter properties of various types of sea ice over primarily winter conditions is shown. Results of effects of snow cover on backscatter properties of sea ice are included. X- and L-band synthetic aperture radar imagery of sea ice are compared for selection of the optimum frequency for sea ice detection and classification of ice types. To aid in the selection of an appropriate SAR resolution for use on sea ice, SAR imagery equivalent to the 25 meter Seasat-A resolution is successively degraded to 50 meter and 100 meter resolutions and the results shown for purposes of comparison. Finally, sea ice data from a four frequency passive microwave radiometer are displayed. The paper concludes with an outline of ONR's future plans for sea ice remote sensing. (Author)

A82-47519
ON ESTIMATING THE GLOBAL OCEAN SURFACE CIRCULATION FROM SATELLITE ALTIMETRY
C. RIZOS (New South Wales, University, Kensington, Australia) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 865-870. refs

Four sets of coefficients representing wavelengths of the sea surface topography (SST) of approximately 2000 km are considered. Even though the models are not exactly equivalent, all are plausible low degree harmonic models of the stationary SST. The gyres in the North Pacific and North Atlantic oceans appear in all four SST models. Major discrepancies, however, are found in the Southern Hemisphere oceans. Two possible causes for these discrepancies are proposed. The first is that the circulation patterns are not purely geostrophic in nature. The second is that the spherical harmonic models for the horizontal gradients of the SST lack the resolution, particularly in the southern oceans, to model any steady-state currents of less energetic nature than the Gulf Stream and the Kuroshio. The results demonstrate the difficulty of obtaining a reliable estimate of stationary SST associated with limited features of the ocean surface circulation from presently available data. They also reveal the extent to which the fact that the world's ocean current systems are in geostrophic balance is the limiting factor in the use of geodetic techniques for ocean dynamic modeling. C.R.

A82-47520
REGIONAL SURFACE OCEAN CIRCULATION FROM SATELLITE ALTIMETRY
R. COLEMAN (Australian National University, Canberra, Australia) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 871-876. refs

The dense coverage of short pulse mode GEOS-3 altimeter data in the western North Atlantic provides a method for studying, on a regional basis, oceanographic parameters of interest. Both time varying and stationary components of the sea surface height (SSH) have been examined to quantify ocean circulation information. Time variations in the sea surface heights were investigated in regional monthly models of the Sargasso Sea for the period July 1975 to April 1976. Shortwave maxima and minima in the regional sea surface models were examined for correlations with subsurface and infrared temperature data. Estimates of the dynamic SSH using the regional models and the best available geoid were used to calculate the geostrophic current under the assumptions of a nonaccelerated system and the absence of frictional and atmospheric pressure gradients. (Author)

A82-47521
WESTERN BOUNDARY CURRENT VARIABILITY DERIVED FROM SEASAT ALTIMETRY DATA
H. M. BYRNE and P. E. PULLEN (NOAA, Pacific Marine Environmental Laboratory, Seattle, WA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 877-884. refs

Altimetry data are adduced showing that the scale of horizontal variations in time and space of the two western boundary currents are similar and can be monitored adequately using a radar altimeter in a fixed repeat orbit. It is also shown that, with a high resolution geoid, surface velocities that appear reasonable are easily calculated. The repeat orbit reduces the need for a high resolution geoid when only the variability is sought, but surface current speeds cannot be obtained without such a geoid. It is pointed out that when rigorous pass-to-pass intercomparisons are attempted, compensation should be made for the horizontal variations of surface atmospheric pressure, electromagnetic sea level shifts, and tropospheric water vapor variations. C.R.

A82-47523
OCEAN TIDE DETERMINATION FROM SATELLITE ALTIMETRY
R. D. BROWN and M. K. HUTCHINSON (Phoenix Corp., McLean, VA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 897-906. refs
(Contract N00014-79-C-0409)

It is noted that orbit error translates directly into tide height error and that several investigators have found that the orbit error is not sufficiently random to ignore. For data arcs of less than 1/2-orbit in length, however, it is possible to separate the longer wavelength orbit error from the shorter wavelength ocean tide

effects. With such short arcs, the orbit error may be parameterized by a low order polynomial and corrected in a least squares data adjustment. Harmonic analyses can then be carried out on the differences in sea height at satellite subtrack intersections (crossovers). Preliminary results produce good agreement with bottom pressure gauge measurements at several points, indicating that these altimeter tide determinations are feasible and that the orbit error problem can be solved. It is also pointed out that a time series harmonic analysis at selected points of high crossover density in the Northeast Pacific indicates that the M2 tide changes spatially more rapidly than has been predicted. C.R.

A82-47524
APPLICATION OF SATELLITE RADAR ALTIMETER DATA TO THE DETERMINATION OF REGIONAL TIDAL CONSTITUENTS AND THE MEAN SEA SURFACE
J. M. DIAMANTE (NOAA, National Ocean Survey, Rockville, MD) and T.-S. NEE (Optimum Systems, Inc., Rockville, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 907-918. refs

A method has been developed to correct the systematic satellite ephemeris errors in satellite radar altimeter data over an extended extrapolation area, having first determined these errors in a reference region where an accurate gravimetric geoid and tide model are available. The method has been applied using GEOS-3 altimeter data in the GEOS-3 Atlantic Ocean Calibration Area, using a portion of the Hatteras Abyssal Plain as the reference area, to derive the mean sea surface and five tidal constituents in the extrapolation region. (Author)

A82-47525* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TIDES ON THE PATAGONIAN SHELF FROM THE SEASAT RADAR ALTIMETER
M. E. PARKE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 919-925. refs
(Contract NAS7-100)

The purpose of the study described here is to show comparisons between measurements of the sea surface height by the Seasat radar altimeter and tidal elevations based on gauge data along the coast for two passes by the satellite along the shelf. The results provide initial confirmation that tides can be detected in this region by way of satellite altimetry. The study extends a similar presentation by Parke (1980). C.R.

A82-47526
SEASAT ALTIMETER MEASUREMENTS OVER THE ENGLISH CHANNEL - AN ERROR ANALYSIS
C. LE PROVOST (Grenoble, Institut de Mecanique, Grenoble, France) and C. BROSSIER (Centre National d'Etudes Spatiales, Groupe de Recherches de Geodesie Spatiale, Toulouse, France) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 927-932. Research supported by the Centre National de la Recherche Scientifique; Centre National pour l'Exploitation des Oceans refs
(Contract CNEXO-78/1967)

A study has been carried out in order to determine the magnitude of the error term in the altimetric equation relating the satellite geocentric radius, the altimetric distance between sea surface and satellite, the geoid height (referred to a geocentric ellipsoid radius), and the variable height of sea surface above the geoid. The English Channel, where geodesy and oceanography have been intensively studied, is used as a calibration area, and satellite data are those derived from Seasat tracking and from altimeter measurements corrected for instrument and atmospheric refraction effects. After elimination of tidal contributions, altitude residual curves give a measured estimate of the geoid slope between the English and French coasts with a height difference of the order of 3 m, which is in good agreement with the geoid model of Monka et al. (1979). V.L.

A82-47595*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WATER RAMAN NORMALIZATION OF AIRBORNE LASER FLUOROSENSOR MEASUREMENTS - A COMPUTER MODEL STUDY
L. R. POOLE and W. E. ESAIAS (NASA, Langley Research Center, Hampton, VA) Applied Optics, vol. 21, Oct. 15, 1982, p. 3756-3761. refs

The technique for normalizing airborne lidar measurements of chlorophyll fluoresence by the water Raman scattering signal is investigated for laser-excitation wavelengths of 480 and 532 nm using a semianalytic Monte Carlo methodology (SALMON). The signal-integration depth for chlorophyll fluorescence Z(90,F), is found to be insensitive to excitation wavelength and ranges from a maximum of 4.5 m in clearest waters to less than 1 m at a chlorophyll concentration of 20 microgram/liter. For excitation at 532 nm, the signal-integration depth for Raman scattering, Z(90,R), is comparable to Z(90,F). For excitation at 480 nm, Z(90,R) is four times as large as Z(90,F) in clearest waters but nearly equivalent at chlorophyll concentrations greater than 2-3 microgram/liter. Absolute signal levels are stronger with excitation at 480 nm than with excitation at 532 nm, but this advantage must be weighed against potential ambiguities resulting from different integration depths for the fluorescence and Raman scattering signals in clearer waters. To the precision of the simulations, Raman normalization produces effectively linear response to chlorophyll concentration for both excitation wavelengths. (Author)

A82-47950
A SEMI-EMPIRICAL SEA-SPECTRUM MODEL FOR SCATTERING COEFFICIENT ESTIMATION
A. K. FUNG and K. K. LEE (University of Kansas Center for Research, Inc., Lawrence, KS) IEEE Journal of Oceanic Engineering, vol. OE-7, Oct. 1982, p. 166-176. European Space Agency refs
(Contract ESA-85,655)

A semi-empirical sea-spectrum model is proposed for use in a two-scale radar sea scatter model to obtain estimates of radar backscatter over the frequency bands L to Ku, the incidence angular range 20-65 deg, the azimuth angular range 0-180 deg from the wind direction, and wind speed range 3.5-30 m/s at 19.5 m above the mean sea level. It is shown that the theoretical estimates obtained are consistent with the existing measurements. (Author)

N82-28502*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR DELTA K SYNTHETIC APERATURE RADAR MEASUREMENT OF OCEAN CURRENT Patent Application
A. JAIN, inventor (to NASA) (JPL) 18 Mar. 1982 11 p
(Contract NAS7-100)
(NASA-CASE-NPO-15704-1; US-PATENT-APPL-SN-359382)
Avail: NTIS HC A02/MF A01 CSCL 17I

A synthetic aperture radar is employed for delta k measurement of ocean current from a spacecraft without the need for a narrow beam and long observation times. The SAR signal is compressed to provide image data for different sections of the chirp bandwidth, equivalent to frequencies f sub 1 (ta,t), f sub 2 (ta,t), f sub n (ta,t), and a common area for the separate image fields is selected. The image for the selected area at each frequency is deconvolved to obtain the image signals for the different frequencies (f sub 1, f sub 2, f sub m) and the same area. A product of pairs of signals is formed, Fourier transformed and squared. The spectrum thus obtained for different areas for the same pair of frequencies f sub jk, f sub j+n,k are added to provide an improved signal to noise ratio. The shift of the peak from the center of the spectrum is measured and compared to the expected shift due to the phase

velocity of the Bragg scattering wave. Any difference is a measure of current velocity v sub c. NASA

N82-28712*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OCEANOGRAPHIC SATELLITE REMOTE SENSING: REGISTRATION, RECTIFICATION, AND DATA INTEGRATION REQUIREMENTS
D. A. NICHOLS *In its* Proc. of the NASA Workshop on Registration and Rectification p 105-111 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The problem of data integration in oceanography is discussed. Recommendations are made for technique development and evaluation, understanding requirements, and packaging techniques for speed, efficiency and ease of use. The primary satellite sensors of interest to oceanography are summarized. It is concluded that imaging type sensors make image processing an important tool for oceanographic studies. E.A.K.

N82-28741# Electronics Research Lab., Adelaide (Australia).
LASER HYDROGRAPHY IN AUSTRALIA
M. F. PENNY Feb. 1982 39 p refs Presented at the Lasers 81 Intern. Conf. on Lasers and Applications (4th), New Orleans, Dec. 1981
(AD-A113584; ERL-0229-TR; AR-002-821) Avail: NTIS HC A03/MF A01 CSCL 08J

In response to a Royal Australian Navy requirement, the Electronics Research Laboratory has developed and evaluated an experimental Laser Airborne Depth Sounder. The system provides discrete soundings, in a rectangular pattern extending 270 m across track, with a nominal spacing between soundings of 10 m. This note describes the experimental system, including the position fixing elements, with emphasis on depth sounding performance. Author (GRA)

N82-28743# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
AN EXPERIMENTAL COMPUTER ALGORITHM FOR SEAMOUNT MODEL PARAMETER ESTIMATION BASED ON SEASAT-A SATELLITE RADAR ALTIMETRY Final Report
W. J. GROEGER Sep. 1981 58 p refs
(AD-A113169; NSWC/TR-81-200) Avail: NTIS HC A04/MF A01 CSCL 17I

An experimental computer program for seamount model parameter estimation is formulated. The computer algorithm documented was designed to automatically recognize those characteristic perturbations among satellite radar altimetry data that indicate the presence of seamounts. A digital filter, a roughness detector, a physical model containing the potential theory associated with seamounts and specifying their effect on the sea surface and, finally, the estimator algorithm for the model parameters, in particular peak submergence depth are discussed. An error analysis and computer program checkout data are also included. Author

N82-28879*# Nova Univ., Fort Lauderdale, Fla. Satellite Surface Stress Working Group.
SCIENTIFIC OPPORTUNITIES USING SATELLITE WIND STRESS MEASUREMENTS OVER THE OCEAN
Jun. 1982 166 p refs
(Contract NAS5-26714)
(NASA-CR-169100; NAS 1.26:169100) Avail: NTIS HC A08/MF A01 CSCL 04B

The ability to determine the vector wind field at the sea surface was assessed. The vector stress or wind field from space is used for the study of upper ocean circulation. The required measurement is the vector horizontal tangential stress, which is the lower boundary condition for the atmosphere and the upper boundary condition for any wind driven wave or ocean current model. Since limited direct observations of vector stress were obtained over the ocean, the wind speed and direction were estimated at 19.5 m. S.L.

N82-28937# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Oceanography Div.
MEASUREMENTS OF WHITECAP COVERAGE AND SURFACE WINDS OVER THE GULF OF MEXICO LOOP CURRENT
P. M. SMITH Oct. 1981 28 p refs
(AD-A114429; NORDA-43) Avail: NTIS HC A03/MF A01 CSCL 08C

The fraction of the ocean surface covered by whitecaps has long been thought to be some monotonically increasing function of the prevailing wind velocity at least for large fetches. In order to determine the extent to which other factors such as air column stability or water mass type can influence the areal coverage of whitecaps, photographic data was collected over the Loop Current from a NAVOCEANO P-3 aircraft. The variation of whitecap coverage along a line of closely spaced (25 km) stations was determined and compared with other aircraft and data buoy information. The data indicates that, on the day of the flight, white-capping within the boundaries of the Loop Current depended little on the local wind, but demonstrated a noticeable dependence on air column stability. The strength and nature of this dependence varied over mesoscale distances. These results indicate that microwave radiometric measurements can be sensitive to variables other than surface wind since microwave brightness is quite sensitive to sea foam. The value of areal whitecap coverage as a measurable geophysical variable is also examined. GRA

N82-29674*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SCIENCE REQUIREMENTS FOR FREE-FLYING IMAGING RADAR (FIREX) EXPERIMENT FOR SEA ICE, RENEWABLE RESOURCES, NONRENEWABLE RESOURCES AND OCEANOGRAPHY
F. CARSEY 1 Jun. 1982 54 p refs
(Contract NAS7-100)
(NASA-CR-169153; JPL-PUBL-82-32; NAS 1.26:169153) Avail: NTIS HC A04/MF A01 CSCL 17I

A future bilateral SAR program was studied. The requirements supporting a SAR mission posed by science and operations in sea-ice-covered waters, oceanography, renewable resources, and nonrenewable resources are addressed. The instrument, mission, and program parameters were discussed. Research investigations supporting a SAR flight and the subsequent overall mission requirements and tradeoffs are summarized. Author

N82-29843*# National Marine Fisheries Service, Bay Saint Louis, Miss. Fisheries Center.
MAPPING OF SUBMERGED VEGETATION USING REMOTE SENSING TECHNOLOGY
K. J. SAVASTANO, K. H. FALLER, L. W. MCFADIN, and H. HOLLEY Sep. 1981 104 p refs Sponsored in part by NASA
(NASA-CR-169104; NAS 1.26:169104; PB82-163072; NOAA-TM-NMFS-SEFC-73; NOAA-81120307) Avail: NTIS HC A06/MF A01 CSCL 08A

Techniques for mapping submerged sea grasses using aircraft supported remote sensors are described. The 21 channel solid state array spectroradiometer was successfully used as a remote sensor in the experiment in that the system operated without problem and obtained data. The environmental conditions of clear water, bright sandy bottom and monospecific vegetation (Thalassia) were ideal. GRA

N82-30448# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Oceanography Div.
DUAL FREQUENCY RADAR ICE AND SNOW SIGNATURES
R. D. KETCHUM, JR. Dec. 1981 26 p refs
(AD-A115297; NORDA-TN-135) Avail: NTIS HC A03/MF A01 CSCL 17I

Dual frequency (X-band and L-band) synthetic aperture radar imagery of sea ice is examined to show the differences between the bands and their complementary nature for resolving ambiguities in interpretation. High backscatter at X-band from visibly smooth thin ice is not observed at L-band. The hypothesis is that the high X-band backscatter is caused by a reflective layer at the

snow/ice interface. A second hypothesis is that the high X-band backscatter may be caused by moisture in the snow. High backscatter at L-band is observed for slush on open water. The return is very weak at X-band, thus allowing distinction of sluch by comparing L-band and X-band images. High intensity, but only partial returns from icebergs at L-band have been observed. The hypothesis is that internal iceberg/sea water reflections are occurring. Some signals are directed away from the antenna; other reinforced signals are returned, producing very bright images. Occasionally, the time-delayed signals are returned causing a false image at far range from the iceberg. The conclusion is that L-band is a poor choice for studies of iceberg distribution and size, but a good choice for studies of iceberg detection because of the high reinforced returns from many icebergs and the low return from the adjacent sea ice. The penetration and subsequent signal loss of L-band in glacial ice, when compared to high X-band returns, may be useful to map glaciated land masses. Author (GRA)

N82-30458# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
THE UTILITY OF SAR TO MONITOR OCEAN PROCESSES Final Report, Jan. 1980 - Sep. 1981
R. A. SHUCHMAN, E. S. KASISCHKE, G. A. MEADOWS, J. D. LYDEN, D. R. LYZENGA, P. L. JACKSON, A. L. MAFFETT, and A. KLOOSTER, JR. Nov. 1981 405 p refs
(Contract N00014-76-C-1048; NR PROJ. 387-132)
(AD-A115188; ERIM-124300-11-F) Avail: NTIS HC A18/MF A01

This report investigates the utility of using synthetic aperture radar (SAR) to monitor the Earth's oceans. The report consists of three parts which include: (1) a review on the present capability of SARs to monitor ocean processes, (2) a status report on the processing and preliminary analysis of UPD-4 and UPD-6 data collected during the MARSEN'79 Experiment, and (3) a collection of journal articles and symposia papers which resulted from this ONR-funded ERIM research. The review of the present status of SAR's utility to monitor the oceans includes the detection and measurement of gravity waves, currents, long-period waves, internal waves, frontal boundaries, bottom topographic features, surface winds, surf zone conditions, oil slicks, and sea ice. Results of this analysis indicate the UPD-4 X-band SAR imagery is not significantly improved, with regard to visibility of waves on the imagery when motion compensation adjustments are incorporated into the processing of the SAR signal histories. Selected passes of UPD-4 and UPD-6 X-band imagery have been digitized and comparisons between SAR generated wave spectra and surface measured spectra were made. GRA

N82-30543# Electronics Research Lab., Adelaide (Australia).
MONTE CARLO SIMULATION OF LASER BACKSCATTER FROM SEA WATER
B. W. KOERBER and D. M. PHILLIPS Jan. 1982 30 p refs
(AD-A115410; ERL-0224-TR; AR-002-811) Avail: NTIS HC A03/MF A01 CSCL 12A

A Monte Carlo simulation study of laser backscatter from sea water has been carried out to provide data required to assess the feasibility of measuring inherent optical propagation properties of sea water from an aircraft. The possibility was examined of deriving such information from the backscatter component of the return signals measured by the WRELADS laser airborne depth sounder system. Computations were made for various water turbidity conditions and for different fields of view of the WRELADS receiver. Using a simple model fitted to the computed backscatter data, it was shown that values of the scattering data absorption coefficients can be derived from the initial amplitude and the decay rate of the backscatter envelope. Author (GRA)

N82-30823*# Analytic Sciences Corp., Reading, Mass.
NOSS ALGORITHM SPECIFICATIONS FOR OCEAN CURRENT MAPPING, VOLUME 1
J. V. WHITE Jul. 1982 45 p refs 2 Vol.
(Contract NAS6-3163)
(NASA-CR-156886-VOL-1; NAS 1.26:156886-VOL-1) Avail: NTIS HC A03/MF A01 CSCL 08C

National Oceanic Satellite System (NOSS) algorithm specifications for ocean current mapping are provided. The signal-processing theory on which the algorithms are based is summarized. Author

N82-30824*# Analytic Sciences Corp., Reading, Mass.
NOSS ALGORITHM SPECIFICATIONS FOR OCEAN CURRENT MAPPING, VOLUME 2
J. V. WHITE Jul. 1982 108 p refs 2 Vol.
(Contract NAS6-3163)
(NASA-CR-156886-VOL-2; NAS 1.26:156886-VOL-2) Avail: NTIS HC A06/MF A01 CSCL 08C

The development of National Oceanic Satellite System (NOSS) algorithms for ocean current mapping and the verification of algorithm performance with SEASAT-A radar altimeter data is described. Author

N82-30830# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
REMOTE BATHYMETRY WITH A MULTISPECTRAL ACTIVE/PASSIVE AIRBORNE SYSTEM Final Report, 1980 - May 1981
D. R. LYZENGA, J. S. OTT, J. P. LIVISAY, and F. C. POLCYN Feb. 1982 87 p refs
(Contract N61331-80-C-0022)
(AD-A115099; AD-F200026; ERIM-149600-1-F) Avail: NTIS HC A05/MF A01 CSCL 08J

Active/passive multispectral data collected at 1000 ft to 10,000 ft altitudes in the Bahamian Calibration Area were processed in order to construct bathymetric charts and images of the bottom reflectance. Preprocessing methods were developed to correct for sunglint and atmospheric attenuation effects as a function of scan angle. While depth charts can be made with ship measured control points as well as band ratio techniques, lidar time differences measured at 1000 ft altitude were found to be the best source of water depth calibration input data needed to identify parameters for extrapolation of water depth measuring techniques to higher altitudes. Author (GRA)

N82-31739# National Oceanic and Atmospheric Administration, Washington, D. C. Basic Weather Branch.
SEA ICE CHARTS OF THE NAVY/NOAA JOINT ICE CENTER
R. H. GODIN *In* International Geophysical Year World Data Center A Snow Watch 1980 p 71-78 Oct. 1981
Avail: NTIS HC A07/MF A01 CSCL 08L

The data sources and preparation procedures for the Navy/NOAA Joint Ice Center weekly Arctic and Antarctic ice analyses are described. The chart features include ice concentration, ages and stages, morphological descriptives, ice limits and boundaries, estimated limits, and seven-day limit forecasts. The advantages and disadvantages of satellite imagery at different spectral ranges are discussed. M.G.

N82-31740*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTARCTIC SEA ICE COVER FROM SATELLITE PASSIVE MICROWAVE
H. J. ZWALLY, J. COMISO, C. PARKINSON, W. CAMPBELL, F. CARSEY, and P. GLOERSEN *In* International Geophysical Year World Data Center A Snow Watch 1980 p 79-86 Oct. 1981
Avail: NTIS HC A07/MF A01 CSCL 08L

The 3-day images from the Nimbus 5 electrically scanning microwave radiometer were combined to form monthly average maps and contour plots. These show clearly the yearly cycle from minimum ice extent in February to maximum ice extent from August to September and the spatial distribution of ice 15 to 50 percent

concentrated, 50 to 85 percent concentrated, and 85 to 100 percent concentrated. The yearly cycle of the monthly extent of ice is plotted for each of the four years (1973-76). The total 4-year range in monthly mean concentrations (over the 30 km x 30 km grid elements with ice present) is 50 to 80 percent, and the yearly cycle is far less distinct than that for the ice areas. R.J.F.

N82-31743# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
STUDY OF THE SEA ICE DISTRIBUTION IN THE NORTH POLAR REGIONS
I. HAUPT *In* International Geophysical Year World Data Center A Snow Watch 1980 p 97-102 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

With regard to the important role of the polar regions in the general atmospheric circulation and to the interaction between atmosphere and surface, a systematic study was made to investigate the behavior of sea ice in the north polar regions in relation to the monthly pressure and temperature distribution for the period 1966 - 1979. R.J.F.

N82-32786*# Lille Univ. (France). Lab. d'Optique Atmospherique.
SEA SURFACE TEMPERATURE OF THE COASTAL ZONES OF FRANCE Final Report
P. Y. DESCHAMPS, M. CREPON (Museum d'Histoire Naturelle, Paris), J. M. MONGET (Ecole des Mines, Valbonne, France), F. VERGER, Principal Investigators (Ecole Normale Superieure), R. FROUIN, J. CASSANET (Ecole Normale Superieure), and L. WALD (Ecole des Mines, Valbonne, France) Jun. 1982 196 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E82-10364; NASA-CR-169162; NAS 1.26:169162) Avail: NTIS HC A09/MF A01 CSCL 08B

Thermal gradients in French coastal zones for the period of one year were mapped in order to enable a coherent study of certain oceanic features detectable by the variations in the sea surface temperature field and their evolution in time. The phenomena examined were mesoscale thermal features in the English Channel, the Bay of Biscay, and the northwestern Mediterranean; thermal gradients generated by French estuary systems; and diurnal heating in the sea surface layer. The investigation was based on Heat Capacity Mapping Mission imagery. J.D.

N82-33797# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
SEASAT SATELLITE RADAR ALTIMETRY DATA PROCESSING SYSTEM
G. B. WEST May 1981 32 p
(AD-A115972; NSWC-TR-81-234) Avail: NTIS HC A03/MF A01 CSCL 09B

Measurements from the SEASAT satellite radar altimeter are combined with the Doppler precise orbit, corrected for atmospheric and environmental effects, and reduced to along-track geoid heights and vertical deflections by an adaptive Kalman smoother, which is based upon a third-order Markov process. The altimeter data processing system at the Naval Surface Weapons Center (NSWC) is described in this report. Author (GRA)

N82-33972# Nova Univ., Dania, Fla. Oceanographic Center.
MODELING AND ADJUSTING GLOBAL OCEAN TIDES USING SEASAT ALTIMETER DATA Final Report, 1 Nov. 1977 - 31 Dec. 1981
G. BLAHA Hanscom AFB, Mass. AFGL Mar. 1982 103 p refs
(Contract F19628-78-C-0013; AF PROJ. 2309)
(AD-A115841; AFGL-TR-82-0114) Avail: NTIS HC A06/MF A01 CSCL 08C

In the recent past, SEASAT altimeter data together with global geoidal parameters and sets of state vectors parameters were adjusted at AFGL through the short arc algorithm using NSWC precise ephemeris. The excellent quality of the data system, including the altimeter measurements, the ephemeris, the input geoidal parameters, etc., was confirmed by the finding that the empirical variance for geoid undulations is significantly lower than the theoretical variance. The altimeter residuals from this adjustment served in regional modeling of short wavelength geoidal features, as well as in studying geophysical phenomena such as ocean bottom topography. Since the geoid is assumed to coincide with the ocean surface sensored by the altimeter, the sea surface effects were ignored in this adjustment. Due to increasing geophysical interest in a realistic representation of the open ocean tide, the latest development of the short arc satellite altimetry model allows for the inclusion of the most important tidal constituents. In particular, an adjustment algorithm has been designed in which four long period constituents, three diurnal constituents and four semidiurnal constituents may be subject to adjustment within the overall adjustment of SEASAT altimetric observations. GRA

06

HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

A82-39204
RUNOFF MODELING FROM SNOW COVERED AREA
J. MARTINEC (Eidgenoessisches Institut fuer Schnoe- und Lawinenforschung, Davos, Switzerland) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 259-262. refs

Numerical models for the snowmelt runoff following precipitation are reviewed. The basic form of a runoff model comprises a quantification of the snowmelt and transformation of the snowfall and rain into a discharge from a basin. The models can either be derived from actual measurements of snowfall or from estimations for the accumulation and ablation of snow. Snow coverage in alpine basins is categorized into different elevation zones. Snow depletion curves are developed from airborne or satellite imaging of the snowfall regions, updated each day. Data for the Rio Grande River basin being fed from Rocky Mountain runoff were obtained by Landsat imagery during each winter day to calculate the cumulative depletion for the following summer. Particularly successful predictions were made during wet years. It is concluded that accurate simulations are possible using Landsat data, temperature, and precipitation measurements. M.S.K.

A82-39205*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLASSIFICATION OF SIMULATED AND ACTUAL NOAA-6 AVHRR DATA FOR HYDROLOGIC LAND-SURFACE FEATURE DEFINITION
J. P. ORMSBY (NASA, Goddard Space Flight Center, Hydrological Sciences Branch, Greenbelt, MD) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 262-268. refs

An examination of the possibilities of using Landsat data to simulate NOAA-6 Advanced Very High Resolution Radiometer (AVHRR) data on two channels, as well as using actual NOAA-6 imagery, for large-scale hydrological studies is presented. A running average was obtained of 18 consecutive pixels of 1 km resolution taken by the Landsat scanners were scaled up to 8-bit data and investigated for different gray levels. AVHRR data comprising five channels of 10-bit, band-interleaved information covering 10 deg latitude were analyzed and a suitable pixel grid was chosen for comparison with the Landsat data in a supervised classification format, an unsupervised mode, and with ground truth. Landcover delineation was explored by removing snow, water, and cloud features from the cluster analysis, and resulted in less than 10% difference. Low resolution large-scale data was determined useful for characterizing some landcover features if weekly and/or monthly updates are maintained. M.S.K.

A82-39280
A COSMIC-RAY METHOD FOR DETERMINING SNOW WATER CONTENT AND SOIL MOISTURE [METOD OPREDELENIIA VLAGOZAPASOV V SNEGE I VLAZHNOSTI POCHV PO KOSMICHESKIM LUCHAM]
E. V. KOLOMEETS and SH. D. FRIDMAN Leningrad, Gidrometeoizdat, 1981. 160 p. In Russian. refs

The determination of snow water content and soil moisture by measuring the neutron component of the galactic cosmic-ray flux is described. The modes of operation of cosmic-ray systems for the measurement of snow and soil moisture are discussed along with errors of the method. Attention is given to the utilization of different components of cosmic rays and secondary gamma quanta to determine the mass and structure of glaciers, to study discharge in rivers and canals, and to evaluate the biological productivity of vegetation and humus reserves in soils. The incorporation of the cosmic-ray technique in an automated hydrological remote-sensing system is considered. B.J.

A82-39492
MONITORING OF SNOW COVERED AREA USING SATELLITE DATA
H. OCHIAI (Toba Merchant Marine College, Toba, Mie, Japan) and K. TAKEDA (Science and Technology Agency, National Institute of Natural Resources, Tokyo, Japan) Advances in Earth Oriented Applications of Space Technology, vol. 1, no. 4, 1982, p. 181-191.

Snow is considered to be one of the prime water resources in Japan, thus the monitoring of snowfall is a recognizably important project. A digital analysis of both Landsat MSS data and NOAA AVHRR data is discussed, including histograms of the data and photographs. Satellite photographs of snow covered areas are presented comparing Landsat MSS imagery with Landsat RBV imagery. Landsat MSS data, if obtained periodically, is concluded to be very effective in detecting snowfall, particularly in mountainous regions. Landsat RBV data shows a clearer snow line than MSS data and its high resolution imagery is considered effective in monitoring hydrological aspects of snow covered areas. Satellite remote sensing is the most economic and effective method of monitoring at the present time. R.K.R.

A82-42151
THE USE OF REMOTE SENSING IN HYDROLOGY IN NORWAY
G. OSTREM (Norwegian Water Power Board, Oslo, Norway) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 258-269.

Remote sensing is employed for snow surveys in Norway to predict the melt-water flow and permit the management of reservoir capacity for hydroelectric power production. One method measures the attenuation by snow cover of ground radiation from an aircraft. Another method, used operationally, took data from TIROS-N and NOAA 6 satellites. Daily values of the pixel (900m x 900m) grey-scale numbers for a given region were correlated with the percentage of snow cover and with the runoff over several years, thereby establishing a characteristic relation for Norwegian high mountain drainage areas. The determination of glacial mass balance, needed to predict the melt water flow from glaciers, from data provided by LANDSAT satellites is also explained. A.B.

A82-42152
RADIO ECHO SOUNDING OF ICE MASSES - PRINCIPLES AND APPLICATIONS
D. J. DREWRY (Cambridge University, Cambridge, England) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 270-284. refs

A review is presented of methods for the remote sensing of large ice masses by radio echo sounding techniques, which provide information on ice thickness, and the electrical properties in ice, and enables the study of ice sheet surface form, thickness, internal structure, dynamics, thermodynamics, and basal conditions and processes. Following a discussion of the factors involved in the design of radio sounding systems, the general principles of the interpretation of the returned echo are presented, along with the interpretation of echos in three specific cases (the ice/bedrock interface, the ice/water interface, and the ice/moraine interface). Some glaciological results and applications are discussed, including studies of the ice sheet surface, sub-ice water, ice layers, and sub-ice geology/geophysics. N.B.

A82-43281
PROBLEMS IN THE USE OF AERIAL AND SPACE IMAGERY IN THE INTERESTS OF SERVICES FOR THE MANAGEMENT OF AMELIORATION SYSTEMS [VOPROSY ISPOL'ZOVANIIA MATERIALOV AEROKOSMICHESKOI S'EMKI V INTERESAKH SLUZHB UPRAVLENIIA MELIORATIVNYMI SISTEMAMI]
V. A. LEONIDOV, V. A. KHARITONOV, and V. P. SHCHUKLIN (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 30-37. In Russian. refs

The use of remote sensing data in the interests of water-resources management is considered, with particular reference to irrigation and amelioration experience in Central Asia. A Bayesian algorithm of automatic classification is described which can be used to identify water-resources amelioration objects. The algorithm has been verified by aerial scanner data. B.J.

A82-43284
SOLUTION OF AIRBORNE MICROWAVE-RADIOMETRIC TEST PROBLEMS AND DETERMINATION OF THE PARAMETERS OF WATER AREAS IN THE RADIO-ASTRONOMICAL RANGE [RESHENIE TESTOVYKH SVCH-RADIOMETRICHESKIKH SAMOLETNYKH ZADACH I OPREDELENIE PARAMETROV AKVATORII V RADIOASTRONOMICHESKOM DIAPAZONE]
L. F. BORODIN, L. V. VASENKOV, V. F. KRAPIVIN, and V. I. MALIUTIN (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 44-50. In Russian. refs

Problems pertaining to radiometer calibration in passive microwave remote sensing systems in the radio-astronomical

frequency range are discussed. Attention is given to the use of water areas on the Earth's surface as test objects or natural reference surfaces. B.J.

A82-43418
METHODS OF INTERPRETING MULTISPECTRAL SATELLITE DATA FOR MONITORING THE PHYSICOCHEMICAL COMPOSITION OF BODIES OF WATER ON THE LAND SURFACE [VOPROSY METODIKI INTERPRETATSII MNOGOZONAL'NYKH KOSMICHESKIKH DANNYKH DLIA KONTROLIA FIZIKO-KHIMICHESKOGO SOSTAVA POVERKHNOSTNYKH VOD SUSHI]
V. A. KRIULKOV (Simferopol'skii Gosudarstvennyi Universitet, Simferopol, Ukrainian SSR) and S. M. SAZHIN (Gosudarstvennyi Nauchno-Issledovatel'skii Tsentr Izucheniia Prirodnykh Resursov, Moscow, USSR) Meteorologiia i Gidrologiia, Aug. 1982, p. 47-53. In Russian. refs

Methodological questions encountered in analyzing data from synchronous measurements of an area of Lake Baikal made by ship and by the MKF-6 camera on Soyuz 22 are addressed. The multispectral images obtained are classified with the aid of interactive computer methods. The classification makes it possible to demarcate zones having different concentrations of suspended matter on the basis of the multispectral satellite data. C.R.

A82-43427
LITERATURE REVIEW OF THE CURRENT USE AND TECHNOLOGY OF MSS DIGITAL DATA FOR LAKE TROPHIC CLASSIFICATION
A. S. WITZIG and C. A. WHITEHURST (Louisiana State University, Baton Rouge, LA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 1-20. refs

Current methods used for describing lake trophic state from multispectral imagery are assessed. Literature and discussions on the use of MSS data in trophic state applications and trophic state indices are reviewed. Indices correlated with MSS data are derived from: principal components analyses, subjective indices, and Carlson's single variable index. Automatic data processing and other classification techniques are presented, in particular, a semiautomated technique (Scarpace et al., 1978) based on regressions between Landsat data and trophic data. These regression models can be used to account for regional variability, but further work on the reliability of ground truth exercises is needed. R.K.R.

A82-43428
VERMONT LAKES CLASSIFICATION - A LANDSAT/CITIZEN INTERACTION
T. H. MACE (Lockheed Engineering and Management Services Co., Inc., Houston, TX; U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, NV) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 23-35. refs

Classifications of 1980 Landsat-2 multispectral scanner data have been produced to evaluate water quality in the lakes of Vermont. Secchi depth data for 36 lakes (provided by the Vermont Department of Water Resources) were used by the EPA to produce a maximum likelihood classification of two Landsat scenes covering the state of Vermont. Landsat data were haze-corrected, transformed, and input to a best subsets multiple linear regression program. Six predictors of Secchi depth were selected as the best transformation by multiple linear regression. Color-coded thematic maps of Secchi depth for the lakes are produced by transforming and classifying the data sets. It is demonstrated by digital interpretation that a cost-effective regional survey can be produced in this manner, and the large number of samples obtained increases the validity of the regression equation. Landsat ground truth statistics are included. R.K.R.

A82-46169
THE USE OF CONICAL SCANNING TO OBSERVE WATER AREAS IN THE OPTICAL BAND [OB ISPOL'ZOVANII KRUGOVOGO SKANIROVANIIA DLIA NABLIUDENIIA AKVATORII V OPTICHESKOM DIAPAZONE]
A. S. SELIVANOV and IU. M. GEKTIN Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 122-124. In Russian.

The features and advantages of conical scanning for the observation of water areas are examined. Due to its high accuracy, and decoding and coverage characteristics, conical scanning was found to be the optimal method for the observation of surface phenomena in global survey systems. B.J.

A82-46751
WATER QUALITY MODELS WITH DIFFERENT FUNCTIONS OF EXOTECH RADIOMETER BANDS
K. R. RAO, R. KRISHNAN, A. K. CHAKRABORTY, and B. L. DEEKSHATULU (National Remote Sensing Agency, Secunderabad, India) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 262-268. refs

An attempt to obtain regional models of water quality of inland reservoirs and lakes is described. Stepwise multiple linear regression analyses between water quality parameters and several functions of Exotech radiometer (the Landsat ground-truth radiometer) band reflectance values, namely bands alone, bands and their ratios, and bands and their products, are evaluated with respect to the performance of the regression parameters. It is shown that the pairwise product of the reflectance in different bands is better correlated than the bands and their ratios. It is thought that a possible explanation for this is the higher order nonlinear relation between the water quality parameters and the spectral bands. C.R.

A82-47501* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL MAPS OF ATMOSPHERIC WATER VAPOR, CLOUD WATER, AND RAINFALL DERIVED FROM NIMBUS-7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER DATA A CASE STUDY
A. T. C. CHANG, T. T. WILHEIT, and P. GLOERSEN (NASA, Goddard Space Flight Center, Greenbelt, MD) In: Oceanography from space; Proceedings of the Symposium, Venice, Italy, May 26-30, 1980. New York, Plenum Press, 1981, p. 683-689. refs

N82-28774# Environmental Research and Technology, Inc., Concord, Mass.
COMPARISON OF THEORETICAL AND ACTUAL SATELLITE MICROWAVE BRIGHTNESS TEMPERATURES TO DETERMINE SNOWPACK PROPERTIES Final Report
H. H. K. BURKE, C. J. BOWLEY, and J. C. BARNES Jul. 1981 85 p refs
(Contract NA80SA-C-00763)
(PB82-161118; ERT-A653-F; NOAA-81111604) Avail: NTIS HC A05/MF A01 CSCL 08L

The use of satellite microwave data to determine snowpack properties is investigated. The objectives were to calculate theoretical microwave brightness temperatures using a radiative transfer model, and to compare the computed brightness temperatures with actual satellite microwave measurements. Archived data from the Nimbus-5 and Nimbus-6 Electrically Scanning Microwave Radiometers (ESMR), as well as data from the Nimbus-7 Scanning Multifrequency Microwave Radiometer (SMMR), were analyzed for the primary study area in the north-central United States. Author (GRA)

N82-28775# Christian Michelsens Institutt for Videnskap og Andsfrihet, Bergen (Norway).
NORSEX: TOTAL AND MULTIYEAR ICE CONCENTRATION AT SVALBARD IN SEPTEMBER AND OCTOBER 1979, MAPPED BY SATELLITE MICROWAVE SENSOR AT FREQUENCIES 37 GHZ AND 10 GHZ
K. KLOSTER May 1981 43 p
(PB82-160029; CMI-781120-6) Avail: NTIS HC A03/MF A01 CSCL 08L

The satellite Nimbus-7 with passive microwave imaging sensor SMMR was used for the production of two-daily maps of total ice and multiyear ice concentration between Sept. 17 and Oct. 27, 1979. The dual-channel algorithm used is based on a simple radiation model. GRA

N82-29693# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
EVALUATION OF REMOTE SENSING METHODS FOR STUDY OF VARIABLE HYDROLOGIC SOURCE AREAS
D. D. HUFF, J. M. KELLEY (Tennessee Valley Authority, Muscle Shoals, Ala.), and C. D. SAPP (Tennessee Valley Authority, Chattanooga) Jan. 1982 57 p refs
(Contract W-7405-ENG-26; EPA-IAG-D6-0721)
(DE82-010328; ORNL-5800; ORNL-ESD-1794) Avail: NTIS HC A04/MF A01

The merit of using remote sensing techniques in conjunction with field studies of hydrologic transport was evaluated at three different sites that exhibit considerable contrast in terms of topography, geology, soils and vegetation. Color infrared photography and multispectral scanner data were collected, processed, manipulated, enhanced, and analyzed for the purpose of delineating variable hydrologic source areas. Analysis of the data showed that flying height, timing, terrain and vegetative cover were important considerations. Even though difficulties attributable to the previously mentioned factors were encountered, remote sensing techniques and products are definitely useful in hydrologic transport studies. DOE

N82-29700# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE WHITE SULFUR SPRINGS NTMS QUADRANGLE, MONTANA
Nov. 1981 189 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005892; GJBX-266-81) Avail: NTIS HC A09/MF A01

A hydrogeochemical and stream sediment reconnaissance (HSSR) of the White Sulphur Springs NTMS quadrangle, Montana is presented. Location data, field analyses, and laboratory analyses of several different sample media are included. The sample media are described and the analytical results for each medium is summarized. The data were subdivided into groups of stream sediment, stream water, and ground water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements were included. Maps showing results of multivariate statistical analyses are also included. DOE

N82-29701# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE GRAND JUNCTION NTMS QUADRANGLE, COLORADO/UTAH
Nov. 1981 143 p
(Contract DE-AC13-76GJ-01664)
(DE82-000406; GJBX-264-81) Avail: NTIS HC A07/MF A01

Hydrogeochemical and Stream Sediment of the Kenai NTMS quadrangle, Colorado/Utah was studied. The data contain information on location, field analyses, and laboratory analyses of several different sample media. The sample media are described and the analytical results for each medium are summarized. The data are subdivided into groups of stream sediment, lake sediment, stream water, lake water, and ground water samples. For each group statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included. Maps showing results of multivariate statistical analyses are also included. DOE

N82-29776*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMAGE PROCESSING DEVELOPMENTS AND APPLICATIONS FOR WATER QUALITY MONITORING AND TROPHIC STATE DETERMINATION
R. J. BLACKWELL 1 Mar. 1982 98 p refs
(Contract NAS7-100)
(NASA-CR-169139; JPL-PUBL-82-4; NAS 1.26:169139) Avail: NTIS HC A05/MF A01 CSCL 13B

Remote sensing data analysis of water quality monitoring is evaluated. Data anaysis and image processing techniques are applied to LANDSAT remote sensing data to produce an effective operational tool for lake water quality surveying and monitoring. Digital image processing and analysis techniques were designed, developed, tested, and applied to LANDSAT multispectral scanner (MSS) data and conventional surface acquired data. Utilization of these techniques facilitates the surveying and monitoring of large numbers of lakes in an operational manner. Supervised multispectral classification, when used in conjunction with surface acquired water quality indicators, is used to characterize water body trophic status. Unsupervised multispectral classification, when interpreted by lake scientists familiar with a specific water body, yields classifications of equal validity with supervised methods and in a more cost effective manner. Image data base technology is used to great advantage in characterizing other contributing effects to water quality. These effects include drainage basin configuration, terrain slope, soil, precipitation and land cover characteristics. S.L.

N82-31731# International Geophysical Year World Data Center A, Boulder, Colo. Glaciology (Snow and Ice).
SNOW WATCH 1980
G. KUKLA, ed. (Lamont-Doherty Geological Observatory), A. HECHT, ed. (NSF), and D. WIESNET, ed. (NOAA, Washington, D.C.) Oct. 1981 143 p refs Workshop held in Washington, D.C., 1-2 Oct. 1980
(PB82-169301; NOAA-81123002; GD-11) Avail: NTIS HC A07/MF A01 CSCL 08L

The impact of seasonal snow fields, deposited on land or sea ice, on climate and climate modeling is addressed. In addition the content and accuracy of snow and ice cover charts and the digital products and indices related to snow and ice are discussed.

N82-31735# Maryland Univ., College Park. Dept. of Meteorology.
THE USE OF SNOW AND ICE IN ENERGY BALANCE CLIMATE MODELING
A. ROBOCK *In* International Geophysical Year World Data Center A Snow Watch 1980 p 41-43 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

Snow and ice data as well as satellite derived measurements of the planetary radiative balance were used to develop parameterizations of the effects of snow and ice on the planetary albedo. The findings were then applied to a seasonal climate model and the consequent decrease in model sensitivity is discussed. M.G.

N82-31736# National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
SUMMARY REQUIREMENTS OF GCMS FOR OBSERVED SNOW AND ICE COVER DATA
D. G. HAHN *In* International Geophysical Year World Data Center A Snow Watch 1980 p 45-53 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

Figures which include examples of how satellite derived data sets can be used to validate climate general circulation model (GCM) results are discussed. The model results displayed in the comparisons are those of a global spectral GCM with rhomboidal truncation at wave number 15. This model was time integrated for

15 model years. The seasonal evolution of computed (by the GCM) and observed monthly mean snow cover is averaged over the Northern Hemisphere, over Eurasia, and North America. The model tends to overestimate snow cover in the winter seasons, and this is somewhat more serious over Eurasia than North America. The seasonal evolution of computed and observed standard deviation of monthly mean snow cover for the Northern Hemisphere is also shown. Observations indicate that the interannual variability of monthly mean snow cover is largest in the months of October and November over the Eurasian continents. This feature is not duplicated by the model. M.G.

N82-31737# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
NORTHERN HEMISPHERE SNOW AND ICE CHARTS OF NOAA/NESS
F. SMIGIELSKI *In* International Geophysical Year World Data Center A Snow Watch 1980 p 59-62 Oct. 1981
Avail: NTIS HC A07/MF A01 CSCL 08L

The data sources and preparation of the National Earth Satellite Service weekly snow and ice boundary chart are described. This chart is prepared on a 1:50,000,000 polar-stereographic base map centered on the North Pole. The primary source of information is satellite imagery from the visible scanning radiometers of the National Oceanic and Atmospheric Administration polar orbiting satellite systems. Secondary input comes from the visible scanning radiometers of the Geostationary Satellite systems over the North American continent south of 60 N, and occasionally from the Defense Meteorological Satellite Program systems. The specifications of currently used satellite sensors are given. Photointerpretation categories and problem areas are defined. M.G.

N82-31738# Air Force Global Weather Central, Offutt AFB, Nebraska.
THE US AIR FORCE SNOW COVER CHARTS
R. C. WORONICZ *In* International Geophysical Year World Data Center A Snow Watch 1980 p 63-70 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

The snow cover analysis model, SNODEP, is described. It is run once daily at Air Force Global Weather Central to produce a gridded analysis of snow depth and age. The grid is superimposed on a polar-stereographic map projection so that the grid point spacing is about 25nm (46.3km) at 60 N and S. The model is global in scope, providing analyses in both the Northern and Southern Hemispheres. The data sources are described and an experiment to test the feasibility of using visible/near infrared satellite imagery to discriminate cloud covered from snow covered scenes is discussed. M.G.

N82-31741# Lamont-Doherty Geological Observatory, Palisades, N. Y.
LAMONT CLIMATIC SNOW COVER CHARTS
G. KUKLA, D. ROBINSON, and J. BROWN *In* International Geophysical Year World Data Center A Snow Watch 1980 p 87-92 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

The recharting of a climatic series of snow cover charts is discussed. The objective is to increase the accuracy and homogeneity of the NOAA snow cover series from 1966 through 1973. For that interval, the NOAA weekly charts are considerably less accurate and less detailed than the more recent products. Most seriously affected is the information on the relative reflectivity and the position of snow cover in the zone of poor illumination in autumn. The early inaccuracy is due to the inferior quality of early satellite imagery and the relative inexperience of the NOAA interpreters at that time. The recharting is designed to present the information in a manner compatible with the current NOAA series. To that end, they indicate separately all snow cover visible on clear days. They are to be compatible with the recent U.S. Air Force charts. Therefore they indicate separately the snow cover under persistent clouds. They are designed to identify the charted information with a time resolution of two days or less. A numerical code is used which includes symbols specifying the date of the observation. They are also designed to improve the information on the relative snow cover reflectivity. R.J.F.

N82-31742# Atmospheric Environment Service, Downsview (Ontario).
SNOW AND ICE MAPPING IN CANADA
B. GOODISON *In* International Geophysical Year World Data Center A Snow Watch 1980 p 93-96 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

The archiving and mapping of Canadian snow cover and sea ice data are reviewed. The processing of near real-time water budgets for approximately 225 synoptic stations across Canada is discussed. Future plans for ice data acquisition, ice forecasting, and ice climatology are given. Climate modeling needs are discussed. R.J.F.

N82-31744# Lamont-Doherty Geological Observatory, Palisades, N. Y.
CLIMATIC VALUE OF OPERATIONAL SNOW AND ICE CHARTS
G. KUKLA and D. ROBINSON *In* International Geophysical Year World Data Center A Snow Watch 1980 p 103-120 Oct. 1981 refs
(Contract NSF ATM-77-28522; NSF ATM-80-01470)
Avail: NTIS HC A07/MF A01 CSCL 08L

Operational snow and ice cover charts produced by NOAA, the Navy and the U.S. Air Force Global Weather Central were compared with ground station reports and original satellite imagery. The objective was to find out how accurately snow presence and thickness, as well as the snow impact on surface albedo, are depicted in space and time. It was concluded that the information on snow line postion is sufficiently accurate for use in the current generation of global circulation models in all seasons except autumn. However, the quality of the information on surface albedo, on the thickness of snow covers, and on the proportion of open water within the pack needs radical improvements. R.J.F.

N82-31746# Nebraska Univ., Lincoln.
SNOW COVER DIGITAL PRODUCTS
K. F. DEWEY *In* International Geophysical Year World Data Center A Snow Watch 1980 p 129-134 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

It is noted that there is a significant interaction between the extent of snow cover and synoptic-scale atmospheric conditions. One of the limiting factors in a study of this interaction has been the lack of digitized snow cover data. The Climatology Dept. at the University of Nebraska-Lincoln did a study which has resulted in the digitization of all Weekly Snow and Ice Charts back to 1966. Accepting the fact that detail and accuracy have probably improved through time, it is noted that this is the only complete record of Northern Hemisphere snow cover dating back to the 1960's. Therefore, a decision was made to retain all charts and to digitize the complete set. An I, J matrix overlay (based upon the NMC grid) was provided by NESS and utilized in the digitization of each of the snow and ice charts. Any individual grid box was indicated to be snow or ice covered if, through visual interpretation, at least 50 percent of the box was marked in the chart as covered by snow or ice. The format that the data are stored in is presented. The display of the digitized product is illustrated for the entire Northern Hemisphere. The data are stored by continent so it is possible to have, for example, just a display of Eurasia or North America. B.W.

N82-31747# Lamont-Doherty Geological Observatory, Palisades, N. Y.
MAXIMUM SNOW AREA DENSITY DIGITIAL PRODUCT
G. KUKLA and D. ROBINSON *In* International Geophysical Year World Data Center A Snow Watch 1980 p 135-138 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

Maximum snow area density (SAD) of stable snow cover in six

classes is shown for the Northern Hemisphere. Data are available in digitzed form in the NMC grid. Author

N82-31748# Illinois Univ., Urbana.
SNOW AND ICE DATA SETS
J. E. WALSH *In* International Geophysical Year World Data Center A Snow Watch 1980 p 139-144 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

Data sets describing the variability of sea ice are presented. Sea ice data sets are pertinent to the study of snow cover to the extent that sea ice serves as a platform for snow cover over the oceans. Aside from its association with snow cover, sea ice is a potentially important climatic variable in its own right. Three types of data sets are distinguished: (1) regional data sets and indices describing ice variability over the synoptic scale; (2) hemispheric or global data sets in which there is some information pertinent to sea ice, but in which ice variability is not the major concern; and (3) hemispheric/global ice data sets directed specifically at sea ice variability. The last two categories should generally be most appropriate for large-scale climatic studies. B.W.

N82-32788*# Kentron International, Inc., Hampton, Va.
DETERMINATION OF TURBIDITY PATTERNS IN LAKE CHICOT FROM LANDSAT MSS IMAGERY
S. R. LECROY, Principal Investigator Jan. 1982 52 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NAS1-16000; PROJ. AGRISTARS)
(E82-10366; NASA-CR-167616; CP-32-04237; NAS 1.26:167616; V-19100/2LTR-020) Avail: NTIS HC A04/MF A01 CSCL 02C

A historical analysis of all the applicable LANDSAT imagery was conducted on the turbidity patterns of Lake Chicot, located in the southeastern corner of Arkansas. By examining the seasonal and regional turbidity patterns, a record of sediment dynamics and possible disposition can be obtained. Sketches were generated from the suitable imagery, displaying different intensities of brightness observed in bands 5 and 7 of LANDSAT's multispectral scanner data. Differences in and between bands 5 and 7 indicate variances in the levels of surface sediment concentrations. High sediment loads are revealed when distinct patterns appear in the band 7 imagery. Additionally, the upwelled signal is exponential in nature and saturates in band 5 at low wavelengths for large concentrations of suspended solids. M.G.

N82-32795*# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
HCMM HYDROLOGICAL ANALYSIS IN UTAH Quarterly Progress Report
1982 17 p refs Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E82-10373; NASA-CR-169168; NAS 1.26:169168; QPR-1) Avail: NTIS HC A02/MF A01 CSCL 08H

Data reduction and preliminary comparisons and correlations of Heat Capacity Mapping Mission data to ground truth measurements were made. The data covered Utah Lake and the surrounding area. Output modes include a digital hard copy record of the intensity value for each pixel and color graphics. Analyses of non-diatom net plankton (algae), turbidity, nitrogen, phosphorus, and temperatures were made. In addition, infrared data for the agricultural area around Utah lake were also preliminarily examined and compared to depth to groundwater data. M.G.

N82-32801*# National Park Service, Homestead, Fla. Everglades National Park.
AN APPLICATION OF LANDSAT MULTISPECTRAL IMAGERY FOR THE CLASSIFICATION OF HYDROBIOLOGICAL SYSTEMS, SHARK RIVER SLOUGH, EVERGLADES NATIONAL PARK, FLORIDA
P. W. ROSE and P. C. ROSENDAHL, Principal Investigator 1979 106 p refs Sponsored by NASA ERTS
(E82-10379; NASA-CR-169171; NAS 1.26:169171; T-544) Avail: NTIS HC A06/MF A01 CSCL 05B

Multivariant hydrologic parameters over the Shark River Slough were investigated. Ground truth was established utilizing U-2 infrared photography and comprehensive field data to define a control network which represented all hydrobiological systems in the slough. These data were then applied to LANDSAT imagery utilizing an interactive multispectral processor which generated hydrographic maps through classification of the slough and defined the multispectral surface radiance characteristics of the wetlands areas in the park. The spectral response of each hydrobiological zone was determined and plotted to formulate multispectral relationships between the emittent energy from the slough in order to determine the best possible multispectral wavelength combinations to enhance classification results. The extent of each hydrobiological zone in slough was determined and flow vectors for water movement throughout the slough established. J.D.

N82-32834# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Ocean Technology and Engineering Services.
AN ESTIMATE OF THE AREA SURVEYABLE WITH AN AIRBORNE LASER HYDROGRAPHY SYSTEM AT TEN US SITES
D. B. ENABNIT, G. C. GUENTHER, J. WILLIAMS, and F. A. SKOVE Sep. 1981 54 p refs Prepared in cooperation with Naval Academy
(PB82-170184; NOAA-TR-OTES-5; NOAA-81121701) Avail: NTIS HC A04/MF A01 CSCL 08J

The amount of area surveyable with a proposed airborne laser hydrography system is estimated to total 82,000 square kilometers for 10 U.S. sites. The technique uses an aircraft mounted, scanning beam, pulsed laser system to measure water depths. It has been shown that this technique can gather large quantities of accurate bathymetric soundings at a lower cost and with less manpower than present methods. Author

07

DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A82-38700
IMAGES FROM SPACE RESHAPE NASA PLANS
C. COVAULT Aviation Week and Space Technology, vol. 117, Aug. 2, 1982, p. 17, 18.

Results from two NASA earth-imaging systems, the Landsat 4 thematic mapper and the Shuttle imaging radar (SIR-A), are reported, along with plans to verify the observed phenomena on the ground and to develop new imaging systems. The Landsat 4 instrument provided 30-m resolution pictures, with new algorithms and minimum satellite orbital dynamics being responsible for the fineness of the imagery. Subsurface images of the Sahara were obtained by means of the SIR-A. The depth penetration is attributed to the dryness of the terrain, and radar impulses which played over the sand were reflected from underlying bedrock. An expedition is being formed to explore the area viewed by the SIR-A. A new version of the SIR-A, the SIR-B, in development and featuring 15-65 deg incidence capability, is intended for flight

in 1984. Active microwave experiments with variable incidence angle and polarization will also be performed from the Orbiter in 1987-88. M.S.K.

A82-38871#
A TECHNIQUE FOR SELECTING SCENES TO BE VIEWED FROM ORBIT
D. M. GALVIN and J. C. CABANILLAS (Rockwell International Corp., Downey, CA) American Institute of Aeronautics and Astronautics and American Astronautical Society, Astrodynamics Conference, San Diego, CA, Aug. 9-11, 1982, AIAA 5 p.
(AIAA PAPER 82-1426)

A mission planning technique is presented for stare point selection in satellites, in which the precise earth scene viewed by an infrared sharing mosaic sensor during an orbital pass can be previewed. Since the area within the sensor's point of view may vary by a ratio of twenty to one as the satellite passes over a scene location, due to the wide pointing range of the sensor, an automated planning process is required which accommodates the full range of geometries, scene types, and sensor configurations, including a display of the scene as viewed from the satellite. A computer program is presented that superimposes the sensor field-of-view on a photographic image of the terrain at any designated point in the orbit, which is selected on the photograph by using a computer-interactive light pen. The system utilizes computer graphics to select new stare points or to vary the mission timeline. In addition, postmission data is also provided which can serve as a source of truth data for comparison. N.B.

A82-39216* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LOCATION OF SPACEBORNE SAR IMAGERY
J. C. CURLANDER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 359-364. refs
(Contract NAS7-100)

A method has been developed to determine the location of a pixel in a digital SAR image. This technique utilizes the spacecraft ephemeris data and the characteristics of the SAR data collection system to produce an estimate of the latitude and longitude of an arbitary pixel. This approach has an advantage over previous techniques in that it requires no reference points and is independent of spacecraft attitude knowledge or control. Tests were conducted using Seasat SAR imagery, comparing predicted feature location with the location as determined by high precision area maps. Rusults indicate an accuracy of 200 m is attainable with this method. Error sources are analyzed and recommendations are given to improve image location accuracy in future spaceborne SAR's. (Author)

A82-39493
DATA COLLECTION AND LOCATION BY SATELLITE - THE ARGOS SYSTEM
J. L. BESSIS (Centre National d'Etudes Spatiales, Service Argos, Toulouse, France) Advances in Earth Oriented Applications of Space Technology, vol. 1, no. 4, 1982, p. 193-203. refs

The primary function of the French Argos System on meteorological NOAA satellites is to locate then collect environmental data from fixed or mobile platforms. Platform results, which deal with meteorology, oceanography, offshore studies, hydrology, biology, vulcanology, and seismology, are accessible via telephone or telex from Toulouse, France several hours after their acquisition. The system, composed of user platforms, onboard equipment, and data processing and acquisition centers, is described, including the use of flow charts and data tables. Operational for three years, the system has proved its efficiency and reliability, particularly in regard to the present need to supply countries with data. The number of Argos users increased from 1980 to 1981, and its continued use is anticipated. R.K.R.

A82-40845
'SCALE-UP' ESTIMATORS FOR AERIAL SURVEYS WITH SIZE-DEPENDENT DETECTION
L. D. MAXIM and L. HARRINGTON (Everest Consulting Associates, Princeton Junction, NJ) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1271-1287. refs

Three approaches which demonstrate the concepts and techniques required to analyze aerial survey data subject to size-dependent detection are presented. A simple scale-up model involves random sampling from a total survey area, calculation of the area missed, and multiplicative expansion of area and object coverage. A discrete size detection method requires several categorizations of the size of observed fields and a large ground truth sample. Subsequent scale-up is optimal if resolution is below satisfactory levels. A third system, parametric size dependent detection, comprises a population distribution of field sizes and estimation of the size dependent detection mechanism from survey or ground truth data. Computer modeling is required, using either cookie cutter detection with an exponential parent, exponential detection with an exponential parent, an inverse Gaussian distribution, or extreme value detection distribution with an inverse Gaussian parent. M.S.K.

A82-40846* South Dakota State Univ., Brookings.
GRID CELL SIZE IN RELATION TO ERRORS IN MAPS AND INVENTORIES PRODUCED BY COMPUTERIZED MAP PROCESSING
M. WEHDE (South Dakota State University, Brookings, SD) Photogrammetric Engineering and Remote Sensing, vol. 48, Aug. 1982, p. 1289-1298. refs
(Contract NGL-42-003-007)

A82-42153
EXAMPLES OF APPLICATIONS OF DIGITAL IMAGE PROCESSING OF REMOTELY SENSED PHENOMENA
K. A. ULBRICHT (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wessling, West Germany) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 285-294. refs

Applications of digital image processing using the Digital Interactive Bavarian Image Analysis System (DIBIAS) are illustrated. Thematic mapping of the Rhine-Graben region in Germany employed Landsat data to test the use of a classification algorithm for a land-use inventory. Ground checks established the accuracy of the classification as varying between 60-85 percent, with misclassifications attributable to the dispersed land-use pattern of the region and the limited spatial resolution (about 80 m) of the Landsat scanner. Contrast manipulation, gray level addition and the classification of spectral ground reflectance were employed on Landsat images of Morocco and the Sudan to detect geomorphological features. Limnological conditions and phytoplankton development were also examined with these methods. A.B.

A82-42446
EXTRACTION OF DATA ON THE VERTICAL AND HORIZONTAL DISTRIBUTION OF RELATIVE HUMIDITY OVER THE NORTH ATLANTIC FROM SATELLITE PHOTOGRAPHY IN THE VISIBLE SPECTRAL RANGE [GEWINNUNG VON ANGABEN UEBER DIE VERTIKALE UND HORIZONTALE VERTEILUNG DER RELATIVEN LUFTFEUCHTIGKEIT UEBER DEM NORDATLANTIK AUS SATELLITENAUFNAHMEN IM SICHTBAREN SPEKTRALBEREICH]
H. NEUMEISTER and H. SCHINDOWSKI (Meteorologischer Dienst, Potsdam, East Germany) Zeitschrift fuer Meteorologie, vol. 32, no. 2, 1982, p. 105-126. In German. refs

A82-43037
THE ANALYSIS OF AREAL DATA IN THEMATIC MAPPING EXPERIMENTS
G. H. ROSENFIELD (U.S. Geological Survey, Reston, VA) Photogrammetric Engineering and Remote Sensing, vol. 48, Sept. 1982, p. 1455-1462.

Several techniques of nonparametric statistics which are applicable to the analysis of areal data in thematic mapping experiments are described: Kendall's coefficient of concordance test and Freedman's method of ranks test for the analysis of multiple related samples, and the Kendall tau statistic test and the Wilcoxon signed rank test for the analysis of paired samples. In each case, these tests examine the shape of two curves and the separation between them in order to determine if there are significant differences. The application of these tests is illustrated by two examples from the remote-sensing literature. B.J.

A82-43120#
THE DETERMINATION OF RELATIVE COORDINATES BETWEEN STATIONS BY MEANS OF SATELLITE DOPPLER TRANSLOCATION TECHNIQUE
W.-Y. ZHU, H.-G. XU, X. CHEN, and G.-Q. TANG (Astronomical Observatory, Shanghai, People's Republic of China) Acta Astronomica Sinica, vol. 23, June 1982, p. 156-162. In Chinese, with abstract in English. refs

The correlation of each source of error in satellite Doppler positioning was studied using simultaneous observation data from JSZ-4 Doppler receivers at Shanghai and Beijing stations. The observational and computational programs for three dimensional multipass and multistation translocations are presented. Fourteen passes of simultaneous observational data for August 1980 are evaluated for precision; the internal error of relative position is about two meters, and the external error of base line length compared to geodetic survey results is about 1.5 meters. The method is thus shown to be efficient for determining relative positions and baselines between stations. C.D.

A82-43199
DIGITAL IMAGE ENHANCEMENT OF NOISY SCANNER IMAGERY [DIGITALE BILDVERBESSERUNG VON VERRAUSCHTEN ABTASTERDATEN]
M. EHLERS and P. LOHMANN (Hannover, Universitaet, Hanover, West Germany) Bildmessung und Luftbildwesen, vol. 50, Sept. 1, 1982, p. 161-171. In German. refs

Digital filtering of thermal scanner imagery prior to the use of atmospheric correction yields an increase in accuracy of temperature allocation. For this purpose a special digital filter-method for scanner imagery is developed and compared with common methods. This filter method allows a quantitative evaluation even of images with a very low signal-to-noise-ratio. (Author)

A82-43279
EXPERIENCE WITH THE DEVELOPMENT OF SOFTWARE FOR THE COMPUTER PROCESSING OF FRAME IMAGERY [OPYT RAZRABOTKI MATEMATICHESKOGO OBESPECHENIIA DLIA AVTOMATIZIROVANNOI OBRABOTKI KADROVOI VIDEOINFORMATSII NA ES EVM]
P. I. GUBIN and A. A. NATAN (Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov. 1980.) Geodeziia i Aerofotos'emka, no. 2, 1982, p. 19-24. In Russian.

The paper describes the basic features of SMOOKI, a software system for the automated interpretation of aerial and space images relating to the remote sensing of earth resources. SMOOKI can be considered as an example of the utilization of a library of modules oriented toward the processing of digital data presented in a matrix (frame) format. B.J.

A82-43433
NORMALIZATION OF LANDSAT MSS DATA USING DIGITAL ELEVATION MODELS
C. E. HENDERSON (California, University, Berkeley, CA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 90-100. refs

A method is discussed for normalizing Landsat MSS data using Digital Elevation Models (DEM); in this way the effects of variable solar illumination of mountainous terrain can be corrected an; the indirect solar illumination component determined. The angular relationship of the ground surface represented by each pixel of a data set to the solar position at the time of image acquisition is modelled, and the expected relative direct solar illumination for each pixel is estimated. After estimating a constant representing indirect illumination for a 1% sample of the test area, the value with the lowest coefficient of variation for each band in the sample set is selected as the best estimate of relative indirect illumination. The entire Landsat data set is then normalized for direct and indirect illumination components, effectively reducing the variability. A.B.

A82-43436
CLASSIFICATION ACCURACY - A REVIEW
S. ARONOFF (TES Research and Consulting, Ltd., Calgary, Alberta, Canada) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 125-136. refs

Statistical theories relevant to map accuracy estimations are discussed, and a sampling design system which may provide for low consumer's and producer's risks is proposed. Criteria for judging such proposals are: a low probability of accepting a low accuracy map, a high probability of accepting a high accuracy map, and a minimum number of required ground data sample points. A hypothesis test is presented in terms of two separate assumptions (the map is less accurate than required, and the accuracy is equal to or greater than that required). It is shown that producer's risk can be reduced by increasing the consumer's risk or the sample size. The binomial distribution is considered to be the most accurate in sampling performance. Computer calculations which give precise binomial probabilities are presented and curtailed sampling calculations are presented. In addition, confusion matrices may provide methods of comparing land-use methods which are superior to single comparison estimations, but further documentation is required. R.K.R.

A82-43462
ACCURACY OF EARTHWORK CALCULATIONS FROM DIGITAL ELEVATION DATA
K. W. WONG and Y. M. SIYAM (Illinois, University, Urbana, IL) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 399-408.

Recent developments in photogrammetric methods, in general, and orthophoto mapping in particular, have resulted in the increasing availability of digital elevation data. In the orthophoto scanning process, the accuracy of the elevation data is dictated by the requirements of the orthophoto scanning process, and the accuracy of the digital elevation data obtained from the orthophoto scanning process is usually below the level normally needed for earth work calculations. On the other hand, the density and quantity of the elevation data collected from orthophoto mapping exceeds greatly the coverage usually used in the conventional method of photogrammetric profiling for earthwork calculation. The question arises whether the increase in density and quantity of the data base can compensate for the decrease in data accuracy. The present investigation attempts to answer this question. If is found

that elevation data generated from the orthophoto scanning process can potentially be used to provide accurate volume measurements. G.R.

A82-43474
EFFECT ON VARYING ISOCLS PARAMETERS ON CLASSIFICATION OF LANDSAT MULTISPECTRAL SCANNER DATA
G. MARTIN (Technicolor Graphic Services, Inc., Anchorage, AK) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 591-607. U.S. Geological Survey (Contract USGS-14-08-0001-16439)

It is noted that one of the first processes employed in the digital analysis of Landsat data is the development of a set of statistics that defines spectral clusters. These statistics are often used with a maximum likelihood decision rule in order to classify all data into a finite number of information categories. One of the algorithms used in developing cluster statistics, ISOCLS (Iterative Self-Organizing Clustering Program), iteratively constructs clusters that are based on parameters provided by the analyst. Here, parameter values can be manipulated to alter the number of clusters computed and to control the separation between clusters. The purpose of the study described here is to determine how variations in the ISOCLS parameters affect the number of clusters produced, the computer processing time required, and the accuracy of classification. C.R.

A82-43494
MEASUREMENTS OF THE REFLECTION COEFFICIENT OF SNOW COVER IN THE SHORT-WAVE PART OF THE MILLIMETER RANGE [IZMERENIIA KOEFFITSIENTA OTRAZHENIIA SNEZHNOGO POKROVA V KOROTKOVOLNOVOI CHASTI MILLIMETROVOGO DIAPAZONA]
IU. S. BABKIN, A. T. ISMAILOV, S. S. NOVIKOV, and L. I. STROGANOV Radiotekhnika i Elektronika, vol. 27, no. 8, Aug. 1982, p. 1641-1643. In Russian.

The effect of the underlying surface on the propagation of millimeter waves on near-surface quasi-horizontal paths in the presence of reflection from the underlying surface is manifested in the formation of an interference structure in the field. An analysis of experimental measurements of this interference structure can be used to compute the effective reflection coefficient of the underlying surface. In this paper, this coefficient is computed at wavelengths of 1.15 and 2 mm from experimental data on the interference structure in the vertical plane from a path 510 m long, covered by a layer of snow about 60 cm thick. B.J.

A82-44212
PRINCIPLES OF THE PHOTOGRAMMETRIC PROCESSING OF INFRARED SCAN PHOTOGRAPHS [PRINTSIPY FOTOGRAMMETRICHESKOI OBRABOTKI SKANERNYKH INFRAKRASNYKH SNIMKOV]
A. P. GUK (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR) and O. I. EGOROVA Geodeziia i Aerofotos'emka, no. 3, 1982, p. 85-91. In Russian. refs

The structure of infrared scan images is examined, and methods for the photogrammetric processing of such images are described. Recommendations on the use of the polynomial method and the method of parametric algorithms are given. B.J.

A82-45415
COMPARATIVE RADIOMETRIC DETERMINATIONS AND INDICATORS OF NATURAL OBJECTS - A DELTAIC SATELLITE SUBSTATION FOR REMOTE SENSING RESOLUTIONS [DETERMINATIONS COMPARATIVES RADIOMETRIQUES ET D'INDICATEURS DES OBJECTS NATURELS; UNE STATION POUR LES DETERMINATIONS SOUS-SATELLITAIRES DELTAIQUES DE TELEDETECTION]
N. OPRESCU (Institutul de Constructii, Bucharest, Rumania) and E. MANDESCU (Commission Roumaine de l'Activite Spatiale, Bucharest, Rumania) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 183-190. In French. refs

The development of sampling techniques for establishing a data base for satellite remote sensing studies of ecosystems, in addition to calibrating the spaceborne measurements with ground-truth readings is discussed. Attention is given to determination of the proper wavelengths for viewing natural features, establishing necessary analytical corrections for interpreting data influenced by levels of insolation and atmospheric interference, and defining weighting coefficients for interpretations of remotely sensed data. Block diagrams are presented for analog and digital recording of radiometric data, and the construction of ground-based satellite substations with apparatus for identifying variables in satellite remote-sensing operations by the construction of standardized surface features, such as a water channel, is described. M.S.K.

A82-45425
A PRELIMINARY STUDY OF THE DATA IN THE LANDSAT D THEMATIC MAPPER 5 /1.55-1.75 MICRONS/ OBTAINED FROM A SIMULATION FLIGHT [UNE ETUDE PRELIMINAIRE DE L'INFORMATION CONTENUE DANS LA BANDE THEMATIC MAPPER 5 /1,55-1,75 MICRONS/ DE LANDSAT D A PARTIR D'UN VOL DE SIMULATION]
F. BONN and G. CLICHE (Sherbrooke, Universite, Sherbrooke, Quebec, Canada) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 315-322. In French. refs

Results of an aerial survey simulating the spectral and spatial resolution of the first five bands of the Landsat D thematic mapper (TM) are presented. The data analysis is based on information obtained from the TM band 5 in a south east region of Quebec (240 sq km, 512 x 512 pixels). A numerical analysis of TM 5 data in relation to TM 1, 2, 3, and 4 data reveals the unique spectral characteristics of TM 5 data. An inverse relation between TM 5 reflectance and water content of vegetation is revealed, as well as for the biomass, with TM 5 data statistically independent of other data. The TM 5 data band will be useful in improving the precision of agricultural environment classification methods. R.K.R.

A82-45431
SPECTRAL SIGNATURES AND TEXTURES - TWO COMPLEMENTARY AND INSEPARABLE ASPECTS OF SATELLITE IMAGERY INTERPRETATION [TEXTURES ET SIGNATURES SPECTRALES DEUX ASPECTS COMPLEMENTAIRES ET INDISSOCIABLES POUR L'INTERPRETATION DES IMAGES DE SATELLITE]
P. FOIN (Institut Geographique National, Saint-Mande, Val-de-Marne, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 371-377. In French.

Current studies for improving algorithms used to interpret satellite imagery data, by extending the environment of a given pixel, are presented. The fact that pixels are interpreted in terms of reflectance, without considering localization association, leads to the necessity of examining the structure of an image. This is applied in a study of coppice in the Alencon region of France. Results indicate that a good correlation exists between the

classification which considered reflectance and surrounding pixels, and that which was derived from photographic interpretation. It is concluded, that in considering more pixels, it is also necessary to make structural considerations in order to avoid error. Two methods being developed are one which examines homogeneous geographical zones, and another which focuses on developing more sophisticated algorithms. R.K.R.

A82-45442
DETERMINATION OF THE SPECTRAL SIGNATURES OF A GLACIER
A. DELLA VENTURA, P. MUSSIO, A. RAMPINI (CNR, Istituto di Fisica Cosmica, Milan, Italy), R. RABAGLIATI (IBM Italia S.p.A., Venice, Italy), and R. SERANDREI BARBERO (CNR, Istituto per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 477-486. refs

A82-45444
DIRECTIONAL REFLECTANCE PROPERTIES DETERMINED BY ANALYSIS OF AIRBORNE MULTISPECTRAL SCANNER DATA AND ATMOSPHERIC CORRECTION
W. OTT, B. PFEIFFER, and F. QUIEL (Karlsruhe, Universitaet, Karlsruhe, West Germany) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 521-530.

The directional reflectance properties of natural surfaces are investigated by analyzing multispectral scanner data in order to determine the dependence between statistical values and scan angle which vary with wavelength (0.4-1.1 microns) and classes (e.g., bare soil, vegetation). A model is developed to describe this relationship and the atmospheric effects are computed by parameterization of the multiple scattered skylight. A comparison of the scanner data with the corresponding model shows that the differences between airborne and ground measurements are due to atmospheric effects. The directional variation in brightness is found to be mainly caused by the object itself with the exception of short wavelengths and/or a very low albedo, while the hue shift of the vegetation is essentially produced by the object and modified by the atmosphere. A marked improvement in comparison with previous algorithms can be obtained by taking into account the directional reflectance properties in a direction-dependent classification procedure. In addition, this method can be used to determine the quantitative relationships between ground measurements and radiation data registered by airborne sensors including atmospheric effects. N.B.

A82-45446
ATMOSPHERIC INFLUENCE IN REMOTE SENSING OF TERRESTRIAL RESOURCES - MODELING AND ERROR PROBABILITIES [INFLUENCE DE L'ATMOSPHERE EN TELEDETECTION DES RESSOURCES TERRESTRES - MODELISATION ET POSSIBILITES DE CORRECTION]
P. Y. DESCHAMPS, M. HERMAN, and D. TANRE (Lille I, Universite, Villeneuve-d'Ascq, Nord, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 543-558. In French. refs

A numerical model is developed for including atmospheric effects in automated processing of remote sensing data gathered for vegetation studies. Considering that proper spectral bands are chosen so that aerosols alone must be considered as the perturbative factors in what is otherwise a clear atmospheric window, account is made of the optical thickness of the atmosphere. A cut-off level is determined for automatic decisions on whether or not a correction must be applied to remotely sensed data, and a correction coefficient is formulated for differing levels of diffusion by aerosols. Examples are provided for color measurements of the ocean at 0.4 and 0.7 micron, and for observations of black soil at 0.7 micron. It is noted that accurate assessment of the correction depends on ground truth determination of the optical thickness. M.S.K.

A82-45449
ATMOSPHERIC CONDITIONS AND RADIO-WAVE PROPAGATION EFFECTS ON SPECTRAL SIGNATURES OF OBJECTS
A.-M. MARTIN (Bochum, Ruhr-Universitaet, Bochum, West Germany) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 579-590. refs

It is pointed out that the spectral signatures of objects in satellite imagery are affected in their degree of recognition by the state of the atmosphere at the time when the imagery is taken. An additional effect is the dislocation of the spectral signatures of objects between visible and infrared bands. This may derive from the influence of the atmosphere on the bundled radio signal beamed down from the satellite, where the differing bands are shifted within the radio signal in relation to each other. A typical real-time direct readout signal is included showing the visible and infrared information on the oscilloscope. Here, the line-for-line correlation should be no more than 900 meters on the ground. Simple cartographic measurements in various parts of the images will help in defining the degree of dislocation within the images and provide corrections for both gridding and computer image print-out procedures. C.R.

A82-45486#
ON THE USE OF SATELLITE DATA TO INFER SURFACE FLUXES AT METEOROLOGICAL SCALES
J. C. PRICE (U.S. Department of Agriculture, Hydrology Laboratory, Beltsville, MD) Journal of Applied Meteorology, vol. 21, Aug. 1982, p. 1111-1122. refs

For numerical meteorological prediction, the determination of energy, momentum and moisture fluxes at the Earth's surface requires knowledge of surface properties at a very coarse spatial resolution. A procedure is described for estimating the important surface properties through analysis of high spatial resolution visible and thermal infrared data from satellites. An averaging method is then specified for aggregating or parameterizing local estimates of surface properties to a relatively coarse grid spacing. The method considers grid scale fluxes between ground and atmosphere, specifying that parameterized surface values should yield fluxes equal to those produced by integration of the high spatial resolution description of the surface. This allows estimation of latent and sensible heat exchange with the atmosphere at the large scales of general circulation models. The procedure is illustrated by application to a data set from the Heat Capacity Mapping Mission. (Author)

A82-45665
PROCESSING SYNTHETIC APERTURE RADAR DATA
R. K. RANEY (Canada Centre for Remote Sensing, Ottawa, Canada) (International Union of Radio Science, Open Symposium on Remote Sensing, Washington, DC, Aug. 11, 12, 1981.) International Journal of Remote Sensing, vol. 3, July-Sept. 1982, p. 243-257. refs

Basic operational principles of synthetic aperture radar systems are reviewed, with an emphasis on the data processing requirements. The techniques of image formation for these systems are covered, using either optical or digital techniques. Examples of imagery are shown to illustrate the data processing results. SAR processing capabilities as they exist worldwide are summarized. (Author)

A82-45721#
IMPROVEMENT OF NUMERICAL FINE MESH ANALYSIS OF HUMIDITY USING IR-IMAGE OF NOAAS SATELLITE DATA
E. HILT and E. REIMER (Berlin, Freie Universitaet, Berlin, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 61-64. refs

Radiosonde and surface observations are used to consider relative humidity more effectively. The fine mesh analysis of the moisture field is improved by comparing it to infrared imagery which is geometrically located by a three-dimensional temperature analysis. The temperature data are derived from digital-processed NOAAS APT data, and the received analog signals are normalized and transformed to equivalent blackbody temperatures. Figures presented show good results, and future tests will ensue, considering, in particular, the usual time difference between the satellite image and the radiosonde observations. R.K.R.

A82-45744#
DETERMINATION OF THE CUMULUS CLOUD SIZE DISTRIBUTION ON THE BASIS OF LANDSAT IMAGERY [BESTIMMUNG DER CUMULUS-GROESSENVERTEILUNG AUS LANDSAT-BILDERN]
E. KARG, H. MUELLER, and H. QUENZEL (Muenchen, Universitaet, Munich, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 142-144. In German.

A solar-tower power station transforms solar energy into heat which is used for the generation of electric power by conventional technological approaches. A mirror system is used to direct solar radiation to a receiver mounted on a tower. Changes concerning the insolation cause temperature variations in the receiver. These temperature variations subject the receiver material to thermal stresses and prevent a steady operation of the power station. The magnitude of the solar power transmitted to the receiver is largely determined by the characteristics of the cloud cover and the individual clouds. The present investigation is concerned with suitable methods for the determination of cloud size, and the characteristics of cloud size distribution. It is found that currently only the Landsat system provides the basis for a suitable cloud size determination. By increasing the mirror area, the power station can be made less sensitive to changes in the cloud cover. G.R.

A82-45749#
DETERMINATION OF GLOBAL RADIATION AND OF CLOUDINESS FROM METEOSAT IMAGE DATA
W. MOESER and E. RASCHKE (Koeln, Universitaet, Cologne, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 161-163. refs

An algorithm is developed in order to determine the fields of global radiation at the ground and cloud cover with a spatial resolution of about 25 km in mid-Europe by utilizing radiation data from the geostationary satellite Meteosat. In addition, the satellite results are compared with the hourly data of global radiation that was measured by 19 pyranometers of the DWD radiation network between 1-15 June 1979. Results show that the RMS differences reach a maximum of 100 Wm-2 at noon, while averaging over 15 days reduces these errors to 40% of those for single day values. N.B.

A82-46162
CONCERNING A TEST OF FIT FOR THE BRIGHTNESS PROBABILITY DISTRIBUTION OF HOMOGENEOUS NATURAL OBJECTS [K PROVERKE GIPOTEZ O ZAKONE RASPREDELENIIA VEROIATNOSTEI DLIA IARKOSTEI ODNORODNYKH PRIRODNYKH OBRAZOVANII]
A. A. IAKOVLEV (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 59-65. In Russian. refs

A new test-of-fit criterion is proposed for the probability distribution of the spectral brightnesses of natural objects. This criterion, which is effective for small samples and in the presence of rejected data, is evaluated by analyzing a distribution of spectral brightnesses in the 2-5.5 micron range. This distribution is shown to be close to the Gaussian one. B.J.

A82-46166
TOWARDS SOLVING THE PROBLEM OF THE TRANSFER OF THE OPTICAL IMAGE OF THE EARTH'S SURFACE IN THE HORIZONTALLY INHOMOGENEOUS ATMOSPHERE [K RESHENIIU ZADACHI O PERENOSE OPTICHESKOGO IZOBRAZHENIIA ZEMNOI POVERKHNOSTI V GORIZONTAL'NO-NEODNORODNOI ATMOSFERE]
I. V. MISHIN (Gosudarstvennyi Nauchno-Issledovatel'skii Tsentr Izucheniia Prirodnykh Resursov, Moscow, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 95-104. In Russian. refs

A general method is proposed for calculating spatial distortions of the optical image of the earth's surface in a horizontally inhomogeneous atmosphere above a surface with inhomogeneous albedo. The method is based on the use of functions that describe linear and nonlinear optical-image distortions; these functions are independent of atmosphere optical thickness and surface albedo fluctuations. B.J.

A82-46167
MATHEMATICAL MODEL OF A SPACE IMAGE OF THE EARTH'S SURFACE, OBTAINED BY SYNTHETIC-APERTURE RADAR [MATEMATICHESKAIA MODEL' KOSMICHESKOGO IZOBRAZHENIIA ZEMNOI POVERKHNOSTI, POLUCHENNOGO S POMOSHCH'IU RADIOLOKATORA S SINTEZIROVANNOI APERTUROI]
V. I. KHIZHNICHENKO Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 105-114. In Russian. refs

The proposed model takes into account effects associated with the motion of the satellite and the attitude system, as well as those associated with radar-image synthesis, based on optimal filtering of the received coherent signal with respect to range and Doppler coordinates. Particular attention is given to the development of algorithms for the phase, amplitude, and geometric correction of the radar images, and to methods for evaluating the maximum spatial resolution of synthetic-aperture radar systems. B.J.

A82-46543* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMAGE-DATA-PROCESSING FOR EARTH RESOURCES - AN OVERVIEW
F. C. BILLINGSLEY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Journal of Applied Photographic Engineering, vol. 8, Feb. 1982, p. 2-14. refs
(Contract NAS7-100)

A total remote-sensing system comprises four distinct operations: data-acquisition, archiving, production, and dissemination of individual products, and extraction of the required information. The Landsat satellite system acquires data in several spectral bands, with a ground resolution of 80 meters (currently) or 30 meters (future). Radiometric and geometric corrections are normally applied, after which the data may be enhanced for photointerpretation or analyzed by computer. The accuracy of the analysis model for either is important. The extraction of information from remotely sensed data will generally be dependent on the use of it with other data such as maps or, perhaps, weather information. Methods are being developed to use the various data

together in geographic data systems. The availability of remotely sensed data has encouraged the development of new models or analysis procedures for the use of this information. (Author)

A82-46739
AN APPLICATION OF LARGE SCALE COMPUTING FACILITIES TO THE PROCESSING OF LANDSAT DIGITAL DATA IN AUSTRALIA
D. W. BEACH (IBM Australia, Ltd., Sydney, Australia) and K. W. DAWBIN (New South Wales Department of Agriculture, Sydney, Australia) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 146-157. refs

A82-46741
DIGITAL CORRECTION OF SOLAR ILLUMINATION AND VIEWING ANGLE ARTIFACTS IN REMOTELY SENSED IMAGES
T. SHIBATA, W. FREI, and M. SUTTON (Southern California, University, Marina del Rey, CA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 169-177. refs
(Contract DE-AS03-76SF-00113)

Shading artifacts caused by varying solar illumination conditions and different viewing angles in aerial photographs are simulated and corrected for the purpose of more accurate image change analysis and interpretation. A synthetic image simulating the shading effects for the sun angle and viewing angle in the original (real) image is generated using a terrain reflectance model and digital elevation data. The synthetic image is used to remove the shading artifacts from the real image, and both images are projected into the same perspective space. The resulting image is found to show useful information that is not apparent in the original image. A three-dimensional perspective representation of a terrain with a corresponding aerial photograph mapped on it is presented to demonstrate the usefulness of the representation for better image interpretation. F.G.M.

A82-46743
REGISTRATION OF DIGITAL IMAGERIES USING OPTIMIZATION TECHNIQUE
A. D. KULKARNI, B. L. DEEKSHATULU, and K. R. RAO (National Remote Sensing Agency, Secunderabad, India) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 181-187. refs

An algorithm that uses a sequential simplex method is developed for carrying out an optimized search for similarity between two digital images, one reference and one nonreference, whose coordinates have been related by affine transformation. The search method is essentially of the gradient type and searches for the optimum with the steepest route; the algorithm evaluates the transformation coefficients by conducting the search in six-dimensional space. As an example, the algorithm is used for the registration of two Landsat scenes. Only translational differences are considered, and the optimized search is carried out in only two dimensions. The upper bound on registration accuracy is determined. F.G.M.

A82-46744* General Electric Co., Philadelphia, Pa.
LANDSAT D THEMATIC MAPPER IMAGE RESAMPLING FOR SCAN GEOMETRY CORRECTION
A. PRAKASH and E. P. BEYER (General Electric Co., Philadelphia, PA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 189-200.
(Contract NAS5-25300)

The Landsat D system is described, and the geometric correction processing for the Thematic Mapper (TM) is reviewed. The resampling procedure (the generation of a TM output image) is analyzed with emphasis on the effect of sampling geometry on output image. Effects of scan gaps and spacecraft jitter on output image are studied by means of a simulation of the sampling and resampling processes for three sampling geometries. Visual inspection of the resampling results shows that the resampling algorithm works excellently under all conditions and that distortion is visible only in the rare case of large gaps between scans. F.G.M.

A82-46753* Purdue Univ., Lafayette, Ind.
CONTEXTUAL CLASSIFICATION ON A CDC FLEXIBLE PROCESSOR SYSTEM
B. W. SMITH, H. J. SIEGEL, and P. H. SWAIN (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 283-291. refs
(Contract NAS9-15466)

A potential hardware organization for the Flexible Processor Array is presented. An algorithm that implements a contextual classifier for remote sensing data analysis is given, along with uniprocessor classification algorithms. The Flexible Processor algorithm is provided, as are simulated timings for contextual classifiers run on the Flexible Processor Array and another system. The timings are analyzed for context neighborhoods of sizes three and nine. F.G.M.

A82-46754* Purdue Univ., Lafayette, Ind.
CONTEXTUAL CLASSIFICATION OF MULTISPECTRAL IMAGE DATA - AN UNBIASED ESTIMATOR FOR THE CONTEXT DISTRIBUTION
J. C. TILTON, P. H. SWAIN (Purdue University, West Lafayette, IN), and S. B. VARDEMAN (Iowa State University of Science and Technology, Ames, IA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 304-313. refs
(Contract NAS9-15466; NSF MCS-78-04366)

Recent investigations have demonstrated the effectiveness of a contextual classifier that combines spatial and spectral information employing a general statistical approach. This statistical classification algorithm exploits the tendency of certain ground-cover classes to occur more frequently in some spatial contexts than in others. Indeed, a key input to this algorithm is a statistical characterization of the context: the context distribution. Here a discussion is given of an unbiased estimator of the context distribution which, besides having the advantage of statistical unbiasedness, has the additional advantage over other estimation techniques of being amenable to an adaptive implementation in which the context distribution estimate varies according to local contextual information. Results from applying the unbiased estimator to the contextual classification of three real Landsat data sets are presented and contrasted with results from noncontextual classifications and from contextual classifications utilizing other context distribution estimation techniques. (Author)

A82-46755
A NEW CLASSIFIER OF MSS DATA - NATURAL BOUNDARY FINDING IN THE FEATURE SPACE
W. Y. CHEN (Shandong, University, Jinan, People's Republic of China) and W. G. COLLINS (Aston, University, Birmingham, England) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 314-320.

A method of classifying MSS data is proposed that does not contain preprocessing constraints on the data distribution in feature space. The method is based on the supposition that the data from one particular type of ground cover tend to cluster in a small area with boundaries that can be found by region growing. With the method, the data for a processed scene need be passed through the computer only twice. Examples are presented that illustrate the classification procedure for one-, two-, and three-dimensional data. F.G.M.

A82-46756
A NEW CLUSTERING METHOD FOR LANDSAT IMAGES USING LOCAL MAXIMUMS OF A MULTI-DIMENSIONAL HISTOGRAM
K. MATSUMOTO, M. NAKA, and H. YAMAMOTO (National Aerospace Laboratory, Tokyo, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 321-326.

This paper describes a new clustering method for a huge satellite image. This method is composed of two major schemes, a multi-layered hashing scheme for multi-dimensional histogram (MDH) and a histogram clustering scheme using MDH. The MDH construction scheme works in 3 stages. In the 1st stage it constructs a few histogram layers for each part of an image, and in the 2nd and 3rd stages histogram layers are combined into one histogram. The clustering scheme searches for local maximums of MDH, and decides clusters around local maximums as sets of hyperrectangles. The major parameters of the clustering scheme are briefly discussed, and some results are also shown. (Author)

A82-46757
SEQUENTIAL CLASSIFICATION ALGORITHMS
R. KRISHNAN and K. R. RAO (National Remote Sensing Agency, Secunderabad, India) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 327-330.

Four versions of the sequential maximum-likelihood algorithm are described and are used to classify Landsat MSS data. The performances of the four versions are intercompared and, in addition, are compared with the performance of the conventional maximum-likelihood algorithm. It is shown that two versions of the sequential algorithm perform better than the conventional algorithm and that one of the two versions appears to be better than the other. F.G.M.

A82-46758
A NEW APPROACH TO AUTOMATIC IDENTIFICATION OF GROUND OBJECTS VIA THE REFLECTANCE LOOK-UP TABLES
Y. KAWATA, T. KUSAKA, Y. HABA, and S. UENO (Kanazawa Institute of Technology, Ishikawa, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 331-335. refs

In the present study a method to estimate the optical thickness of the atmospheric haze is described. A true surface reflectance data set is obtained from a Landsat data set by using the Atmospheric Effect Correction System developed at the Kanazawa Institute of Technology. A data base of classes of land covers containing the statistical information on the spectral reflectance is constructed from true surface reflectance data sets. Finally a new and powerful table look-up approach in classification is described and the results are presented (Author)

A82-46759
MULTITEMPORAL SEGMENTATION BY MEANS OF FUZZY SETS
R. JEANSOULIN, Y. FONTAINE, and W. FREI (Southern California, University, Marina del Rey, CA; CNRS, Langages et Systemes Informatiques, Toulouse, France) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 336-339. Research sponsored by the Centre National d'Etudes Spatiales and Institut National de Recherche en Informatique et en Automatique. refs

A technique is described for automating the segmentation of data within a remotely sensed image through the use of monospectral, multispectral, and multitemporal properties measured by several visual and qualitative criteria, which are combined with the aid of fuzzy-set theory. Some basic concepts of the theory are developed, and several algorithms are given for performing the segmentation of an entity designated by only one inner point. A method based on the use of geometric corrections is outlined for combining the results of a segmentation performed on different dates. An example is presented that illustrates the extraction of the radiometries of a rectangular field of about 50 x 60 pixels in the green and red spectral bands. F.G.M.

A82-46762
CORRECTING FOR ANISOTROPIC REFLECTANCES IN REMOTELY SENSED IMAGES FROM MOUNTAINOUS TERRAINS
H. HUGLI and W. FREI (Southern California, University, Marina del Rey, CA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 363-374. refs
(Contract DE-AS03-76SF-00113)

A quantitative analysis of a remote sensing model is performed to demonstrate both the mechanisms of reflection in the case of natural surfaces in mountainous terrains and the effects of the mechanisms on the radiometry of remotely sensed images from such terrains. The reflectance characteristics of sand, the lunar surface, snow, and a forest are used to generate simulated images of mountainous terrains on the assumption of a surface with an orientation-invariant reflectance characteristic. It is shown that the assumption is valid only for a certain class of surfaces and the surfaces with an important vertical structure (e.g., vegetated surfaces or a forest) require a more complex reflection model that includes the effect of surface orientation. For practical purposes, a simpler reflection model is proposed that performs the major radiometric corrections for remotely sensed images from mountainous terrains. F.G.M.

A82-46764* Purdue Univ., Lafayette, Ind.
COMPUTER-BASED CLASSIFICATION ACCURACY DUE TO THE SPATIAL RESOLUTION USING PER-POINT VERSUS PER-FIELD CLASSIFICATION TECHNIQUES
R. S. LATTY (Technicolor Graphic Services, Inc., Moffet Field, CA) and R. M. HOFFER (Purdue University, West Lafayette, IN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 384-393. refs
(Contract NAS9-15889)

Data sets simulating three different spatial resolutions (SR's) are computed from data with a 15-m nominal SR that were obtained with NASA's Thermatic Mapper Simulator from an altitude of about 6 km. The classification accuracies (CA's) achieved with the data

of each of the four different SR's using a per-point Gaussian maximum likelihood classifier (GMLC) are intercompared. The CA's obtained using simulated 30-m SR data with the per-point GMLC are compared with the CA's achieved with a per-field classifier. It is found that: (1) the use of successively higher SR data resulted in lower overall CA's for classifications with the per-point GMLC, especially in cover classes associated with relatively higher spectral variability across adjacent pixels; (2) higher CA's were achieved using the per-field classifier with 30-m SR data than were achieved with the per-point GMLC; and (3) the largest increases in CA's were achieved with the per-field classifier in cover classes associated with relatively high levels of spectral variability across adjacent pixels. F.G.M.

A82-46770
IMAGE PROCESSING FOR CARTOGRAPHIC APPLICATIONS
M. H. LOEW, R. L. PICKHOLTZ, and L. GOLDMAN (George Washington University, Washington, DC) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 447-453. refs
(Contract DAAK70-79-C-0147)

A procedure is developed for the automatic classification of bridges in aerial photos. A relatively small set of bridge candidates is extracted from a raw digitized image by performing a Hough transform on each edge-detected subimage and keeping only those entries corresponding to long parallel lines that are close together. The bridge candidates are represented by matrix entries in the same column and in rows that are adjacent or nearly adjacent. Each candidate is then subjected to a series of simple environmental tests or further analyses to determine whether or not a bridge is actually present. As an example, the edginess of the region around a bridge candidate is used to attempt a classification of four potential bridges. The two candidates classified as bridges turn out to be actual bridges. F.G.M.

A82-46773* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARIZONA GEOPHYSICAL DATA BASE
R. G. MCLEOD (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 491-496. refs
(Contract NAS7-100)

A series of digital data sets were compiled for input into a geophysical data base for a one degree quadrangle in Arizona. Using a Landsat digital mosaic as a base, information on topography, geology, gravity as well as Seasat radar imagery were registered. Example overlays and tabulations are performed.
(Author)

A82-46774
COMPREHENSIVE GEO-DATA BASE CONTROL WITH AN ELECTRONIC COORDINATE DIGITIZER
T. D. FRANK (Illinois, University, Urbana, IL) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 497-504. refs

A report is given on progress being made in designing an image-based geographic information system that uses digital image datatype and data structures but emphasizes a communication subsystem that allows the user to perceive the data structures as map datatype. To enhance the visual interaction between the user and the system, an electronic coordinate digitizer serves as the primary communication mechanism. System control is discussed, along with the data structures used, data encoding, the communication subsystem, and data analysis. As an example, the relationship between vegetation patterns and elevation is analyzed for a Landsat MSS scene of a mountainous location in Montana. F.G.M.

A82-46775
TECHNIQUES TO UPDATE A LAND MANAGEMENT INFORMATION SYSTEM WITH LANDSAT
C. A. NELSON (Technicolor Graphic Services, Inc., Sioux Falls, SD), D. E. MEISNER (Minnesota, University, St. Paul, MN, and B. Smekofski (Minnesota State Planning Agency, St. Paul, MN), and B. SMEKOFSKI (Minnesota State Planning Agency, St. Paul, MN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 505-517. refs

Computer manipulation, classification, and accuracy assessment techniques for updating land use data in a land management information system with Landsat data are evaluated. Four approaches to statistical computer manipulation are attempted, and the resulting statistics are applied to Landsat image data by means of three pattern-recognition algorithms. For accuracy assessment, 12 output images are compared with photointerpreted samples, ground-verified samples, and the current land use data base. The results show that, for a reconnaissance inventory, statistical computer manipulation by means of polygons selected from aerial photos and applied by canonical analysis with a minimum-distance-to-mean algorithm is the most accurate and efficient approach. Cross-tabulation with the accuracy samples indicates classification accuracies of 20% to 40%. F.G.M.

A82-46780* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SENSITIVITY OF GEOGRAPHIC INFORMATION SYSTEM OUTPUTS TO ERRORS IN REMOTELY SENSED DATA
H. K. RAMAPRIYAN (NASA, Goddard Space Flight Center, Greenbelt, MD), R. K. BOYD, F. J. GUNTHER, and Y. C. LU (Computer Sciences Corp., Silver Spring, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 555-566. refs

The sensitivity of the outputs of a geographic information system (GIS) to errors in inputs derived from remotely sensed data (RSD) is investigated using a suitability model with per-cell decisions and a gridded geographic data base whose cells are larger than the RSD pixels. The process of preparing RSD as input to a GIS is analyzed, and the errors associated with classification and registration are examined. In the case of the model considered, it is found that the errors caused during classification and registration are partially compensated by the aggregation of pixels. The compensation is quantified by means of an analytical model, a Monte Carlo simulation, and experiments with Landsat data. The results show that error reductions of the order of 50% occur because of aggregation when 25 pixels of RSD are used per cell in the geographic data base. F.G.M.

A82-46785
THE EXPANSION OF THE PROBABILITY DENSITY FUNCTION TO NON-GAUSSIAN DISTRIBUTION
M. AKIYAMA (Geographical Survey Institute, Tsukuba, Ibaraki, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 604-608.

A nonsymmetric Gaussian probability density function with two independent standard deviations is expanded by introducing antisymmetricity as a third parameter. The expansion is carried out so that the function can approximate the antisymmetricity of a pattern-class histogram and still include the conventional symmetric Gaussian function as a special case. Some characteristics of the nonsymmetric function are examined; its fit to an original histogram

is evaluated by means of a chi-squared test and is compared with the fit of the conventional function. The symmetric and nonsymmetric functions are also compared by means of a test run using Landsat MSS data. F.G.M.

A82-46786* Florida Univ., Gainesville.
COMPUTER GENERATED MAPS FROM DIGITAL SATELLITE DATA - A CASE STUDY IN FLORIDA
L. G. ARVANITIS, R. M. REICH (Florida, University, Gainesville, FL), and R. NEWBURNE (Florida, Div. of Forestry, Environmental Resources Management, Miami, FL) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 609-616. NASA-supported research. refs

Ground cover maps are important tools to a wide array of users. Over the past three decades, much progress has been made in supplementing planimetric and topographic maps with ground cover details obtained from aerial photographs. The present investigation evaluates the feasibility of using computer maps of ground cover from satellite input tapes. Attention is given to the selection of test sites, a satellite data processing system, a multispectral image analyzer, general purpose computer-generated maps, the preliminary evaluation of computer maps, a test for areal correspondence, the preparation of overlays and acreage estimation of land cover types on the Landsat computer maps. There is every indication to suggest that digital multispectral image processing systems based on Landsat input data will play an increasingly important role in pattern recognition and mapping land cover in the years to come. G.R.

A82-46788* General Electric Co., Lanham, Md.
IMAGE REGISTRATION SYSTEM IN THE LANDSAT-D PRODUCTION ENVIRONMENT
P. KISS, P. ARNOLD, and J. GOLDSTINE (General Electric Co., Lanham, MD) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 621-625.
(Contract NAS5-25300)

It is the purpose of the considered system to take pieces of imagery, called control point chips (CPC), whose geodetic location has been previously determined and stored, and locate their position in later imagery of the same area. The registration processes are carried out partially on a DEC VAX 780 computer and partially on a Floating Point Systems Array Processor. Typically sets of 20 control points are processed at a time. To process these as sets, and to optimize the use of both machines, operations are grouped into loops instead of a sequential processing for each point. Attention is given to cloud cover assessment, enhancement, correlation techniques, pixel registration, and subpixel registration. G.R.

A82-46790
AN APPROACH TO DEVELOP INTERPRETATION KEYS FOR THE ANALYSIS OF SINGLE BAND BHASKARA SATELLITE TV-DATA
K. L. MAJUMDER, A. K. S. GOPALAN, D. S. KAMAT, A. N. PATEL (Indian Space Research Organization, Space Applications Centre, Ahmedabad, India), and P. SENCHAUDHURI (Indian Institute of Management, Ahmedabad, India) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 633-638.

A way of increasing the usefulness of data from the earth observation satellite Bhaskara is outlined. The approach is developed using both digital and photographic techniques with a view to arriving at a standard set of keys for analyzing and interpreting the TV data. The basis of the digital technique is the frequency distribution of gray tones (reflectance values) for identifying important cover types and the generation of three new data sets by assigning pseudo-gray codes to the classified data. The pseudo-gray coded data are then used to generate photographically color codes for each of the cover types. The pseudo-data sets are turned into a photographic film transparency and assigned the colors red, green, and blue, respectively. The color composite made using these transparencies is the new color-coded thematic ground cover picture from Bhaskara. C.R.

A82-46791
AN EXPERIMENTAL LANDSAT QUICK-LOOK SYSTEM FOR ALASKA
J. M. MILLER (Alaska, University, Fairbanks, AK) and N. CAMPBELL (MacDonald, Dettwiler and Associates, Richmond, British Columbia, Canada) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 639-646.

Since 1972, Landsat Multispectral Scanner (MSS) data have been applied to surveys of natural resources and land use patterns as well as to ocean and sea-ice studies. At the present time, U.S. users are experiencing large delays between data acquisition and delivery. For this reason, a program is being developed to accelerate the delivery of high quality Landsat images of Alaska. A preliminary evaluation of the potential benefits of delivering Landsat MSS imagery to users in less than several weeks was conducted. Based on encouraging results obtained in this evaluation, a Quicklook Image Recording System (QLIRS) has been specified, designed, and built. The new system when interfaced to NASA's existing Landsat ground station at Fairbanks, will generate 1:1,000,000 scale, full resolution black and white images as well as reduced resolution color images. The system is intended as a limited volume production facility for users of Landsat MSS data in Alaska. G.R.

A82-46795
USE OF AN APPLE COMPUTER TO IDENTIFY VEGETATION AND ASSESS THE COVERAGE WITHIN SINGLE LANDSAT PIXELS
H. C. SWEET (Central Florida, University, Orlando, FL) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 695-701. Research supported by the University of Central Florida and Florida State Forestry. refs

The presence of two different objects within a reflectance spectrometer's field of view will yield a spectrum intermediate between that of the two components. Because the instantaneous field of view of the multispectral scanner of the Earth Resources Technology Satellite is 1.6 acres, when the satellite views an area which is highly heterogeneous, the resulting spectra is difficult to correctly classify. Several different approaches have been employed to permit analyzing the four data points of picture elements (pixels) which contain mixtures. The least squares technique developed for solving pulse height spectra, called Ridas, offers several advantages. Thus, Ridas was converted from FORTRAN to PASCAL and installed on an Apple II computer. In the process Ridas was extensively revised. A description is presented of the rationale of the method, and test results obtained with Melaleuca are provided. The identification of Melaleuca had previously presented problems. G.R.

A82-46949#
UTILIZATION OF THE SPOT SYSTEM [L'EXPLOITATION DU SYSTEME SPOT]
G. CALES International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 8 p. In French.
(IAF PAPER 82-101)

An overview of the SPOT system is presented, with the primary goals being to obtain 700 images a day, to produce 70

preprocessed images per day, and to decentralize accessible images. The satellite is capable of covering a 60-80 km zone of the earth, and repeats its path every 26 days, with a precision of plus or minus 5 km. SPOT images are transmitted in 8 GHz band at a rate of 50 Mbits/sec, and appropriate magnetic tapes are recorded at the Centre de Rectification des Images de Satellite (CRIS). A SPOT image measures 60x60 km, and is corrected at CRIS for the relative calibration of the detectors, and is also radiometrically corrected. The SPOT system is capable of providing color images and enlargements, and can be used by foreign stations. An October 1984 launch is anticipated. R.K.R.

N82-28696 Royal Aircraft Establishment, Farnborough (England).
THE USE OF TERRAIN HEIGHT INFORMATION FOR IMPROVING THE ACCURACY OF CLASSIFICATION OF LANDSAT DATA
P. A. ROBERTS Jan. 1982 19 p refs
(RAE-TM-SPACE-297; BR82645) Avail: Issuing Activity

An algorithm that transforms digitized height contours into an equispaced grid of points is presented. A method which uses this height matrix to derive the magnitude and direction of the slope of the terrain is described. This information is used to calculate the variation in direct solar illumination over an area. Height, slope, and variation in direct solar illumination are represented as gray tone images, assigning pixel value according to intensity. Aspect is displayed by assigning a value of 0 deg to a zero image intensity (flat terrain) and 360 deg to maximum intensity. Classification of multispectral Landsat imagery, using terrain parameters as extra image planes, or by modifying pixel intensities in the Landsat image, was studied. Results for a wooded area are inconclusive because of: lack of ground truth data for verifying classifications; the nature of the terrain (not rugged enough); and the restricted area of the sample. Author (ESA)

N82-28699*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE NASA WORKSHOP ON REGISTRATION AND RECTIFICATION
N. A. BRYANT, ed. 1 Jun. 1982 535 p refs Workshop held in Leesburg, Va., 17-19 Nov. 1981
(Contract NAS7-100)
(NASA-CR-169133; JPL-PUB-82-23; NAS 1.26:169133) Avail: NTIS HC A23/MF A01 CSCL 08B

Issues associated with the registration and rectification of remotely sensed data. Near and long range applications research tasks and some medium range technology augmentation research areas are recommended. Image sharpness, feature extraction, inter-image mapping, error analysis, and verification methods are addressed.

N82-28700*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
WORKSHOP RATIONALE
F. C. BILLINGSLEY *In its* Proc. of the NASA Workshop on Registration and Rectification p 13-20 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The problems involved in processing remotely sensed data are defined within the contex of the total information system structure. The correlation of various data sets through georeferencing and cataloging is emphasized along with geometric rectification. The sources and types of possible geometric errors are outlined. M.G.

N82-28702*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF SUBPANEL ON FEATURE EXTRACTION
In its Proc. of the NASA Workshop on Registration and Rectification p 27-32 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The state of knowledge in feature extraction for Earth resource observation systems is reviewed and research tasks are proposed. Issues in the subpixel feature estimation problem are defined as: (1) the identification of image models which adequately describe the data and the sensor it is using; (2) the construction of local feature models based on those image models; and (3) the problem of trying to understand these effects of preprocessing on the entire process. The development of ground control point (GCP) libraries for automated selection presents two concerns. One is the organization of these GCP libraries for rectification problems, i.e., the problems of automatically selecting by computer the specific GCP's for particular registration tasks. Second is the importance of integrating ground control patterns in a data base management system, allowing interface to a large number of sensor image types with an automatic selection system. The development of data validation criteria for the comparison of different extraction techniques is also discussed. M.G.

N82-28703*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF SUBPANEL ON INTER-IMAGE MATCHING
In its Proc. of the NASA Workshop on Registration and Rectification p 33-37 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Research needs in the area inter-image matching for remote Earth observation systems are defined. Correlation considerations include types of correlation algorithms, preprocessing techniques, limits on subpixed accuracy, relief and atmospheric refraction effects, evaluation of success rate, and evaluation of accuracy. Also recommended are investigations of the interaction of inter-image matching procedures and selection of ground control points for a given sensor; global multisensor control point library feasibility; multiple control point considerations; centralized processing systems; and user systems. M.G.

N82-28704*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT ON THE SUBPANEL ON REMAPPING PROCEDURES
In its Proc. of the NASA Workshop on Registration and Rectification p 38-42 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Problems associated with remapping procedures are defined and research tasks are proposed. It is noted that the remapping/rectification process could be significantly aided through engineering systems improvements in attitude control, with subsequent improvement in spacecraft ephemeris modeling accuracy. There is a need for state-of-the-art technology assessments prior to initiation of major programs, and the high potential return from well formulated testing of algorithms on selected data sets of actual and synthetic imagery. In addition, there is a need for tasks that incorporate standard photogrammetric methodology and formulas and that more fully utilize platform and calibration data from current and proposed sensors to reproject digital imagery. The impact of improved platform stability and integration of global positioning system measurements on reduced ground segment processing needs to be critically assessed. Also highlighted is the need for a substantial effort in the development of remapping software and systems that are modular and transportable. M.G.

N82-28705*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF THE SUBPANEL ON RESAMPLING FUNCTIONS
In its Proc. of the NASA Workshop on Registration and Rectification p 43-45 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The state of the art and anticipated requirements for resampling in applications of remote sensing are examined. It is noted that the wide range of potential applications and expanded needs for resampling versatility in new imaging sensors leads to a concern for creating standardized test data sets and ground training sites. Several research areas are defined including the development of (1) a theory for defining an input psf of an instrument such that upon resampling of the processed data into the desired output grid the radiometric and geometric properties are a best estimate of the true upwelling radiances; (2) algorithms for estimating missing

data or for ignoring missing data; (3) optimal resampling functions; (4) standard data sets; and (5) merit functions for assessing resampling techniques. M.G.

N82-28707*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF THE SUBPANEL ON METHODS OF VERIFICATION
In its Proc. of the NASA Workshop on Registration and Rectification p 60-67 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

A program to improve the state of understanding and of the meaning of verification and the application of verification procedures to a variety of sensor systems is recommended. The program would involve an experimental hands-on data demonstration and evaluation of those procedures in a controlled test bed experiment. M.G.

N82-28714*# Santa Barbara Research Center, Goleta, Calif.
THEMATIC MAPPER PERFORMANCE
J. ENGLE *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 130-137 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The thematic mapper primarily and its difference from MSS is reviewed. The TM has 30 meter resolution and the MSS has 80 meter resolution. This provides on agriculture an ability to accurately classify 10 acre fields with the TM versus 70 acre fields with the MSS data. There are six reflected light bands in the thematic mapper. Two bands are a new spectral region out in the IR, the shortwave IR region, as opposed to MSS's four reflected light bands. Four thematic mapper reflected light bands in the visible portion of the spectrum are designated to enhance the classification capability. The TM has better signal-to-noise ratio performance and radiometric sensitivity. The scan efficiency is increased through the use of bidirectional scanning, which gives a scan efficiency of 85% versus 45% with the multispectral scanner and more detectors per band. Greater encoding resolution is obtained in the multiplexer, 8 bit resolution versus 6 bits for MSS. E.A.K.

N82-28717*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GEOMETRIC AND REDIAMETRIC DISTORTION IN SPACEBORNE SAR IMAGERY
J. C. CURLANDER *In its* Proc. of the NASA Workshop on Registration and Rectification p 163-197 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Distortions inherent on synthetic aperture radio (SAR) imagery and the development to date of unsupervised postprocessing rectification techniques are described. The geometric distortion can be divided into two categories: (1) distortion derived from the radar viewing geometry, this includes such effects as ground range nonlinearities, radar foreshortening and radar layover; (2) distortion introduced during the data processing, these distortions result from approximations made during the correlation such as in estimation of the target phase history, or compensation for the Earth rotation. The processor induced distortions depends on the specific correlation algorithm used for image formation. The effects are addressed on the image product resulting from assumptions during the processing and it specifically considers distortions inherent in digital imagery produced by the digital image processor. E.A.K.

N82-28723*# Purdue Univ., Lafayette, Ind.
A DISCUSSION OF IMAGE SHARPNESS
P. ANUTA *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 243-250 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The image sharpness problem is discussed in terms of a scene which is viewed by a sensor. The sensor has some sort of function which is a nonpoint observing function, and it's a function that gathers energy from some region around a point in the scene. That energy is integrated and is contributed to each point or each sample that is taken of the scene. The samples become the pixels, and the pixels are assembled together into the digital image. Each one has some blurr or some of what is called the point's spread function creating the value of information or data that is seen in each pixel. Then the sensor and electronic part of the system acts on that signal out of the sensor and perhaps adds more blurring, more loss of resolution to the system. Finally, sampling and quantization of the data produce their effects. The signal is sampled at some rate and the digital image is created from that. The sampling or digitizing process puts the continuous voltage into a number of discrete binary levels, and another error is introduced there. T.M.

N82-28724*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
THE DIGITAL STEP EDGE
R. M. HARALICK *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 251-303 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The facet model was used to accomplish step edge detection. The essence of the facet model is that any analysis made on the basis of the pixel values in some neighborhood has its final authoritative interpretation relative to the underlying grey tone intensity surface of which the neighborhood pixel values are observed noisy samples. Pixels which are part of regions have simple grey tone intensity surfaces over their areas. Pixels which have an edge in them have complex grey tone intensity surfaces over their areas. Specially, an edge moves through a pixel only if there is some point in the pixel's area having a zero crossing of the second directional derivative taken in the direction of a non-zero gradient at the pixel's center. To determine whether or not a pixel should be marked as a step edge pixel, its underlying grey tone intensity surface was estimated on the basis of the pixels in its neighborhood. Author

N82-28725*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTER-IMAGE MATCHING
R. H. WOLFE, JR. (IBM, Houston) and R. D. JUDAY *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 304-336 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Interimage matching is the process of determining the geometric transformation required to conform spatially one image to another. In principle, the parameters of that transformation are varied until some measure of some difference between the two images is minimized or some measure of sameness (e.g., cross-correlation) is maximized. The number of such parameters to vary is faily large (six for merely an affine transformation), and it is customary to attempt an a priori transformation reducing the complexity of the residual transformation or subdivide the image into small enough match zones (control points or patches) that a simple transformation (e.g., pure translation) is applicable, yet large enough to facilitate matching. In the latter case, a complex mapping function is fit to the results (e.g., translation offsets) in all the patches. The methods reviewed have all chosen one or both of the above options, ranging from a priori along-line correction for line-dependent effects (the high-frequency correction) to a full sensor-to-geobase transformation with subsequent subdivision into a grid of match points. T.M.

N82-28727*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPUTATIONAL ASPECTS OF REMAPPING DIGITAL IMAGERY
A. L. ZOBRIST *In its* Proc. of the NASA Workshop on Registration and Rectification p 358-370 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

One of the advantages of automated cartography is that map data stored in the digital computer can be plotted or displayed at any scale or projection by recomputing the coordinates of the data. This is especially easy in the case of vector (graphics) data but in the case of digital image (raster) data, remapping is a more difficult operation. Examples of the remapping of digital imagery would include rectification of a LANDSAT MSS to an orthographic

or Mercator projection, warping of one image to register with another, or rotation, scale, or aspect changes of a digital image. Use of general purpose computers and array processors for this task will be covered. Data processing error will be discussed for each modelling/warping approach. T.M.

N82-28728*# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
A QUANTITATIVE ASSESSMENT OF RESAMPLING ERRORS
R. H. DYE *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 371-376 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Applications associated with digital geographic imagery are subject to great diversity in required cell size, cartographic projection, etc. The need for resampling remote sensing scanner data is evident in all but the most undemanding cases. It is shown that proper resampling of such data is dependent in important ways on the detailed knowledge of the original scanner's effective point-spread function and to the desired point-spread function of resampled data. When both of these are known, it is relatively straightforward to compute the resampling coefficients which do the best job of approximating the shape and position of the synthesized point-spread function. The resulting synthesized psf are compared with an ideal psf located at various interpixel positions and any differences observed as errors. T.M.

N82-28729*# General Electric Co., Philadelphia, Pa. Space Center.
GEOMETRIC ERROR CHARACTERIZATION AND ERROR BUDGETS
E. BEYER *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 377-386 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Procedures used in characterizing geometric error sources for a spaceborne imaging system are described using the LANDSAT D thematic mapper ground segment processing as the prototype. Software was tested through simulation and is undergoing tests with the operational hardware as part of the prelaunch system evaluation. Geometric accuracy specifications, geometric correction, and control point processing are discussed. Cross track and along track errors are tabulated for the thematic mapper, the spacecraft, and ground processing to show the temporal registration error budget in pixel (42.5 microrad) 90%. A.R.H.

N82-28730*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
GEOMETRIC VERIFICATION
G. J. GREBOWSKY *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 387-391 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

Present LANDSAT data formats are reviewed to clarify how the geodetic location and registration capabilities were defined for P-tape products and RBV data. Since there is only one geometric model used in the master data processor, geometric location accuracy of P-tape products depends on the absolute accuracy of the model and registration accuracy is determined by the stability of the model. Due primarily to inaccuracies in data provided by the LANDSAT attitude management system, desired accuracies are obtained only by using ground control points and a correlation process. The verification of system performance with regards to geodetic location requires the capability to determine pixel positions of map points in a P-tape array. Verification of registration performance requires the capability to determine pixel positions of common points (not necessarily map points) in 2 or more P-tape arrays for a given world reference system scene. Techniques for registration verification can be more varied and automated since map data are not required. The verification of LACIE extractions is used as an example. A.R.H.

N82-28732*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DATA VS. INFORMATION: A SYSTEM PARADIGM
F. C. BILLINGSLEY *In its* Proc. of the NASA Workshop on Registration and Rectification p 401-409 1 Jun. 1982
(Contract NAS7-100)
Avail: NTIS HC A23/MF A01 CSCL 08B

The data system designer requires data parameters, and is dependent on the user to convert information needs to these data parameters. This conversion will be done with more or less accuracy, beginning a chain of inaccuracies which propagate through the system, and which, in the end, may prevent the user from converting the data received into the information required. The concept to be pursued is that errors occur in various parts of the system, and, having occurred, propagate to the end. Modeling of the system may allow an estimation of the effects at any point and the final accumulated effect, and may prove a method of allocating an error budget among the system components. The selection of the various technical parameters which a data system must meet must be done in relation to the ability of the user to turn the cold, impersonal data into a live, personal decision or piece of information. A.R.H.

N82-28733*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODELING MISREGISTRATION AND RELATED EFFECTS ON MULTISPECTRAL CLASSIFICATION
F. C. BILLINGSLEY *In its* Proc. of the NASA Workshop on Registration and Rectification p 410-427 1 Jun. 1982 refs
(Contract NAS7-100)
Avail: NTIS HC A23/MF A01 CSCL 08B

Any noise in measurements (due to the scene, sensor, or the analog to digital process) causes a finite fraction of measurements to fall outside of the classification limits. For field boundaries, where the misregistration effects are felt, the misregistration causes the border in a given (set of) band(s) to be closer than expected to a given pixel, so that the mixed materials in the pixels cause additional pixels to fall outside of the class limits. Considerations of the transient distance involved in the difference in brightness between adjacent fields, when scaled to 'per pixel', allow the estimation of the width of the border zones. The entire problem is then scaled to field sizes to allow estimation of the global effects. This approach allows the estimation of the accuracy of multispectral classification which might be expected for field interiors, the useful number of quantization bits, and one set of criteria for an unbiased classifier. A.R.H.

N82-28739*# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
CURRENT STATUS OF METRIC REDUCTION OF (PASSIVE) SCANNER DATA
E. M. MIKHAIL and J. C. MCGLONE *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 475-486 1 Jun. 1982 refs Presented also at the 14th Cong. of the Intern. Soc. for Photogrammetry, Hamburg, 13-25 Jul. 1980
Avail: NTIS HC A23/MF A01 CSCL 08B

The extraction of metric information from scanner (particularly multispectral) data is presented. Data from both aircraft and spacecraft; singly scanned areas and areas with multiple coverage; various mathematical models used up to the present time; and published numerical results are considered. Future trends are also discussed. A.R.H.

N82-28767# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
FEASIBILITY OF B SPLINE DATA REDUCTION ON REMOTE SENSING DATA
W. C. HUISMAN and N. J. J. BUNNIK 20 Nov. 1980 27 p refs Sponsored by Netherlands Agency for Aerospace Programs (NIVR) Original contains color illustrations
(NLR-TR-80023-U) Avail: NTIS HC A03/MF A01

Data reduction in the spatial domain of multispectral data, using spline approximation, was investigated for the low frequency

components of LANDSAT data, consisting of 240 X 240 pixels. Images of an area featuring high and low frequencies, well defined rectangular landscape features and a good selection of spectral clusters was selected. Four files, each containing pixel data of one band were made. The pixel data were filtered, using spline approximation of order three, and the approximating pixels were calculated by a least squares method. The data were rewritten in FORTRAN, and statistics, isocontours and gray plots were produced. Edge enhancement is recommended. Author (ESA)

N82-29945 Massachusetts Univ., Amherst.
ON THE USE OF FRACTALS FOR EFFICIENT MAP GENERATION
F. S. HILL, JR. and S. E. WALKER, JR. *In* National Research Council of Canada Proc.: Graphics Interface, 1982 p 288-289 1982 refs
Avail: Issuing Activity

Techniques are described for compressing, storing, and regenerating outline map images in such 'cramped' applications as cockpit instrument-panel splays with on-board microcomputers. a large map database is compacted into a vastly smaller one off-line, and stored on-board (or radioed as needed to the aircraft). During the regeneration process fractal curves are used to flesh out the compressed map outlines into visually compelling maps. Because the compression process retains key information that is later used in the fractalizing phase, an overall dramatic saving is made in dataset size and speed of regeneration. Author

N82-30587# General Electric Co., Lanham, Md. Space Systems Div.
INTERACTIVE DIGITAL IMAGE PROCESSING FOR TERRAIN DATA EXTRACTION Final Report, Sep. 1980 - Sep. 1981
T. F. WESCOTT, W. C. DALLAM, and C. J. PETERSON Sep. 1981 133 p
(Contract DAAK70-79-C-0153)
(AD-A114815; ETL-0277) Avail: NTIS HC A07/MF A01 CSCL 09B

The phase 2 of an experimental study has been performed to investigate the feasibility and use of man-machine interactive digital image processing techniques when applied to the extraction of terrain analysis data from aerial imagery. This phase of the study concentrated on applying techniques to extract water resources data elements and on the development and coding of software and algorithms. The developed software and algorithms, pertained to filtering of themes, and image scaling. Two digital processing techniques to 'skeletonize' features, best mapped as lines, were established and tested with limited success. Relative to water resources data elements, success was achieved in the extraction of alignment of watercourses and shore line alignment of watercourses of water bodies. Partial success was achieved with the elements of delineation of wet areas and the identification of terminal points of watercourse segments. Image processing techniques for the extraction of areas subject to flooding and for the measurement of bank heights were not practical with the existing software. The development/implementation of software, and the processing and analysis of imagery was conducted at the General Electric Digital Image Analysis Laboratory.
Author (GRA)

N82-30608# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Office of Remote Sensing Technology Implementation.
HIGH-ALTITUDE IMAGERY USER GUIDE
R. E. HINKLE Aug. 1981 127 p refs
(Contract USDA/FS-53-3187-0-29)
(PB82-158353; LEMSCO-16312; NFAP-224) Avail: NTIS HC A07/MF A01 CSCL 02F

New and more efficient remote sensing methods to users in the field are presented. The high altitude aircraft and associated sensor systems are discussed. Applications in use, such as resource inventories, pest management, catastrophic damage assessment, resource management and planning are outlined.
GRA

N82-31745# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
DIGITIZATION OF THE NOAA/NESS CONTINENTAL SNOW COVER DATA BASE
M. MATSON and M. S. VARNADORE *In* International Geophysical Year World Data Center A Snow Watch 1980 p 123-128 Oct. 1981 refs
Avail: NTIS HC A07/MF A01 CSCL 08L

The progress NOAA/NESS Northern Hemisphere continental snow cover data base is discussed. It is being incorporated more frequently into climate modeling and diagnostic studies. In an effort to facilitate this integration, NESS, in conjunction with the University of Nebraska-Lincoln, has undertaken the digitization of the continental snow cover data base from 1966-1980. The Northern Hemisphere Weekly Snow and Ice Cover Chart is being digitized using a NMC I, J box grid overlayed on a polar-stereographic map. The grid selected is the same as that used for the satellite-based earth radiation budget. After establishing the appropriate geography into the data base each grid box is designated snow-covered if the grid box has 50 percent or more snow cover; non-snow covered if there is 50 percent or less snow cover. The reflectivity classes are not digitized. To enhance the display of snow cover on the computer printout, a microfilm product was developed which allows the snow-covered areas to be displayed on an appropriate background geography (see figure 4). Although not shown here, a color microfilm map was developed with water as blue, land as green, and snow as gold. Archival of the digitized continental snow cover data will not only be on microfilm, but also on punch cards and computer-compatible tape. B.W.

N82-32594# European Space Agency, Paris (France).
VISUAL EVALUATION OF SIDE-LOOKING AIRBORNE RADAR (SLAR) IMAGERY
J. NITHACK May 1982 63 p refs Transl. into ENGLISH of "Visuelle Auswertung von E-SLAR-Aufnahmen" Rept. DFVLR-FB-81-11 DFVLR, Oberpfaffenhofen, West Ger., Feb. 1981 51 p
(ESA-TT-734; DFVLR-FB-81-11) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 13,10

The use of aerial photography data analysis techniques with geoscientific SLAR data, recorded on video tape during aircraft flights, was investigated. Good geomorphological information can be obtained if the variations in the rock and soil are morphologically displayed. Data can be interpreted morphologically even where there are height differences of + or - 200m (in relation to a mean level). The flight paths should run parallel to the principal morphological structures. Land use cartography is difficult because the dynamic range of video registration is too narrow and photographic representation of the data leads to a decisive loss of information. Gray tone and surface texture are ambiguous. Satisfactory grassland charting requires recordings obtained in different seasons. Author (ESA)

N82-32810*# Texas Univ. at Dallas, Richardson. Center for Space Sciences.
INVESTIGATION OF THE EFFECTS OF EXTERNAL CURRENT SYSTEMS ON THE MAGSAT DATA UTILIZING GRID CELL MODELING TECHNIQUES Quarterly Status Technical Progress Report, 1 Apr. - 30 Jun. 1982
D. M. KLUMPAR, Principal Investigator 1 Jul. 1982 9 p refs ERTS
(Contract NAS5-26309)
(E82-10388; NASA-CR-169177; NAS 1.26:169177; UTD-E0533-01; QSTPR-7) Avail: NTIS HC A02/MF A01 CSCL 05B

The status of the initial testing of the modeling procedure developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere is reported. The modeling technique utilizes a linear current element representation of the large scale space-current system. M.G.

N82-32812*# Institute of Geological Sciences, London (England).
SPHERICAL HARMONIC REPRESENTATION OF THE MAIN GEOMAGNETIC FIELD FOR WORLD CHARTING AND INVESTIGATIONS OF SOME FUNDAMENTAL PROBLEMS OF PHYSICS AND GEOPHYSICS Progress Report
D. R. BARRACLOUGH, R. HIDE (Meteorological Office), B. R. LEATON, F. J. LOWES (Newcastle-upon-Tyne Univ.), S. R. C. MALIN, and R. L. WILSON, Principal Investigators (Liverpool Univ.) 1 Jun. 1982 3 p Sponsored by NASA ERTS
(E82-10390; NASA-CR-169179; NAS 1.26:169179) Avail: NTIS HC A03/MF A01 CSCL 08G

Progress in the harmonic analysis of MAGSAT data is reported. Single-day data sets were subdivided into information on the sunrise side of the Earth and information on the sunset side of the Earth. Data for the main and external fields each demonstrate a clear and consistent systematic difference between the sets of data which was determined to be, due to ionospheric currents which differ from the sunset to the sunrise terminator. A toroidal field was analyzed for and determined to be an apparent toroidal field resulting from electric currents concentrated in the two terminators. Progressive elimination of auroral zone data demonstrates that the information presented does not arise from complications due to Birkeland currents. J.D.

N82-32821# Naval Surface Weapons Center, Dahlgren, Va.
SEASAT SATELLITE RADAR ALTIMETRY DATA PROCESSING SYSTEM
G. B. WEST May 1981 28 p refs
(NSWC/TR-234) Avail: NTIS HC A03/MF A01

Measurements from the SEASAT satellite radar altimeter are combined with the Doppler precise orbit, corrected for atmospheric and environmental effects, and reduced to along-track geoid heights and vertical deflections by an adaptive Kalman smoother, which is based upon a third-order Markov process. The altimeter data processing system at the Naval Surface Weapons Center is described. Author

N82-32823# Office of Naval Research, Pasadena, Calif.
ARABIAN SEA PROJECT OF 1980: COMPOSITES OF INFRARED IMAGES, SUPPLEMENT
B. J. CAGLE and R. WHRITNER Dec. 1981 50 p
(AD-A116710; ONRWEST-81-5-SUP) Avail: NTIS HC A03/MF A01 CSCL 08C

It became apparent, by feedback from the distribution of ONRWEST Report 81-5, that the composites of infrared images of the Arabian Sea should be reproduced in a larger size. The larger size permits some improvement in spatial details. Also, an effort has been made to improve the contrast in grey shades representing the ocean features, which were the subject of the original report. Figures 1 and 36 through 45 of ONRWEST Report 81-5 are reproduced herein. GRA

N82-33803# Technische Univ., Graz (Austria). Inst. for Applied Geodesy and Photogrammetry.
REGISTRATION OF DIGITIZED AERIAL PHOTOGRAPHY WITH A DIGITAL MAP DATA BASE Final Report, Oct. 1979 - Jan. 1982
F. W. LEBERL and H. RANZIGER 15 Jan. 1982 105 p refs
(Contract DAJA37-80-C-0020; DA PROJ. 1T1-61102-BH-57)
(AD-A117510) Avail: NTIS HC A06/MF A01 CSCL 08B

The feasibility of automatic registration of a digital aerial image with existing map data bank is investigated. The geometry of an aerial image can be modelled mathematically by a central perspective. The background of this model various strategies to solve the problem of resection in space are discussed. A method to recognize automatically areal features of the map in the image and to extract control points for the reconstruction of the imaging configuration is proposed. Recognition is done by three algorithms: by correlation, by thresholding and by adaption of a binary mask. Estimates for the distance of projected features from actual objects and dislocations caused by variation of the transformation parameters are given. Experiments performed with an actual aerial photograph are included. Author

08

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A82-38210
MODEL FOR THE FORMATION OF SPECTRAL PATTERNS OF NATURAL OBJECTS [MODEL' FORMIROVANIIA SPEKTRAL'NYKH OBRAZOV PRIRODNYKH OB'EKTOV]
P. V. BYSTROV, V. I. GORODETSKII, and L. I. CHAPURSKII Issledovanie Zemli iz Kosmosa, May-June 1982, p. 77-82. In Russian. refs

The effectiveness of the automatic recognition of natural objects on the basis of multispectral remote sensing of the earth's surface depends significantly on the quality and volume of training sequences. It is shown that training sequences can be generated on the basis of a mathematical model for the conversion of spectral-brightness signals in the atmosphere as well as for the conversion of spectral-brightness signals in the multispectral scanner. The quality of the model is evaluated, and its computer implementation in PL/1 is described. B.J.

A82-38211
STATISTICAL STRUCTURE OF ERRORS IN SATELLITE MEASUREMENTS OF THE BRIGHTNESS TEMPERATURE OF THE EARTH'S RADIO EMISSION [STATISTICHESKAIA STRUKTURA OSHIBOK IZMERENIIA IARKOSTNOI TEMPERATURY SOBSTVENNOGO RADIOIZLUCHENIIA ZEMLI S ISZ]
B. Z. PETRENKO (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR) Issledovanie Zemli iz Kosmosa, May-June 1982, p. 83-89. In Russian. refs

A statistical analysis is presented of errors in the measurement of the brightness temperature and brightness contrasts of the earth's microwave emission for the case of the 'external' calibration of the satellite microwave radiometer with regard to reference regions of the earth's surface. Formulas are obtained for calculating the spectral and temporal covariations and variances of measurement errors, with allowance for calibration errors. B.J.

A82-38212
RATIONAL ORBITS OF THE METEOR SATELLITES FOR THE REMOTE SENSING OF EARTH RESOURCES [RATSIONAL'NYE ORBITY ISZ 'METEOR', ZAPUSKAEMYKH DLIA ISSLEDOVANIIA PRIRODNYKH RESURSOV ZEMLI]
A. A. ASTASHKIN, V. K. SAULSKII, and G. R. USPENSKII Issledovanie Zemli iz Kosmosa, May-June 1982, p. 90-94. In Russian.

A number of orbits are proposed for the Meteor remote sensing satellites. To achieve greatest effectiveness, the satellites should be injected into orbit at a average height of about 632 km. The admissible range of variation of the average orbital height is several hundred meters, which corresponds to oscillations of the satellite revolution period of the order of 0.25-0.9 sec. This orbit provides for the most effective continuous operational survey of the earth for bands 600 and 85 km wide. It is also noted that in order to assure that the earth be covered by all five bands of the Meteor-satellite instrumentation, the satellite should be injected into an orbit 696 km high with an admissible average-height error of 15-30 m and a revolution-period error of 0.2-0.035 sec. B.J.

A82-38322
DETERMINATION OF SPECTRAL DEPENDENCE OF ATMOSPHERIC OPTICAL THICKNESS BY SATELLITE INVESTIGATIONS WITH SPECTRUM 15 MULTI-CHANNEL SYSTEM
D. N. MISHEV, V. V. RIUMIN, V. S. DZHEPA-PETROUA, V. S. BOICHEVA, A. I. SIMONOV, and S. T. KOVACHEV (Blgarska Akademiia na Naukite, Tsentralna Laboratoriia po Kosmicheski Izsledvaniia, Sofia, Bulgaria) Bolgarskaia Akademiia Nauk, Doklady, vol. 35, no. 3, 1982, p. 331-334. refs

An analysis of the atmosphere investigations on board the Salyut space station as part of the Intercosmos program is presented. The optical depth of the atmosphere was measured, taking into account the effects of single and multiple scattering, the difference between two indicatrix points symmetric with respect to the nadir, and the symmetrical nature of the indicatrix of the scattered radiation and the radiation reflection by the underlying surface with Lambert properties. The difference between two symmetric points of the scattering indicatrix is shown to depend on the single scattering component. The satellite data are corrected by the transmission function of the atmosphere above specific sectors. The studies thus serve in the development of a statistical base for the atmosphere's parameters as observed from a satellite. M.S.K.

A82-38719* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PASSIVE MICROWAVE REMOTE SENSING OF THE EARTH FROM SPACE - A REVIEW
E. G. NJOKU (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) IEEE, Proceedings, vol. 70, July 1982, p. 728-750. NASA-supported research. refs

A brief discussion of the historical development of microwave radiometry from space is provided, followed by a review of radiometer system concepts as applied to spacecraft platforms. One of the earliest meteorological applications of spaceborne radiometry was in global atmospheric temperature sounding. Surface-sensing applications can be divided into three main categories, including ocean, ice, and land. A radiometer system description is presented, and spacecraft considerations are discussed. Spaceborne radiometric sensors are examined, taking into account the Nimbus-5 Microwave Spectrometer, the Electrically Scanning Microwave Radiometer, the Skylab microwave radiometer/scatterometer and altimeter instrument, S-194 on Skylab, the Scanning Microwave Spectrometer on Nimbus 6, the Scanning Multichannel Microwave Radiometer on Seasat and Nimbus 7, Soviet sensors, and an Indian microwave radiometer. G.R.

A82-39201*
RECENT ADVANCES IN REMOTE SENSING; PROCEEDINGS OF THE FIRST INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM, WASHINGTON, DC, JUNE 8-10, 1981
R. MCINTOSH, (ED.) (Massachusetts, University, Amherst, MA) Symposium sponsored by the Institute of Electrical and Electronics Engineers, American Geophysical Union, NASA, et al IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982. 189 p.

The state of the art in remote sensing of the earth and the planets was discussed in terms of sensor performance, signal processing, and data interpretation. Particular attention was given to lidar for characterizing atmospheric particulates, the modulation of short waves by long ocean gravity waves, and runoff modeling for snow-covered areas. The use of NOAA-6 spacecraft AVHRR data to explore hydrologic land surface features, the effects of soil moisture and vegetation canopies on microwave and thermal microwave emissions, and regional scale evapotranspiration rate determination through satellite IR data are examined. A Shuttle experiment to demonstrate high accuracy global time and frequency transfer is described, along with features of the proposed Gravsat, radar image processing for rock-type discrimination, and passive microwave sensing of temperature and salinity in coastal zones. M.S.K.

A82-39217*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
ATMOSPHERIC EFFECTS ON TM MEASUREMENTS - CHARACTERIZATION AND COMPARISON WITH THE EFFECTS ON MSS
R. K. KIANG (NASA, Goddard Institute for Space Studies, New York, NY) (IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 365-370. refs

The effects of the earth's atmosphere on the Thematic Mapper (TM) measurements are studied with two radiative transfer models. A doubling model is used to compute the effective reflectance of the earth-atmosphere system, as measured by the TM for the reflective bands. An emission-transmission model is used to compute the satellite-received radiance for the thermal band. The influences of the aerosol loading, the amount of water vapor, and the solar illumination angle on the effective reflectance are investigated. The effect of varying atmospheric water vapor on the measurements of the thermal band is studied. The scattering and absorption effects on TM bands are compared with those on Multispectral Scanner System (MSS) bands. While the changes in the aerosol loading introduce comparable variation of the effective reflectance for both sensors, the changes in the water vapor amount give less impact on TM4 than MSS7. (Author)

A82-39221*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A REVIEW OF THE UTILITY OF REMOTE SENSING IN ALASKAN PERMAFROST STUDIES. D. K. HALL [NASA, GODDARD SPACE FLIGHT CENTER, HYDROLOGICAL SCIENCES BRANCH, GREENBELT, MD]
(IEEE, AGU, NASA, et al., International Geoscience and Remote Sensing Symposium on Recent Advances in Remote Sensing, 1st, Washington, DC, June 8-10, 1981.) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, July 1982, p. 390-394. refs
(Previously announced in STAR as N81-19528)

A82-41093
VICARIOUS SATELLITE CALIBRATION IN THE SOLAR SPECTRAL RANGE BY MEANS OF CALCULATED RADIANCES AND ITS APPLICATION TO METEOSAT
P. KOEPKE (Muenchen, Universitaet, Munich, West Germany) Applied Optics, vol. 21, Aug. 1, 1982, p. 2845-2854. Bundesministerium fuer Forschung und Technologie refs
(Contract BMFT-MF-0235)

The method of vicarious calibration by means of calculated radiances allows absolute calibration of satellite radiometers in orbit. It works by comparing counts from the radiometer to be calibrated with corresponding absolute radiances, calculated from actual values of the relevant optically acting parameters of the atmosphere and the earth's surface. The method is applied to the VIS-channel of the European geostationary satellite Meteosat-1. To minimize uncertainties, the procedure is carried out over different surfaces, at different atmospheric conditions, and at different sun and satellite angles. The ratio between the effective radiances and the measured 6-bit counts of the Meteosat-1-VIS-channel is the calibration constant csat equals 2.66 W/sq m-sr per count. The accuracy of the calibration is within 6%. The inaccuracy is mainly due to the broad digitization steps of the channel. Conversion factors are presented which allow one to calculate from the effective radiance the radiance at the satellite. (Author)

A82-41096#
VICARIOUS CALIBRATION OF METEOSAT'S INFRARED SENSORS
S. CAMPBELL (ESA, European Space Operations Centre, Darmstadt, West Germany) ESA Journal, vol. 6, no. 2, 1982, p. 151-162. refs

The operational techniques used to calibrate Meteosat's infrared channels are described, for both the 6 micrometer and 11

micrometer channels. The reasons for using ground truth rather than on-board measurements for absolute calibration are presented and results obtained with several different calibration techniques are reviewed. (Author)

A82-42157
MICROWAVE RADIOMETRY AND APPLICATIONS
D. P. THOMAS (British Aircraft Corp., Bristol, England) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 357-369. refs

Passive microwave radiometers are distinguished from active microwave sensors. The physics underlying the radiation of the earth's surface in the microwave band is discussed, as is radiation from the sea surface. Attention is also given to the effect of the atmosphere, and it is shown that the components for surface radiance, upwelling atmospheric radiance, downwelling atmospheric radiance, and space must be added together. The principles behind microwave radiometers are elucidated, together with the way in which radiometers are used in meteorology and in studying the sea surface and land. Data processing, including preprocessing and geophysical algorithms, is also treated. C.R.

A82-43426
AMERICAN SOCIETY OF PHOTOGRAMMETRY AND AMERICAN CONGRESS ON SURVEYING AND MAPPING, FALL TECHNICAL MEETING, SAN FRANCISCO, CA, SEPTEMBER 9-11, 1981 AND HONOLULU, HI, SEPTEMBER 14-16, 1981, ASP TECHNICAL PAPERS
Falls Church, VA, American Society of Photogrammetry, 1981. 637 p $12.50

Various topics in the field of photogrammetry are addressed. Among the subjects discussed are: remote sensing of Gulf Stream dynamics using VHRR satellite imagery; an interactive rectification system for remote sensing imagery; use of a single photo and digital terrain matrix for point positioning; crop type analysis using Landsat digital data; use of a fisheye lens in solar energy assessment; remote sensing inventory of Rocky Mountain elk habitat; Washington state's large scale ortho program; educational image processing. Also discussed are: operational advantages of on-line photogrammetric triangulation; analysis of fracturation field; photogrammetry as a tool for measuring glacier movement; double model orthophotos used for forest inventory mapping; map revisioning module for the Kern PG2 stereoplotter; assessing accuracy of digital land-use and terrain data; accuracy of earthwork calculations from digital elevation data. C.D.

A82-43448* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
ON THE UNCERTAINTY IN THE DETERMINATION OF GROUND REFLECTANCE AND TEMPERATURE FROM TM MEASUREMENTS
R. K. KIANG (NASA, Goddard Institute for Space Studies, New York, NY) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 263-272. refs

Uncertainties in the derivation of the ground reflectance and temperature relative to the uncertainty in the estimation of aerosol loading and water vapor amount are presented. To compute the reflectance for TM 1 (thematic mapper) through TM6, a doubling model is used, and to compute satellite-received radiance for TM7, an emission-transmission model is employed. It is shown that at a water vapor concentration of higher than 50% above normal, the relative sensitivity remains as low as 8% for ground reflectance determinations. The relative sensitivity for determining ground temperature for midlatitude summer climatological profile is less than 5%, but as the ground temperature is approximately 300 K, low sensitivity still means a variation of a few degrees. An increase in water vapor amount causes an uncertainty in ground temperature and reflectance calculations comparable to the uncertainty in aerosol loading and water vapor amount estimations. R.K.R.

A82-43459
THE US-2 - THE FOUNDATION INSTRUMENT FOR THE PHOTOGRAMMETRIC FIRM
R. R. CHAMARD (Helava Associates, Inc., Southfield, MI) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 373-383.

The uses of the US-2 analytic stereoplotter as a foundation or 'building block' photogrammetric system for photogrammetry firms are explored. Various uses of the US-2 are discussed in detail, including photogrammetric control extension, profiling, map compilation, terrain digitizing, feature digitizing, resource data digitizing, and close range and terrestrial applications. Time requirements for tasks and typical production costs are discussed and compared to costs of doing work with analog equipment. (Author)

A82-43466
MULTIPLE-MODE LASER AIRBORNE, TERRAIN, WAVE AND ICE PROFILING SYSTEM
J. JEPSKY (Associated Controls and Communications, Inc., Salem, MA) In: American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers. Falls Church, VA, American Society of Photogrammetry, 1981, p. 492-503.

The design and operational specifications for a dual-mode, pulsed gallium arsenide airborne laser profiler, suitable for a variety of surveying and geodetic applications, are presented. Wave measurement resolution is plus or minus 9 cm plus .03 percent of the range. For terrain profiling in the single pulse mode, accuracies at an altitude of 3000 feet or more and at speeds of 500 knots will be plus or minus 15 cm. The laser transmitter operates at a pulse rate of 2000 or 4000 pps at a peak power of 75 W. At 4000 pps, measurement is possible every 2 inches along the line of flight, and in the integration mode by averaging 100 pulses, a range accuracy of about .06 inches is possible. Over foliage, first and last pulse operation provides simultaneous tree height and terrain profiling data. In addition, wave profiling, ice profiling, and photogrammetric control may be performed. A.B.

A82-43712#
AN IMPROVED METHOD TO RETRIEVE THE CLEAR COLUMN RADIANCE FROM PARTIALLY CLOUDY SPOTS OF RADIOMETER ON BOARD SATELLITE
T. AOKI (Meteorological Satellite Center, Tokyo, Japan) Meteorological Society of Japan, Journal, vol. 60, Apr. 1982, p. 758-764. refs

A modification to the algorithm for retrieving clear sky radiance developed by Aoki (1980) is shown to make the formula applicable even when AVHRR data is not used. The method is shown to require data from the eighth HIRS channel as a basis for calculating the Q value for the other channels. Accuracy is noted to be only slightly lower compared to cloud content results when done with the AVHRR data, and an example is provided for NOAA-6 data. A modification to the Tiros-N instrumentation is suggested, comprising splitting the light entering the radiometer to cause it to fall on a detector with 100 x 1000 photosensitive elements which are scanned by CCDs, thus eliminating computational time necessary for image processing. M.S.K.

A82-44573* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE UOSAT MAGNETOMETER EXPERIMENT
M. H. ACUNA (NASA, Goddard Space Flight Center, Laboratory for Extraterrestrial Physics, Greenbelt, MD) Radio and Electronic Engineer, vol. 52, Aug.-Sept. 1982, p. 431-436. refs

The magnetometer aboard the University of Surrey satellite (UOSAT) and its associated electronics are described. The basic fluxgate magnetometer employed has a dynamic range of plus or minus 8000 nT with outputs digitized by a 12-bit successive approximation A-D converter having a resolution of plus or minus 2 nT. Noise in the 3-13 Hz bandwidth is less than 1 nT. A bias field generator extends the dynamic range to plus or minus 64,000 nT with quantization steps of 8000 nT. The magnetometer experiment is expected to provide information on the secular variation of the geomagnetic field, and the decay rate of the dipole term. Special emphasis will be placed on the acquisition of real time and memory data over the poles which can be correlated with that from Magsat. A.B.

A82-44675#
NOAA PRICES FOR LANDSAT DATA PRODUCTS AND SERVICES
R. KOFFLER and D. J. COTTER (NOAA, National Earth Satellite Service, Washington, DC) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 4 p.
(IAF PAPER 82-115)

NOAA will begin an operational land satellite program based on the Landsat D and D' spacecraft on January 31, 1983, which will continue through 1988. Each satellite will carry a Multispectral Scanner (MSS) and a Thematic Mapper (TM), with TM operations beginning in January 1985. The Landsat system will provide scheduled data collections, production line processing, and direct read-out for foreign ground stations. Atmospheric profiles of temperature and humidity will be provided by the MSS along with cloud observations and surface temperature measurements. In addition, customers may request special acquisitions of MSS data for an added system access fee. On October 1, 1982, new prices for Landsat products became effective, which on the average are 2.7 times greater than the previous prices. For example, 10 inch black and white negative film products are now $35, up from $12. The new prices are meant to more accurately reflect the actual cost of providing these products and services. A.B.

A82-44678#
ERS-1 EXPERIMENTAL PAYLOAD PACKAGE
M. L. REYNOLDS (ESA, Toulouse, France) and D. T. LLEWELLYN-JONES (Science and Engineering Research Council, Rutherford Appleton Laboratory, Didcot, Oxon, England) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 5 p.
(IAF PAPER 82-124)

Proposals were received in response to an Announcement of Opportunity in April 1981. The proposals received were evaluated by two independent panels: a science panel appointed by the Earth Observation Advisory Committee and an Agency-internal technical panel. The five proposals that met all the evaluation criteria were the imaging lightning flash detector, the along-track scanning radiometer (ATSR), the precise range and range rate equipment (PRARE), the tropospheric and stratospheric wind and composition investigation, and the conical scan radiometer. The scientific evaluation panel preferred two alternative combinations: the PRARE with, if possible, a redefined and down-graded mini-imaging microwave radiometer, and the PRARE with the ASTR and, if possible, a nadir looking microwave sounder to provide water vapor correction in all-weather conditions. C.R.

A82-44827* Stanford Univ., Calif.
DE-1 OBSERVATIONS OF VLF TRANSMITTER SIGNALS AND WAVE-PARTICLE INTERACTIONS IN THE MAGNETOSPHERE
U. S. INAN and R. A. HELLIWELL (Stanford University, Stanford, CA) Geophysical Research Letters, vol. 9, Sept. 1982, p. 917-920. refs
(Contract NAS5-25688; NSF DPP-80-22282; NSF DPP-80-22540 ; NSF DPP-79-23171)

A broadband VLF receiver on the DE-1 satellite measures signals injected into the magnetosphere by ground-based transmitters. VLF emissions triggered by these signals indicate that the waves interact strongly with trapped energetic particles in the magnetosphere. The propagation paths from the source to the satellite are deduced on the basis of the group time delay and Doppler shift. Although there are many different paths, emissions are triggered by the later-arriving pulses that have traversed the geomagnetic equator. First satellite-based observations of emission triggering by high-power communications transmitters and their possible implications are discussed. (Author)

A82-44835* Michigan Univ., Ann Arbor.
NEUTRAL COMPOSITION IN THE POLAR THERMOSPHERE - OBSERVATIONS MADE ON DYNAMICS EXPLORER
G. R. CARIGNAN (Michigan, University, Ann Arbor, MI), T. DACHEV (Michigan, University, Ann Arbor, MI; B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Kosmicheski Izsledvaniia, Sofia, Bulgaria), A. E. HEDIN, C. A. REBER, and N. W. SPENCER (NASA, Goddard Space Flight Center, Greenbelt, MD) Geophysical Research Letters, vol. 9, Sept. 1982, p. 949-952. refs
(Contract NAS5-26069)

A neutral mass spectrometer on the lower altitude satellite of the Dynamics Explorer program is providing observations of compositional variability in the thermosphere. The 90 deg inclination of the satellite orbit provides excellent coverage over the polar caps. Two data sets, one in the Southern Hemisphere and the other in the Northern, are used to further illustrate the strong magnetic control of some of the heat and momentum sources at high latitudes and the complex morphology that results. (Author)

A82-44837* Michigan Univ., Ann Arbor.
NEUTRAL WINDS IN THE POLAR THERMOSPHERE AS MEASURED FROM DYNAMICS EXPLORER
T. L. KILLEEN, P. B. HAYS (Michigan, University, Ann Arbor, MI), N. W. SPENCER, and L. E. WHARTON (NASA, Goddard Space Flight Center, Greenbelt, MD) Geophysical Research Letters, vol. 9, Sept. 1982, p. 957-960. refs
(Contract NAS5-25691)

Possibilities for experimental investigations related to the study of the dynamics of the thermosphere have been markedly improved by the new instrumentation deployed on the Dynamics Explorer Satellite (DE). The Fabry-Perot interferometer (FPI) on DE measures altitude profiles of the meridional component of the neutral wind below the spacecraft by remotely sensing the Doppler shift of the thermospheric O(1D). The Wind and Temperature Spectrometer (WATS) measures the in situ zonal component of the neutral wind by measuring the angle of arrival of the beam of neutral atoms entering the aperture to a mass spectrometer. A description is provided of data handling procedures, and the first results obtained by combining the data sets from the two instruments are presented. Acquisition and determination of neutral wind vectors from the remote (FPI) and in-situ (WATS) measurements requires careful handling of the data to ensure that the two components relate to the same volume of space. G.R.

A82-44838* Iowa Univ., Iowa City.
GLOBAL OBSERVATIONS OF A SAR ARC
J. D. CRAVEN, L. A. FRANK, and K. L. ACKERSON (Iowa, University, Iowa City, IA) Geophysical Research Letters, vol. 9, Sept. 1982, p. 961-964. refs
(Contract NAS5-25689; N00014-76-C-0016; NGL-16-001-002)

A description is presented of the first results from observations of a stable auroral red (SAR) arc with the global auroral imaging instrumentation on board Dynamics Explorer (DE) 1. This instrumentation includes three spin-scan imaging photometers and a data control unit. The last visible-wavelength imaging sequence prior to onset of the geomagnetic storm begins at 0517 UT on October 20, 1981. An auroral substorm is observed in progress two orbits later, and as the substorm subsides and the diffuse aurora retreats poleward a narrow band of 630-nm emissions is observed at latitudes previously occupied by the aurora. This band is detected at 630 nm only, and is identified as the first optical observation of the SAR arc with DE 1. The third orbit of observations commences at 0830 UT on October 21 with the arc remaining visible across the nightside of earth. No visual signature of the SAR arc is detected during the sixth orbit. G.R.

A82-45401
SPECTRAL SIGNATURES OF OBJECTS IN REMOTE SENSING; INTERNATIONAL CONFERENCE, AVIGNON, FRANCE, SEPTEMBER 8-11, 1981, REPORTS [SIGNATURES SPECTRALES D'OBJECTS EN TELEDETECTION; COLLOQUE INTERNATIONAL, AVIGNON, FRANCE, SEPTEMBER 8-11, 1981, COMMUNICATIONS]
G. GUYOT, (ED.) and M. VERBRUGGHE (Institut National de la Recherche Agronomique, Montfavet, Vaucluse, France) Conference sponsored by the Institut National de la Recherche Agronomique, Centre National d'Etudes Spatiales, and Conseil General de Vaucluse Versailles, Institut National de la Recherche Agronomique (INRA, Colloques, 5), 1981. 675 p. In French and English
$34.25

Topics covered in the papers comprise delineations of the spectral properties of targets, the definition of relationships between the characteristics of an object and its spectral properties, and the effects of the conditions of the measurements. Attention was given to laboratory and field measurements of spectra from ocean waters, vegetation, and soils, using IR, visible, and microwave channels. Comparisons between ground-based and airborne radiometric measurements of vegetation, minerals, and soil conditions with ground truth data are presented. The relations between crop health, diseases, canopy coverage, and canopy geometry and the spectral response of reflected light are discussed. The fabrication of low-cost portable radiometers, hand held radiometers, and numerical models for spectral responses are reported. M.S.K.

A82-45407
FINE TUNING THE SPOT SATELLITE SPECTRAL BANDS TO THE SPECTRAL CHARACTERISTICS OF OBSERVED OBJECTS [ADAPTATION FINE DES BANDES SPECTRALES DU SATELLITE SPOT AUX CARACTERISTIQUES SPECTRALES DES OBJETS OBSERVES]
G. BEGNI (Centre National d'Etudes Spatiales, Toulouse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 95-105. In French.

Analytical principles for reflectance which guided the calibration and choices of observation wavelengths for the French remote sensing satellite SPOT are discussed. Methods of quantifying reflected solar radiation are defined, along with techniques for accounting for atmospheric attenuation. The SPOT spacecraft will carry two radiometers, each viewing in three spectral bands: 0.50-0.59, 0.61-0.68, and 0.79-0.89 microns with 20 m resolution in the first two and 10 m in the panchromatic channel. The wavelengths were chosen to minimize atmospheric interference such as ozone, water vapor, and decreases in Rayleigh scattering at higher wavelengths. Solar radiation is noted to be maximal at 0.48 micron, and decreases in intensity with increasing wavelength. Calibrating trials with gray granite, red clay, dry earth, beets, fallow ground, trees, and grass are described. M.S.K.

A82-45441
SIGNIFICANCE OF SATELLITE IR THERMOGRAPHY FOR THE AGROCLIMATOLOGY OF SOUTHEASTERN FRANCE [SIGNIFICATION DE LA THERMOGRAPHIE I.R. PAR SATELLITE EN AGROCLIMATOLOGIE DANS LE SUD-EST DE LA FRANCE]
B. SEGUIN (Institut National de la Recherche Agronomique, Montfavet, Vaucluse, France), B. BAELTZ, J. M. MONGET (Ecole des Mines, Valbonne, Alpes-Maritimes, France), J. C. FAVARD (Centre National d'Etudes Spatiales, Toulouse, France), and J. C. MANDEVILLE (ONERA, Centre d'Etudes et de Recherches de Toulouse, Toulouse, France) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 467-476. In French. refs

A82-45451
ATMOSPHERIC INFLUENCE ON LOW ALTITUDE AIRBORNE REFLECTANCE MEASUREMENTS OVER LAKE SURFACES
K. STAENZ (Zuerich, Universitaet, Zurich, Switzerland) In: Spectral signatures of objects in remote sensing; International Conference, Avignon, France, September 8-11, 1981, Reports. Versailles, Institut National de la Recherche Agronomique, 1981, p. 601-610. refs

A82-45715#
FUTURE MEASUREMENTS OF THE PLANETARY RADIATION BUDGET
H. J. PREUSS and E. RASCHKE (Koeln, Universitaet, Cologne, West Germany) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Ozeanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 42-44. Research sponsored by the Bundesministerium fuer Forschung und Technologie and Deutsche Forschungsgemeinschaft. refs

The sampling problem in determining the Earth's radiation balance is discussed and a new multispectral conical scan radiometer is described along with a planned multisatellite system meant to deal with the problem. The radiometer allows observations under different zenith and azimuth angles, increasing the angular coverage by 300 percent. Some of its major specifications are shown, as are the planned satellite system's orbit parameters and the scan pattern in azimuth/scan angle representation. C.D.

A82-45731#
TEMPERATURE PROFILES OF THE ATMOSPHERE BY MICROWAVE RADIOMETRY
G. K. HARTMANN (Max-Planck-Institut fuer Aeronomie, Katlenburg, West Germany) and K. F. KUENZI (Bern, Universitaet, Berne, Switzerland) (Deutsche Meteorologische Gesellschaft, Symposium ueber Strahlungstransportprobleme und Satellitenmessungen in der Meteorologie und Oceanographie, Cologne, West Germany, Mar. 22-26, 1982.) Annalen der Meteorologie, no. 18, 1982, p. 94-96. Deutsche Forschungsgemeinschaft.
(Contract DFG-HA-1141/1; DFG-HA-1141/2-2)

The 53,596 GHz O2 spectral line is measured by microwave radiometry aboard a research aircraft in order to study the atmospheric temperature profile between 30 km and 60 km. Calculations of the temperature profile from the O2 thermal emission data are improved by taking into account the Zeeman-splitting and other factors, and yield good agreement with the theoretical calculations. This double precision calculation enables the calculation of temperatures to better than 0.1 degree Kelvin. In addition, the derived formulae and computer programs can easily be modified for any other type of microwave radiometric observations. N.B.

A82-46163
THE POSSIBILITY OF CHANGING SPECTRAL BANDS IN THE REMOTE SENSING OF THE EARTH [O VOZMOZHNOSTI IZMENENIIA GRANITS SPEKTRAL'NYKH DIAPAZONOV PRI DISTANTSIONNYKH ISSLEDOVANIIAKH ZEMLI]
N. I. ANDREEVA, S. A. IVANOV, and L. I. CHAPURSKII Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 66-71. In Russian. refs

It is suggested that the 1.24-2.4 micron band be used instead of the 1.55-1.75 micron or 2.05-2.35 micron bands in the remote sensing of earth resources in order to increase spatial or energetic resolution. Calculations and experimental results which serve to support this proposal are presented. B.J.

A82-46168
EQUIPMENT FOR AIRCRAFT-BORNE STUDIES OF THE OPTICAL CHARACTERISTICS OF THE SYSTEM COMPRISING THE EARTH'S SURFACE AND THE ATMOSPHERE [APPARATURA DLIA SAMOLETNYKH ISSLEDOVANII OPTICHESKIKH KHARAKTERISTIK SISTEMY ZEMNAIA POVERKHNOST'-ATMOSFERA]
E. M. KOZLOV (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) Issledovanie Zemli iz Kosmosa, July-Aug. 1982, p. 115-121. In Russian. refs

A six-channel photometer operating in the 0.45-0.77 spectral region has been installed on the Il-14 aircraft. The basic design and operating principles of this photometer, which is intended for the investigation of the brightness field of the surface-atmosphere system, are described. Some sample results are presented, relating to measurements of the vertical distribution of atmosphere optical thickness and the brightness of the surface-atmosphere system in various spectral regions. B.J.

A82-46738
PROCESSING SYSTEM TECHNIQUES FOR THE 80'S
R. A. HOLMES (General Motors Institute, Flint, MI) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 140-144. refs

Some aspects of the scene-to-data tape portion (SDTP) of a remote sensing system are considered for passive optical sensors in the reflective portion of the spectrum. Effects of the SDTP of a system on the processing of scene-derived remote sensing data are examined. Attention is given to the modeling of atmospheric effects over earth scenes, geometric distortions in data acquired by passive sensors, and recent efforts aimed at correcting both atmospheric effects and sensor/platform-induced errors. F.G.M.

A82-46752
PROBLEMS IN TEMPERATURE ESTIMATION FROM REMOTELY SENSED THERMAL IR DATA
S. FUJIMURA, H. TOYOTA, M. INAMURA, H. HANAIZUMI (Tokyo, University, Tokyo, Japan), and T. YOKOTA (National Institute of Environmental Studies, Tsukuba, Japan) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 276-280.

Regression analysis is applied to investigate discrepancies between water temperatures estimated from thermal IR data acquired with an airborne multispectral scanner and water temperatures measured in buckets and used as ground truth data. It is found that the regression coefficient obtained by taking the ground truth data as independent variables and the estimated temperatures as dependent variables tends to be less than unity. Probable causes considered for the discrepancies include atmospheric effects and relative differences between the remote sensing and ground truth experiments. The two causes are examined by means of a model atmosphere analysis and laboratory experiments, respectively. F.G.M.

A82-46951#
COMPLEX DATA PROCESSING OF BULGARIA-1300-II EXPERIMENT PERFORMED SIMULTANEOUSLY WITH MULTIZONAL VIDEODATA FROM OTHER REPRODUCING SYSTEMS FOR REMOTE SENSING PURPOSES
D. MISHEV and P. PETROV (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Kosmicheski Izsledvaniia, Sofia, Bulgaria) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 8 p. refs
(IAF PAPER 82-105)

A numerical model is developed for the simultaneous processing of satellite microwave passive remote sensing of the earth surface by several spacecraft, and results are compared from data taken by the B-1300-11, Landsat MSS, and the Meteor-Priroda spacecraft. The necessity of obtaining extensive ground-truth data for successfully verifying the validity of remotely sensed imagery is noted. Methods of relating brightness measurements from different instruments at different altitudes and angles with varying resolutions are developed. A calorimetric analysis is explored and determined to be valid for remote sensing purposes, due to the homogeneity of spatially close measured elements. Simultaneous processing of video imagery from a number of multizonal scanners provided a better reference structure for multizonal imagery. M.S.K.

A82-46953#
UHF CAPABILITIES FOR EARTH OBSERVATION IN THE YEAR 2000 [LES CHARGES UTILES HYPERFREQUENCES D'OBSERVATION DE LA TERRE A L'HORIZON DE L'AN 2000]
J. C. ANNE International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 14 p. In French.
(IAF PAPER 82-107)

Projections are made for optical and radiometric remote sensing capabilities which will be available in the year 2000. It is noted that satellite performance will be enhanced by planning which begins by the year 1990, by laboratory development, and by over a quarter century of space technology development. Additional benefits will come from advanced data handling facilities, data treatment, and GEO relay spacecraft. The technology of the year 2000 is predicted based on extrapolations of current technology, active programs, and spacecraft under development, including the ARGOS, ERS, and SPOT satellites. Data collection will be in real time, originating from both LEO and GEO placed spacecraft, thus allowing the spacecraft to serve purely as sensors, with all data collection and processing occurring on the ground. Finally, features of passive radiometers, SAR systems, and data relay systems which will be developed are explored. M.S.K.

A82-46987#
FIRST RESULTS OF THE BULGARIA-1300 SATELLITE EXPERIMENTS
K. SERAFIMOV, S. CHAPKNOV, M. GOGOSHEV, I. KUTIEV, M. GUSHEVA, T. IVANOVA, N. PETKOV, T. SAMARDZHIEV, S. SARGOICHEV (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Kosmicheski Izsledvaniia, Sofia, Bulgaria), V. BALEBANOV (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR) et al. International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 6 p. refs
(IAF PAPER 82-202)

The distribution of the ion density obtained by processing the data obtained from one orbit of the satellite is given. The optical complex aboard the Bulgaria-1300 is described, and the main characteristics of this optical equipment are given. It is noted that the optical axes of the two photometers, EMO-5 and Photon-1, that make up part of the optical equipment are oriented in nadir. The UV-spectrometer operates in the spectral region of 1150 A to 2550 A, with a spectral resolution of 10 A. A spectrum of the daytime or nighttime atmosphere is obtained every 3.5 min. Results from the ion mass-spectrometer aboard the satellite are presented. This combined system is designed to yield simultaneous measurements of the differential energy spectrum of the ions in

two sub-ranges: 1-30 eV (cool plasma) and 0.2-15 keV (hot plasma), as well as the mass composition within the range 1-64 amu.
C.R.

N82-28701*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF SUBPANEL ON IMAGE SHARPNESS
In its Proc. of the NASA Workshop on Registration and Rectification p 22-26 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Factors effecting the sharpness of images acquired by multispectral scanners, synthetic aperture radar, thermal infrared sensors, and multispectral linear arrays are defined. Factors associated with the sensor include the atmospheric blur/scatter function, the point spread function of the sensor, the sensor aperture, the filter characteristics, and the sampling rate and quatization effects. Several research tasks are proposed which include investigating the use of optical prefilters which include investigating the use of optical prefilters and the relationships of the instantaneous field of view (aperture width) on the performance of geocorrelation systems. M.G.

N82-28706*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF THE SUBPANEL ON ERROR CHARACTERIZATION AND ERROR BUDGETS
In its Proc. of the NASA Workshop on Registration and Rectification p 46-59 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The state of knowledge of both user positioning requirements and error models of current and proposed satellite systems is reviewed. In particular the error analysis models for LANDSAT D are described. Recommendations are given concerning the geometric error model for the thematic mapper; interactive user involvement in system error budgeting and modeling and verification on real data sets; and the identification of a strawman mission for modeling key error sources. M.G.

N82-28713*# General Electric Co., Philadelphia, Pa. Space Center.
SPACEBORNE SCANNER IMAGING SYSTEM ERRORS
A. PRAKASH *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 113-129 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The individual sensor system design elements which are the priori components in the registration and rectification process, and the potential impact of error budgets on multitemporal registration and side-lap registration are analyzed. The properties of scanner, MLA, and SAR imaging systems are reviewed. Each sensor displays internal distortion properties which to varying degrees make it difficult to generate on orthophoto projection of the data acceptable for multiple pass registration or meeting national map accuracy standards and is also affected to varying degrees by relief displacements in moderate to hilly terrain. Nonsensor related distortions, associated with the accuracy of ephemeris determination and platform stability, have a major impact on local geometric distortions. Platform stability improvements expected from the new multi mission spacecraft series and improved ephemeris and ground control point determination from the NAVSTAR/global positioning satellite systems are reviewed.
E.A.K.

N82-28715*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SCANNER IMAGING SYSTEMS, AIRCRAFT
S. G. UNGAR *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 138-152 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The causes and effects of distortion in aircraft scanner data are reviewed and an approach to reduce distortions by modelling the effect of aircraft motion on the scanner scene is discussed. With the advent of advanced satellite borne scanner systems, the geometric and radiometric correction of aircraft scanner data has become increasingly important. Corrections are needed to reliably simulate observations obtained by such systems for purposes of evaluation. It is found that if sufficient navigational information is available, aircraft scanner coordinates may be related very precisely to planimetric ground coordinates. However, the potential for a multivalue remapping transformation (i.e., scan lines crossing each other), adds an inherent uncertainty, to any radiometric resampling scheme, which is dependent on the precise geometry of the scan and ground pattern. E.A.K.

N82-28716*# National Aeronautics and Space Administration, Washington, D. C.
MLA IMAGING SYSTEMS
K. J. ANDO *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 153-162 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

The development of the enabling technology and instrument/mission definition phase for the application of advanced solid state sensors for future experimental remote sensing missions is discussed. The development of focal planes, instrument concept/design, mission studies, and service requirements and an imaging spectrometer technology and a Shuttle sortie mission definition are outlined. E.A.K.

N82-28718*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACECRAFT INDUCED ERROR SOURCES
H. S. HEUBERGER *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 198-201 1 Jun. 1982
Avail: NTIS HC A23/MF A01 CSCL 08B

The attitude control and measurement systems aboard the LANDSAT 2 and D satellites are described and associated errors are discussed. Also, the ephemeris errors from various tracking systems are examined. Use of the Global Positioning System and improved attitude control instruments is expected to greatly reduce the errors in LANDSAT D in comparison with previous LANDSATS. M.G.

N82-28726*# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
PHOTOGRAMMETRIC ASPECTS OF REMAPPING PROCEDURES
E. M. MIKHAIL *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 337-358 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Photogrammetric control generation is discussed. Techniques in remote sensing data reduction are described. Emphasis is placed on methods of rectification of aerial photography and frame photography. Examples of multispectral band scanner data that were processed are presented. T.M.

N82-28735*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCEPT FOR A MULTIPLE RESOLUTION PUSHBROOM SENSOR
F. C. BILLINGSLEY *In its* Proc. of the NASA Workshop on Registration and Rectification p 444-449 1 Jun. 1982 refs
(Contract NAS7-100)
Avail: NTIS HC A23/MF A01 CSCL 08B

A general purpose pushbroom sensor will have parameters determined by the needs of the majority of potential users. These parameters may not satisfy the needs of certain users: Agriculture requires a very short return visit interval; cartography requires a very small pixel size; land use and geology would be satisfied with moderate resolution and seasonal return times. The aggregate solution of these needs would produce a sensor with extremely high data rates. A sensor concept is proposed which may meet the combined needs without the extreme data rate. Author

N82-28736*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATTITUDE TRACKER
F. C. BILLINGSLEY *In its* Proc. of the NASA Workshop on Registration and Rectification p 450-453 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Line array sensors produce data which has no inherent geometrical continuity. Hence, any platform attitude variation will be evidenced as a distortion when the data lines are displayed in the normal Cartesian raster. Ancillary sensing is required to establish the platform attitude to allow geometric rectification. This is normally provided by inertial or star reference attitude sensors. However, in the absence of such sensors or if performance of them is degraded, the required attitude information is lost. A strawman sensor design is proposed which utilizes small image areas on the ground to provide a series of motion vectors with which the platform attitude can be tracked; this allows the distorted image received by the normal image line sensor to be rectified.
Author

N82-28737*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Mission Design Section.
A CASE FOR INHERENT GEOMETRIC AND GEODETIC ACCURACY IN REMOTELY SENSED VNIR AND SWIR IMAGING PRODUCTS
J. M. DRIVER *In its* Proc. of the NASA Workshop on Registration and Rectification p 454-468 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Significant aberrations can occur in acquired images which, unless compensated on board the spacecraft, can seriously impair throughput and timeliness for typical Earth observation missions. Conceptual compensations options are advanced to enable acquisition of images with inherent geometric and geodetic accuracy. Research needs are identified which, when implemented, can provide inherently accurate images. Agressive pursuit of these research needs is recommended. A.R.H.

N82-28738*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Scientific Center.
A CONCEPT FOR A FUTURE GROUND CONTROL DATA SET FOR IMAGE CORRECTION
R. BERNSTEIN *In* JPL Proc. of the NASA Workshop on Registration and Rectification p 469-474 1 Jun. 1982 refs
Avail: NTIS HC A23/MF A01 CSCL 08B

Strips of ground control can be established with current and future satellite sensors. These can provide precise and reliable geometric references for locating and correcting satellite image data and to support temporal image registration. This paper briefly describes the concept and approach for implementing this data base called a Ground Control Strip, and recommends additional work. The advent of new solid state imaging systems, in particular the linear array detectors (pushbroom sensors), make this new concept particularly attractive and practical. Author

N82-30280# Joint Publications Research Service, Arlington, Va.
KATE-140 AND MKF-6M SPACE CAMERAS
V. KUCHUMOV *In its* USSR Rept.: Space, No. 16 (JPRS-81359) p 89-92 26 Jul. 1982 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 1, Jan. 1982 p 40-41
Avail: Issuing activity

The KATE-140 large-format topographic camera made it possible to obtain photographs suitable for precision photographic-survey processing. It has a field of vision of 85 deg which makes it possible for a single frame to contain an image of a 450x450-km segment of the Earth's surface from orbital altitude. Precise measurement of the linear dimensions of objects and their mutual positions can be carried out on the photographs. Moreover, the camera's high resolution meets imagery-interpretation requirements. A guidance device provides for both single and strip photographs with a given interval. A punching machine is used to separate the strips. Before being used on the Salyut-6 station, the other fixed camera, the MKF-6M, underwent thorough testing onboard the Soyuz-22 spacecraft. The multispectral MKF-6M camera is designed to obtain information about the spectral characteristics of natural objects in order to increase the reliability of their interpretation. It has six spectral channels, four of which encompass the visible spectra and two of which are in the near-infrared. Author

N82-30602# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
HIGH ALTITUDE PHOTOGRAPHY TRAINING MANUAL
M. L. MATHEWS, W. A. BEFORT, A. S. BENSON, C. A. CLARK, R. N. COLWELL, R. E. HINKLE, M. L. MATHEWS, J. C. PRILL, and J. F. WARD Sep. 1981 177 p refs
(Contract USDA/FS-53-3187-1-42)
(PB82-164096; LEMSCO-16864-REV; NFAP-223) Avail: NTIS HC A09/MF A01 CSCL 05I

A training manual designed as a working tool for forest service personnel being introduced to the principles of high altitude photography is presented. The syllabus serves experienced photointerpreters and is a background for novice photointerpreters. High altitude photography, photointerpretation, and field exercise are also treated. GRA

N82-31728*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SHUTTLE ACTIVE-MICROWAVE EXPERIMENTS (SAMEX) PROGRAM Executive Summary Report
C. ELACHI, ed. 1 Jul. 1982 16 p refs
(Contract NAS7-100)
(NASA-CR-169285; JPL-PUB-82-59; NAS 1.26:169285) Avail: NTIS HC A02/MF A01 CSCL 22A

The Shuttle active microwave experiments (SAMEX) program is reviewed. The key implementation aspects are presented. S.L.

N82-32726# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
LASER ALTIMETER FOR STEREO LINE SCANNING
C. WERNER, F. KOEPP, and F. MALOTA Dec. 1981 45 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-777)
(DFVLR-MITT-82-06) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 13,50

A satellite-borne laser altimeter for applications in meteorology, oceanography and geodesy is described. The system parameters, and the weight and power requirements were determined. The system was compared with other planned systems, showing that only the altimeter part with weight of about 300 kg and power requirement of 1-5 kw is expensive. Interpretation problems arise with cloud applications. Due to the large power consumption a combined measurement using the WINDSAT experiment is proposed. Author (ESA)

N82-32805*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
PERFORMANCE EVALUATION AND CALIBRATION OF A MODULAR MULTIBAND RADIOMETER FOR REMOTE SENSING FIELD RESEARCH
B. F. ROBINSON, R. E. BUCKLEY (Barnes Engineering Co., Stamford, Conn.), and J. A. BURGESS, Principal Investigators (Barnes Engineering Co., Stamford, Conn.) Jun. 1982 15 p refs Repr. from SPIE, v. 308, Contemp. Infrared Standards and Calibration, 1981 p 146-157 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; PROJ. AGRISTARS)
(E82-10388; NASA-CR-167710; SR-P2-04318; NAS 1.26:167710; LARS-061182) Avail: NTIS HC A02/MF A01 CSCL 02C

A multiband radiometer suitable for operation from helicopter, small plane, truck, or tripod platforms was developed. The standard unit is equipped with the seven thematic mapper spectral bands with an added band from 1.5 to 1.30 microns; however, up to eight user specified bands from 0.4 to 15 microns may be installed under clean field conditions. Results of prototype tests of the

spectral responsivity of the detectors, the transmittance of the optical filters as a function of wavelength, the fields of view, and the system linarity, temperature stability, noise performance, and dynamic range were evaluated. Minor modifications were made to the instrument and the results of final testing are reported. M.G.

N82-32825# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
REMOTE SENSING OF GASES USING LIDAR RESONANCE SCATTERING TECHNIQUES FROM THE SPACE SHUTTLE M.S. Thesis
G. C. KWEDER Oct. 1981 93 p refs
(AD-A115627; AFIT/GEP/PH/81D-5) Avail: NTIS HC A05/MF A01 CSCL 17H

Remote sensing from the space shuttle utilizing laser-induced fluorescence techniques was investigated. A feasibility study of LIDAR (Light Detection and Ranging) techniques to detect twelve gases of scientific and military interest was carried out. Evaluation of a European Space Agency LIDAR hardware design was also a task. The main emphasis was on determination of background noise, spectral transitions, atmospheric transmission and molecular absorption cross-section of the target in order to determine the minimum target concentration required to be detectable. Atomic sodium, molecular iodine and hydrogen fluoride were determined to be promising candidates for LIDAR resonance detection. Other molecules investigated, such as hydrogen chloride, xenon and krypton were considered marginally detectable at best because of their small absorption cross-sections. Lack of sufficient data prevented extended analysis of the remaining molecules.
Author (GRA)

N82-32827# New York Univ., New York. College of Environmental Science and Forestry.
ANGULAR EXTERIOR ORIENTATION OF AIRBORNE SENSORS Final Technical Report, 29 Dec. 1980 - 30 Sep. 1981
R. H. BROCK Griffiss AFB, N.Y. RADC Mar. 1982 52 p refs Prepared in cooperation with Southeastern Center for Electrical Engineering Education
(Contract F30602-78-C-0148; AF PROJ. LD13)
(AD-A115846; RADC-TR-82-41) Avail: NTIS HC A04/MF A01 CSCL 08B

The results of an investigation into the feasibility of a radar sensor independent method of dynamic calibration by a bore sighted metric camera are presented. Analytic aerotriangulation of oblique photographic imagery containing ground control provide an independent measurement of radar sensor bias errors. Error correction models are generated which provide position and angular corrections to the radar output to be applied in real time over random targets. Utilizing fictitious data, it was concluded that such calibration procedures can be successful and practical and indeed should be further developed. Author (GRA)

N82-33320*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EARTH RADIATION SCIENCE SEMINARS
J. B. HALL, JR., comp. Aug. 1982 175 p refs Seminars held at Hampton, Va., Jun. 1980 - Oct. 1981
(NASA-CP-2239; L-15483; NAS 1.55:2239) Avail: NTIS HC A08/MF A01 CSCL 03B

Earth radiation budget experiments, instrumentation, computational methods, and the effect of increased CO2 on climate were discussed.

N82-33325*# Cologne Univ. (West Germany).
DERIVATION OF THE RADIATION BUDGET AT GROUND LEVEL FROM SATELLITE MEASUREMENTS
E. RASCHKE *In* NASA. Langley Research Center Earth Radiation Science Seminars p 89-98 Aug. 1982 refs
Avail: NTIS HC A08/MF A01 CSCL 03B

Determination of the Earth radiaton budget and progress in measurement of the budget components and in the treatment of imaging data from satellites are described. Methods for calculating the radiation budget in a general circulation model, radiative transfer characteristics of clouds, computation of solar radiation at ground level using meteorological data and development of a 10-channel radiometer are discussed. J.D.

N82-33596*# Missouri Univ., Columbia.
ACTIVE MICROWAVE REMOTE SENSING RESEARCH PROGRAM PLAN. RECOMMENDATIONS OF THE EARTH RESOURCES SYNTHETIC APERTURE RADAR TASK FORCE
Jun. 1980 116 p refs
(Contract NAS9-15896)
(NASA-CR-167726; NAS 1.26:167726) Avail: NTIS HC A06/MF A01 CSCL 17I

A research program plan developed by the Office of Space and Terrestrial Applications to provide guidelines for a concentrated effort to improve the understanding of the measurement capabilities of active microwave imaging sensors, and to define the role of such sensors in future Earth observations programs is outlined. The focus of the planned activities is on renewable and non-renewable resources. Five general application areas are addressed: (1) vegetation canopies, (2) surface water, (3) surface morphology, (4) rocks and soils, and (5) man-made structures. Research tasks are described which, when accomplished, will clearly establish the measurement capabilities in each area, and provide the theoretical and empirical results needed to specify and justify satellite systems using imaging radar sensors for global observations. J.M.S.

N82-33796*# Bionetics Corp., Hampton, Va.
NORSEX 1979 MICROWAVE REMOTE SENSING DATA REPORT Summary Report, 29 Sep. - 12 Oct. 1979
H. F. HENNIGAR and S. K. SCHAFFNER May 1982 223 p refs
(Contract NAS1-16978)
(NASA-CR-165967; NAS 1.26:165967) Avail: NTIS HC A10/MF A01 CSCL 05B

Airborne microwave remote sensing measurements obtained by NASA Langley Research Center in support of the 1979 Norwegian Remote Sensing Experiment (NORSEX) are summarized. The objectives of NORSEX were to investigate the capabilities of an active/passive microwave system to measure ice concentration and type in the vicinity of the marginal ice zone near Svalbard, Norway and to apply microwave techniques to the investigation of a thermal oceanic front near Bear Island, Norway. The instruments used during NORSEX include the stepped frequency microwave radiometer, airborne microwave scatterometer, precision radiation thermometer and metric aerial photography. The data are inventoried, summarized, and presented in a user-friendly format. Data summaries are presented as time-history plots which indicate when and where data were obtained as well as the sensor configuration. All data are available on nine-track computer tapes in card-image format upon request to the NASA Langley Technical Library. A.R.H.

09

GENERAL

Includes economic analysis.

A82-39319
REMOTE SENSING
C. VOUTE (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands) ITC Journal, no. 1, 1982, p. 37-44.

Some of the apparent trends for the next 20 years of automated remote sensing space technology are discussed. Expected technical developments include: better sensor performance and overall improvement of sensing capabilities, high precision orbit control, further development of onboard data compression and selective data collection, increased capabilities for handling high

to extremely high bit rates, improved data recording techniques, further development of 'machine intelligence' for interactive data handling and information extraction, and generation of self-correcting capabilities for various subsystems. These technical improvements will allow a wider range of observational capabilities, improved repetition rates, continuous local, regional and worldwide monitoring, and faster, better and less ambiguous information. Finally, three diverging scenarios are proposed for the future development of satellite remote sensing, and are shown to be dependent on the options and trends in available technology, requirements determined by types of application and functions, and also on policy decisions. N.B.

A82-42134
REMOTE SENSING IN METEOROLOGY, OCEANOGRAPHY AND HYDROLOGY
A. P. CRACKNELL, (ED.) (Dundee, University, Dundee, Scotland) Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981. 542 p $105

Various aspects of remote sensing are discussed. Topics include: the EARTHNET data acquisition, processing, and distribution facility; the design and implementation of a digital interactive image processing system; geometrical aspects of remote sensing and space cartography; remote sensing of a complex surface; legal aspects of remote sensing; remote sensing of pollution, dust storms, ice masses, and ocean waves and currents; use of satellite images for weather forecasting. Notes on field trips and work-sheets for laboratory exercises are included. C.D.

A82-42135
BACKGROUND - THE PHYSICAL BASIS OF REMOTE SENSING
A. P. CRACKNELL (Dundee, University, Dundee, Scotland) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 27-44. refs

A brief introduction to remote sensing is presented. The topics covered include the origins of remote sensing, the distinction between active and passive systems, the platforms used, some satellite programs, sources of satellite data for users, the generation and reflection of electromagnetic radiation, atmospheric attenuation, signatures, spatial resolution, microwaves, and radar. C.D.

A82-42136
THE EARTHNET DATA ACQUISITION, PROCESSING AND DISTRIBUTION FACILITY
J. GHESQUIERE (European Space Research Institute, Frascati, Italy) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 45-55.

The European Space Agency's mandatory EARTHNET program is discussed. The program's network structure is shown, and its activities are briefly described, including the satellites handled, the ground stations, the tasks of the program office, and the role of the National Points of Contact. Project and product plans through 1985 are mentioned, and the data distribution system is described in some detail. Future prospects are assessed. C.D.

A82-42138
REMOTE SENSING FROM SPACE - REVIEW OF FUTURE PLANS AND PROSPECTS
G. DUCHOSSOIS (ESA, Application Programmes Dept., Paris, France) and J. PLEVIN (Natural Environment Research Council, Swindon, Wilts., England) In: Remote sensing in meteorology, oceanography and hydrology. Chichester, Sussex, England, Ellis Horwood, Ltd.; New York, Halsted Press, 1981, p. 66-80. refs

A general description is given of the plans and prospects for future remote sensing systems that are currently under development or study in North America, Europe, Japan, and other regions. Among the projects discussed are the thematic mapper, the Metric Camera Experiment, the Microwave Remote Sensing Experiment, and the more problematical U.S. operational earth resources program and STEREOSAT plan. The latter, still in the conceptual stage, would acquire worldwide stereoscopic coverage through a single-instrument system. The mission objectives for the European ERS-1 and ERS-2 projects are discussed along with preparatory studies that have been done. C.D.

A82-43276
ALL-UNION CONFERENCE ON PROBLEMS IN THE STUDY OF EARTH RESOURCES AND THE WORLD OCEANS BY AERIAL AND SPACE METHODS, MOSCOW, USSR, NOVEMBER 1980, PROCEEDINGS [VSESOIUZNAIA KONFERENTSIIA PO PROBLEMAM ISSLEDOVANIIA PRIRODNYKH RESURSOV ZEMLI I MIROVOGO OKEANA AVIATSIONNO-KOSMICHESKIMI SREDSTVAMI, MOSCOW, USSR, NOVEMBER 1980, MATERIALY]
,Geodeziia i Aerofotos'emka, no. 2, 1982. 128 p. In Russian.

Papers are presented on such topics as an automatic stereophotogrammetric system of analytical type, a multipurpose airborne remote-sensing laboratory, software for the automated processing of remote-sensing imagery, and the active microwave remote sensing of forests in the Soviet Union. Also considered are the use of remote sensing in amelioration projects, the development of aerial photography for geological purposes, and the comparability of remote (satellite) and contact methods for measuring ocean-surface temperature. B.J.

A82-43683
INDIA IN SPACE - AN OVERVIEW
N. KIDGER British Interplanetary Society, Journal (Space Chronicle), vol. 35, Oct. 1982, p. 467-471.

The Indian space program has focussed on the potential of space for mass communications and for the timely surveying and management of that country's natural resources. Since the early 60's, five satellites of its design have been orbited by other nations, and the SLV-3 launcher with the capability to place small (about 40 kg) satellites into near-earth orbit has been developed. An augmented SLV, capable of placing 150 kg into near-earth orbit, and a polar SLV, capable of placing 600 kg into a sun-synchronous polar orbit, are planned for the mid-80's. Use has been made of data from NOAA, Landsat and TIROS satellites for meteorology and remote sensing, and Indian scientists are also participating in experiments due to be flown on the Spacelab 1 mission. A.B.

A82-44668#
INTELSAT - NEW FRONTIERS, NEW CHALLENGES
S. ASTRAIN (International Telecommunications Satellite Organization, Washington, DC) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 8 p.
(IAF PAPER 82-89)

The growth of Intelsat since its establishment in 1964 and future technological programs are presented. Charts of growth in four areas are included: volume of ocean region traffic (4,000 half circuits in 1970 to 51,000 in 1982), number of earth stations (51 antennas in 30 countries in 1970 to 396 antennas in 135 countries in 1981), number of preassigned pathways (approximately 120 in 1970 to 980 in 1981), and number of countries, territories, and independent possessions using Intelsat (60 in 1970 to about 165 in 1981). New aims include increased satellite size and capacity, and improved cost-efficiency and reliability. Proposed methods of achieving these goals are the use of multibeam antennas and space platforms, advanced launch vehicle capabilities, and improved digital communications techniques. New services are being researched such as videoconferencing and videophone services, business related services, and rural communications services. R.K.R.

A82-44671*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE LANDSAT-D RESPONSIVENESS TO USER COMMUNITY NEEDS
V. V. SALOMONSON (NASA, Goddard Space Flight Center, Greenbelt, MD) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 6 p. refs
(IAF PAPER 82-100)

Initial examinations of the Landsat-4 Multispectral Scanner and Thematic Mapper (IM) imagery indicate that these systems and the ground-based data processing systems are performing well. A combination of the spatial resolution of the multispectral scanner with the four band (0.5-0.6, 0.6-0.7, 0.7-0.8, and 0.8-1.1 microns) multispectral capability provides a useful observation technique for identifying crop type, phenological state of development, and a real condition assessment. Landsat multispectral scanner imagery has become more important in the search for new deposits of oil and mineral resources, and geological applications indicate that image analysis complements geological mapping techniques. Advantages of the TM include more precise measurements of the increased reflectance of vegetation in the green and near infrared. In addition, TM has improvement vegetation species differentiation, due to measurements made in new spectral bands. Preliminary TM data analysis reveals that systems have performed to optimum expectations. R.K.R.

A82-44674#
ERS-1 USER BENEFITS
L. VANDEPUT (ESA, Directorate of Application Satellites, Toulouse, France) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 6 p.
(IAF PAPER 82-113)

Case studies performed on the economic benefits of the ERS-1 (ESA Remote Sensing Satellite) in the areas of shipping, fishing, off-shore activities, and pollution are presented. Analysis reveals a $33,000 savings in an oil tanker route around Africa, by using ERS-1 data for rerouting in the Madagascar region and for obtaining sea-state information. In regard to fishing, a yearly sale increase of 2.1 M$ is expected due to a longer possible fishing period. Off-shore oil and gas exploration costs can be reduced by 30% since campaign duration can be reduced if satellite data are available. A savings in development costs, dependent on the number of drilling rigs, is potentially between 3.3 M$ and 6.8 M$ in 1987. Four types of pollution monitoring could prove beneficial: marine ecology (not quantifiable, but will allow better decisions); marine law (better damage evaluation resulting in a 2.3 M$ savings); pollution detection (reducing aircraft deployment survey costs by 3.7 M$ in European countries); and pollution countermeasures (potential maximum savings for off-shore clean-ups of 3.8 M$). R.K.R.

A82-46745
REMOTE SENSING EDUCATION: A SPECIAL REPORT ON THE CONFERENCE OF REMOTE SENSING EDUCATORS - CORSE-81
T. M. LILLESAND (Minnesota, University, St. Paul, MN) In: Machine processing of remotely sensed data with special emphasis on range, forest, and wetlands assessment; Proceedings of the Seventh International Symposium, West Lafayette, IN, June 23-26, 1981. West Lafayette, IN, Purdue University, 1981, p. 205-212.

CORSE-81, Conference On Remote Sensing Education, was held May 18-22, 1981, at Purdue University. Co-sponsored by NASA and NOAA, the conference was organized and conducted by the Purdue University Laboratory for Applications of Remote Sensing (LARS). Attended by approximately 200 educators from a broad range of disciplines, CORSE-81 represented the first national conference in the U.S. dealing solely with the topic of remote sensing education. This paper is an attempt to summarize the major trends and issues in remote sensing education which crystallized from the presentations and discussions of CORSE-81. These include: (1) a profile (by discipline) of remote sensing courses taught throughout the U.S., (2) the manpower and skill requirements for students trained in remote sensing, (3) the impact of 'low cost' digital image processing on the remote sensing education process, and (4) the concern of the educational community about the fundamental philosophy of design and implementation of an operational land remote sensing program. (Author)

A82-47001#
A SOCIO-ECONOMIC EVALUATION OF THE LUNAR ENVIRONMENT AND RESOURCES. III - SELENOSPHERIC ECONOMICS AND CISLUNAR/TERRESTRIAL MARKET ANALYSIS
K. A. EHRICKE (Space Global Co., La Jolla, CA) International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, 25 p. refs
(IAF PAPER 82-235)

Geosocio-economically useful lunar development requires adoption of a development strategy designed to balance investments and returns as attractively as possible. This paper deals with a systematic approach to developing early and profitable returns through an appropriate investment strategy and through cislunar and terrestrial market research. In addition, long-term aspects are outlined, including the production of helium-3 for terrestrial fusion power plants and of water from fusion products and lunar oxygen. (Author)

N82-30281# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Rept.: Space, No. 16 (JPRS-81359) p 103-105 26 Jul. 1982 Transl. into ENGLISH from TASS, n.d., n.p.
Avail: Issuing activity

A table showing launch dates and orbital parameters for 33 communication, meteorological, and Earth resources satellites is presented. N.W.

N82-30582*# National Aeronautics and Space Administration, Washington, D. C.
STUDIES AND PROPOSALS ON REMOTE SENSING PROGRAMS FOR THE EVALUATION AND MANAGEMENT OF RESOURCES IN LATIN AMERICA (COLUMBIA)
May 1982 25 p Transl. into ENGLISH of "Estudio y propuestas sobre programas de sensores remotos para la evaluacion y manejo de recursos en America Latina" (Columbia), 1982 p 1-27 Presented at the United Nations Reg. Seminar on Space Appl., Quito, Ecuador, 19-23 Apr. 1982 Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASW-3542)
(NASA-TM-76889; NAS 1.15:76889) Avail: NTIS HC A02/MF A01 CSCL 05A

A report is given on the situation in regard to diagnostic studies carried out on the use of remote sensing techniques at the regional level, and discussions held at international meetings on this topic. Studies and proposals presented by different organizations are discussed. It is concluded that a consultative body must be established at the regional level. Author

N82-30583*# National Aeronautics and Space Administration, Washington, D. C.
STUDIES ON THE APPLICATION OF REMOTE SENSING BY ARGENTINIAN ORGANIZATIONS
May 1982 9 p Transl. into ENGLISH of "Trabajos de Aplicacion de la Teledeteccion Organismos Nacionals (Argentina)" Buenos Aires, 1982 6 p Presented at the United Nations Reg. Seminar on Space Appl., 1982 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-3541)
(NASA-TM-76897; NAS 1.15:76897) Avail: NTIS HC A02/MF A01 CSCL 05B

A bibliography is given of papers relating to the use of remote sensing information (mostly LANDSAT data) by various Argentinian organizations. R.J.F.

N82-30584*# National Aeronautics and Space Administration, Washington, D. C. Center of Remote Sensing.
PRESENT AND FUTURE PROGRAMS FOR THE APPLICATION OF REMOTE SENSING IN ARGENTINA
F. A. ALVAREZ May 1982 7 p Transl. into ENGLISH of "Programas Presentes y Futuros de Aplicacion de la Teleobservacion en la Rep. Arg.' Argentina, 1982 p 1-6 Presented at the UN Reg. Seminar on Space Appl., 1982 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by National Space Research Commission
(Contract NASW-3541)
(NASA-TM-76898; NAS 1.15:76898) Avail: NTIS HC A02/MF A01 CSCL 05B

Remote sensing activities in Argentina are summarized. They include reception and processing of satellite data, applications, research, and training. S.L.

N82-32254# Danish Academy of Technical Sciences, Copenhagen.
SPACE RESEARCH IN DENMARK Annual Report, 1980-1981
1982 12 p refs Presented at 24th COSPAR Plenary Meeting, Ottawa, 17 May-2 Jun. 1982
Avail: NTIS HC A02/MF A01

Danish participation in ESA programs, and research in astrophysics, X-ray astronomy, geophysics, plasmas, and geodesy are summarized. High energy cosmic rays, the Earth's magnetic field auroras, particle precipitation, analog weather images, and the Earth's gravity field were studied. Author (ESA)

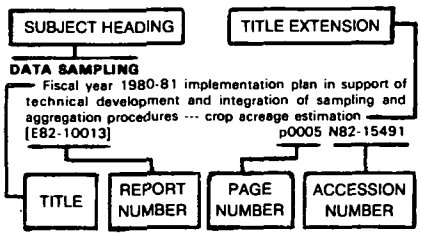
N82-32279# Joint Publications Research Service, Arlington, Va.
FURTHER COMMENTARY ON ACCOMPLISHMENTS OF COSMOS SATELLITES
V. LYNDIN *In its* USSR Rept.: Space, No. 17 (JPRS-81552) p 13-16 17 Aug. 1982 Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1982 p 43-44
Avail: Issuing Activity

The accomplishments of the Cosmos artificial satellites are reviewed. Standardization enabled the use of unified hulls, service systems to control the on board equipment and to change to series production of the satellites and the completing elements. Cosmos satellites are used for the following purposes: space meteorological services; television tracking of clouds; launching of meteorological satellites; ocean studies by space technology; long range space television, telegraph, and telephone communications; study of the Earth's magnetic field; investigation and utilization of natural resources; improvement of safety of marine navigation; aids to manned space flights; and medical and biological experiments. E.A.K.

N82-33332*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT: 1981 ACTIVITIES
1981 92 p refs
(NASA-TM-84719; NAS 1.15:84719) Avail: NTIS HC A05/MF A01 CSCL 05B

Achievements in the aeronautics and space program by function are summarized. Activities in communications, Earth's resources and environment, space science, space transportation, international activities, and aeronautics are included. S.L.

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section (of this supplement). If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

A

B

C

D

E

F

G

H

I

J

K

L

LANDSAT 1

LANDSAT 2

LARVAE

LASER ALTIMETERS

LASER APPLICATIONS

LASER RANGE FINDERS

LASER SPECTROSCOPY

LAUNCH DATES

LIGHT SCATTERING

LIMNOLOGY

LINEAR ARRAYS

LUMINANCE

LUMINOUS INTENSITY

LUNAR ENVIRONMENT

M

MAGNETIC ANOMALIES

MAGNETIC DISTURBANCES

MAGNETIC FIELDS

MAGNETIC FLUX

MAGNETIC SURVEYS

N

O

P

R

S

T

U

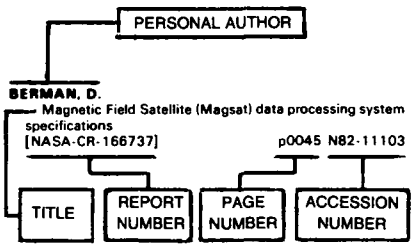
V

W

X

Y

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title, e.g., p0045 N82-11103. Under any one author's name the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

A

B

C

D

E

F

G

H

L

M

N

O

P

Q

R

S

T

U

V

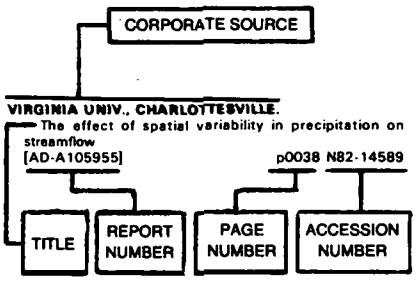
W

X

Y

Z

Typical Corporate Source Index Listing



The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

A

B

C

D

K

L

M

N

O

P

Q

R

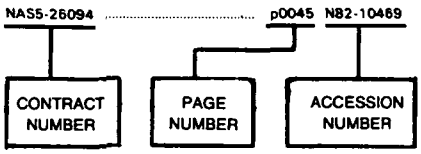
S

T

V

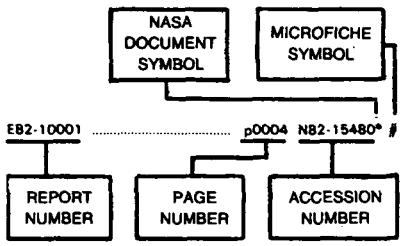
W

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the AIAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

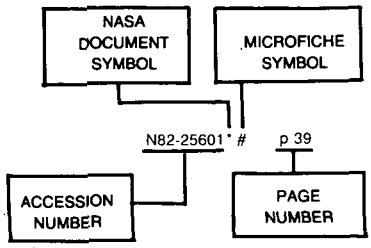
Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

REPORT

Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7041(36)		

4. Title and Subtitle	5. Report Date
EARTH RESOURCES A Continuing Bibliography (Issue 36)	January 1983
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D.C. 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This bibliography lists 576 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System between October 1 and December 31, 1982. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Bibliographies Earth Resources Remote Sensors	Unclassified - Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
Unclassified	Unclassified	156	$12.00 HC

*For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1983

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley
COLORADO
University of Colorado, Boulder
DISTRICT OF COLUMBIA
Library of Congress
GEORGIA
Georgia Institute of Technology, Atlanta
ILLINOIS
The John Crerar Library, Chicago
MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge
MISSOURI
Linda Hall Library, Kansas City
NEW YORK
Columbia University, New York
OKLAHOMA
University of Oklahoma, Bizzell Library
PENNSYLVANIA
Carnegie Library of Pittsburgh
WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an '*' following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library
COLORADO
Denver Public Library
CONNECTICUT
Hartford Public Library
MARYLAND
Enoch Pratt Free Library, Baltimore
MASSACHUSETTS
Boston Public Library
MICHIGAN
Detroit Public Library
MINNESOTA
Minneapolis Public Library and Information Center
NEW JERSEY
Trenton Public Library
NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library
OHIO
Akron Public Library
Cincinnati and Hamilton County Public Library
Cleveland Public Library
Dayton Public Library
Toledo and Lucas County Public Library
TEXAS
Dallas Public Library
Fort Worth Public Library
WASHINGTON
Seattle Public Library
WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols '#' and '*', from: ESA - Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

8 1 SP-7041, 830214 S90569AU 850609
NASA
SCIEN & TECH INFO FACILITY
ATTN: ACCESSIONING DEPT
P O BOX 8757 BWI ARPRT
BALTIMORE MD 21240