NASA SP-7041(15)

EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

ISSUE 15

OCTOBER 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7041(15) Earth Resources Pages 153–206 OCTOBER 1977

PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES

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NASA SP-7041 (15)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 15

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 July 1, 1977 and September 30, 1977

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

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OCTOBER 1977
Washington, D.C.

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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 387 reports, articles, and other documents announced between July 1 and September 30, 1977 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 This procedure, which saves time and money, accounts for the variation in citation appearance

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 A77-10,000 in ascending accession number order;

STAR entries identified by accession number series N77-10,000 in ascending accession number order.

After the abstract section, there are five indexes

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

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A77-10000 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 are available at $5 00 per document up to a maximum of 20 pages The charge for each additional page is 25 cents Microfiche[1] are available at the rate of $1 50 per microfiche for documents identified by the # symbol following the accession number A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library Minimum airmail postage to foreign countries is $1 00 Please refer to the accession number, e g , (A77-31739) when requesting publications

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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

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

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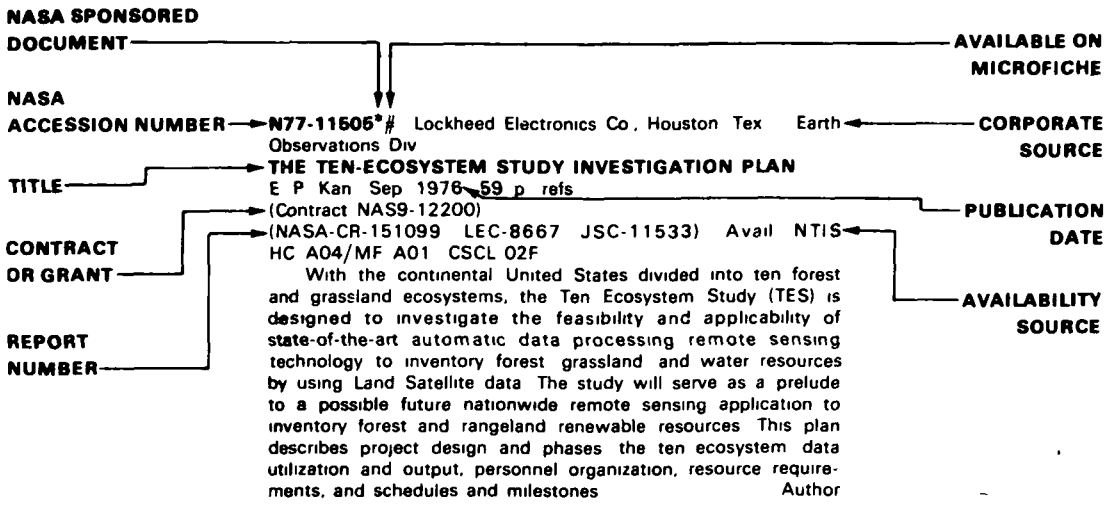
Subject Categories

TYPICAL CITATION AND ABSTRACT FROM *STAR*



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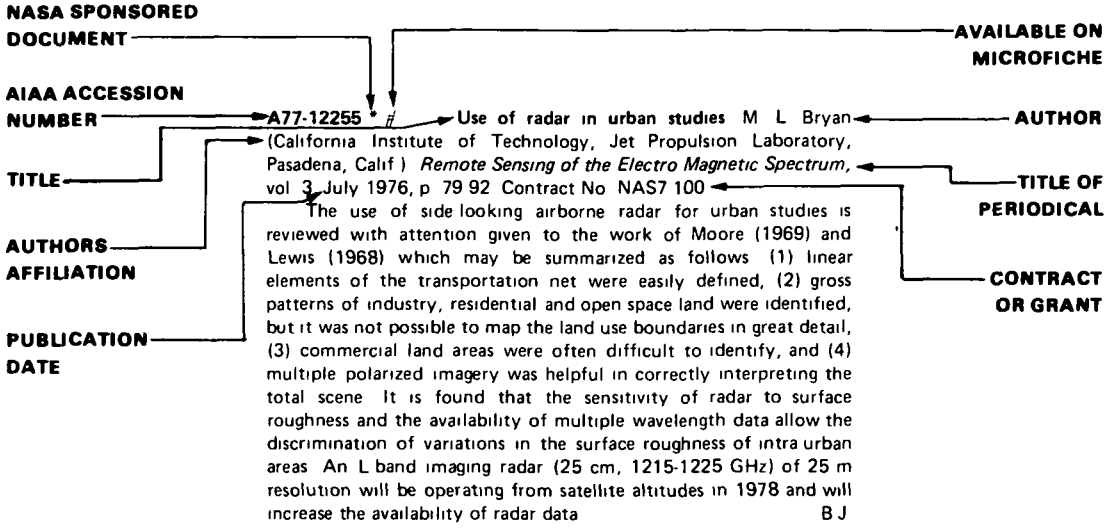

EARTH RESOURCES

A Continuing Bibliography (Issue 15)

OCTOBER 1977

01
AGRICULTURE AND FORESTRY

Include crop forecasts crop signature analysis soil identification disease detection harvest estimates range resources timber inventory forest fire detection and wildlife migration patterns

A77 30238 **Albedo measurement for remote sensing of crop yields** S B Idso, R J Reginato, and R D Jackson (U S Department of Agriculture, Water Conservation Laboratory, Phoenix, Ariz) *Nature,* vol 266, Apr 14, 1977, p 625 628

A77-31209 **Asymptotic nature of grass canopy spectral reflectance** C J Tucker *Applied Optics,* vol 16, May 1977, p 1151-1156 15 refs NSF Grants No GB-31862X2, No GB 41233X, No BMS-73-02027A02, No DEB-73 02027A03

The asymptotic nature of grass canopy spectral reflectance has been evaluated from field experimental data collected over the wavelength region of 0 500-1 000 micron at 0 005-micron intervals The spectral reflectance of green vegetation against a soil background decreases in regions of absorption and increases in regions of minimal or no absorption as the vegetational density increases until a stable or unchanging spectral reflectance, called the asymptotic spectral reflectance, is reached Results indicated that spectral reflectance asymptotes occurred at significantly lower levels of total wet biomass, total dry biomass, dry green biomass, chlorophyll content, and leaf water content in regions of strong pigment absorption (low detectability threshold) than in the photographic IR region where absorption was at a minimum (high detectability threshold) These findings suggested that photographic IR sensors were more suited to remote sensing of moderate to high biomass levels or vegetational density in a grass canopy than were sensors operating in regions of the spectrum where strong absorption occurred (Author)

A77-31563 **Densitometric methods of processing remote sensing data, with special reference to crop-type and terrain studies** E S Owen Jones (Bedford College, London, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977 p 101-124 8 refs Research supported by the Department of Industry and Ministry of Defence (Procurement Executive)

Quantitative measurements of the tonal values in the film are required for the identification of the surface cover of a scene with the aid of computer processing The densitometers for conducting these measurements include the rotating drum scanner, the flying-spot scanner, and the flat-bed machine Film properties and requirements are discussed and the principles of densitometry are examined The application of classification techniques to agricultural and natural terrain areas is considered, giving attention to a crop-type analysis and the classification of natural terrain G R

A77-31567 **Ground monitoring for airborne and space studies of land use and soil conditions** L F Curtis (Bristol, University, Bristol, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 192-215 58 refs

The development of remote sensing techniques for crop and soil studies is reviewed and the increasing demand for ground data in respect of sensor calibration and data processing is noted Current practices and problems in ground truth data collection for land-use/crop studies are discussed in terms of the range of data required, problems of ground-data recording and the platforms available for data collection near the ground Ground truth for remote sensing studies of soil conditions is discussed with particular emphasis on soil moisture and structure data Recent microwave studies of soil moisture conditions are considered to have limited value owing to the nature of the ground data used Considerations affecting the location, shape and size of ground-truth data collection areas are reviewed (Author)

A77-31568 **Ground information for the earth-resources Skylark** J R G Townshend (Reading, University, Reading, Berks , England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 216 245 14 refs Ministry of Defence of England Contracts No AT/2035/015/SP, No AT/2035/025/ASA

The collection of ground information in Argentina is considered, taking into account a case in which a scheme of ground information collection had to be devised for an area of 300,000 sq km, within which considerable regional variations in environmental conditions and crop combination are to be found Difficulties in the collection of ground information are examined and an assessment is conducted of the usefulness of ground information characteristics collected in Argentina Attention is given to the relations between ground properties and the properties of rocket photographs, problems of crop type prediction, ground information for terrain surveys, and implications for future ground-information surveys G R

A77 32837 # **Density of surface soil of Venus from Venera-10 data (Plotnost' poverkhnostnoi porody Venery po dannym AMS 'Venera-10')** Iu A Surkov, F F Kirnozov, V K Khristianov, B N Korchuganov, V N Glazov, and V F Ivanov *Kosmicheskie Issledovaniia,* vol 14, Sept -Oct 1976, p 697 703 7 refs In Russian

The paper describes direct measurements of the density of the Venus soil by the densitometer on the Venera 10 spacecraft The instrument operated as follows Gamma quanta emitted by an isotope source are scattered by the soil and recorded by three detectors placed behind a screen at different distances from the source The probability of Compton scattering is proportional to the density of the soil Measurements reported give a density of the surface soil of Venus of 2 8 g/cu cm with a rms error of plus or minus 0 1 g/cu cm By a terrestrial analog, this density would correspond to basalts of massive texture with low porosity P T H

A77-34519 **An equation for potential evaporation from soil, water, and crop surfaces adaptable to use by remote sensing** S B Idso, R J Reginato, and R D Jackson (U S Water Conservation Laboratory, Phoenix, Ariz) *Geophysical Research Letters,* vol 4, May 1977, p 187, 188 5 refs

The paper examines a technique for estimating rates of daily evaporation from bare soils that appears readily adaptable to remote sensing The technique requires knowledge of daily solar radiation, moist surface albedo, and maximum and minimum surface and air temperatures New data is presented for four vegetative surfaces from three different locations and for a water surface that indicate that the technique may also apply to crop and water surfaces B J

A77-35455 # **Vegetation and land use on the New England upland, in historical perspective** R B Simpson (Dartmouth College, Hanover, N H) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 35-41

Two photographs taken near Hanover, New Hampshire on a scale of about 1 6000 are given as an exercise in interpretation Special attention is given to identification of features reflecting land use changes over a period of time Features permitting the identification of trees typical of the Northern Forest area are described, as is a method of estimating the height of trees from the length of their shadows C K D

A77-36432 * **Soil spectra contributions to grass canopy spectral reflectance** C J Tucker and L D Miller (NASA, Goddard Space Flight Center, Greenbelt, Md) *Photogrammetric Engineering and Remote Sensing,* vol 43, June 1977, p 721 726 10 refs NSF Grants No GB-7824, No GB-31862X, No GB-31862X2, No GB-41233X, No BMS-73-02027A02

The soil or background spectra contribution to grass canopy spectral reflectance for the 0 35 to 0 80 micron region was investigated using in situ collected spectral reflectance data Regression analysis was used to estimate accurately the unexposed soil spectral reflectance and to quantify maxima and minima for soil-green vegetation reflection contrasts (Author)

A77-37591 # **Microwave remote sensing of productive moisture reserves in the soil (Mikrovolnovaia distantsionnaia indikatsiia zapasov produktivnoi vlagi v pochve)** K Ia Kondrat'ev, Iu I Rabinovich, E M Shul'gina, and V V Melent'ev (Glavnaia Geofizicheskaia Observatoriia, Leningrad, USSR) *Akademiia Nauk SSSR, Doklady,* vol 233, Apr 11, 1977, p 828-830 6 refs In Russian

The paper describes a procedure for aircraft remote sensing of moisture reserves in agricultural soil from microwave radiation To compute reserves of productive and total moisture in a 1-m-thick surface layer, a two-parameter model of the moisture profile is proposed, based on the correlation between the moisture profile and the profile of the least field moisture capacity As one of the parameters, the moisture of the layer 5-10 cm is used, determined from radiometric measurements at 18 cm wavelength The second parameter is the gradient of the average profile of the least field moisture capacity of the given soil type Experimental testing of the procedure in northern Kazakhstan is described P T H

N77-22579*# Bureau of Land Management Denver Colo
A LANDSAT STUDY OF EPHEMERAL AND PERENNIAL RANGELAND VEGETATION AND SOILS Final Report, 1 Mar 1975 - 1 Dec 1976
R Gordon Bentley Jr Principal Investigator Bette C Salmon-Drexler William J Bonner and Robert K Vincent 1 Dec 1976 244 p refs Original contains color imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(NASA Order S-53966-A)
(E77-10150 NASA-CR-152650 YA-300-1700-1012) Avail NTIS HC A11/MF A01 CSCL 08F

The author has identified the following significant results Several methods of computer processing were applied to LANDSAT data for mapping vegetation characteristics of perennial rangeland in Montana and ephemeral rangeland in Arizona The choice of optimal processing technique was dependent on prescribed mapping and site condition Single channel level slicing and ratioing of channels were used for simple enhancement Predictive models for mapping percent vegetation cover based on data from field spectra and LANDSAT data were generated by multiple linear regression of six unique LANDSAT spectral ratios Ratio gating logic and maximum likelihood classification were applied successfully to recognize plant communities in Montana Maximum likelihood classification did little to improve recognition of terrain features when compared to a single channel density slice in sparsely vegetated Arizona LANDSAT was found to be more sensitive to differences between plant communities based on percentages of vigorous vegetation than to actual physical or spectral differences among plant species

N77-22580*# Centre d Etude Spatiale des Rayonnements Toulouse (France)
AGRESTE PROGRAMME PART 2 FRENCH TEST SITES Progress Report, Jul - Dec 1976
G Flouzat Principal Investigator P Cassirame and J Quach Dec 1976 41 p refs Sponsored by NASA Original contains imagery Orginal photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(E77-10151 NASA-CR-152651) Avail NTIS HC A03/MF A01 CSCL 05B

The author has identified the following significant results Results show that the available timber is decreasing after 1980 This comes from the corn extension program Timber volume evaluations are given by biometrical connections between the mean surface of poplar crowns in a plantation and the mean circumference of the same trees taken at 1 30 m LANDSAT imagery was found sufficient for large field discrimination but small parcels like market-gardens were not discernible Discrete operators were used to smooth sharpen or detect edges of digital pictures

N77-23567*# Texas A&M Univ College Station Remote Sensing Center
APPLIED REGIONAL MONITORING OF THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION IN THE GREAT PLAINS CORRIDOR Final Report, Feb 1975 - Dec 1976
John W Rouse Jr Principal Inyestigator D W Deering R H Haas R I Welch J C Harlan and P R Whitney Jan 1977 235 p refs Original contains imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(Contract NAS5-20796)
(E77-10153 NASA-CR-152699 RSC-3018-6) Avail NTIS HC A11/MF A01 CSCL 08F

The author has identified the following significant results LANDSAT 2 has shown that digital data products can be effectively employed on a regional basis to monitor changes in vegetation conditions The TV16 was successfully applied to an extended test site and the Great Plains Corridor in tests of the ability to assess green forage biomass on rangelands as an index to vegetation condition A strategy for using TV16 on a regional basis was developed and tested These studies have shown that (1) for rangelands with good vegetative cover, such as most of the Great Plains and which are not heavily infested with brush or undesirable weed species the LANDSAT digital data can provide a good estimate (within 250 kg/ha) of the quantity of green forage biomass and (2) at least five levels of pasture and range feed conditions can be adequately mapped for extended regions

N77-23568*# Ceylon Inst of Scientific and Industrial Research Colombo (Sri Lanka)
INVESTIGATION OF THE AGRICULTURAL RESOURCES IN SRI LANKA Progress Report, Jul 1976 - Apr 1977

A T M Silva S D F C Nanayakkara and L S K B Herath Principal Investigators Apr 1977 25 p Sponsored by NASA ERTS
(E77-10164 NASA-CR-152665) Avail NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results Several in-house capabilities were developed The facilities to prepare color composites of excellent quality were developed using bulk B/W 70 mm transparencies or 1 1 000 000 positive transparencies These color composites were studied through optical devices on light tables A zoom transfer scope was also added enabling direct transfer of LANDSAT composite data on to base maps

N77-23569*# Geological Survey Reston Va
DETECTION OF SHORT-TERM CHANGES IN VEGETATION COVER BY USE OF LANDSAT IMAGERY Final Report, 1 Jul 1972 - 30 Jun 1974
Raymond M Turner Principal Investigator and Frederick M Wiseman Jun 1975 52 p refs Sponsored by NASA Original contains imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(E77-10165 NASA-CR-152666) Avail NTIS HC A04/MF A01 CSCL 02C

The author has identified the following significant results By using a constant band 6 to band 5 radiance ratio of 1 25 the changing pattern of areas of relatively dense vegetation cover was detected for the semiarid region in the vicinity of Tucson Arizona Electronically produced binary thematic masks were used to map areas with dense vegetation The foliar cover threshold represented by the ratio was not accurately determined but field measurements show that the threshold lies in the range of 10 to 25 percent foliage cover Montana evergreen forests with constant dense cover were correctly shown to exceed the threshold on all dates The summer active grassland exceeded the threshold in the summer unless rainfall was insufficient Desert areas exceeded the threshold during the spring of 1973 following heavy rains the same areas during the rainless spring of 1974 did not exceed threshold Irrigated fields parks golf courses and riparian communities were among the habitats most frequently surpassing the threshold

N77-23571*# South Dakota State Univ Brookings Remote Sensing Inst
INVESTIGATION OF REMOTE SENSING TECHNIQUES AS INPUTS TO OPERATIONAL RESOURCE MANAGEMENT MODELS Interim Report, 11 Jun - 10 Dec 1976
F A Schmer Principal Investigator R E Isakson and J C Eidenshink Feb 1977 36 p refs Original contains imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(Contract NAS5-20982)
(E77-10168 NASA-CR-152669 SDSU-RSI-77-01) Avail NTIS HC A03/MF A01 CSCL 05A

The author has identified the following significant results Successful operational applications of LANDSAT data were found for level 1 land use mapping drainage network delineation and aspen mapping Visual LANDSAT interpretation using 1 125 000 color composite imagery was the least expensive method of obtaining timely level 1 land use data With an average agricultural/rangeland interpretation accuracy in excess of 80% such a data source was considered the most cost effective of those sources available to state agencies Costs do not compare favorably with those incurred using the present method of extracting land use data from historical tabular summaries The cost increase in advancing from the present procedure to a satellite-based data source was justified in terms of expanded data content

N77-23572*# Environmental Research Inst of Michigan Ann Arbor
WHEAT PRODUCTIVITY ESTIMATES USING LANDSAT DATA Progress Report, 16 Nov 1976 - 15 Feb 1977
Richard F Nalepka John Colwell Principal Investigators and Daniel P Rice 15 Feb 1977 41 p refs ERTS
(Contract NAS5 22389)
(E77-10169 NASA-CR-152670 ERIM-114800 31-L) Avail NTIS HC A03/MF A01 CSCL 02C

The author has identified the following significant results An initial demonstration was made of the capability to make direct production forecasts for winter wheat using early season LANDSAT data The approach offers the potential to make production forecasts quickly and simply possibly avoiding some of the complexities of alternate procedures

N77-23584# Netherlands Interdepartmental Working Group on the Application of Remote Sensing Delft
A MODEL STUDY ON THE RELATIONS BETWEEN CROP CHARACTERISTICS AND CANOPY SPECTRAL REFLECTANCE PART 1 DEDUCTION OF CROP PARAMETERS FROM CANOPY SPECTROREFLECTANCE DATA PART 2 DETECTABILITY OF VARIATIONS IN CROP PARAMETERS BY MULTISPECTRAL SCANNING
W Verhoef and N J J Bunnik Dec 1975 101 p refs (NIWARS-Publ 33) Avail NTIS HC A06/MF A01

The canopy reflectance model developed by G H Suits was used to establish relationships between canopy reflectance and agricultural crop parameters These relationships were calculated for perpendicular view and a fixed sun angle Attempts to find methods of deduction of crop parameters from canopy spectroreflectance data based on the Suits model have not yet led to satisfactory results This is mainly due to the variability of leaf and soil optical characteristics The detectability of variations in certain crop parameters was studied by identifying the scanner s noise equivalent reflectance difference with a canopy reflectance difference caused by variation of a crop parameter The results obtained should be used in an indicative way Author (ESA)

N77-23585# Netherlands Interdepartmental Working Group on the Application of Remote Sensing Delft
THE SPECTRAL DIRECTIONAL REFLECTANCE OF ROW CROPS PART 1 CONSEQUENCES OF NON-LAMBERTIAN BEHAVIOUR FOR AUTOMATIC CLASSIFICATION PART 2 MEASUREMENTS ON WHEAT AND SIMULATIONS BY MEANS OF A REFLECTANCE MODEL FOR ROW CROPS
W Verhoef and N J J Bunnik Jun 1976 144 p refs (NIWARS-Publ-35) Avail NTIS HC A07/MF A01

The one-layer Suits model for canopy reflectance was applied to simulate a multispectral scanning flight over an agricultural area Non-Lambertian behavior and misclassification were studied on the basis of unprocessed and preprocessed data from the reflectance simulations A new experimental model for the calculation of the directional reflectance of row crops based on the one-layer Suits model is presented This model was applied to simulate measurements of the spectral directional reflectance on mechanically sowed wheat at several growth stages in the summer of 1974 In general input and output data of both model and field data agree well Specular reflection at leaves not incorporated in the present model appears to be a significant factor for crop reflectance Author (ESA)

N77-23713*# Aeronutronic Ford Corp Houston Tex Aero-Comm Engineering Service Div
SCREWWORM ERADICATION DATA SYSTEM (SEDS) PREPROCESSOR PROGRAM DOCUMENTATION, PART 1
7 Apr 1976 129 p ref
(Contract NAS9 1261)
(NASA CR-147864 JSC-10019-Pt-1) Avail NTIS HC A07/MF A01 CSCL 06C

To achieve the capability required by the Screwworm Eradication Data System (SEDS) and to process the 14 track analog tapes supplied by the National Oceanic and Atmospheric Administration the existing Earth Resources Preprocessor Software Subsystem (ERPSS) was enhanced A brief overview of the ERPSS is given along with descriptions of only those computer program components that were modified to meet the SEDS requirements Author

N77-23715*# Aeronutronic Ford Corp Houston Tex Engineering Services Div

SCREWWORM ERADICATION DATA SYSTEM (SEDS) OPERATIONAL MANUAL, PART 3

6 Jul 1976 258 p ref

(Contract NAS9-1261)

(NASA-CR 147866 JSC 10019 Pt-3) Avail NTIS HC A12/MF A01 CSCL 06C

All phases of SEDS operation as well as utility routines error messages and system disk maintenance procedures are described Display layouts and examples of runs are included as additional explanation to SEDS program procedures Author

N77-24551*# National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex

THE SCREWWORM ERADICATION DATA SYSTEM ARCHIVES

Charles M Barnes Robert R Spaulding and Lorrain E Giddings (Lockheed Electronics Co Inc) Apr 1977 30 p refs

(NASA-TM-X-58197 JSC-11432) Avail NTIS HC A03/MF A01 CSCL 06C

The archives accumulated during 1 year of operation of the Satellite Temperature-Monitoring System during development of the Screwworm Eradication Data System are reported Brief descriptions of all the kinds of tapes as well as their potential uses are presented Reference is made to other documents that explain the generation of these data Author

N77-24557*# Environmental Research Inst of Michigan Ann Arbor Infrared and Optics Div

WHEAT SIGNATURE MODELING AND ANALYSIS FOR IMPROVED TRAINING STATISTICS Final Report, 15 May 1975 - 14 May 1976

Richard F Nalepka Principal Investigator W A Malila R C Cicone and J M Gleason May 1976 170 p refs EREP

(Contract NAS9-14123)

(E77-10162 NASA-CR-150997 ERIM-109600-66-F) Avail NTIS HC A08/MF A01 CSCL 02C

The author has identified the following significant results The spectral spatial and temporal characteristics of wheat and other signatures in LANDSAT multispectral scanner data were examined through empirical analysis and simulation Irrigation patterns varied widely within Kansas 88 percent of wheat acreage in Finney was irrigated and 24 percent in Morton as opposed to less than 3 percent for western 2/3 s of the State The irrigation practice was definitely correlated with the observed spectral response wheat variety differences produced observable spectral differences due to leaf coloration and different dates of maturation Between-field differences were generally greater than within-field differences and boundary pixels produced spectral features distinct from those within field centers Multiclass boundary pixels contributed much of the observed bias in proportion estimates The variability between signatures obtained by different draws of training data decreased as the sample size became larger also the resulting signatures became more robust and the particular decision threshold value became less important

N77-24558*# Commission of the European Communities Ispra (Italy)

AGRICULTURAL RESOURCES INVESTIGATIONS IN NORTHERN ITALY AND SOUTHERN FRANCE, AGRESTE PROJECT PART 1 ACTIVITY PERFORMED ON THE ITALIAN TEST SITES Progress Report, 1 Jan - 31 Mar 1977

31 Mar 1977 22 p refs Sponsored by NASA Original contains color imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS

(E77-10163 NASA-CR-153042 PR-5) Avail NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results It was found that the standard atmospheric correction procedure cannot be successfully applied to water targets if a better correlation of MSS data with radiance input to LANDSAT sensors was not reached It was confirmed that the six line effect must be avoided unless more sophisticated data handling techniques allow subtraction of various amounts of path radiance for the six satellite detectors The COPTRAN program for atmospheric corrections of scan angle influence on atmospheric path was modified and completed Six rice varieties were discriminated in proportions ranging from 65 percent to more than 80 percent The same techniques were applied to poplar groves with a 70 percent precision

N77-24560*# Battelle Columbus Labs Ohio

BENEFITS OF AN IMPROVED WHEAT CROP INFORMATION SYSTEM Final Report

Ivan L Kinne Dec 1976 39 p refs

(Contract NASw-2800)

(NASA-CR 153006 BCL OA-TFR-76-12) Avail NTIS HC A03/MF A01 CSCL 02C

The ECON work and the results of the independent reviews are summarized Attempts are made to put this information into layman s terms and to present the benefits that can realistically be expected from a LANDSAT-type remote sensing system Further the mechanisms by which these benefits can be expected to accrue are presented The benefits are given including the nature of expected information improvements how and why they can lead to benefits to society and the estimated magnitude of the expected benefits A brief description is presented of the ECON models how they work their results and a summary of the pertinent aspects of each review The ECON analyses show that substantial benefits will accrue from implementation of an improved wheat crop information system based on remote sensing Author

N77-24569*# ECON Inc Princeton N J

UNITED STATES BENEFITS OF IMPROVED WORLDWIDE WHEAT CROP INFORMATION FROM A LANDSAT SYSTEM OVERVIEW Final Report

30 Jan 1976 47 p refs Revised

(Contract NASw-2558)

(NASA-CR-153061 Rept-76-122-1A) Avail NTIS HC A03/MF A01 CSCL 02C

The value of improvements in worldwide information on wheat crops provided by LANDSAT was measured in the context of world wheat markets These benefits were based on exiting LANDSAT technical goals and assumed that information would be made available to the United States and other countries at the same time The benefits to the United States of such public LANDSAT information on wheat crops were found to be 174 million dollars a year on the average The benefits from improved wheat crop information compare favorably with the annual system s cost of about $62 million A detailed empirical sample demonstration of the effect of improved information was developed The history of wheat commodity prices for 1971-72 was reconstructed and the price changes from improved vs historical information were compared Author

N77-24686*# Jet Propulsion Lab Calif Inst of Tech Pasadena

JPL FIELD MEASUREMENTS AT THE FINNEY COUNTY, KANSAS, TEST SITE, OCTOBER 1976 GROUND-BASED MICROWAVE RADIOMETRIC MEASUREMENTS

E G Njoku and N I Yamane 1 Apr 1977 29 p ref

(Contract NAS7-100)

(NASA-CR 153205 JPL-Publ-77-13) Avail NTIS HC A03/MF A01 CSCL 08N

Microwave brightness temperature measurements were made as part of the Joint Soil Moisture Experiment These measurements are reported with a description of the JPL microwave radiometry van facility The data will be used with ground truth data from the test site and microwave data from aircraft overflights to investigate the potential of microwave radiometry for soil moisture remote sensing under field conditions Author

N77-25604*# Lockheed Electronics Co Houston, Tex Systems and Services Div

A PRELIMINARY TRAINING GUIDE FOR UTILIZING HIGH-ALTITUDE, COLOR-INFRARED PHOTOGRAPHY IN COMPILING SOIL MAPS

J E Weaver, W H Parkhurst J F Ward, and R H Almond Apr 1977 113 p refs
(Contract NAS9-15200)
(NASA-CR-151420 LEC-8283) Avail NTIS HC A06/MF A01 CSCL 08B

Instruction for acquiring and analytically processing small-scale color-infrared photography to perform a soil resources inventory over forests of the southern U S is provided Planning the project acquiring aerial photography materials equipment and supplemental data and preparing the photography for analysis are discussed The procedures for preparing ancillary and primary component overlays are discussed The use of correlation charts and dichotomous keys for mountain landforms water regime, and vegetation is explained Author

N77-25606*# Kansas State Univ Manhattan

RESPONSE OF WINTER AND SPRING WHEAT GRAIN YIELDS TO METEOROLOGICAL VARIATION Final Report

Arlin M Feyerherm Edward T Kanemasu and Gary M Paulsen Feb 1977 142 p refs
(Contract NAS9-14282)
(NASA-CR-151429) Avail NTIS HC A07/MF A01 CSCL 02C

Mathematical models which quantify the relation of wheat yield to selected weather-related variables are presented Other sources of variation (amount of applied nitrogen improved varieties cultural practices) have been incorporated in the models to explain yield variation both singly and in combination with weather-related variables Separate models were developed for fall-planted (winter) and spring-planted (spring) wheats Meteorological variation is observed, basically by daily measurements of minimum and maximum temperatures, precipitation and tabled values of solar radiation at the edge of the atmosphere and daylength Two different soil moisture budgets are suggested to compute simulated values of evapotranspiration one uses the above-mentioned inputs, the other uses the measured temperatures and precipitation but replaces the tabled values (solar radiation and daylength) by measured solar radiation and satellite-derived multispectral scanner data to estimate leaf area index Weather-related variables are defined by phenological stages rather than calendar periods to make the models more universally applicable Author

N77-25608# World Meteorological Organization Geneva (Switzerland)

AN EVALUATION OF CLIMATE AND WATER RESOURCES FOR DEVELOPMENT OF AGRICULTURE IN THE SUDANO-SAHELIAN ZONE OF WEST AFRICA

E G Davy F Mattei and S I Solomon 1976 303 p refs Prepared in cooperation with UN Environ Program
(WMO-459 SER-9, ISBN-92-63-10459-X) Avail NTIS HC A14/MF A01 WMO Geneva

A comprehensive background of summarized hydrometeorological data and methodologies for practical application in agricultural planning and management in Mauritania, Senegal Gambia, Mali Upper Volta Niger and Czad is presented Physiography posts land cover and land use of the region are described together with the general climatological pattern The hydrological characteristics of the zone are noted, and the relation of crop yields and rainfall and rain flow is discussed Tables give results of measurements of various parameters in 27 agroclimatic areas of the zone and these are discussed ESA

N77-25626# Rome Air Development Center Griffiss AFB N Y

AGRICULTURAL CROP YIELD PREDICTION UTILIZING NARROWBAND MULTISPECTRAL, TEMPORALLY REGISTERED IMAGERY (A FEASIBILITY STUDY'S TECHNICAL REPORT AND RECOMMENDATIONS) Report for Jun 1974 - Jun 1976

Gregory B Pavlin Dec 1976 490 p refs
(AD-A037821 RADC-TR-76-380) Avail NTIS HC A21/MF A01 CSCL 02/4

Selected narrowband multispectral photography, dedicated to detecting levels of stress within corn was collected regularly at low and high altitudes over eight large agricultural test sites in Central Pennsylvania during the period of April thru October of 1974 A spectroradiometry survey was conducted at the test sites during three intervals of the 1974 corn growth cycle to verify the selection of the multispectral camera system s filters Superlative ground and image truth were collected regularly to supplement the multispectral photography of the test sites After analyzing the multispectral photography with additive color analysis techniques selected multispectral photography of three test sites spanning the entire growth cycle was digitized and registered both spectrally and temporally using the image processing resources of the Rome Air Development Center s Image Processing Facility By analyzing the digital temporally-registered multispectral image data with weather and ground truth data utilizing the techniques of multivariate and regression analysis the feasibility of agricultural crop yield prediction was investigated GRA

N77-26580*# Kansas State Univ Manhattan Evapotranspiration Lab

ESTIMATED WINTER WHEAT YIELD FROM CROP GROWTH PREDICTED BY LANDSAT Final Report, Mar 1976 - Mar 1977

Edward T Kanemasu May 1977 181 p refs
(Contract NAS9-14899)
(NASA-CR-151431) Avail NTIS HC A09/MF A01 CSCL 02C

An evapotranspiration and growth model for winter wheat is reported The inputs are daily solar radiation maximum temperature minimum temperature precipitation/irrigation and leaf area index The meteorological data were obtained from National Weather Service while LAI was obtained from LANDSAT multispectral scanner The output provides daily estimates of potential evapotranspiration transpiration evaporation soil moisture (50 cm depth) percentage depletion net photosynthesis and dry matter production Winter wheat yields are correlated with transpiration and dry matter accumulation Author

N77-26582*# Operations Research Inc Silver Spring, Md

AGRICULTURE AVIATION STUDY AND PROGRAM PLAN VOLUME 1 PROJECT SUMMARY Final Report

6 Jun 1976 51 p 2 Vol
(Contract NASw-2880)
(NASA-CR-153283) Avail NTIS HC A04/MF A01 CSCL 02C

An assessment of the impact of agricultural aviation on agricultural productivity and the technology needs of agricultural aviation are presented Author

N77-26583*# Operations Research Inc Silver Spring Md

AGRICULTURE AVIATION STUDY AND PROGRAM PLAN VOLUME 2 SUPPLEMENTAL INFORMATION Final Report

9 Jun 1976 74 p 2 Vol
(Contract NASw-2880)
(NASA-CR-153284) Avail NTIS HC A04/MF A01 CSCL 02C

An assessment of the impact of agricultural aviation on agricultural productivity and the technology needs of agricultural aviation are presented Author

N77-26589*# National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex
LACIE A LOOK TO THE FUTURE
R B MacDonald and F G Hall 29 Apr 1977 38 p refs Presented at 11th Intern Symp on Remote Sensing of Environ Ann Arbor Mich 25-29 Apr 1977
(NASA-TM-74623 JSC-11685) Avail NTIS HC A03/MF A01 CSCL 08B

The Large Area Crop Inventory Experiment (LACIE) is described The experiment s approach to production monitoring is described briefly and its status is reviewed as of the conclusion of 2 years of successful operation Examples of acreage and yield monitoring in the Soviet Union are used to illustrate the experiment s approach Author

N77-26592*# Prairie View Agricultural and Mechanical Coll Tex
MEASUREMENT OF GROWTH, MEASUREMENT AND BIDIRECTORAL SCATTERING PARAMETERS OF WHEAT Final Report
Jan 1977 28 p
(Grant NsG-9006)
(NASA-CR-151351) Avail NTIS HC A03/MF A01 CSCL 02C

This project was conducted to measure ambient air temperatures at standard 2 meter heights and surface radiative temperatures (thermal infrared radiation) over a maturing winter wheat canopy and bare sandy soil The purpose of the project was to relate ground truth measurements to satellite derived surface radiative temperatures The goal was to develop models from which satellite-derived measurements could be used to predict wheat growth patterns and yields As a corollary advantage, the data for soil moisture and temperature wind velocity relative humidity canopy characteristics and yields were also collected and added to the agronomic data bank used to develop practices which would enhance yields of grain in South Texas Author

N77-26596# Netherlands Interdepartmental Working Group on the Application of Remote Sensing Delft
ANALYSIS OF SIGNIFICANCE WITHIN CROP-SPECTRA A COMPARISON STUDY OF DIFFERENT MULTISPECTRAL SCANNERS
J N P Beers May 1975 46 p refs
(NIWARS-Publ-30) Avail NTIS HC A03/MF A01

In order to study the spectral signatures of vegetation canopies reflectance data of 11 crops were gathered during the 1973 growing season using the NIWARS double beam type spectrometer Using the spectra obtained it was possible to determine for each crop or group of crops the part of the spectrum which is most significant From this knowledge the use of the channels of different multispectral scanners is concluded in relation to the relative information content of the channels This information summary leads to quick classification resulting in a comparison of the multispectral scanners Author (ESA)

N77-26726*# Kanner (Leo) Associates Redwood City Calif
RESULTS OF UHF RADIOMETRIC AND DIRECT GROUND MEASUREMENTS OF SOIL MOISTURE IN 1975
A Ye Basharinov B M Liberman, Ye A Peutov, A A Chukhlantsev and A M Shutko Washington NASA Feb 1977 21 p refs Transl into ENGLISH of Russian report from Academy of Sciences USSR (Moscow) 1976 23 p
(Contract NASw-2790)
(NASA-TT-F-17521) Avail NTIS HC A02/MF A01 CSCL 08M

Measurement results are presented in figures and tables and they are discussed It was found that there is good correlation between radiating power at 18 cm and bulk soil moisture in the 0-30 cm layer, that the presence of cotton plants up to 1 m high causes no more than 20% error in the UHF (Ultrahigh Frequencies) measurements that it is possible to measure up to 10 gradations of moisture content of both open and planted soil by 18 cm UHF radiometry, and that good correlation between moisture content of adjacent soil layers permits estimation of the moisture reserve up to 1 m deep from UHF radiometric measurements Author

N77-27460 Kansas Univ Lawrence
EXAMINATION AND ANALYSIS OF VEGETATION BOUNDARY ZONES USING AERIAL AND ORBITAL DATA SOURCES Ph D Thesis
Norman Edward Hardy 1976 124 p
Avail Univ Microfilms Order No 77-2221

Parts of four areas Texas Kansas Wyoming and Alberta have been selected as test sites Environmental variations have been shown to exist between the four independent test areas Climates geology soils and vegetation have been discussed at length and variations between sites have been considered Dissert Abstr

N77-27461 California Univ Los Angeles
WOODY VEGETATION PATTERNS IN THE CONIFEROUS FOREST ZONE OF THE SOUTHERN SIERRA NEVADA Ph D Thesis
Paul Harvey Leskinen 1976 239 p
Avail Univ Microfilms Order No 77-1643

The composition of various types of woody vegetation under different ecological conditions in the Southern Sierra Nevada was compared Open slope vegetation in two traverses across the Sierra was sampled in a series of short transects grouped around stations at 500 foot (150 m) contour intervals It was found that altitudinal zonation is not well defined in the Southern Sierra Nevada Overall the most significant changes in vegetation occur from east to west at any given altitude rather than from north to south with climate topography the frequency of lightning fires and to a minor extent lithology as the main environmental variables There is no way to handle properly the spatial distribution of the woody plant species in terms of the traditional association Selection of dominant species would be purely arbitrary The various plant species are present in response to individual edaphic and climatic requirements Dissert Abstr

N77-27463 Kansas Univ Lawrence
VARIABILITY OF THE ACCURACY OF DELINEATING AGRICULTURAL FIELD BOUNDARIES FROM SATELLITE IMAGES OF THE UNITED STATES Ph D Thesis
David Eugene Schwarz 1976 204 p
Avail Univ Microfilms Order No 77-2275

A study of agricultural land use and its interpretation from satellite images indicates that the same level of accuracy of agricultural land use data cannot be extracted from comparably high quality satellite images from diverse environments in the southern United States The agricultural landscapes were analyzed in terms of the interpretability of the primary segments which compose them- agricultural fields or their equivalent such as woodlots The degree to which interpreted field boundaries conformed with actual field boundaries was evaluated both qualitatively and quantitatively including optical data processing Dissert Abstr

N77-27465*# Agricultural Research Service Weslaco Tex
SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS Final Report, 13 Jan 1975 - 13 Jun 1977
Craig L Wiegand Harold W Gausman Ross W Leamer Arthur J Richardson James H Everitt and Alvin H Gerbermann, Principal Investigators Jun 1977 120 p refs Original contains color imagery Original photography may be purchased from the EROS Data Center Sioux Falls, S D 57198 ERTS
(NASA Order S-53876-AG)
(E77-10175 NASA-CR-153273) Avail NTIS HC A06/MF A01 CSCL 08F

The author has identified the following significant results The best wavelengths in the 0 4 to 2 5 micron interval were determined for detecting lead toxicity and ozone damage distinguishing succulent from woody species and detecting silverleaf sunflower A perpendicular vegetation index a measure of the distance from the soil background line in MSS 5 and MSS 7 data space of pixels containing vegetation was developed and tested as an indicator of vegetation development and crop vigor A table lookup procedure was devised that permits rapid identification of soil background and green biomass or phenological development in LANDSAT scenes without the need for training data

N77-27469*# Environmental Research Inst of Michigan, Ann Arbor
THE USE OF UNSUPERVISED CLUSTERING AS A CLASSIFIER FOR LACIE MSS DATA
Alex P Pentland Principal Investigator Oct 1975 12 p refs EREP
(Contract NAS9-14123)
(E77-10179 NASA-CR-151329 ERIM-109600-39-R) Avail NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results This classification method appears to give accurate field center results and to give practical statistically consistent and accurate estimates of crop proportions The accuracy of this method is attributable to certain qualities of the particular clustering algorithm These qualities are freedom from assumptions about Gaussian data and the continual updating of distribution estimates including updating the number of modes This method is relatively tolerant of errors in the determination of crop type as crop identity is used only for identifying clusters and not for computing signatures

N77-27480*# National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex
RESULTS OF LARGE AREA CROP INVENTORY EXPERIMENT (LACIE) DROUGHT ANALYSIS (SOUTH DAKOTA DROUGHT 1976)
David R Thompson Sep 1976 39 p Original contains color illustrations
(NASA-TM-74760 LACIE-00437 JSC-11666) Avail NTIS HC A03/MF A01 CSCL 08H

LACIE using techniques developed from the southern Great Plains drought analysis indicated the potential for drought damage in South Dakota This potential was monitored and as it became apparent that a drought was developing LACIE implemented some of the procedures used in the southern Great Plains drought The technical approach used in South Dakota involved the normal use of LACIE sample segments (5 x 6 nm) every 18 days Full frame color transparencies (100 x 100 nm) were used on 9 day intervals to identify the drought area and to track overtime The green index number (GIN) developed using the Kauth transformation was computed for all South Dakota segments and selected North Dakota segments A scheme for classifying segments as drought affected or not affected was devised and tested on all available 1976 South Dakota data Yield model simulations were run for all CRD s Crop Reporting District) in South Dakota Author

N77-27481*# ECON, Inc , Princeton N J
A DISTRIBUTION BENEFITS MODEL FOR IMPROVED INFORMATION ON WORLDWIDE CROP PRODUCTION VOLUME 1 MODEL STRUCTURE AND APPLICATION TO WHEAT
John Andrews 30 Jun 1976 99 p refs
(Contract NASw-2558)
(NASA-CR-153903, Rept-76-104-1A) Avail NTIS HC A05/MF A01 CSCL 02B

The improved model is suitable for the study of benefits of worldwide information on a variety of crops Application to the previously studied case of worldwide wheat production shows that about $108 million per year of distribution benefits to the United States would be achieved by a satellite-based wheat information system meeting the goals of LACIE The model also indicates that improved information alone will not change world stock levels unless production itself is stabilized The United States benefits mentioned above are associated with the reduction of price fluctuations within the year and the more effective use of international trade to balance supply and demand Price fluctuations from year to year would be reduced only if production variability were itself reduced Author

N77-27482*# ECON Inc , Princeton N J
***A DISTRIBUTION BENEFITS MODEL FOR IMPROVED INFORMATION ON WORLDWIDE CROP PRODUCTION VOLUME 2 APPLICATION TO VARIOUS CROPS* Final Report**
John Andrews 30 Jun 1976 126 p refs
(Contract NASw-2558)
(NASA-CR-153902 Rept-76-104-1B) Avail NTIS HC A07/MF A01 CSCL 02B

ECON s distribution benefits model has been applied to worldwide distribution of corn rye oats barley soybeans and sugar and to domestic distribution of potatoes The results indicate that a LANDSAT system with thematic mapper might produce benefits to the United States of about $119 million per year due to more efficient distribution of these commodities The benefits to the rest of the world have also been calculated with a breakdown between trade benefits and those associated with internal use patterns By far the greatest part of the estimated benefits are assigned to corn with smaller benefits assigned to soybeans and the small grains (rye, oats and barley) Author

N77-27635 Kansas Univ Lawrence
GEOGRAPHIC ANALYSIS OF VARIATION ACROSS A SOIL BOUNDARY AND WITHIN SOIL MAPPING UNITS Ph D Thesis
James Batchelder Campbell Jr 1976 267 p
Avail Univ Microfilms Order No 77-2200

An 18 x 40 gridded sampling array was positioned over the boundary between two contrasting soil series the Ladysmith silty clay loam a spatially uniform soil formed from fine-textured sediments and the Pawnee clay loam a more variable, and coarser textured soil formed from glacial till The B2 horizons of both soils were sampled and the 737 samples were analyzed for gravel sand and silt content for pH and for Munsell color (hue value and chroma) Dissert Abstr

02

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis urban and metropolitan studies environmental impact air and water pollution geographic information systems and geographic analysis

A77-30303 **A bispectral method for cloud parameter determination** D W Reynolds and T H Vonder Haar (Colorado State University, Fort Collins, Colo) *Monthly Weather Review,* vol 105, Apr 1977, p 446-457 39 refs NSF NOAA Army supported research

The paper outlines the theory of the bispectral technique together with its underlying assumptions The bispectral technique analyzes the visible and IR data received at a contiguous array of scan spots in a quantitative manner for several different locations The data are used to derive the cloud amount and the cloud top temperature, cloud height is determined through an appropriate nearby vertical temperature sounding The technique is also designed to approach the problem of determining cloud amounts and heights for cloud sizes below the size of the sensor's geometric field of view An uncertainty analysis is used to show the required measurement accuracy needed for the technique to be successful The technique is verified by using data obtained from the NOAA polar orbiting satellites together with concurrent cloud estimates from the ground The bispectral technique should prove valuable in the analysis of SMS/GOES, DMSP and Tiros N satellite data sets which have simultaneous visible and IR capabilities S D

A77-30521 # **Satellite beacon studies of global F-region disturbance effects** M Mendillo (Boston University, Boston, Mass) In The geophysical use of satellite beacon observations, Proceedings of the Symposium, Boston, Mass , June 1-4, 1976 (A77 30501 13 46) Boston, Boston University, 1976, p 307 322 20 refs

A high time resolution, relative accuracy, and potential for data continuity make the satellite beacon measurements a valuable technique for the specification of ionospheric disturbances The present review concentrates on the use of the satellite beacon derived parameter total electron content (TEC) as a means of studying F region plasma disturbance effects A semi global network of TEC monitoring stations has presented the most detailed morphology of an F-region solar flare effect recorded to date (7 August 1972), and a summary of these observations is presented The satellite beacon community has also made significant contributions to the study of magnetic storm effects upon the F region Two approaches have been used construction of 'average storm patterns' at a single site, and 'case study' approach of describing a few particularly large events as observed by a network of stations Both of these schemes are reviewed, as applied to large geomagnetic storm-induced perturbations Attention is given to the great potential of using the ATS-6 satellite to study storm effects in the plasmaspheric content

(Author)

A77-31283 **Molniya data on the proton component in the earth's radiation belts** A S Kovtiukh, M I Panasiuk, and E N Sosnovets (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *(Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia,* vol 40, Mar 1976, p 496-501) *Academy of Sciences, USSR, Bulletin, Physical Series,* vol 40, no 3, 1976, p 37-41 21 refs Translation

A77-31299 **Amplitude distribution of the pulsations of electrons trapped in the inner geomagnetic field** J Kolar (Ceske Vysoke Uceni Technicke, Prague, Czechoslovakia) and S Fischer (Ceskoslovenska Akademie Ved, Astronomicky Ustav, Ondrejov, Czechoslovakia) *(Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia,* vol 40, Mar 1976, p 558-560) *Academy of Sciences, USSR, Bulletin, Physical Series,* vol 40, no 3, 1976, p 89 91 6 refs Translation

A77-31390 * **The magnetopause at 5 2 R/E/ on August 4, 1972 - Magnetopause shape and structure** R L Kaufmann (New Hampshire, University, Durham, N H) and L J Cahill, Jr (Minnesota, University, Minneapolis, Minn) *Journal of Geophysical Research,* vol 82, Apr 1, 1977, p 1573 1584 27 refs NSF Grant No DES 75 03012, Grant No NSG 7237

The relatively large magnitude magnetopause field observed in several crossings associated with the ATS 5 and Explorer 45 satellites on August 4, 1972 is used to examine the structure of the magnetopause The discussion covers magnetopause normals and their intepretation with respect to the shape of the magnetopause and to waves propagating in the magnetopause, magnetopause structure in terms of the field changes observed during magnetopause passages and of the associated magnetopause electric currents interred from the observations, and comparison of the observations with theoretical properties of open and close magnetopause models Features necessary for comparison of magnetometer observations with pertinent theories are highlighted S D

A77-31408 **Energetics of the lidar in remote detection of oil films on sea water** I Ia Gurevich (Gosudarstvennyi Okeanografi cheskii Institut, Leningrad, USSR) and K S Shifrin (Akademiia Nauk SSSR, Institut Okeanologii, Moscow, USSR) *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol 12, Aug 1976, p 863-867) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics,* vol 12, Mar 1977, p 527 529 11 refs Translation

An estimate is made of the energy entering the input of a lidar receiver system, utilizing a CO2 laser, during remote sounding of the sea Allowance is made in the calculations for attenuation of a 10 6-micron laser beam in the atmosphere as well as for variation of the sea-surface brightness coefficient as a function of wind speed It is found that the energy entering the input decreases with an increase in wind speed from 2 to 15 m/s during nadir ranging, but sharply increases during ranging at an angle of 20 deg This is attributed mainly to the variation in the brightness coefficient of a choppy sea A concrete example is examined which allows estimation of the ranging height from which an oil slick on the sea can be detected with a medium-power CO2 lidar system F G M

A77 31647 # **Use of a minimum Stormer pulse for determining a proton flare spectrum on the basis of latitude effect (Ispolzovanie minimal'nogo Shtermerovskogo impul'sa dlia opredeleniia spektra protonnoi vspyshki po shirotnomu effektu)** P I Shavrin (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Geomagnetizm i Aeronomiia,* vol 17, Jan Feb 1977, p 133, 134 In Russian

A77-31660 # **Drift mirror instability in a curved magnetic field (Dreifovo-zerkal'naia neustoichivost' v krivom magnitnom pole)** V A Pilipenko and O A Pokhotelov (Akademiia Nauk SSSR, Institut Fiziki Zemli, Moscow, USSR) *Geomagnetizm i Aeronomiia,* vol 17, Jan -Feb 1977, p 161-163 8 refs In Russian

The characteristics of drift mirror instability are reviewed, and the development of this instability is analyzed for curved geomagnetic lines of force The analysis is based on a method proposed by Mikhailovkii (1971) V P

A77-32023 # **Some applications of spherical harmonic analysis in geomagnetic investigations (Nekotorye primeneniia sfericheskogo garmonicheskogo analiza v geomagnitnykh issledovaniiakh)** N P Ben'kova (Akademiia Nauk SSSR, Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln, Krasnaya Pakhra, USSR) *Akademiia Nauk SSSR, Izvestiia, Fizika Zemli*, Jan 1977, p 65-69 9 refs In Russian

Spherical analysis of magnetic storm fields is used to produce models of external and internal induced current systems Equatorial ring currents are evaluated, and the conductivity of the earth's interior is numerically estimated A Y

A77-32914 **Distant source sensing by statistical treatment of air quality data** T E Graedel (Bell Telephone Laboratories, Inc , Murray Hill, N J) *Atmospheric Environment*, vol 11, no 4, 1977, p 313-319 6 refs

The normalized concentration rose and the concentration boxplot are introduced and applied to data on hydrogen sulfide concentrations and horizontal wind flow at a site near several sources of H2S The techniques are shown to be effective for remote identification and semiquantitative estimation of both sporadic and continuous sources and of their relative emission rates, utilizing only data that are commonly available from air quality monitoring stations (Author)

A77-33142 **Marine disposal of waste material - Potential and limitations** R C Bostrom (Washington, University, Seattle, Wash) In Ocean resources utilization, Proceedings of the Winter Annual Meeting, New York, N Y , December 5-10, 1976 Meeting sponsored by the American Society of Mechanical Engineers New York, American Society of Mechanical Engineers (Ocean Engineering Symposia Series OED Volume 3), 1976, p 131 153 27 refs

The paper describes wastes entering the marine environment, and analyzes technical and legal factors involved in their treatment. The disposal of wastes generated by seafloor installations is complicated by the increasing use of the sea for land-generated wastes. *Estimates of future waste disposal and a discussion of regulatory* trends are provided M L

A77-33535 * **NOAA-5 views dust storm** C H Vermillion (NASA, Goddard Space Flight Center, Earth Observation Systems Div , Greenbelt, Md) *American Meteorological Society, Bulletin*, vol 58, Apr 1977, p 330

A77-33653 * **Remote sensing of estuarine fronts and their effects on pollutants** V Klemas and D F Polis (Delaware, University, Newark, Del) *Photogrammetric Engineering and Remote Sensing*, vol 43, May 1977, p 599 612 16 refs NSF Grant No GI-41896, Contracts No NAS5-21937, No NAS5 20983

Estuarine fronts represent regions of extremely high gradient or discontinuity in various parameters of physical interest, the most important being the water velocity and density fields Such fronts strongly influence pollutant dispersion by capturing oil slicks and other pollutants concentrated in surface films and drawing them down into the water column Aircraft and boats were combined to study the behavior of different types of fronts in Delaware Bay and their effect on pollutants in order to provide a basis for improving an oil drift and spreading model Imagery from the Landsat satellites provided the most effective means of determining the location and extent of frontal systems over all portions of the tidal cycle This information is being used to modify the oil drift and spreading model (Author)

A77-34530 * **Intensity of the first negative band system of nitrogen in the night sky over Arecibo** J W Meriwether, Jr and J C G Walker (Arecibo Ionospheric Observatory, Arecibo, P R) *Journal of Geophysical Research*, vol 82, May 1, 1977, p 1855-1858 29 refs Grant No NsG 7104

A77-35372 **Aircraft studies of the atmospheric transfer function in the spectral intervals around 0 61, 0 744, and 1 036 microns** E M Kozlov and V V Badaev (Akademiia Nauk SSSR, Institut Fiziki Atmosfery, Moscow, USSR) *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol 12, Sept 1976, p 938-946) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics*, vol 12, Apr 1977, p 574-578 15 refs Translation

The dependence of the transfer function of the atmosphere on the optical characteristics of the atmosphere and the underlying surface in the visible and near infrared is studied on the basis of measurements obtained from aircraft A formula is proposed which permits transfer from reflected solar radiation intensities measured from satellites and aircraft to terrestrial brightnesses V P

A77-35373 **Selection of thermal and nonthermal radio emission in sounding of the earth from satellites** L G Kachurin and V I Poltinnikov (Leningradskii Gidrometeorologicheskii Institut, Leningrad, USSR) *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol 12, Sept 1976, p 947 952) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics*, vol 12, Apr 1977, p 579-582 11 refs Translation

The transition to the range of wavelengths currently used on ERTS satellites involves determination of the thermal radiation against a background of the nonthermal radiation from clouds In terrestrial and satellite measurements, there arose a signal selection problem associated with the necessity of identifying the 'thermal portion' of a signal and determining the electrical parameters of the earth's atmosphere In the present paper, the relationship between thermal and nonthermal radiation within a wide range of wavelengths is studied with a view toward the problem of their mutual selection for the determination of both the radio brightness temperature of thermal radiation and the characteristics of thunderstorm activity V P

A77 35383 **Spectral brightness of noctilucent clouds in the visible and near infrared** D P Veselov, O I Popov, V I Semenova, G I Seleznev, and E O Fedorova *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol 12, Oct 1976, p 1097-1099) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics*, vol 12, May 1977, p 674, 675 Translation

A77 35475 # **The use of laser radar for determining the pollution of the sea surface by oil products (O primenenii lazernoi lokatsii dlia opredeleniia zagriaznenia poverkhnosti moria neftepro-duktami)** O I Abramov, V I Evemin, L I Lobov, and V V Polovinko (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, Gosudarstvennyi Okeanograficheskii Institut, USSR) *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol 13, Mar 1977, p 331 334 5 refs In Russian

A backscattering lidar technique using a laser emitting at a wavelength of 0 3472 micron was used to study the pollution of the sea surface by oil products Backscattering spectra were obtained under laboratory conditions and for the Bosphorus region, and used to determine the thickness of oil product films on the water surfaces B J

A77-35661 # **Secular variations of the geomagnetic field for the period 1966 1975 studied on the basis of observations of the Ulan Bator Observatory (Vekovaia variatsiia geomagnitnogo polia za 1966 1975 gg po nabliudeniiam na Observatorii Ulan-Bator)** G Chimiddorzh, Ch Biamba, A Gunchin Ish, U Sukhbaator, and V I Afanas'eva (Akademiia Nauk Mongol'skoi Narodnoi Respubliki, Institut Fiziki i Tekhniki, Mongolia, Akademiia Nauk SSSR, Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln, Krasnaya Pakhra, USSR) *Geomagnetizm i Aeronomiia*, vol 17, Mar -Apr 1977, p 363-365 In Russian

A77-35698 # **Investigation of the optical emission of the sea (K voprosu issledovaniia opticheskogo izluchenila moria)** V V Polovinko *Geodeziia i Aerofotos'emka,* no 6, 1976, p 109-114 5 refs In Russian

An experiment was conducted during March 1975 to determine the relation between the optical emission of the Caspian Sea and the turbilization and pollution of the sea surface by oil The measuring instrumentation consisted of a radiometer with variable field for measuring the energetic characteristics of the emission in the 0 4-1 2 micron range, a scanner for operation in the 0 4-1 8 micron range, and an ellipsometer for measuring the polarization characteristics of the emission The GM-61 wave-graph was used to measure wave excitation B J

A77-36022 **Overview of IR instrumentation in ambient air monitoring** C B Ludwig (Science Applications, Inc , La Jolla, Calif) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo-Optical Instrumentation Engineers, 1976, p 48-54 29 refs

A brief overview of point and remote monitors that operate in the infrared region is given At present, optical correlations techniques are widely used in point samples Thus, a brief description of the historical development is given, which started with the nondispersive infrared (NDIR) technique and has recently emerged as the gas filter correlation (GFC) technique The basic theoretical formula tion for GFC is given Infrared remote monitors are applied more frequently in recent times They include both active and passive systems These systems come in many configurations, providing line integral, line average and line profile data The theoretical sensitivity of practical systems is discussed, including eye safety considerations for laser systems (Author)

A77-36023 * **Remote measurement of pollution from aircraft** H G Reichle, Jr (NASA, Langley Research Center, Hampton, Va) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo-Optical Instrumentation Engineers, 1976, p 55-65 13 refs

This paper discusses the problem of the remote measurement of tropospheric air pollution from aircraft platforms Following a discussion of the energy sources available for passive remote sensing and the location of the absorption bands of the gases, it describes the spectral resolution that would be required and the relative merits of the shorter and longer infrared wavelengths It then traces the evolution of one instrument concept (the gas filter correlation radiometer) to its present state, and describes flight results that show the technique to be capable of measuring carbon monoxide over water A new instrument is described that will allow the measurements to be extended to areas over land (Author)

A77-36025 **Evaluation of infrared television /IRTV/ for remote monitoring of stack effluent velocity and SO2 concentrations** E F Cross, J A McKay, and R J Nichols (Aerospace Corp , El Segundo, Calif) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo-Optical Instrumentation Engineers, 1976, p 74-83 U S Environmental Protection Agency Contract No 68-02-2242

Field measurements were carried out to determine the feasibility of using infrared television systems to measure plume characteristics of power plant stack emissions Emphasis was placed on determining the suitability of these imaging systems for monitoring sulfur dioxide concentrations and effluent velocities in stack emissions Specific objectives were (1) to obtain experimental infrared data on stack plume characteristics, (2) to establish optimum infrared television system parameters for detection and measurement of these stack plume emissions, and (3) to determine the feasibility of using the General Electric infrared vidicon to monitor stack plume parameters of interest This paper describes in detail the test equipment, measurement techniques, and resulting data associated with experiments conducted at the Duke Power Company Riverbend Station Data on observed infrared emissions from refinery burn-off stacks are also presented for comparison (Author)

A77-36443 **Global structure of geomagnetic sudden commencements** T Araki (Kyoto University, Kyoto, Japan) *Planetary and Space Science,* vol 25, Apr 1977, p 373-384 35 refs

Sudden storm commencements are analyzed using rapid-run magnetograms from eight American zone stations, and the frequent occurrence of the equatorial daytime commencement and its close correlation to commencements in the afternoon side of high latitude are established in the analysis The results are interpreted as showing the polar origin of the equatorial preliminary reverse impulse and the existence of two types of interaction between the magnetosphere and the shock or discontinuity in the solar wind during sudden storm commencements B J

A77-37161 **Simultaneous observations of particle precipitations and auroral emissions by the Isis 2 satellite in the 19-24 MLT sector** A T Y Lui, S-I Akasofu (Alaska, University, Fairbanks, Alaska), D Venkatesan, C D Anger (Calgary, University, Calgary, Alberta, Canada), W J Heikkila, J D Winningham (Texas, University, Richardson, Tex), and J R Burrows (National Research Council, Ottawa, Canada) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2210-2226 74 refs NSF Grant No DES-74-23832

The paper reports simultaneous observations of auroral emissions and particle precipitation in the 19-24 MLT (magnetic local time) sector by instruments on the Isis 2 satellite The optical intensity of the diffuse aurora is found to be produced mainly by a relatively uniform precipitation of low-energy electrons between about 100 eV and 10 keV with monotonic energy spectra Discrete auroras are embedded within diffuse aurora and are caused by highly structured and intense electron precipitation The corresponding electron energy spectrum consists of a monotonic component similar to that in the diffuse aurora and a peaked component often narrower than a Maxwellian spectrum The diffuse auroras are suggested to be the optical image of the earthward termination of the plasma sheet at the auroral altitudes, which perhaps implies that the source particles of discrete auroras lie along the geomagnetic field lines within but usually near the poleward boundary of the plasma sheet M L

A77-37169 **The effect of strong pitch angle scattering on the location of the outer-zone electron boundary as observed by low-altitude satellites** A L Vampola (Aerospace Corp , Space Sciences Laboratory, El Segundo, Calif) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2289-2294 18 refs

By using simultaneous observations of low altitude energetic electron fluxes from the magnetic electron spectrometer on OV3 3 and equatorial electron fluxes observed by ATS 1 a previously identified strong pitch angle scattering mechanism is shown to be a low-altitude phenomenon only The relationship between this scattering process and the apparent location of the outer zone energetic electron boundary as observed by low-altitude polar orbiting satellites is demonstrated The process explains observations of rapid electron boundary motions during geomagnetically quiet times In addition, by assuming that the process also explains the energetic electron spike sometimes seen at the apparent outer-zone cutoff the magnitude of the spike itself is used to determine the high altitude limit of the rapid scattering region (Author)

A77-37179 * **An alternative analysis of low- and high-altitude observations of ring current ions during a storm recovery phase** L R Lyons (NOAA, Space Environment Laboratory, Boulder, Colo) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2367 2370 15 refs NASA Order S-55028

Explorer 45 equatorial observations of ring current ions during a storm recovery phase have shown pitch angle distributions and decay

rates inconsistent with proton charge exchange with neutral hydrogen This inconsistency has led to the suggestion that recovery phase ring current ions at L less than or equal to 4 and energies not greater than 50 keV are dominated by He(+) rather than protons The absence of He(+) on flux tubes from which H(+) and O(+) were precipitating in ion mass spectrometer measurements made during the same period by the low altitude polar orbiting satellite 1971 089A led Sharp et al to suggest a source of H(+) and O(+) to L = 3 during this period An alternative explanation, in which the magnetic field lines labeled L = 3 at the earth's surface near local midnight were mapped to about 3 7 earth radii in the equatorial plane during the storm recovery phase and during the period of enhanced activity, is proposed If the proposed explanation is correct, the observations of Sharp et al are not incompatible with the conclusion that the recovery phase ions at less than 50 keV were dominated by He(+) for L not greater than 3 7 C K D

A77 37188 Tests of electrodynamic consistency from daytime ionospheric drift observations J E Salah and J V Evans (MIT, Lexington, Mass) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2413 2418 18 refs NSF Grant No GA 42230

The average electrodynamic consistency of daytime horizontal drifts in the E and F regions measured by incoherent scatter radar at Millstone Hill (Evans, 1972) with the tidal winds in the lower thermosphere at mid-latitudes derived from radar observations and tidal theory (Salah et al , 1975) is examined E region average winds derived from observed ion drifts are shown to be consistent with measurements made using other techniques and confirm the tidal structure of the lower atmosphere deduced from ion temperature observations The observed winds and electric fields are used to derive the dynamo current flowing locally in the E region and the magnetic perturbations produced at the ground, results are in good agreement with height averaged tidal winds in the lower thermo sphere corresponding primarily to the (2,4) propagating mode The magnetic fluctuations at the surface are in reasonable agreement with average mid latitude solar quiet variation These results support the suggestion that observed electric fields are of dynamo origin C K D

A77-37191 * Adiabatic evolution of trapped particle pitch angle distributions during a storm main phase L R Lyons (NOAA, Space Environment Laboratory, Boulder, Colo) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2428 2432 NASA Order S 50028

Equatorial pitch angle distributions of over 200 keV ions obtained near L = 4 by Explorer 45 during a storm main phase show the development of marked minima at 90 deg pitch angle in direct association with a greater than a-factor of 2 reduction in the equatorial magnetic field magnitude The evolution of these pitch angle distributions can be quantitatively explained as a result of conserva tion of the first two adiabatic invariants provided the magnitude of the magnetic field decrease was approximately constant along field lines (Author)

A77-38261 Airborne measurements of pollutants over urban and rural sites A J Alkezweeny and D R Drewes (Battelle Pacific Northwest Laboratories, Richland, Wash) *Journal of Applied Meteorology,* vol 16, May 1977, p 561-563 Contract No E(45 1)-1830

Results of urban pollutant measurements made during an aircraft flight downwind of St Louis are presented Decreases in the levels of SO2, NOx, and aerosol are noted, while O3 is observed to increase to more than 200 ppb at 150 km downwind The influence of a power plant plume is also observed (Author)

A77-39587 Vertical ozone distribution above several urban and adjacent rural areas across the United States. H Westberg, K J Allwine, and D Elias (Washington State University, Pullman, Wash) In Specialty Conference on Ozone/Oxidants - Interaction with the Total Environment, Dallas, Tex , March 10-12, 1976, Proceedings Pittsburgh, Pa , Air Pollution Control Association, 1976, p 84-95

An instrumented aircraft has been used to measure vertical and horizontal ozone concentrations over considerable distances Relationships between vertical ozone structure and various meteorological conditions such as temperature inversions and synoptic weather patterns are derived from these data Attention is given to oxidant studies over Phoenix, in northeastern Ohio, and over coastal New England It is clear that ozone levels exceeding 100 ppb are commonly recorded in many sections of the United States B J

A77-39974 * # Problems in characterizing atmospheric aerosols by lidar alone A C Holland (NASA, Wallops Flight Center, Wallops Island, Va) In International Laser Radar Conference, 8th, Philadelphia, Pa , June 6-9, 1977, Invited Papers
Philadelphia, Pa , Drexel University, 1977 25 p 29 refs

In this paper we review the scattering properties of real atmospheric aerosols as they relate to laser radar measurements We address two major subjects theoretical approximations for modeling lidar experiments and laboratory measurements for characterizing real aerosols In the first category we review (1) the Mueller algebra and Stokes vectors, (2) approximations for the single scattering properties of various aerosols, (3) the information content of the Mueller or scattering matrix and related limitations of lidar measure ments, and (4) the effects of multiple scattering on lidar returns In the second category we review (1) polar nephelometers, (2) calibration procedures for nephelometers, and (3) characterization of the scattering medium Finally, we summarize the outstanding problems in measuring the atmospheric aerosols by lidar alone (Author)

A77-40135 # Determination of the ozone profile from the outgoing thermal radiation (Opredelenie profilia ozona po ukhodiashchemu teplovomu izluchen iiu) E P Borisenkov, A E Kaigorodtsev, and O M Pokrovskii (Glavnaia Geofizicheskaia Observatoriia, Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) *Meteorologiia i Gidrologiia,* May 1977, p 11-22 13 refs In Russian

The effectiveness of two remote sensing techniques - the satellite nadir and limb radiant intensity measurements - in determining the spectral and angular distribution of the outgoing thermal radiation of the atmosphere-earth system in 9 6-micron ozone absorption band is assessed Some mathematical aspects of interpreting the measured thermal radiation characteristics to obtain the vertical ozone profile in the atmosphere are examined V P

A77-40247 Low-energy charged particle ring around equator in the altitude range 400-1100 km R K Kaul, H Razdan (Nuclear Research Laboratory, Srinagar, India), and J A Lockwood (New Hampshire, University, Durham, N H) *Astrophysics and Space Science,* vol 46, Jan 1977, p 215 223 12 refs

Measurements of charged-particle fluxes at energies of at least 13 MeV (if protons) by means of a detector system of high geometrical factor flown on the OGO 6 satellite reveal a ring of low-energy charged particles around equator with fluxes of the order of 50 70 particles per sq m/sec per sr in the altitude range from 400 to 1100 km The ring of charged particles exists below the inner radiation belt and is restricted to within plus or minus 4 deg of the geomagnetic equator The distribution of the maximum flux with geomagnetic latitude and L is presented Comparison of the observed fluxes with earlier measurements of low-energy particles reveals a differential power-law energy spectrum with the exponent nearly equal to 2 4 to 3 (Author)

N77-22587# Hawaii Univ Honolulu Dept of Mechanical Engineering
THE INFLUENCE OF LATERAL MASS EFFLUX ON FREE CONVECTION BOUNDARY LAYERS IN A SATURATED POROUS MEDIUM

Ping Cheng 28 Apr 1976 23 p refs
(Contract E(04-3)-1093 Grant NSF GI-38319)
(PB-261558/1 HGP-TR-13, NSF/RA-760372) Avail NTIS HC A02/MF A01 CSCL 08I

The effects of lateral mass efflux with prescribed temperature and velocity on vertical free convection boundary layers in a saturated porous medium at high Rayleigh numbers are studied Within the framework of boundary layer theory similarity solutions are obtained for the special case where the prescribed temperature and velocity of the fluid vary as (x to the lambda power) and (x to the power((lambda-1)/2)) respectively The effects of mass efflux on surface heat transfer rate and boundary layer thickness are shown Application to warm water discharge along a well or fissure to an aquifer of infinite extent is discussed GRA

N77-22595# Georgia Inst of Tech Atlanta Environmental Resources Center
OPTICAL REMOTE SENSING OF WATER POLLUTANTS Completion Report, Jul 1973 - Jun 1976
J J Gallagher and J B McManus Aug 1976 30 p refs
(Contract DI-14-31-0001-4010)
(PB-261346/1 ERC-0876 W77-02192 OWRT-A-046-GA(1)) Avail NTIS HC A03/MF A01 CSCL 13B

Calculations were performed to compare three optical scattering processes for remote sensing of water pollutants The relative merits of the Raman effect the resonance Raman effect and fluorescence are discussed The greater intensity of the fluroescence signal was considered in comparing these techniques for remote sensing Instrumentation of laser sources applicable to water pollutants monitored was investigated to identify sources currently available for light scattering experiments Preliminary measurements of Raman scattering using a single monochromator an argon ion laser as the excitation source and photon counting techniques were performed GRA

N77-22695# National Oceanic and Atmospheric Administration Boulder Colo Environmental Research Labs
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF, VOLUME 1 Principal Investigators' Reports, Apr - Jun 1976
Sep 1976 951 p refs Sponsored by Bureau of Land Management
(PB-263064/8, NOAA-76122707-Vol-1) Avail NTIS HC A99/MF A01 CSCL 13B

Quarterly reports of baseline studies on the environmental effects of the development of resources on the Alaska continental shelf are presented Baseline studies encompass the marine mammals birds fish plankton benthos and littoral biota GRA

N77-22711# Polytechnic Inst of New York Brooklyn
CORRELATION OF MATHEMATICAL MODELS FOR WATER TEMPERATURE WITH AERIAL INFRARED WATER TEMPERATURE SURVEYS
J C Cataldo, R R Zavesky and A S Goodman Dec 1976 70 p refs Sponsored by New York State Energy Res and Develop Authority
(PB-261579/7 NYSERDA-75/19) Avail NTIS HC A04/MF A01 CSCL 13B

A phenomenological model based on field measurements of heated surface discharges into Lake Michigan and Ontario and an analytic dispersion-type far field model were investigated A predictive model was developed for phenomenological relationships for surface areas within isotherms A series of exponential equations relating the surface area to the subsurface area was formulated which can predict subsurface temperatures within 1 C to at least ten feet below the surface A far field hydrothermal analytic model considering longitudinal advection and dispersion in the transverse and vertical direction was also developed GRA

N77-23580# Geological Survey Reston Va
A LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA
James R Anderson Ernest E Hardy John T Roach and Richard E Witmer 1976 31 p refs
(USGS Circ-671 USGS Professional Paper-964) Avail NTIS HC A03/MF A01 CSCL 08B

The framework of a national land use and land cover classification system is presented for use with remote sensor data The classification system was developed to meet the needs of Federal and state agencies for an up-to-date overview of land use and land cover throughout the country on a basis that is uniform in categorization at the more generalized first and second levels and that will be receptive to data from satellite and aircraft remote sensors The proposed system uses the features of existing widely used classification systems that are amenable to data derived from remote sensing sources Author

N77-23582# Netherlands Interdepartmental Working Group on the Application of Remote Sensing Delft
REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE 1 REVIEW OF REMOTE SENSING METHODS EMPHASIZING RADAR
J vanKuilenburg Jul 1975 29 p refs
(NIWARS-Publ-21) Avail NTIS HC A03/MF A01

The problem of monitoring oil pollution is described and the remote sensing methods applicable for that purpose are reviewed A detailed discussion is presented on radar observations of oil slicks and of the surrounding sea surface A selected bibliography is given Author (ESA)

N77-23583# Netherlands Interdepartmental Working Group on the Application of Remote Sensing Delft
REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE 2 DAMPING OF WATER WAVES BY AN OIL LAYER AS A POSSIBLE INDICATOR FOR SLAR OBSERVATIONS Ph D Thesis - Univ of Technol
A C Pronk Jul 1975 12 p refs
(NIWARS-Publ-22) Avail NTIS HC A02/MF A01

The damping action of oil pollution on sea waves is discussed in view of observation from the air It is found that oil layers of all thicknesses damp a part of the wave spectrum Only in the case of thicker layers is the damping related to the nature of the oil The distance over which the sea waves damp out after an oil slick has entered seems a useful indicator for the oil properties Author (ESA)

N77-23664# Defence Research Establishment Suffield Ralston (Alberta)
COMPUTER SIMULATION OF ANOMALIES CREATED BY AN ARRAY OF FERROUS OBJECTS IN THE EARTH'S MAGNETIC FIELD
R W Hemrich Nov 1976 26 p refs
(AD-A034036 DRES-Memo-29/76) Avail NTIS HC A03/MF A01 CSCL 08/14

This report describes a FORTRAN IV computer simulation of a three-dimensional array of ferrous objects and its effect on the earth s magnetic field The program output is a plot of the magnetic anomaly amplitude versus distance along a path similar to that recorded by a total field magnetometer passing over the array The array size object mass direction of the earth s field and the altitude and direction of the path of the magnetometer are controlled by the user One hundred and one computer words of storage are required for each pass This study was done as part of a Range Clearance Technology task leading to the design of equipment for the detection of unexploded ordnance found on military ranges Author (GRA)

N77-24045# National Geophysical and Solar-Terrestrial Data Center Boulder Colo
SOLAR-GEOPHYSICAL DATA NO 388 PART 1 PROMPT REPORTS DATA FOR NOVEMBER 1976 - OCTOBER 1976

Hope I Leighton Dec 1976 121 p 2 Vol
(PB-264163/7 SGD-388-Pt-1 NOAA-77012503-Pt-1) Avail NTIS HC A06/MF A01 CSCL 03B

Solar activity data gathered by Pioneer 6 and SMS-2 GOES satellite are presented in tables and graphs Also included are indexes for sudden ionospheric disturbances solar radio waves cosmic rays geomagnetism and radio propagation GRA

N77-24046# National Geophysical and Solar-Terrestrial Data Center Boulder Colo

SOLAR-GEOPHYSICAL DATA NO 388 PART 2 COMPREHENSIVE REPORTS DATA FOR JUNE 1976 - MAY 1976 AND MISCELLANEA

Hope I Leighton Dec 1976 35 p refs 2 Vol
(PB-264164/5 SGD-388-Pt-2 NOAA-77012504-Pt-2) Avail NTIS HC A03/MF A01 CSCL 03B

Information recorded by Explorer satellites is presented in tables and graphs Data provided include solar flares solar radio waves abbreviated calendar record regional flare index and a synoptic chart GRA

N77-24552*# Science Applications Inc La Jolla Calif

COMMENT ON RELATIVE ATMOSPHERIC AEROSOL CONTENT FROM ERTS OBSERVATIONS

M Griggs Principal Investigator [1976] 3 p refs ERTS (Contract NAS5-20899)
(E77-10157 NASA-CR-152711) Avail NTIS HC A02/MF A01 CSCL 04A

N77-24563*# Goodwin (Glen) Sun City Ariz

BENEFIT AND IMPACT OF THE ARIZONA LAND-USE EXPERIMENT EXECUTIVE SUMMARY

Glen Goodwin 3 Jan 1977 16 p
(NASA Order A-23739)
(NASA-CR-151985) Avail NTIS HC A02/MF A01 CSCL 08B

The benefits and impact of the Arizona Land-Use Experiment on the people of Arizona are examined along with the process of the technology transfer to the political and private sector of the Arizona community Since the remotely-sensed data in use in Arizona consisted of a blend of spacecraft and aircraft information it was hoped that the role of the aircraft in the transfer process would be identified and its benefit be determined in a real-world situation In addition the role of the institutional arrangements set up in Arizona to facilitate the transfer of remotely-sensed information to the user community was examined Author

N77-24564*# Goodwin (Glen) Sun City Ariz

BENEFIT AND IMPACT OF THE ARIZONA LAND-USE EXPERIMENT

Glen Goodwin 3 Jan 1977 91 p
(NASA Order A-23739-B)
(NASA-CR-151986) Avail NTIS HC A05/MF A01 CSCL 05B

For abstract, see N77-24563

N77-24641# California Univ Berkeley Lawrence Berkeley Lab

APPLICATION OF MICROWAVE FABRY-PEROT RESONATORS IN INSTRUMENTATION FOR AIR POLLUTION RESEARCH

H T Buscher B Leskovar and W F Kolbe 16 Feb 1976 11 p refs
(Contract W-7405-eng-48)
(LBL-4469) Avail NTIS HC A02/MF A01

The usefulness of the Fabry-Perot resonator as a sample cell in microwave spectrometer-type gaseous pollution detectors is discussed The design of a new 70 GHz semiconfocal resonator with variable microwave coupling and wide-range piezoelectric tuning is presented Experimental data were taken on cavity tuning performance and on the behavior of the variable microwave coupling structure Theoretically obtained value for the cavity Q-factor is compared with experimental data ERA

N77-24646# Office of Water Research and Technology, Washington D C Water Resources Scientific Information Center

ESTUARINE POLLUTION A BIBLIOGRAPHY, VOLUME 2

Dec 1976 579 p 2 Vol
(PB-263772/6 OWRT/WRSIC-76-207-Vol-2 W77-04109) Avail NTIS HC A25/MF A01 CSCL 13B

Selected bibliographies on water pollution of estuaries are presented I M

N77-24663# California Univ Berkeley Lawrence Berkeley Lab

INVESTIGATION OF THE USE OF THE RESONANCE RAMAN EFFECT AS AN ENVIRONMENTAL MONITOR Final Report

Owen Chamberlain Peter Robrish, and Hal Rosen Oct 1976 65 p refs
(Grant NSF AG-413)
(PB-262336/1 LBL-5288 NSF/RA-760383) Avail NTIS HC A04/MF A01 CSCL 07D

The resonance Raman effect was investigated to determine its usefulness in a Raman Lidar system Remote detection of pollutant gases experimental work in molecular spectroscopy and a description of various research activities were reviewed GRA

N77-24668# Herkimer-Oneida Counties Comprehensive Planning Program Utica N Y

LAND USE INVENTORY UPDATE AND PROJECTION UTICA-ROME AIR QUALITY MAINTENANCE AREA (AQMA) Final Report

Stephen S Olney Jan 1977 52 p
(Contract EPA-68-02-2305)
(PB-262906/1 EPA-902/4-77-001) Avail NTIS HC A04/MF A01 CSCL 13B

The Utica-Rome AQMA consists of 14 Mohawk Valley towns and cities in Herkimer and Oneida Counties New York Land uses in the area were inventoried based upon aerial photo measurements of a sample of kilometer squares Urban land uses are projected to 1980 1985 1990, and 2000 GRA

N77-24710# Lamont-Doherty Geological Observatory Palisades N Y

STUDY OF EARTHQUAKE HAZARDS IN NEW YORK AND ADJACENT STATES Annual Technical Report, 1 Jul 1975 - 30 Jun 1976

Marc Sbar Yash Aggarwal and Lynn Sykes 12 Jan 1977 104 p refs Sponsored in part by Nuclear Regulatory Commission
(PB-262248/8 NYSERDA-75/20) Avail NTIS HC A06/MF A01 CSCL 08K

Over the last five years Lamont-Doherty has installed a network of 30 short period seismic stations in New York State and adjacent parts of New Jersey and Vermont to study the seismicity stress, earthquake source properties, and crustal structure in this area The data indicate that seismic activity in New York is concentrated in the northern, western and southeastern parts of the state the central part appears to be relatively aseismic GRA

N77-25659# Environmental Protection Agency Washington D C Office of Monitoring Systems

PROCEEDINGS OF THE 2D CONFERENCE ON ENVIRONMENTAL QUALITY SENSORS

Dec 1976 779 p Conf held at Las Vegas Nevada 10-11 Oct 1973
(PB-264183/5, EPA-600/9-76-031) Avail NTIS HC A99/MF A01 CSCL 14B

The Second Conference on Environmental Quality Sensors was held at the U S Environmental Protection Agency s National Environmental Research Center Las Vegas Nevada on October 10 and 11, 1973 The papers presented covered such topics as aircraft satellite and land based remote sensing systems for monitoring and/or identifying pollutants in the air in water and on land in situ monitoring systems remote sensing techniques for land use mapping environmental impact assessment water surface temperature determination, and oil and hazardous material spills identification Environmental monitoring requirements of the EPA regions were also addressed GRA

N77-25690# California State Dept of Transportation, Sacramento Transportation Lab

TRANSPORTATION SYSTEMS AND REGIONAL AIR QUALITY AN APPROACH AND COMPUTER PROGRAM FOR WIND FLOW FIELD ANALYSIS Interim Report

James A Racin and Andrew J Ranzieri May 1976 50 p (PB-263921/9 CA-DOT-TL-7169-4-76-38, FHWA/CA-76/38) Avail NTIS HC A03/MF A01 CSCL 04B

Regional air quality studies and photochemical simulation models described the wind flow patterns for specific hours of various meteorological regimes An interdisciplinary team that includes a meteorologist and air pollution modeler an environmental planner and an air quality engineer used plots of wind vectors to design a network of wind monitoring stations Along with user instructions input forms and a computer program an approach for conducting a wind flow field analysis is presented GRA

N77-25691# General Electric Co Pittsfield, Mass Ordnance Systems

CARBON DIOXIDE LASER SYSTEM TO MEASURE GASEOUS POLLUTANTS Final Report, May 1974 - May 1975

R J Gillmeister and L R Snowman Jan 1977 111 p refs (Contract EPA-68-02-1290)
(PB-263028/3 EPA-600/2-77-009) Avail NTIS HC A06/MF A01 CSCL 07D

The development of a gas laser system for air pollution monitoring over long paths, a kilometer or more using infrared absorption is considered Modifications to a breadboard system for simultaneous detection of O3 NH3, C2H4 and the addition of beam steering optics to give the system area monitoring capability are discussed Operation for a two month period in St Louis in conjunction with the RAPS program is also discussed Data comparing system performance with that of conventional monitors is presented along with the results of problem investigations GRA

N77-26188# Lincoln Lab, Mass Inst of Tech, Lexington

SPECULAR REFLECTION TIMING PREDICTIONS FOR THE PERIOD PRECEDING THE 1977 VERNAL EQUINOX Project Report

Alan S Friedman 26 Jan 1977 33 p
(Contract F19628-76-C-0002)
(AD-A036982 ETS-8, TR-77-29) Avail NTIS HC A03/MF A01 CSCL 22/3

With the approach of the vernal equinox preparations for observing specular reflections from cylindrical synchronous satellites have begun The purpose of this report is to assemble the results of preliminary computations to make them available for observation scheduling at the GEODSS Experimental Test Site Author (GRA)

N77-26366# Motorola, Inc Scottsdale Ariz Government Electronics Div

PERFORMANCE OF COHERENT-ON-RECEIVE SYNTHETIC APERTURE SIDE LOOKING AIRBORNE RADAR Final Report, Apr - Jul 1976

D E Fraser and G V Morris Oct 1976 166 p refs Sponsored in part by Coast Guard and Army
(Contract F42600-75-A-1861)
(AD-A035032 GED-2213, USCG-D-109-76) Avail NTIS HC A08/MF A01 CSCL 17/9

The Coast Guard's Oil Slick Detection Side Looking Airborne Radar was modified to add a synthetic aperture mode The modification used the technologies of real time digital synthetic aperture processing and making the existing magnetron transmitter/receiver unit coherent-on-receive Improvement in resolution by a factor of ten and imaging of the ocean surface and moving vessels were demonstrated Synthetic oil slicks generated using Oleyl alcohol were detected by the synthetic aperture radar at a range of 25 km under 10 knot wind conditions and at 9 km under 4 knot wind Comparison imagery was taken by a standard AN/APS-94D The OSDR provided greater detection ranges of oil, due primarily to the higher sea return of the 8-foot vertically polarized antenna of the OSDR The AN/APS-94D, with the higher gain 16-foot horizontally polarized antenna, detected vessels at longer ranges Author (GRA)

N77-26570*# Department of the Northern Territory, Darwin (Australia)

LAND DEVELOPMENT IN THE DALY BASIN Progress Report, Jan 1977

B G Wood Principal Investigator 18 Jan 1977 1 p Sponsored by NASA ERTS
(E77-10155 NASA-CR-152709) Avail NTIS HC A02/MF A01 CSCL 05B

N77-26571*# Department of the Northern Territory Darwin (Australia)

LAND DEVELOPMENT IN THE DALY BASIN Progress Report

Blair G Wood Principal Investigator 4 May 1977 1 p Sponsored by NASA ERTS
(E77-10156 NASA-CR-152710) Avail NTIS HC A02/MF A01 CSCL 08B

N77-26576*# Texas Univ, Austin

DEVELOPMENT AND APPLICATION OF OPERATIONAL TECHNIQUES FOR THE INVENTORY AND MONITORING OF RESOURCES AND USES FOR THE TEXAS COASTAL ZONE Quarterly Report, Jun 1976 - Feb 1977

Peggy Harwood Principal Investigator (General Land Office Austin, Tex) Patricia Malin (General Land Office Austin Tex) Robert Finley Samuel McCulloch David Murphy Bill Hupp and John A Schell (Texas A and M Univ College Station) May 1977 101 p refs ERTS
(Contract NAS5-20986)
(E77-10174 NASA-CR-153262) Avail NTIS HC A06/MF A01 CSCL 05A

The author has identified the following significant results Four LANDSAT scenes were analyzed for the Harbor Island area test sites to produce land cover and land use maps using both image interpretation and computer-assisted techniques When evaluated against aerial photography the mean accuracy for three scenes was 84% for the image interpretation product and 62% for the computer-assisted classification maps Analysis of the fourth scene was not completed using the image interpretation technique because of poor quality false color composite but was available from the computer technique Preliminary results indicate that these LANDSAT products can be applied to a variety of planning and management activities in the Texas coastal zone

N77-26578*# Environmental Research Inst of Michigan Ann Arbor Infrared and Optics Div

REMOTE SENSING IN MICHIGAN FOR LAND RESOURCE MANAGEMENT Final Report, 1 Jun 1972 - 31 May 1977

I J Sattinger L B Istvan, N E G Roller, and D S Lowe May 1977 81 p refs
(Grant NGR-23-005-552)
(NASA-CR-153392 ERIM-193400-16-F) Avail NTIS HC A05/MF A01 CSCL 05A

An extensive program was conducted to establish practical uses of NASA earth resource survey technology in meeting resource management problems throughout Michigan As a result a broad interest in and understanding of the usefulness of remote sensing methods was developed and a wide variety of applications was undertaken to provide information needed for informed decision making and effective action Author

N77-26581*# Kentucky Univ Research Foundation Lexington Dept of Forestry
REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY Final Report, 11 Oct 1974 - 31 May 1977
Donald H Graves and George B Colthrap 31 May 1977 170 p refs
(Contract NAS8-31006)
(NASA-CR-150306) Avail NTIS HC A08/MF A01 CSCL 08H

An intensive study was conducted to determine the utility of manual densitometry and color additive viewing of aircraft and LANDSAT transparencies for monitoring land use and land use change The relationship between land use and selected water quality parameters was also evaluated Six watersheds located in the Cumberland Plateau region of eastern Kentucky comprised the study area for the project Land uses present within the study area were reclaimed surface mining and forestry Fertilization of one of the forested watersheds also occurred during the study period Author

N77-26701*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
IN SITU MEASUREMENTS OF ARCTIC ATMOSPHERIC TRACE CONSTITUENTS FROM AN AIRCRAFT
Gregory M Reck Daniel Briehl and Ted W Nyland Washington Jun 1977 64 p refs
(NASA-TN-D-8491 E-9040) Avail NTIS HC A04/MF A01 CSCL 13B

In situ measurements of the ambient concentrations of several atmospheric trace constituents were obtained using instruments installed on board the NASA Convair 990 aircraft at altitudes up to 12 5 kilometers over Alaska and the Arctic Ocean Concentration data on ozone carbon monoxide water vapor and particles larger than 0 5 micrometer in diameter were acquired Author

N77-26711# Oak Ridge National Lab Tenn
SHORT- AND LONG-TERM DISPERSION FACTORS FOR CALCULATING THE ENVIRONMENTAL BURDEN DUE TO EXHAUST AIR STREAMS
K J Vogt H Geiss and E Voelz 1974 43 p refs Transl into ENGLISH from West Ger report ZST-198
(ORNL-TR-4234, ZST-198) Avail NTIS HC A03/MF A01

The distribution of ground-level concentration is measured with about 100 sampling stations for various weather conditions and different altitudes of emission (50 and 100 m) The results show that the maxima of the ground-level concentration in comparison to the Pasquill prognostics depending on the diffusion category, are located closer to the source by a factor of 2 to 5 whereby the absolute value of the concentration at the maximum is underestimated by a factor of 2 This discrepancy may be explained by the fact that in determining the diffusion categories by the method based on synoptic observations the differing irregularities of the terrain are not taken into consideration Statistical studies are being made in order to determine the relation between the dispersion parameters measured in experiments as well as stability parameters such as for example, the Richardson number In addition studies are being conducted on the determination of the ground roughness parameters The results are used in calculating the environmental burden from emitters of harmful substances ERA

N77-26784# Battelle Columbus Labs , Ohio
THE TRANSPORT OF OXIDANT BEYOND URBAN AREAS COMPILATION OF DATA FOR THE NEW ENGLAND STUDY, 1975 Final Report
Chester W Spicer Darrell W Joseph and Gerald F Ward Nov 1976 398 p
(Contract EPA-68-02-2241)
(PB-264205/6 EPA-600/3-76-109) Avail NTIS HC A17/MF A01 CSCL 04B

A study of oxidant transport was conducted in New England for wide area and vertical aerial sampling The mobile laboratory was equipped to continuously monitor O3, NO, NO2, NOx, CH4 C2H2 C2H4 C2H6, non-methane hydrocarbon, fluorocarbon 11(F-11), CC14 CO temperature solar intensity, relative humidity, wind speed wind direction and barometric pressure The airplane was outfitted to continuously monitor ozone nitric oxide, and temperature and to collect air samples in Teflon bags The bag samples were analyzed GRA

N77-27475*# Transemantics Inc Washington, D C
THE ROLE OF SATELLITE OBSERVATIONS IN THE MANAGEMENT OF ENVIRONMENTAL RESOURCES, WITH PARTICULAR REGARD TO THE AGRESITE PROJECT
Gianna Calabresi NASA Jul 1977 10 p Transl into ENGLISH of Report no B/11156 Dept of Political Sci Rome Univ 1975 - 1976 p 143-156
(Contract NASw-2792)
(NASA-TM-X-75028) Avail NTIS HC A02/MF A01 CSCL 05A

Potential applications of LANDSAT remote sensing technology to worldwide resources management are discussed Some concern is expressed regarding a potential threat to individual national security D M L

03
GEODESY AND CARTOGRAPHY

Includes mapping and topography

A77-30901 * **A simple thermal model of the earth's surface for geologic mapping by remote sensing** A B Kahle (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif) *Journal of Geophysical Research,* vol 82, Apr 10, 1977, p 1673-1680 31 refs Contract No NAS7 100

Thermal inertia of the earth's surface can be used in geologic mapping as a complement to surface reflectance data as provided by Landsat Thermal inertia cannot be determined directly but must be inferred from radiation temperature measurements (by thermal IR sensors) made at various times in the diurnal cycle, combined with a model of the surface heating processes A model is developed which differs from those created previously for this purpose, because it includes sensible and latent heating Tests of this model using field data indicate that it accurately determines the surface heating When the model is used with field measurements of meteorological variables and is combined with remotely sensed temperature data, a thermal inertia image can be produced (Author)

A77-31562 **The use of remote sensing data in cartography** H Chismon (Hunting Surveys and Consultants, Ltd Boreham Wood, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 82-100 7 refs

Aspects of cartography and remote sensing are examined and the sources of remote sensing data for use in cartography are considered, taking into account the cartographer's requirements for remote sensing data, questions of aerial photography, side looking airborne radar, high-altitude aerial photography, Gemini and Apollo photography, Landsat imagery, and investigations conducted with the aid of Skylab Attention is given to standards of accuracy, questions of scale, and repetitive imagery G R

A77-32452 **Design of maps and map-related research** L M Potash (U S Army, Research Institute for the Behavioral and Social Sciences, Arlington, Va) *Human Factors,* vol 19, Apr 1977, p 139 150 37 refs

Three characteristics of hardcopy maps, scale, interrelatedness of symbols, and standardized symbology, are reviewed Their implications for future map-related research and design are discussed Research on types of coding used in visual displays is discussed in terms of its applicability to hardcopy maps Specific suggestions for hardcopy map design are based on the literature comparing different kinds of map products (Author)

A77-33138 # **The development of gravimetric measurements for geodesic purposes (Razvitie gravimetricheskikh izmerenii dlia geodezicheskikh tselei)** M E Kheifets *Geodeziia i Kartografiia,* Jan 1977, p 16-28 16 refs In Russian

Topics discussed include early organization of gravimetry research in the Soviet Union, precision requirements for gravimetric measurements, and gravimetric equipment and techniques Statistical, land, sea, benthic, and ballistic gravimetry are discussed The application of gravimetric measurements to defense and surveying projects is examined M L

A77-34129 # **Prologue** D G King-Hele (Royal Aircraft Establishment, Farnborough, Hants , England) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A,* vol 284, no 1326, May 11, 1977, p 421-430 21 refs

Attention is given to the utilization of measurements between stations on earth and reflectors embedded in artificial satellites or placed on the moon The discussion focuses on advances already made in geodesy and geophysics using less accurate observations of artificial satellites and briefly outlines previous lunar dynamical studies B J

A77-34131 # **The University of Hawaii lunar ranging experiment geodetic-geophysics support programme** W E Carter, E Berg, and S Laurila (Hawaii, University, Honolulu, Hawaii) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A,* vol 284, no 1326, May 11, 1977, p 451-456

The University of Hawaii will implement a comprehensive geodetic-geophysical program in support of its lunar ranging program Measurements will include (1) repeated geodetic surveys between the observatory and selected points on the island of Maui and neighboring islands, (2) repeated surveys on the island tied to ocean tide gages, (3) tilt meter monitoring of changes in the local vertical, (4) gravimetric earth tidal measurements, and (5) seismic monitoring of crustal activity B J

A77-34140 * # **Geodetic applications of laser ranging** D E Smith, R Kolenkiewicz, G H Wyatt (NASA, Goddard Space Flight Center, Greenbelt, Md), P J Dunn, and M H Torrence (Washington Analytical Services Center, Inc , Riverdale, Md) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A,* vol 284, no 1326, May 11, 1977, p 529-536 8 refs

The paper describes the use of dynamic methods of laser ranging of a low altitude satellite along with proposed experiments involving both dynamic and geodetic methods of laser ranging of the Lageos satellite Particular attention is given to the testing of laser ranging techniques across the San Andreas Fault in California where it is hoped that plate motion will be observable after several years of measurements B J

A77 34142 # **Towards a theory of irregular variations in the length of the day and core-mantle coupling** R Hide (Meteorological Office, Bracknell, Berks , England) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A,* vol 284, no 1326, May 11, 1977, p 547-554 68 refs

Studies of the fluctuations in the length of day show changes due to the transfer of angular momentum between the earth's 'solid' mantle and the overlying atmosphere on time scales upwards of a few weeks, as well as the slower but more pronounced decade variations due largely to angular momentum transfer between the mantle and the earth's liquid core The paper considers the idea of topographic coupling associated with hypothetical undulations of the core-mantle interface, quantitative difficulties being encountered in the suggestion that the stresses are electromagnetic in origin B J

A77-35260 # **Minimum areal of detection of a geosystem from the results of iconometric analysis of remote-sensing data (Minimum-areal vyiavleniia geosistemy po rezul'tatam ikonometricheskogo analize distantsionnykh dannykh)** B V Vinogradov (Akademiia Nauk SSSR, Institut Geografii, Moscow, USSR) *Akademiia Nauk SSSR, Doklady,* vol 233, Mar 1, 1977, p 253-256 In Russian

The minimum areal in the identification of a geosystem is understood to mean such an area of the system in which both the global concept of the geosystem and the integrity of the component relations are retained In terms of iconometric analysis, the minimum areal is defined as the minimal sampling aggregate of the iconographic elements of the geosystem, which (within a prescribed probability and permissible deviation) is characteristic of the global features of the system In the present paper, the determination of the

minimum areal from the iconographic characteristics of an aerial photograph is discussed and is demonstrated for an actual geosystem V P

A77-35456 # **Moraine and outwash plains** W. M. McKinney (Wisconsin, University, Stevens Point, Wis.) *Remote Sensing of the Electro Magnetic Spectrum*, vol. 4, Jan. 1977, p. 42-45

An aerial photograph on a scale of 1:20,000 over Portage County, Wisconsin, a region of postglacial topography, is analyzed. The contours of the terminal moraine and outwash plains are identified, as is an alluvial fan formed by a flow of glacial meltwater. Land use patterns are pointed out and related to topographical features. C K D

A77-35458 # **Atchafalaya wetlands mapping exercise** W. T. Mealor, Jr. (Southern Mississippi, University, Hattiesburg, Miss.) *Remote Sensing of the Electro Magnetic Spectrum*, vol. 4, Jan. 1977, p. 64-70

An applications-oriented exercise using aircraft generated color infrared photography is presented. Students apply knowledge of the edaphic and spectral characteristics of vegetation as surrogates to infer the dynamic ecological conditions in a wetlands area in the Atchafalaya River Basin. Four broadly-defined vegetation communities are used to identify areas of recently accreted land, relatively well-drained natural levees, and potential sites of increased land accretion. Surface turbidity features are also explored. Finished products are a map of vegetation and water turbidity and a land-type map. The amount of area in each classification is determined. C K D

A77-36179 # **Satellite geodesy** S. Domaradzki. *Artificial Satellites*, vol. 12, Jan. 1977, p. 27-29. 8 refs.

A method has been developed for estimating the accuracy of determining the position of a tracking station from photographic and laser observations of artificial satellites. The method was used to obtain optimal observation conditions when determining the coordinates of the Borowiec station in the Standard Earth system in relation to four reference stations whose coordinates are known. B J

A77-36522 # **Procedures and existing results of satellite geodesy (Uber Verfahren und bisherige Ergebnisse der Satellitengeodasie)** K. Rinner. *Österreichische Akademie der Wissenschaften, Matematisch-naturwissenschaftliche Klasse, Sitzungsberichte, Abteilung 2*, vol. 185, no. 4-7, 1976, p. 239-266. 16 refs. In German.

The scientific geodesy has the objective to determine, in addition to the global geometrical and gravimetrical parameters of the earth and its orientation, also the change of the parameter values as a function of time. The practical geodesy is to determine the geometrical form of all natural and artificial objects located on the earth's crust. The procedures of satellite geodesy include all methods which utilize satellites as aids for the solution of geodetic problems. Attention is given to the determination of direction, distance, the difference of distances, altitudes above the ground level, and gravity gradients. The model concepts of satellite geodesy are also discussed, taking into account geometrical procedures, dynamical procedures, and combined procedures. Tables are provided with data concerning the Goddard Earth Model (GEM) 6. G R

A77-36849 # **Method of determining the earth's gravitation potential by the measurement of the topographical coordinates of the ocean surface** I. P. Nedialkov, D. N. Mishev, and T. K. Ianev (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia za Kosmicheski Izsledvaniia, Sofia, Bulgaria) *Bolgarskaia Akademiia Nauk, Doklady*, vol. 30, no. 3, 1977, p. 367-370

A method is proposed for determining the geopotential from ocean-surface topographical data. Data were obtained from Skylab and Geos III altimeter readings. It is assumed that only gravity anomalies affect the function which describes ocean-surface topography. The distribution function of the gravitation potential above the ocean surface is derived. Additional calculations are presented concerning the interaction of the earth's mass with a disturbing mass. M L

A77-36998 * **An astrogeodetic geoid of Japan** Y. Ganeko (Smithsonian Astrophysical Observatory, Cambridge, Mass.) *Journal of Geophysical Research*, vol. 82, June 10, 1977, p. 2490-2500. 16 refs. Grant No. NGR-09-015-002

Three kinds of astrogeodetic geoid maps for Japan are presented: one referred to the global (18, 18) geoid of the 1973 Smithsonian Standard Earth (3) (SE 3), one referred to the ellipsoid of the SE 3 system, and one referred to the reference ellipsoid of the Tokyo datum. Interpolations of the deflection of the vertical are carried out by a least squares estimation method. The geoid height differences obtained are compared with solutions of satellite-derived station positions. (Author)

A77-37600 # **Automatic interpretation of topographic landscape aerial photographs (K voprosu ob avtomaticheskom deshifrovanii aerofotoizobrazhenii ploshchadnykh topograficheskikh ob'ektov)** V. I. Gorbunov, B. N. Epifantsev, and V. A. Molodykh (Tomskii Politekhnicheskii Institut, Tomsk, USSR) *Geodeziia i Aerofotos'emka*, no. 1, 1977, p. 91-96. 8 refs. In Russian.

In the present paper, the concept of treating aerial photographs of topographic areal features as random optical-density fields is used to formulate, within the framework of probability and random-process theories, a methodological approach to automatic interpretation. In this approach, interpretation may be centered on any one of the three following issues: the identification of the boundaries of random texture fields, the establishment of the class to which the identified field belongs, and the numerical evaluation of the field parameters of particular interest. Some specific aspects of solving the automation problem are examined. V P

A77-37804 **Short arc reductions of GEOS-3 altimetric data** G. Hadgigeorge (USAF, Geophysics Laboratory, Bedford, Mass.) and J. E. Trotter (DBA Systems, Inc., Melbourne, Fla.) *Geophysical Research Letters*, vol. 4, June 1977, p. 223-226. 6 refs.

The Air Force Geophysics Laboratory (AFGL) computer program SARRA (Short Arc Reduction of Radar Altimetry) has been used for geoid determination with altimetric observations from the GEOS-3 satellite. A unique feature of SARRA is the simultaneous recovery of the orbit parameters and the surface coefficients as defined by the kernel function analysis. Orbits good to approximately 20 meters are adequate for precise geoid determinations by virtue of the orbital adjustment in the reductions. Altimetric data over adjacent areas of the Indian and South Pacific Oceans and a portion of the North Atlantic have been processed with the SARRA program. Preliminary results indicate that highly accurate reference orbits are not a stringent requirement for the AFGL SARRA reductions. The recovered geoid in the GEOS 3 calibration area shows good agreement with gravimetric geoids in that area. (Author)

A77-37951 **Actual tasks of satellite geodesy (Aktuelle Aufgaben der Satellitengeodasie)** R. Sigl. *Zeitschrift fur Vermessungswesen*, vol. 102, no. 1, 1977, p. 20-40. 43 refs. In German.

The development of satellite geodesy is briefly reviewed and its objectives and significance are examined. The objectives of geodesy can be assigned to four different areas. In certain cases, needed geodetic data can only be obtained with the aid of satellite experiments. In many cases, however, satellite geodesy can only supply the global framework for a classification of the results of astrogeodetic and gravimetric methods. In particular, in connection with improvements concerning the accuracy of laser distance measurements, satellite geodesy will provide in the future more contributions to geodynamics. The operational procedures of satel-

lite geodesy are discussed, taking into account aspects of satellite motion, the characteristics of geodetically employable satellites, questions of satellite observations, and the geodetic utilization of artificial earth satellites Attention is given to problems of a refined geoid determination with the aid of satellite methods G R

A77-38483 On airborne wave tilt measurements R J King *Radio Science,* vol 12, May-June 1977, p 405-414 22 refs Research supported by the Danmarks Tekniske Hojskole and University of Wisconsin, NSF Grant No GK 21218A

The relationship between the wave tilt and the local surface impedance for ground waves propagating over a nonhomogeneous surface has been studied It is shown that a sufficient condition for their equivalence is that the normal (vertical) electric field and the tangential (horizontal) magnetic field be simply related by the intrinsic impedance of free space The 'phase quadrature' airborne method of measuring the imaginary part of the wave tilt is modified to allow measurement of the imaginary part of the surface impedance A second method for airborne measurement of the wave tilt is also proposed It uses two orthogonal electric dipoles lying in the plane of incidence, oriented so that errors resulting from small mechanical misalignment are second order The system is best suited for airborne reconnaissance mapping of poorly conducting areas, giving basic information concerning the electrical properties and structure of the uppermost few meters of ground (Author)

A77-38773 * Thermal inertia mapping - A new view of the earth J C Price (NASA, Goddard Space Flight Center, Atmospheric and Hydrospheric Applications Div , Greenbelt, Md) *Journal of Geophysical Research,* vol 82, June 20, 1977, p 2582-2590 12 refs

The thermal response of a substance to a time-varying surface power input is determined by its thermal inertia Remote sensing (e g , from satellites) can be utilized to measure this property, which is related to surface composition or to near-surface soil moisture An algorithm is developed which relates thermal inertia to remote measurements of surface temperature and reflectance Application to geosynchronous satellite data illustrates the contrast between irrigated and desert areas in the region north of the Gulf of California The effect of local weather conditions (latent and sensible heat transfer to the atmosphere) must be estimated before precise values for thermal inertia can be specified (Author)

N77-22582*# Jet Propulsion Lab Calif Inst of Tech Pasadena
TRANSFORMATIONS FROM AN OBLATE SPHEROID TO A PLANE AND VICE VERSA THE EQUATIONS USED IN THE CARTOGRAPHIC PROJECTION PROGRAM MAP2
Denis A Elliott and Arnold A Schwartz 15 Feb 1977 29 p refs
(Contract NAS7-100)
(NASA-CR-152679 JPL-Publ-77-7) Avail NTIS HC A03/MF A01 CSCL 08B

The relationships between the coordinates of a point on the surface on an oblate spheroid and the coordinates of the projection of that point in several common map projections are discussed Because several of the projections are conformal the theory of conformally mapping an oblate spheroid to the plane is summarized For each projection considered the equations which map the spheroid to the plane and their inverses are given Author

N77-22601# National Geodetic Survey Rockville Md
DETERMINATION OF NORTH AMERICAN DATUM 1983 COORDINATES OF MAP CORNERS
T Vincenty Oct 1976 14 p ref
(PB-262442/7 NOAA-TM-NOS NGS-6 NOAA-76112905) Avail NTIS HC A02/MF A01 CSCL 08B

The use of Doppler data is reported in predicting approximate changes of coordinates of map corners from the North American Datum 1927 (NAD 27) to the North American Datum 1983 (NAD 83) system A brief description of the computer program and pertinent mathematical formulas are included GRA

N77-22603# Colorado School of Mines Golden
GEOTHERMAL EXPLORATION AN EVALUATION OF THE MICROSEISMIC GROUNDNOISE METHOD Ph D Thesis
Jacob Jerome Skokan 1974 126 p refs
(PB-262575/4 T-1701 NSF/RA/N-74 318) Avail NTIS HC A07/MF A01 CSCL 08I

An attempt to test the geothermal-groundnoise hypothesis--that is geothermal reservoirs are dynamic systems and can be located by measuring ground motion above them-resulted in extensive groundnoise surveys in two areas which appear to have great geothermal potential These surveys were carried out at Kilauea Volcano and the East Rift of Kilauea Volcano on the island of Hawaii Even in this relatively ideal environment the surveys indicated changes in the acoustic properties of rocks rather than changes in groundnoise activity resulting from dynamic geothermal reservoirs GRA

N77-22752# Litton Systems, Inc Woodland Hills Calif Guidance and Control Systems Div
POST-MISSION SMOOTHING AND ANALYSIS OF THE MEASUREMENTS OF THE CHANGE IN THE DEFLECTION OF THE VERTICAL OBTAINED BY THE RAPID GEODETIC SURVEY SYSTEM (RGSS) AT THE WHITE SANDS TEST RANGE
James R Huddle and Richard H Lentz Sep 1976 349 p
(Contract DAAG53-75-C-0248)
(AD-A032525 ETL-0065) Avail NTIS HC A15/MF A01 CSCL 08/5

The objectives of this report were (1) to apply off-line post-mission smoothing to raw real-time estimates of the changes in the deflection of the vertical as collected by the Rapid Geodetic Survey System (RGSS) at White Sands (2) to analyze the residual errors in the smoothed estimates of the changes in the deflection of the vertical for those runs where reference change information was available to determine significant sources of estimate degradation and (3) to recommend a further course of action as a result of this analysis which should lead to improvement in the deflection recovery accuracy of the RGSS Author (GRA)

N77-23563 Oklahoma State Univ Stillwater
STANDARD MAPS AND THE CLASSIFICATION OF TOPOLOGICAL SPACES Ph D Thesis
Gary Michael Huckabay 1976 45 p
Avail Univ Microfilms Order No 77-5100

The original definition of standard map is modified so as to obtain classification theorems in a more general setting Algebraic and topological properties of standard maps are also examined Vobach s original definition of standard map is modified so that classification theorems for locally compact separable metric spaces and complete separable metric spaces are obtained It is shown that X is connected if and only if G(f X) cannot be written as a direct sum Sufficient conditions in terms of G(f X) for X to be contractible or to have the fixed point property with respect to homeomorphisms A group A(f X) is defined which contains G(f X) as a closed normal subgroup It is shown that a certain subgroup of H(X) is the continuous homomorphic image of A(f X) Furthermore G(f X) is the kernel of this map Dissert Abstr

N77-23593# California Univ Riverside Inst of Geophysics and Planetary Physics
TELLURIC MAPPING OVER THE MESA GEOTHERMAL ANOMALY IMPERIAL VALLEY, CALIFORNIA

John P Maas 1975 12 p refs Sponsored by NSF
(PB-262828/7 IGPP-UCR-75-10 NSF/RA/N-75 361) Avail NTIS HC A02/MF A01 CSCL 08I

Telluric measurements were made at thirty-nine stations in the vicinity of the Mesa Geothermal Anomaly Imperial Valley California to evaluate the usefulness of the method as a geothermal prospecting tool The area of investigation is characterized by thick (about 3 km) and highly conductive (resistivity on the order of 5 ohm-m) sediments Relative ellipse areas were determined for the stations and plotted as total field and residual contour maps These maps clearly reveal the presence of the thermal anomaly They coincide well in geometry with the anomaly shown by shallow thermal gradient data and are consistent with temperature data from five deep wells in the area GRA

N77-23651# Ohio State Univ Columbus Dept of Geodetic Science
GEODETIC ACCURACIES OBTAINABLE FROM MEASUREMENTS OF FIRST AND SECOND ORDER GRAVITATIONAL GRADIENTS Interim Report
Klaus-Peter Schwarz Hanscom AFB Mass AFGL Aug 1976 62 p refs
(Contract F19628-76-C-0010 OSURF Proj 4214 A1)
(AD-A031331 DGS-242 AFGL-TR-76-0189 SR-4) Avail NTIS HC A04/MF A01 CSCL 08/5

The accuracy of an airborne accelerometer-gradiometer system is studied for geodetic applications A detailed analysis of interpolation downward continuation and mean value determination is given using the method of least-squares collocation The influence of measuring errors is considered and the contribution of accurate satellite altimetry to a combined accelerometer-gradiometer system is taken into account The results of this study show that a system of this kind can significantly contribute to our knowledge of the anomalous gravity field if second-order gravitational gradients can be measured with an accuracy of a few Eotvos Author (GRA)

N77-23675 Deutscher Wetterdienst Offenbach am Main (West Germany)
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE VOLUME 18, NO 139 MONTHLY PRECIPITATION MAPS FOR THE ENTIRE GLOBE [BERICHTE DES DEUTSCHEN WETTERDIENSTES BAND 18, NR 139 MONATSKARTEN DES NIEDERSCHLAGS FUER DIE GANZE ERDE]
Lutz Jaeger 1976 51 p refs In GERMAN ENGLISH summary
(ISBN-3-88148-147-8) Avail Issuing Activity

The maps were plotted with grid-points of precipitation values The surface of the earth was divided into 2 592 five-degree fields in the center of which were situated the grid-points For each grid-point monthly values of precipitation data were determined On the continents this was realized by using climatic atlases with monthly maps as far as possible from the registration period 1931 to 1960 on the oceans the annual map of Geiger was used The monthly precipitation rates were determined with the help of percentage frequencies from the atlases of the U S Navy On the basis of the monthly grid-point-values found monthly maps of precipitation were plotted for the whole earth The sum of the monthly values permitted the construction of a new annual map In addition to this balances were computed as well as the monthly and in zonal relation for land and oceans for twelve big areas shaped on the surface of the earth As far as possible the results were compared with those from earlier publications for example with the isopleth-diagrams of Brooks/Hunt the quarterly values of Moller or the American simulations of global precipitation on data processing machines The precipitations in the tropical Pacific are looked at separately using an atlas made with island data by Taylor The correlation of the monthly amounts of precipitation over South America and Africa are also examined with the length of the ITC Author (ESA)

N77-25617# Control Data Corp Minneapolis Minn Image Systems Div
DIGITAL CARTOGRAPHIC STUDY AND BENCHMARK Interim Technical Report
D J Panton and M E Murphy Sep 1976 44 p
(Contract DAAG53-75-C-0195)
(AD-A035157 ETL-0092 IR-3) Avail NTIS HC A03/MF A01 CSCL 08/2

The work and findings of Phase C are to implement and test--on fast microprogrammable processors--the stereo matching algorithm that was designed and analyzed in AD s A035 155 and A035 156 This implementation was performed in terms of a benchmark to shed some light on the practicality of such a concept and to uncover the advantages and disadvantages of this particular kind of parallel processing application The results stem from actually performing the benchmark rather than from a paper study outlining the approach to be taken The benchmark was evaluated both in terms of its speed and accuracy It was found that it takes about 11 hours of CDC 6600 processing to complete the correlation and matching of a typical 9x9 inch frame stereo overlap area while the benchmark implementation can process the same area in a little over one-half hour GRA

N77-25618# Army Engineer Topographic Labs Fort Belvoir Va
HOLOGRAPHIC TERRAIN DISPLAYS
Michael M McDonnell Oct 1976 54 p refs
(DA Proj 4A1-61102-B-52C)
(AD-A035154 ETL-0083) Avail NTIS HC A04/MF A01 CSCL 08/2

The suitability of holography as a method for recording and reproducing visual displays of terrain is examined in a tutorial non-mathematical manner The paper is based chiefly on a literature search combined with some original work by the author A brief introduction to the terminology of holography is followed by an exposition of a scheme of classifying hologram types which is used in the rest of the paper Consideration of requirements for 3-D displays in general and the particular problem of making holograms of terrain is followed by a detailed discussion of the different types of hologram and how they may be used to make terrain displays with different characteristics Emphasis is on the 2-photograph stereoscopic hologram which is called a holographic stereomodel Techniques to enhance certain characteristics of holographic displays such as color rendition and efficient use of illumination are examined and possible uses of holography in tasks related to map making are suggested GRA

N77-26573*# Instituto Geofisico del Peru Lima
APPLICATION OF REMOTE SENSING TECHNIQUES FOR THE STUDY AND EVALUATION OF NATURAL RESOURCES IN PERU Progress Report
Jose Pomalaza Principal Investigator [1976] 5 p Sponsored by NASA Original contains imagery Original photography may be purchased from the EROS Data Center, Sioux Falls S D 57198 ERTS
(E77-10171 NASA-CR-153227) Avail NTIS HC A02/MF A01 CSCL 08F

There are no author-identified significant results in this report

N77-26608# Naval Surface Weapons Center Dahlgren Va
MAP PROJECTION EQUATIONS Final Report
Frederick Pearson II Mar 1977 343 p refs
(AD-A037381 NSWC/DL-TR-3624) Avail NTIS HC A15/MF A01 CSCL 08/2

Map projection equations in cartesian coordinates are derived for the most important mapping schemes The important unifying principles of differential geometry are applied to produce the equal area conformal and conventional projections This report has collected under one cover the major map projections useful to scientists and engineers The notation is uniform The derivations proceed in all cases from first principles to usable equations suitable for hand plotting digital/analog plotting or CRT display

The problem is stated and the reader is introduced to the terminology of the art of map projections Basic transformation theory is introduced and then particularized for the transformation from the spheroid or sphere onto a developable surface The criterion for the derivations is to use the most simple and direct approach The model of the earth is then considered The most recent parameters to describe the figure of the earth are given and tables incorporating these are included for meridian length parallel length and the relation between geodetic and geocentric latitude The computer programs which generated these tables are included in the appendix Equal area conformal and conventional projection equations are derived These equations are incorporated into an original computer program which generated the map plotting tables for the most important projections This program which produces either a complete grid or individualized points is also in the appendix Since the proof of all of the derivations is a correct graticule of meridians and parallels original figures of these have been produced The plotting tables and the figures reflect the modern parameters for the earth GRA

N77-26609# Naval Weapons Center China Lake Calif
A TECHNIQUE FOR MEASURING OPTICAL LINE OF SIGHT Technical Publication, Jan - Jul 1976
Carol J Burge and Judith H Lind Jan 1977 47 p refs
(AD-A037191 NWC-TP-5916) Avail NTIS HC A03/MF A01 CSCL 08/6

This report is a companion to NWC TP 5908 Line-of-Sight Handbook Its purpose is to explain how the data were collected and the computations made to produce the data presented in that report The objective of this masking measurement program is to present probability of line of sight (LOS) as a function of terrain range and altitude Preparation of the handbook included carrying out a literature search to determine if the required data existed and if it did not if there was a proven technique that could be used to obtain it Map studies field studies and models were examined Models were rejected for use because their correlation with reality was not known Information obtained from maps has many advantages but also limitations--mainly that there is no good way to determine the effects of vegetation on LOS There were some field data in existence but information was all gathered for particular sites with no attempt made to generalize according to types of terrain However the literature search did result in discovery of a technique that could be used with some modification to obtain desired data on LOS in the field As a result of the lack of detailed and generalizable information it was decided to undertake a measurement program that would describe the LOS characteristics of various types of terrain GRA

N77-27091# IIT Research Inst Annapolis Md
ALASKAN AIR NAVIGATION REQUIREMENTS VOLUME 3 FAA ALASKAN VHF OMNIDIRECTIONAL RANGE (VOR) SITE COVERAGE Final Report
Robert L Harlem and Henry Bernstein Jan 1977 21 p
(Contracts DOT-FA70WAI-175 F19628-76-C-0017)
(AD-A038663 ECAC-PR-75-077-Vol-3, FAA-RD-76-27-Vol-3)
Avail NTIS HC A02/MF A01 CSCL 17/7

Map overlays were developed for 30 existing and 28 proposed VOR sites in Alaska for the Federal Aviation Administration The overlays were to be utilized to determine the VOR coverage provided by these sites in Alaska A new terrain data extraction technique called the Chromatic Extraction Technique, was developed for this task and is described Author

N77-27255# National Geodetic Survey Rockville Md
TEST RESULTS OF FIRST-ORDER CLASS III LEVELING
Charles T Whalen and Emery Balazs Nov 1976 37 p refs
(PB-265421/8, NOAA-TR-NOS-68 NOAA-TR-NOS-68-NGS-4 NOAA-77012502) Avail NTIS HC A03/MF A01 CSCL 08E

The National Geodetic Survey has programmed for a partial releveling of the first order, National vertical control net and for readjustment of the entire first- and second-order net during 1977 through 1985 In the past first-order class I or II double run leveling was used exclusively to establish and relevel the first-order net Programmed funds permit releveling and replacing destroyed marks on approximately half of the National first-order net by double-run leveling or on essentially the entire net by new first-order class III single-run leveling The new specifications, based on an analysis of leveling errors were field-tested on a level line from Waldorf to Baltimore Md between December 1975 and April 1976 Test results indicate that first-order class III leveling can provide a viable alternative to first-order class I leveling for releveling the first-order National vertical control net GRA

N77-27462 Wisconsin Univ Madison
THEORETICAL AND PRACTICAL RELATIONSHIPS BETWEEN REMOTE SENSING AND CARTOGRAPHY Ph D Thesis
Arthur Jon Kimerling 1976 309 p
Avail Univ Microfilms Order No 76-25566

A limited version of a system which combines remote sensing and cartography into a single improved strategy for handling geographic information was developed which in expanded form could serve as a prototype for digitally based thematic mapping systems The model utilizes a local smoothing operator which is iterative and frequency based to simplify nominal level classified data A thorough statistical comparison of vegetation maps of the same area created through application of traditional manual methods and produced by these two means increases with each simplification iteration Guidelines as to the number of iterations neighborhood size and reclassification threshold needed to satisfactorily simplify classified data were also determined The results of this modern mapping experiment illustrate the close relationship that exists between the two fields at the present time and demonstrate the need to combine remote sensing and cartographic activities Dissert Abstr

N77-27474*# Kanner (Leo) Associates, Redwood City Calif
LANDSAT (ERTS) USED AS A BASIS FOR GEOLOGICAL VOLCANOLOGICAL MAPPING IN THE CENTRAL ANDES
S Kussmaul and C E Brockman Washington NASA Jul 1977 19 p refs Transl into ENGLISH from Geol Jahrb (Hanover W Germany) v A33 1976 p 133-144
(Contract NASw-2790)
(NASA-TM-75024) Avail NTIS HC A02/MF A01 CSCL 08G

LANDSAT images of the central Andes (N-Chile W-Bolivia) were effectively used for volcanological mapping of an area about 160 000 km The map shown exhibits more and better details than the older small scale geological maps of that area Even on a scale of 1 1 000 000 details greater than 200 m in size are recognizable The interpretation of LANDSAT images makes it possible to establish relative age sequences of strato-volcanoes Finally the images will also be helpful in prospecting for mineral deposits and geothermal sources Author

N77-27632 Ohio State Univ Columbus
MONITORING OF CRUSTAL MOVEMENTS IN THE SAN ANDREAS FAULT ZONE BY A SATELLITE-BORNE RANGING SYSTEM Ph D Thesis
Muneendra Kumar 1976 152 p
Avail Univ Microfilms Order No 77-2439

The Close Grid Geodynamic Measurement System is conceived as an orbiting ranging device with a ground base grid of reflectors or transponders (spacing 1 0 to 30km) which are projected to be of low cost (maintenance free and unattended) and which will permit the saturation of a local area to obtain data useful to monitor crustal movements in the San Andreas fault zone A station network of 75 stations covering an area between 36 deg N and 38 deg N latitudes and 237 deg E and 239 deg E longitudes is envisioned with roughly half of the stations on either side of the faults Laser radar is considered to be the main ranging system pending final selection from many possible candidates Geometric and short arc modes are the two main methods for handling ranges and solution/adjustment of the system Dissert Abstr

04
GEOLOGY AND MINERAL RESOURCES

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

A77-31739 * **Uranium in NIMROC standard igneous rock samples** M W Rowe (Texas A & M University, College Station, Tex) and J M Herndon (California, University, La Jolla, Calif) *Geochemical Journal*, vol 10, 1976, p 219 221 Research supported by the Robert A Welch Foundation, Grant No NGR 44-001-152

Results are reported for analysis of the uranium in multiple samples of each of six igneous-rock standards (dunite, granite, lujavrite, norite, pyroxenite, and syenite) prepared as geochemical reference standards for elemental and isotopic compositions Powdered rock samples were examined by measuring delayed neutron emission after irradiation with a flux of the order of 10 to the 13th power neutrons/sq cm per sec in a nuclear reactor The measurements are shown to compare quite favorably with previous uranium determinations for other standard rock samples F G M

A77-31740 * **Uranium in rock standards JG-1 and JB-1** M W Rowe (Texas A & M University, College Station, Tex) and J M Herndon (California, University, La Jolla, Calif) *Geochemical Journal*, vol 10, 1976, p 163, 164 12 refs Grant No NGR-44-001-152

A77-33505 # **Analysis of noise during aero-electrical prospecting by the method of transient processes (Analiz pomekh pri aeroelektrorazvedke metodom perekhodnykh protsessov)** A A Vakul'skii, F M Kamenetskii, A S Lutsyshin, V A Mamaev, and V M Timofeev *Otbor i Peredacha Informatsii*, no 48, 1976, p 41 47 In Russian

The noise level acting on the magnetic sensors is the main factor limiting the search depth during the airborne electrical prospecting for ferrous metals in the earth The paper considers methods for suppressing the effects of synchronous, nonsynchronous and contact noise on an inductive sensor B J

A77-36999 **Geothermal significance of magnetotelluric sounding in the eastern Snake River Plain-Yellowstone region** W D Stanley (U S Geological Survey, Denver, Colo), J E Boehl, F X Bostick, and H W Smith (Texas, University, Austin, Tex) *Journal of Geophysical Research*, vol 82, June 10, 1977, p 2501-2514 42 refs Research supported by the U S Geological Survey and NSF

Magnetotelluric sounding along a profile extending from the Raft River geothermal area in southern Idaho to Yellowstone National Park in Wyoming reveal a highly anomalous crustal structure involving a conductive zone at depths that range from 18 km in the central park of the eastern Snake River Plain to 7 km beneath the Raft River thermal area and as little as 5 km in Yellowstone It is determined that the conductive zone at shallow depths is probably caused by elevated temperatures, and noted that these findings should have an impact on geothermal exploration and on the estimation of the total geothermal resources of the western United States B J

N77-22584*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST
Lewis J Allison Washington Apr 1977 81 p refs
(NASA-TN-D-8469 G7702-F6) Avail NTIS HC A05/MF A01 CSCL 08G

Large plateaus of Eocene limestone and exposed limestone escarpments in Egypt and Saudi Arabia respectively were indicated by cool brightness temperatures recorded by the Nimbus-5 electrically scanning microwave radiometer (ESMR) over a 2-year period Nubian sandstone desert eolian sand and igneous-metamorphic rock of the Pliocene Miocene Oligocene and Cretaceous periods were differentiated from these limestone areas by warm T sub B values These brightness temperature differences are a result of seasonal in-situ ground temperatures and differential emissivity of limestone and sand sandstone and granite whose dielectric constants are 6 to 8 9 and 2 9 and 4 2 to 5 3 respectively at 19 35 GHz Author

N77-22741*# Jet Propulsion Lab Calif Inst of Tech Pasadena
APPLICATIONS OF AEROSPACE TECHNOLOGY TO PETROLEUM EXPLORATION VOLUME 1 EFFORTS AND RESULTS
Leonard D Jaffe 30 Sep 1976 145 p refs 2 Vol
(Contract NAS7-100)
(NASA-CR-152694 JPL-Doc-5040-32-Vol-1) Avail NTIS HC A07/MF A01 CSCL 08G

The feasibility of applying aerospace techniques to help solve significant problems in petroleum exploration is studied Through contacts with petroleum industry and petroleum service industry important petroleum exploration problems were identified For each problem areas of aerospace technology that might aid in its solution were also identified where possible Topics selected for investigation include seismic reflection systems down-hole acoustic techniques identification of geological analogies drilling methods remote geological sensing and sea floor imaging and mapping Specific areas of aerospace technology are applied to 21 concepts formulated from the topics of concern Author

N77-22742*# Jet Propulsion Lab , Calif Inst of Tech Pasadena
APPLICATIONS OF AEROSPACE TECHNOLOGY TO PETROLEUM EXPLORATION VOLUME 2 APPENDICES
Leonard D Jaffe 30 Sep 1976 296 p refs 2 Vol
(Contract NAS7-100)
(NASA-CR-152693 JPL-Doc-5040-32-Vol-2) Avail NTIS HC A13/MF A01 CSCL 08G

Participants in the investigation of problem areas in oil exploration are listed and the data acquisition methods used to determine categories to be studied are described Specific aerospace techniques applicable to the tasks identified are explained and their costs evaluated A R H

N77-24571# Southwest Research Inst San Antonio, Tex Div of Geothermal Energy
DEVELOPMENT OF AN ASSESSMENT METHODOLOGY FOR GEOPRESSURIZED ZONES OF THE UPPER GULF COAST BASED ON A STUDY OF ABNORMALLY PRESSURED GAS FIELDS IN SOUTH TEXAS Final Report
R K Swanson P Oetking J S Osoba and R C Hagens
Aug 1976 122 p refs
(Contract E(11-1)-2687)
(COO-2687-5) Avail NTIS HC A06/MF A01

Individual fields were assessed for their potential to produce large quantities of geothermal fluid based on reservoir study and detailed geological investigation Five locations within the study region have been selected as potential candidates for further evaluation and possible eventual testing Based on investigation of permeability and temperature, the upper limit of fluid temperature likely to be produced in the lower south Texas study region is 300 F In Live Oak County the possibility of producing fluid at higher temperatures is somewhat improved with a reasonable possibility of producing fluid at 350 to 375 F ERA

N77-25623# Utah Univ Salt Lake City Dept of Geology and Geophysics
DIPOLE-DIPOLE RESISTIVITY SURVEYS, ROOSEVELT HOT SPRINGS KGRA, VOLUME 2 Final Report

S H Ward and W R Sill Jun 1976 52 p refs
(Grant NSF GI-43741)
(PB-264897/0 NSF/RA-760369) Avail NTIS HC A04/MF A01 CSCL 08I

Three different dipole spacings were used 99 km of traverse line were surveyed with 100 m dipoles 50 km with 300 m dipoles and 44 km with 1 km dipoles The resistivity surveys delineated regions of low resistivity associated with fracturing brines high temperatures and clay alteration The resistivity of rocks that are typical of hydrothermal environments is due to two main conduction mechanisms electrolytic conduction and porosity of rocks GRA

N77-25624# TRW Systems and Energy Redondo Beach Calif
IMPROVED MINERAL EXCAVATION NOZZLE DESIGN STUDY Interim Report
P D Lohn and D A Brent Apr 1976 104 p
(Contract DI-BM-J0255024)
(PB-264138/9 TRW-27752-6003-TU-00 BM-OFR-33-77) Avail NTIS HC A06/MF A01 CSCL 08I

The best shape for a borehold mining application consists of an initial fourth degree polynomial (quartic) at the entrance followed by a straight section with a 20 deg (half-angle) taper at the exit The techniques developed were used to analyze the performance of a water jet as a function of flow conditions For a borehold mining application an operating stagnation pressure of about 2 000 psi is recommended GRA

N77-26572*# Utah Univ , Salt Lake City Dept of Geology and Geophysics
APPLICATION OF STANDARD PHOTOGEOLOGIC TECHNIQUES TO LANDSAT IMAGERY FOR MINERAL EXPLORATION IN THE BASIN AND RANGE PROVINCE OF UTAH AND NEVADA Final Report
Laurence H Lattman, Principal Investigator Jun 1977 243 p refs Original contains imagery Original photography may be purchased from the EROS Data Center Sioux Falls S D 57198 ERTS
(Contract NAS5-20955)
(E77-10170 NASA-CR-153229) Avail NTIS HC A11/MF A01 CSCL 08G

The author has identified the following significant results Standard photogeologic techniques were applied to LANDSAT imagery of the basin and range province of Utah and Nevada to relate linear tonal textural drainage and geomorphic features to known mineralized areas in an attempt to develop criteria for the location of mineral deposits No consistent correlation was found between lineaments mapped according to specified criteria, and locations of mines mining districts or intrusive outcrops Tonal and textural patterns were more closely related to geologic outcrop patterns than to mineralization A statistical study of drainage azimuths of various length classes as measured on LANDSAT showed significant correlation with mineralized districts in the length class of 3-6 km Alignments of outcrops of basalt a rock type highly visible on LANDSAT imagery appear to be colinear with acidic and intermediate intrusive centers in some areas and may assist on the recognition of regional fracture systems for mineral exploration

N77-26584*# Florida Univ Gainesville Engineering and Industrial Experiment Station
THE USE OF REMOTE SENSING IN SOLVING FLORIDA'S GEOLOGICAL AND COASTAL ENGINEERING PROBLEMS Status Report, 1 Jul 1976 - 31 Mar 1977
H K Brooks B E Ruth Y H Wang and R L Ferguson (General Electric Daytona Beach Fla) 31 Mar 1977 28 p refs Original contains color illustrations
(Grant NsG-7236)
(NASA-CR-153286 SR-1) Avail NTIS HC A03/MF A01 CSCL 08C

LANDSAT imagery and NASA high altitude color infrared (CIR) photography were used to select suitable sites for sanitary landfill in Volusia County Florida and to develop techniques for preventing sand deposits in the Clearwater inlet Activities described include the acquisition of imagery its analysis by the IMAGE 100 system, conventional photointerpretation evaluation of existing data sources (vegetation soil and ground water maps) site investigations for ground truth and preparation of displays for reports Author

N77-26598# Groundwater Survey-TNO Delft (Netherlands)
GEOPHYSICAL WELL LOGGING FOR GEOHYDROLOGICAL PURPOSES IN UNCONSOLIDATED FORMATIONS
F Walter, ed 1976 112 p refs
Copyright Avail NTIS HC A06/MF A01

Geophysical well logging implies the recording of one or more physical variables which provide information regarding the lithology stratography and physico-chemical properties of the liquid filling the pores of a perforated formation Logging methods of importance to geohydrological investigations are described These include determination of the spontaneous potential the formation resistivity and the natural gamma radiation intensities of the rocks ESA

N77-26728*# Lamont-Doherty Geological Observatory Palisades N Y
RESURVEY OF SITE STABILITY QUADRILATERALS, OTAY MOUNTAIN AND QUINCY, CALIFORNIA Supplementary Report
C H Scholz Jul 1977 8 p ref
(Grant NGR-33-008-146)
(NASA-CR-149155) Avail NTIS HC A02/MF A01 CSCL 08E

Trilateration quadrilaterals established across two faults near the San Andreas Fault Experiment laser/satellite ranging sites were resurveyed after four years No evidence of significant tectonic motion was found Author

N77-27466*# Colorado School of Mines, Golden
REMOTE SENSING OF GEOLOGIC MINERAL OCCURRENCES FOR THE COLORADO MINERAL BELT USING LANDSAT DATA Final Report, 1 Jul 1975 - 30 Sep 1976
Robert H Carpenter Principal Investigators and David W Trexler 30 Sep 1976 161 p refs ERTS
(Contract NAS5-20955)
(E77-10176 NASA-CR-153274) Avail NTIS A08/MF A01 CSCL 08G

The author has identified the following significant results LANDSAT imagery was examined as a practical and productive tool for mineral exploration along the Colorado Mineral Belt An attempt was made to identify all large active and/or abandoned mining districts on the imagery which initially were discovered by surface manifestations A number of strong photolinements circular features and color anomalies were identified Some of these form a part of the structural and igneous volcanic framework in which mineral deposits occur No specific mineral deposits such as veins or porphyries were identified Promising linear and concentric features were field checked at several locations Some proved to be fault zones and calderas others were strictly topographic features related to stream or glacial entrenchment The Silverton Caldera region and the Idaho Springs-Central City district were chosen and studied as case histories to evaluate the application of LANDSAT imagery to mineral exploration Evidence of specific mineralization related to ore deposits in these two areas were observed only on low level photography

05

OCEANOGRAPHY AND MARINE RESOURCES

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

A77-30302 **The relationship of satellite inferred convective activity to easterly waves over West Africa and the adjacent ocean during Phase III of GATE** S W Payne and M M McGarry (Washington, University, Seattle, Wash) *Monthly Weather Review,* vol 105, Apr 1977, p 413-420 13 refs NSF-NOAA-supported research

A77-31409 **Certain results from study of the state of the sea surface with a highly sensitive radiometer** V I Andrianov, A A Glotov, S V Dotsenko, S O Lomadze, D T Matveev, V G Mirovskii, V V Nikitin, N Ia Nikolaev, M D Raev, and I A Troitskii (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovanii and Institut Fiziki Atmosfery, Akademiia Nauk Ukrainskoi SSR, Morskoi Gidrofizicheskii Institut, Moscow, USSR) *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol 12, Aug 1976, p 868-874) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics,* vol 12, Mar 1977, p 530-533 7 refs Translation

Results are reported for a study of statistical sea-surface properties which employed a radiometer operating at a wavelength of 2 08 cm with a fluctuation sensitivity of 0 03 deg and a response time of one second The radiometer was installed on a cliff about 50 m from the shore line at a height of about 8 m above mean sea level, its parabolic reflector was directed toward the open sea Spectral methods of studying fluctuations in thermal radio emission are evaluated as a means of determining the statistical properties of a choppy sea surface The results presented show that a radiometer of such high sensitivity may be used as a remote-sensing device for measuring temporal statistical sea-surface properties from distances of several tens or hundreds of meters F G M

A77-31570 **Oceanographic surface observations from ships and buoys** C H Clayson (Institute of Oceanographic Sciences, Godalming, Surrey, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 259 275 21 refs

The development of the science of oceanography has led to increasing use of ships and buoys as observing stations for the collection of sea surface data Appreciable progress has been made in the application of remote sensing techniques to oceanography in the fields of measurement of sea-surface conditions Such measurements require calibration and correction by means of surface-truth observations made from ships and buoys The parts played by research vessels, special data-gathering ships, ocean weather ships, lightships and the voluntary observing fleet are discussed An assessment is made of the costs and relative advantages of ships as observation platforms Observations from buoy systems are discussed, and the characteristics of drifting and special-purpose buoys are evaluated (Author)

A77-31726 * **On the observed annual cycle in the ocean-atmosphere heat balance over the Northern Hemisphere** A H Oort (NOAA, Geophysical Fluid Dynamics Laboratory, Princeton, N J) and T H Vonder Haar (Colorado State University, Fort Collins, Colo) *Journal of Physical Oceanography,* vol 6, Nov 1976, p 781-800 32 refs Grant No NGR-06 002-102

Based on the best presently available satellite radiation, atmospheric and oceanic data sets, the long-term mean heat balance of the earth and its normal seasonal variation are investigated over the Northern Hemisphere Quantitative estimates for the various flux and storage terms in the atmospheric and terrestrial branches of the heat balance are given for 10-deg-wide latitude belts and for each calendar month The results are presented in both graphical and tabular form As was known before, the storage of heat in the oceans is found to dominate the energy storage in the combined atmosphere-ocean-land-cryosphere system In the tropics, large changes in oceanic heat storage are found in the 10 N-20 N belt with a maximum in spring and a minimum in late summer The main new finding of this study is that the inferred oceanic heat transports appear to undergo very large seasonal variations especially in the tropics (Author)

A77-32244 **Use of Landsat data for the detection of marine oil slicks** M Deutsch (U S Geological Survey, Reston, Va), A E Strong (NOAA, Rockville, Md), and J E Estes (California, University, Santa Barbara, Calif) *American Institute of Mining, Metallurgical and Petroleum Engineers, Offshore Technology Conference, Houston, Tex , May 2 5, 1977, Paper* 8 p 8 refs

The capability of Landsat to detect some oil slicks in marine waters has been verified Reflectance anomalies associated with the slicks have been detected visually on film data, by photo optical enhancement techniques and by computer processing Applications of Landsat oil slick data include environmental monitoring of coastal waters and detection of natural seeps such as in the Santa Barbara Channel, which may serve as a worldwide exploration aid (Author)

A77-32554 * **Limitations on oceanographic use of beam-limited target-referenced radars** E J Walsh (NASA, Wallops Flight Center, Wallops Island, Va) *IEEE Transactions on Antennas and Propagation,* vol AP-25, May 1977, p 312-318 10 refs

A general development is undertaken to determine the limitations on the use of beam-limited target-referenced radars in the measurement of ocean wave height This class of radars is concerned only with the range extent of the target, not the range to the target The nonzero range extent of a flat waveless sea and the compounding effect of pointing errors due to radar platform instability cause difficulty in measuring low wave heights and impose a maximum operating altitude on such systems It is seen that it is impractical to obtain accurate measurements for wave heights of interest at altitudes above those used by commercial aircraft (10,000 m) Additionally, the typical ratio of dominant wavelength to significant wave height (SWH) of 30 for wind-driven gravity waves imposes an upper limit on the SWH measurable for a given altitude and beamwidth (Author)

A77-32580 * # **Spectral structure of the field of solar radiation reflected from the ocean/atmosphere system (O spektral'noi strukture polia solnechnoi radiatsii, otrazhennoi sistemoi okean-atmosfera)** M S Malkevich, L G Istomina, and W A Hovis, Jr (NASA, Goddard Space Flight Center, Greenbelt, Md , Akademiia Nauk SSSR, Institut Fiziki Atmosfery, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol 13, Feb 1977, p 153-162 6 refs In Russian

The statistical characteristics of the spectral structure of the brightness field of the ocean/atmosphere system are determined from the spectra of incident radiation and the radiation reflected from the ocean, obtained from aircraft (Conveyor 990) at heights of 0 3 and 10 km above the Atlantic Ocean Analysis of the spectral structure reveals a weak correlation between atmospheric brightness variations in the 0 4 to 0 5 micron and 0 55 to 0 70 micron regions of the spectrum This is attributed to the possible influence of variations of the scattering coefficient or optical thickness on the brightness variations (whose sign depends on the predominance of damping or multiple scattering in a given spectral region) V P

A77-33973 **State of the art in recovery of materials from the sea (Der gegenwartige Stand der Rohstoffgewinnung aus dem Meer)** H Backer *Metall*, vol 31, May 1977, p 538 540 In German

Sea-bottom winning of raw materials for industry, particularly manganese nodules and accompanying minerals, is discussed The marine origin of many continental deposits of economically interesting raw materials is emphasized Outstanding problems include high costs, still inadequate technology for exploration and winning, and legal uncertainties as to ownership of mineral rights (3-mile limit, 12-mile limit, other national claims) Echo-sounding techniques, sidescan sonar, airgun, boomer, magnetometer, photoslits, towed scintillometer, nuclear logging, coring, dredging, and vibration probing are among the techniques mentioned Occurrences of manganese nodules (with Ni, Cu, Co, Zn, Mo), ore sludges (Zn, Cu, Ag, Cd, S), phosphates, construction raw materials, and mineral soaps in various locations are noted R D V

A77-34137 # **The earth's variable rate of rotation - A discussion of some meteorological and oceanic causes and consequences** K Lambeck (Paris VI, Universite, Paris VII, Universite, Paris, France) and A Cazenave (Centre National d'Etudes Spatiales, Groupe de Recherches de Geodesie Spatiale, Toulouse, France) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A*, vol 284, no 1326, May 11, 1977, p 495 506 49 refs

Some of the geophysical factors perturbing the earth's rotation from what it would be if rigid body rotation theory was valid are discussed Attention is given to zonal winds and their correlation with annual and semi-annual changes in the length of day, changes in the astronomical biennial term, and higher frequency variations in the length of day It is noted that an area where satellite observations can make an important contribution to studies of the earth's rotation concerns the separation of the secular tidal and non tidal changes in length of day by studying the tidal perturbations in satellite orbits B J

A77-34141 # **Oceanographic applications of ranging to artificial satellites** D E Cartwright (Institute of Oceanographic Sciences, Birkenhead, Ches , England) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A*, vol 284, no 1326, May 11, 1977, p 537-546 20 refs

The paper discusses the use of laser ranging to an artificial satellite for the precise determination of the geocentric level of the sea surface as a function of latitude, longitude, and time A traverse of the ocean surface measured geocentrically by laser ranging to a satellite-borne altimeter will include contributions from the geoid (50 m), static anomalies in mean sea level (1 m), variable anomalies due to atmospheric presure (0 2 m), oceanic plus earth tides (0 8 m), and unaccounted errors (0 5 m) B J

A77 34148 * # **The N A S A earth and ocean dynamics programme** F O Vonbun (NASA, Goddard Space Flight Center, Greenbelt, Md) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial Satellites and the Moon, London, England, Feb 26, 27, 1976) Royal Society (London), Philosophical Transactions, Series A*, vol 284, no 1326, May 11, 1977, p 607-619 15 refs

Practical applications of NASA space systems, science, and technology to the study of oceans and solid earth are discussed Goals involving earth dynamics include earthquake hazard assessment and alleviation, and global surveying and mapping, while goals involving ocean dynamics include the determination of ocean currents and circulation, and the monitoring of ocean surface conditions Satellites used to obtain data are described, and projects such as the study of open ocean tides and earth motion determination are reviewed, with consideration given to the techniques (e g , laser ranging, satellite-to-satellite track) used in these studies Several physical phenomena, the extent to which they presently can be measured, and possible future requirements for more accurate measurements are examined M L

A77-34520 **Satellite observation of internal wave refraction in the South China Sea** R Fett and K Rabe (U S Navy, Naval Environmental Prediction Research Facility, Monterey, Calif) *Geophysical Research Letters*, vol 4, May 1977, p 189-191 7 refs

A visible image for May 21, 1973 obtained from the DMSP satellite suggests the occurrence of internal waves refracting around the Pratas Islands in the South China Sea Arguments are presented suggesting that the waves are tidally forced along the density interface prevalent for that area during the spring season (Author)

A77-36429 **Landsat goes to sea.** J C Hammack (U S Defense Mapping Agency, Hydrographic Center, Washington, D C) *Photogrammetric Engineering and Remote Sensing*, vol 43, June 1977, p 683-691 16 refs

Attention is called to the inadequacies of current surveys and charts of the world's oceans, and the main directions of national and international efforts to improve the quantity, currency, and accuracy of worldwide hydrographic survey data are examined In particular, the use of Landsat MSS film imagery in pursuing this goal is singled out Landsat high-gain imagery has been found to be helpful in detecting and mapping shoals in clear water to depths equal to or greater than those required for most surface shipping. A project consisting in the revision of the Chagos Archipelago chart is described, revealing that the extents of banks and reefs as revealed by Landsat can be significantly different from what they are shown to be on current charts P T H

A77-36573 **Recent progress in the remote sensing of ocean surface currents** G A Maul (NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, Fla) *Marine Technology Society Journal*, vol 11, no 1, 1977, p 5-13 24 refs

Major ocean currents have surface manifestations that make them observable by spacecraft sensors Under certain conditions, any one or a combination of the following may be used to identify the current's boundary changes in sea surface temperature, salinity, color, sea state, sea surface topography, wave refraction patterns, and modifications to the lower atmosphere Infrared sensors have been used most extensively to study ocean circulation, however, new instruments such as passive and active microwave sensors can sense temperature, salinity, sea state, and surface topography, and multi spectral visible scanners and spectroradiometers are providing new information on ocean color and sea state Man's role as an observer and photographer provides the highest spatial resolution to date for describing visible changes across boundaries as well as sea and swell patterns (Author)

A77-36793 **Variable currents in mid-ocean** J C Swallow (Natural Environment Research Council, Institute of Oceanographic Sciences, Wormley, Surrey, England). *Oceanus*, vol 19, Spring 1976, p 18-25 35 refs

The history of the study of ocean eddies is reviewed Mid ocean eddies contain currents varying markedly within the same horizontal scales and can involve areas tens or hundreds of kilometers across Currents were originally plotted from temperature and salinity measurements, which determine density Multiship surveys were required for simultaneous measurements Later, neutrally buoyant floats were used to study deep currents Components of the American and British Mid-Ocean Dynamics Experiment (MODE-1) and the Soviet POLYGON experiments are being combined in POLYMODE, to permit extended observations in time and space Most of this investigation of ocean currents will take place during 1977 and 1978 M L

A77-36795 **Sea surface temperature during MODE-1** A Voorhis and E Schroeder (Woods Hole Oceanographic Institution, Woods Hole, Mass) *Oceanus,* vol 19, Spring 1976, p 82-86

Long-term variations in mean sea-surface temperature are studied to obtain information about energy exchange between ocean and atmosphere, and thereby to learn more about past and future world climate patterns The contours of the mean March 1973 sea surface temperatures in the western Atlantic and the Caribbean Sea are compared to the contours representing the surface dynamic topography relative to 1500 decibars that was computed from the location pattern of temperature and salinity lowerings It is concluded that, in at least some parts of the ocean, surface currents from large-scale eddies are responsible for large-scale, slowly changing patterns in the sea-surface temperature, and that these varying temperature patterns introduce an additional uncertainty into the use of surface temperature data, measured by satellite or rapid ship surveys, for gaining an understanding of long-term changes in the mean sea surface M L

A77-38244 **Remote sensing of ocean color** W A Hovis (NOAA, National Environmental Satellite Service, Washington, D C) and K C Leung (Computer Sciences Corp , Silver Spring, Md) *Optical Engineering,* vol 16, Mar Apr 1977, p 158-166 7 refs

Investigations with aircraft were conducted during 1971 and 1972 to determine the feasibility of an observation of subtle changes in ocean reflectance through the entire atmosphere The investigations employed a nadir viewing spectrometer scanning the range from 400 to 700 nanometers It was found that there was sufficient information in the backscattered energy emerging from the top of the atmosphere to determine the color of the ocean to a sufficient degree to remotely sense areas of chlorophyll concentration A spatially scanning, multispectral radiometer was built to carry out further investigations A description is presented of ocean color scanner studies which were conducted with the new instrument A U-2 aircraft flying at an operating altitude of 19 8 km was employed in the studies G R

A77-38484 **Extraction of wave parameters from measured HF radar sea-echo Doppler spectra** D E Barrick (NOAA, Wave Propagation Laboratory, Boulder, Colo) *Radio Science,* vol 12, May-June 1977, p 415-424 14 refs

A77-38485 **Derivation of directional ocean-wave spectra by integral inversion of second-order radar echoes** B Lipa (Stanford University, Stanford, Calif) *(Inter-Union Commission on Radio Meteorology, Colloquium on Radio Oceanography, Hamburg, West Germany, Sept 29-Oct 6, 1976) Radio Science,* vol 12, May-June 1977, p 425-434 16 refs Contracts No N0014-75-C-0356, No NOAA-03-6-022-35260

A77-39875 # **Surveying and remote sensing techniques for coasts and seas (Vermessungs- und Fernerkundungsverfahren an Kusten und Meeren)** G Konecny (Hannover, Technische Universitat, Hanover, West Germany) *Hannover, Technische Universitat, Zeitschrift,* vol 4, no 1, 1977, p 3-10 In German

Problems of geoid determination in regions of the sea and in coastal regions are considered The basic measurements concerning the various types of angles, distances, and altitude differences are related to the direction of the gravity force A description of surveying procedures for the determination of the location and altitude of fixed points is presented, taking into account the approaches used to overcome the special problems related to position determinations in coastal regions and in regions of the sea The determination of coastal and sea topography is discussed and attention is given to remote sensing techniques which attempt to obtain object information on the basis of the spectrum of electro magnetic waves G R

N77-22598# Washington Univ Seattle Charles W Harris Hydraulics Lab

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS

Richard A Hardt and Stephen J Burges Jun 1976 90 p refs

(Contract DI-14-31-0001-6050 OWRT Proj A-078-WASH(1)) (PB-261258/8 W77-01947 TR-48) Avail NTIS HC A05/MF A01 CSCL 08H

Hypothetical watersheds were studied to determine some bounds to the overall runoff management issue Developments in urban and suburban areas to maintain peak flow rates from their sites at the level that existed prior to urbanization were examined GRA

N77-22599# National Oceanic and Atmospheric Administration Miami Fla Alantic Oceanographic and Meteorological Labs

AN EXPERIMENT TO EVALUATE SKYLAB EARTH RESOURCES SENSORS FOR DETECTION OF THE GULF STREAM

George A Maul Howard R Gordon Stephen R Baig Michael McCaslin and Roger De Vivo Aug 1976 77 p refs

(PB-262420/3 AOML-23 NOAA-TR-ERL-378 NOAA-76112405) Avail NTIS HC A05/MF A01 CSCL 08C

An experiment to evaluate the SKYLAB Earth Resources Package for observing ocean currents was performed in the Straits of Florida Data from the S-190 photographic facility S-191 spectroradiometer and the S-192 multispectral scanner were compared with surface observations made simultaneously GRA

N77-22600# National Oceanic and Atmospheric Administration Boulder Colo Wave Propagation Lab

IMPLEMENTATION OF COASTAL CURRENT-MAPPING HF RADAR SYSTEM Progress Report

D E Barrick and M W Evans Jul 1976 74 p refs

(PB-261926/0 NOAA-TR-ERL-373 WPL-47 NOAA-76101207 PR-1) Avail NTIS HC A04/MF A01 CSCL 08B

A concept for radar remote sensing of near surface ocean currents in coastal regions is described and progress is reviewed on the design and construction of the first units In an operational system a radar pair will take simultaneous measurements over an ocean area with a grid having a 3-km spacing Vectors will be constructed for each 3-km square section and a map of the near surface current field will be output in real time by a minicomputer on site All radar and digital gear is contained in two shock-mounted fiberglass cases only 44 inches high and weighing under 200 pounds The radar antenna are easily erectable frames holding three vertical aluminum pipes The entire system can be set up in less than one hour GRA

N77-22788# National Oceanic and Atmospheric Administration Miami Fla Atlantic Oceanographic and Meteorological Labs

A COMPARISON OF SATELLITE-OBSERVED SEA-SURFACE TEMPERATURES WITH GROUND TRUTH IN THE INDIAN OCEAN

Ants Leetmaa and Matthew Cestari Aug 1976 17 p refs

(PB-262414/6 NOAA-TR-ERL-376 AOML-22 NOAA-76112404) Avail NTIS HC A02/MF A01 CSCL 08J

Daily worldwide sea-surface temperature maps are produced by the National Environmental Satellite Service For the first half of 1975 sea-surface temperatures recorded on these maps were compared with concurrent ship observations in the Indian Ocean Additional comparisons were made with historical data These show systematic differences between the satellite and sea-surface observations The satellite-derived temperatures appear to be too low along the equator and along the East African coast in the vicinity of the equator GRA

N77-22791# Environmental Research Inst of Michigan Ann Arbor

WAVE VELOCITY EFFECTS ON SAR IMAGERY AS OBSERVED IN THE OPTICAL PROCESSOR

R A Shuchman and J S Zelenka 20 Aug 1976 17 p ref
(Grant NOAA-04-6-158-44078)
(PB-262439/3 ERIM-123000-5-T, NOAA-76112908) Avail NTIS HC A02/MF A01 CSCL 08C

ERIM X-L data collected at Marineland on December 15 1975 was selected for the experimental study Using data that covered shallow deep and Gulf Stream conditions wave velocity and direction was transferred into velocities that correspond to positive or negative motion parallel to the aircraft direction (i e traveling essentially in the azimuth direction) GRA

N77-22792# Environmental Research Inst of Michigan, Ann Arbor

PRELIMINARY ENGINEERING MEASUREMENTS FROM L-BAND DATA COLLECTED AT MARINELAND

J S Zelenka R Shuchman and A Klooster 27 Aug 1976 21 p Revised
(PB-262500/2 ERIM-123000-6-T-Rev) Avail NTIS HC A02/MF A01 CSCL 08C

Some preliminary measurements obtained from the L-Band H-H polarization data collected with the ERIM multichannel radar are reported A portion of the L-Band data collected near the Gulf Stream was scanned in the image plane of an optical processor The resulting measurement enabled investigators to obtain an estimate of the modulation depth associated with this particular example of wave imagery and the results should be representative of the prevailing seastate GRA

N77-23587# Environmental Research Inst of Michigan Ann Arbor

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS Quarterly Report, 16 Jul - 15 Oct 1976

R A Shuchman D R Lyzenga and F J Thomson 1976 6 p refs
(Contract N00014-74-C-0273)
(AD-A032447 ERIM-108900-8-L) Avail NTIS HC A01/MF A01 CSCL 17/8

During the quarterly period 16 July - 15 October 1976 three principle activities took place The second year interim report was printed and distributed Work was completed on obtaining critical optical properties of beach minerals to be used as inputs into the Beach and Environment Models In the water modeling area the water-atmosphere model was tested and used in a study for the Naval Coastal Systems Lab and analysis of model results in the context of MRA development has begun In connection with this task a letter was sent to the Editor of Applied Optics on the reflectance of a flat ocean in the limit of zero water depth GRA

N77-23710*# Business and Technological Systems Inc Seabrook Md

A COMPUTER SOFTWARE SYSTEM FOR THE GENERATION OF GLOBAL OCEAN TIDES INCLUDING SELF-GRAVITATION AND CRUSTAL LOADING EFFECTS Final Report

R H Estes Feb 1977 64 p refs
(Contract NAS5-20045)
(NASA-CR-152502 BTS-TR-77-41) Avail NTIS HC A04/MF A01 CSCL 08C

A computer software system is described which computes global numerical solutions of the integro-differential Laplace tidal equations including dissipation terms and ocean loading and self-gravitation effects for arbitrary diurnal and semidiurnal tidal constituents The itegration algorithm features a successive approximation scheme for the integro-differential system with time stepping forward differences in the time variable and central differences in spatial variables Author

N77-24561*# ECON Inc Princeton N J

AN EVALUATION OF SEASAT-A CANDIDATE OCEAN INDUSTRY ECONOMIC VERIFICATION EXPERIMENTS Final Report

1 Apr 1977 249 p refs
(Contract NASw-3047)
(NASA-CR-153009 Rept-76-242-1) Avail NTIS HC A11/MF A01 CSCL 05C

A description of the candidate economic verification experiments which could be performed with SEASAT is provided Experiments have been identified in each of the areas of ocean-based activity that are expected to show an economic impact from the use of operational SEASAT data Experiments have been identified in the areas of Arctic operations, the ocean fishing industry the offshore oil and natural gas industry as well as ice monitoring and coastal zone applications Author

N77-24562*# Old Dominion Univ Research Foundation Norfolk Va

THE USE OF SKYLAB IN THE STUDY OF PRODUCTIVITY ALONG THE EASTERN SHELF WATERS OF THE UNITED STATES Final Report

Harold G Marshall and David E Bowker Mar 1976 28 p refs
(Contract NAS1-11707)
(NASA-CR-152848) Avail NTIS HC A03/MF A01 CSCL 08A

Data sampling from the Rappahannock River and Assateague Island areas are discussed correlating Skylab and ground based measurements At all sampling stations information was obtained on composition and density of phytoplankton total chlorophyll salinity and water temperature The results of the water analysis are presented in tables M C F

N77-24567*# National Aeronautics and Space Administration Washington D C

SEASAT GLOBAL OCEAN MONITORING SYSTEM

[1977] 101 p
(NASA-TM-X-74621) Avail NTIS HC A06/MF A01 CSCL 05B

General information and descriptive material about the SEASAT program is given This is the central document covering the program Author

N77-24751# National Oceanic and Atmospheric Administration Boulder Colo Environmental Research Lab

STD OBSERVATIONS FROM THE R/V COLUMBUS ISELIN DURING PHASE 3 OF GATE

William McLeish and S Michael Minton Aug 1976 108 p refs
(PB-263395/6 NOAA-TR-ERL-379 AOML-24
NOAA-76120601) Avail NTIS HC A06/MF A01 CSCL 08J

A computer processing scheme was modified for these particular data Plots of temperature salinity and sigma T versus pressure and temperature salinity diagrams were prepared The processed values at 1-decibar intervals were written on magnetic tape and placed in the archives of the National Oceanographic Data Center GRA

N77-24753# Massachusetts Inst of Tech Cambridge Sea Grant Program

BRINGING THE OCEANS INTO AMERICA'S FUTURE A REPORT ON THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY SEA GRANT PROGRAM Annual Report, 1 Jul 1975 - 30 Jun 1976

S Bronwyn Hurd and Ralph Coburn Dec 1976 35 p Sponsored by NOAA
(PB-264262/7 MITSG-77-2 NOAA-77012509
INDEX-77-002-Zay) Avail NTIS HC A03/MF A01 CSCL 08J

Summaries of various activities completed or underway on advising industry of the oceans potential new technologies management of coastal environments treatment of oil spills and living resources are presented GRA

N77-24935# Physics Lab RVO-TNO The Hague (Netherlands)

INFRARED SEA AND SKY BACKGROUND RADIATION

J B VandeVrie Nov 1976 53 p refs
(PhL-1976-41 TDCK-68562) Avail NTIS HC A04/MF A01

An investigation of sea and sky background radiance as a function of elevation in three wavelength intervals 3 0-5 0 3 4-4 1 and 8 0-14 0 micron is described A computer model which has the lowtran 3 atmospheric transmission model as a subroutine was developed to study the separate influence of a few meteorological parameters on these functions The occurrence of a dip in the apparent temperature of the sea near the horizon has notably been analyzed Results are summarized of the measurements of the background radiation around the horizon made during a year by a scanning radiometer at an altitude of 30 meter above the sea surface The radiance of the sky is measured and computed also for higher elevations (0-90 deg) Computations and measurements are in very good agreement except for the small interval 3 4-4 1 micron The latter might be caused by an overestimation of the transmission by the lowtran 3 model in this wavelength band Author (ESA)

N77-24942# Kansas State Univ Manhattan Dept of Physics

THE OPTICAL CONSTANTS OF WATER AND SEA WATER IN THE INFRARED

Dudley Williams 20 Dec 1976 18 p refs
(Contract N00014-76-C-0252)
(AD-A034071 SR-1) Avail NTIS HC A02/MF A01 CSCL 07/4

The results of earlier studies of reflection and absorption in various spectral regions are reviewed and then used to provide values of the complex index of refraction N = n + ik of water at 27 C in the spectral range 1/5000-10 cm, corresponding to wavelengths in the range 2 micrometer to 1 mm Optical Properties of Sea Water in the Infrared Quantitative measurements of the ratio of the infrared spectral reflectance of standard sea water at near-normal incidence to the corresponding spectral reflectance of pure water at 27 C were made The infrared spectral reflectance of standard sea water was determined from the measured ratio and the known optical constants for pure water The real n(v) and the imaginary k(v) parts of the complex index of refraction of standard sea water were then determined by KramerKronig methods The results obtained for the standard sea water are compared with previous results obtained for pure water and with previous studies of sea water GRA

N77-25622# *Scripps Institution of Oceanography La Jolla Calif*

PLEIADES EXPEDITION, LEG 04, MN76-01, R/V MELVILLE PRELIMINARY CRUISE REPORT

F N Spiess and J Greenslate Dec 1976 99 p refs
(Grants NSF OCE-76-04724 NSF OCE-75-12968)
(PB-264626/3 NSF/IDOE-77-48 NSF/IDOE-Manganese Nodule-15) Avail NTIS HC A05/MF A01 CSCL 08I

Undersea mineral deposits of manganese nodules were studied Specific areas selected are representative of a variety of manganese deposition environments and were chosen to be as free of complicating factors as possible The first area was located at 11 deg N latitude and 140 deg W longitude It lies in a region of little apparent tectonic activity is far removed from continental influences and is within the zone in which the richest nodule deposits occur The second site (Station 21 on the track chart) was chosen to represent the equatorial Pacific region which has much recent calcareous sediment and is characteristically free of manganese deposits GRA

N77-25766# World Meteorological Organization Geneva (Switzerland)

INTEGRATED GLOBAL OCEAN STATION SYSTEM GENERAL PLAN AND IMPLEMENTATION PROGRAMME, 1977 - 1982

Jan 1977 42 p refs
(WMO-466 T-Ser-16 ISBN-92-63-10466-2) Avail NTIS HC A03/MF A01 WMO Geneva

The purpose principles expected benefits and elements of the Integrated Global Ocean Station System (IGOSS) are reviewed followed by a summary of the relation of IGOSS to other international programs and organizations The elements of the observing system the telecommunication arrangements the data processing and services system and the data archiving and exchange system are all described ESA

N77-26480*# *National Aeronautics and Space Administration* Langley Research Center, Langley Station, Va

ANALYSIS OF LASER FLUOROSENSOR SYSTEMS FOR REMOTE ALGAE DETECTION AND QUANTIFICATION

Edward V Browell Washington Jun 1977 41 p refs
(NASA-TN-D-8447 L-11007) Avail NTIS HC A03/MF A01 CSCL 20E

The development and performance of single- and multiple-wavelength laser fluorosensor systems for use in the remote detection and quantification of algae are discussed The appropriate equation for the fluorescence power received by a laser fluorosensor system is derived in detail Experimental development of a single wavelength system and a four wavelength system which selectively excites the algae contained in the four primary algal color groups, is reviewed and test results are presented A comprehensive error analysis is reported which evaluates the uncertainty in the remote determination of the chlorophyll a concentration contained in algae by single- and multiple-wavelength laser fluorosensor systems Results of the error analysis indicate that the remote quantification of chlorophyll a by a laser fluorosensor system requires optimum excitation wavelength(s) remote measurement of marine attenuation coefficients and supplemental instrumentation to reduce uncertainties in the algal fluorescence cross sections Author

N77-26575*# Delaware Univ Newark Center for Remote Sensing

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES ***Progress Report, Apr - Jun 1977***

V Klemas Principal Investigator D Bartlett W Philpot and G Davis 15 Jun 1977 5 p refs ERTS
(Contract NAS5-20983)
(E77-10173 NASA-CR-153211) Avail NTIS HC A02/MF A01 CSCL 08C

N77-26577*# Stanford Research Inst Menlo Park, Calif

MICROWAVE PROPERTIES OF ICE FROM THE GREAT LAKES Final Report

R S Vickers Jan 1975 36 p refs
(Contract NAS3-19092 SRI Proj 3571)
(NASA-CR-135222) Avail NTIS HC A03/MF A01 CSCL 08L

The increasing use of radar systems as remote sensors of ice thickness has revealed a lack of basic data on the microwave properties of fresh-water ice A program in which the complex dielectric constant was measured for a series of ice samples taken from the Great Lakes is described The measurements were taken at temperatures of -5 -10 and -15 C It is noted that the ice has considerable internal layered structure and the effects of the layering are examined Values of 3 0 to 3 2 are reported for the real part of the dielectric constant with an error bar of + or - 0 01 Author

N77-26591# Naval Oceanographic Office Washington, D C

AERIAL ICE RECONNAISSANCE AND SATELLITE ICE INFORMATION MICROFILM FILE

Peter A Mitchell Aug 1976 39 p refs
(AD-A037300 NOO-RP-17) Avail NTIS HC A03/MF A01 CSCL 08/12

Interest in the polar regions has increased manyfold in recent years principally due to the newly developing economic incentives and revived military significance of the Arctic and the continuing scientific research in the Antarctic Improvement and further development of operational sea ice forecasting techniques that allow our naval forces to operate safely in these areas depend

heavily upon the maintenance of historical ice data files The Aerial Ice Reconnaissance and Satellite Ice Information Microfilm File effectively substitutes for the terminated Oceanographic Office annual reports of the Arctic and Antarctic ice observing and forecasting programs This publication provides the researcher with listings of available microfilm in one of the Navy's more extensive ice data files and describes the procedures to follow to obtain copies of the original chart analyses of aerial ice reconnaissance and satellite ice data Author (GRA)

N77-26600# Helsinki Univ of Technology Espoo (Finland) Radio Lab

MICROWAVE RADIOMETER THEORY AND MEASUREMENTS OF SEA ICE CHARACTERISTICS Project Sea Ice 1975

Martti Tiuri Martti Hallikainen, and Antti Laaperi 1976 49 p refs Sponsored by the Finn-Swed Board for Winter Navigation Res

(Rept-S-89 ISBN-951-750-742-9) Avail NTIS HC A02/MF A01

A project for studying the relation between the physical properties and microwave brightness temperature of sea ice in the Bay of Bothnia in 1975 is described The results of the experiments and the theory for obtaining the brightness temperature of the sea ice are given The results indicate that the brightness temperature measured at 600 MHz is related to the thickness of ice During the experiments the ice temperature was fairly close to the melting point and hence the brightness temperature at 4 7 GHz can be correlated within the ice thickness for thin ice only For ice ridges the 600 MHz radiometer shows thick ice and the 4 7 GHz radiometer thin ice This can be employed for detecting ice ridges The theory predicts that for ice thinner than about 30 cm the brightness temperature oscillates as a function of ice thickness Hence a radiometer operating on a narrow band-width probably cannot be used for determining the thickness of thin ice Author (ESA)

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

A77-31913 **Remote sensing of coastal wetland vegetation and estuarine water properties** V Klemas (Delaware, University, Newark, Del) In Estuarine processes Volume 2 - Circulation, sediments, and transfer of material in the estuary New York, Academic Press, Inc , 1977, p 381 403 53 refs

The advantages and limitations of remote sensing techniques for collecting synoptic data over large coastal and estuarine areas are reviewed with emphasis on the need for a proper balance between remotely sensed data and 'ground truth' Specific applications include mapping wetland vegetation and coastal land use, monitoring natural and man-induced changes in the coastal zone, charting current circulation, including the movement and dispersion of known water pollutants, and determining the type and concentration of suspended matter in coastal waters The photo-interpretation of aircraft and satellite imagery with the aid of 'ground truth' is illustrated, employing both direct visual and automated computer techniques For some applications, it is shown that an integrated boat aircraft-satellite approach can produce better results or cost less, than the deployment of large numbers of boats or field teams without remote sensor support (Author)

A77-33652 * **Field measurements of the spectral response of natural waters** L A Bartolucci, B F Robinson, and L F Silva (Purdue University, West Lafayette, Ind) *Photogrammetric Engineering and Remote Sensing,* vol 43, May 1977, p 595-598 11 refs Contract No NAS9 13301

The spectral response (air water interface reflectance and water-volume scattering) of turbid river water (99 mg/liter suspended solids) and relatively clear lake water (10 mg/liter suspended solids) was measured in situ with a field spectroradiometer The influence of the river bottom on the spectral response of the water also was determined by using a modified Secchi disc approach The results indicated that turbid river water had a higher spectral response than clear lake water (about 6 percent) in the red (0 6-0 7 micron) and near infraied (0 7-0 9 micron) portions of the spectrum Also, the reflectance characteristics of the river bottom did not influence the spectral response of the turbid river water when the water was deeper than 30 cm (Author)

A77-34596 # **Pulse-echo method of measuring ice cover thickness (Radiolokatsionnyi impul'snyi metod izmereniia tolshchiny ledianogo pokrova)** A N Chizhov, V G Glushnev, and B D Slutsker (Gosudarstvennyi Gidrologicheskii Institut, Leningrad, USSR, Rizhskii Institut Grazhdanskoi Aviatsii, Riga, Latvian SSR) *Meteorologiia i Gidrologiia,* Apr 1977, p 90-96 5 refs In Russian

The theory of a pulse-echo method for measuring ice thicknesses on lakes, rivers, and water reservoirs is outlined The parameters and characteristics of an ice thickness measuring facility which uses shock excitation of meter and decimeter wavelength transmitting antennas to generate nanosecond pulses are described, and results obtained from airborne measurements are examined V P

A77-35459 # **Interpretation of the Mid-Columbia Basin of South Central Washington and North Central Oregon** R A Weinkauf (South Dakota State University, Brookings, S Dak) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 80-87 5 refs

A77-36110 # **Utilization of ground water balance for checking the natural ground water resources (Ispol'zovanie balansa podzemnykh vod dlia kontrolia ikh estestvennykh resursov)** S S Beletskii (Belorusskii Nauchno-Issledovatel'skii Geologo-Razvedochnyi Institut, Belorussian SSR) *Akademiia Nauk BSSR, Doklady,* vol 21, Mar 1977, p 262 265 10 refs In Russian

An attempt is made to check the natural ground water resources that contribute to subsurface effluence to rivers against ground water balance data It is concluded that, in vew of the existence of horizontal return flows, a juxtaposition of the type attempted is possible only for the total subsurface effluence, defined as the sum of the subsurface effluence to rivers and the transit effluence V P

A77-36283 # **Interpreting aerial and space photographs in investigations of seepage flow (Deshifrirovanie aero- i kosmicheskikh snimkov pri izuchenii podzemnogo stoka)** R G Dzhamalov, I S Zektser, and Iu L Ob'edkov (Akademiia Nauk SSSR, Institut Vodnykh Problem, Moscow, USSR) *Razvedka i Okhrana Nedr,* Jan 1977, p 45-52 9 refs In Russian

Methods of interpreting photographs taken from aircraft and spacecraft to aid hydrogeological investigations are reviewed Such problems as investigation of the underground water resources of a given location, determination of the depth and degree of mineralization of underground water, study of the character and extent of interrelationship between subterranean and surface waters and of the effects of natural and artificial factors on underground seepage flow are discussed The possibility of using space and aerial photos to study the conditions of formation of underground waters is examined C K D

N77-22578*# Colorado School of Mines Golden
GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO A REMOTE SENSING INVESTIGATION
Keenan Lee Principal Investigator and David Huntley Dec 1976 313 p refs Original contains imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(Grant NGL-06-001-015)
(E77-10149 NASA-CR-152649 Rept 76-3) Avail NTIS HC A14/MF A01 CSCL 08H

The author has identified the following significant results Ground water recharge to the aquifers of San Luis Valley west of San Luis Creek was primarily from ground water flow in the volcanic aquifers of the San Juan Mountains The high permeability and anisotropic nature of the volcanic rocks resulted in very little contrast in flow conditions between the San Juan Mountains and San Luis Valley Ground water recharge to aquifers of eastern San Luis Valley was primarily from stream seepage into the upper reaches of the alluvial fans at the base of the Sangre de Cristo Mountains The use of photography and thermal infrared imagery resulted in a savings of time and increase in accuracy in regional hydrogeologic studies Volcanic rocks exhibited the same spectral reflectance curve as sedimentary rocks with only the absolute magnitude of reflectance varying Both saline soils and vegetation were used to estimate general ground water depths

N77-22585# Johns Hopkins Univ Baltimore Md Dept of Geography and Environmental Engineering
OPTIMAL DESIGN AND OPERATION OF MULTIRESERVOIR SYSTEMS VOLUME 1 EXPLICITLY STOCHASTIC MODELS Final Report
Mark H Houck and Jared L Cohon Jun 1976 208 p refs 2 Vol
(Grant NSF GK-42123)
(PB-262017/7 SAE-PDM-76-01-Vol-1) Avail NTIS HC A10/MF A01 CSCL 13B

Optimization models offer a valuable tool to the river basin planner Two models - the Linear Decision Rule (LDR) and the Sequential Explicit Stochastic Linear Programming (SESLP) models - are of particular importance because they can consider

in a comprehensive format the issues of locating sizing and operating multiple-use, multiple-reservoir systems These two models are restructured and extended A reformulation of the SESLP models results in a substantial reduction in computational burden so that the models are now usable for realistic systems The LDR model is extended to explicitly include economic benefits or losses Energy generation is also considered for the first time in the LDR model and a new perspective on the water supply potential of a reservoir system is given GRA

N77-22586# Johns Hopkins Univ Baltimore Md Dept of Geography and Environmental Engineering
OPTIMAL DESIGN AND OPERATION OF MULTI-RESERVOIR SYSTEMS VOLUME 2 ALTERNATIVE OPTIMIZATION MODELS OF THE LEHIGH RIVER BASIN Final Report
Mark H Houck and Jared L Cohon Jun 1976 162 p refs 2 Vol
(Grant NSF GK-42123)
(PB-262018/5 SAE-PDM-76-02-Vol-2) Avail NTIS HC A08/MF A01 CSCL 13B

Many optimization models for reservoir design and/or operation were suggested in the literature In this report many of these models are formulated for the analysis of the Lehigh River Basin Tentative conclusions on the relative strengths and weaknesses of the models are drawn GRA

N77-22588# Texas A&M Univ College Station Water Resources Inst
ENVIRONMENTAL EVALUATION OF WATER RESOURCES DEVELOPMENT
Wesley P James Calvin E Woods and Robert E Blanz Sep 1976 231 p refs
(Contracts DI-14-31-0001-5044 DI-14-31-0001-6045)
(PB-262011/0 TR-76 W77-02828 OWRT-A-028-TEX(1)) Avail NTIS HC A11/MF A01 CSCL 13B

Methodology for the utilization of LANDSAT-1 imagery and aerial photography on the environmental evaluation of water resources development is presented Environmental impact statements for water resource projects were collected and reviewed for the various regions of Texas The environmental effects of channelization and surface impoundments are discussed for twelve physiographic regions of the state as delineated on black and white satellite (LANDSAT-1) mosaic of band 7 With the aid of LANDSAT-1 imagery representative or typical transects were chosen within each region Profiles of each site were constructed from topographic maps and environmental data were accumulated for each site and related to low altitude aerial photography and enlarged LANDSAT-1 false color composites GRA

N77-22589# American Society of Civil Engineers New York Urban Water Resources Research Council
METHODS FOR CALCULATING MAXIMUM FLOOD DISCHARGES FOR NATURAL WATERCOURSES AND URBAN AREAS IN THE USSR
V V Kuprianov Aug 1976 23 p refs
(Grant NSF ENG-74-20326)
(PB-262070/6 TM-IHP-5) Avail NTIS HC A02/MF A01 CSCL 08H

Support of the international hydrological program Project 7 Effects of urbanization on the hydrological regime and on water quality is reported Design criteria applicable to control of natural streams and sizing of facilities for urban drainage in the U S S R are defined GRA

N77-22592# Virginia Polytechnic Inst and State Univ Blacksburg
A MODEL FOR PREDICTING FLOOD HAZARDS DUE TO SPECIFIC LAND-USE PRACTICES
B B Ross D N Contractor E A Li V O Shanholtz and J C Carr Sep 1976 124 p refs Sponsored by Dept of Interior
(PB-261389/1, VPI-VWRRC-Bull-99 W77-02078 OWRT-A-062-VA(2)) Avail NTIS HC A06/MF A01 CSCL 13B

A finite element model for mathematically routing overland and channel flow when rainfall excess is known is developed To determine rainfall excess a procedure was developed to subdivide a drainage area into similarly responding units defined as hydrologic response units These units were functions of soil texture soil depth land use and hydrology group classification A computer model based on the Mein and Larson and Holtan infiltration equations was developed to generate excess precipitation for each hydrologic response unit GRA

N77-22597# Minnesota Univ Minneapolis Water Resources Research Center
THE 8TH ANNUAL WATER RESOURCES SEMINAR GROUNDWATER RESOURCES AND DEVELOPMENT
May 1976 53 p refs
(OWRT Proj A-999-MINN(40))
(PB-261491/5 WRRC-Bull-87 W77-02223) Avail NTIS HC A04/MF A01 CSCL 13B

The proceedings of a conference on groundwater are presented Topics include issues and trends in groundwater use occurrence and quality of groundwater in Minnesota monitoring of groundwater stormwater as a potential contaminant and regional approaches to groundwater management GRA

N77-23581# Nevada Univ Reno Center for Water Resources Research
WATER TABLE AND RELATED MAPS FOR NEVADA TEST SITE AND CENTRAL NEVADA TEST AREA
Paul R Fenske and Chalon L Carnahan Apr 1976 132 p refs
(Contract E(29-2)-1253)
(NVO-1253-9) Avail NTIS HC A07/MF A01

Water table maps water table gradient maps and depth-to-water maps were constructed for the Nevada Test Site and the Central Nevada Test Area by empirical simulation using a digital computer Although the digital computer program was developed specifically for the areas mapped it is directly applicable to any hydrologic province where ground water recharge areas occur between the discharge areas such a humid regions and the arid Great Basin of the western United States Maps constructed during May 1975 a listing of the water level control points and a brief description of the empirical mapping technique are presented ERA

N77-23590# Particle Measuring Systems Boulder Colo
THE RESPONSE OF OPTICAL ARRAY SPECTROMETERS TO ICE AND SNOW A STUDY OF 2-D PROBE AREA-TO-MASS RELATIONSHIPS Final Report, 22 Mar - 30 Jun 1976
Robert G Knollenberg 8 Nov 1976 36 p refs
(Contract F19628-75-C-0141 AF Proj 627A)
(AD A034741 AFGL-TR-76-0273) Avail NTIS HC A03/MF A01 CSCL 20/6

Theoretical and field data analysis were performed to determine area-to-mass relationships for the response of 2-D Optical Array Spectrometers to snow crystals A single theoretical relationship was found adequate to correct the measured area to true area for all but stellar dendrites and needles Area-to-mass relationships established from the analysis of field data were found to be well behaved The application of software without complete habit definition is discussed and shown to be potentially feasible GRA

N77-23595# New Mexico State Univ University Park Water Resources Research Inst
APPLICATION OF ENVIRONMENTAL TRITIUM IN THE MEASUREMENT OF RECHARGE AND AQUIFER PARAMETERS IN A SEMI-ARID LIMESTONE TERRAIN Completion Report

Geraldo Wolfgang Gross Roberta N Hoy and Christopher J Duffy Nov 1976 225 p refs Prepared in cooperation with New Mexico Inst of Mining and Technology
(Contract DI-14 31-0001 4107)
(PB-263289/1 WRRI-080 W77-04106
OWRT-B 041-NMEX(1)) Avail NTIS HC A10/MF A01 CSCL 08H

This project is part of a continuing inquiry into regional patterns of recharge and groundwater flow Starting from the hydrologic model established in a previous investigation this phase has concentrated on determinations of environmental tritium in the basin s recharge belt Special attention was given to the southern part of the study area where tritium peaks predicted by the model apparently had failed to materialize For the sampled wells all available information on depth and geologic character of water-bearing horizons as well as construction and history of each well were collected and summarized The areal precipitation over the basin was recomputed for the year 1955-1974 and statistics on surface runoff have been assembled Tritium concentrations in groundwater from the Recharge Belt are on the whole lower than might be expected from the Model Also in considerable parts of the Recharge Belt the groundwater is confined The distribution of environmental tritium within the basin itself both in time and space suggests that interaquifer leakage is an important factor in these patterns GRA

N77-23596# Wyoming Univ Laramie Water Resources Research Inst
DEVELOPMENT OF COMMERCIAL/INSTITUTIONAL PARAMETER UNITS FOR THE MAIN II SYSTEM OF WATER DEMAND FORECASTING
A Gerald Thompson Verne E Smith and William R Colvin Nov 1976 60 p refs
(Contract DI-14-31-0001-5220)
(PB-263493/9 W77-04182 OWRT C-6188(5220)(1)) Avail NTIS HC A04/MF A01 CSCL 13B

Commercial/institutional data were collected for 20 cities in the western United States Analysis led to the development of linear relationships to predict commercial/institutional parameters from population Geographic regions and classification by city size were not found to be significant factors The MAIN 2 (Municipal And Industrial Needs) water forecasting computer model was modified to include the option of estimating commercial/institutional parameters if the data are not input Application of the modified model to three test cities gave very good results GRA

N77-23644 California Univ Berkeley
A STUDY OF SUBMERGED AND SURFACE HORIZONTAL BUOYANT JETS Ph D Thesis
Atambir Singh Rao 1976 145 p
Avail Univ Microfilms Order No 77-4579

A theroretical and experimental study was made of two classes of buoyant jet problems as they relate to thermal discharges from power plants to stagnant and non-stratified ambient fluids A set of entrainment constants and relative spreading ratio for the submerged jet was determined by comparison of theoretical and experimental results for jet centerline temperature decay and jet width Two different sets of constants were required to define the centerline temperature decay and jet width accurately The experiments for the surface jet were conducted in the same pool using two discharge pipe diameters Three dimensional temperature profiles were measured using thermistors up to a distance of 40 diameters from the discharge The majority of the temperature profiles were measured however using a remote sensing radiometer Results using both measurement techniques yielded identical results Dissert Abstr

N77-23688# Air Force Geophysics Lab Hanscom AFB Mass Meteorology Div
SNOW/CLOUD DISCRIMINATION Final Report
Francis R Valovcin 4 Aug 1976 17 p refs
(AF Proj 6698)
(AD-A032385 AFGL-TR-76-0174 AFGL AFSG-349) Avail NTIS HC A02/MF A01 CSCL 04/2

The main objective of this investigation was to evaluate the usefulness of the data from the S192 Multispectral Scanner aboard Skylab in snow cloud discrimination From the available S192 screening films and digital tape data the reflectance characteristics of snow ice and water clouds in different spectral bands from the visible into the near infrared spectral region can be determined In the visible part of the spectrum snow ice and water clouds appear white In the near infrared Band 11 (1 55 to 1 75 micrometers) water clouds are white ice clouds are gray and snow is black The ratio of the radiance values in Band 6 (0 68 to 0 76 micrometers) to Band 11 (1 55 to 1 75 micrometers) appears to provide a method for discriminating between snow cover ice and water clouds Author (GRA)

N77-24553*# Army Engineer District San Francisco Calif
CALIFORNIA COASTAL PROCESSES STUDY, LANDSAT 2 Final Report, Feb 1975 - Jan 1977
Douglas M Pirie (Earth Science Consulting and Technology Costa Mesa Calif) and David D Steller Principal Investigators Apr 1977 164 p refs Original contains imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(NASA Order S-54062A)
(E77-10158 NASA-CR-153043) Avail NTIS HC A08/MF A01 CSCL 08J

The author has identified the following significant results By using suspended sediments as tracers objectives were met by qualitative definition of the nearshore circulation along the entire coast of California with special study sites at Humboldt Bay the mouth of the Russian River San Francisco Bay Monterey Bay and the Santa Barbara Channel Although LANDSAT primarily imaged fines and silts in the surface waters the distribution of sediments allowed an examination of upwelling convergences and coastal erosion and deposition In Monterey Bay and Humboldt Bay these coastal phenomena were used to trace seasonal trends in surface currents

N77-24554*# Department of the Environment Ottawa (Ontario)
RETRANSMISSION OF HYDROMETRIC DATA IN CANADA Quarterly Report, Jan - Mar 1977
R A Halliday Principal Investigator and I A Reid May 1977 9 p refs Sponsored by NASA ERTS
(E77-10159 NASA-CR-153044) Avail NTIS HC A02/MF A01 CSCL 08H

The author has identified the following significant results During the winter of 1974-75 the number of transmissions dropped with lower temperatures and ceased at -20 C During the winter of 1975-76 the same pattern occurred except that the platform ceased at slightly lower temperatures probably due to the addition of 3 1 5 V primary cells to the power supply The next winter (1976-77) the same pattern occurred

N77-24555*# Department of the Environment Ottawa (Ontario)
HYDROLOGIC DATA RELAY BY SATELLITE FROM REMOTE AREAS
R A Halliday Principal Investigator 1977 22 p refs Presented at Technical and Sci Sessions on Water Resources World Water Conf Mar del Plata Argentina 14-25 Mar 1977 Sponsored by NASA ERTS
(E77-10160 NASA-CR-153045) Avail NTIS HC A02/MF A01 CSCL 08H

The author has identified the following significant results Experimental use of LANDSAT data collection system and the GOES system has demonstrated the feasibility of using this technology to relay hydrologic data from remote areas on a near real time basis The system has proved to be accurate reliable and cost effective

N77-24556*# Department of the Environment Ottawa (Ontario)
HYDROLOGIC APPLICATIONS OF THE TIROS-N ARGOS DATA COLLECTION SYSTEM

R A Halliday Principal Investigator and I A Reid 1977 10 p refs Presented at 1st Argos Users Working Group Meeting Washington D C 21 22 Apr 1977 Sponsored by NASA ERTS
(E77-10161 NASA-CR-153046) Avail NTIS HC A02/MF A01 CSCL 08H

N77-24559*# Texas A&M Univ College Station Remote Sensing Center
SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS Progress Report, 1 Sep 1976 - 28 Feb 1977
Bruce J Blanchard Principal Investigator Mar 1977 13 p ERTS
(Contract NAS5-22534)
(E77-10166 NASA-CR-152667 RSC-3273-5 RSC-3273-6) Avail NTIS HC A02/MF A01 CSCL 08H

N77-24576# Massachusetts Inst of Tech Cambridge Ralph M Parsons Lab for Water Resources and Hydrodynamics
NUMERICAL MODELING OF DISPERSION IN STRATIFIED WATERS
George Christodoulou and Jerome J Connor 20 Nov 1976 25 p refs
(Grant NOAA-04-6-158-44007)
(PB-263379/0 MITSG-76-17 NOAA-76122912) Avail NTIS HC A02/MF A01 CSCL 08C

The dispersion process in a two layer system which represents an approximation for a natural coastal water body during the summer season when a distinct thermocline usually exists is quantitatively described using a formulation based on the convection-diffusion equation vertically integrated between the layer boundaries Layer velocities and thicknesses are assumed to be obtained from a separate hydrodynamic model The quantification of the physical processes of entrainment and mixing through the density interface as well as the horizontal dispersion mechanism is discussed The model is applied to a particle dispersion experiment carried out recently in the Massachusetts Bay and comparisons with field data are presented GRA

N77-24578# Purdue Univ Lafayette Ind Water Resources Research Center
AN EXPERIMENTAL INVESTIGATION OF THE RAINFALL ON THE TURBULENCE PROPERTIES OF OVERLAND FLOW
Hagop Shahabian and Jacques W Delleur Dec 1976 128 p refs Sponsored by Office of Water Res and Technol
(PB-263494/7 TR-88 W77-04177 OWRT-A-037-IND(1)) Avail NTIS HC A07/MF A01 CSCL 08M

The principal turbulence characteristics of two-dimensional shallow water flow on a smooth boundary with and without rainfall were studied The mean and fluctuating components of the longitudinal and vertical velocities and the corresponding Reynolds stress were measured through the depth of the flow and the mean and fluctuating components of the bottom shear stress were obtained by means of a split hot film sensor and a shear stress sensor respectively The spectral density estimates and autocorrelation functions for each of the shear stresses and of the velocities are calculated and presented GRA

N77-25605*# Bittinger (M W) and Associates, Inc Fort Collins Colo
SNOWPACK GROUND TRUTH DONNER PASS SITE, SODA SPRINGS, CALIFORNIA Mission Report, 18 Jan 1977
E Bruce Jones Feb 1977 14 p Original contains color illustrations
(Contract NAS5-22312)
(NASA-CR-152532) Avail NTIS HC A02/MF A01 CSCL 08L

Ground truth data taken near Soda Springs California on January 18 1977 in support of the NASA Airborne Instrumentation Research Program are presented Ground truth data taken in support of this mission were as follows (1) snow depths were taken every 400 feet (2) snow densities were taken every 1 200 feet (3) two snowpits were dug and limited density vertical layer classifications and soil observations were taken and (4) temperatures of the upper 6 inches of the snowpack were taken at one location Author

N77-25607*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt, Md
REMOTE SENSING INPUTS TO LANDSCAPE MODELS WHICH PREDICT FUTURE SPATIAL LAND USE PATTERNS FOR HYDROLOGIC MODELS
Lee D Miller Craig Tom and Kaew Nualchawee May 1977 49 p refs Sponsored in part by the US Dept of Interior the United Nations Colo State Univ and Kasetsart Univ Bangkok Thailand
(NASA-TM-X-71330 X-923-77-115) Avail NTIS HC A03/MF A01 CSCL 08B

A tropical forest area of Northern Thailand provided a test case of the application of the approach in more natural surroundings Remote sensing imagery subjected to proper computer analysis has been shown to be a very useful means of collecting spatial data for the science of hydrology Remote sensing products provide direct input to hydrologic models and practical data bases for planning large and small-scale hydrologic developments Combining the available remote sensing imagery together with available map information in the landscape model provides a basis for substantial improvements in these applications Author

N77-25610# Colorado State Univ Fort Collins Environmental Resources Center
DETERMINATION OF SNOW DEPTH AND WATER EQUIVALENT BY REMOTE SENSING Final Report
Harold W Steinhoff and Albert H Barnes Jun 1976 21 p
(Contracts DI-14-31-0001-3806 D1-14-31-0001-4006)
(PB-264229/6 W77-05104 OWRT-A-019-COLO(2)) Avail NTIS HC A02/MF A01 CSCL 08L

By measuring the melt date and environmental variables one could predict snow depth and water equivalent once these equations were established for a given area Melt date can be measured by observation from two aerial flights at three-day intervals in early spring It is concluded that determination of snow depth and water equivalent by remote sensing from aircraft is possible GRA

N77-25611# Geological Survey Anchorage Alaska Water Resources Div
WATER RESOURCES DATA FOR ALASKA WATER YEAR 1975 Water-Data Report, 1 Oct 1974 - 30 Sep 1975
Dec 1976 424 p
(PB-264228/8, USGS-WDR-AK-75-1
USGS-WRD-HD-76-0050) Avail NTIS HC A18/MF A01 CSCL 08H

Water resources data for the 1975 water year for Alaska consist of records of stage discharge and water quality of streams stage and water quality of lakes and water levels and water quality in wells and springs This report contains discharge records for 107 gaging stations, stage only records for 2 gaging stations, water quality for 31 stations, and water levels for 19 observation wells Also included are 85 creststage partial-record stations These data represent that part of the National Water Data System operated by the U S Geological Survey and cooperating State and Federal agencies in Alaska GRA

N77-25620# State Univ of New York Albany Atmospheric Sciences Research Center
US IFYGL COASTAL CHAIN PROGRAM REPORT 2 TRANSPORT, CURRENTS AND TEMPERATURE FROM THE UNITED STATES AND CANADIAN COASTAL CHAIN STUDIES

Dennis R Landsberg and Jon T Scott Aug 1976 225 p refs
(Grants NOAA-2-35388 NOAA-2-35281)
(PB-263829/4 ASRC-Pub-387 NOAA-77010403) Avail NTIS HC A10/MF A01 CSCL 08H

Limnologists are provided with several kinds of summarized temperature velocity and transport data for the five coastal chains combined The introductory text provides a review of the measurement techniques including assessment of data accuracy plus the methods of calculation used in the report and the limitations that should be placed on use of the data GRA

N77-25621# National Weather Service Silver Spring Md Hydrologic Research Lab
CATCHMENT MODELING AND INITIAL PARAMETER ESTIMATION FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM
Eugene L Peck Jun 1976 86 p refs
(PB-264154/6 NOAA-TM NWS-HYDRO-31-DOC NOAA-76081102 NOAA/DF77-002a) Avail NTIS HC A05/MF A01 CSCL 08H

A major revision has been made in the soil moisture accounting for the catchment model The components for soil moisture accounting of the Sacramento Model have replaced those of the modified Stanford Model as used in the original system The conceptual features and characteristics of the Sacramento Model are discussed GRA

N77-26574*# Instituto Geofisico del Peru Lima
APPLICATION OF REMOTE SENSING TECHNIQUES FOR THE STUDY AND EVALUATION OF NATURAL RESOURCES IN PERU Progress Report
Jose Pomalaza Principal Investigator [1976] 5 p Sponsored by NASA ERTS
(E77-10172, NASA-CR-153228) Avail NTIS HC A02/MF A01 CSCL 08F

N77-26579*# Texas A&M Univ College Station Remote Sensing Center
DEMONSTRATION TO CHARACTERIZE WATERSHED RUNOFF POTENTIAL BY MICROWAVE TECHNIQUES Final Report
Bruce J Blanchard 1 Jun 1977 37 p refs
(Contract NAS9-14898)
(NASA-CR-151426 RSC-3345) Avail NTIS HC A03/MF A01 CSCL 08H

Characteristics such as storage capacity of the soil volume of storage in vegetative matter and volume of storage available in local depressions are expressed in empirical watershed runoff equations as one or more coefficients Conventional techniques for estimating coefficients representing the spatial distribution of these characteristics over a watershed drainage area are subjective and produce significant errors Characteristics of the wear surface are described as a single coefficient called the curve number Author

N77-26585*# Virginia Inst of Marine Science Gloucester Point
APPLICATIONS OF REMOTE SENSING TO ESTUARINE MANAGEMENT Annual Report
John C Munday Jr Hayden H Gordon and Harold F Hennigar Jun 1977 74 p refs
(Grant NGL-47-022-005)
(NASA-CR-153287 AR-5) Avail NTIS HC A04/MF A01 CSCL 05A

Remote sensing was used in the resolution of estuarine problems facing federal and Virginia governmental agencies A prototype Elizabeth River Surface Circulation Atlas was produced from photogrammetry to aid in oil spill cleanup and source identification Aerial photo analysis twice led to selection of alternative plans for dredging and spoil disposal which minimized marsh damage Marsh loss due to a mud wave from a highway dyke was measured on sequential aerial photographs An historical aerial photographic sequence gave basis to a potential Commonwealth of Virginia legal claim to accreting and migrating coastal islands Author

N77-26587*# Florida Univ Gainesville Dept of Geology
BASIC HYDROGEOLOGIC AND REMOTE SENSING DATA FOR SELECTION OF SANITARY LANDFILL SITES
H K Brooks B E Ruth and J D Degner 5 Apr 1977 28 p refs
(Grant NsG-7236)
(NASA-CR-153280, UFL/COEL-77/002 Rept-1) Avail NTIS HC A03/MF A01 CSCL 08G

Solid waste disposal were studied in Volusia County to protect the water supply in the area Highlands in this County are of limited areal extent and, most significantly the sand hills and ridges are in areas where recharge of the Floridan aquifer occurs This study proves that well drained soils meeting the current State requirements are of limited areal extent These areas should not be utilized as sanitary landfill sites! Rather it is recommended that the Tomoka Farm Road site into the adjacent wetlands be extended The County site on Rima Ridge recommended by Greenleaf-Telesca as the primary waste burial site in the County should be re-evaluated because of potential danger to the Daytona Beach water supply Author

N77-26588*# Environmental Research Inst of Michigan Ann Arbor Infrared and Optics Div
REMOTE SENSING OF WETLANDS
Norman E G Roller Mar 1977 165 p refs
(Grant NGR-23-005-522)
(NASA-CR-153282 ERIM-193400-14-T) Avail NTIS HC A08/MF A01 CSCL 14E

The concept of using remote sensing to inventory wetlands and the related topics of proper inventory design and data collection are discussed The material presented shows that aerial photography is the form of remote sensing from which the greatest amount of wetlands information can be derived For extensive general-purpose wetlands inventories however the use of LANDSAT data may be more cost-effective Airborne multispectral scanners and radar are in the main too expensive to use - unless the information that these sensors alone can gather remotely is absolutely required Multistage sampling employing space and high altitude remote sensing data in the initial stages appears to be an efficient survey strategy for gathering non-point specific wetlands inventory data over large areas The operational role of remote sensing insupplying inventory data for application to several typical wetlands management problems is illustrated by summary descriptions of past ERIM projects Author

N77-26599# World Meteorological Organization Geneva (Switzerland)
STATISTICAL INFORMATION ON ACTIVITIES IN OPERATIONAL HYDROLOGY
1977 219 p
(WMO-464 OHR-10 ISBN-92-63-10464-6) Avail NTIS HC A10/MF A01

Statistical information on activities in operational hydrology indicative of the status of progress and future plans of WMO members at national regional and global levels is presented

The information given covers international and national organizations dealing with hydrology and water resources principal river basins networks of hydrological observing stations, cost and manpower for operation of hydrometric networks, and hydrological data banks ESA

N77-26607# Massachusetts Inst of Tech Cambridge Ralph M Parsons Lab for Water Resources and Hydrodynamics
DISCRIMINATION OF ALTERNATIVE HYDROLOGIC REGRESSION MODELS A USER'S MANUAL Final Report
Juan B Valdes and Ignacio Rodriguez-Iturbe Jul 1976 117 p refs
(Grant NSF GK-41643)
(PB-264285/8 TN-19 T76-7) Avail NTIS HC A06/MF A01 CSCL 08H

The listings and documentation of the computer programs used in Valdes and Rodriguez-Iturbe for discrimination of hydrologic regression models are presented The programs implemented allow the user to discriminate standard regression models alternative forms of the covariance matrix of the disturbances and competing functional forms One example is presented for each main program to illustrate the input/output forms GRA

N77-27459 Kansas Univ , Lawrence
ANALYSIS OF ERROR IN GROUNDWATER MODELLING Ph D Thesis
Mehmet Arif Yukler 1976 194 p
Avail Univ Microfilms Order No 77-2297

An equation was derived for the case of unconfined groundwater flow which more accurately describes the movement of the free surface This is an approximation to the three-dimensional flow systems A new method using sensitivity coefficients was developed to analyze the errors in hydraulic head values due to errors in hydraulic conductivity specific yield, storage coefficient and transmissivity A direct closed form of the sensitivity equation was obtained The groundwater flow and the sensitivity equations were applied to west-central Kansas Pliocene aquifer It was concluded that (1) Darcy s law is valid in modelling of large groundwater systems where the velocity of flow is averaged over a large areas (2) dependence of transmissivity on time can be neglected (3) The storage coefficient can be assumed independent of time and space if the formation compacts less than 5% of its original thickness and (4) Dupuit-Forchhemier assumptions are valid for large groundwater systems Dissert Abstr

N77-27464 Purdue Univ , Lafayette Ind
DIGITAL PROCESSING OF SATELLITE MULTISPECTRAL SCANNER DATA FOR HYDROLOGIC APPLICATIONS Ph D Thesis
Luis Alberto Bartolucci-Castedo 1976 251 p
Avail Univ Microfilms Order No 77-1682

The development of computer-aided procedures to extract useful hydrologic information from satellite digital multispectral data for applications to surface water inventory and snowcover mapping in mountainous regions is presented LANDSAT MSS and SKYLAB S-192 multispectral data were utilized The results indicated that the smallest water body that can be reliably identified using computer-aided multispectral classification of LANDSAT data should be at least three hectares (approximately equal to or larger than 8 acres in size) Smaller water bodies can be identified only in particular cases in which at least one spatial resolution entirely covers the water surface Use of a mixture spectral class however allows reliable identification of water bodies as small as one hectare (approximately equal to 2 5 acres) in size Dissert Abstr

N77-27468*# Milan Univ (Italy)
GEOMORPHIC AND LANDFORM SURVEY OF NORTHERN APPENNINE RANGE (NAR) Final Report
C M Marino, Principal Investigator and E Zilioli Jun 1977 30 p Sponsored by NASA Original contains color imagery Original photography may be purchased from the EROS Data Center Sioux Falls, S D 57198 ERTS
(E77-10178 NASA-CR-153276) Avail NTIS HC A03/MF A01 CSCL 08G

The author has identified the following significant results An approach to landslide hazard detection was developed through the analysis of satellite imagery (LANDSAT 2) showing many landslide areas that occur on marine silts and clays in northern Appennine Range in Italy A landslide risk score was given for large areas by narrowing and extending well defined areas whose behavior and reflectivity variation was due to upper surface changes Results show that this methodology allows evolution pattern of clay outflows to be distinguished

N77-27483*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
MULTISPECTRAL REMOTE OBSERVATIONS OF HYDROLOGIC FEATURES ON THE NORTH SLOPE OF ALASKA
Dorothy K Hall and M Leonard Bryan (JPL, Pasadena, Calif) May 1977 46 p refs Submitted for publication
(NASA-TM-X-71351, X-913-77-124) Avail NTIS HC A03/MF A01 CSCL 08H

Visible and near-infrared satellite data and active and passive microwave aircraft data are used to analyze some hydrologic features in Arctic Alaska The following features have been studied the small thaw lakes on the Arctic Coastal Plain (oriented lakes), Chandalar Lake in the Brooks Range several North Slope rivers, surface water on the tundra and snowcover on the North Slope and in the Brooks Range Passive microwave brightness temperatures (T sub b) as seen on Electrically Scanned Microwave Radiometer (ESMR) imagery are shown to increase with increasing ice thickness on all of the lakes studied Aufeis an important hydrologic parameter in the Arctic is observable in the Sagavanirktok River channel on April ESMR imagery LANDSAT imagery with better (80 m) resolution is useful for measuring aufeis extent using band 5 imagery obtained just after snowmelt in June It is shown that the extent of aufeis (as measured on LANDSAT imagery) varies with meteorological conditions and therefore may be a useful indicator of annual climate fluctuations on the North Slope Snow and ice breakup has been traced from the Brooks Range Mountains to the Arctic Ocean Coast using LANDSAT band 7 imagery in May when melting begins in the mountains Author

N77-27488# Hawaii Univ Honolulu Water Resources Research Center
SIMPLIFIED TECHNIQUES FOR DETERMINING WATER CONDUCTING AND WATER STORAGE PROPERTIES OF SOILS Completion Report, 1 Jul 1975 - 30 Jun 1976
Lajpat R Ahuja and Richard E Green Oct 1976 40 p refs
(Contract DI-14-34-0001-6012)
(PB-265171/9 TMR-51, W77-05853, OWRT-A-060-HI (1)) Avail NTIS HC A03/MF A01 CSCL 08M

Four simplified methods of simultaneously determining both hydraulic conductivity and water characteristic functions of a soil from field tensiometric data for drainage were investigated These soil-water properties were assumed to be described by certain simple power or logarithmic functional forms Two of the function parameters were the near-saturated values of soil-water content and hydraulic conductivity which were assumed to be known (from measurements during infiltration preceding the drainage) The other two unknown parameters were determined either by the least-squares optimization over the complete range of data or by the algebraic manipulation of data for two consecutive time values GKA

N77-27489# Rocky Mountain Forest and Range Experiment Station Fort Collins Colo
COMPUTER SIMULATION OF SNOWMELT

Rhev M Solomon (Gila National Forest) Peter F Ffolliott (Arizona Univ Tucson) Malchus B Baker, Jr and J R Thompson Oct 1976 14 p refs
(Contract DI-14-31-0001-3803)
(PB-265109/9 FSRP-RM-174 W77-05735
OWRT-A-042-ARIZ(13)) Avail NTIS HC A02/MF A01 CSCL 08L

A previously developed computer model of snowmelt was modified to model intermittent snowpacks The modified program SNOWMELT is dependent on four daily input variables-maximum and minimum temperatures precipitation and shortwave radiation or percent cloud cover Initializing the model requires limited knowledge of local watershed and snowpack parameters Model verification and seven experimental watersheds in Arizona proved satisfactory GRA

N77-27490# National Committee for the International Hydrological Decade Washington D C Work Group on Snow and Ice Hydrology
SNOW AND ICE HYDROLOGY IN THE UNITED STATES CURRENT STATUS AND FUTURE DIRECTIONS Final Report
1976 75 p refs
(Grant NSF G-310)
(PB-264466/4) Avail NTIS HC A04/MF A01 CSCL 08L

Specific research needs in snow and ice hydrology are identified, and recommended (1) lead-agency responsibility for data collection and dissemination (2) development of a national data system (3) an increase in funding for research and (4) direction of research toward the synthesis of results from many geographic areas and toward studies of the primary chemical and physical processes affecting snow and ice GRA

N77-27492# Nevada Univ Las Vegas Water Resources Center
CONSIDERATION OF TOTAL ENERGY LOSS IN THEORY OF FLOW TO WELLS
R L Cooley and A B Cunningham Mar 1977 55 p refs
(Contract DI-14-31-0001-5028)
(PB-264717/0 H-W-Pub-30, W77-05368
OWRT-A-061-NEV(1)) Avail NTIS HC A04/MF A01 CSCL 08H

A coupled numerical solution for unsteady flow in single or multiple aquifiers and the well penetrating the system was developed Analysis of hypothetical problems indicates that, because of friction losses and nonuniform flow in the well bore a significant region of nonradial flow in the aquifer(s) results whenever aquifer hydraulic conductivity is greater than about 0 015 m/min and pumping rate is greater than about 1 2 cubic meters min Because of this nonradial flow significant errors in computed aquifer transmissivity can occur whenever aquifer hydraulic conductivity is greater than about 0 03 m/min GRA

07

DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing computer technology satellite and aircraft hardware and imagery

A77-31565 * An image-processing system applied to earth-resource imagery P Carter and W E Gardner (Atomic Energy Research Establishment, Harwell, England) In Environmental remote sensing 2 Practices and problems
London, Edward Arnold (Publishers), Ltd , 1977, p 143-162 18 refs Contract No NAS7-100

The Harwell Image Processing System (HIPS) has been adapted for processing earth-resource imagery in either film or tape format Data from film are obtained using a computer-controlled flying spot scanner Local rapid interactive processing is based on a PDP 11/20 minicomputer which has suitable display facilities for immediate visual appraisal of results and also a fast data link to an IBM 370/168 computer complex An extensive subroutine library is being assembled for data preprocessing and feature extraction This chapter includes a discussion of the basic principles of image analysis, a description of the HIPS system, and finally, for illustrative purposes, a description of several simple software routines (Author)

A77-31566 Objective generalization of Landsat images A C Armstrong and K M Clayton (East Anglia, University, Norwich, England) In Environmental remote sensing 2 Practices and problems (A77-31556 13 43) London, Edward Arnold (Publishers), Ltd , 1977, p 163 189 18 refs Research supported by the Department of Industry and Natural Environmental Research Council

The characteristics of Landsat data are discussed along with the classification procedures in remote sensing A description of selection procedures is presented, taking into account aspects of field selection and feature selection The choice of clustering algorithms is considered, giving attention to the selection problem, the classical cluster analysis, the iterative clustering method, the chain clustering method, and visual analysis A description is given of the results of a study of ERTS-I test data G R

A77-31569 An assessment of ERTS I imagery as a base-map for natural resource surveys in developing countries M A Keech (National College of Agricultural Engineering, Silsoe, Bedford, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 246-258 9 refs

The requirements of field surveyors and the place of Landsat data in development planning are outlined Examples are then given of studies in Rhodesia and Sierra Leone using Landsat data from the MSS sensor The objective has been to see what value Landsat imagery has for the field worker engaged in resource identification without the aid of extensive technological assistance The scalar accuracy and locational value of Landsat imagery are assessed Subsequently the identification of geological, mining, geomorphological, soils, vegetation and land-use features are commented upon It is concluded that Landsat imagery is a valuable complementary source of information to the resource surveyor, particularly when techniques of color-enhancement are employed (Author)

A77-31701 # Problems in electromagnetic scanning of conducting media (Problemy elektromagnitnoi lokatsii provodiashchikh sred) G Ia Shaidurov *Radioelektronika,* vol 20, Jan 1977, p 11-16 9 refs In Russian

A generalized approach to the study of conducting media via electromagnetic fields established in air is addressed, with emphasis on EM detection and pattern recognition of objects immersed in the conducting medium Various types of EM scanning systems are discussed in terms of function and application conventional radar, surveys of natural resources and of land use by radar like systems (ground-based, submarine, satellite based, airborne), introscopy, and flaw detection Outlines of a statistical theory applicable to the generality of radar like EM scanning systems are sketched Microwave radar scanning of lunar resources, scanning of interfaces in layered media, and signal transmission and antenna positioning are discussed R D V

A77-33132 Geometrical referencing of Landsat images by affine transformation and overlaying of map data D Steiner (Eidgenossische Technische Hochschule, Zurich, Switzerland) and M E Kirby (INTERA Environmental Consultants, Ltd , Ottawa, Canada) *Photogrammetria,* vol 33, Apr 1977, p. 41-75 23 refs National Research Council of Canada Grant No A-7501

This paper presents a solution to the problem of referencing Landsat images to a geometrical base by using overlays of UTM map data matched by a simple affine transformation The adequacy of such a transformation is first examined theoretically by considering systematic imaging errors along scan lines, as well as earth rotation and map projection effects, the latter in the form of an approximation A more rigorous test is carried out by transforming points on hypothetical ideal Landsat images forwards to the map base by means of the projection equations and backwards again to the images by affine transformation An experiment is then conducted in which digitized map data are matched to two selected actual Landsat images (Lake Erie region and Manitoba) In this context, the authors discuss problems of selecting and measuring control points and an iterative affine transformation procedure based on the gradual rejection of outliers Finally, overlays of map grids and other linear features are produced The residual standard errors range from 83 to 185 m at ground scale (Author)

A77-33139 # Ways to increase the accuracy of distance measurement by aircraft phase radio rangefinder systems (Puti povyshenia tochnosti izmerenia rasstoianii samoletnymi fazovymi radiodal'nomernymi sistemami) A S Maslennikov and Iu P Grichuk *Geodezia i Kartografia,* Feb 1977, p 29-34 In Russian

A77-33651 A radiometric interpretive legend for Landsat digital thematic maps C J Robinove (U S Geological Survey, Reston, Va) *Photogrammetric Engineering and Remote Sensing,* vol 43, May 1977, p 593, 594

A legend is suggested for use with computer-generated thematic maps made from Landsat digital data that designates some of the radiometric characteristics of each thematic map unit as well as the described terrain attributes of each map unit The relationship between spectral band and radiance for each map unit is shown by a two dimensional polygon with the four Landsat multispectral scanner bands plotted on the ordinate and radiance levels on the abscissa The resulting shape is colored to correspond with the map unit color, thus facilitating the recognition and understanding of the computer-generated map units (Author)

A77-35451 # CIR interpretation exercise - Landsat J W Frasca (California State College (Sonoma), Rohnert Park, Calif) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 1-5

A two part lab exercise which may be used to develop skills in interpreting satellite imagery at a variety of scales is described Slides of Landsat imagery of different terrains are used in a portable, rear-screen slide projector unit equipped with an audio component (cassette-type tape recorder) on which questions may be pre-recorded In the second part of the exercise, individual students view Landsat MSS images using portable light tables A series of questions regarding the imagery is provided to each student by the instructor

Anderson's Level I and II land-use classification system for remote-sensor data is used as a lab text C K D

A77-35452 # **Diazo Landsat color composites.** C L Ernst (Purdue University, West Lafayette, Ind.) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 6-9

The diazo development method, with which color images are made easily and inexpensively from Landsat black and white positive transparencies, is described The process uses a special diazo film, which is exposed to ultraviolet light (or direct sunlight) and developed in ammonia gas Color composites are obtained by overlaying three separate diazo transparencies The process does not damage the original Landsat transparency, total cost is about $0 30 per diazo C K D

A77-35453 # **Radar image interpretation** S A Morain (Arizona, University, Tucson, Ariz.) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 10-17

A sample exercise in radar image interpretation is presented The image used was obtained with the Goodyear 'GEMS' side-looking radar system at an altitude of 35,000 feet over Tucson, Arizona Characteristic types of terrain-system interaction represented in the sample image are discussed C K D

A77-35454 # **Comparison of color, color infrared, and thermal infrared images** S A Morain (Arizona, University, Tucson, Ariz.) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 18 26

The theoretical basis of color, color infrared, and thermal infrared images is outlined The information which can be provided by each type of image is discussed, and their applications are compared Special attention is given to the reasons for which the appearance of vegetation differs from one type of image to another C K D

A77-35457 # **The San Antonio Bay test site in the Texas coastal zone** R Holz (Texas, University, Austin, Tex.) *Remote Sensing of the Electro Magnetic Spectrum,* vol 4, Jan 1977, p 52-63

Information and field data gathered in the course of an investigation of techniques for using Landsat data for inventory and monitoring of Texas coastal zone areas are used in a laboratory exercise in the interpretation of satellite imagery An area on the San Antonio Bay was selected for its varied landscape in which land use and ecological patterns are being actively modified by dynamic physical processes (formation of an extensive delta by the San Antonio and Guadaloupe Rivers) and human enterprises (shell dredging) The use of maps to enhance interpretation techniques and aid in object identification is suggested C K D

A77-36102 # **The use of multispectral spaceborne photographs in geographical surveys and thematic mapping (Ob ispol'zovanii mnogozonal'nykh kosmicheskikh snimkov v geograficheskikh issledovaniiakh i tematicheskom kartografirovanii)** V I Kravtsova *Geodeziia i Kartografiia,* Mar 1977, p 44-49 5 refs In Russian

A77-36123 **Meteorite impact crater discovered in Central Alaska with Landsat imagery** P J Cannon (Alaska, University, Fairbanks, Alaska) *Science,* vol 196, June 17, 1977, p 1322-1324 9 refs

Several supporting observations indicate that Sithylemenkat Lake, Alaska, occupies a meteorite impact crater formed near the end of the Wisconsinan glaciation The initial identification with Landsat imagery is attributed to the unique perspective provided by such imagery (Author)

A77-36420 **An automatic image registration and overlay system.** K Y K Ng (Operational Research and Analysis Establishment, Ottawa, Canada) *Computers and Electrical Engineering,* vol 4, Mar 1977, p 71-85 10 refs

In this paper we present an automatic algorithm for registering and overlaying imagery The algorithm basically attempts to find by successive approximations the best affine transformation or second order polynomial relating to the two images The method requires the specification of only a matching pair of control points, then new control points are found approximately by extrapolating the old affine transformation to larger areas and then using correlation to find the best match Thus an obvious advantage of this algorithm lies in its automatic feature in locating and matching more potential ground control points This paper also discusses the effect of the distribution of control points on the affine transformation Finally, the method is tested on Landsat data and the results are discussed (Author)

A77-36985 # **Some results of the interpretation of high resolution imagery data from NOAA spacecraft.** P R S Salter (Meteorological Office, Bracknell, Berks., England) *Weather,* vol 32, June 1977, p 208-216 7 refs

A method is described for estimating sea-surface temperatures from infra-red high-resolution imagery obtained from very-high-resolution radiometer sounding data Since visible-spectrum data is not required, the method can be equally applied to both day-time and night-time imagery and at high latitudes in winter Although precise determinations of temperature are not obtained by this approach, the accuracy of the results is considered sufficiently good so that the method can be used in conjunction with vertical temperature profile radiometer sounding data for better retrieval of upper air temperature M L

A77-37504 * # **Flooding of Monroe County, Michigan - A comparison of three remote sensor data sets** M L Bryan (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif., Michigan, Environmental Research Institute, Ann Arbor, Mich.) *Michigan Academician,* vol 8, Spring 1976, p 425-440 8 refs

During the spring of 1973, three techniques were used to obtain remotely sensed data pertaining to the flooded shoreline of Monroe County, Michigan Although digitized data from the Earth Resources Technology Satellite were available on magnetic tapes, analysis was based on interpretation methods normally used for aerial photography, since the black and white IR photography and side-looking airborne radar (SLAR) data were available only as images Using IR photography as the standard, it was found that ERTS-1 Band 7 imagery had a 93% accuracy in detecting areas in the combined category of open water and flooded fields X(HH) data from SLAR detected that built up and wet areas were built-up (89 to 100% accuracy), but not that they were wet It is suggested that these two sensors used in concert from orbital heights could provide information useful to relief organizations in flooded areas It is considered likely that SLAR data will improve as higher resolution becomes available M L

A77-37599 # **Calculation of the total illumination of the earth surface when taking photographs from great heights and in the solution of photometric problems (Podschet summarnoi osveshchennosti zemnoi poverkhnosti pri fotografirovanii s bol'shikh vysot i pri reshenii fotometricheskikh zadach)** A I Lavrov and G I Ovchinnikov (Vsesoiuznoe Ob'edinenie Lesproekt, USSR) *Geodeziia i Aerofotos'emka,* no 1, 1977, p 87 89 6 refs In Russian

A formula in which the type of atmosphere is taken into consideration is proposed for calculating the total illumination of the earth surface The formula is helpful in determining exposures when taking photographs from great heights It yields illuminance value to within 10%, which is of importance in the determination of luminance factors of objects V P

A77-38192 **What can artificial intelligence techniques do for processing of satellite pictures.** R Bajcsy (Pennsylvania, University, Philadelphia, Pa) In Modeling and simulation Volume 7 - Proceedings of the Seventh Annual Pittsburgh Conference, Pittsburgh, Pa , April 26, 27, 1976 Part 1 Pittsburgh, Pa , Instrument Society of America, 1976, p 277-280 13 refs NSF Grant No GJ-43440

A description is presented of examples which illustrate applications of artificial intelligence techniques in satellite picture processing A program which recognizes bridges, rivers, and lakes is considered as an example for the use of a three-dimensional model of the world In this case use is made of the fact that bridges are above the water area Artificial intelligence techniques take into account that the world has three dimensions although the images are two-dimensional projections of the three-dimensional objects It is pointed out that the recognition process should provide a description of objects, their properties, and their relationships rather than just a classification of objects G R

A77-38340 **Scatter and emission characteristics of natural media at 3 millimeter wavelength** E Schanda, G Schaerer, and R Hofer *(Radiotekhnika,* vol 31, Sept 1976, p 3-10) *Telecommunications and Radio Engineering, Part II - Radio Engineering,* vol 31, Sept 1976, p 54-58 9 refs Translation

Imagery of the thermal radiation of the earth at 3 mm wavelength with a radiometer of 10 arcminutes angular resolution has been performed In particular the scatter and emission properties of flat, rough and heterogeneous surface layers of natural media have been studied Examples of the mm-wave images of various sceneries are presented The results of the experimental scatter and emission studies, the characterization of the emission properties of the media and the classification due to the structuring are discussed (Author)

A77-39973 # **The effect of multiple scattering on lidar measurements** A Cohen (Jerusalem, Hebrew University, Jerusalem, Israel) In International Laser Radar Conference, 8th, Philadelphia, Pa , June 6-9, 1977, Invited Papers Philadelphia, Pa , Drexel University, 1977 22 p 21 refs

The lidar equation in its standard form involves the assumption that the scattered irradiance reaching the lidar receiver has been only singly scattered However, in the cases of scattering from clouds and thick aerosol layers, it is shown that multiple scattering cannot be neglected An experimental method for the detection of multiple scattering by depolarization measurement techniques is discussed One method of theoretical calculations of double-scattering is presented and discussed (Author)

N77-22067# Applied Physics Lab Johns Hopkins Univ Laurel Md

EXPERIMENTAL RESEARCH ON THE PROPAGATION OF LORAN-C SIGNALS VOLUME C THE MEASUREMENT SYSTEM

S F Oden and J A Perschy Aug 1976 72 p ref
(Contract N00017-72-C-4401)
(AD-A031597, APL-JHU-TG-1298C) Avail NTIS
HC A04/MF A01 CSCL 11/7

This report describes the design, assembly and electrical matching of two identical measurement systems that were used in an experiment conducted by APL for the U S Air Force and the Defense Advanced Research Projects Agency to determine the validity of one facet of the theory of groundwave propagation at 100 kHz It is Volume C of four volumes Volume A is the summary report Volume B covers test operations and Volume D documents the data and analysis The goal of the experiment was to determine if an analytic function could be developed for operational use that relates secondary phase factor (SPF) to envelope to cycle difference (ECD) so that geodetic position can be computed accurately and in real time Field test data were collected and analyzed and show trends that tend to support the hypothesis that the desired functional relationship exists, at least under certain conditions Additional analysis and perhaps tests will be necessary to define these conditions or to prove conclusively the existence of such a relationship Author (GRA)

N77-22321# Kansas Univ Center for Research Inc Lawrence Remote Sensing Lab

A DEMONSTRATION AND EVALUATION OF THE UTILIZATION OF SIDE LOOKING AIRBORNE RADAR FOR MILITARY TERRAIN ANALYSIS Final Report

Louis F Dellwig Bradford C Hanson Norman E Hardy Julian C Holtzman and Paul L Hulen 1 Oct 1976 156 p refs
(Contract DAAG02-75-C-0145)
(AD-A033557 RSL-TR-288-1 ETL-0023) Avail NTIS
HC A08/MF A01 CSCL 17/9

Side looking airborne radar (SLAR) imagery acquired in diverse terrains and environments was studied to demonstrate its value in military tactical terrain analysis Capabilities unique to SLAR, such as all-weather and day or night image acquisition, are highlighted In addition other capabilities and limitations are also stressed to permit the utilization of SLAR with other sensors for maximum data retrieval Imagery studied was selected on the basis of geographic location and data content not system characteristics and estimates are made of the improved data content that could be realized by modification of system parameters By using a broader range of the electro-magnetic spectrum than most sensors and by operating under many controllable parameters the appropriate radar system and system configuration can be selected for any mission by the user to realize maximum target information Author (GRA)

N77-22577*# Atomic Energy Commission Dacca (Bangladesh)

INVESTIGATIONS USING DATA FROM LANDSAT-2 Quarterly Report, Oct - Dec 1976

Anwar Hossain Principal Investigator Feb 1977 4 p refs Sponsored by NASA ERTS
(E77-10138 NASA-CR-152632) Avail NTIS
HC A02/MF A01 CSCL 05B

The author has identified the following significant results New lands for forestation were set aside in the coastal area of Bangladesh based on LANDSAT mosaics (Chittagong - 195 000 acres Noakhali - 450,000 acres Barisal - 360 000 acres and Patuakhali - 225 000 acres) LANDSAT imageries were used for identification of drainage patterns in both the old and and new Comilla district

N77-22581*# Environmental and Regional Research Associates Inc Johnson City Tenn

PHOTOMORPHIC ANALYSIS TECHNIQUES AN INTERIM SPATIAL ANALYSIS USING SATELLITE REMOTE SENSOR IMAGERY AND HISTORICAL DATA Final Report

Harold R Keuper Robert W Peplies and Robert P Gillooly Jan 1977 268 p refs
(Contract NAS8-31329)
(NASA-CR-150227 ERRA-74-17(R)-Y) Avail NTIS
HC A12/MF A01 CSCL 05B

The use of machine scanning and/or computer-based techniques to provide greater objectivity in the photomorphic approach was investigated Photomorphic analysis and its application in regional planning are discussed Topics included delineation of photomorphic regions inadequacies of existing classification systems tonal and textural characteristics and signature analysis techniques pattern recognition and Fourier transform analysis and optical experiments A bibliography is included Author

N77-22740*# Jet Propulsion Lab , Calif Inst of Tech Pasadena

DETECTION OF ALTERATION ASSOCIATED WITH A PORPHYRY COPPER DEPOSIT IN SOUTHERN ARIZONA

M J Abrams and B S Siegal 1 Feb 1977 10 p
(Contract NAS7-100)
(NASA-CR-152677 JPL-TM-33-810) Avail NTIS
HC A02/MF A01 CSCL 08G

Computer processing of Landsat MSS data was performed using contrast stretching and band-to-band ratioing A false color ratio composite picture showed color anomalies which coincided with known areas of alteration on and about Red Mountain A helicopter survey of the study area was undertaken using a portable field reflectance spectrometer One hundred fifty-six spectra were obtained in the 0 4 to 2 5 micrometer wavelength region The spectra were digitized and contour maps for 24 wavelength intervals were produced no spectral anomalies were evident for the known altered areas A contour map produced from the 1 6 and 2 2 micrometer ratio generally delineated the alteration areas The 1 3 1 6 and 2 2 micrometer wavelength data were canonically transformed using a transformation empirically derived from discriminant function analysis of altered and unaltered materials for the Goldfield Nevada region and a contour map was produced for the first canonical variable The known areas of alteration were clearly defined on the contour map Author

N77-23168# Defense Mapping Agency Topographic Center Washington D C
DOPPLR A POINT POSITIONING PROGRAM USING INTEGRATED DOPPLER SATELLITE OBSERVATIONS Final Report, 1971 - 1976
Randall W Smith Charles Schwarz and William D Googe Apr 1976 59 p
(AD-A033620 DMATC TR-76 1) Avail NTIS HC A04/MF A01 CSCL 22/2

This report describes the FORTRAN 5 program DOPPLR developed for use on the UNIVAC 1108 electronic computer It is designed to derive the position of a reciever observing integrated Doppler shifts in transmissions from an artificial Earth satellite Author (GRA)

N77-23293*# Hughes Aircraft Co Culver City Calif Radar Systems Group
SHUTTLE IMAGING RADAR (SIR) CALIBRATION STUDY Final Report
Nov 1976 108 p refs
(Contract NAS9-14273)
(NASA-CR-151336 P76 448 HAC-Ref-D2617) Avail NTIS HC A06/MF A01 CSCL 17I

A radar calibration subsystem for measuring the radar backscattering characteristics of an imaged terrain is described To achieve the required accuracy for the backscattering coefficient measurement (about 2 dB with 80 percent confidence) the space hardware design includes a means of monitoring the state parameters of the radar For example the transmitter output power is sampled and a replica of its output waveform is circulated through the receiver These are recorded digitally and are used on the ground to determine such radar parameters as the transmitter power and the receiver gain This part of the data is needed by the ground processor to measure the terrain backscattering characteristics Author

N77-23564 Oklahoma State Univ Stillwater
OPTICAL ROUTING OF LARGE SCALE MARINE SEISMIC MAPPING OPERATIONS Ph D Thesis
Thomas Chih-Hsiung Chen 1976 150 p
Avail Univ Microfilms Order No 77-5050

Three approaches were investigated dynamic programming method branch and bound method and graph theoretic method Five algorithms have been developed and seven separate computer programs have been coded in the first phase of the research work The best algorithm developed to solve the single-ship through single-prospect problem is the algorithm based upon a modification of Little s branch and bound method The computer program for this algorithm requires only 60 K bytes to solve a 14-line configuration problem The computation time is also very effective Dissert Abstr

N77-23578*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
LANDSAT US STANDARD CATALOG, 1 FEBRUARY 1977 - 28 FEBRUARY 1977
28 Feb 1977 78 p
(NASA-TM-X-74692 GSFC/LU-C/002 NTISUB/C/138-002) Avail NTIS HC A05/MF A01 CSCL 05B

The U S Standard Catalog lists U S imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month Data such as data acquired cloud cover and image quality are given for each scene The microfilm roll and frame on which the scene may be found is also given Author

N77-23579*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
LANDSAT NON-US STANDARD CATALOG, A MARCH 1977 - 31 MARCH 1977
31 Mar 1977 88 p
(NASA-TM-X-74693 GSFC/LN-C/003 NTISUB/C/139-003) Avail NTIS HC A05/MF A01 CSCL 05B

The Non-U S Catalog lists Non-I S imagery acquired by LANDSAT 1 and 2 which has been processed and input of the data files during the referenced month Data such as date acquired cloud cover and image quality are given for each scene The microfilm roll andframe on which the scene may be found is also given Author

N77-23586# Army Engineer Topographic Labs Fort Belvoir Va Computer Sciences Lab
STEREO ANALYSIS OF A SPECIFIC DIGITAL MODEL SAMPLED FROM AERIAL IMAGERY
Michael A Crombie Sep 1976 64 p refs
(AD-A033567 ETL-0072) Avail NTIS HC A04/MF A01 CSCL 08/2

Approximately 160 000 points were matched over a digitized stereo model using correlation algorithms coded in FORTRAN for the CDC 6400 Each of the digitized stereo pair was represented by over 4 million pixels which were measured on a microdensitometer and stored on disc in the Image Processing Center at ETL The matched point coordinates and the associated local coordinates were also stored on disc The derived digital model will be used in the Interactive Image Processing Center to evaluate a variety of problems in digital image processing of stereo photography GRA

N77-23588*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
LANDSAT NON-US STANDARD CATALOG
28 Feb 1977 101 p
(NASA-TM-X-74691 GSFC/LN-C/002 NTISUB/C/139-002) Avail NTIS HC A06/MF A01 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis The U S Standard Catalog includes imagery covering the continental United States Alaska and Hawaii The Non-U S Standard Catalog identifies all the remaining coverage Sections 1 and 2 describe the contents and format for the catalogs and the associated microfilm Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles Sections 4 and 5 cover LANDSAT-1 and LANDSAT-2 coverage respectively Author

N77-23589*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
LANDSAT US STANDARD CATALOG
31 Mar 1977 93 p
(NASA-TM-X-74690 GSFC/LU-C/003 NTISUB/C/138-003) Avail NTIS HC A05/MF A01 CSCL 05B

Information regarding the availability of LANDSAT imagery processed and input to the data files by the NASA Data Processing Facility is published on a monthly basis The U S Standard Catalog includes imagery covering the continental United States Alaska and Hawaii The Non-U S Standard Catalog identifies all the remaining coverage Sections 1 and 2 describe the contents

and format for the catalogs and the associated microfilm Section 3 provides a cross-reference defining the beginning and ending dates for LANDSAT cycles Sections 4 and 5 cover LANDSAT-1 and LANDSAT-2 coverage respectively Author

N77-23659# M&S Computing Inc Huntsville Ala
PAR AURORAL STUDY VOLUME 2 A TECHNIQUE FOR STANDARDIZING THE PROCESSING OF AURORAL RADAR BACKSCATTER DATA Interim Report
M J Mitchell 19 May 1976 28 p refs 6 Vol
(Contract DASG60-74-C-0026)
(AD-A034503 Rept-76-0016-Vol-2) Avail NTIS HC A03/MF A01 CSCL 04/1

The topic of radar reflectivity of aurora effects is discussed The report describes a method for representing the volume backscattering characteristics of auroral irregularities The objective was to develop a universal relationship for calculating the aurora reflectivity The expression would then normalize all radar-dependent parameters including geographic location In attempting to derive a classical solution to the problem some ambiguous terms remain However the technique should prove useful for making certain limited comparisons of data from different radars GRA

N77-24346# Physics Lab RVO-TNO The Hague (Netherlands)
THE MULTIPATH RADAR CROSS SECTION (RCS) MEASURING FACILITY AT NOOTDORP
H Sittrop Nov 1976 18 p ref
(PhL-1976-44 TDCK-68625) Avail NTIS HC A02/MF A01

Methods of measurement and calibration are described for an outdoor multipath radar cross section measuring facility The operating frequency bands are X- and Ku-band respectively at 9284 MHz and 16500 MHz The two radars cannot be operated simultaneously Author (ESA)

N77-24568# Lockheed Missiles and Space Co , Palo Alto Calif
METHOD OF DETERMINING AND INVESTIGATING THE DEPENDENCE OF AIRCRAFT THERMAL DETECTORS RESOLUTION ON OBJECT CONTRAST
A M Shirobokov [1976] 4 p refs Transl into ENGLISH from Optiko-Mekhanicheskaia Promyshl (USSR) no 4 1976 p 75-77
Avail NTIS HC A02/MF A01 National Translation Center John Crerar Library Chicago, Illinois 60616

An aircraft heat detector was studied by using a new method The resolution was determined for comparatively high contrasts between the objects and the background which corresponded to a 10 deg initial temperature drop A photograph was taken on type 15 isopanchrome aerial photography film and developed in UP-2 The objects were gray rectangular objects with emissivity e = 0 95 The dependence of the resolution level of the heat detector under investigation and of the resolution on the contrast are shown Knowledge of the dependence of the resolution on the object contrast permits a deeper analysis of the heat maps obtained by using the heat detector Author

N77-24570*# National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex
DATA-HANDLING CONSIDERATIONS FOR ADVANCED HIGH-RESOLUTION MULTISPECTRAL SCANNERS
Sidney L Whitley Washington May 1977 24 p refs
(NASA-TN-D-8489 JSC-S-472) Avail NTIS HC A02/MF A01 CSCL 05B

Several scanner design parameters that greatly affect data rates were varied to determine overall effect on data rates Bit rates were calculated for scanners with 10- 15-, 20- and 30-meter instantaneous fields of view with 5 7 and 10 channels and with swath widths of 46 3 92 6, 138 9 and 185 2 kilometers (25 50 75, and 100 nautical miles) The data were analyzed to determine whether they could be (1) recorded onboard the spacecraft with currently available equipment (2) recorded onboard with the equipment proposed for the 1980-90 period (3) transmitted to earth with current or proposed equipment and (4) compressed and decompressed without significant degradation of classification accuracy The effect of classifying 10-meter scanner data on the existing and the development pattern-recognition systems was examined Author

N77-24574# RCA Advanced Technology Labs Camden, N J
SCANNING CURSOR TECHNIQUES Final Technical Report, Jun 1974 - May 1976
G W Hunka Dec 1976 58 p
(Contract F30602-74-C-0318)
(AD-A034599 ATL-CR-76-05 RADC-TR-76-363) Avail NTIS HC A04/MF A01 CSCL 08/2

This report describes the effort to design fabricate and test a digitizing cursor with integral line centering capability The resultant cursor is transmissive in nature utilizing a linear photodiode array an optical system and array signal processing electronics Processor output is a binary count representing position of the image traced feature on the array A computer algorithm uses the information as a corrective term to yield accurate coordinate data Computer-generated rotational commands serve to continuously position the array to be orthogonal to the feature to ensure maximum accuracy in tracing features containing curvatures or forming closed contours Accuracy of + or - 003 inch is obtainable in digitizing with the cursor Author (GRA)

N77-24575# PRC Information Sciences Co , McLean, Va
USER'S MANUAL FOR THE REFERENCE SCENE SOFTWARE (RSS)
Steven H Moritz 15 Oct 1976 77 p
(Contract DAAK02-75-C-0098)
(AD-A033631 PRC-R-1938 ETL-0066) Avail NTIS HC A05/MF A01 CSCL 08/2

The Reference Scene Software (RSS) is a set of eleven CDC 6400 computer programs used in-house at the U S Army Engineer Topographic Laboratories (USAETL) Ft Belvoir, Virginia to produce simulated Plan Position Indicator (PPI) radar scenes The two inputs required by RSS are a matrix array (raster format) of digital terrain elevations and a corresponding vector digitized list of planimetry features (roads, lakes railroads cities rivers etc) The output of RSS is a raster format magnetic tape image of the circular PPI scene which is later formatted onto 35mm film and machine compared to the actual scene of the area to determine the 'goodness of correlation These programs were originally developed by the Naval Training Equipment Center (NTEC) Orlando Florida for visual flight simulation They were converted to run on the ETL CDC 6400 computer new input and output routines were developed and the radar modeling algorithm was changed to produce a better machine readable rather than better human readable scene RSS is being used to determine the data base input requirements and the radar modeling algorithm parameters necessary for producing correlatable reference scenes GRA

N77-25609# Naval Training Equipment Center, Orlando Fla Electronics and Acoustics Lab
PERI-APOLLAR 360 DEGREE LENS DISTORTION FREE LINEAR MAPPING Interim Report, Nov - Dec 1976

John C McKechnie Feb 1977 34 p refs
(ZF55522002)
(AD-A036150, NAVTRAEQUIPC-TN-55) Avail NTIS HC A03/MF A01 CSCL 20/6

Several methods including fiber-optics are considered for producing a distortion free linear image transfer at both the optical probe and projection lens image planes of 360 deg nonprogrammed visual display A description of five methods is given and each alternative examined analytically Author (GRA)

N77-25615# Army Engineer Topographic Labs Fort Belvoir Va

CAPABILITIES OF REMOTE SENSORS TO DETERMINE ENVIRONMENTAL INFORMATION FOR COMBAT

Jack N Rinker Judy Ehlen, Alan E Krusinger, Thomas R Currin, and Ambrose O Poulin Nov 1976 247 p
(DA Proj 4A1-61102-B-52C)
(AD-A035139, ETL-0081) Avail NTIS HC A11/MF A01 CSCL 15/4

U S Army Field and Technical Manuals were used to develop a list of 313 environmental information needs or factors required by the Army to accomplish its various tasks Each factor was evaluated against a list of remote sensing systems to determine the extent to which each system could provide the needed information Interpretation procedures were restricted to evaluation of imagery by conventional interpretation techniques and equipment The systems evaluated are LANDSAT (ERTS), radar, thermal infrared, low-level oblique photography, standard photo index sheets, stereo 1 100,000 scale vertical aerial photography and stereo 1 20 000 scale vertical aerial photography GRA

N77-25616# Army Engineer Topographic Labs, Fort Belvoir Va

PHOTO ANALYSIS OF A DESERT AREA

Judy Ehlen Apr 1976 74 p refs
(DA Proj 4A1-61102-B-52D)
(AD-A035481, ETL-0068) Avail NTIS HC A04/MF A01 CSCL 08/6

Information derived from 1 9 600 scale stereoscopic aerial photography of a desert area near Yuma Arizona is presented Physiography geology climate landform drainage erosional aspects vegetation and cultural features are considered in the context of local and regional environmental engineering and military considerations The second part of this report presents a field verification of the general geology geomorphology and vegetation in the study area with a list of selected references Author (GRA)

N77-25619# Tel-Aviv Univ (Israel)

***CONFORMAL MAPPINGS AND BOUNDARY VALUE PROBLEMS* Final Technical Report, Jul 1975 - Oct 1976**

J Burbea A Ghandour and R Mandelbaum Oct 1976 27 p refs
(Grant DA-EPRO-124-74-G0069)
(AD-A036084) Avail NTIS HC A03/MF A01 CSCL 12/1

Three principal areas of investigation are as follows (1) Kernel functions and related areas Results have been obtained on polynomial density in Bers Spaces Berman Spaces over multiply-connected domains Total Positively and reproducing kernels Szego kernels and the Riesz projection theorem and Metric on Annuli (2) BVP (Boundary Value Problems) and IVP (Initial Value Problems) Study has been undertaken of transforming BVP into IVP In particular a method whereby a well-posed elliptic boundary-value problem of the Dirichlet type is transformed into a first-order non-linear equation governing the Green s function of an embedded problem is studied and (3) Singularities The study of smoothings of analytic singularities is discussed In particular generalized complete intersections and their spaces of deformations are analyzed GRA

N77-25627# PRC Information Sciences Co McLean Va

ACS SYMBOLIZATION FOR DMAAC VOLUME 1 SYSTEM IMPLEMENTATION AND OPERATION PROCEDURES Final Technical Report, Jun 1975 - Apr 1976

Paul D Bell John A Neuffer and M Lynn Taylor Griffiss AFB N Y RADC Nov 1976 70 p 2 Vol
(Contract F30602-75-C-0319)
(AD-A036014 RADC-TR-76-334-Vol-1) Avail NTIS HC A04/MF A01 CSCL 08/2

RADC has implemented a Graphic Line Symbolization System (GLSS) on the Univac 1108 computer system located at the Defense Mapping Agency Aerospace Center (DMAAC) The software accepts data in the DMAAC Linear Input System format and creates symbolized line data for final color separation plotting Symbols are applied according to Joint Operations Graphics (JOG) specifications In addition to the lineal symbol capability the GLSS is capable of creating a significant number of point symbols The software is written in ASCII COBOL and FORTRAN 5 languages and requires approximately 40K words of memory for loading and execution of all functions The software configuration is highly segmented into areas of job set-up, file input job monitoring symbol application control symbol specification job reporting and file output Author (GRA)

N77-25628# PRC Information Sciences Co, McLean Va

ACS SYMBOLIZATION FOR DMAAC VOLUME 2 COMPUTER PROGRAM DOCUMENTATION Final Technical Report, Jun 1975 - Apr 1976

Paul D Bell John A Neuffer and M Lynn Taylor Griffiss AFB N Y RADC Nov 1976 342 p 2 Vol
(Contract F30602-75-C-0319)
(AD-A035993 RADC-TR-76-334-Vol-2) Avail NTIS HC A15/MF A01 CSCL 08/2

PRC/ISC under a RADC contract, converted and expanded the Graphic Line Symbolization System (GLSS) to operate in the production environment at the Defense Mapping Agency Aerospace Center (DMAAC) The system was converted from the HIS-635 to the UNIVAC 1108 Major enhancements to the original software system included additional point symbol capabilities and additional output file formats for interfacing with DMAAC plotter systems GRA

N77-25907# Naval Postgraduate School Monterey Calif

AN ALGORITHM FOR SOLVING A RANGE CONSTRAINED TRAVELING SALESMAN PROBLEM M S Thesis

John William Harms Dec 1976 50 p refs
(AD-A035842) Avail NTIS HC A03/MF A01 CSCL 12/2

A problem of routing earth resource survey aircraft proposed by NASA is formulated as a traveling salesman problem in which the salesman (aircraft) has a range constraint A heuristic algorithm is presented which seeks a minimal length set of subtours through n cities The aircraft begins a subtour at the base location visits a subset of the n cities and returns when the range constraint prevents a visit to another city Additional subtours are created until all cities are visited The algorithm is programmed in FORTRAN for use on digital computers The IBM-360/67 computer at the Naval Postgraduate School was used to fine solutions to three operational problems of size seven eighteen and twenty-five cities Computation times for each problem was under 20 seconds and the solutions were significantly better than feasible solutions calculated without the use of the algorithm Author (GRA)

N77-26053*# Lockheed Missiles and Space Co, Palo Alto Calif Research Lab

ANALYSIS OF SIMULTANEOUS SKYLAB AND GROUND BASED FLARE OBSERVATIONS Final Summary Report

J L Kulander Dec 1976 82 p refs
(Contract NASw-2854)
(NASA-CR-153029 LMSC-D553908) Avail NTIS HC A05/MF A01 CSCL 03B

HeI and HeII resonance line data from Skylab were reduced, analyzed and compared with HeI D3 line intensities taken simultaneously from the Lockheed Rye Canyon Solar Observatory Computer codes were developed for the calculation of total He line intensities and line profiles from model flare regions These codes incorporate simultaneous solution of the line and continuum transport equations as needed together with the statistical equilibrium equations for a 30 level HeI HeII HeIII system The energy level model consists of all terms through principal quantum number four Interpretation of the observed data in terms of these parametric solutions and with simultaneous solution of the transport equations are discussed Author

N77-26457*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
GSFC SHORT PULSE RADAR, JONSWAP-75
D M LeVine, W T Walton J Eckerman, R L Kutz M Dombrowski, and J E Kalshoven, Jr Jun 1977 45 p refs (NASA-TN-D-8502, G-7702-F11) Avail NTIS HC A03/MF A01 CSCL 17I

In September 1975, the Goddard Space Flight Center operated a short pulse radar during ocean wave measuring experiments off the coast of West Germany in the North Sea The experiment was part of JONSWAP-75 The radar system and operations during the experiment are described along with examples of data Author

N77-26597# Dornier-System G m b H Friedrichshafen (West Germany)
MULTIDISCIPLINARY LIDAR SYSTEM IN SPACELAB FOR APPLICATION TO ATMOSPHERIC PHYSICS AND REMOTE SENSING Final Report
Wolfgang Englisch (Battelle Inst) Eberhard Achtermann Thorstein Halldorsson (MBB Ottobrunn West Ger) Rasmus Beck (Battelle Inst) Gerhard Lorch Wolf Wiesemann (Battelle Inst) Erhard Wedel and Guenther Wirths Bonn Bundesmin fuer Forsch u Technol Dec 1976 314 p refs In GERMAN, ENGLISH summary Report will also be announced as translation (ESA-TT-404)
(Contracts BMFT-WRT-1075 DFVLR-BPT-01-QS-405-V23)
(BMFT-FB-W-76-23) Avail NTIS HC A14/MF A01 ZLDI Munich DM 65 95

Possible applications of a lidar system onboard an airplane or onboard Spacelab were studied The selection of lasers and detection techniques for the different tasks is discussed and intensity calculations are performed A combination of an aerosol and a trace gas lidar is proposed for the first Spacelab mission The aerosol lidar uses pulsed lasers the trace gas lidar, a CW-CO2-laser and a heterodyne detection technique for the differential absorption method in the IR The telescope of the Spacelab lidar lies within the 1 m class An airborne lidar puts minor requirements on its subsystems It is proposed therefore that this should precede the Spacelab lidar so that experience can be obtained with the technical subsystems, and the scientific benefits can be appraised Author (ESA)

N77-27168*# Lockheed Electronics Co Houston Tex
THE STATUS OF ENVIRONMENTAL SATELLITES AND AVAILABILITY OF THEIR DATA PRODUCTS
C L Hughes and C E Campbell Mar 1977 152 p refs
(Contract NAS9-15200)
(NASA-CR-151459, JSC-12706 LEC-10344) Avail NTIS HC A08/MF A01 CSCL 22B

The latest available information about the status of unclassified environmental satellite (flown by the United States) and their data products is presented The type of environmental satellites discussed include unmanned earth resource and meteorological satellites, and manned satellites which can act as a combination platform for instruments The capabilities and data products of projected satellites are discussed along with those of currently operating systems Author

N77-27473*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
LANDSAT 2 CUMULATIVE NON-US STANDARD CATALOG Annual Cumulative Report, 22 Jan 1976 - 22 Jan 1977
22 Feb 1977 1424 p
(NASA-TM-74758, GSFC/LN-C/013 NTISUB/C/139-013) Avail NTIS HC A99/MF A01 CSCL 05B

The Non-U S Standard Catalog lists imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referred month Data, such as data acquired cloud cover and image quality are given for each scene The microfilm roll and frame on which the scene may be found is also given Author

N77-27477*# Transemantics Inc Washington, D C
EXPERIMENTAL PROGRAM FOR THE OPERATIONAL STUDY OF DATA COLLECTION PLATFORMS IN BOLIVIA
Washington NASA Jun 1977 13 p Transl into ENGLISH from Serv Geol Bolivia, (La Paz) Dec 1975 p 1-10z
(Contract NASw-2792)
(NASA-TM-75019) Avail NTIS HC A02/MF A01 CSCL 05B

The system developed for the SMS/GOES satellite while learning the limitations possessed by this system with regard to the LANDSAT 1 and 2 satellites with respect to the transmission distance and horizon angle is investigated The advantages possessed by this system in comparison with conventional methods are evaluated so as to permit studying the feasibility of introducing it into this country in the near future Author

N77-27479*# National Aeronautics and Space Administration Earth Resources Lab Slidell La
DIGITAL OVERLAYING OF THE UNIVERSAL TRANSVERSE MERCATOR GRID WITH LANDSAT-DATA DERIVED PRODUCTS
Thomas W Pendleton Jun 1976 45 p refs
(NASA-TM-74761 Rept-160) Avail NTIS HC A03/MF A01 CSCL 08B

Software has been written in FORTRAN IV for a Varian 73 computer which reformats LANDSAT-data-derived surface classifications and pictorial representations into a digital array which corresponds to the Universal Transverse Mercator Grid Author

N77-27485*# Environmental Research Inst of Michigan Ann Arbor
ACTIVE AND PASSIVE MULTISPECTRAL SCANNER FOR EARTH RESOURCES APPLICATIONS AN ADVANCED APPLICATIONS FLIGHT EXPERIMENT Final Report, 12 Jun 1975 - 20 Apr 1977
P G Hasell Jr L M Peterson F J Thomson E A Work and F J Kriegler Jun 1977 98 p refs
(Contract NAS9-14594)
(NASA-CR-151461 ERIM-115800-49-F) Avail NTIS HC A05/MF A01 CSCL 20F

The development of an experimental airborne multispectral scanner to provide both active (laser illuminated) and passive (solar illuminated) data from a commonly registered surface scene is discussed The system was constructed according to specifications derived in an initial programs design study The system was installed in an aircraft and test flown to produce illustrative active and passive multi-spectral imagery However data was not collected nor analyzed for any specific application Author

N77-27486*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt Md
LANDSAT 2 CUMULATIVE US STANDARD CATALOG Annual Cumulative, 22 Jan 1976 - 22 Jan 1977
22 Feb 1977 878 p
(NASA-TM-74757 GSFC/LU-C/013, NTISUB/C/138-013) Avail NTIS HC A99/MF A01 CSCL 05B

The U S Standard Catalog lists U S imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month Data, such as date acquired cloud cover and image quality are given for each scene The microfilm roll and frame on which the scene may be found is also given Author

N77-27487# DBA Systems Inc , Melbourne Fla
STUDIES IN ADVANCED PHOTOGRAMMETRIC TRIANGULATION TECHNIQUES Final Technical Report, Mar - Oct 1976
T Riding and S Mundy Mar 1977 145 p refs
(Contract F30602-76-C-0172)
(AD-A038138 RADC-TR-77-72) Avail NTIS HC A07/MF A01 CSCL 14/5

Analytical photogrammetry spurred on by a rapidly evolving computer technology has achieved major advances within the past decade Contained in this report is an attempt to define those near term challenges brought about by larger data sets such developments as the Global Positioning System and continued improvement in auxiliary sensors (e g inertial platforms, stratoscope units etc) Continued research commensurate with these challenges are of paramount importance where a first order, wide area mapping requirement exists GRA

08

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors

A77-30228 * A scanning multichannel microwave radiometer for Nimbus-G and SeaSat-A P Gloersen (NASA, Goddard Space Flight Center, Greenbelt, Md) and F T Barath (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif) *IEEE Journal of Oceanic Engineering,* vol OE-2, Apr 1977, p 172-178 26 refs

A scanning multichannel microwave radiometer (SMMR) has been designed for the Nimbus-G spacecraft and incorporated also into the SeaSat-A payload for the primary purpose of determining sea surface temperatures and wind stress on a nearly all-weather basis Observations of microwave polarization components will be made at wavelengths of 0 8, 1 4, 1 7, 2 8, and 4 6 cm over a swath 822 km wide below the Nimbus-G and 595 km wide below the SeaSat-A spacecraft The smallest spatial resolution cell is about 20 km at a wavelength of 0 8 cm, and proportionately larger at the other wavelengths Using algorithms based on a combination of experimental data and physical models for converting the observed brightness temperatures, the indicated accurates of the results (excluding conditions of significant rainfall) are within 1 K for sea surface temperature and 2 m/s for surface wind speeds, over a range from 0-50 m/s (Author)

A77-30229 * The SeaSat-A satellite scatterometer W L Grantham, E M Bracalente, W L Jones, and J W Johnson (NASA, Langley Research Center, Hampton, Va) *IEEE Journal of Oceanic Engineering,* vol OE-2, Apr 1977, p 200-206 13 refs

This paper describes the methods used to develop performance requirements and design characteristics for the microwave scatterometer (SASS) ocean-surface wind sensor on the NASA SeaSat-A satellite Wind vector measurement requirements from the SeaSat user community (wind speed and direction accuracy, resolution cell size, grid spacing, and swath width) define instrument characteristics The resulting scatterometer is designed for 14 6 GHz using four fan beam antennas to measure wind speed and direction over a 1000-km swath width with a resolution cell size 50 x 50 km Results show scatterometer accuracy satisfies user requirements for wind speed from 4 m/s to greater than 24 m/s for the nominal SeaSat-A orbit of 790 km altitude, 108 deg inclination, and 0 001 eccentricity (Author)

A77-31791 Applications of the pyroelectric vidicon T Conklin (Amperex Electronic Corp , Slatersville, R I) and E H Stupp (North American Philips Co , Inc , Philips Laboratories Div , Briarcliff Manor, N Y) *Optical Engineering,* vol 15, Nov Dec 1976, p 510 515 9 refs Army-supported research

Pyroelectric vidicons (PEV) are low-cost infrared TV camera tubes which operate at room temperature and image in any wavelength band within the 2 400-micron range For the 8 14-micron band, the PEV has a typical minimum resolvable temperature (MRT) of less than 1 C at 250 TVL When operated with increased pedestal current, the MRT can be reduced to 0 6 C at 250 TVL This paper reviews the significant parameters of the PEV, viz , electron beam discharge lag, sensitivity, and thermal spread in the target Some applications include fire location (specifically, forest fire mapping), security, industrial uses, and medical diagnostics Forest fire mapping has shown that local sources of burning totally obscured by smoke were readily located by the PEV system The unique ability of the PEV to detect motion lends itself to security applications A chopping and storage mode of operation has been developed for industrial and medical applications (Author)

A77 31896 Data acquisition and control in large-scale numerical photogrammetry (Acquisition et contrôle des donnees par photogrammetrie numerique a grande echelle) J Denegre (Institut Geographique National, St Mande, Val de-Marne, France) *Photogrammetria,* vol 33, Mar 1977, p 19 40 16 refs In French

The article reviews digital data acquisition techniques in large-scale photogrammetry, and covers measuring, recording, checking, and editing of data A classification of methods used in data acquisition and editing is presented Advances in automation of altimetric data (digitized directly from the model, with automatic orthophotography), in direct digitization of planimetric features involving interactive CRT display systems, two dimensional digitization from line-maps and orthophotographs, and use of stereo orthophotographs are discussed, along with automatic interpretation (pattern recognition) and automatic revision R D V

A77-32579 # Thermal emission from inhomogeneous laminar media (O teplovom izluchenii sluchaino neodnorodnykh sloistykh sred) V L Brekhovskikh and V I Tatarskii (Akademiia Nauk SSSR, Institut Fiziki Atmosfery, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol 13, Feb 1977, p 144 152 8 refs In Russian

Thermal radio emission from such laminar structures as Antarctic ice exhibits certain characteristic features associated with multiple reflections by discontinuities In the present paper, the coefficients of electromagnetic wave reflection from a weakly absorbing laminar randomly inhomogeneous medium are calculated for both horizontally and vertically polarized emission, on the basis of equations for the probability distribution of the coefficients Angular dependences of the brightness temperature are obtained for each polarization type V P

A77-33200 A comparison of velocity spectra from hot-film anemometer and gust-probe measurements M S Moss and F J Merceret (NOAA, National Hurricane and Experimental Meteorology Laboratory, Coral Gables, Fla) *Journal of Applied Meteorology,* vol 16, Mar 1977, p 319, 320 9 refs

Velocity spectra obtained from a hot-film anemometer and a gust-probe on board the NOAA DC 6 (39C) during a research mission into Hurricane Eloise 1975 are compared at common frequencies The spectra compare reasonably well, thus justifying some confidence in measurements acquired from the individual instruments (Author)

A77-33620 Contribution to accuracy enhancement in terrestrial photogrammetric point determination (Zur Leistungssteigerung der terrestrisch-photogrammetrischen Punktbestimmung) B Wrobel and K -H Ellenbeck *Bildmessung und Luftbildwesen,* vol 45, May 1, 1977, p 69-77 11 refs In German

Measured orientation parameters treated in a bundle block adjustment with photo coordinates are discussed, requisite analytical formulas are derived Accuracy studies based on an example taken from architectural photogrammetry demonstrate the advantage of introducing additional information into the bundle block adjustment reduction of the number of ground control points or even elimination of control points in close range work, homogeneous accuracy of triangulated points It is shown that at least three images can be bridged without measured orientation elements and without ground control points, with only slight degradation R D V

A77-34134 # Applications of very-long-baseline interferometry to geodesy and geodynamics B Anderson (Manchester, Victoria University, Macclesfield, Ches , England) *(Royal Society, Discussion on Methods and Applications of Ranging to Artificial*

Satellites and the Moon, London, England, Feb 26, 27, 1976) *Royal Society (London), Philosophical Transactions, Series A,* vol 284, no 1326, May 11, 1977, p 469-473 6 refs

The paper considers the technique of very long baseline interferometry, published results in the field, and potential improvements in accuracy VLBI systems can currently make baseline determinations with precisions of about 15 cm and should approach precisions of a few centimeters It seems unlikely that an international network of antennas will be established solely for geodetic and geodynamic purposes so that the production of comprehensive data for the geophysicist will come from the cooperative efforts of existing radio observatories and communications facilities with the necessary equipment B J

A77-34240 * Remote sounding of cloudy atmospheres III - Experimental verifications M T Chahine, H H Aumann, and F W Taylor (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif) *Journal of the Atmospheric Sciences,* vol. 34, May 1977, p 758 765 9 refs NSF Grant No AG 505, Contract No NAS7 100

The cloud-filtering technique developed in Parts I and II of this study is experimentally verified in this paper The verification is based on radiance data measured in the 4 3 and 15 micron CO2 bands using a multidetector sounder mounted on an aircraft The results presented here show that, from the aircraft height of 7 6 km and in the presence of multiple cloud formations, it is possible to recover simultaneously (1) the clear column atmospheric temperature profile with an rms error of 1 K with respect to radiosondes, (2) the land and sea surface temperature at all sun zenith angles The accuracy of the recovered sea-surface temperature is 0 5-1 K with respect to measured bucket temperatures, (3) the humidity profile (water vapor mixing ratio) with a precision of 10%, (4) the fractional covers and heights of up to three cloud formations, and (5) the types of clouds, i e , whether convective or nonconvective (Author)

A77-34531 * On propagation direction of ring current proton ULF waves observed by ATS 6 at 6 6 R sub E S-Y Su (Lockheed Electronics Co , Inc , Aerospace Systems Div , Houston, Tex), A Konradi (NASA, Johnson Space Center, Houston, Tex), and T A Fritz (NOAA, Space Environment Laboratory, Boulder, Colo) *Journal of Geophysical Research,* vol 82, May 1, 1977, p 1859-1868 26 refs

From June 11 to September 16, 1974, the NOAA low energy proton detector on board the ATS 6 satellite observed 71 cases of ultralow-frequency oscillations of proton flux intensities The oscillation periods varied from 40 s to 6 min, and the events were observed most frequently during moderate geomagnetic conditions The flux oscillations occurred at various local times, yet almost two thirds of the events were detected in the near dusk region of the magnetosphere For a majority of the events in this set a substantial phase shift in flux oscillation was detected between different energy channels and/or between two oppositely oriented detector telescopes The phase shift is mainly due to the finite gyroradius effect of the protons gyrating in the geomagnetic field By examining this finite gyroradius effect on the perturbed particle distribution function associated with the wave in a nonuniform magnetic field, the propagation direction of the wave from particle observations made by a single spacecraft is determined (Author)

A77-36021 Long wavelength infrared heterodyne detection E R Washwell and S K Ichiki (Lockheed Research Laboratories, Palo Alto, Calif) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo Optical Instrumentation Engineers, 1976, p 41 46 11 refs Research supported by the Lockheed Independent Research Funds

The detection of molecular line radiation is of interest in a variety of applications such as atmospheric pollution monitoring, investigation of astronomical sources, and basic spectroscopic studies In the following discussion, the heterodyne detection of molecular line radiation is shown to have significant advantages over direct detection at longer infrared wavelengths The development of a heterodyne receiver operating in the long wavelength infrared region using tunable semiconductor laser local oscillators is described The techniques used to operate the receiver at selectable discrete wavelengths are applicable to the entire spectral range covered by semiconductor lasers Results are presented for the heterodyne receiver operating in the 24-micron spectral region (Author)

A77-36027 High energy tunable IR source and applications R L Byer (Stanford University, Stanford, Calif) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo-Optical Instrumentation Engineers, 1976, p 92 95 5 refs

Remote analytical sensing requires a high pulse energy tunable infrared source for detection of molecular species This paper describes progress made in a Nd YAG pumped, computer controlled LiNbO3 parametric oscillator with a tuning range of 1 4-4 4 microns The device is now well engineered and is finding applications in laser chemistry and remote air pollution monitoring (Author)

A77-36028 Remote measurement of gases using discretely tunable infrared lasers E R Murray (Stanford Research Institute, Menlo Park, Calif) In Modern utilization of infrared technology II Civilian and military, Proceedings of the Seminar, San Diego, Calif , August 26, 27, 1976 Palos Verdes Estates, Calif , Society of Photo-Optical Instrumentation Engineers, 1976, p 96-104 14 refs Research supported by the U S Geological Survey and NSF

Single ended laser radars using discretely tunable infrared gas lasers have been demonstrated to be capable of high-sensitivity remote measurement of gases Two systems have been investigated (1) a deuterium fluoride laser was used for remote measurement of the integrated concentration of HCl, CH4, and N2O between the lidar system and a topographic target, and (2) a CO2 laser was used for range-resolved measurement of water vapor using radiation backscattered from naturally occurring aerosols in the atmosphere Calculations indicate that range resolved concentration profiles can be obtained for many gases at a range of 10 km using commercially available components (Author)

A77 37153 * A global thermospheric model based on mass spectrometer and incoherent scatter data MSIS I - N2 density and temperature A E Hedin, C A Reber, G P Newton, N W Spencer (NASA, Goddard Space Flight Center, Greenbelt, Md), J E Salah, J V Evans (MIT, Lexington, Mass), D C Kayser (Minnesota, University, Minneapolis, Minn), D Alcayde (Centre d'Etudes Spatiales des Rayonnements, Toulouse, France), P Bauer (Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux, Hauts de Seine, France), and L Cogger (Calgary, University, Calgary, Alberta, Canada) *Journal of Geophysical Research,* vol 82, June 1, 1977, p 2139 2147 44 refs

Measurements of neutral nitrogen density from mass spectrometers on five satellites (AE-B, Ogo 6, San Marco 3, Aeros A, and AE C) and neutral temperatures inferred from incoherent scatter measurements at four ground stations are combined to produce a model of thermospheric neutral temperatures and nitrogen densities similar to the Ogo 6 empirical model (Hedin et al , 1974) This global model is designated MSIS (mass spectrometer and incoherent scatter) The global average temperature, the annual temperature variation, lower bound density, and lower bound temperature are discussed The data set covers the time period from the end of 1965 to mid-1975 and also a wide range of solar activities Diurnal and semidiurnal variations in lower bound density and temperature are considered, as is magnetic activity M L

A77-38120 **Comments on 'Selective radiant temperature mapping using a layered classifier'** E H Conrow (General Dynamics Corp , Convair Aerospace Div , San Diego, Calif) *IEEE Transactions on Geoscience Electronics,* vol GE-15, July 1977, p 180, Reply, p 180-183 6 refs

A77-38193 **A two-stage classifier for remotely sensed data.** D Kazakos (New York, State University, Buffalo, N Y) In Modeling and simulation Volume 7 - Proceedings of the Seventh Annual Pittsburgh Conference, Pittsburgh, Pa , April 26, 27, 1976 Part 1 Pittsburgh, Pa , Instrument Society of America, 1976, p 281, 282

Maximum likelihood classifications under the multivariate Gaussian assumption are considered for the machine processing of remotely sensed data A description is presented of a new type of classifier which by design takes into account computational costs The classifier makes use of a two-stage decision process Attention is given to the trade-off between computational cost and classification accuracy G R

A77-38260 * **A satellite technique for quantitatively mapping rainfall rates over the oceans** T T Wilheit, A T C Chang, E B Rodgers, J S Theon (NASA, Goddard Space Flight Center, Greenbelt, Md), and M S V Rao (Environmental Research and Technology, Inc , Concord, Mass) *Journal of Applied Meteorology,* vol 16, May 1977, p 551 560 31 refs

A theoretical model for calculating microwave radiative transfer in raining atmospheres is developed These calculations are compared with microwave brightness temperatures at a wavelength of 1 55 cm measured by the Electrically Scanning Microwave Radiometer (ESMR) on the Nimbus-5 satellite and rain rates derived from WSR-57 meteorological radar measurements A specially designed ground based verification experiment was also performed, wherein upward-viewing microwave brightness temperature measurements at wavelengths of 1 55 and 0 81 cm were compared with directly measured rain rates It is shown that, over ocean areas, brightness temperature measurements from ESMR may be interpreted in terms of rain rate with about an accuracy of a factor of 2 over the range 1 to 25 mm/hr rain rate (Author)

A77-38489 * **Satellite measurements of ionic concentrations applied to low altitude incoherent scatter interpretations** M R Torr (Michigan, University, Ann Arbor, Mich , South African Council for Scientific and Industrial Research, National Institute for Telecommunications Research, Johannesburg, Republic of South Africa, National Astronomy and Ionosphere Center, Ithaca, N Y) and R Harper (Arecibo Ionospheric Observatory, Arecibo, P R) *Radio Science,* vol 12, May June 1977, p 461 465 14 refs Contract No NAS5-20705

The determination of ion and electron temperatures and electron density from incoherent scatter radar data has in the past involved assumptions concerning the ionospheric composition below 250 km Using a very large data base of measurements of O(+), O2(+), NO(+), and N2(+) made by the Atmosphere Explorer C satellite, a model has been developed of the ionic concentration between 130 and 300 km as a function of solar zenith angle As the effect of the new model is to increase the radar determinations of the temperature, this may explain previous discrepancies between Langmuir probe and incoherent scatter temperatures, where the comparisons have been made at these low altitudes (Author)

A77-38506 **Internal induction by the equatorial electrojet in India examined with surface and satellite geomagnetic observations** A Yacob *Journal of Atmospheric and Terrestrial Physics,* vol 39, May 1977, p 601-606 15 refs

Extrapolation to satellite heights of the surface electrojet field at Trivandrum on 47 fairly quiet days for comparison with jet signatures reported from POGO data suggests, on the basis of a parabolic current-band model of the electrojet, generation by the electrojet of an internal induction field equivalent to that of an image electrojet of about 1000 km depth Extrapolation on the basis of a two-band model of half-widths 350 and 700 km and central current intensities I sub zero and either -I sub zero/2 or I sub zero/3 for the main and subsidiary bands respectively, with no induction field included, indicates, on the other hand, values comparable with the jet signatures No definite conclusion regarding generation of induction within the earth by the electrojet emerges but the internal field contribution is smaller than magnitudes assumed hitherto (Author)

A77-39525 # **Aircraft scatterometer** G Bommas and G Deike *Dornier-Post* (English Edition), no 2, 1977, p 63, 64

An experimental model of a two frequency microwave scatterometer (2FS) containing major system elements of a Spacelab version has been developed and tested Making use of the fact that microwaves couple with surface waves of the same order of magnitude, the 2FS measures the two-dimensional spectrum of the ocean surface in the long-wave range from beams directed obliquely towards it By simultaneously transmitting two frequencies, the system measures only the components of the long-wave motion spectrum meeting the Bragg scatter condition for the defined difference in frequency The full two-dimensional spectrum can be determined by varying the frequency difference and turning the antenna in azimuth C K D

N77-22372*# Kansas Univ Lawrence Remote Sensing Lab

POOR-RESOLUTION SATELLITE OBSERVATIONS OF RADAR RETURN FROM NORTH AMERICA, BRAZIL, AND THE OCEANS

Richard K Moore Arun Sobti (Motorola Inc Schaumburg Ill) and James D Young (General Dynamics Ft Worth, Texas) *In* AGARD New Devices Tech and Systems in Radar Feb 1977 19 p refs

(Contracts NAS9-13331 NAS9-13642)

Avail NTIS HC A25/MF A01

The 13 9 GHz radar scatterometer on Skylab produced statistics of radar returns from thousands of points in North America and Brazil as well as from the oceans The resolution cell of the system varied from about 11 km in diameter at vertical incidence to 20 by 30 km at 50 deg incidence Although these cells are larger than the preprocessing cells to be expected from spacecraft synthetic-aperture radars they are at least as comparable with such cells as are the observation cells when aircraft radars are used Results are presented both in terms of composite statistics for North America Brazil and the oceans and in terms of statistics for particular classes of terrain Both vertical and horizontal polarization data are presented for the land and cross-polarized measurements are presented as well as for the sea Correlations are indicated for the returns at different angles and polarizations Author

N77-22583*# Aerospace Corp El Segundo Calif Systems Engineering Operations
BRAVO ECONOMIC STUDY OF LANDSAT FOLLOW-ON Final Report
Ernest I Pritchard Richard T Blake James A Plough Orin J Mead and John J Dawson Jan 1977 56 p refs
(Contract NAS5-23592)
(NASA-CR-152497 ATR-76(7597)-1) Avail NTIS HC A04/MF A01 CSCL 05B

The LANDSAT Follow-On satellite consists of two major systems the instrument module and the Multi-Mission Modular Spacecraft (MMS) The instrument module contains the thematic mapper and the five-band multispectral scanner instruments The instrument module also includes the solar array the tracking and data relay satellite (TDRS) antenna and the wideband data module The MMS contains the modularized and standardized power propulsion attitude control and command and data handling subsystems The Shuttle will be supporting the LANDSAT Follow-On system The LANDSAT Follow-On Project plans two Delta 3910 launches The first is scheduled for 1981 the second Delta launch will occur as needed to keep one satellite operational on orbit The second satellite will be ready six months after the first It could be launched any time after that Shuttle support of the system could begin in early 1983 but would be scheduled to start after the second Delta launch Author

N77-22605# Stanford Research Inst Menlo Park Calif
OPTICAL BASES FOR REMOTE BIOLOGICAL AEROSOL DETECTION Quarterly Progress Report, 17 Mar - 2 Jul 1976
William B Grant Nov 1976 18 p
(Contract DAAA15-76-C-0042 DA Proj 1W7 62711-AP-34 SRI Proj 4805)
(AD-A032472 ED-CR-76103 QPR-2) Avail NTIS HC A02/MF A01 CSCL 15/2

Measurements and calculations are being made to determine whether lidar techniques based on fluorescence and scatter can remotely detect and identify biological aerosols The spectrofluorimeter has been calibrated A forward-scatter instrument has been assembled to monitor aerosol flow rate The facilities for generating aerosols have been assembled tested and calibrated Aerosol concentrations up to 80 mg/cu m have been generated from 1% solutions of ammonium fluorescein The mass median diameters of the dried particles are in the range of 2 to 5 micrometer Preliminary measurements of the excitation and fluorescence spectra of aerosols of ammonium fluorescein and tryptophan have been made A 20-m cell for the measurement of extinction by aerosols has been purchased GRA

N77-23573*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
RESULTS FROM THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION REMOTE SENSING EXPERIMENTS IN THE NEW YORK BIGHT, 7-17 APRIL 1975
John B Hall Jr comp and Albin O Pearson comp Apr 1977 190 p refs
(NASA-TM-X-74032) Avail NTIS HC A09/MF A01 CSCL 05B

A cooperative operation was conducted in the New York Bight to evaluate the role of remote sensing technology to monitor ocean dumping Six NASA remote sensing experiments were flown on the C-54 U 2 and C-130 NASA aircraft while NOAA obtained concurrent sea truth information using helicopters and surface platforms The experiments included (1) a Radiometer/Scatterometer (RADSCAT) (2) an Ocean Color Scanner (OCS) (3) a Multichannel Ocean Color Sensor (MOCS) (4) four Hasselblad cameras (5) an Ebert spectrometer and (6) a Reconafax IV infrared scanner and a Precision Radiation Thermometer (PRT-5) The results of these experiments relative to the use of remote sensors to detect quantify and determine the dispersion of pollutants dumped into the New York Bight are presented Author

N77-23650# Regis Coll Weston Mass
[GEOMAGNETIC OBSERVATIONS FROM GREENLAND, 1 JULY 1974 - 31 MARCH 1976] Final Report, 1 Jul 1973 - 30 Jun 1976
Dale F Korff Hanscom AFB Mass AFGL 31 Aug 1976 93 p refs
(Contract F19628-73-C-0259)
(AD-A031494 AFGL TR-76-0197 Scientific-2) Avail NTIS HC A05/MF A01 CSCL 08/14

A summary of VLF magnetometer riometer and 5577A photometer ten-minute averaged data from the Geopole Observatory Thule Air Base Greenland for the period 01 July 1974 - 31 March 1976 is presented along with a thirty-second data survey for the same sensors of energetic particle and magnetic disturbance events for the winter seasons 1973 74 1974-75 and 1975-76 The occurrence of these events in relation to the interplanetary magnetic field sector structure and Godhavn 30 MHz riometer absorption is discussed Five energetic particle events are examined in greater detail An analysis of the 5577A night airglow in the northern Polar Cap is discussed Author (GRA)

N77-24125# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt Brunswick (West Germany) Inst fuer Flugfuehrung
FLIGHT TESTING OF DISPLAYS IN A HELICOPTER
R Beyer *In* AGARD Flight Test Tech Apr 1977 11 p refs

Avail NTIS HC A18/MF A01

Electro-optical sensors and electronic displays for a future helicopter avionics system may extend the flexibility of helicopter operation at night and in bad weather Flight tests were made with a simulated system which presented a combination of flight instruments and an image of the terrain to the pilot Means were developed to assess flight performance and pilot strain in flights with the system and some of the measures and the results obtained are discussed Author

N77-24726*# National Aeronautics and Space Administration Wallops Station Wallops Island Va
AN ATLAS OF 1975 GEOS-3 RADAR ALTIMETER DATA FOR HURRICANE/TROPICAL DISTURBANCE STUDIES, VOLUME 1
H Ray Stanley Barbara Chan (EG and G Pocomoke City Md), and John R Munson (EG and G Pocomoke City Md) Apr 1977 245 p
(Contract NAS6-2639)
(NASA-TM-X-69364-Vol-1) Avail NTIS HC A11/MF A01 CSCL 04B

Geographic locations of 1975 hurricanes and other tropical disturbances were correlated with the closest approaching orbits of the GEOS-3 satellite and its radar altimeter The disturbance locations and altimeter data were gathered for a seven-month period beginning with GEOS-3 launch in mid-April 1975 Areas of coverage were the Atlantic Ocean the Carribean, the Gulf of Mexico the west coast of the continental United States, and the central and western Pacific Ocean Volume 1 contains disturbance coverage data for the Atlantic Ocean Gulf of Mexico, and Eastern Pacific Ocean Central and Western Pacific coverage is documented in Volume II Author

N77-24727*# National Aeronautics and Space Administration Wallops Station Wallops Island Va
AN ATLAS OF 1975 GEOS-3 RADAR ALTIMETER DATA FOR HURRICANE/TROPICAL DISTURBANCE STUDIES, VOLUME 2
H Ray Stanley Barbara Chan (Wolfe Research and Development Corp Pocomoke City Md) and John R Munson (Wolfe Research and Development Corp Pocomoke City Md) Apr 1977 241 p
(Contract NAS6-2639)
(NASA-TM-X-69364-Vol-2) Avail NTIS HC A11/MF A01 CSCL 04B

For abstract see N77-24726

N77-25238*# ITT Aerospace/Optical Div Fort Wayne Ind
HEAT CAPACITY MAPPING RADIOMETER FOR AEM SPACECRAFT Final Engineering Report, Jul 1975 - Mar 1977
G E Sonnek Mar 1977 162 p
(Contract NAS5-20621)
(NASA-CR-152529) Avail NTIS HC A08/MF A01 CSCL 14B

The operation maintenance and integration of the applications explorer mission heat capacity mapping radiometer is illustrated in block diagrams and detail schematics of circuit functions Data format and logic timing diagrams are included along with radiometric and electronic calibration data Mechanical and electrical configuration is presented to provide interface details for integration of the HCMR instrument to AEM spacecraft
Author

N77-25949# Environmental Research Inst of Michigan Ann Arbor Infrared and Optics Div
REDUCTION OF SOLAR GLINTS FROM THE SEA WITH A LINEAR POLARIZER
J J Beard Oct 1976 31 p refs
(Contract N00123-76-C-0708 ZF3234401)
(AD-A036152 ERIM-120500-9-T) Avail NTIS HC A03/MF A01 CSCL 15/4

Shipboard defense systems employing infrared warning receivers have experienced saturation of threat detection processing circuits due to the signal resulting from solar reflection from the rough sea surface The saturation has made it necessary to blank the threat sector below the horizon for an azimuth extent of up to + or - 23 deg either side of the azimuth of the sun The analysis shows that the use of linear polarizer with a shipboard IR warning receiver can be expected to increase number of daylight hours that the sensor can be operated without any blanking and to narrow the azimuth sector for which blanking is required for low sun angles The linear polarizer will be most effective during the middle of the day during the spring summer and fall The unpolarized receiver typically may have to be blanked over a + or - 23 deg segment of its azimuth search below the horizon nine to eleven hours per day With a linear polarizer the number of hours for which blanking will be necessary can typically be reduced to six to eight hours per day and the aximuthal extent of the blaking during the remaining hours reduced to + or - 12 deg Further consideration is needed of Navy operational practices and the types and frequencies of occurrence of various sea states encountered at various latitudes a wave slope model valid for high slopes and wind speeds and a simulation in which the ship defense system noise threshold and spatial resolution are parameters Author (GRA)

N77-26376# Rome Air Development Center, Griffiss AFB N Y
VLF/LF REFLECTIVITY OF THE POLAR IONOSPHERE, 20 JULY - 20 SEPTEMBER 1975
John E Rasmussen, John P Turtle Ralph J McLain and Wayne I Klemetti Oct 1976 33 p refs
(AD-A036913, RADC-TR-76-327) Avail NTIS HC A03/MF A01 CSCL 04/1

This report provides a summary of high latitude ionospheric reflectivity as observed by the USAF high resolution VLF/LF ionosounder operating in northern Greenland Ionospheric reflectivity parameters including reflection heights and coefficients are presented as a function of time of day VLF long path propagation measurements, along with magnetometer and riometer data are presented as supplemental information
Author (GRA)

N77-26595# Brookhaven National Lab Upton N Y Dept of Applied Science
REGIONAL LAND USE AND ENERGY MODELING
A S Kydes J B Sanborn and T O Carroll 1976 12 p refs Presented at Intern Conf on Cybernetics and Soc Washington D C 1 Nov 1976
(Contract E(30-1)-16)
(BNL-21809 Conf-761122-1) Avail NTIS HC A02/MF A01

The land-use energy-simulation model with the integrated capability for generating energy demand is an extension of the classic Lowry model Such a model framework described captures two essential features of the land use energy-utilization interaction the spatial location of the land use activity is explicit and transportation energy demand is determined as an integral part of the spatial configuration The model is divided both conceptually and computationally into three parts the land use model a submodel for transportation which provides the work and shop trip distribution for spatial allocation of activities within the land use submodel and an energy submodel which determines energy demand resulting from the land use configuration ERA

N77-26731# Weston Observatory Mass
INVESTIGATION OF MAGNETIC FIELD PHENOMENA IN THE IONOSPHERE Final Report, 1 Aug 1973 - 30 Jun 1976
John F Devane Robert Dalrymple and Edward Johnson Sep 1976 37 p refs
(Contract F19628-74-C-0003)
(AD-A037541 AFGL-TR-76-0230) Avail NTIS HC A03/MF A01 CSCL 08/14

Weston Observatory (Boston College) has maintained a geomagnetic observatory to continuously monitor changes in the geomagnetic field and to provide standards for magnetic instrumentation as well as a coil system in which a wide variety of magnetic instrumentation has been tested and calibrated to support AFGL testing and installation of portions of a magnetometer network for the collection and digital transmission of magnetic activity data to Bedford Mass The observatories are at approximately 55 deg N corrected geomagnetic latitude on sites from Massachusetts to the State of Washington There are detailed engineering drawings of the sites the instrumentation shelters and the instrumentation vans Some problems with the instrumentation and their solutions are described Author (GRA)

N77-26738# Denver Univ Colo Dept of Physics and Astronomy
WATER VAPOR, NITRIC ACID AND OZONE MIXING RATIO HEIGHT PROFILES DERIVED FROM SPECTRAL RADIOMETRIC MEASUREMENTS
David G Murcray James N Brooks Aaron Goldman John J Kosters and W John Williams Feb 1977 145 p refs Supersedes BRL-IMR-267 and BRL-IMR-361
(Contract DAAD05-74-C-0795)
(AD-A037375 BRL-CR-332 BRL-IMR-267 BRL-IMR-361) Avail NTIS HC A07/MF A01 CSCL 04/1

Two balloon flights of 27 June 1974 and 19 February 1975 are reported here The LHe spectral radiometer which was developed for these flights is described in detail The calibration and data reduction procedures are also described in detail Plots of spectral radiance at various altitudes up to 38 km are shown

Finally mixing ratio height profiles derived from this data for H2O HNO3 and O3 are calculated Author (GRA)

N77-26747# *Environmental Research and Technology Inc* Concord Mass
AN ALGORITHM TO RETRIEVE WATER VAPOR INFORMATION FROM SATELLITE MEASUREMENTS Final Report
Robert K Crane 22 Nov 1976 52 p refs
(Contract N00228-75-C-2378)
(AD-A037405, NEPRF-TR-7-76(ERT)) Avail NTIS HC A04/MF A01 CSCL 17/5

Radiance values for the eight water vapor channels on the DMSP/SSH infrared sounder were simulated for cloud free conditions The simulated values were inverted using a statistical multiple regression procedure to estimate total precipitable water Inversions were also obtained using both the infrared water vapor channel data and temperature profile data For the sounder channels incorporated into the DMSP/SSH sensor package, profile measurements are not possible below the height of the tropopause using the infrared channel data alone Successful inversions with more than an 80 percent reduction of variance from climatological values were accomplished using both temperature profile data (perhaps obtained from the CO2 channel data) and one or more infrared water vapor channel observations Author (GRA)

N77-27257 *Ohio State Univ Columbus*
PASSIVE MICROWAVE MAPPING OF ICE THICKNESS Ph D Thesis
John Janis Apinis 1976 154 p
Avail Univ Microfilms Order No 77-2339

The basic calculations from which the feasibility of a scanning microwave radiometer system for mapping the thickness of lake ice may be evaluated are presented An analytical model for the apparent brightness temperature as a function of ice thickness was developed and elaborated to include such variables as galactic and atmospheric noise aspect angle polarization temperature gradient in the ice the presence of transition layers such as snow slush and water increased loss due to air inclusions in the ice layer and the presence of multiple ice thicknesses within the antenna footprint It was found that brightness temperature measurements at six or seven frequencies in the range of 0 4 to 0 7 GHz were required to obtain unambiguous thickness estimates A number of data processing methods were examined Dissert Abstr

N77-27280# Technology Service Corp Silver Spring, Md
TAGSEA CLUTTER MEASUREMENT VERIFICATION
L W Brooks F E Nathanson and P R Brooks 29 Oct 1976 67 p refs Prepared for APL Laurel Md
(Contract N00017-72-C-4401)
(AD-A037249 B50711 TSC-WO-284r) Avail NTIS HC A04/MF A01 CSCL 17/9

This is the final TSC report on our overview of the TAGSEA sea clutter measurement program It includes some general comments on the techniques used by Raytheon and General Dynamics in obtaining the data the data reduction and test results Since the early discussions on procedures and tests were covered in monthly meetings and reported earlier this report emphasizes the validity of the results and their use in relating sea clutter models for Navy use TSC has no reason to question the validity of the data itself While the system was not designed for quantitative measurement of sigma sub zero the results should be accurate to within a few decibels (+ or - 3 db(2 sigma)) Both Raytheon and General Dynamics appear to have performed good tests in the time allotted Two areas deserve special attention While the measurement of sea reflectivity sigma sub zero was not a primary function of the tests the results showed the greatest deviation from earlier models For grazing angles of 10 deg - psi - 45 deg the TAGSEA mean values of sigma sub zero were 6-9 db higher than earlier models especially those of NRL for the higher sea states (SS=4) It is proposed in Section 3 that TSC believes that the TAGSEA results are probably more representative of high sea state reflectivity than the earlier models and that some values in new models should be raised by 4-6 db GRA

N77-27367* National Aeronautics and Space Administration Pasadena Office Calif
PENETROMETER Patent
Isak Kloc inventor (to NASA) (JPL) Issued 30 Nov 1971 5 p Filed 19 Jan 1970 Sponsored by NASA
(NASA-Case-NPO-11103-1 US-Patent-3 623 359 US-Patent-Appl-SN-3654 US-Patent-Class-73-84) Avail US Patent Office CSCL 14B

A penetrometer was developed for use in empirically determining the load-bearing characteristics of a surface inclined with respect to a horizontal plane The device is characterized by a penetrometer mount rotatably supporting a vertically driven probe The probe is supported for simultaneous displacement in both vertical and lateral directions The extent of resulting lateral displacement imposed on the probe as vertical displacement operatively is imparted thereto can be detected and measured for purposes of accurately indicating the true load-bearing characteristics of the surface regardless of its angle of inclination Official Gazette of the U S Patent Office

N77-27369*# EG and G Washington Analytical Services Center Inc Rockville Md Wolf Research and Development Group
ALTIMETER ERROR SOURCES AT THE 10-cm PERFORMANCE LEVEL
C F Martin Apr 1977 70 p refs
(Contract NAS6-2639)
(NASA-CR-141420) Avail NTIS HC A04/MF A01 CSCL 01D

Error sources affecting the calibration and operational use of a 10 cm altimeter are examined to determine the magnitudes of current errors and the investigations necessary to reduce them to acceptable bounds Errors considered include those affecting operational data pre-processing and those affecting altitude bias determination with error budgets developed for both The most significant error sources affecting pre-processing are bias calibration propagation corrections for the ionosphere and measurement noise No ionospheric models are currently validated at the required 10-25% accuracy level The optimum smoothing to reduce the effects of measurement noise is investigated and found to be on the order of one second based on the TASC model of geoid undulations The 10 cm calibrations are found to be feasible only through the use of altimeter passes that are very high elevation for a tracking station which tracks very close to the time of altimeter track such as a high elevation pass across the island of Bermuda By far the largest error source based on the current state-of-the-art is the location of the island tracking station relative to mean sea level in the surrounding ocean areas Author

N77-27399# Washington Univ Seattle Applied Physics Lab
STABILIZED LASER GRAVIMETER Final Report, 1 Jun 1974 - 31 Oct 1976
Howard C Merchant and G Rodney Huggett 1 Nov 1976 49 p refs
(Contract F19628-75-C-0042)
(AD-A038902 AFGL-TR-76-0275) Avail NTIS HC A03/MF A01 CSCL 08/5

The development and testing of a stabilized laser gravimeter is discussed A parametric excitation system that is adaptable to the gravimeter is also described The design and initial development of the stabilized laser gravimeter system have been previously described in AFCRL-TR-74-0355 In the design a mirror forming one end of a Fabry-Perot optical cavity is mounted on a mechanical suspension system The suspension consists of a beam end loaded to obtain the required sensitivity to changes in gravitation *A He-Ne illuminating laser is locked to a fringe of the Fabry-Perot cavity A He-Ne laser stabilized by locking to a vibration-rotation absorption line of a methane cell is used as a reference The output of the system is a beat frequency between the two lasers proportional to the gravity change The proposed parametric excitation system applies a periodic end load in addition to the static load on the beam suspension system It has been shown theoretically and experimentally that significant order of magnitude gains in sensitivity can be realized by parametric excitation Author (GRA)

09
GENERAL

Includes economic analysis

A77-31556 Environmental remote sensing 2 Practices and problems Edited by E C Barrett and L F Curtis (Bristol, University, Bristol, England) London, Edward Arnold (Publishers), Ltd , 1977 319 p $34 50

Questions of policy-making for remote sensing are examined, taking into account current systems and services for remote sensing in relation to common user requirements, commercial considerations in remote sensing engineering, national programs for remote sensing and remote sensing from Spacelab The processing and presentation of remote sensing data is considered along with aspects of in situ observation and the interpretation of remote sensing data Attention is given to the use of remote sensing data in cartography, densitometric methods of processing remote sensing data, optical processing as an aid in analyzing remote sensing imagery, an image-processing system applied to earth-resource imagery, an objective generalization of Landsat images, and problems in analyz ing and interpreting data from meteorological satellites G R

A77-31557 Current systems and services for remote sens- ing in relation to common user requirements L P White (General Technology Systems, Ltd Hounslow, Middx , England) In En vironmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 12 24

Wavebands and systems for environmental remote sensing are considered, taking into account the ultraviolet to near infrared region, the thermal infrared region, the microwave region, photo graphic cameras, vidicon cameras, and multispectral line-scanners Airborne equipment and related services are discussed along with satellite systems and related services, data treatment services, and user requirements Attention is given to practical considerations, aerial photography, infrared imagery, side looking radar imagery, and satellite imagery G R

A77-31559 National programmes for remote sensing - A personal viewpoint with special reference to the United Kingdom E A Stephens (Institute of Geological Sciences, London, England) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 41-47

The need for national programs in remote sensing is discussed, taking into account the need for an appropriate administrative organization in the United Kingdom European experimental pro grams in the remote sensing of earth resources are listed in a table Attention is given to the ESRO program, the United Kingdom program, and a proposed program for the United Kingdom The list of proposed programs includes a microwave program, a largely uncoordinated program of research for application from airborne platforms, and a cooperative program through European agencies based on sensors in the visible part of the spectrum G R

A77-31560 Remote sensing from Spacelab - A case for international cooperation J Plevin (ESA, Neuilly-sur Seine, Hauts-de Seine, France) In Environmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 48-71 7 refs

It appears today that remote sensing techniques will very probably provide the information upon which decisions regarding the utilization of material resources will be based The development of suitable information-gathering remote sensing systems requires an extensive preparatory phase The use of Spacelab during this experimental spaceborne phase is considered Attention is given to the Spacelab program, the operational objectives, the experimental role, experimental programs, European experiment proposals, pay- loads, and questions of international cooperation regarding the Spacelab project G R

A77-31561 Thoughts on the legal aspects of remote sensing of the earth by satellites H Kaltenecker and G Laffer randerie (ESA, Neuilly sur-Seine, Hauts-de-Seine, France) In En vironmental remote sensing 2 Practices and problems London, Edward Arnold (Publishers), Ltd , 1977, p 72 80 11 refs

Methods objectives, and features of remote sensing are con- sidered, taking into account the nature of remote sensing, the value of the information, the territorial origin of the information, requirements and programs, and the organization of the space segment and the ground segment A description of the legal framework is presented and the establishment of regulations is discussed Attention is given to public international law, the Treaty on Outer Space, natural resources, national security, prior consent problems, the objectives of a series of regulations, and projects before the United Nations G R

A77-32440 Space A resource for earth An AIAA review Edited by J Grey (American Institute of Aeronautics and Astronau tics, Inc , New York, N Y), P Downey (Boeing Aerospace Co , Seattle, Wash), and B Davis (Battelle Columbus Laboratories, Columbus, Ohio) New York, American Institute of Aeronautics and Astronautics, Inc , 1977 73 p $8 50

The present review identifies and documents the many applica- tions of space systems that have improved the quality of human life on earth It provides a sourcebook of information on the technical elements, histories, uses, and impacts of communication satellite systems, navigation satellite systems, land-observation systems, satel- lites designed for sea and maritime observations, meteorological and other atmospheric-observation satellites, as well as on the future potential of space processing, life science programs in space, and space based solar power Specific satellites and space systems discussed include Echo I, Syncom, ATS, Intelsat/Comsat, the Defense Satellite Communication Systems, Aerosat, Marisat, Transit I, the Navstar/GPS system, the Defense Meteorological Satellite Program, Skylab, the Landsat system, GEOS-3, Seasat, Tiros, Nimbus, ITOS, SMS, GOES, the space shuttle, and Spacelab Detailed attention is given to the utilization and benefits of each system, Landsat results, meteorological observations, various space processing experiments, and proposed designs for space-based solar power plants F G M

A77-34628 * # Remote sensing techniques applied to multi- spectral recognition of the Aranjuez pilot zone (Técnicas de teledetección aplicadas a un reconocimiento multiespectral de la zona piloto de Aranjuez) G L Lemos (Instituto Geografico y Catastral, Madrid, Spain), J Salinas (Madrid, Universidad Politecnica, Madrid, Spain) and M Rebollo (Madrid, Universidad Autonoma, Madrid, Spain) *IAA/Ingenieria Aeronáutica y Astronáutica,* vol 29, Mar 1977, p 13-30 In Spanish NASA-supported research

A rectangular (7 x 14 km) area 40 km S of Madrid was remote-sensed with a three stage recognition process Ground truth was established in the first phase, airborne sensing with a multispec- tral scanner and photographic cameras were used in the second phase, and Landsat satellite data were obtained in the third phase Agronomic and hydrological photointerpretation problems are dis- cussed Color, black/white, and labeled areas are displayed for crop recognition in the land use survey, turbidity, concentrations of pollutants and natural chemicals, and densitometry of the water are considered in the evaluation of water resources R D V

A77-35329 * **An operational earth resources satellite system - The Landsat follow-on program** W G Stroud (NASA, Goddard Space Flight Center, Greenbelt, Md) In Space Congress, 14th, Cocoa Beach, Fla , April 27-29, 1977, Proceedings Cocoa Beach, Fla , Canaveral Council of Technical Societies, 1977, p 8-11 to 8-21 7 refs

The Landsats 1 and 2 have demonstrated the role of remote sensing from satellite in research, development, and operational activities essential to the better management of our resources Hundreds of agricultural, geological, hydrological, urban land use, and other investigations have raised the question of the development of an operational system providing continuous, timely data The Landsat follow-on study addressed the economics, technological performance, and design of a system in transition from R&D to operations Economic benefits were identified and a complete system from sensors to the utilization in forecasting crop production, oil and mineral exploration, water resources management was designed Benefits-to-costs ratio in present-worth dollars is at least 4 1 (Author)

A77-35675 **The uses of air photography /2nd edition/** Edited by J K S Saint Joseph (Cambridge University, Cambridge, England) London, John Baker (Publishers), Ltd , 1977 194 p $16 35

The scope of air photography is examined and aspects of air photography and cartography are investigated, taking into account the effect of height distortion, the parallax bar, the assembling of slotted templates, a modern analog-type plotting machine, single image photogrammetry, flight lines of an aircraft on survey, the schematic diagram of a stereoscope, the measurement of parallax, and the working principles of the multiplex plotter Attention is also given to air photography and geology, air photography and geography, air photography and soil science, air photography and plant ecology, air photography and plant disease, air photography and zoology, air photography in East African game management, air photography and archaeology, air photography and history, towns and monumental buildings, and contemporary planning G R

A77-35767 # **Investigation of earth from space - The cooperative experiment carried out by scientists of the USSR and the German Democratic Republic using the Soyuz-22 spacecraft (Issledovanie zemli iz kosmosa - Sovmestnyi eksperiment uchenykh SSSR i GDR na kosmicheskom korable 'Soiuz-22')** R Z Sagdeev *Akademiia Nauk SSSR, Vestnik,* no 3, 1977, p 6-19, Discussion, p 19, 20 In Russian

Major steps in the evolution of spectral observations of the earth from a space platform are briefly reviewed A description at the layman's level of the multispectral space photosystem MKF 6, developed in a cooperative program with the German Democratic Republic for monitoring earth resources, is provided The adaptation of this system to the Soyuz-22 spacecraft is discussed in general terms During the Soyuz 22 mission, 2000 photographs, each covering an area of 165 by 115 km with a resolution of 10-20 m, were transmitted The high quality of these photographs indicates a bright future for systems similar to the MKF-6 in evaluating natural resources and in monitoring crop growth C K D

A77-36527 * **The space transportation system and its payloads** J Naugle (NASA, Washington, D C) In Space shuttle missions of the 80's, Proceedings of the Twenty first Annual Meeting, Denver, Colo , August 26 28, 1975 Part 1 San Diego, Calif , American Astronautical Society, 1977, p 7-19 (AAS 75-121)

The STS and its three major elements - the Space Shuttle, Spacelab, and a propulsive Upper Stage - are discussed Attention is given to other NASA programs which have a bearing on STS, including Skylab, Landsat, and ATS B J

A77-39970 **International Laser Radar Conference, 8th, Drexel University, Philadelphia, Pa , June 6-9, 1977, Invited Papers** Conference sponsored by the American Meteorological Society Philadelphia, Pa , Drexel University, 1977 139 p $45

Attention is given to some directions in laser meteorology, to lidar for air pollution monitoring, and to absorption spectroscopy applied to lidar atmospheric probing Also considered are the effect of multiple scattering on lidar measurements and the use of lidar for stratospheric measurements B J

N77-22696# National Oceanic and Atmospheric Administration Boulder Colo Environmental Research Labs
ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF, VOLUME 2 Principal Investigators' Reports, Apr - Jun 1976
Sep 1976 873 p refs Sponsored by Bureau of Land Management
(PB-263065/5 NOAA-76122708-Vol-2) Avail NTIS HC A99/MF A01 CSCL 13B

Quarterly reports of baseline studies on the environmental effects of the development of resources on the Alaska continental shelf are presented Baseline studies encompass pollution effects chemistry and microbiology physical oceanography geology ice and data management GRA

N77-23566*# Atomic Energy Commission Dacca (Bangladesh)
INVESTIGATIONS USING DATA FROM LANDSAT-2 Quarterly Report, Jan - Mar 1977
Anwar Hossain Principal Investigator Apr 1977 3 p refs Sponsored by NASA ERTS
(E77-10152 NASA-CR-152698) Avail NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results LANDSAT imageries of Mirpur area of Dacca district were used in connection with surveys for black plastic clay The imageries showed the broad pattern of small valleys cutting into Madhupur clay Land use maps of Haor areas of Sylhet and Mymensingh districts were prepared As a test case two thana areas namely Nickley and Astogram were classified in different categories such as crop settlement and water It does not show much agreement with the Agriculture Dept s statistics

N77-23570*# Instituto Geografico y Catastral Madrid (Spain)
THEMATIC MAPPING, LAND USE, GEOLOGICAL STRUCTURE AND WATER RESOURCES IN CENTRAL SPAIN Final Report
Nunez DelasCuevas Principal Investigator 6 Nov 1976 286 p refs Sponsored by NASA Original contains color imagery Original photography may be purchased from the EROS Data Center 10th and Dakota Avenue Sioux Falls S D 57198 ERTS
(E77-10167 NASA-CR-152668) Avail NTIS HC A13/MF A01 CSCL 08B

The author has identified the following significant results The images can be positioned in an absolute reference system (geographical coordinates or polar stereographic coordinates) by means of their marginal indicators By digital analysis of LANDSAT data and geometric positioning of pixels in UTM projection accuracy was achieved for corrected MSS information which could be used for updating maps at scale 1 200 000 or smaller Results show that adjustment of the UTM grid was better obtained by a first order or even second order algorithm of geometric correction Digital analysis of LANDSAT data from the Madrid area showed that this line of study was promising for automatic classification of data applied to thematic cartography and soils identification

N77 23574*# Purdue Univ Lafayette Ind Lab for Applications of Remote Sensing
DISSEMINATING TECHNOLOGICAL INFORMATION ON REMOTE SENSING TO POTENTIAL USERS

J D Russell and John C Lindenlaub 1977 12 p refs
(Contracts NAS9-14016 NAS9-149170)
(NASA-CR-151340 N-042777) Avail NTIS HC A02/MF A01 CSCL 05B

The Laboratory for Applications of Remote Sensing developed materials and programs which range from short tutorial brochures to post-doctoral research programs which may span several years To organize both the content and the instructional techniques a matrix of instructional materials was conceptualized Each row in the matrix represents a subject area in remote sensing and each column in the matrix represents a different type media or instructional strategy Author

N77-23575*# Purdue Univ Lafayette Ind Laboratory for Applications of Remote Sensing
THE FOCUS SERIES A COLLECTION OF SINGLE-CONCEPT REMOTE SENSING EDUCATIONAL MATERIALS
S M Davis 1977 83 p
(Contract NAS9-14016 NAS9-14970 Grant NGL-15-005-112)
(NASA-CR-151341 LARS-IN-052977) Avail NTIS HC A05/MF A01 CSCL 05B

The FOCUS series is a collection of two-page foldout documents each consisting of a diagram or photograph and an extended option of three to four hundred words The series was developed to present basic remote sensing concepts in a simple concise way Issues currently available are collected in this information note Author

N77-23576*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
AN OPERATIONAL EARTH RESOURCES SATELLITE SYSTEM THE LANDSAT FOLLOW-ON PROGRAM
W G Stroud Mar 1977 23 p refs Presented at 14th Space Congr Lompoc Calif 27-29 Apr 1977 Submitted for publication
(NASA-TM-X-71306 X-900-77-68) Avail NTIS HC A02/MF A01 CSCL 22A

The LANDSATS 1 and 2 have demonstrated the role of remote sensing from satellite in research development and operational activities essential to the better management of our resources Hundreds of agricultural geological hydrological urban land use and other investigations have raised the question of the development of an operational system providing continuous timely data The LANDSAT Follow-on Study addressed the economics technological performance and design of a system in transition from R and D to operations Economic benefits were identified and a complete system from sensors to the ultilization in forecasting crop production oil and mineral exploration and water resources management was designed Author

N77-23577*# National Aeronautics and Space Administration Washington D C
WHAT'S THE USE OF LAND? (A SECONDARY SCHOOL SOCIAL STUDIES PROJECT)
Oct 1976 60 p refs
(NASA-EP-103) Avail NTIS HC A04/MF A01 CSCL 05B

The concept of a student land use survey was discussed with the curriculum development team of the Jefferson County Public Schools in Colorado In these discussions it soon became apparent that the curriculum potentials included much more than a classroom activity involving mapping the features on the ground in the area of study A new flood control dam to be located in the area of Denver Colorado became the central topic in a program involving a wide variety of curriculum fields such as mapmaking local community history physical geography mathematics and environmental studies Consequently a prototype of a multidisciplinary unit concept was developed for later incorporation by the Jefferson County curriculum team Author

N77-24565*# Scientific Translation Service Santa Barbara Calif
THE INVESTIGATION OF THE ENVIRONMENT BY SPACE MEANS GEOBOTANICS, GEOMORPHOLOGY, SOIL SCIENCE AGRICULTURAL LAND AND LANDSCAPE SCIENCE
S V Zoni L A Vedeshin and A M Grinberg Washington NASA May 1977 309 p refs Transl into ENGLISH of collection of papers presented at the Methods of Utilizing Aerospace Data Meeting Moscow 17-24 Nov 1975
(Contract NASw-2791)
(NASA-TT-F-17529) Avail NTIS HC A14/MF A01 CSCL 05B

Collection of papers presented at the Methods of Utilizing Aerospace Data Meeting in Moscow Topics covered include all aspects of the interpretation of aerial photographs from satellites for agriculture and related fields Author

N77-26568* Cornell Univ, Ithaca N Y
REMOTE SENSING PROGRAM Semiannual Status Report, 1 Dec 1976 - 31 May 1977
Ta Liang Arthur J McNair and Warren R Philipson Jun 1977 276 p refs
(Grant NGL-33-010-171)
(NASA-CR-153288 SASR-10) Avail Issuing Activity CSCL 05B

Remotely sensed data obtained by aircraft and satellite were used to assess land suitability for septic tanks analyze linears for ground water sources delineate town aquifers evaluate land for state park development and assess drainage for an historic building Projects in progress include environmental analysis of proposed fly ash disposal sites thermal analysis of building insulation and an assessment of vineyard-related problems Spinoff and future projects are briefly described A R H

N77-26569*# Comision Nacional del Espacio Exterior Mexico City (Mexico)
COMPREHENSIVE STUDY OF LEON-QUERETARO AREA
Hector Alonso Espinosa Humberto Ramos Moreno Josue Macias Morales Jorge Olivares Martell, and Ernesto Bribiesca Correa Principal Investigators 30 Mar 1977 8 p Sponsored by NASA Original contains imagery Original photography may be purchased from the EROS Data Center Sioux Falls, S D 57198 ERTS (E77-10154 NASA-CR-152707 Rept-2) Avail NTIS HC A02/MF A01 CSCL 08F

There are no author-identified significant results in this report

N77-26586*# Mississippi State Univ Mississippi State
APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROGRAMS Semiannual Progress Report, 1 Nov 1976 - 30 Apr 1977
W Frank Miller, Bradley D Carter David E Pettry and Gary K Higgs 1 May 1977 149 p
(Grant NGL-25-001-054)
(NASA-CR-153279 SAPR-7) Avail NTIS HC A07/MF A01 CSCL 05A

The problem includes data acquisition and transformation to products acceptable to the users Optimized institutionalization of data management product transfer and education of the user community are also of major concern With respect to the lattice various structures were suggested and the fields of application are presented Author

N77-26590*# Lockheed Electronics Co Houston Tex
ADVANCED SENSORS AND APPLICATIONS STUDY (ASAS)
S B Chism and C L Hughes Nov 1976 353 p refs
(Contract NAS9-12200)
(NASA-CR-151441 LEC-7790-Rev-A JSC-10975) Avail NTIS HC A16/MF A01 CSCL 14B

The present EOD requirements for sensors in the space shuttle era are reported with emphasis on those applications which were deemed important enough to warrant separate sections The

application areas developed are (1) agriculture (2) atmospheric corrections (3) cartography (4) coastal studies (5) forestry (6) geology (7) hydrology (8) land use (9) oceanography and (10) soil moisture For each application area The following aspects were covered (1) specific goals and techniques (2) individual sensor requirements including types bands resolution etc (3) definition of mission requirements type orbits coverages, etc and (4) discussion of anticipated problem areas and solutions The remote sensors required for these application areas include (1) camera systems (2) multispectral scanners (3) microwave scatterometers (4) synthetic aperture radars (5) microwave radiometers and (6) vidicons The emphasis in the remote sensor area was on the evaluation of present technology implications about future systems Author

N77-26593*# General Electric Co Philadelphia Pa GE LANDSAT Operations Control Center
LANDSAT-1 AND LANDSAT-2 FLIGHT EVALUATION REPORT, 23 JULY - 23 OCTOBER 1976
30 Nov 1976 220 p
(Contract NAS5-21808)
(NASA-CR-152474 Doc-76SDS4278) Avail NTIS HC A10/MF A01 CSCL 05B

The LANDSAT-1 spacecraft was launched from the Western Test Range on 23 July 1972 at 18 08 06 508Z The launch and orbital injection phase of the space flight was nominal, and deployment of the spacecraft followed predictions Performance evaluation of the spacecraft is presented Author

N77-26594*# General Electric Co Philadelphia Pa LANDSAT Operations Control Center
LANDSAT-1 AND LANDSAT-2 FLIGHT EVALUATION REPORT Quarterly Report, 23 Jan - 23 Apr 1976
14 Jul 1976 223 p refs
(Contract NAS5-21808)
(NASA-CR-152475 Doc-76SDS4248 QR-16) Avail NTIS HC A10/MF A01 CSCL 05B

The LANDSAT-1 spacecraft was launched from the Western Test Range on 23 July 1972 at 18 08 06 508Z The launch and orbital injection phase of the space flight was nominal and deployment of the spacecraft followed predictions Orbital operations of the spacecraft and payload subsystems were satisfactory through Orbit 147 after which an internal short circuit disabled one of the Wideband Video Tape Recorders (WBVTR-2) Operations resumed until Orbit 196 when the Return Beam Vidicon failed to respond when commanded off The RBV was commanded off via alternate commands LANDSAT-1 continued to perform its imaging mission with the Multispectral Scanner and the remaining Wideband Video Tape Recorder providing image data Author

N77-26754# World Meteorological Organization Geneva (Switzerland)
SCIENTIFIC LECTURES ON METEOROLOGY
1976 61 p refs Partly in FRENCH and partly in ENGLISH Proc of the 7th World Meteorol Congr Geneva May 1975
(WMO-435 ISBN-92-63-10435-2) Avail NTIS HC A04/MF A01 WMO Geneva Sw Fr 16

The six lectures were divided into two groups of three and dealt with the following subjects meteorology and hydrology in aid of food production and implications of outer space technology on development in meteorology and meteorological services

N77-27467*# Earth Satellite Corp Washington D C
FOREIGN LANDSAT STATION CHARGE STUDY Monthly Progress Report, 1-30 Apr 1977
Charles Sheffield Principal Investigator 2 May 1977 9 p refs ERTS
(Contract NASw-3033)
(E77-10177 NASA-CR-153275) Avail NTIS HC A02/MF A01 CSCL 05B

N77-27470*# Kansas Univ Center for Research Inc Lawrence
THE APPLICATION OF REMOTE SENSING TO RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY PROGRAMS IN KANSAS Annual Report, 1 Apr 1976 - 31 Mar 1977
B G Barr Principal Investigator and E A Martinko Apr 1977 83 p refs Original contains color imagery Original photography may be purchased from the EROS Data Center Sioux Falls S D 57198 ERTS
(Grant NGL-17-004-024)
(E77-10180 NASA-CR-153277) Avail NTIS HC A05/MF A01 CSCL 05A

There are no author-identified significant results in this report

N77-27471*# General Electric Co Philadelphia Pa Space Systems Organization
LANDSAT D OPERATIONS CONTROL CENTER STUDY
L Alexander G Brown B Clemson J Efner N Engelberg J Owen and T Winchester 2 May 1977 97 p
(Contract NAS5-23412)
(NASA-CR-152543 Doc-77SDS4232) Avail NTIS HC A05/MF A01 CSCL 05B

Various aspects of the planned LANDSAT D system are discussed LANDSAT D incorporates the Thematic Mapper (TM) as a sensor it utilizes the Multi-mission Modular Spacecraft (MMS) it makes use of the Tracking and Data Relay Satellite System (TDRSS) and it employs a more advanced ground system Each of these represent significant improvements in the state-of-the-art Author

N77-27472*# Lockheed Electronics Co Houston Tex Systems and Services Div
GEMINI PHOTOGRAPHS OF THE WORLD A COMPLETE INDEX
L E Giddings May 1977 106 p
(Contract NAS9-15200)
(NASA-CR-151445 LEC-10508) Avail NTIS HC A06/MF A01 CSCL 05B

The most authoritative catalogs of photographs of all Gemini missions are assembled Included for all photographs are JSC (Johnson Space Center) identification number percent cloud cover geographical area in sight and miscellaneous information In addition details are given on cameras filters films and other technical details Author

N77-27476*# Texas A&M Univ College Station Remote Sensing Center
[APPLICATIONS OF REMOTE SENSING SURVEYS IN TEXAS] Progress Report, 1 Feb 1976 - 31 Jan 1977
31 Jan 1977 64 p refs
(Grant NGL-44-001-001)
(NASA-CR-153295 RSC-10) Avail NTIS HC A04/MF A01 CSCL 05B

The grant project continues to introduce remote sensing technology to users in Texas and other regions in the South through presentation of papers and briefings at technical and professional meetings Author

N77-27478*# Scientific Translation Service Santa Barbara Calif
RESTEC (REMOTE SENSING TECHNOLOGY CENTER), VOLUME 1, NO 1, 1976
Washington NASA May 1977 133 p refs Transl into ENGLISH from RESTEC (Remote Sensing Technology Center) (Japan) v 1 no 1 1976 p 1-75
(Contract NASw-2791)
(NASA-TT-F-17532) Avail NTIS HC A07/MF A01 CSCL 05B

Articles are presented on the use of LANDSAT photographs in geology remote sensing in agriculture remote sensing of the seas the history of remote sensing and other subjects Author

N77-27484*# National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md

REMOTE SENSING OF THE ATMOSPHERE FROM ENVIRONMENTAL SATELLITES

Lewis J Allison Raymond Wexler Charles R Laughlin and William R Bandeen Jun 1977 124 p refs Submitted for publication

(NASA-TM-X-71353, X-901-77-132) Avail NTIS HC A06/MF A01 CSCL 04A

Various applications of satellite remote sensing of the earth are reviewed, including (1) the use of meteorological satellites to obtain photographic and radiometric data for determining weather conditions (2) determination of the earth radiation budget from measurements of reflected solar radiation and emitted long wave terrestrial radiation (3) the use of microwave imagery for measuring ice and snow cover, (4) LANDSAT visual and near infrared observation of floods and crop growth and (5) the use of the Nimbus 4 backscatter ultraviolet instrument to measure total ozone and vertical ozone distribution Plans for future activities are also discussed D M L

N77-27651# California Univ Livermore Lawrence Livermore Lab

ENERGY AND TECHNOLOGY REVIEW

R W Selden Nov 1976 17 p refs

(Contract W-7405-eng-48)

(UCRL-52000-76-11) Avail NTIS HC A02/MF A01

The resolution of serious discrepancy between lunar magnetic field data and melting studies of lunar basalts is discussed Estimates of the subsurface temperature based on lunar electrical conductivity measurements and laboratory experiments were hundreds of degrees below those given by models using known melting points of various minerals A basic flaw in previous measurements was uncovered New measurements under more realistic conditions brought the electrical conductivity temperature estimates into agreement with temperatures derived from melting experiments A satellite ozone analysis center is also described It is expected to produce daily high resolution global maps of ozone concentration Correlated with ground observations these maps should make it possible to establish the average ozone level to check the effects of solar flares volcanic eruptions and atmospheric nuclear tests on that level to detect long term trends in ozone concentration and eventually to predict the effects of various forms of atmospheric pollution Finally a computer pattern recognition system for analyzing crime is discussed D M L

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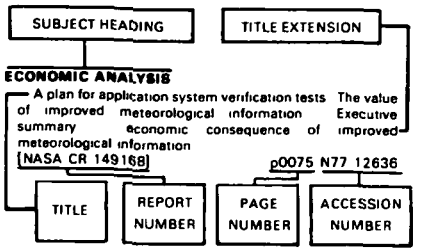

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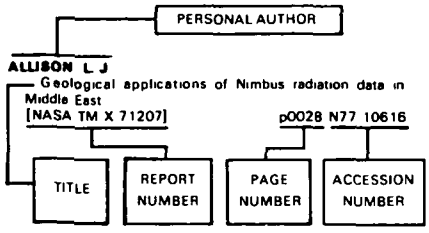

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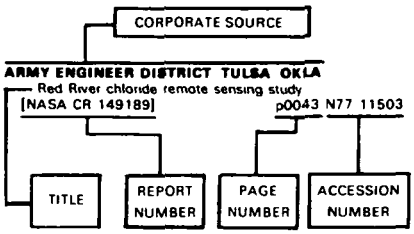

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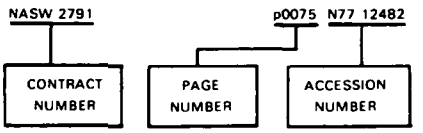

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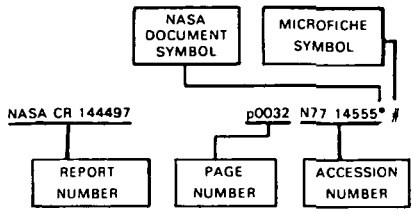

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16 Abstract

This bibliography lists 387 reports, articles, and other documents introduced into the NASA scientific and technical information system between July 1 and September 30, 1977. 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.

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