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Earth Resources
A Continuing
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NASA SP-7041 (21)
April 1979

National Aeronautics and
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NASA SP-7041 (21)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 21

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 January 1, 1979 and March 31, 1979

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

NASA Scientific and Technical Information Branch 1979
National Aeronautics and Space Administration
Washington, DC

This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, at the price code E05 ($9.00 domestic; $18.00 foreign).

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 369 reports, articles, and other documents announced between January 1 and March 31, 1979 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 A79-10,000 in ascending accession number order;

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After the abstract section, there are five indexes:

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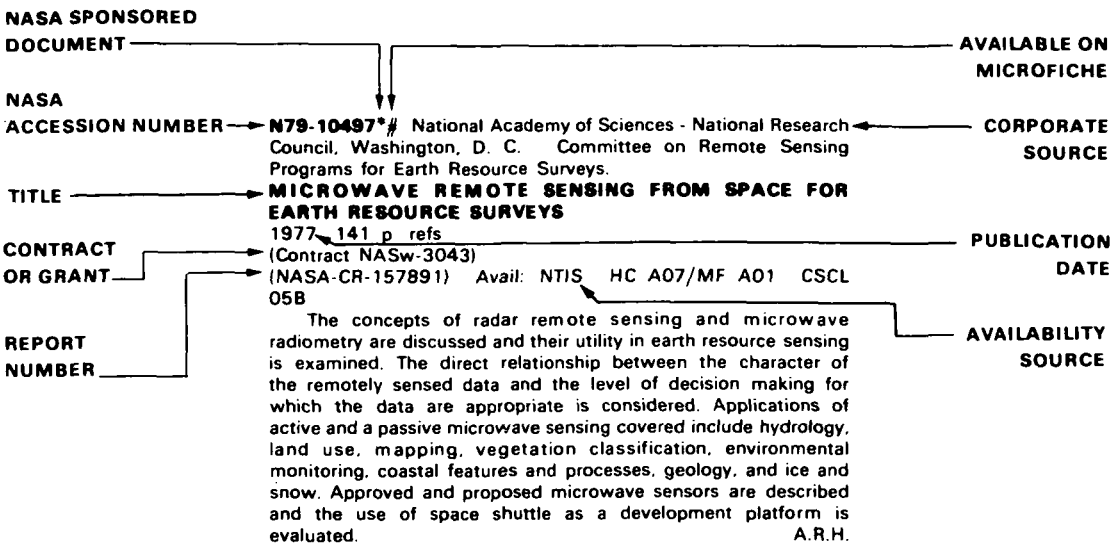

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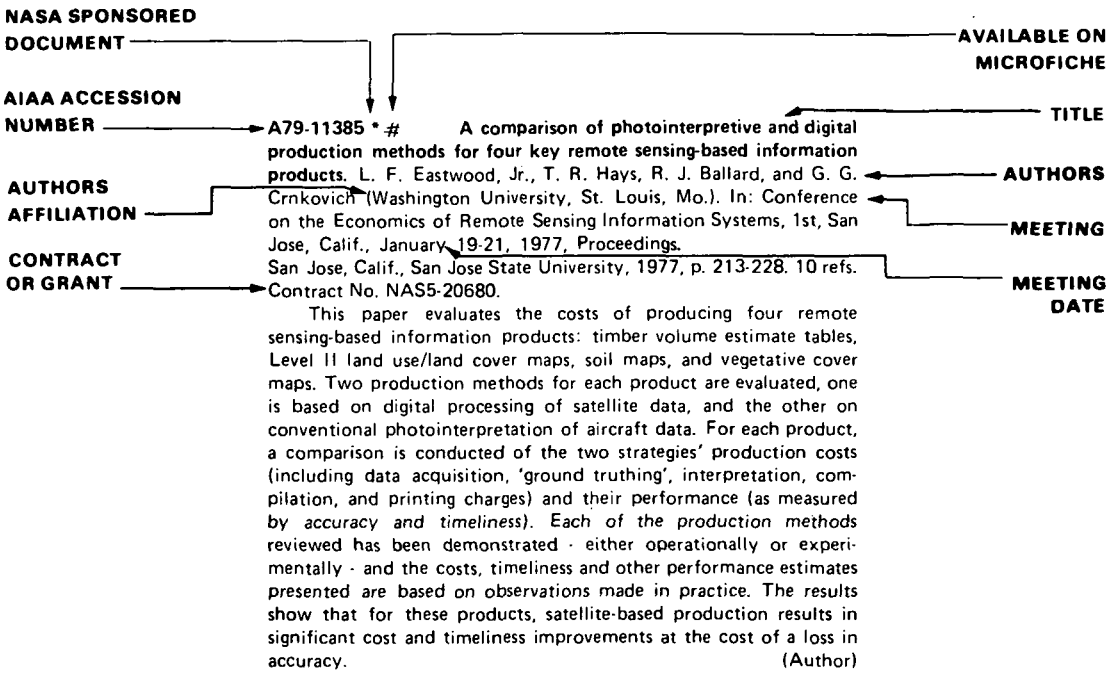

EARTH RESOURCES

A Continuing Bibliography (Issue 21)

APRIL 1979

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.

A79-11254 **An example of the economic interest in remote sensing - Forecasting of maize crops.** M. Susplugas (Centre National d'Etudes Spatiales, Paris, France), M. Malet (Institut National de la Recherches Agronomiques, Versailles, France), and M. Fraysse. *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-116.* 10 p. In French.

Consideration is given to the development of statistical agroclimatological prediction models on the basis of remote sensing data. In particular the paper considers the economic advantages to be gained from improving the prediction of corn harvests in France. The economic impact of remote-sensing-based prediction techniques on stock management is examined. B.J.

A79-11357 **Experiment on the interaction of microwaves with natural surfaces from the viewpoint of their use in the remote sensing of agricultural zones (Expérience sur l'interaction des micro-ondes avec des surfaces naturelles en vue de leur utilisation à la télédétection des zones agricoles).** M. Pausader (Centre d'Etudes Spatiales des Rayonnements, Toulouse, France). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-ST-01.* 9 p. 5 refs. In French.

The multifrequency scatterometer Ramses (five frequencies 1.5-9 GHz) was used to study the effect of surface roughness and soil moisture on the diffusion of radar waves by bare soil. The scatterometer is described, and the use of a numerical model based on Maxwell's equations to interpret the data is examined. Analytic and geometric models are indicated, and the extension of the method to provide information on more complex agricultural soil conditions is considered. M.L.

A79-11377 # **The value of improved global crop information - An empirical approach to Landsat benefits.** K. P. Heiss (ECON, Inc., Princeton, N.J.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 49-77.

The work done to date on the value of improved crop information in the context of world food distribution and production is quite encouraging. Monthly models for distribution as well as production processes and decisions have been formulated and implemented to date. The effect of alternative, improved decisions, month by month, due to improved crop information, is being assessed at a level of reasonable disaggregation to arrive at benefit estimates of the Landsat and the Landsat Follow-on systems for the United States. The overall benefit estimates from information improvements as related to the Landsat Follow-on program are thought to be in the neighborhood of about $250 million a year to the U.S. from wheat crop information alone. G.R.

A79-11382 # **Improvement of earth resource inventories utilizing remotely sensed data /sampling and remote sensing/.** J. D. Nichols (ESL, Inc., Sunnyvale, Calif.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 162-170. 10 refs.

A description is presented of studies which were conducted to test or demonstrate the usefulness of imagery in providing information for estimating timber volume. The test criterion used was the reduction in the error of the estimate due to the various separations made on the imagery as compared with the standard errors obtained with equal probability ground sampling. This type of testing with a specific estimation problem in mind seems the most appealing form of evaluating an imaging and interpretation system. Attention is given to historical studies, investigations regarding the timber volume of the Plumas National Forest in California, and the Forest Inventory Study of Western Washington. G.R.

A79-11388 * # **An analysis of aircraft requirements to meet United States Department of Agriculture remote sensing goals.** R. D. Arno (NASA, Ames Research Center, Applications Aircraft and Future Programs Office, Moffett Field, Calif.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 261-282.

The survey needs of the U.S. Department of Agriculture are immense, ranging from individual crop coverage at specific intervals to general land use classification. The aggregate of all desirable resolutions and sensor types applicable to airborne platforms yields an annual survey coverage rate equivalent to about 6 times the U.S. land area. An intermediate annual survey level equal to the U.S. area can meet all currently perceived crop survey needs and provide sample imagery over many other resource areas. This decreased survey level can be accomplished with one or two high altitude aircraft or medium altitude aircraft. Survey costs range from about 25 cents to several dollars per square nautical mile depending primarily on resolution requirements and the aircraft used. (Author)

A79-11389 * # **The value of volume and growth measurements in timber sales management of the National Forests.** K. R. Lietzke (ECON, Inc., Princeton, N.J.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 283-323. 17 refs. Contract No. NASw-2558.

This paper summarizes work performed in the estimation of gross social value of timber volume and growth rate information used in making regional harvest decisions in the National Forest System. A model was developed to permit parametric analysis. The problem is formulated as one of finding optimal inventory holding patterns. Public timber management differs from other inventory holding problems in that the inventory, itself, generates value over time in providing recreational, aesthetic and environmental goods. 'Non-

timber' demand estimates are inferred from past Forest Service harvest and sales levels. The solution requires a description of the harvest rates which maintain the optimum inventory level. Gross benefits of the Landsat systems are estimated by comparison with Forest Service information gathering models. Gross annual benefits are estimated to be $5.9 million for the MSS system and $7.2 million for the TM system. (Author)

A79-11659 **Bean area estimates from Landsat and airborne remote sensing data.** R. A. Ryerson (Department of Energy, Mines and Resources, Centre for Remote Sensing, Ottawa, Canada) and V. R. Wallen (Department of Agriculture, Crop Disease Loss Section, Ottawa, Canada). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 18-29.

The purpose of the reported experiment, which was conducted under the direction of the Canada Centre for Remote Sensing was to evaluate remote sensing data for providing accurate and timely white and red kidney bean area measurements in southern Ontario. The Ontario White and Yellow Eye Bean Producers Marketing Board requires white and red kidney bean area estimates which are 90% accurate, 95% of the time. Investigations were carried out for two test sites. Landsat coverage was obtained on August 10, while airborne data were acquired on August 17, 1976. Ground data were collected for each of 419 fields in the two test sites during the periods August 9-11 and August 17-20, 1976. It was found that the accuracy of remote sensing estimates of white and red kidney bean areas in 1976 in the test sites approach or exceed the accuracies required. G.R.

A79-11660 **Multidate/multispectral crop identification - Digital techniques applied to high altitude photography and Landsat imagery.** J. R. Jensen (Georgia, University, Athens, Ga.), L. R. Tinney, and J. E. Estes (California, University, Santa Barbara, Calif.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 30-39. 11 refs.

Multidate crop identification using microdensitometer scanned color infrared high altitude photography (original scale 1:125,000) and Landsat digital data was conduced for an 140 square kilometer study area in Kern County, California. The purpose of this analysis was not to achieve maximum crop identification accuracy per se, but to comparatively evaluate the utility of the two image formats for digital crop identification. Preliminary results indicate that the Landsat digital approach is superior to analysis of digitized high altitude photography. Vignetting in the high altitude photography dataset caused serious signature extension problems. (Author)

A79-11665 **Landsat forest inventory of the Philippines.** D. L. Dietrich and H. M. Lachowski (GE Image Processing and Analysis Center, Beltsville, Md.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 137-144.

A79-12503 **Remote sensing from space and the operational needs of range management.** N. G. Seligman (ARO, Volcani Center, Bet Dagan, Israel). In: The contribution of space observations to global food information systems; Proceedings of the W. Nordberg Memorial Symposium, Tel Aviv, Israel, June 7-18, 1977. Oxford, Pergamon Press, Ltd., 1978, p. 15-22. 16 refs.

A number of published reports on applications of remote sensing from satellites to range management are reviewed. Promising results have been obtained from applications to large scale regional vegetation surveys; effects of grazing use and fire on the range vegetation have been monitored; fairly accurate estimates of green biomass have been obtained. The possible applications of satellite derived information to operational range management is discussed. It is concluded that immediate applications are most promising where administration of range land is conducted by a central authority and in countries where the necessary organizational infra-structure exists. In the long run indirect applications through range research or through estimates of national and international livestock production may have the greater impact on the course of events in the field. (Author)

A79-12504 **Food information systems - Growing conditions.** W. Baier (Agriculture Canada, Chemistry and Biology Research Institute, Ottawa, Canada). In: The contribution of space observations to global food information systems; Proceedings of the W. Nordberg Memorial Symposium, Tel Aviv, Israel, June 7-18, 1977. Oxford, Pergamon Press, Ltd., 1978, p. 77-85. 12 refs.

Space crop-weather models and their use in conjunction with space observations are discussed. FAO and WMO global weather report programs are surveyed, and the use of crop-weather models in regional or global crop information systems is considered. Crop-weather modeling approaches are described, examples of integrated food information systems are presented, and the importance of estimating soil moisture is explained. M.L.

A79-13794 **Quantifying gypsy moth defoliation.** R. L. Talerico, T. A. Skratt (U.S. Department of Agriculture, Northeastern Forest Experiment Station, Hamden, Conn.), and J. E. Walker (Calspan Corp., Buffalo, N.Y.). *Photogrammetric Engineering and Remote Sensing*, vol. 44, Nov. 1978, p. 1385-1392. 9 refs. Research sponsored by the U.S. Department of Agriculture.

The study investigates the potential of using color-infrared film (at a scale of 1:31,640) with the scene color standard (SCS) analysis as an objective method for measuring and mapping insect (gypsy moth, Lymantria dispar) defoliation of forest vegetation from aerial photos. In the SCS analysis, absolute reflectance measurements that can be related over time are produced from sequential aerial photos. This method is used to develop a quantitative index for defoliation based on photo-derived reflectance measurements, and to produce map overlays of the effect of defoliation from this index. A location in central Pennsylvania, USA, is selected. It is shown that aerial photographs analyzed by the SCS method serve as a permanent record of damage, and they provide a total picture of ground conditions such as the distribution of stand susceptibility and defoliation patterns. Sequential photography is suitable for providing a permanent record of changes in insect distribution and defoliation intensity for pest management. S.D.

A79-13852 * # **Sensor needs for agricultural applications.** H. Golden (NASA, Marshall Space Flight Center, Huntsville, Ala.) and J. W. Neiers (General Electric Co., Huntsville, Ala.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1745*. 8 p.

The peculiarities of agricultural remotely sensed data requirements evoke special sensor requirements. Vegetative species do not possess significantly different spectral signature at given phases of their development cycle. Hence, the key to their discriminability is the phasing of the phenologic cycle of the subject species. Significant improvements in classification can be obtained by consistently employing multi-temporal observations taken at specific times during the year. The present approach to agricultural data processing results in extracted data equal to approximately .05% of the acquired data. This paper discusses the derivation of agricultural peculiar requirements and the benefits to the end-to-end processing system by judicial utilization and placement of key editing functions such as sample segment extraction, cloudy image removal, sample registration and the elimination of redundant data. (Author)

A79-14152 # **Spray block mapping control for spruce budworm using Landsat and high altitude remote sensing.** M. D. Ashley and L. Morin (Maine, University, Orono, Me.). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977.

Graz, Technische Universität Graz, 1978, p. 7-9. 9 refs. Research supported by McIntire-Stennis and U.S. Forest Service.

A79-14159 # Interrelation between photogrammetry and remote sensing cadastral localizing of cultivation inventory, obtained by remote sensing. B. L. Y. Dubuisson (Ministére de l'Equipement, Paris, France). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 51-55.

A79-14176 # A branched classification system applied to special problems in multispectral data analysis. F. Quiel (Karlsruhe, Universität, Karlsruhe, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 171-174. Research sponsored by the Bundesministerium für Forschung und Technologie.

A branched classification algorithm is applied to data collected with a 11-channel multispectral scanner during flight over east-west strips in the Rhine Valley. At each branching point in this algorithm a picture element is classified into one of two possible classes. Separation criteria can be selected independently of the criteria used at branching points. The procedure and results are discussed with attention to scan-angle effects, multidate classification, and texture. It is suggested that the high flexibility of the described system permits application to classification tasks for which the maximum likelihood algorithm or unsupervised techniques are unsuitable. (Author)

A79-17274 A study of the potential of Landsat MSS digital data for woodland census in Britain. J. R. Hardy and C. D. Agar (Reading, University, Reading, Berks., England). *British Interplanetary Society, Journal (Satellite Control and Data Processing)*, vol. 31, Dec. 1978, p. 467-474. 9 refs.

The feasibility of woodland census in Britain using Landsat MSS CCT data is investigated. For a test area near Reading of approximately 260 sq km, woodland was distinguished from nonwoodland using a cuboid classification and data for March 1973. Map corrected outputs for National Grid squares were produced at 1:25,000 scale with area calculations. By combining June 1973 and March 1973 data, similar corrected map outputs are possible which separate needleleaf, mixed, and two types of broadleaf woodland. B.J.

A79-17876 Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Symposium sponsored by ISP, ASP, SAF, University of Washington, and Washington State Department of Natural Resources. Falls Church, Va., American Society of Photogrammetry, 1978. 554 p. Members, $12.; nonmembers, $18.

Papers are presented on such topics as the use of vegetation as a transducer for environmental pollution, digital analysis of Landsat data in the detection and mapping of spruce budworm defoliation in Northern Wisconsin, remote analysis of forest tree mortality in California, and remote sensing to determine seedling survival. Consideration is also given to the use of Landsat image differencing to monitor gypsy moth defoliation, jarrah dieback detection and mapping in Australia, and remote detection of the effects of SO2 emissions on vegetation. B.J.

A79-17877 Remote sensing and vegetation damage - A theory for detection and assessment. P. A. Murtha (British Columbia, University, Vancouver, Canada). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 19-52. 23 refs.

This paper discusses the philosophical and technical aspects of remote sensing for vegetation damage assessment. Answers are presented for these questions: (1) what constitutes remote sensing evidence of vegetation damage; (2) how is vegetation damage interpreted from remotely sensed data; and (3) how can the damage be assessed. The answers to these questions are discussed in details relevant to normal color and color-infrared aerial photography. Consideration is given to details of film reaction to variations in spectral reflectance patterns. Damages showing morphological or physiological changes are discussed relative to spectral reflectance changes and presented as a means to code damage types. An hypothesis for quantitatively monitoring forest damage is presented. (Author)

A79-17878 Previsual detection - The elusive dream. L. Fox, III (Humboldt State University, Arcata, Calif.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 53-64. 15 refs.

Previsual detection is defined as the detection of vegetation damage through remote sensing before close-range visual observation could detect it. There is general disagreement as to whether remote sensing techniques can detect plant disease before it becomes visible. The present paper organizes the possible interpretations of previsual detection into a tabular summary. This table might be used to clarify what exactly is meant by the term 'previsual' and to prevent future users from being misled as to what should be expected from a remote sensing device. B.J.

A79-17879 Previsual detection of stressed loblolly pine /Pinus taeda L./. L. A. Alger, P. J. Egan, and H. J. Heikkenen (Virginia Polytechnic Institute and State University, Blacksburg, Va.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 65-72. 10 refs.

An AGA Thermovision System 680 was used to previsually detect relative, apparent temperature differences between stressed and healthy loblolly pines (Pinus taeda L.). Apparent temperatures of stressed foliage were from .5 to 2 C warmer relative to healthy foliage. (Author)

A79-17880 * Using reflectance and photography to detect ozone damage to cantaloupe plants. H. W. Gausman, D. E. Escobar, R. R. Rodriguez, C. E. Thomas, and R. L. Bowen (U.S. Department of Agriculture, Weslaco, Tex.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 73-87. 21 refs. NASA Order S-53876-AG.

Laboratory and field reflectance measurements showed that ozone-damaged cantaloupe (Cucumis melo L.) leaves had lower water contents and higher reflectance than nondamaged leaves. Cantaloupe plants with lightly, severely, and very severely ozone-damaged leaves were distinguishable from nondamaged plants by reflectance measurements in the 1.35-2.5-micron near-IR water absorption band. Ozone-damaged leaf areas were detected photographically 16 hours before the damage was visible. B.J.

A79-17881 The effect of canopy composition on the measured and calculated reflectance of conifer forests in Michigan. L. Fox, III (Humboldt State University, Arcata, Calif.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 89-114. 25 refs.

The Michigan conifer forest study had several aims. They included: (1) measurement of the spectral reflectance of several conifer forest canopies under various angles of incoming and outgoing radiant flux and quantification of the variation observed; (2) measurement of the canopy component (i.e., needles and branches) spectral reflectance and transmittance, density and orienta-

tion of the canopy components, and angular relation between the light source (i.e., the sun) and the sensing instrument; (3) verification and use, if possible, of Suits' canopy reflectance model (1972) to extend the limited field base and aid in explaining empirical results; and (4) investigation of possible forest species discrimination. B.J.

A79-17883 Applications of photometric process in monitoring vegetation damage due to external stresses. D. Gaucher, J. E. Walker (Calspan Corp., Buffalo, N.Y.), and J. R. Schott. In: Symposium on Remote Sensing for Vegetation Damage Asessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 135-159. 23 refs.

An operational vegetation-damage assessment procedure based solely on remote sensing technology has been developed. This new information extraction procedure based on vegetation spectral reflectance can be applied to the remote assessment of defoliation in deciduous forests (defoliation mapping of a Pennsylvania forest is considered as an example). Moreover, it is indicated that other important vegetation management information requirements can also be satisfied through the use of this new information extraction method and with significantly less dependence on ground or aerial observation survey inputs. B.J.

A79-17884 The application of digital terrain model and space resection techniques to digitizing the position of southern pine beetle infestations delineated on large scale aerial photographs. W. H. Clerke (U.S. Forest Service, Atlanta, Ga.) and R. O. Mahan (U.S. Forest Service, Washington, D.C.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 161-179. 10 refs.

A79-17885 Microdensitometry to identify Douglas-fir tussock moth defoliation on color IR aerial photos. Y. J. Lee (Pacific Forest Research Centre, Victoria, British Columbia, Canada) and J. F. Wear (U.S. Forest Service, Portland, Ore.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 181-195.

A79-17886 Detection and mapping of spruce budworm infestation in Northern Wisconsin using digital analysis of Landsat data. H. E. Hogan and R. P. Madding (Wisconsin, University, Madison, Wis.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 197-219. 8 refs. Research supported by the U.S. Forest Service and Wisconsin Department of Natural Resources.

The use of Landsat MSS digital data and computer-assisted analysis techniques was investigated in a study of spruce budworm infestation in forest stands of balsam fir and white spruce in Northern Wisconsin. A Landsat computer-compatible tape was obtained for 11 July 1976 when peak foliage browning of fir and spruce was visible. Color and color IR 70 mm aerial imagery at scales of 1:78,900 and 1:46,800 provided a record of ground conditions. Results indicate that Landsat can be used to identify and map areas of coniferous infestation but that supplementary methods are required to determine the type and severity of defoliation. B.J.

A79-17887 * Monitoring gypsy moth defoliation by applying change detection techniques to Landsat imagery. D. L. Williams (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.) and M. L. Stauffer (Computer Sciences Corp., Silver Spring, Md.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 221-229. 10 refs.

The overall objective of a research effort at NASA's Goddard Space Flight Center is to develop and evaluate digital image processing techniques that will facilitate the assessment of the intensity and spatial distribution of forest insect damage in Northeastern U.S. forests using remotely sensed data from Landsats 1, 2 and C. Automated change detection techniques are presently being investigated as a method of isolating the areas of change in the forest canopy resulting from pest outbreaks. In order to follow the change detection approach, Landsat scene correction and overlay capabilities are utilized to provide multispectral/multitemporal image files of 'defoliation' and 'nondefoliation' forest stand conditions. (Author)

A79-17888 Case applications of remote sensing for vegetation damage assessment. R. C. Heller (Idaho, University, Moscow, Idaho). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 231-252. 26 refs.

The advantages and disadvantages of remote sensing for vegetation damage assessment are discussed. Consideration is then given to successful vegetation assessment techniques, including visual observation, aerial photography, multistage sampling, and risk rating systems. Some future trends in this area are projected. B.J.

A79-17889 Recognition of patterns of damage in tall forests in Australia. T. Bird (Commonwealth Scientific and Industrial Research Organization, Div. of Forest Research, Hobart, Australia), B. J. Myers (Commonwealth Scientific and Industrial Research Organization, Div. of Forest Research, Canberra, Australia), and D. A. Ratkowsky (Commonwealth Scientific and Industrial Research Organization, Div. of Mathematics and Statistics, Hobart, Australia). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 253-266. 18 refs. Research supported by the Tasmanian Forestry Commission.

The paper describes a photointerpretation technique for the identification of patterns of forest decline and discusses its application to the regrowth dieback disorder which affects about 20,000 ha of the commercially important Australian eucalypt forest. The goal of the study was to determine whether a pattern characteristic of other disorders for which causes are known could be established. B.J.

A79-17890 Full coverage at large scale. F. J. Bradshaw and R. J. Chandler (Forests Department, Australia). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 267-290. 6 refs.

The paper considers the use of large-scale 70 mm aerial photography for the detection and mapping of dieback disease in the jarrah forests of Western Australia. Consideration is given to the choice of the dieback detection and mapping system, the design of the 70 mm aerial photographic system, system trials, detection and interpretation procedures, film handling and mapping, cost factors, and operational feasibility. Total coverage of small-format large-scale aerial photography over extensive areas has been shown to be practicable even under time and weather limitations. B.J.

A79-17891 Detection of a crown dieback in Australian eucalypt forests on large-scale aerial photographs. B. J. Myers and T. Bird (Commonwealth Scientific and Industrial Research Organization, Div. of Forest Research, Canberra, Australia). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 291-297.

A79-17892 The use of CIR aerial photography for Dutch elm disease detection. S. E. Fairweather, M. P. Meyer, and D. W. French. In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings.

Falls Church, Va., American Society of Photogrammetry, 1978, p. 299-310.

A79-17893 **Remote sensing approach to identifying preferred Douglas-fir tussock moth /Orgyia pseudotsugata McD./ sites.** W. A. Miller and R. C. Heller (Idaho, University, Moscow, Idaho). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 311-333. 6 refs. Research supported by the University of Idaho and U.S. Department of Agriculture.

A79-17894 **Remote analysis of forest tree mortality in California.** M. E. Schultz (California, University, Berkeley, Calif.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings.

Falls Church, Va., American Society of Photogrammetry, 1978, p. 335-354. 15 refs.

In the study described, large-scale normal color transparencies were found useful for extracting detailed information on forest mortality groups. For Yosemite Valley and the Cleveland National Forest, the cost of using a thermal IR sensor to detect diseased or dying trees might be justified because of the critical need to eliminate hazardous trees in high-use areas. For the Pest Damage Inventory, where a detailed analysis of a large sample of mortality groups is needed, large-scale photos were found to be most useful. The uneven age stands that predominate in California are best photographed with a normal color film under overcast conditions to eliminate the shadow areas in which many of the smaller dead trees are concealed. V.P.

A79-17895 **Multiphase airphoto assessment for annual losses caused by the mountain pine beetle in lodgepole pine.** W. H. Klein, R. W. Young (U.S. Forest Service, Methods Application Group, Davis, Calif.), and D. D. Bennett (U.S. Forest Service, Ogden, Utah). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 355-367.

A79-17896 **Use of color infrared aerial photography for documenting baseline vegetation stress in environmental impact assessment.** R. C. Leupold, J. B. Mathies (Environmental Research and Technology, Inc., Concord, Mass.), R. P. Herbst (Environmental Research and Technology, Inc., Houston, Tex.), and R. J. Kohut (Environmental Research and Technology, Inc; Ecology Consultants, Inc., Fort Collins, Colo.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 369-380.

An attempt is made to show the usefulness of color-infrared photography in an applied remote sensing role. CIR photos have proven to be an effective tool in the detection of vegetation stress and in a wide range of applications for its prevention. They serve as a permanent record which documents baseline conditions and the historical record for future potential impacts and also provide a most important data base for decision making from and during baseline and siting studies. The role of CIR photos is equally important in impact prediction and mitigation. V.P.

A79-17897 # **Detecting the effects of sulfur dioxide emissions on vegetation by remote sensing.** C. D. Sapp (Tennessee Valley Authority, Div. of Environmental Planning, Muscle Shoals, Ala.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings.

Falls Church, Va., American Society of Photogrammetry, 1978, p. 381-400. 8 refs.

The remote sensing techniques studied in the present paper indicate that the aerial mapping camera and color-infrared film are the most useful combination for detecting the effects of SO2 injury to vegetation. There is no substitute for the color-infrared transparency and the mirror stereoscope with binocular magnifiers. The multispectral scanner, given its superior capability for spectral discrimination, could possibly supply more valuable data than photography, provided an appropriate classification technique is developed. V.P.

A79-17898 **Landsat verification of aerial sketch-mapping.** P. A. Murtha (British Columbia, University, Vancouver, Canada) and J. W. E. Harris (Pacific Forest Research Centre, Victoria, British Columbia, Canada). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 417-427. 6 refs.

A zone of tree mortality, caused by Douglas-fir tussock moth defoliation, was aerially sketch-mapped. These results were substantiated by Landsat data interpreted by optical visual analysis techniques (the zone of defoliation was delineated on the mapping screen of a color additive viewer.) It is suggested that forest monitoring agencies should regularly use Landsat data in some of their programs, since interpretation of satellite data can produce equally valuable results as the more expensive conventional techniques. V.P.

A79-17899 **Detection of Armillaria root rot damage with shadowless color infrared photography.** T. Gregg, K. Russell, and E. Knudtson (Washington State, Dept. of Natural Resources, Olympia, Wash.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 429-438.

Armillaria root rot is a world wide forest pathogen that attacks the roots and lower bole of forest trees and numerous other plants. This root disease has become an acute problem in South Central Washington where it causes a high level of mortality in ponderosa pine stands, plus reduces the productive forest land base by killing much of the current inventory before it becomes merchantable. Accurate and efficient methods for detecting this disease are essential for assessing impact and for developing effective control programs. A survey using specialized shadowless color infrared photography was conducted to generate information concerning location, size, and status of Armillaria infections. This paper reviews the remote sensing aspects of this survey; including, design of photographic flight specifications, development of photographic interpretation criteria for detecting Armillaria, and the role of the interpreted data in long-range management planning and control. (Author)

A79-17900 **Vegetation damage surveying in India.** A. C. Chaturvedi (Irrigation Commission, Lucknow, India). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 439-454. 6 refs.

The use of ERTS images to study the Rajasthan, India, desert and the arid area in northwestern India are described. Vegetation is surveyed, flood plain and flood zone areas are demarcated, areas of encroaching desert are identified, and cyclone damage is assessed. The operation, interpretation, capabilities, and costs of the ERTS survey and data are discussed. M.L.

A79-17901 **Washington State forest insect survey - Combining aerial sketch map and remote sensing techniques.** B. Backman, T. Gregg, and R. Johnsey (Washington State, Dept. of Natural Resources, Olympia, Wash.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 455-463.

A79-17902 **Remote sensing for determination of seedling survival.** E. L. Schaefer (Gene Schaefer and Associates, Fountain Valley, Calif.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceed-

ings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 465-495. 7 refs.

To render remote sensing technology useful for assessing the survival of seedlings after transplanting, a variety of natural field conditions must be examined to establish the limiting factors. In the present paper, these conditions are reviewed, and an experimental research project in which remote sensing methods were used to determine seedling survival is described. V.P.

A79-17903 Remote sensing of vegetation damage to assess the effectiveness of prescribed burning in Australia. B. J. Myers (Commonwealth Scientific and Industrial Research Organization, Div. of Forest Research, Canberra, Australia). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 497-509. 5 refs.

A79-17904 Applications of remote sensing to vegetation injury caused by air pollution. D. R. Williams (Lockheed Electronics Co., Inc., Remote Sensing Laboratory, Las Vegas, Nev.). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings.

Falls Church, Va., American Society of Photogrammetry, 1978, p. 529-543. 6 refs. U.S. Environmental Protection Agency Contract No. 68-03-2636.

In the present paper, two separate cases of air pollution injury to vegetation are detailed to show how typical remote sensing surveys can provide useful information in such cases. Some potential uses of this information are described. It is shown that, when accompanied by ground truth, remote sensing surveys, conducted periodically, can assess, in a synoptic manner, the extent and severity of vegetation injury. This information also can serve as a permanent record and is admissible as evidence in legal proceedings. V.P.

A79-18197 Applications of DTM in the Forest Service. T. W. Gossard (U.S. Department of Agriculture, Forest Service, Washington, D.C.). *(American Society of Photogrammetry, Digital Terrain Model Symposium, St. Louis, Mo., May 9-11, 1978.) Photogrammetric Engineering and Remote Sensing,* vol. 44, Dec. 1978, p. 1577-1586. 6 refs.

The paper reviews the basic features and primary uses of the output products of three systems in use within the Forest Service which employ digital terrain data as a source material. TOPAS (Topographic Analysis System) is heavily used by resource managers to evaluate impacts of alternate uses of national forest lands. DTIS (Digital Terrain Information System) is a secondary set of programs within TOPAS that has been enhanced to handle more rigorous analyses related to site-specific projects, often involving engineering reconnaissance and design. MOSAIC (Method of Scenic Alternative Impacts by Computer) is a photomontage system which uses computer graphics to depict proposed landscape alterations to overlay on a terrestrial photograph of an existing area. B.J.

A79-19891 SLAR for forest type-classification in a semi-deciduous tropical region. G. Sicco Smit (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *(International Society for Photogrammetry and International Union of Forest Research Organizations, Symposium, Freiburg, West Germany, July 3-8, 1978.) ITC Journal,* no. 3, 1978, p. 385-401.

The possibilities of interpretation of SLAR images for forest typing in a semi-deciduous tropical region is proved in a pilot area of the natural mahogany (Swietenia macrophylla, King) bearing forest types of the north of the State of Goiás, Brazil, along the river Araguaia. Of this region there are vegetation maps (1:50,000 and 1:200,000) of a FAO/SPEVEA survey, based on fieldwork executed in 1961 and photointerpretation of aerial photographs, scale 1:45,000 from 1957/58. SLAR image 1971/72, strips in the far and near ranges and mosaics at scale 1:250,000 of the 'Projeto Radam Brasil' were available. A detailed comparison was made of three areas of the SLAR material and vegetation maps reduced from the original map to scale 1:250,000. On SLAR, forest and non-forest areas could be accurately delineated but the mahogany forest types could not be differentiated from the non-mahogany bearing low and high forest types, neither by tone nor by physiographic aspects. (Author)

A79-19892 Results of a two-stage unequal probability /PPS/ sampling for timber volume using an orthophoto mosaic. D. A. Stellingwerf (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *(International Society for Photogrammetry and International Union of Forest Research Organizations, Symposium, Freiburg, West Germany, July 3-8, 1978.) ITC Journal,* no. 3, 1978, p. 402-414.

A79-19893 A comparative test of unrestricted, stratified, two-phase and two-stage PPS timber volume sampling using an orthophoto mosaic. D. A. Stellingwerf (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *(International Society for Photogrammetry and International Union of Forest Research Organizations, Symposium, Freiburg, West Germany, July 3-8, 1978.) ITC Journal,* no. 3, 1978, p. 415-428.

Four methods of interpreting orthophoto mosaics at a scale of 1:10,000 are applied to the study of a conifer forest. The mosaic was prepared from black and white infrared aerial photographs with a scale of 1:30,000, and the four methods are unrestricted sampling, stratified sampling, two-phase sampling, and two-stage probability proportional to size (PPS) sampling. While the two-phase technique requires additional photographs, it is the most efficient method with respect to required office and field time. When cost is taken into account, however, the two-stage PPS method is found to be most advantageous. Systematic selection of sampling units increases the desirability of using the two-stage procedure. M.L.

A79-19894 Forest road planning from aerial photographs. J. M. Remeijn (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *(International Society for Photogrammetry and International Union of Forest Research Organizations, Symposium, Freiburg, West Germany, July 3-8, 1978.) ITC Journal,* no. 3, 1978, p. 429-444. 11 refs.

N79-10500*# National Aeronautics and Space Administration, Washington, D. C.

FOREST INVENTORY OF EAST THAILAND USING ERTS-1 AND GROUND TRUTH SURVEY

Darasi Sisaengthong Aug. 1976 35 p refs Transl. into ENGLISH of Rept. No. 750227 Office of the Natl. Sci. Comm. Office of the Min., Bangkok, Sep. 1975 p 1-33 Transl. by Joint Publications Research Service, Arlington

(NASA Order W-13183)

(NASA-TT-F-17065) Avail: NTIS HC A03/MF A01 CSCL 02F

The organization of the project to survey forest areas using LANDSAT 1 photographs is discussed as well as the operation of the satellite itself. Photointerpretation methods are described and discrepancies between the maps based on satellite photographs and ground surveys are examined. A.R.H.

N79-11451*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SEPARABILITY OF AGRICULTURAL COVER TYPES IN SPECTRAL CHANNELS AND WAVELENGTH REGIONS

Ravindra Kumar Oct. 1977 21 p refs

(Grant NGL-15-005-112)

(NASA-CR-157803; INPE-1147-PE/100) Avail: NTIS HC A02/MF A01 CSCL 02C

Spectral channels and wavelength regions (visible, near infrared, middle infrared and thermal infrared) were evaluated with respect to their estimated probability of correct classification (Pc) in discriminating agricultural cover types. Multispectral scanner data in twelve spectral channels in the wavelength range

of 0.4 to 11.7 microns acquired in the middle of July for three flightlines, were analyzed by applying automatic pattern recognition techniques. The same analysis was performed for the data acquired in the middle of August, 1971, over the same three flightlines, to investigate the effect of time on the results. The effect of deletion of each spectral channel as well as each wavelength region on Pc is given. Values of Pc for all possible combinations of wavelength regions in the subsets of one to twelve spectral channels are also given. The overall values of Pc were found to be greater for the data of the middle of August than the data of the middle of July. S.B.S.

N79-12526*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

FOREST RESOURCE INFORMATION SYSTEM Quarterly Report, 1 Apr. - 30 Jun. 1978

R. P. Mroczynski, Principal Investigator 30 Jun. 1978 43 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-15325)

(E79-10010; NASA-CR-151832) Avail: NTIS HC A03/MF A01 CSCL 02F

The author has identified the following significant results. Satisfactory results were obtained separately from both winter and spring LANDSAT data for areal estimates. Bitemporal results were improved by combining winter and spring data. Per-point and per-field classifiers performed comparably, except regarding time, where the per-field classifiers were more efficient.

N79-12527*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

SECONDARY ERROR ANALYSIS: THE EVALUATION OF ANALYST DOT LABELING

K. A. Havens, Principal Investigator Sep. 1978 17 p refs EREP

(Contract NAS9-15200)

(E79-10011; NASA-CR-151847; LEC-12380; JSC-14544) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. From this examination of 25 test segments using AI labeling and ground truth labeling, the PCC on type 1 dots was found to be signficantly better for both types of ground truth labeled procedures than the PCC obtained using AI labeling. No significant difference in the PCC was found for type 2 dots. However, in all three treatments, the type 2 dots included pixels which fell on boundaries or were mixed pixels. This accounted for all PCC2 values being equally low. The proportion estimates achieved in these classifications showed no significant differences between procedures.

N79-12530*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE USE OF LANDSAT DATA FOR THE ESTABLISHMENT, CONTROL AND SUPERVISION OF PASTURE PROJECTS IN THE SOUTHEAST AMAZON REGION

Nelson deJesusParada, Principal Investigator, Armando Pacheco dosSantos, and Evlyn Marcia Leao deMoraesNova Nov. 1977 19 p refs Presented at Simposio Internacional de Percepcion Remota Aplicada a Demografia y Uso Actual de la Tierra, Lapaz, Brazil, 28-30 Nov. Sponsored by NASA ERTS

(E79-10016; NASA-CR-157905) Avail: NTIS HC A02/MF A01 CSCL 02F

N79-12532*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DETERMINATION AND ERROR ANALYSIS OF EMITTANCE AND SPECTRAL EMITTANCE MEASUREMENTS BY REMOTE SENSING

Nelson deJesusParada, Principal Investigator and R. Kumar Sep. 1977 23 p refs Sponsored by NASA Submitted for publication ERTS

(E79-10021; NASA-CR-157910) Avail: NTIS HC A02/MF A01 CSCL 20N

The author has identified the following significant results. From the theory of remote sensing of surface temperatures, an equation of the upper bound of absolute error of emittance was determined. It showed that the absolute error decreased with an increase in contact temperature, whereas, it increased with an increase in environmental integrated radiant flux density. Change in emittance had little effect on the absolute error. A plot of the difference between temperature and band radiance temperature vs. emittance was provided for the wavelength intervals: 4.5 to 5.5 microns, 8 to 13.5 microns, and 10.2 to 12.5 microns.

N79-12536# National Technical Information Service, Springfield, Va.

REMOTE SENSING OF AGRICULTURAL RESOURCES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Oct. 1973 - Sep. 1978

Audrey S. Hundemann Sep. 1978 217 p Supersedes NTIS/PS-77/0867; NTIS/PS-76/0714; NTIS/PS-75/668; NTIS/PS-75/068

(NTIS/PS-78/0969/2; NTIS/PS-77/0867; NTIS/PS-76/0714; NTIS/PS-75/668; NTIS/PS-75/068) Avail: NTIS HC $28.00/MF $28.00 CSCL 02D

Results of agricultural resources surveys using remote sensing techniques for crop identification, acreage measurement, land mapping, and forest density studies are discussed. A few abstracts pertain to identification of plant diseases and insect pests and fishery resources assessment. GRA

N79-12539# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.

A SELECTED BIBLIOGRAPHY: REMOTE SENSING APPLICATIONS FOR TROPICAL AND SUBTROPICAL VEGETATION ANALYSIS

Lawrence R. Pettinger Jul. 1978 50 p

(Contract DI-14-08-0001-16439)

(PB-284683/0) Avail: NTIS HC A03/MF A01 CSCL 02D

This bibliography contains 425 citations of selected technical reports, journal articles, and other publications covering the general subject of tropical and subtropical vegetation analysis. Functionally related topics that include vegetation analysis are included for completeness, and citations are organized under the following subheadings: remote sensing application overviews; vegetation (general); forestry; grasslands/savannah/shrublands; agriculture; land use/thematic mapping; and integrated surveys/multiple resource analysis/land systems. The terms 'tropics and subtropics' are used in the widest context to include applications related to a broad range of equatorial environments. GRA

N79-13424*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

A COMPREHENSIVE DATA PROCESSING PLAN FOR CROP CALENDAR MSS SIGNATURE DEVELOPMENT FROM SATELLITE IMAGERY: CROP IDENTIFICATION USING VEGETATION PHENOLOGY Final Report

C. A. Hlavka, Principal Investigator, S. M. Carlyle, R. M. Haralick, and R. Yokoyama Jul. 1978 118 p refs ERTS

(Contract NAS5-20943)

(E79-10001; NASA-CR-157896; Rept-286-5) Avail: NTIS HC A06/MF A01 CSCL 02C

The author has identified the following significant results. The phenological method of crop identification involves the creation of crop signatures which characterize multispectral observations as phenological growth states. The phenological signature models spectral reflectance explicitly as a function of crop maturity rather than as a function of date. A correspondence of time to growth state is established which minimizes the smallest difference between the given multispectral multitemporal vector and a category mean vector. The application of the method to the identification of winter wheat and corn shows (1) the method is capable of discriminating crop type with about the same degree of accuracy as more traditional classifiers; (2) the use of LANDSAT observations on two or more dates yields better results than the use of a single observation; and (3) some potential is demonstrated for labeling the degree of maturity of the crop, as well as the crop type.

N79-13428*# Agricultural Research Service, Phoenix, Ariz.
HCMM HEAT CAPACITY MAPPING MISSION Quarterly Progress Report, 1 Aug. - 31 Oct. 1978
Ray D. Jackson, Principal Investigator 31 Oct. 1978 7 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS (NASA Order S-40255-B)
(E79-10007; NASA-CR-157899) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Thermal imagery shows a large temperature variation over the 640 acre experimental site. The variation is due to the slope and aspect of the terrain as well as the aircraft flight direction (east-west versus north-south). In spite of these individual temperature differences, mean temperature values from 40 to 640 acre blocks are essentially identical regardless of aircraft flight direction.

N79-13431*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEFORESTATION PLANNING FOR CATTLE GRAZING IN AMAZON BASIN USING LANDSAT DATA
Nelson deJesusParada, Principal Investigator, Armando Pacheco dosSantos, and Evlyn Marcia Leao deMoraisNovo Apr. 1978 54 p refs Presented at 3d UN/FAO Training Course on Remote Sensing Application, Rome, Italy, 15 May - 2 Jun. 1978 Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10018; NASA-CR-157907; INPE-1225-PE/126) Avail: NTIS HC A04/MF A01 CSCL 02F

The author has identified the following significant results. This research did not show the total potential of the LANDSAT system, but tried to open up new research aspects for the utilization of LANDSAT data in natural resource control. Results obtained through this research showed that LANDSAT data can be used to develop monitoring programs in the tropical forest areas of Brazil.

N79-13432*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF REFORESTED AREAS USING LANDSAT IMAGERY [ESTABELECIMENTO DE METODOLOGIA PARA AVALIACAO DE POVOAMENTOS FLORESTAIS ARTIFICIAIS, UTILIZANDO-SE DADOS DO LANDSAT]
Nelson deJesusParada, Principal Investigator, Pedro Hernandez Filho, and Yosio Edemir Shimabukuro Jun. 1978 173 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E79-10019; NASA-CR-157908; INPE-1271-TPT/089) Avail: NTIS HC A08/MF A01 CSCL 02F

The author has identified the following significant results. Visual and automatic interpretation of LANDSAT imagery was used to classify the general Pinus and Eucalyptus according to their age and species. A methodology was derived, based on training areas, to define the legend and spectral characteristics of the analyzed classes. Imager analysis of the training areas show that Pinus taeda is separable from the other Pinus species based on JM distance measurement. No difference of JM measurements was observed among Eucalyptus species. Two classes of Eucalyptus were separated according to their ages: those under and those over two years of age.Channels 6 and 7 were suitable for the discrimination of the reforested classes. Channel 5 was efficient to separated reforested areas from nonforested targets in the region. The automatic analysis shows the highest classification precision was obtained for Eucalyptus over two years of age (95.12 percent).

N79-13435*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF SPECTRAL CHANNELS AND WAVELENGTH REGIONS FOR SEPARABILITY OF AGRICULTURAL COVER TYPES
Nelson deJesusParada, Principal Investigator and R. Kumar Sep. 1977 12 p refs Presented at Intern. Symp. on Remote Sensing of Environment, Ann Arbor, Mich., Apr. 1977 Sponsored by NASA ERTS
(E79-10024; NASA-CR-157913; INPE-1119-PE/087) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Multispectral scanner data in twelve spectral channels in the wavelength range of 0.4 to 11.7 microns acquired in the middle of July for three flightlines were analyzed by applying automatic pattern recognition techniques. The same analysis was performed for the data acquired in mid August, over the same three flightlines, to investigate the effect of time on the results. The effect of deletion of each spectral channel, as well as each wavelength region on P sub c, is given. Values of P sub c for all possible combinations of wavelength regions in the subsets of one to twelve spectral channels are also given. The overall values of P sub c were found to be greater for the data of mid August than the data from mid July.

N79-13436*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF FEATURE SELECTION TECHNIQUES FOR EARTH RESOURCES DATA
Nelson deJesusParada, Principal Investigator and Ravindra Kumar Sep. 1978 13 p refs Presented at Intern. Conf. on Machine-Aided Image Analysis, Oxford, England, 4-6 Sep. 1978 Sponsored by NASA ERTS
(E79-10025; NASA-CR-157914; INPE-1359-PE/167) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13441*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
NATIONWIDE FORESTRY APPLICATIONS PROGRAM: TEN-ECOSYSTEM STUDY (TES) SITE 3, ST. LOUIS COUNTY, MINNESOTA Final Report
J. E. Weaver, Principal Investigator Aug. 1978 53 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-15200)
(E79-10034; NASA-CR-151383; LEC-12262) Avail: NTIS HC A04/MF A01 CSCL 08F

N79-13444*# Environmental Research Inst. of Michigan, Ann Arbor.
ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Progress Report, 15 Jun. - 11 Sep. 1978
John E. Colwell, Principal Investigator, Richard J. Kauth, Richard C. Cicone, and William A. Malila Sep. 1978 143 p refs EREP
(Contract NAS9-15476)
(E79-10037; NASA-CR-151840; ERIM-132400-12-P) Avail: NTIS HC A07/MF A01 CSCL 02C

N79-13445*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ANALYSIS OF THE EFFECTS OF INTERPOLATION AND ENHANCEMENT OF LANDSAT-1 DATA ON CLASSIFICATION AND AREA ESTIMATION ACCURACY
N. Chu, Principal Investigator, C. McGillem, and P. Anuta 4 Nov. 1977 22 p refs EREP
(Contract NAS9-14970)
(E79-10038; NASA-CR-151839; LARS-TR-110477) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13448*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE).

LACIE PHASE 3 ANALYST FIELD TRIP PLAN
[1978] 19 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10041; NASA-TM-79908; LACIE-00623; JSC-11680)
Avail: NTIS HC A02/MF A01 CSCL 02C

N79-13449*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE TRANSITION YEAR OPERATIONS PLAN
Dec. 1977 41 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10042; NASA-TM-79909; LACIE-00627; JSC-11704)
Avail: NTIS HC A03/MF A01 CSCL 02C

N79-13450*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 3 INTERIM ACCURACY ASSESSMENT PLAN
Mar. 1978 134 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10043; NASA-TM-79910; LACIE-00628; JSC-13733)
Avail: NTIS HC A07/MF A01 CSCL 02C

N79-13451*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 3 ACCURACY ASSESSMENT PLAN
Sep. 1978 137 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10044; NASA-TM-79911; LACIE-00630; JSC-13743)
Avail: NTIS HC A07/MF A01 CSCL 02C

N79-13452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE INTEGRATED DROUGHT PLAN
May 1976 29 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10045; NASA-TM-79912; LACIE-00613; JSC-10828)
Avail: NTIS HC A03/MF A01 CSCL 02C

N79-13453*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). PHASE 1 ACCURACY ASSESSMENT PLAN
Jan. 1976 59 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10046; NASA-TM-79913; LACIE-00610; JSC-10812)
Avail: NTIS HC A04/MF A01 CSCL 02C

N79-13454*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE INFORMATION EVALUATION (IE) IMPLEMENTATION/OPERATIONS PLAN
Sep. 1976 52 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10047; NASA-TM-79914; LACIE-C00618; JSC-11339)
Avail: NTIS HC A04/MF A01 CSCL 02C

N79-13455*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 2 ACCURACY ASSESSMENT PLAN
Nov. 1976 116 p refs Sponsored by NASA, NOAA, and USDA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10048; NASA-TM-79915; LACIE-00621; JSC-11665)
Avail: NTIS HC A06/MF A01 CSCL 02C

N79-13456*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). TEST AND EVALUATION PLAN FOR KSU AND CCEA PHASE 3 YIELD MODELS
T. L. Barnett, Principal Investigator Apr. 1977 16 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10049; NASA-TM-79916; LACIE-00622; JSC-11677)
Avail: NTIS HC A02/MF A01 CSCL 02C

N79-13457*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). IMPLEMENTATION PLAN FOR OPERATIONS COORDINATION CENTER
Apr. 1975 17 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10050; NASA-TM-79917; LACIE-00600) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-13458*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE CAMS TRAINING PLAN
Apr. 1975 48 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10051; NASA-TM-79918; LACIE-00601) Avail: NTIS HC A03/MF A01 CSCL 02C

N79-13459*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE QUICK LOOK ACCURACY ASSESSMENT REPORT, REVIEW OF THE DECEMBER 17, 1976 CAR
30 Dec. 1976 13 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10052; NASA-TM-79919; LACIE-CD00438; JSC-11667)
Avail: NTIS HC A02/MF A01 CSCL 02C

N79-13460*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE OPERATIONS PLAN
11 Jul. 1975 75 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10053; NASA-TM-79920; LACIE-C00602) Avail: NTIS HC A04/MF A01 CSCL 02C

N79-13461*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE PROJECT DOCUMENTATION PLAN
Aug. 1975 59 p refs Sponsored by NASA, NOAA, and USDA EREP

(E79-10054; NASA-TM-79921; LACIE-C00603; JSC-09851) Avail: NTIS HC A04/MF A01 CSCL 02C

N79-13462*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). DETECTION OF EPISODIC PHENOMENA ON LANDSAT IMAGERY
C. M. Chesnutwood, Principal Investigator May 1976 29 p Sponsored by NASA, NOAA, and USDA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10055; NASA-TM-79922; LACIE-CD00501; JSC-11328) Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following significant results. Episodic phenomena such as rainfall shortly before data pass, thin translucent clouds, cloud shadows, and aircraft condensation trails and their shadows are responsible for changes in the spectral reflectivities of some surfaces. These changes are readily detected on LANDSAT full-frame imagery. Histograms of selected areas in Kansas show a distinct decrease in mean radiance values, but also, an increase in scene contrast, in areas where recent rains had occurred. Histograms from a few individual fields indicate that the mean radiance values for winter wheat followed a different trend after a rainfall than alfalfa or grasses.

N79-13463*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). SECOND-GENERATION SAMPLING STRATEGY EVALUATION REPORT
J. P. Basu, Principal Investigator, S. M. Dragich, and D. P. McGuigan Jul. 1978 200 p refs Sponsored by NOAA and USDA EREP
(Contract NAS9-15200)
(E79-10056; NASA-TM-79923; LACIE-00465; JSC-13729; LEC-11492) Avail: NTIS HC A09/MF A01 CSCL 02C

The author has identified the following significant results. The stratification procedure in the new sampling strategy for LACIE included: (1) correlation test results indicating that an agrophysical stratum may be homogeneous with respect to agricultural density, but not with respect to wheat density; and (2) agrophysical unit homogeneity test results indicating that with respect to agricultural density many agrophysical units are not homogeneous, but removal of one or more refined strata from any such current agrophysical unit can make the strata homogeneous. The apportioning procedure results indicated that the current procedure is not performing well and that the apportioned estimates of refined strata wheat area are often unreliable.

N79-13464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). EFFECTS OF NON-RESPONSE INCLUDING CLOUD COVER ON AGGREGATION OF WHEAT AREA IN THE US GREAT PLAINS
A. Glen Houston, Principal Investigator Dec. 1976 40 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10057; NASA-TM-79924; LACIE-00441; JSC-11672) Avail: NTIS HC A03/MF A01 CSCL 02C

N79-13465*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE CROP CALENDAR TEST AND EVALUATION PLAN
Nov. 1975 21 p refs Sponsored by NASA, NOAA and USDA EREP
(E79-10058; NASA-TM-79925; LACIE-00608; JSC-09871) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-13466*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LANDSAT 3X GAIN STUDY
Oct. 1975 40 p refs Sponsored by NOAA and USDA EREP (Contract NAS9-12200)
(E79-10059; NASA-TM-79926; LACIE-00500; JSC-09868) Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following results. The maximum likelihood classifier on the ERIPS failed to show any improvement in accuracy when comparing high-gain LANDSAT data with the simulated normal-gain data. Even if an improvement in accuracy had been detected, the timespan within the crop growing season when the use of high-gain data could be advantageous is limited. A total of six sets of LANDSAT-1 imagery is available for the analysis of gain effects. Three of the sets are high-gain data in MSS bands 4 and 5, whereas the other three are simulated normal-gain. The four sets obtained over Imperial Valley have good supporting ground truth information for training; the two sets over Kansas do not. The use of various combinations of the six data sets is recommended in order to uncover the possible advantages of using the data.

N79-13467*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT SUDAM: USE OF LANDSAT DATA TO STUDY THE IMPACT OF AGRICULTURAL PROJECTS IN THE AMAZON [PROJETO SUDAM: USO DE DADOS DO LANDSAT NO ESTUDO DO IMPACTO DA IMPLANTACAO DE PROJETOS AGROPECUARIOS DA AMAZONIA]
Nelson deJesusParada, Principal Investigator, Antonio Tebaldi Tardin, Armando Pacheco dosSantos, and Evlyn Marcia Leao deMoraisNovo Oct. 1977 23 p In PORTUGUESE Sponsored by NASA ERTS
(E79-10060; NASA-CR-157928; INPE-1136-NTE/106) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13469*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE TRANSITION PROTECT, FY 1978-1979: REANALYSIS OF CCEA 1 US GREAT PLAINS WHEAT YIELD MODELS
Clarence M. Sakamoto, Principal Investigator (NOAA) Jun. 1978 107 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10062; NASA-TM-79927; LACIE-00472; JSC-13740; CCEA-TR-78-3) Avail: NTIS HC A06/MF A01 CSCL 02C

N79-13470*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). DETECTING AND MONITORING AGRICULTURAL VEGETATIVE WATER STRESS OVER LARGE AREAS USING LANDSAT DIGITAL DATA
David R. Thompson and Oscar A. Wehmanen, Principal Investigators Apr. 1978 26 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10063; NASA-TM-79928; LACIE-00506; JSC-13737) Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following significant results. The Green Number Index technique which uses LANDSAT digital data from 5x6 nautical mile sampling frames was expanded to evaluate its usefulness in detecting and monitoring vegetative water stress over the Great Plains. At known growth stages for wheat, segments were classified as drought or non drought. Good agreement was found between the 18 day remotely sensed data and a weekly ground-based crop moisture index. Operational monitoring of the 1977 U.S.S.R. and Australian wheat crops indicated drought conditions. Drought isoline maps produced by the Green Number Index technique were in good agreement with conventional sources.

N79-14430*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INDEPENDENT PEER EVALUATION OF THE LARGE AREA CROP INVENTORY EXPERIMENT (LACIE): THE LACIE SYMPOSIUM
Oct. 1978 41 p *refs Symp. held at Houston, Tex. 23-26 Oct.* 1978 Sponsored by NASA, USDA, and NOAA EREP (E79-10009; NASA-TM-79904; JSC-14550) Avail: NTIS HC A03/MF A01 CSCL 02C

Yield models and crop estimate accuracy are discussed within the Large Area Crop Inventory Experiment. The wheat yield estimates in the United States, Canada, and U.S.S.R. are emphasized. Experimental results design, system implementation, data processing systems, and applications were considered.

N79-14431*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN INDEPENDENT EVALUATION BY THE PLENARY PEER REVIEW TEAM
D. Paarlberg (Purdue Univ.), L. Eisgruber (Oregon State Univ.), B. A. Scherr (Data Resources, Inc.), H. O. Hartley (Texas A and M Univ.), D. Ingram (IBM), J. Quirein, D. Goodenough (Canadian Center for Remote Sensing), G. Nagy (Nebraska Univ., Lincoln), R. Holmes (GM Inst.), and R. Shay, Principal Investigators (Oregon State Univ.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 1-8 refs EREP

Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14432*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE EXPERIMENT RESULTS PEER GROUP
L. Eisgruber (Oregon State Univ.), B. A. Scherr (Data Resources, Inc.), F. G. Hall (NASA. Johnson Space Center), B. Blad (Nebraska Univ.), W. Coberly (Tulsa Univ.), A. M. Feyerherm (Kansas State Univ.), G. Hanuschak (USDA Economics, Statistics, and Cooperatives Service, Washington, D. C.), K. Heiss (ECON, Inc.), F. Lamb (Eastern Oregon Farming Co.), and R. E. Selzer, Principal Investigators (Development Planning and Research, Assoc.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 11-14 EREP
Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14433*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE EXPERIMENT DESIGN PEER GROUP
H. O. Hartley (Texas A and M Univ.), R. P. Heydorn (NASA. Johnson Space Center), J. Chromy (Research Triangle Inst.), L. Guseman (Texas A and M Univ.), D. Heerman (USDA Science and Education Administration, Fort Collins, Colo.), R. Thomas (California Univ., Berkeley), and L. Thompson, Principal Investigators (Iowa State Coll. of Agriculture) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 15-22 EREP

Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14434*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE SYSTEM IMPLEMENTATION AND OPERATIONS PEER GROUP
D. Ingram (IBM), J. Quirein Schlumberger, C. Johannsen (Missouri Univ.), J. L. Dragg (NASA. Johnson Space Center), S. DeGloria (California Univ., Berkeley), D. Saxton (NOAA Environmental Data and Information Service, Washington, D. C.), J. Sos, Principal Investigators (NASA. Goddard Space Center), and S. Wall (California Univ., Berkeley) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 23-26 EREP

Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14435*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE DATA PROCESSING SYSTEMS DESIGN PEER GROUP
D. Goodenough (Canadian Center for Remote Sensing), J. Sulester (NASA. Johnson Space Center), J. Kast (Purdue Univ.), and T. Phillips, Principal Investigators (Purdue Univ.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 27-34 refs EREP

Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14436*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE USDA APPLICATIONS TEST SYSTEM PEER GROUP
G. Nagy (Nebraska Univ., Lincoln), J. D. Murphy (USDA Foreign Agricultural Service, Houston, Tex.), D. W. Cary (CIA), H. Harkness (Sparks Commodities, Inc.), R. Head (USDA Office of Automated Data Systems, Washington, D. C.), R. Henderson (MITRE Corp.), R. LeGault (ERIM), and R. McArdle, Principal Investigators (USDA *World Food and Agricultural Outlook and Situation Board*, Washington, D. C.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 35-38 EREP

Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14437*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE LACIE SUPPORTING RESEARCH PEER GROUP
R. Holmes (GM Inst.), R. Shay (Oregon State Univ.), J. D. Erickson (NASA. Johnson Space Center), W. Anderson (USGS), J. Estes (California Univ., Santa Barbara), C. Hay (California Univ., Berkeley), R. Jensen (NOAA National Weather Service, Honolulu, Hawaii), R. W. Leamer (USDA Science and Education Administration, Weslaco, Tex.), B. Liska (Purdue Univ.), and R. Welch, Principal Investigators (NASA. Ames Res. Center) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 39-40 refs
Avail: NTIS HC A03/MF A01 CSCL 02C

N79-14449*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCEEDINGS OF PLENARY SESSION: THE LACIE SYMPOSIUM
Oct. 1978 130 p refs Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, USDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10028; NASA-TM-79906; JSC-14551) Avail: NTIS HC A07/MF A01 CSCL 02C

A technology assessment of the LACIE data processing and information systems was discussed during the Large Area Crop Inventory Experiment Symposium. Crop inventories of wheat yield in the United States as well as several other nations (such as the U.S.S.R., Canada, etc.) were discussed, along with the methodology involved in acquiring this data.

N79-14450*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE STATUS OF EXISTING GLOBAL CROP FORECASTING
Bruce A. Scherr (Data Resources, Inc.), William E. Kibler (USDA Economics, Statistics, and Cooperatives Service, Washington, D. C.), and Forrest G. Hall, Principal Investigators (NASA. Johnson Space Center) *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 1-16 refs EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-14451*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: AN EXPERIMENT IN GLOBAL CROP FORECASTING
R. B. MacDonald and F. G. Hall, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 17-48 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A07/MF A01 CSCL 02C
The author has identified the following significant results. Both the accuracy and efficiency with which LACIE crop survey estimates were made have shown significant improvement in three years. In the U.S. and U.S.S.R. winter wheat regions, the original accuracy goals were met or exceeded, with 90/90 estimates achieved in the United States 1.5 to 2 months before harvest. Additionally, all available accuracy parameters indicate 90/90 estimates for the U.S.S.R. total crop. Key technology problems were identified during phase 2 with spring wheat in the United States and Canada which prevented the attainment of 90/90 accuracies in these regions. Technology solutions developed and tested in phase 3 partly resolved these issues with a significant improvement realized in the accuracy of the spring wheat area estimates.

N79-14452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE APPLICATIONS EVALUATION SYSTEM: A DESIGN OVERVIEW
J. L. Dragg, W. E. Hensley, R. O. Hill, R. G. Musgrove, and T. T. White, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 49-63 refs EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-14453*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LACIE SUPPORTING RESEARCH PROGRAM: A FOCUSED APPROACH TO RESEARCH AND DEVELOPMENT
Jon D. Erickson, Richard P. Heydorn, Milton C. Trichel, and Allen L. Grandfield, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 65-89 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A07/MF A01 CSCL 02C
There are no author-identified significant results in this

N79-14454*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS IN SUPPORT OF LACIE AND FUTURE AGRICULTURAL RESEARCH PROGRAMS
Donald H. Hay, Principal Investigator *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 91-104 refs EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-14457*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE OUTLOOK FOR SATELLITE REMOTE SENSING FOR CROP INVENTORY
R. Bryan Erb (NASA. Johnson Space Center), Robert E. Tokerud (Lockheed Electronics Co., Houston, Tex.), and Robert B. MacDonald, Principal Investigators (NASA. Johnson Space Center) *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 125-131 EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-14458*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BRIEFING MATERIALS FOR TECHNICAL PRESENTATIONS, VOLUME A: THE LACIE SYMPOSIUM
Oct. 1978 239 p Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, MSDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10030; NASA-TM-79930; JSC-14557-Vol-A) Avail: NTIS HC A11/MF A01 CSCL 02C
Tables, charts, and outlines of various segments within the Large Area Crop Inventory Experiment are presented. Experiment design, system implementation and operations, and data processing system design were considered.

N79-14459*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: EXPERIMENT DESIGN OVERVIEW
C. Hallum, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 1-6 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14460*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: SAMPLING AND AGGREGATION IN LACIE
C. Hallum, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 7-18 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14461*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: GROWTH STAGE ESTIMATION
V. Whitehead, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 19-20 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14462*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: WHEAT YIELD MODEL DEVELOPMENT
C. Sakamoto, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 31-48 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14463*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

EXPERIMENT DESIGN SESSION: CLASSIFICATION AND MENSURATION APPROACH
R. P. Heydorn, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 49-68 Original contains imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S. D. 57198 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: ACCURACY ASSESSMENT, THE STATISTICAL APPROACH TO PERFORMANCE EVALUATION
G. Houston, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 69-82 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14465*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: THE LACIE APPLICATION EVALUATION SYSTEM (AES), A DESIGN OVERVIEW
R. O. Hill, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 83-96 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14466*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: ACQUISITION AND PREPROCESSING OF LANDSAT DATA
L. Brown, Principal Investigator (NASA. Goddard Space Flight Center) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 97-102 EREP

Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14467*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: CLASSIFICATION AND MENSURATION, AN APPROACH TO LANDSAT DATA ANALYSIS FOR CROP IDENTIFICATION
R. Biffell, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 103-120 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A11/MF A01 CSCL 08B

N79-14468*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: IMPLEMENTATION AND OPERATION OF YIELD FORECASTING AND CROP GROWTH STAGE ESTIMATION
D. McCrary, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 121-128 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14469*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: SYSTEM IMPLEMENTATION AND APPROACHES USED FOR GENERATION OF CROP PRODUCTION REPORTS
R. E. Hatch, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 129-140 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14470*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: ACCURACY ASSESSMENT, SYSTEM IMPLEMENTATION AND OPERATION
D. E. Pitts, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 141-163 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14471*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: LACIE AES EFFICIENCY REPORT
T. T. White, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 165-173 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14472*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: DATA PROCESSING SYSTEMS OVERVIEW
D. H. Hay, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 175-183 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14473*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: EVOLUTION OF THE EARTH RESOURCES INTERACTIVE PROCESSING SYSTEM (ERIPS)
J. Lyon, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 185-191 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14477*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: THE CARTOGRAPHIC LABORATORY
M. Rader, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 225-234 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14480*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BRIEFING MATERIALS FOR TECHNICAL PRESENTATIONS, VOLUME B: THE LACIE SYMPOSIUM
Oct. 1978 251 p Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, USDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS

Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10031; NASA-TM-79929; JSC-14557-Vol-B) Avail: NTIS HC A12/MF A01 CSCL 02C

Tables, charts, and LACIE segments are used to demonstrate the accuracy of estimated crop conditions and yield from 1974 to 1976, and to demonstrate the benefits of meteorological and LANDSAT data. Developments in data acquisition, sampling, and reduction are reviewed. The USDA application test system is highlighted with emphasis on user requirements, technology transfer, data base design, and cost data models for data base operation and management.

N79-14481*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: LACIE CROP YEARS, AN ASSESSMENT OF CROP CONDITIONS
J. Hill, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 261-288 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14482*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE ESTIMATES
G. Houston, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 293-316 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14483*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE YIELD ESTIMATES
D. Phinney, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 317-332 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14484*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE CROP DEVELOPMENT MODELS
S. Woolley, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 333-343 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14485*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ECONOMIC EVALUATION; CONCEPTS, SELECTED STUDIES, SYSTEM COST, AND A PROPOSED PROGRAM
F. Osterhoudt, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 345-360 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14486*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: SUPPORTING RESEARCH, A FOCUSED APPROACH TO RESEARCH DEVELOPMENT
J. Erickson, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 361-376 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14487*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: METHODS FOR SEGMENT WHEAT AREA ESTIMATION
R. P. Heydorn, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 377-393 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14488*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: MANUAL IDENTIFICATION OF CROP TYPES
C. Hay, Principal Investigator (California Univ., Berkeley) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 395-411 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14489*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: STATUS OF YIELD ESTIMATION TECHNOLOGY, A REVIEW OF SECOND-GENERATION MODEL DEVELOPMENT
R. Stuff, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 413-435 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14490*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: PREDICTION OF WHEAT PHENOLOGICAL DEVELOPMENT, A STATE-OF-THE-ART REVIEW
M. Seeley, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 435-447 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14491*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: NEW DEVELOPMENTS IN SAMPLING AND AGGREGATION FOR REMOTELY SENSED SURVEYS
A. Feiveson, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 449-463 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14492*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

USDA APPLICATION TEST SYSTEM (ATS) SESSION: TECHNOLOGY TRANSFER; CONCEPTS, USER REQUIREMENTS, AND THEIR PRACTICAL APPLICATION
J. D. Murphy, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 469-477 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14493*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: THE APPLICATION TEST SYSTEM, AN APPROACH FOR TECHNOLOGY TRANSFER
F. C. David, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 479-487 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14494*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: FUNCTIONAL DEFINITION AND DESIGN OF A USDA SYSTEM
S. Evans, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 489-496 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14495*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: ATS, TECHNICAL APPROACH AND SYSTEM DESIGN
R. Hurst, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 497-505 EREP
Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14496*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: DATA BASE DESIGN FOR A WORLDWIDE MULTICROP INFORMATION SYSTEM
G. Driggers, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 507-517 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14497*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: ATS EXPERIENCE TO DATE AND FUTURE PLANS
G. May, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 519-531 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A12/MF A01 CSCL 02C

N79-14498*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

USDA APPLICATION TEST SYSTEM (ATS) SESSION: RESOURCE MODELLING, A REALITY FOR PROGRAM COST ANALYSIS
L. Fouts, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 533-543 EREP
Avail: NTIS HC A13/MF A01 CSCL 02C

N79-14507# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla.
FLAME: FORESTRY LANDS ALLOCATED FOR MANAGING ENERGY. FEASIBILITY STUDY Final Report, Jun. - Aug. 1978
James D. Lowther Sep. 1978 28 p refs
(AD-A059993; CEEDO-TR-78-41) Avail: NTIS HC A03/MF A01 CSCL 21/4

This study evaluated the feasibility of using wood grown on USAF installations as fuel to supply the heating energy requirements of the installations, replacing conventional fossil fuels currently being used. Arnold Engineering Development Center, Tennessee; Barksdale AFB, Louisiana; Eglin AFB, Florida; and Tyndall AFB, Florida have the potential for supplying significant portions of their heating energy requirements with non-merchantable timber grown on the installations. Avon Park Air Force Range, Florida has the potential to supply its own small heating energy requirements plus those of MacDill AFB, which is 75 miles away. Arnold Engineering Development Center presently has a central plant heating system. The system can be converted to a wood-burning system by altering existing boilers or replacing them with boilers having wood-firing capability. The remaining installations do not have central plant heating systems, but use small natural gas and oil-fired heating units in individual buildings. Conversion of these installations to burn wood would require construction of a wood-fired central system or systems. An alternate method of converting these installations is through the use of a pyrolysis unit to convert wood to fuel gas and fuel oil which can be burned in existing heating units. The latter alternative cannot be implemented until a large scale, continuously operated pyrolysis unit is developed. Author (GRA)

N79-15345*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). REVIEW OF LACIE METHODOLOGY, A PROJECT EVALUATION OF TECHNICAL ACCEPTABILITY
Jul. 1976 27 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10069; NASA-TM-79932; LACIE-00421; JSC-11327)
Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following significant results. Results indicated that the LANDSAT data and the classification technology can estimate the small grains area within a sample segment accurately and reliably enough to meet the LACIE goals. Overall, the LACIE estimates in a 9 x 11 kilometer segment agree well with ground and aircraft determined area within these segments. The estimated c.v. of the random classification error was acceptably small. These analyses confirmed that bias introduced by various factors, such as LANDSAT spatial resolution, *lack of spectral resolution, classifier bias, and repeatability,* was not excessive in terms of the required performance criterion. Results of these tests did indicate a difficulty in differentiating wheat from other closely related small grains. However, satisfactory wheat area estimates were obtained through the reduction of the small grain area estimates in accordance with relative amounts of these crops as determined from historic data; these procedures are being further refined.

N79-15349*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; CLASSIFICATION AND MENSURATION SUBSYSTEM (CAMS) REQUIREMENTS, VOLUME 2, REVISION E

May 1978 121 p Revised Sponsored by NASA, NOAA, and USDA EREP
(E79-10070; NASA-TM-79933; LACIE-C00200-Vol-2-Rev-E; JSC-11330-Vol-2-Rev-E) Avail: NTIS HC A06/MF A01 CSCL 02C

N79-15350*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). YIELD-WEATHER REGRESSION MODELS FOR THE CANADIAN PRAIRIES
Sharon K. LeDuc, Principal Investigator Jun. 1977 28 p refs Revised Sponsored by NASA, NOAA, and USDA EREP
(E79-10071; NASA-TM-79934; LACIE-00433-Rev-A; JSC-11658-Rev-A) Avail: NTIS HC A03/MF A01 CSCL 02C

N79-15351*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
NATIONWIDE FORESTRY APPLICATIONS PROGRAM. A LITERATURE REVIEW OF MAJOR REMOTE SENSING PROJECTS MAPPING FOREST LAND IN THE UNITED STATES, USING SATELLITE DATA AND AUTOMATIC DATA PROCESSING
E. P. F. Kan, Principal Investigator Oct. 1978 73 p EREP
(Contract NAS9-15200)
(E79-10072; NASA-CR-151858; LEC-12131; JSC-13978) Avail: NTIS HC A04/MF A01 CSCL 02C

N79-15352*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; SYSTEM PERFORMANCE EVALUATION, REPORT INTEGRATION (SPE-RI) REQUIREMENTS, VOLUME 6-B
16 Dec. 1974 48 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10073; NASA-TM-79965; LACIE-00200-Vol-6-B) Avail: NTIS HC A03/MF A01 CSCL 02C

N79-15356*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
TEST AND EVALUATION OF PRINCIPAL COMPONENT CLUSTER IMAGES IN LACIE
R. A. Abotteen, Principal Investigator Mar. 1977 17 p refs EREP
(Contract NAS9-15200)
(E79-10077; NASA-CR-151860; LEC-10052) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-15358*# Texas A&M Univ., College Station. Remote Sensing Center.
DRYLAND PASTURE AND CROP CONDITIONS AS SEEN BY HCMM Progress Report, Jul. - Oct. 1978
W. D. Rosenthal, Principal Investigator, J. C. Harlan, and Bruce J. Blanchard Oct. 1978 20 p ERTS
(Contract NAS5-24383)
(E79-10079; NASA-CR-157972; RSC-3712-3) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. The soil moisture difference between the flight lines was partly due to water-holding capacity differences of the two soil types. Fields along the east flight line were in clay; while along the west flight line, the soil was sandy loam which holds less moisture. Due to differences in the amount of green material, the pastures were wetter than the wheat fields. Most of the pastures average from 40-80% green material, while wheat averages from 90-100% green material. A large amount of green material transpired more water and depleted the soil water content faster than dead vegetation. Visicorder data found temperature differences between the rangeland and winter wheat fields. Pasture had a larger percentage of dead material with different thermal properties than live vegetation, and surface temperature was primarily dependent on insolation. Dead material transpired less, but warms up faster than wheat fields.

N79-15359*# Agricultural Research Service, Weslaco, Tex.
PLANT COVER, SOIL TEMPERATURE, FREEZE, WATER STRESS, AND EVAPOTRANSPIRATION CONDITIONS Quarterly Progress Report, 1 Sep. - 1 Dec. 1978
Craig L Wiegand, Paul R Nixon, Harold W. Gausman, L. Neal Namken, Ross W. Leamer, and Arthur J. Richardson, Principal Investigators Dec. 1978 11 p refs ERTS
(NASA Order S-40198-B)
(E79-10080; NASA-CR-157973) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-15366*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
APPLICATION OF LANDSAT IN THE EVALUATION OF ARGICULTURAL AND FOREST RESOURCES [APLICACO DO SISTEMA LANDSAT NA AVALIACAO DE RECURSOS AGRONOMICOS E FLORESTAIS]
Nelson deJesusParada, Principal Investigator and Mario Valerio Filho Nov. 1977 10 p refs In PORTUGUESE Sponsored by NASA ERTS
(E79-10088; NASA-CR-157980; INPE-1153-PE/105) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-15367*# South Dakota State Univ., Brookings. Remote Sensing Inst.
REMOTE SENSING APPLICATIONS TO RESOURCE PROBLEMS IN SOUTH DAKOTA Annual Progress Report, 1 Jul. 1977 - Jul. 1978
Victor I. Myers, Principal Investigator, R. G. Best, K. J. Dalsted, M. E. DeVries, J. C Eidenshink, F. A. Schmer, J. T. StreckFuss, and M. E. Wehde 1 Jul. 1978 127 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NGL-42-003-007)
(E79-10089; NASA-CR-157981; SDSU-RSI-78-14) Avail: NTIS HC A07/MF A01 CSCL 08F

The author has identified the following significant results. Change in the vegetative structure was taking place in the Black Hills. Temporal analysis of the areal extent of open meadows was accomplished using black and white and color infrared aerial photography. A reduction of nearly 1100 hectares of open meadows was determined using photointerpretation. Techniques were developed for the management of meandering lakes, including use of LANDSAT imagery for continuous monitoring, classification of hydrophytes on low altitude CIR imagery, and planning and evaluation of improvements and multiple uses on aerial photography and photo mosaics. LANDSAT data were analyzed statistically from small and entire study scene areas to determine the effect of soils stratifications of corn signatures. Band 5 early season and band 7 later season recorded the strongest evidence of the influence of soils on corn signatures. Significant strata were determined by a multiple range test.

N79-15369*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). AN APPLICATION OF REMOTE SENSING BY MULTISPECTRAL SCANNERS
R. Bryan Erb, Principal Investigator 1975 12 p refs Sponsored by NASA, NOAA, and USDA Original contains color illustrations EREP
(E79-10091; NASA-CR-157983) Avail: NTIS HC A02/MF A01 CSCL 02C

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.

A79-11256 **Evaluation of Landsat image data for land-use mapping.** W. Kirchhof, P. Haberäcker, E. Krauth, G. Kritikos, and R. Winter (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-118.* 11 p. 7 refs.

An attempt is made to determine whether land-use information of a central European region (Mannheim-Speyer) can be extracted from multispectral Landsat image data for several applications. The results are presented in a form adapted to user requirements: land-use, regional planning, problems of different earth sciences, and user groups. A method of multispectral maximum likelihood classification is proposed, which assumes that each picture element belongs to a special class exclusively defined by its spectral properties. These properties are defined by the intensity of the solar radiation reflected by the earth, detected in the four spectral bands of Landsat from the visible to near-infrared. It is shown that pixel-by-pixel verification of individual classes exhibits high failure rate, that integration of subclasses to main classes results in higher classification accuracy, that the highest classification accuracy is obtained for agricultural land, and that the degree of fit increases with the size of homogeneous land-use zones. S.D.

A79-11257 **The use of earth surface observation data for development planning of Greater Jakarta Metropolitan Area.** H. Djojodihardjo and E. Saparjan (Indonesian National Institute for Aeronautics and Space, Djakarta, Indonesia). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-119.* 16 p. 14 refs.

The paper presents a macrophenomenological working model for applying earth surface observation data to the regional development planning of the Greater Jakarta (Indonesia) Metropolitan Area. The model is intended to facilitate the study of development objectives and to help decision makers to determine an overall environmental assessment. Regional development objectives and relevant input variables are considered, and some information derived from Landsat data is presented. M.L.

A79-11263 **Application of a digital image processing system to land use mapping from Landsat data.** M. Checchi, C. Iannucci, and A. Penna (Italeco S.p.A., Rome, Italy). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-130.* 15 p. 7 refs.

In the course of a territorial planning study, Landsat data have been used to obtain information on land use. These data have been processed by means of a supervised system and compared with ground truth in a test area. A further comparison has been made between the results of automatic classification and the statistical information obtainable from official sources. The discrepancies between the results of the automatic classification and ground truth are indicated with the aim of analyzing the causes. (Author)

A79-11664 **Mapping land covers from satellite images - A basic, low cost approach.** C. D. Elifrits, D. J. Barr (Missouri-Rolla, University, Rolla, Mo.), T. W. Barney, and C. J. Johannsen (Missouri-Columbia, University, Columbia, Mo.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 106-122.

Better land management can be accomplished only through adequate collection of data which identifies present land resources and provides a basis for evaluation of land resource capabilities with respect to future needs. Remote sensor imagery and satellite imagery in particular, provides a means for supplying data which is current, synoptic, readily obtainable and relatively inexpensive. The launching of the Earth Resources Technology Satellite now called Landsat, initiated a new era in the application of remote sensing technology to land resource inventory. An outline is presented of a visual interpretation approach for interpreting and mapping general land cover types from Landsat images. Emphasis is placed upon the use of Landsat false color composites at a scale of 1:250,000. This approach is designed for users who have little or no experience with satellite imagery, want to minimize their expenditures of time and financial resources, and have limited or essentially no access to equipment normally used in image interpretation. G.R.

A79-11668 * **Techniques for land use change detection using Landsat imagery.** G. L. Angelici, N. A. Bryant, and S. Z. Friedman (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 217-228. Contract No. NAS7-100.

A variety of procedures were developed for the delineation of areas of land use change using Landsat Multispectral Scanner data and the generation of statistics revealing the nature of the changes involved (i.e., number of acres changed from rural to urban). Techniques of the Image Based Information System were utilized in all stages of the procedure, from logging the Landsat data and registering two frames of imagery, to extracting the changed areas and printing tabulations of land use change in acres. Two alternative methods of delineating land use change are presented while enumerating the steps of the entire process. The Houston, Texas urban area, and the Orlando, Florida urban area, are used as illustrative examples of various procedures. G.R.

A79-11669 * **A reduction in ag./residential signature conflict using principal components analysis of Landsat temporal data.** D. L. Williams (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, Md.) and F. Y. Borden (Pennsylvania State University, University Park, Pa.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 230-238. 9 refs.

One important objective of a cooperative project between the U.S. Bureau of Census and NASA is to develop the ability to accurately delineate the types of land cover in the urban-rural transition zone of metropolitan areas. The application of principal components analysis to multidate Landsat imagery is being investigated as a method of reducing the overlap between residential and agricultural spectral signatures. The statistical concepts of principal components analysis are discussed, as well as the results of this analysis when applied to multidate Landsat imagery of the Washington, D.C. metropolitan area. (Author)

A79-11754 # **Interpretation of satellite and aircraft imagery for planning/design and management of marine parks and reserves.** J. A. Dobbin (James Dobbin Associates, Toronto, Canada). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings.
Falls Church, Va., American Society of Photogrammetry, 1978, p. 93-117. 38 refs. Research supported by the Ford Foundation.

The establishment of marine parks and reserves represents an important new approach for the protection of critical marine ecosystems. Interpretation of remotely sensed imagery could be an effective method for the collection, classification, and analysis of

resource information for planning and managing marine parks and reserves. This potential was examined in two case studies using Landsat, high and low altitude aircraft imagery, and the technique of density slicing to supplement existing information obtained from ground observations. In both case studies, interpretations revealed important new information and established the value of these techniques for site specific analyses. Landsat imagery could also be a vital tool for a survey team in the efficient acquisition of up-to-date data, especially in remote areas, for the planning of regional systems of marine parks and reserves. (Author)

A79-11759 # **Landsat derived, land cover and imperviousness categories for metropolitan Washington - An urban/non-urban, computer approach.** J. B. McKeon, L. E. Reed, R. H. Rogers (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), R. M. Ragan (Maryland, University, College Park, Md.), and O. C. Wiegand (Metropolitan Washington Council of Governments, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 226-239. 16 refs.

The paper discusses the computer processing of Landsat data to obtain land-cover and imperviousness categories for urban areas with particular reference to Washington, D.C. The complete steps used to produce the data are outlined noting the 64 ground control points, delineations of the urban area, and the white aerial photographs and color infrared photography used as reference materials. It is noted that the land-cover and imperviousness results are applicable to hydrologic models when used in conjunction with data such as drainage, slope, soil, and storm-event intensity. The models may be used to evaluate water quality, to estimate peak discharges, and to assess the effects of urbanization in a cost-effective manner. S.C.S.

A79-12094 **Ecosystem alteration detection by aerial color infrared photography and satellite multispectral scanner.** W. A. Blanchard (Louisiana State University, Baton Rouge, La.). In: Modern utilization of infrared technology III: Civilian and military; Proceedings of the Third Seminar, San Diego, Calif., August 25, 26, 1977. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 221-227. 7 refs.

In the ecological succession process, the dominant vegetation population is deteriorated because of a change in the local environment. This change results in the proliferation of a species or community better suited to the altered environment. Stresses on the health, vigor and productivity of the succeeded plant population are early signs of the environmental alteration. Visual interpretation of aerial color infrared photography of a south Louisiana swamp determines where an ecosystem succession may occur by monitoring the advance signs of stress invisible to conventional films. The digital data from bands five (0.6-0.7 micrometers) and seven (0.8-1.1 micrometers) of Landsat earth orbiting satellite is used to characterize and compare the spectral signatures of known areas of environmental alteration in the swamp lands with areas of unaffected swamp vegetation. The image classification capability of a Comtal-Varian Interactive Image Processing System uses the spectral signatures of the test areas as a search tool for locating other potential succession areas over a wide region. (Author)

A79-13835 # **The Pacific Northwest Regional Commission's Land Resource Inventory Demonstration Project - The user's experience.** M. J. McCormick (Washington State Planning and Community Affairs Agency, Olympia, Wash.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1719.* 6 p.

A79-14093 # **Future applications of a satellite observation system for the long-term monitoring of geodynamic processes (Zukünftige Anwendung eines Satellitenbeobachtungs-Systems zur langfristigen Überwachung geodynamischer Vorgänge).** D. Bannert (Bundesanstalt für Geowissenschaften und Rohstoffe, Hanover, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt and Hermann-Oberth-Gesellschaft, Deutscher Luft- und Raumfahrtkongress, Darmstadt, West Germany, Sept. 19-23, 1978, DGLR Paper 78-147.* 21 p. 6 refs. In German.

After a brief review of the Landsat program and of remote sensing satellites in general, the paper discusses the planning of a satellite system for the monitoring of desert areas and of areas prone to desertification. The photomapping of desert areas is discussed with reference to the type of observation platform, the receiving station, and data transmission and processing. The development of national or international programs for the monitoring of desertification processes is examined. Particular attention is given to the Landsat monitoring of desert areas in the Republic of Niger. B.J.

A79-14167 # **Realistic land use mapping.** O. Kolbl (Eidgenössische Anstalt für das Forstliche Versuchswesen, Birmensdorf, Switzerland). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 103-106. 7 refs.

Several land-use mapping methods are compared with reference to two projects in Switzerland: a national forest inventory and a land-use statistic for regional planning. The methods taken into consideration are: (1) the use of multispectral images combined with automatic classification modes, (2) texture analysis of conventional black and white photographs, and (3) visual photointerpretation supported by electronic data processing. The paper tries to highlight the state of the art in remote sensing as applied to very specific tasks. B.J.

A79-14173 # **Spectral and spatial signature recognition in urbanizing areas of southern California from U-2 color infra-red imagery.** C. S. Miller (California State Polytechnic University, Pomona, Calif.). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 141-147. 7 refs.

A79-15023 * **Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings.** Conference sponsored by ACS, AIAA, AIChE, AMS, EPA, ERDA, IEEE, ISA, NASA, NOAA, HUD, U.S. Geological Survey, U.S. Department of State, and DOT. Washington, D.C., American Chemical Society, 1978. 960 p. $50.

Papers are presented on such topics as environmental chemistry, the effects of sulfur compounds on air quality, the prediction and monitoring of biological effects caused by environmental pollutants, environmental indicators, the satellite remote sensing of air pollution, weather and climate modification by pollution, and the monitoring and assessment of radioactive pollutants. Consideration is also given to empirical and quantitative modeling of air quality, disposal of hazardous and nontoxic materials, sensing and assessment of water quality, pollution source monitoring, and assessment of some environmental impacts of fossil and nuclear fuels. B.J.

A79-15034 **A national program for land use and land cover mapping using remotely sensed data.** R. L. Kleckner (U.S. Geological Survey, Reston, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 91-94. 5 refs.

Using remotely sensed data, the Geography Program, part of the Land Information and Analysis Office of the U.S. Geological Survey, has undertaken the mapping of land use and land cover for the entire nation. This mapping effort was begun in 1975 and is scheduled for completion by 1982 with updates provided as needed. This paper describes the Program, examines the geographic information sys-

and describes the role of Landsat. Particular emphasis is placed on utilization of the land use and land cover data for purposes of pollution monitoring and control. B.J.

A79-15051 **Monitoring vegetation changes in a large impacted wetland using quantitative field data and quantitative remote sensing data.** S. L. Wynn and R. W. Kiefer (Wisconsin, University, Madison, Wis.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 178-180. U.S. Environmental Protection Agency Grant No. R-803971.

Vegetation community classification by botanic and remote sensing methods is discussed. Vegetation community data collected by field and remote sensors are characterized, and procedures for defining communities are considered. One of the goals of the described study is to demonstrate the use of various methods for monitoring change over time. The study is also intended to determine the most cost effective procedures for obtaining the desired information. M.L.

A79-15082 **Development of a pollutant monitoring system for biosphere reserves and results of the Great Smoky Mountains pilot study.** G. B. Wiersma, K. W. Brown, and A. B. Crockett (U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, Nev.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 451-456. 30 refs.

The paper describes a methodology for developing a pollutant monitoring system over a spectrum of biosphere reserves. The biosphere reserve sites cover large land areas, so it is not feasible to sample the entire area. General criteria are proposed which should be used in the selection of specific sampling sites within each biosphere reserve. The criteria deal with topography, soil, vegetation uniformity, access, vegetation types, and sampling site size. Results of a presampling program carried out in the Great Smoky Mountains National Park are presented. The objectives were to determine minimum levels of pollutants detectable, variability of samples, and the value of some new sampling techniques. P.T.H.

A79-16597 **The automated generation and processing of digital terrain data for engineering planning.** J. Bethel, B. C. Crawley, G. Shepphird, and M. Hussain (Teledyne Geotronics, Long Beach, Calif.). In: Digital Terrain Models Symposium, St. Louis, Mo., May 9-11, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 469-480.

The paper describes a system for the automated generation of digital terrain data on an economical production basis. The system is based on the collection of three-dimensional terrain surface data from an oriented pair of vertical photographs, the ordering of the data according to a conventional rectangular coordinate grid, and the merging of data from several models to provide more extensive areal coverage. The resulting data bases are well suited to the conventional application of automated generation of contour plots for extensive project areas and may also be processed for a variety of end products. The generation of profiles along and across the drainage in a project area has successfully been demonstrated as an innovative application of digital terrain data for engineering planning. B.J.

A79-17882 ***The use of vegetation as a transducer for environmental pollution.*** A. M. Tonelli (ARCO, Milan, Italy). In: Symposium on Remote Sensing for Vegetation Damage Assessment, Seattle, Wash., February 14-16, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 115-126.

A method for pollution monitoring based on the ratio of near infrared reflection of vegetation canopies to their thermal band emission is described. The ratio method (using 1-2-micron and 9-11-micron bands) was successfully applied to mapping SO2 distribution in the vicinity of a power plant in Northern Italy for a period of two years. The same method has also been used to detect gas losses from pipelines and to study the effects of magmatic gases on vegetation growing in volcanic areas. B.J.

N79-10505# National Technical Information Service, Springfield, Va.
REMOTE SENSING APPLIED TO ENVIRONMENTAL POLLUTION DETECTION AND MANAGEMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1978
Audrey S. Hundemann Aug. 1978 163 p Supersedes NTIS/PS-77/0674 3 Vol.
(NTIS/PS-78/0789/4; NTIS/PS-77/0674) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Application of remote sensing methods to air, water, and noise pollution problems is discussed. Topic areas cover characteristics of dispersion and diffusion by which pollutants are transported, eutrophication of lakes, thermal discharges from electric power plants, outfalls from industrial plants, atmospheric aerosols under various meteorological conditions, monitoring of oil spills, and application of remote sensing to estuarian problems. This updated bibliography contains 156 abstracts, 23 of which are new entries to the previous edition. GRA

N79-10506# National Technical Information Service, Springfield, Va.
REMOTE SENSING APPLIED TO URBAN AND REGIONAL PLANNING. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1978
Audrey S. Hundemann Aug. 1978 70 p Supersedes NTIS/PS-77/0675 3 Vol.
(NTIS/PS-78/0790/2; NTIS/PS-77/0675) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Urban and regional planning using aerial photography and satellite remote sensing methods is discussed. Abstracts cover the use of remote sensing in land use mapping, traffic surveys and urban transportation planning, and taking inventories of natural resources for urban planning. Abstracts dealing with land use and residential quality associated with acting as an influence on health and physical well being are included. This updated bibliography contains 63 abstracts, 3 of which are new entries to the previous edition. GRA

N79-10509# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
A SELECTIVE BIBLIOGRAPHY: REMOTE SENSING APPLICATIONS IN LAND USE AND LAND COVER INVENTORY TASKS
William J. Todd Apr. 1978 37 p refs
(Contract DI-14-08-0001-16439)
(PB-283027/1) Avail: NTIS HC A03/MF A01 CSCL 08B

The bibliography contains more than 300 citations of selected publications on the applications of remote sensing techniques to regional and metropolitan land-use and land-cover inventory tasks. Most of the citations were published between January 1968 and June 1977, although some earlier works of continuing interest are included. GRA

N79-12519 California Univ., Riverside.
THE DIGITAL USE OF LANDSAT DATA FOR INTEGRATED LAND RESOURCE SURVEY: A STUDY IN THE EASTERN MOJAVE DESERT, CALIFORNIA Ph.D. Thesis
Charles Frederick Hutchinson 1978 277 p
Avail: Univ. Microfilms Order No. 7821353

Systems of land classification were examined within the framework of classification logic. It was found that a priori or deductive, divisive systems of classification have some serious shortcomings and are often unable to meet the purpose for which they were designed. In general, a posteriori or inductive, agglomerative approaches to land classification were found to produce more satisfactory results. An inductive approach was adopted based loosely on landform. Three methods of digital

multispectral classification of LANDSAT data were examined: supervised, unsupervised, and modified unsupervised. The last technique, in a qualitative sense, was judged to combine the best of the other systems by allowing some control in the selection of training areas which would allow representation of all terrain types felt to be of significance (as in supervised classification), but which also retained a significant amount of statistical objectivity (characteristic of the unsupervised approach).

Dissert. Abstr.

N79-13430*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

POPULATION AND GROWTH ESTIMATES OF URBAN AREAS IN THE STATE OF SAO PAULO UTILIZING LANDSAT IMAGES [ESTIMATIVAS POPULACIONAIS E DE CRESCIMENTO DE AREAS URBANAS NO ESTADO DE SAO PAULO, COM UTILIZACAO DE IMAGENS LANDSAT]

Nelson deJesusParada, Principal Investigator and Celina Foresti Jun. 1978 115 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E79-10015; NASA-CR-157904; INPE-1298-TPT/095) Avail: NTIS HC A06/MF A01 CSCL 05B

N79-13447*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

APPLICATIONS OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Quarterly Report, Sep. - Nov. 1978

Toby N. Carlson, Principal Investigator 1 Dec. 1978 3 p Sponsored by NASA ERTS

(E79-10040; NASA-CR-157927) Avail: NTIS HC A02/MF A01 CSCL 08B

N79-14456*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE IMPACT OF LACIE ON A NATIONAL METEOROLOGICAL CAPABILITY

N. Strommen (NOAA Environmental Data Information Service, Washington, D. C.), M. Reid (NOAA Environmental Data and Information Service, Houston, Tex.), and J. Hill, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 119-124 EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-15363*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

UTILIZATION OF ORBITAL DATA FROM LANDSAT 1 IN THE CLASSIFICATION OF URBAN LAND USAGE OF THE SAO JOSE GRASSLAND [UTILIZACAO DE DADOS ORBITAIS DO LANDSAT-1 NA CLASSIFICACAO DE USO DO SOLO URBANO DE SAO JOSE DOS CAMPOS]

Nelson deJesusParada, Principal Investigator and Madalena Niero Jul. 1978 81 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E79-10085; NASA-CR-157977; INPE-1295-TPT/093) Avail: NTIS HC A05/MF A01 CSCL 08B

N79-15364*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LANDSAT AND ENVIRONMENTAL IMPACT IN THE PARAIBA VALLEY OF SAO PAULO [LANDSAT E IMPACTO AMBIENTAL NO VALE DO PARAIBA ESTADO DE SAO PAULO]

Nelson deJesusParada, Principal Investigator and Dall Arthur Cottrell 20 Apr. 1978 9 p refs In PORTUGUESE Sponsored by NASA ERTS

(E79-10086; NASA-CR-157978; INPE-1222-PE/124) Avail: NTIS HC A02/MF A01 CSCL 13B

N79-15373# Forschungsinstitut fuer Informationsverarbeitung, Karlsruhe (West Germany).

SEMIAUTOMATIC EXTRACTION OF ROADS FROM AERIAL PHOTOGRAPHS Final Technical Report, 15 May 1977 - 15 Apr. 1978

W. Kestner Jun. 1978 50 p refs

(Grant DA-ERO-77-G-044; DA Proj. 1T1-61102-BH-57)

(AD-A060065) Avail: NTIS HC A04/MF A01 CSCL 14/5

Three different methods have been developed for the semiautomatic extraction of roads from aerial photographs. The interpreter has to initialize the procedures by defining parameter values and starting points on the roads. The results of the extraction procedures are displayed immediately for control and necessary correction by the interpreter. All three methods are described in principle, while one of them is described in detail. Test material for the methods had been provided by USAETL. Test results are shown and serve to explain the abilities and limits of the extraction methods. An assessment of the methods and discussions of further work conclude this report.

Author (GRA)

03

GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A79-10997 **Surface texture analysis with thermal and near infrared scanners.** A. M. Tonelli (Rossi A. R. Co., Milan, Italy). *Photogrammetric Engineering and Remote Sensing*, vol. 44, Oct. 1978, p. 1273-1278. 8 refs.

Texture analysis applied to scannings collected in the domain of reflected and emitted infrared radiance can be usefully employed for detecting glacial crevasses, and fault lines and for monitoring the current pattern at the sea's surface. Such an analysis, performed by high frequency extraction from scanning data followed by multistage logarithmic compression, enhances very subtle discontinuities existing at the surfaces in the field of reflection and emission. The contribution of the numerous phenomena involved can often be distinguished by the study of the correlation between the 1 to 2-micron and 9 to 11-micron channels. This method seems particularly useful in sensing the input of small volumes of water into the sea. It is useful for establishing a model for current circulation when bathymetric data are also used. While a number of appropriate methods have been developed for the mapping of faults, the thermal texture analysis method seems to be a promising tool for use in the study of glaciers, enabling the location of crevasses to be drawn on a map. (Author)

A79-11258 **Ruptural fabric of Yugoslavia on Landsat scanograms.** M. D. Dimitrijevic (Beograd, Univerzitet, Belgrade, Yugoslavia). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-121.* 9 p. 18 refs.

Eighteen Landsat scanograms were selected to obtain a source for analysis of the ruptural fabric of Yugoslavia on a scale of 1:1,000,000. A map of fractures and ring structures was compiled. The fractures visible on the scanograms are believed to be mostly neotectonically active ones and fractures generated during the Neogene or Quaternary. Only in places do these fractures correspond to faults known from geological maps. In general, a new pattern distinct from the one shown by more ancient faults is obtained, corresponding to a new stress field. P.T.H.

A79-11259 * **Eulusmap - An international land resources map utilizing satellite imagery.** T. Paludan (NASA, Marshall Space Flight Center, Earth Resources Office, Huntsville, Ala.) and E. Csati (Institute of Surveying and Mapping, Budapest, Hungary). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-124.* 13 p. 12 refs.

The paper describes the European land use map ('Eulusmap') sponsored by the World Land Use Survey Commission and printed in May 1978. The map was compiled on the basis of theme extraction techniques applied to Landsat-1 imagery. Various aspects of Landsat-image analysis are discussed here, and detailed consideration is given to the land-use classification system developed by the World Land Use Survey Commission. 8.J.

A79-14179 # **A self-contained Landsat data reception and precision cartographic image production system.** D. S. Sloan and R. Orth (MacDonald, Dettwiler and Associates, Ltd., Richmond. British Columbia, Canada). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977.
Graz, Technische Universität Graz, 1978, p. 189-196. 16 refs.

The paper outlines the design and capabilities of the Line Scan Receiving and Processing System (LSRPS) devised as a self-contained direct readout ground station system for the reception and processing of data from earth-observation satellites. Attention is given to the digital Image Analysis System (IAS) which can be incorporated into the LSRPS when located at the same site, or operates as a stand-alone system in an installation remote from ground reception facilities. The IAS permits precision cartographic and thematic products to be developed from digital line-scan data. The entire IAS system is developed around the four main activities encountered in digital image analysis, viz. radiometric correction, geometric correction, image classification, and image manipulation. The IAS provides the user with a standard image analysis framework involving a set of basic modules which can be easily extended or modified to allow for new developments and needs. S.D.

A79-18193 **Digital terrain models - An overview.** F. J. Doyle (U.S. Geological Survey, Reston, Va.). *(American Society of Photogrammetry, Digital Terrain Model Symposium, St. Louis, Mo., May 9-11, 1978.) Photogrammetric Engineering and Remote Sensing*, vol. 44, Dec. 1978, p. 1481-1485.

The rapid development in the ability to handle terrain data in a completely digital form offers the promise of reducing the drudgery of cartographic operations, providing a wide variety of data interactions, and reducing time and cost. The present paper gives a definition of digital terrain models and discusses their origin. Consideration is also given to digital data acquisition, digital data preprocessing, data storage and management, applications of DTM data, and the future directions of DTM (i.e., national and world data banks, interaction with other digital data, and computer-controlled cartography). B.J.

A79-18194 **DTM application in topographic mapping.** M. M. Allam (Department of Energy, Mines and Resources, Surveys and Mapping Branch, Ottawa, Canada). *(American Society of Photogrammetry, Digital Terrain Model Symposium, St. Louis, Mo., May 9-11, 1978.) Photogrammetric Engineering and Remote Sensing*, vol. 44, Dec. 1978, p. 1513-1520.

The Gestalt Photomapper GPM-2/3 system has been acquired for the production of DTMs (digital terrain models). The analytical model is scanned and continuously transformed according to electronic correlator measurements until the corresponding images from both cameras for a 9 x 8 mm patch are in register. A computer system was developed for the postprocessing of the DTMs and the production of digital contour overlays for 1:50,000 topographic maps, and digital terrain elevation data base on a UTM grid. B.J.

A79-18195 **Production mapping with orthophoto digital terrain models.** W. H. Young and D. M. Isbell (Riverside County Flood Control and Water Conservation District, Riverside, Calif.). *(American Society of Photogrammetry, Digital Terrain Model Symposium, St. Louis, Mo., May 9-11, 1978.) Photogrammetric Engineering and Remote Sensing*, vol. 44, Dec. 1978, p. 1521-1536.

A79-18196 **Experimental investigation into the accuracy of contouring from DTM.** F. Ackermann (Stuttgart, Universität, Stuttgart, West Germany). *(American Society of Photogrammetry, Digital Terrain Model Symposium, St. Louis, Mo., May 9-11, 1978.) Photogrammetric Engineering and Remote Sensing*, vol. 44, Dec. 1978, p. 1537-1548. 8 refs.

Experimental results are presented on the accuracy of digital-terrain-model (DTM) interpolation of digitally derived contours. The test area (Soehnstetten, Germany) was precisely surveyed by electronic tacheometry, including a number of check profiles. Furthermore, a plane table survey was available along with a state base map at 1:2500 scale. Wide angle photography at a photoscale of 1:10,000 was used for photogrammetric restitution. Results confirm that DTM contouring is equivalent to direct photogrammetric contouring or contouring from ground surveys. B.J.

A79-18863 **Contemporary tectonics in the Tien Shan region.** J. Ni (Cornell University, Ithaca, N.Y.). *Earth and Planetary Science Letters*, vol. 41, no. 3, Nov. 1978, p. 347-354. 22 refs. ARPA-supported research; Grant No. AF-AFOSR-77-3170.

New fault plane solutions of recent earthquakes, along with previously published fault plane solutions, field geologic data, and faults interpreted from Landsat imagery indicate thrust faulting in the Tien Shan region. For most of the fault plane solutions compressive stress axes are nearly horizontal and trending approxi-

mately north-south, perpendicular to the trend of the Tien Shan fold belts. Contemporary tectonics of the Tien Shan region can be interpreted as resulting from convergence of the Indian and Eurasian plates. (Author)

N79-11457# European Space Agency, Paris (France).
THE COVERAGE FIELD OF EARTH OBSERVATION SATELLITES AT THE EARTH'S SURFACE. DESCRIPTION OF THE COMPUTER PROGRAM COFI
E. Fritz Jochim and W. Pawlik Aug. 1978 77 p refs Transl. into ENGLISH of 'Das Ueberdeckungsfeld erdbeobachtender Satelliten auf der Erdoberflaeche. Beschreibung des Rechnerprogramms COFI', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-IB-552-77/40, 1977 Original report in GERMAN previously announced as N78-31516
(ESA-TT-487; DLR-IB-552-77/40) Avail: NTIS HC A05/MF A01

The computer program described produces a printer plot of the coverage field and coverage frequency within a given period in geographical coordinates or in geographical latitude against the mean solar time. Nadir angle and half width of the perpendicular to the orbit scanning sensor may be chosen freely. Multiply-covered regions are made evident by a variable density or special characters. Restrictions are possible on mean local solar time intervals. The subsatellite curve can be represented with the Local Mean Time marked on the curve. The program aids in the mission analysis of earth observation satellites.
Author (ESA)

N79-12485# Technische Hogeschool, Delft (Netherlands).
ON POTENTIAL USES OF SPACE TECHNIQUES FOR APPLIED GEODESY
L. Aardoom *In* ESA Space Oceanog., Navigation, and Geodyn. Apr. 1978 p 85-88

Avail: NTIS HC A16/MF A01

The question of how space techniques and satellite techniques in particular could be used for applied geodesy is addressed and general aspects are considered. Current trends in space geodesy are reviewed. The European position to set out on a program of applied geodesy by means of space techniques is outlined. Author (ESA)

N79-12486# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SATELLITE TRACKING TECHNIQUES AND THEIR APPLICATIONS FOR GEODESY AND NAVIGATION
P. Wilson *In* ESA Space Oceanog., Navigation, and Geodyn. Apr. 1978 p 93-97 refs

Avail: NTIS HC A16/MF A01

Measurement principles used for tracking near earth satellites, such as angular measurements, interferometry, range measurements and Doppler techniques are reviewed. The current status of ranging, Doppler and interferometry instrumentation is discussed and some thoughts on future trends are offered. ESA

N79-12497# Geodetic Inst., Helsinki (Finland).
ON THE GRAVIMETRIC SURVEY OF THE GULF OF BOTHNIA
Juhani Kakkuri *In* ESA Space Oceanog., Navigation, and Geodyn. Apr. 1978 p 171-173 refs

Avail: NTIS HC A16/MF A01

The activities of the Finnish Geodetic Institute with respect to the gravimetric survey of the Gulf of Bothnia are described. Topics include gravimetric experiments on the surface of the ice, gravity survey of the ice of the Bothnian Gulf and calibrating the satellite altimeter. ESA

N79-12501# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REVIEW OF SATELLITE TRACKING TECHNIQUES PROBABLY CAPABLE OF MONITORING PLATE TECTONICS
D. Lelgemann *In* ESA Space Oceanog., Navigation, and Geodyn. Apr. 1978 p 213-217 refs
Avail: NTIS HC A16/MF A01

The basic observation features and investigation techniques used in satellite geodesy and eventually capable of monitoring geotectonic motions are reviewed. Considering the physical information (time-, phase-, and frequency-differences) extracted from electro-magnetic signals, the principles of the observational methods (interferometry, ranging, and Doppler techniques) are described by which the geometrical information (angle, range, and range differences) needed to compute global or regional coordinates as a final result of geodetic efforts is obtained. The current status of some tracking systems, which may perhaps provide the superprecise information necessary for geotectonic investigations, is discussed. Author (ESA)

N79-12503# Technische Hochschule, Darmstadt (West Germany). Inst. of Physical Geodesy.
GEODETIC HIGH PRECISION MEASUREMENTS IN ACTIVE TECTONIC AREAS
E. Groten and G. W. Hein *In* ESA Space Oceanog., Navigation, and Geodyn. Apr. 1978 p 223-229 refs

Avail: NTIS HC A16/MF A01

The use of space borne laser ranging for monitoring the movements of retroreflectors installed along active tectonic zones together with a net of regionally distributed reflectors (at distances of more than 100 km) is discussed. It gives the opportunity to detect motion and movement in active zones with respect to more or less stable surroundings. The application in Iceland and Iran is considered. The difficulties encountered with terrestrial methods when the same information is to be studied by classical geodetic approaches are outlined. Author (ESA)

N79-13438*# SRI International Corp., Menlo Park, Calif.
A SCENE-ANALYSIS APPROACH TO REMOTE SENSING Final Report
Jay M. Tenenbaum, Principal Investigator, Martin A. Fischler, and Helen C. Wolf Jun. 1978 85 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Contract NASw-2865; SR Proj. 4683)
(E79-10029; NASA-CR-157916) Avail: NTIS HC A05/MF A01 CSCL 05B

The author has identified the following significant results. Geometric correspondance between a sensed image and a symbolic map is established in an initial stage of processing by adjusting parameters of a sensed model so that the image features predicted from the map optimally match corresponding features extracted from the sensed image. Information in the map is then used to constrain where to look in an image, what to look for, and how to interpret what is seen. For simple monitoring tasks involving multispectral classification, these constraints significantly reduce computation, simplify interpretation, and improve the utility of the resulting information. Previously intractable tasks requiring spatial and textural analysis may become straightforward in the context established by the map knowledge. The use of map-guided image analysis in monitoring the volume of water in a reservoir, the number of boxcars in a railyard, and the number of ships in a harbor is demonstrated.

N79-13475*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EULUSMAP: AN INTERNATIONAL LAND RESOURCES MAP UTILIZING SATELLITE IMAGERY
T. Paludan and E. Csati (Inst. of Surveying and Mapping, Budapest) Dec. 1978 20 p refs
(NASA-TP-1371; M-271) Avail: NTIS HC A02/MF A01 CSCL 08B

In 1972, the International Geographical Union's Commission on World Land Use Survey adopted a project for a land-use map of Europe. Such a map, under the name Eulusmap was started earlier under sponsorship of several government offices in Hungary. Although there was great response from a number of contributors in many countries, it became evident by mid-1974 that the map would contain gaps and some inaccuracies unless additional data sources were utilized. By then, the satellite Landsat-1 had obtained imagery of most of Europe. Using theme extraction techniques, the map was completed in draft form and portions of it displayed at the 23d International Geographical

Congress in Moscow during July 1976. Printing of the completed map was accomplished in May 1978. Author

N79-15394# Kansas State Geological Survey, Lawrence.
THE ORIGIN OF SURFACE LINEAMENTS IN NEMAHA COUNTY, KANSAS
Susan M. DuBois Aug. 1978 58 p refs
(Contract NRC-04-77-017)
(PB-287302/4; NUREG-CR-0321) Avail: NTIS HC A04/MF A01 CSCL 08G

The geology and seismicity of Kansas was examined in connection with design criteria for dams, nuclear power plants, and other earthquake-sensitive structures. A search for surface lineaments was conducted using LANDSAT-MSS and side-looking airborne radar imagery as well as conventional and satellite photography. The origin of the surface lineaments observed in Nemaha County and portions of the surrounding counties in Kansas and Nebraska was investigated. GRA

N79-15508# Desert Research Inst., Reno, Nev. Water Resources Center.
MAPPING OF EARTH FISSURES IN LAS VEGAS VALLEY, NEVADA
R. O. Patt and G. B. Maxey Mar. 1978 28 p refs
(OWRT Proj. A-071-Nev(1))
(PB-286969/1; PUB-41051; W78-12107) Avail: NTIS HC A03/MF A01 CSCL 08G

Seven zones of fissuring in the vicinity of Las Vegas are outlined and discussed. Fissures in Las Vegas Valley can be correlated with the following features: (1) fault scarps (compaction or tectonic); (2) well fields; and (3) tectonic activity. Several features are noted which may be interrelated with subsidence and fissuring in Las Vegas Valley. Damage to streets and homes as a result of fissuring is discussed. GRA

04
GEOLOGY AND MINERAL RESOURCES

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

A79-11249 **Application of space images to geological investigations in the USSR to date and in future.** V. N. Bruikhanov, B. N. Mozhaev, and G. V. Makhin. *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-111.* 10 p.

The application of TV and scanner images from such spacecraft as Meteor, Salyut and Soyuz to photogeological studies of the U.S.S.R. is reviewed. Various aspects of geological photomapping are discussed. B.J.

A79-11250 **Results of application of data from space to geological survey in Yugoslavia.** M. Oluic (Industroprojekt, Zagreb, Yugoslavia). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-112.* 12 p. 13 refs.

Applications of data obtained from satellites, especially Landsat satellites, to geological research in Yugoslavia are discussed. Tectonic structure and seismotectonic activity are studied, and the exploration for oil and mineral resources is described. The use of large-scale and small-scale images is considered, and area features suggesting the presence of oil and bauxite are reported. M.L.

A79-11260 **Estimation of the soil composition by IR observation of the earth by satellites.** R. Monti. *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-126.* 16 p. 7 refs.

The determination of the thermal conductivity and the volume heat capacity of soils from two (satellite) measurements of soil temperature is discussed. Numerical results following from a two-dimensional unsteady heat transfer analysis are computed for a variety of soil conditions, and the time evolution of the surface temperature is examined. Application of the indicated procedure for estimating soil composition requires that satellites must follow specified orbits and obtain data for a given site during two consecutive passes. M.L.

A79-11763 # **Landsat geologic reconnaissance of the Washington, D.C. area westward to the Appalachian Plateau.** G. A. Rabchevsky, U. Boegli, and J. Valdes (American University, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 345-360. 17 refs.

The usefulness of satellite and aircraft remote sensor imagery in the mapping of major geologic structures, boundaries of geologic units and lithologies, and geomorphic provinces in the Washington, D.C. area, westward to the Appalachian Plateau is investigated. The remote sensor imagery data base consisted of Landsat and Skylab data and high-altitude infrared aerial photography. The imagery was processed primarily by photo-optical techniques and analyzed by conventional photographic interpretation methods. A series of geological and geobotanical overlays were prepared showing the interpreted results. The results showed that conventional published geologic maps of regions can be effectively supplemented by interpreted satellite and aircraft imagery overlays. (Author)

A79-11857 * **Discrimination of geologic units in Death Valley using dual frequency and polarization imaging radar data.** M. Daily (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; California, University, Santa Barbara, Calif.), C. Elachi, T. Farr (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). and G. Schaber (U.S. Geological Survey, Flagstaff, Ariz.). *Geophysical Research Letters,* vol. 5, Oct. 1978, p. 889-892. 8 refs. Contract No. NAS7-100.

A simultaneous analysis of dual-frequency and dual-polarization radar imagery of an area located in the central part of Death Valley, Calif., is discussed. The radar imagery analyzed consists of like-polarized L-band, cross-polarized L-band, and like-polarized X-band imagery digitally combined and ratioed to enhance the variation in the backscatter cross section of different geologic units. It is shown that simultaneous analysis of such radar imagery leads to a synergism effect which, in the case of the area studied in Death Valley, allows nearly complete discrimination of surficial geologic units. Radar backscatter is found generally to increase with roughness from smooth Quaternary sand facies to rough and extremely rough Quaternary silty rock salt. F.G.M.

A79-14157 # **Classification of rocks on the basis of signatures and texture-measures from Landsat imagery.** H. Burger (Berlin, Freie Universität, Berlin, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 33-35.

An algorithm is described which uses both texture and signature information from multispectral images for terrain classification. The method of Haralick et al. (1973) for texture analysis is generalized to the multispectral case; other texture measures are also examined. The classification has been tested on a Landsat image of the Tibesti Mountains of Chad. Preliminary results indicate that this evaluation of the classification technique was not entirely successful. B.J.

A79-14164 # **Digital processing of Landsat data for geological applications.** R. Haydn (Zentralstelle für Geo-Photogrammetrie und Fernerkundung, Munich, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 89-92.

Various digital image processing techniques are described and their feasibility for geological applications is discussed. Based on Landsat images mainly representing arid areas, the treatment of single-band and multiband data is demonstrated using algorithms for contrast manipulations, for statistical enhancement and analysis, and for logical operations. The use of analog techniques such as the combination of processed images by color composition techniques is also discussed. From a methodological point of view, principal-component transformation and band ratioing are found to be extremely useful, especially in combination with postprocessing techniques. B.J.

A79-14180 # **Interactive digital image processing of Landsat data for geologic analysis.** A. F. Smith (GE Space Systems Organization, Beltsville, Md.). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977 Graz, Technische Universität Graz, 1978, p. 197-212. 16 refs.

Several image processing and enhancement techniques employed to extract geological information are discussed. Particular consideration is given to the application of the Image 100 multispectral image processing system to the digital analysis of Landsat imagery of a study area in southwestern Arizona. The relative advantages of several supervised and unsupervised classification routines, including single-cell parallelepiped signature analysis, feature-space parti-

tioning, and single-band density slicing are discussed. Enhancement techniques, including several combinations of linear and nonlinear contrast stretching and ratioing, are also described. Results indicate that interactive processing of Landsat data significantly aids in the mapping and analysis process for the preparation of geological maps. B.J.

A79-16725 # **Landsat - Developing techniques and applications in mineral and petroleum exploration.** C. J. Simpson. *BMR Journal of Australian Geology and Geophysics,* vol. 3, Sept. 1978, p. 181-191. 45 refs.

The extensive research into satellite data technology that followed the launch of Landsat-1 (ERTS-1) in 1972 has resulted in progressive improvements to product quality and digital data analysis techniques. Improved image quality has direct significance to the many mineral and petroleum exploration organisations that are now routinely applying conventional photogeological interpretation techniques to Landsat multispectral scanner imagery. Photogeological techniques will continue to be the main means of Landsat interpretation; however, even the best quality imagery may contain less than one quarter of the total data recorded and computer techniques offer the only adequate means of analysing all the data in a Landsat scene. Considerable progress has been made with computer analysis of Landsat digital data and some techniques have definite application to mineral and petroleum exploration. In specific environments direct detection of iron weathering products associated with both hydrothermal alteration and uranium deposits has been achieved. Various computer-enhancement techniques have also been employed to reveal structural and lithological information not obvious on conventional Landsat imagery or aerial photography. (Author)

A79-16777 # **The importance of repeated and multispectral analyses in geological-structural applications of data obtained from space (L'importanza dell'analisi multitemporale e multispettrale nelle applicazioni geologico-strutturali dei dati di provenienza spaziale).** C. M. Marino (Milano, Università, Milan, Italy). In: Space in the service of man; International Scientific Conference on Space, 18th, Rome, Italy, March 15, 16, 1978, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1978, p. 301-307. 7 refs. In Italian.

Reasons for obtaining repeated remote-sensor observations of land features are examined, and factors which affect feature appearance are described. Landsat data for some areas in northern Italy are studied to determine seasonal variation in the appearance of geological and structural features. Structural features, primarily linear features, were studied in different spectral bands. Application of observational equipment and techniques is discussed. M.L.

N79-10501*# National Aeronautics and Space Administration, Washington, D. C.

REMOTE SENSING APPLIED TO PROSPECTING OF THERMOMINERAL WATER IN THE COUNTY OF CALDAS NOVAS-GOIAS

Paulo Veneziani and Celio EustaquiodosAnjos Nov. 1978 13 p refs Transl. into ENGLISH of "Sensores Remotos Aplicados a Prospeccao de Aguas Termominerais no Municipio de Caldas Novas-Goias", Rept. INPE-1327-PE/157 Inst. de Pesquisas Espaciais, Sao Paulo, Brazil, Aug. 1978 10 p Presented at the 30th Brazilian Congr. of Geol., Recife, Brazil, 1 Nov. 1978 Transl. by Sci. Transl. Serv., Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75583; INPE-1327-PE/157) Avail: NTIS HC A02/MF A01 CSCL 08H

LANDSAT imagery of the region were studied allowing the placement of the area of study in the regional geological context. A geological mapping of the 1.60.000 scale was done. A methodology was developed which consisted in a regional temperature mapping using trend surface analysis. Through the correlation of all these data, four different areas were localized with a high potential as thermomineral sources. Author

N79-10502*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MINERAL PRECIPITATION IN NORTH SLOPE AUFEIS

Dorothy K. Hall Sep. 1978 10 p refs Submitted for publication
(NASA-TM-79642) Avail: NTIS HC A02/MF A01 CSCL 08G

The Canning and Shaviovik river aufeis fields were studied on the ground and with aircraft data. Powdered calcium carbonate (CaCO3) patches, a few cm in thickness, were found in discrete locations on both aufeis fields. This is indicative of chemical weathering of limestone bedrock which is known to underlie much of the eastern arctic coastal plain of Alaska. Spring or river water which remains unfrozen throughout much of the winter carries CaCO3 in solution; as the river ice freezes more deeply the CaCO3 in solution is forced upwards through cracks in the river ice. Upon exposure to the cold air CaCO3 is excluded as the water freezes, forming successive layers during aufeis growth. In the melt season CaCO3, slush/powder accumulates in patches on top of the ice as the aufeis melts downward. Author

N79-10507# National Technical Information Service, Springfield, Va.

REMOTE SENSING APPLIED TO GEOLOGY AND MINERALOGY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1973 - Jul. 1978

Audrey S. Hundemann Aug. 1978 154 p Supersedes NTIS/PS-77/0676 3 Vol.
(NTIS/PS-78/0791/0; NTIS/PS-77/0676) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

The use of LANDSAT satellites and other remote sensing methods in geological and mineralogical applications is discussed. Abstracts cover rock and soil mapping, terrain analysis, direct and indirect mineral exploration, fault tectonics, and general geologic studies of various countries. A few abstracts pertain to equipment and techniques used in the studies. This updated bibliography contains 147 abstracts, 25 of which are new entries to the previous edition. GRA

N79-11449*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

OPTIMUM THERMAL INFRARED BANDS FOR MAPPING GENERAL ROCK TYPE AND TEMPERATURE FROM SPACE Final Task Report, Jan. 1978 - Jul. 1978

Quentin A. Holmes and Daniel R. Nuesch Sep. 1978 45 p refs
(Contract NAS9-15362)
(NASA-CR-151842; ERIM-130100-13-F) Avail: NTIS HC A03/MF A01 CSCL 20F

A study was carried out to determine quantitatively the number and locations of spectral bands required to perform general rock-type discrimination from spaceborne imaging sensors using only thermal infrared measurements. Beginning with laboratory spectra collected under idealized conditions from relatively well characterized, homogeneous samples, a radiative transfer model was employed to transform ground exitance values into the corresponding spectral radiance at the top of the atmosphere. Taking sensor noise into account analysis of these data revealed that three 1 micrometer wide spectral bands would permit independent estimators of rock-type and sample temperature from a satellite infrared multispectral scanner. This study, indicates that the location of three spectral bands at 8.1-9.1 micrometers, 9.5-10.5 micrometers and 11.0-12.0 micrometers, and the employment of appropriate preprocessing to minimize atmospheric effects makes it possible to predict general rock-type and temperature for a variety of atmospheric states and temperatures. Author

N79-11450# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

PRELIMINARY GEOLOGICAL PRECAMBRIAN MAP OF PIAUI [MAPA GEOLOGICO PRELIMINAR DO PRECAMBRIANO DO PIAUI]

Edison Crepani, Paulo Roberto Martini, Paulo Veneziani, Augusto PaivaFilno, and Moacir Moco Oct. 1977 22 p refs In PORTUGUESE; ENGLISH summary
(INPE-1146-PE/099) Avail. NTIS HC A02/MF A01

A preliminary geological precambrian map was done using LANDSAT images and SLAR mosaics of the project RADAM/

BRAZIL. The map is presented in three parts which correspond to the South, the East and the North of the State. B.B.

N79-12528*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT GONDWANA: JUGARIBE-SB-24 [PROJETO GONDWANA: FOLHA JAGUARIBE-SB-24]
Nelson deJesusParada, Principal Investigator, Edison Crepani, Paulo Roberto Martini, and Roberto Pereira daCunha Aug. 1978 6 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E79-10013; NASA-CR-157902) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-12529*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING APPLIED TO SURVEYING THE THERMOMINERAL WATER REGION OF CALDAS NOVAS, GOIAS [SENSORES REMOTOS APLICADOS A PROSPECCAO DE AGUAS TERMOMINERAIS NO MUNICIPIO DE CALDAS NOVAS, GOIAS]
Nelson deJesusParada, Principal Investigator, Paulo Veneziani, and Celio Eustaquio dosAnjos Aug. 1978 11 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E79-10014; NASA-CR-157903) Avail: NTIS HC A02/MF A01 CSCL 08H

N79-13433*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
UTILIZATION OF LANDSAT IMAGES FOR GEOLOGICAL INVESTIGATION IN THE CENTRAL PORTION OF MINAS GERAIS [APLICACAO DE IMAGENS LANDSAT NA COMPARTIMENTACAO TECTONICA EM MINAS GERAIS]
Nelson deJesusParada, Principal Investigator, Roberto Pereira daCunha, and Juercio Tavares deMattos Aug. 1978 16 p refs In PORTUGUESE; ENGLISH summary Presented at 30th Congresso Brasileiro de Geologia, Brazil, 1-7 Nov. 1978 Sponsored by NASA ERTS
(E79-10020; NASA-CR-157909; INPE-1325-PE/155) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13446*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE APPLICATION OF REMOTE SENSORS IN THE INTERPRETATION OF LANDSAT DATA FOR REGIONAL GEOLOGICAL MAPPING IN THE CENTRAL PORTION OF MINAS GERAIS [APLICACAO DE SENSORES REMOTOS, COM ENFASE EN IMAGENS LANDSAT, EN MAPEAMENTO GEOLOGICO REGIONAL NO NORTE DE MINAS GERAIS]
Nelson deJesusParada, Principal Investigator, Juercio Tavares deMattos, and Roberto Pereira daCunha Apr. 1978 229 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10039; NASA-CR-157926) Avail: NTIS HC A11/MF A01 CSCL 05B

N79-13472*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF MULTISPECTRAL SCANNER DATA TO THE STUDY OF AN ABANDONED SURFACE COAL MINE
Ernie W. Spisz Nov. 1978 80 p refs Original contains color illustrations
(NASA-TM-78912; E-9647) Avail: NTIS HC A05/MF A01 CSCL 08I

The utility of aircraft multispectral scanner data for describing the land cover features of an abandoned contour-mined coal mine is considered. The data were obtained with an 11 band multispectral scanner at an altitude of 1.2 kilometers. Supervised, maximum-likelihood statistical classifications of the data were made to establish land-cover classes and also to describe in more detail the barren surface features as they may pertain to the reclamation or restoration of the area. The scanner data for the surface-water areas were studied to establish the variability and range of the spectral signatures. Both day and night thermal images of the area are presented. The results of the study show that a high degree of statistical separation can be obtained from the multispectral scanner data for the various land-cover features. G.G.

N79-14501*# National Aeronautics and Space Administration, Washington, D. C.
APPLICATION OF LANDSAT IMAGES IN THE MINAS GERAIS TECTONIC DIVISION
Roberto Pereira daCunha and Juercio Tavares deMattos Dec. 1978 26 p refs Transl. into ENGLISH of "Aplicacao de Imagens LANDSAT na Compartimentacao Tectonica de Minas Gerais", Rept. INPE-1325-PE/155 Inst. de Pesquisas Espaciais, Sao Paulo, Brazil, Aug. 1978 14 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75584; INPE-1325-PE/155) Avail: NTIS HC A03/MF A01 CSCL 08G

The interpretation of LANDSAT data for a regional geological investigation of Brazil is provided. Radar imagery, aerial photographs and aeromagnetic maps were also used. Automatic interpretation, using LANDSAT OCT's was carried out by the 1-100 equipment. As a primary result a tectonic map was obtained, at 1:1,000,000 scale, of an area of about 143,000 square kilometers, in the central portion of Minas Gerais and Eastern Goias States, known as regions potentially rich in mineral resources. G.G.

N79-15360*# Geological Survey, Denver, Colo. Branch of Petrophysics and Remote Sensing.
GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, 1 Sep. - 31 Nov. 1978
Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Dec. 1978 9 p Sponsored by NASA ERTS
(E79-10081; NASA-CR-157974) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. Approximately 400 miles of low altitude scanner data of good quality was acquired over the Powder River Basin between 13-16 Oct. 1978. Radiometric and meteorological data from three ground stations were also acquired in support of low altitude U.S.G.S. overflights.

N79-15379# Lockheed Electronics Co., Inc., Las Vegas, Nev. Remote Sensing Lab.
REMOTE MONITORING OF COAL STRIP MINE REHABILITATION Final Report, 1 Jul. 1975 - 31 Dec. 1976
James E. Anderson and Charles E. Tanner Jul. 1978 71 p refs
(Contract EPA-68-03-2636)
(PB-286647/3; EPA-600/7-78-149) Avail: NTIS HC A04/MF A01 CSCL 08I

The results of manual photointerpretation and automated data analysis are discussed. Included is a feasibility study to use LANDSAT data for performing a regional land-cover classification of a portion of the Powder River Basin area in northeastern Wyoming, where there are numerous coal strip mines. GRA

05

OCEANOGRAPHY AND MARINE RESOURCES

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

A79-11000 * The blue-to-green reflectance ratio and lake water quality. K. R. Piech, J. R. Schott (Calspan Corp., Buffalo, N.Y.), and K. M. Stewart (New York, State University, Buffalo, N.Y.). *Photogrammetric Engineering and Remote Sensing*, vol. 44, Oct. 1978, p. 1303-1310. 19 refs. NSF Grants No. GA-37768; No. GA-32207; Contract No. NAS9-13336.

Correlations between the relative values of the blue and green reflectances of a lake and water quality indices, such as depth of photic zone, Secchi disk transparency, attenuation coefficient, and chlorophyll concentration, have been observed during an intensive satellite, aircraft, and surface vessel study of Lake Ontario and Conesus Lake. Determinations of blue and green reflectances from Skylab S190A color imagery are in excellent agreement with values obtained from small-scale color imagery from aircraft. Further, the accuracy of the satellite data appears within that required for extrapolation to the water quality indices. The study has also determined that changes in chlorophyll, lignin, and humic acid concentration can be discriminated by the behavior of the blue-to-green reflectance ratio and the reflectances of the green and red bands. (Author)

A79-11248 * Application of space remote sensing technology to living marine resources in coastal zones. E. L. Tilton, III (NASA, National Space Technology Laboratories, Earth Resources Laboratory, Slidell, La.). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-110*. 14 p. 8 refs.

This paper describes a compilation of new Landsat satellite remote sensing techniques for treatment of Coastal Zone Living Marine Resource problems. The techniques have been developed over the past three to five years using optimized digital analysis procedures and evaluated in limited coastal areas of the United States. However, most of the techniques are directly applicable to other areas of the world, particularly in those areas where Landsat satellite data are available. Each technique presented herein has been documented and published separately as a NASA report within the last three years. The data required to substantiate the conclusion that 'significant new space remote sensing techniques are now available for the treatment of Coastal Zone Living Marine Resource problems' are contained within these reports and are referenced herein. (Author)

A79-11271 Useful spaceborne synthetic aperture radars. R. C. Beal (Johns Hopkins University, Laurel, Md.). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-148*. 14 p. 11 refs.

The paper surveys the application of spaceborne synthetic aperture radar in remote sensing noting the Seasat program. The Seasat program has been used to study waves generated by winter storms, variations in the polar ice cap, ocean current boundaries, and iceberg drifting. The measurement of relative backscatter is discussed noting potential error sources such as the primary standard, small-scale local errors in the vicinity of strong sources, antenna pattern uncertainties, processing variability, and coherent speckle. Geometric accuracy is described and recommendations are made for future work. S.C.S.

A79-11379 # Remote sensing oceanographic and terrestrial information systems. A. K. McQuillan, J. C. Henein, L. W. Morley (Canada Centre for Remote Sensing, Ottawa, Canada), and D. J. Clough (Waterloo, University, Waterloo, Ontario, Canada). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 105-127. 10 refs.

Some airborne remote sensing applications are considered, taking into account applications of multispectral photography, the detection of heat loss from buildings, the detection of leaks in underground heating systems, and the determination of frost prone areas in the Niagara fruit belt. Questions related to the application and benefits of Landsat data are also discussed, giving attention to the monitoring to snow and fresh water ice conditions, the monitoring of forest conditions, aspects of topographic mapping, operational and historical sea ice information, geological applications, and wheat forecasting benefits. It is pointed out that oceanographic remote sensing information systems have considerable potential economic value because of the dynamic nature of ocean-related phenomena and the difficulty of obtaining adequate information by alternative methods. G.R.

A79-11766 * # Quantitative mapping of particulate iron in an ocean dump using remotely sensed data. C. W. Ohlhorst (NASA, Langley Research Center, Hampton, Va.) and G. S. Bahn (Vought Corp., Hampton, Va.). *American Congress on Surveying and Mapping and American Society of Photogrammetry, Annual Spring Convention, Washington, D.C., Feb. 26-Mar. 3, 1978, Paper.* 17 p. 9 refs.

A remote sensing experiment was conducted at the industrial acid waste ocean dump site located approximately 38 n mi SE of Cape Henlopen, Delaware, to see if there was a relationship between aircraft remotely sensed spectral signatures and the iron concentration measured in the plume. Results are presented which show that aircraft remotely sensed spectral data can be used to quantify and map an acid waste dump in terms of its particulate iron concentration. A single variable equation using the ratio of band 2 (440-490 nm) radiance to band 4 (540-580 nm) radiance was used to quantify the acid plume and the surrounding water. The acid waste varied in age from freshly dumped to 3 1/2 hours old. Particulate iron concentrations in the acid waste were estimated to range up to 1.1 mg/liter at the 0.46 meter depth. A classification technique was developed to remove sunglitter-affected pixels from the data set. (Author)

A79-12506 Space observations over fishing grounds. K.-H. Szekielda (Hamburg, Universität, Hamburg, West Germany). In: The contribution of space observations to global food information systems; Proceedings of the W. Nordberg Memorial Symposium, Tel Aviv, Israel, June 7-18, 1977. Oxford, Pergamon Press, Ltd., 1978, p. 173-179. 7 refs.

The importance of upwelling for fisheries is considered, and the use of satellites to monitor upwelling is discussed. It is suggested that upwelling patterns can be detected from satellite observations of temperature anomalies and changes in sea color. The correlation of changes in these parameters with areas of high productivity is examined. M.L.

A79-13384 Application of the remote sensing of sea color for the study of marine suspensions (Intérêt de la télédétection de la couleur de l'eau de mer pour l'étude des suspensions marines). Y. F. Thomas (Ecole Normale Supérieure, Montrouge, Hauts-de-Seine, France). In: Space research XVIII; Proceedings of the Open Meetings of the Working Groups on Physical Sciences, Tel Aviv, Israel, June 7-18, 1977. Oxford, Pergamon Press, Ltd., 1978, p. 35-38. 8 refs. In French.

Consideration is given to models of radiative transfer applicable to the evaluation of water quality. The models of Gordon (1976), Viollier (1976), and Prieur (1976) are discussed with reference to data obtained from bands 4, 5, and 6 of the Landsat multispectral

scanner. A Landsat image taken in March 1973 is interpreted in conjunction with a retrodiffusion albedo model of the western portion of the Mont Saint Michel Bay. S.C.S.

A79-13837 # **'Smart' remote sensor needs for U.S. Coast Guard ocean environment missions.** R. M. Hayes (U.S. Coast Guard Oceanographic Unit, Washington, D.C.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1721.* 8 p. 24 refs.

Expanded jurisdiction and increased statutory requirements have led the U.S. Coast Guard to evaluate various remote sensing systems for their potential to satisfy operational mission requirements for maritime safety, environmental protection, and law enforcement. The real-time nature of operations, the multiple use aspect of the sensors, and the wide areal coverage dictates a need for complex, swift, and accurate data processing systems. The development of the 'smart' remote sensor concept for ocean environment data collection should include consideration of the operational user with quick turnaround needs. Experience has shown that design goals should be to provide direct to the user preprocessed data to reduce the delay time in data utilization and to facilitate operational use of remotely sensed data. (Author)

A79-13850 * # **Advanced systems requirements for ocean observations via microwave radiometers.** H.-J. C. Blume, C. T. Swift, and B. M. Kendall (NASA, Langley Research Center, Hampton, Va.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1737.* 7 p. 5 refs.

A future microwave spectroradiometer operating in several frequency bands will have the capability to step or sweep frequencies on an adaptable or programmable basis. The on-board adaptable frequency shifting can make the systems immune from radio interference. Programmable frequency sweeping with on-board data inversion by high speed computers would provide for instantaneous synoptic measurements or sea surface temperature and salinity, water surface and volume pollution, ice thickness, ocean surface winds, snow depth, and soil moisture. Large structure satellites will allow an order of magnitude improvement in the present radiometric measurement spacial resolution. (Author)

A79-14158 # **Multispectral classification on tidal lands.** E. Dennert-Möller (Hannover, Technische Universität, Hanover, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 37-40.

The application of maximum-likelihood classification to multispectral images of the tidal flats of the Jade estuary at the North Sea is discussed. Frame photographs, Landsat images, and airborne multispectral scans were obtained of such tidal flat structures as mud flats, sand flats, dry sand, seagrass, diatoms, and certain types of shells. It is found that the maximum likelihood method is successful in classifying uncovered tidal flats (such as mud and sand flats) and in discriminating them from covered flats. The same thing is true for seagrass meadows if the training fields are pretreated in the specified manner. Diatoms, however, cannot be classified in this way. B.J.

A79-15103 * **Signature extraction of ocean pollutants by eigenvector transformation of remote spectra.** G. W. Grew (NASA, Langley Research Center, Hampton, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 659-666.

Spectral signatures of suspended matter in the ocean are being extracted through characteristic vector analysis of remote ocean color data collected with MOCS (Multichannel Ocean Color Sensor). Spectral signatures appear to be obtainable through analyses of 'linear' clusters that appear on scatter diagrams associated with eigenvectors. Signatures associated with acid waste, sewage sludge, oil, and algae are presented. The application of vector analysis to two acid waste dumps overflown two years apart is examined in some detail. The relationships between eigenvectors and spectral signatures for these examples are analyzed. These cases demonstrate the value of characteristic vector analysis in remotely identifying pollutants in the ocean and in determining the consistency of their spectral signatures. (Author)

A79-15119 * **Laboratory studies of in vivo fluorescence of phytoplankton.** C. A. Brown, Jr., F. H. Farmer, O. Jarrett, Jr., and W. L. Staton (NASA, Langley Research Center, Hampton, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings.
Washington, D.C., American Chemical Society, 1978, p. 782-788. 14 refs.

A lidar system is developed that uses four selected excitation wavelengths to induce chlorophyll 'a' fluorescence which is indicative of both the concentration and diversity of phytoplankton. The operating principles of the system and the results of measurements of phytoplankton fluorescence in a controlled laboratory environment are presented. A comparative study of results from lidar fluorosensor laboratory tank tests using representative species of phytoplankton in single and multispecies cultures from each of four color groups reveals that (1) there is good correlation between the fluorescence of chlorophyll 'a' remotely simulated and detected by the lidar system and in-situ measurements using four similar excitation wavelengths in a flow-through fluorometer; (2) good correlation exists between the total chlorophyll 'a' calculated from lidar-fluorosensor data and measurements obtained by the Strickland-Parsons method; and (3) the lidar fluorosensor can provide an index of population diversity. S.D.

A79-16776 # **Remote sensing and ocean modelling - An application to the Adriatic Sea.** P. Malanotte-Rizzoli (CNR, Laboratorio per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) and G. Halikas (California, University, La Jolla, Calif.). In: Space in the service of man; International Scientific Conference on Space, 18th, Rome, Italy, March 15, 16, 1978, Proceedings.

Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1978, p. 291-300. 5 refs.

The complementary use of qualitative and quantitative satellite imagery is considered, and the use of qualitative imagery to study circulation in the Adriatic Sea is described. Visible and infrared wavelength imagery was obtained to supplement and confirm temperature distribution patterns determined from oceanographic cruise data. Interpretation of the satellite data is discussed, temperature patterns of the Adriatic Sea are reported, and a dynamical circulation model of the north Adriatic Sea is summarized. M.L.

N79-11647# National Marine Fisheries Service, Seattle, Wash.
SEA SURFACE TEMPERATURE DISTRIBUTIONS OBTAINED OFF SAN DIEGO, CALIFORNIA, USING AN AIRBORNE INFRARED RADIOMETER
James L. Squire (Natl. Marine Fisheries Service, La Jolla, Calif.)
Mar. 1978 38 p refs
(PB-284736/6; NOAA-TR-NMFS-SSRF-720;
NOAA-78062601) Avail: NTIS HC A03/MF A01 CSCL 08T

Sea surface temperature surveys were conducted weekly off San Diego, Calif., using an airborne infrared radiometer during the months of April through October 1972-74. A total of 900 surveys were made over the 320 mile flight track. The analog chart record of temperature was keyed to a ground truth temperature measurement and read to determine 1 min average temperatures which were plotted on the flight track and 1F(0.56C) isotherms were contoured from the data. The 1972-74 survey temperatures taken over the ground truth calibration site were compared with a time series of temperature observations taken during the same month from 1963 to 1968. GRA

N79-11648# Inter-American Tropical Tuna Commission, La Jolla, Calif.

COASTAL ZONE AND OPEN OCEAN OBSERVATIONS FROM NOAA SATELLITE VERY HIGH RESOLUTION RADIOMETERS Final Report

Merritt R. Stevenson and Robert G. Kirkham Dec. 1977 99 p refs

(Contract NOAA-03-7-208-35236)

(PB-284445/4; NOAA-78070512) Avail: NTIS HC A05/MF A01 CSCL 08J

The utility of very high resolution radiometers, aboard NOAA-5, for measuring sea surface temperature (SST) is considered. The feasibility of deriving reliable SST's from the thermal infrared data sensed by these instruments, for both coastal zone and open ocean regions during CY 1978 is stressed. The investigations include the analysis of very high resolution radiometer infrared (VHRRIR) digital data fields from eight particular NOAA series satellite orbits. The derived SST fields are contoured both by grayscaling, and by the more conventional streamline format, and estimates are also made of absolute derived SST's. GRA

N79-13437*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF LANDSAT SATELLITE IMAGERY AND OCEANOGRAPHIC DATA FOR VERIFICATION OF AN UPWELLING MATHEMATICAL MODEL [APLICACAO DAS IMAGENS DO SATELITE LANDSAT E DADOS OCEANOGRAFICOS NA VERIFICACAO DE UM MODELO MATEMATICO DE RESSURGENCIA]

Nelson deJesusParada, Principal Investigator, Keiko Tanaka, and Emmanuel Gama Almeida Aug. 1978 2,1 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography maybe purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E79-10026; NASA-C -157915; INPE-1349-NTE/131) Avail: NTIS HC A02/MF A01 CSCL 08C

The author has identified the following significant results. Data obtained during the cruise of the Cabo Frio and from LANDSAT imagery are used to discuss the characteristics of a linear model which simulates wind induced currents calculated from meteorological conditions at the time of the mission. There is a significant correspondance between the model of simulated horizontal water circulation, sea surface temperature, and surface currents observed on LANDSAT imagery. Close approximations were also observed between the simulation of vertical water movement (upwelling) and the oceanographic measurements taken along a series of points of the prevailing currents.

N79-13995# Joint Publications Research Service, Arlington, Va.

OCEAN OBSERVATION FROM SPACE

A. Bolshakov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 61-64 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, 1978 p 32-33

Copyright. Avail: NTIS HC A05/MF A01

Investigations of the seas and oceans made from Soviet spaceships and orbiting stations are described. Visual observation and television were used to establish the relationship between cloud cover and ocean currents. Other areas discussed include ocean floor topography, satellite communications systems at sea, ocean surface characteristics, temperature distribution, and petroleum pollution. S.R.S.

N79-14699# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF REMOTE SENSING TO THE ESTIMATION OF CHLOROPHYLL IN OCEAN WATER [O SENSORIAMENTO REMOTO APLICADO NA ESTIMATIVA DA CONCENTRACAO DE CLOROFILA NO MAR]

Joao Antonio Lorenzzetti Oct. 1978 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 5th Simp. Latinoam. Sobre Oceanog. Biol., Sao Paulo, Brazil, 20-25 Nov. 1978

(INPE-1380-PE/177) Avail: NTIS HC A02/MF A01

The feasibility of estimating the chlorophyll content of ocean waters through the use of multispectral remote sensors on board orbiting satellites is discussed. Some aspects of the physical foundations of the interaction processes of visible light with the *atmosphere and liquid mass and some models for this detection* are included. J.M.S.

N79-14712# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE APPLICATION OF REMOTE SENSORS TO A MODEL FOR FISH MAPPING [O SENSORIAMENTO REMOTO APLICADO A UM MODELO DE CARTAS DE PESCA]

Sydnea Maluf Oct. 1978 12 p refs In PORTUGUESE, ENGLISH summary Presented at the 5th Simp. Latinoam. sobre Oceanog. Biol., Sao Paulo, Brazil, 20-25 Nov. 1973

(INPE-1379-PE/176) Avail: NTIS HC A12/MF A01

A methodology for the determination of the best potential fishing zones, for sardines, in the Brazilian coastal area of the *southwestern tropical Atlantic Ocean, between latitudes 21 deg* 45'S and 25 deg 00'S and longitudes 40 deg 50'W and 47 deg 00'W is presented. A fishing chart model was developed from observations relative to the months of July, August, September, November and December. Marine fishing charts containing such zones are presented for the September month. The potentiality of the VHRR-IR and the surface charts of NOAA's satellite in determinating fishing zones is demonstrated. G.G.

N79-15357*# Florida Univ., Gainesville. Florida Agricultural Market Research Center.

COMMERCIAL FISHING PORT DEVELOPMENT IN NORTH FLORIDA

Kary Mathis, Principal Investigator, James C. Cato, Paul D. Degner, Paul D. Landrum, and Fred J. Prochaska Sep. 1978 242 p refs Sponsored by NASA and in part by Gulf and South Atlantic Fisheries Development Foundation, Inc. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E79-10078; NASA-CR-157971; Rept-78-6) Avail: NTIS HC A11/MF A01 CSCL 05C

The author has identified the following significant results. Seven major counties were examined: Escambia, Bay, Gulf, Franklin, Wakulla, Nassau, and Duval. Population and economic activity were reviewed, along with commercial fishing and port facilities. Recommendations for five northwest Florida counties were based on interpretation of aerial photographs, satellite imagery, an aerial survey site visit, and published data. Major *needs in Pensacola included docking, ice supply, and net and* engine repair services. Costs for additional docks, an ice plant, and gear storage were estimated at $3,658,600. Port users in Panama City identified additional docking and gear storage as primary needs, along with gear repair and a marine railway. Estimated costs for dock and gear storage were $2,860,000. Added docking, gear storage, and ice supply, as well as gear electronics and diesel repair were needed in Port St. Joe. Costs were calculated at $1,231,500. Franklin County has three ports (Apalachicola - $1,107,000 for docks and gear storage, East*point - $420,000 for additional docks, and Carrabella* - $2,824, 100 for docks, gear storage, and ice plant).

N79-15371*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

SEASAT A. OCEANOGRAPHY TODAY

[1978] 15 p Sponsored by NASA Original contains color illustrations

(NASA-CR-158064) Avail: NTIS HC A02/MF A01 CSCL 08C

The mission, orbital flight, and onboard instrumentation of Seasat A are described. F.O.S.

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.

A79-11661 **40 years of Mississippi River floodplain change assessed by aerial photography.** K. N. Olson (Idaho, Dept. of Lands, Boise, Idaho) and M. P. Meyer (Minnesota, University, St. Paul, Minn.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 40-53. 8 refs. Grant No. DACW37-74-C-0043.

A79-11667 * **Landsat change detection can aid in water quality monitoring.** H. C. MacDonald, K. F. Steele, W. P. Waite (Arkansas, University, Fayetteville, Ark.), and M. R. Shinn. In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings.
Falls Church, Va., American Society of Photogrammetry, 1977, p. 192-203. NASA-supported research.

Comparison between Landsat-1 and -2 imagery of Arkansas provided evidence of significant land use changes during the 1972-75 time period. Analysis of Arkansas historical water quality information has shown conclusively that whereas point source pollution generally can be detected by use of water quality data collected by state and federal agencies, sampling methodologies for nonpoint source contamination attributable to surface runoff are totally inadequate. The expensive undertaking of monitoring all nonpoint sources for numerous watersheds can be lessened by implementing Landsat change detection analyses. (Author)

A79-11672 * **Multispectral remote observations of hydrologic features on the North Slope of Alaska.** D. K. Hall (NASA, Goddard Space Flight Center, Greenbelt, Md.) and M. L. Bryan (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 393-424. 43 refs.

Visible and near-infrared Landsat satellite imagery and active and passive aircraft microwave data are used to analyze some hydrologic features in Arctic Alaska. Lake studies using passive microwave imagery reveal that an increase in the microwave brightness temperature correlates with an increase in ice thickness. Synthetic Aperture Radar (SAR) imagery allows determination of lakes that are frozen to the bottom under certain conditions. Landsat imagery of lakes can be used to study summer ice cover dissipation, an indicator of lake depth. River channel morphometry and morphology studies are accomplished using SAR data with good (25 m) resolution. Landsat imagery is shown to be useful for analyzing interannual variations in the extent of river icings (aufeis). Snow depth variations are shown to be potentially discernable using passive microwave data. Finally, the present and potential applications of these remote sensing studies are discussed; these data are useful for locating potable water sources, planning construction in good locations, and for analyzing interannual climate fluctuations. (Author)

A79-11755 # **The use of Landsat-derived land cover data in a flood peak correlation study.** A. W. Voss (Tennessee Valley Authority, Mapping Services Branch, Chattanooga, Tenn.), J. E. Baker (Hydrocomp, Inc., Atlanta, Ga.), G. E. Hauser, and D. W. Newton (Tennessee Valley Authority, Flood Control Branch, Knoxville, Tenn.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 135-146. 7 refs.

Ground-cover information derived from Landsat data has been used to estimate the flood-flow frequency for ungaged watersheds. A set of prediction equations, defining flood flow at several exceedence frequencies as a function of ground cover and other geomorphic and climatic characteristics, is developed on the basis of multiple regression techniques. Nine ground-cover groups are defined for two Landsat scenes: eastern Tennessee and portions of the Tennessee Valley. Eleven geomorphic characteristics for each watershed are found from 1:24,000-scale topographic maps. The results indicate that a significant decrease in the standard error of estimate is achieved when Landsat ground-cover data is used in the regression analysis. S.C.S.

A79-11756 # **Landsat analysis of lake quality for statewide lake classification.** F. L. Scarpace, L. T. Fisher (Wisconsin, University, Madison, Wis.), and K. W. Holmquist (Wisconsin Department of Natural Resources, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 173-195. 6 refs.

Landsat data have been used in the cooperative program between the Wisconsin Department of Natural Resources and the University of Wisconsin at Madison in a study of the trophic status of inland lakes. As part of the analysis procedures, a computer program was developed to decode multispectral data from Landsat tapes and to create character maps. The results show that Landsat multispectral scanner data is capable of monitoring lake trophic conditions when multitemporal satellite data is employed. Corrections for atmospheric effects and additional ground calibration data are also required. S.C.S.

A79-11757 # **Multidate data extraction procedures for a statewide Landsat lake quality monitoring program.** L. T. Fisher, F. L. Scarpace (Wisconsin, University, Madison, Wis.), and R. G. Thomsen (Kinetic Research, Inc., Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings.
Falls Church, Va., American Society of Photogrammetry, 1978, p. 196-213. 7 refs.

The paper discusses the project developed to operationally monitor water quality in about 3,000 inland lakes in Wisconsin developed by the University of Wisconsin at Madison and the Wisconsin Department of Natural Resources. The requirements of the data-extraction process are identified as multidate analysis, atmospheric corrections, consistent data-set size, the use of automated techniques, and the utilization of existing hardware. The programs and files developed to meet these requirements are discussed including: a master lakes file called ACCESS, a control point file, a data file linked to ACCESS, programs to generate, test and edit the files, a control point file, a navigation program called SATNAV, and a data extraction program called EXTRACT. S.C.S.

A79-11758 # **Summary report - Application of Landsat to the surveillance of lake eutrophication in the Great Lakes basin.** R. H. Rogers, J. B. McKeon (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), V. E. Smith (Cranbrook Institute of Science, Bloomfield Hills, Mich.), and J. P. Scherz (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 214-225.

The cost benefits of using Landsat on an operational basis in the surveillance and control of lake eutrophication was established. To

accomplish this, Landsat data were used to derive maps and data graphics to support the EPA's study of lake eutrophication in Saginaw Bay, the State of Michigan, and the State of Wisconsin's lake and watershed studies. These users provided ground truth and supported evaluation of cost benefits of Landsat products. The significant results of the program included the demonstration of cost-effective systems for monitoring: trophic state of areas/scenes containing 200 or more lakes of 50 acres or larger; trophic state of the Great Lakes; and watershed land use required to predict pollutants in runoff. (Author)

A79-12007 * An interactive lake survey program. A. Y. Smith (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Applications of digital image processing; Proceedings of the International Optical Computing Conference, San Diego, Calif., August 25, 26, 1977. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 21-27. 5 refs.

Consideration is given to the development and operation of the interactive lake survey program developed by the Jet Propulsion Laboratory and the Environmental Protection Agency. The program makes it possible to locate, isolate, and store any number of water bodies on the basis of a given digital image. The stored information may be used to generate statistical analyses of each body of water including the lake surface area and the shoreline perimeter. The hardware includes a 360/65 host computer, a Ramtek G100B display controller, and a trackball cursor. The system is illustrated by the LAKELOC operation as it would be applied to a Landsat scene, noting the FARINA and STATUS programs. The water detection algorithm, which increases the accuracy with which water and land data may be separated, is discussed. S.C.S.

A79-15131 Biological water quality monitoring from remote stations and NASA GOES satellite. E. L. Morgan, K. W. Eagleson (Tennessee Technological University, Cookeville, Tenn.), N. McCollough (Tennessee, University, Knoxville, Tenn.), and R. Herrmann (U.S. Department of the Interior, National Park Service, Atlanta, Ga.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 885-887. 5 refs.

A two-component remote sensing unit for monitoring biological water quality is described. One component involves a biomonitor which uses digital logic to measure fish breathing rates; the biomonitor is interfaced with a NASA remote data collection platform for GOES-satellite transmission of data. The other component is a chemical/physical probe which simultaneously measures dissolved oxygen, temperature, hydrogen ion concentration, conductance, and oxidation-reduction potential. Biological and physical data are transmitted to a data processing center for immediate interpretation of data. Uses of the system are considered. M.L.

A79-15132 * Trophic classification of Colorado lakes utilizing contact data, Landsat and aircraft-acquired multispectral scanner data. D. H. P. Boland (U.S. Environmental Protection Agency, Las Vegas, Nev.) and R. J. Blackwell (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 888-894. 15 refs. Contract No. NAS7-100.

Multispectral scanner data, acquired over several Colorado lakes using Landsat-1 and aircraft, were used in conjunction with National Eutrophication Survey contact-sensed data to determine the feasibility of assessing lacustrine trophic levels. A trophic state index was developed using contact-sensed data for several trophic indicators (chlorophyll a, inverse of Secchi disk transparency, conductivity, total phosphorous, total organic nitrogen, algal assay yield). Relationships between the digitally processed multispectral scanner data, several trophic indicators, and the trophic index were examined using a supervised multispectral classification technique and regression techniques. Statistically significant correlations exist between spectral bands, several of the trophic indicators (chlorophyll a, Secchi disk transparency, total organic nitrogen), and the trophic state index. Color-coded photomaps were generated which depict the spectral aspects of trophic state. Multispectral scanner data acquired from satellite and aircraft platforms can be used to advantage in lake monitoring and survey programs. (Author)

A79-15133 Use of Landsat imagery for Lake Nasser resource management. S. E. Smith, E. M. Fead, and K. H. Mancy (Michigan, University, Ann Arbor, Mich.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 895-898. 14 refs. Research supported by the U.S. Environmental Protection Agency and Ford Foundation.

Landsat imagery, in combination with ground-truthed measurements, were used for the study of the Lake Nasser Reservoir, created by the Aswan High Dam on the River Nile in Egypt and Sudan. Morphometric determinations included shoreline length and surface area and their seasonal and annual variations based on five different measurement techniques. In addition, geographical and temporal variations of surface turbidity were determined, based on Secchi disc water transparency data correlated with microdensitometric measurements of Landsat imagery. Results were interpreted in terms of the geographical distribution and degree of sedimentation of Nile silt in the reservoir. These data are being used for the assessment of current and future holding capacity of the reservoir and the impact of siltation on lake morphology and its fish resources. (Author)

A79-19895 On the nature of base flow and groundwater occurrences in the Serayu River basin. A. M. J. Meijerink (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *ITC Journal*, no. 3, 1978, p. 503-513.

A79-20134 * Remote sensing of surface soil moisture. T. Schmugge (NASA, Goddard Space Flight Center, Greenbelt, Md.). *(Conference on Hydrometeorology, 2nd, Toronto, Canada, Oct. 25-27, 1977.) Journal of Applied Meteorology*, vol. 17, Oct. 1978, p. 1549-1557. 16 refs.

The unique thermal and dielectric properties of water afford two possibilities for remotely sensing the moisture content in the surface layer of the soil. Observations of the diurnal range of surface temperature, the microwave brightness temperature (emissivity) and radar backscatter of the soil have shown correlations of up to 0.9 with the moisture in the surface layer (about 5 cm thick). The microwave techniques appear to maintain their sensitivity to moisture variations in the presence of a crop canopy. Observations of microwave brightness temperature from satellite platforms have qualitatively confirmed this sensitivity for a wide range of conditions. (Author)

N79-12523 North Carolina State Univ. at Raleigh.
THE ECOLOGY OF FOUR COASTAL LAKES IN NORTH CAROLINA: TROPHIC STATES MEASURED FROM SPACE IMAGERY Ph.D. Thesis
Robert Edward Hollman, III 1978 187 p
Avail: Univ. Microfilms Order No. 7820032

The investigation was twofold. The first was to establish seasonal water quality changes occurring in Lake Mattamuskeet, Lake Phelps, New and Pungo Lakes of North Carolina, and the second was to ascertain if any water quality parameter(s) could be correlated with satellite imagery to form the basis of a trophic state monitoring system. From the wide variety of possible trophic state indicators, Secchi disc depth, total phosphorus, conductivity, and chlorophyll-a were found to be most useful. The four parameters provided the most efficient indices for determining

eutrophication. The study demonstrates that the effectiveness and accuracy of the satellite monitoring system for shallow coastal lakes is dependent upon the interpreter's knowledge of the probable seasonal cycle of the lake and of the general lake environment. Dissert. Abstr.

N79-12534# Conservation Foundation, Washington, D. C.
PHYSICAL MANAGEMENT OF COASTAL FLOODPLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT
Dec. 1977 184 p refs Sponsored in part by EPA, Wash. D.C.
(PB-284164/1; NOAA-78060505) Avail: NTIS HC A09/MF A01 CSCL 13B

Development and conservation guidelines for the coastal floodplain are offered in this technical report. Focusing primarily on water systems and water-related aspects of the shoreland, guidelines for nine generalized 'places of concern' were developed. Conservation of coastal ecosystems is one of the two principal objectives of this report. This report deals only with the maintenance of natural defenses against storms and flooding. Characteristics and boundaries, ecological functions, natural resistance to hazards, environmental problems, potential management responses, and conservation guidelines and restoration techniques are discussed. GRA

N79-13425*# Ministry of Construction, Seoul (South Korea).
LAND USE SURVEY AND MAPPING AND WATER RESOURCES INVESTIGATION IN KOREA Final Report
Jae Hwa Choi, Won-Ik Kim, and Dae-Sung Son, Principal Investigators 31 Aug. 1978 34 p Sponsored by NASA ERTS
(E79-10003; NASA-CR-157898) Avail: NTIS HC A03/MF A01 CSCL 08B

The author has identified the following significant results. Land use imagery is applicable to land use classification for small scale land use mapping less than 1:250,000. Land use mapping by satellite is more efficient and more cost-effective than land use mapping from conventional medium altitude aerial photographs. Six categories of level 1 land use classification are recognizable from MSS imagery. A hydrogeomorphological study of the Han River basin indicates that band 7 is useful for recognizing the soil and the weathering part of bed rock. The morphological change of the main river is accurately recognized and the drainage system in the area observed is easily classified because of the more or less simple rock type. Although the direct hydrological characteristics are not obtained from the MSS imagery, the indirect information such as the permeability of the soil and the vegetation cover, is helpful in interpreting the hydrological aspects.

N79-13483# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT, SUMMARY REPORT
13 Apr. 1978 58 p
(PB-285746/4) Avail: NTIS HC A04/MF A01 CSCL 13B

A specific problem analysis was conducted by regional sponsors, one from 21 water resources regions. State and regional viewpoints about the following were examined: (1) existing and future water related problems; (2) conflicts associated with meeting state and regional objectives; and (3) issues needing resolution. B.B.

N79-13485# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
ICEBERGS FOR USE AS FRESH WATER
Jul. 1978 12 p
(PB-285664/9; CIO-78/1) Avail: NTIS HC A02/MF A01 CSCL 13B

Over three quarters of the earth's supply of freshwater is locked up in polar ice. Recent estimates have indicated that this water can be made available for use at 20 to 50% of the cost of desalination of seawater. Ice is used in locating and transporting huge icebergs from the Antarctic and mooring them offshore near water-deficient areas. A single iceberg could supply 1 million acre-feet of water -- enough to satisfy 10 million urban users or irrigate 600 square miles of land for 1 year. Its minimum value would be $20 million. Though possible with existing technology, the handling of fragile, melting ice masses on the order ot 100 million tons (200 times the weight of the largest supertankers) presents substantial problems. The environmental effects and legal responsibilities involved in transporting icebergs and locating them offshore are considered. GRA

N79-14512# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 1: INTRODUCTION
Apr. 1978 44 p refs 6 Vol.
(PB-285747/2) Avail: NTIS HC A03/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Recommendations for determining the adequacy of existing programs and policies for meeting the water requirements in each water resources region of the U.S. are proposed. GRA

N79-14513# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 2: WATER MANAGEMENT PROBLEM PROFILES
Apr. 1978 150 p refs 6 Vol.
(PB-285748/0) Avail: NTIS HC A07/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

A general water balance analysis is presented for each of 106 subregions indicating the scope of critical water quantity, quality, and related land problems. The nature of each problem, its implications and options for resolution are discussed for inadequate water supply; ground water depletion; surface water pollution; ground water contamination; domestic water supply contamination; flooding; erosion and sedimentation; drainage, and bay, estuary, and coastal waters. The impact of each is examined with respect to public health, environmental quality, economic efficiency, resources conservation, international relations, pervasiveness, and urgency. The names of the regions and aggregated subregions studied are included. GRA

N79-14514# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 3: FUNCTIONAL WATER USES
Apr. 1978 386 p refs 6 Vol.
(PB-285749/8) Avail: NTIS HC A17/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

The national perspectives regarding existing (1975) and future (1985 and 2000) requirements for water to meet economic and social needs for basic products, services, and environmental conditions are presented. Offstream uses discussed include domestic and industrial needs, manufacturing and related functions, and the production of energy, food, fibers and minerals. Instream requirements are analyzed for recreation activities, navigation requirements, fish and wildlife habitats and the maintenance of natural areas. Flow management is examined in relation to flood damage, erosion, and sedimentation. State and regional viewpoints are considered separately for situations in which there are major viewpoint differences or projections. GRA

N79-14515# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 4: WATER SUPPLY AND WATER QUALITY CONSIDERATIONS
Apr. 1978 99246 p refs 6 Vol.
(PB-285750/6) Avail: NTIS HC A11/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

The atmospheric, surface, and ground water resources of the United States were analyzed to determine methods for augmenting and conserving the nation's water supply to meet national water and regional requirements. A water supply adequacy analysis model is presented. The problem of water pollution is examined with emphasis on its sources and control. Water quality issues related to point and nonpoint sources are considered and the legal and institutional aspects of water allocation and management are explored. GRA

N79-14516# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 5: REGIONAL ASSESSMENT SUMMARIES
Apr. 1978 206 p 6 Vol.
(PB-285751/4) Avail: NTIS HC A10/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Estimates are made of physical and socio-economic data based on goals and objectives of the various states in the New England, MidAtlantic, South Atlantic Gulf, Rio Grande, Great Basin, and the Pacific Northwest regions of the U.S. GRA

N79-14517# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. APPENDIX B: METHODOLOGIES AND SOCIO-ECONOMIC CHARACTERISTICS AND PATTERNS OF CHANGE AND WATER USE AND WATER SUPPLY DATA
Apr. 1978 101 p refs 6 Vol.
(PB-285815/7) Avail: NTIS HC A06/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Basic assumptions and analytical methods used to determine state and regional water use and supply and to prepare a future scenario of economic and social needs for basic products, services, and environmental conditions are presented. GRA

N79-14518# Nevada Univ., Reno. Desert Research Inst.
PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY
P. T. Tueller Apr. 1978 33 p refs
(OWRT Proj. A-064-NEV(1))
(PB-286122/7; PUB-AG-2; PUB-43005; W78-11336) Avail: NTIS HC A03/MF A01 CSCL 08H

Data gathered from the field and subsequent calculations, reasonably accurate figures concerning future water resources can be forecasted from snow course measurements. The feasibility of improving runoff and stream flow prediction using sequential satellite imagery was investigated. Correlations between snow line changes in the Humboldt River Basin on the 1973 imagery and predicted runoff on various tributaries having streamflow gages were developed. A preliminary runoff prediction model for the Humboldt River water shed based on these calculations is presented. GRA

N79-14525# North Dakota Water Resources Research Inst., Fargo.
THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED Completion Report, May 1975 - May 1978
Roland D. Mower May 1978 29 p refs
(Contract DI-14-34-0001-7072)
(PB-286091/4; WI-221-047-78; W78-11373;
OWRT-A-047-NDAK(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

This study was designed to inventory and spatially analyze water and land resources in the Garrison/Devils Lake Region of North Dakota using resource data acquired by ERTS. Preliminary land use studies in Mercer County involved the interpretation of black and white, and color infrared (CIR) aerial photographic imagery (1:24,000), a LANDSAT color composite image (1:250,000), a Mead Dijit Graphics Generator (DGG) image (1:225,000), and a Mead Digital Laser Printer (DLP) image (1:600,000). Subsequent land use/land cover research in the Devils Lake Basin has included the interpretation and analysis of LANDSAT computer compatible tape (CCT) data. The results of this study, in both tabular and graphic format, have been made available to various planning agencies in North Dakota and to all special task force units established by the Devils Lake Committee. GRA

N79-15347*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
DETECTION AND MAPPING PACKAGE. ANALYST'S GUIDE; INTERPRETING IMPOUNDED SURFACE WATER Final Report, Jan. - Apr. 1978
R. C. Carnes, Principal Investigator, E. H. Schlosser, and R. G. Davis Sep. 1978 74 p refs Revised Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-15200)
(E79-10067; NASA-CR-151857; LEC-12149; JSC-13970)
Avail: NTIS HC A04/MF A01 CSCL 08H

N79-15362*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A DETERMINATION OF THE OPTIMUM TIME OF YEAR FOR REMOTELY CLASSIFYING MARSH VEGETATION FROM LANDSAT MULTISPECTRAL SCANNER DATA
M. Kristine Butera, Principal Investigator Oct. 1978 40 p refs Sponsored by NASA EREP
(E79-10084; NASA-TM-58212; Rept-169) Avail: NTIS HC A03/MF A01 CSCL 02F

The author has identified the following significant results. A technique was used to determine the optimum time for classifying marsh vegetation from computer-processed LANDSAT MSS data. The technique depended on the analysis of data derived from supervised pattern recognition by maximum likelihood theory. A dispersion index, created by the ratio of separability among the class spectral means to variability within the classes, defined the optimum classification time. Data compared from seven LANDSAT passes acquired over the same area of Louisiana marsh indicated that June and September were optimum marsh mapping times to collectively classify Baccharis halimifolia, Spartina patens, Spartina alterniflora, Juncus roemericanus, and Distichlis spicata. The same technique was used to determine the optimum classification time for individual species. April appeared to be the best month to map Juncus roemericanus; May, Spartina alterniflora; June, Baccharis halimifolia; and September, Spartina patens and Distichlis spicata. This information is important, for instance, when a single species is recognized to indicate a particular environmental condition.

07

DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A79-11384 * # **Michigan resource inventories - Characteristics and costs of selected projects using high altitude color infrared imagery.** W. R. Enslin and R. Hill-Rowley (Michigan State University, East Lansing, Mich.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 194-212. 14 refs. Grant No. NGL-23-004-083.

A79-11385 * # **A comparison of photointerpretive and digital production methods for four key remote sensing-based information products.** L. F. Eastwood, Jr., T. R. Hays, R. J. Ballard, and G. G. Crnkovich (Washington University, St. Louis, Mo.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 213-228. 10 refs. Contract No. NAS5-20680.

This paper evaluates the costs of producing four remote sensing-based information products: timber volume estimate tables, Level II land use/land cover maps, soil maps, and vegetative cover maps. Two production methods for each product are evaluated, one is based on digital processing of satellite data, and the other on conventional photointerpretation of aircraft data. For each product, a comparison is conducted of the two strategies' production costs (including data acquisition, 'ground truthing', interpretation, compilation, and printing charges) and their performance (as measured by accuracy and timeliness). Each of the production methods reviewed has been demonstrated - either operationally or experimentally - and the costs, timeliness and other performance estimates presented are based on observations made in practice. The results show that for these products, satellite-based production results in significant cost and timeliness improvements at the cost of a loss in accuracy. (Author)

A79-11657 **American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings.** Falls Church, Va., American Society of Photogrammetry, 1977. 505 p. $5.00.

The detection of water pollution from color and infrared color aerial photography is considered along with techniques for land use change detection using Landsat imagery, a review of the uses of Landsat imagery in Mexico, a photogrammetric control survey of a large cooling tower, a simple and rapidly converging orientation and calibration method for nontopographic applications, and the application of high altitude photography in archeological survey. Attention is given to a Landsat forest inventory of the Philippines, the next decade of satellite remote sensing, the application of remote sensing for oil spill prevention, the compensation of systematic image errors using spherical harmonics, an approach for mapping land covers from satellite images, computer software and high speed plotting requirements for automated orthophoto mapping, the internationalization of remote sensing technology, automated stereophotogrammetry of Mars, a new concept in hybrid stereoplotters, future trends in photogrammetric instrumentation, and the Viking Mars Lander stereo analysis system. G.R.

A79-11663 **A review of the uses of Landsat imagery in Mexico.** D. Rodriguez-Bejarano and A. Calderón Acosta (Escuela Nacional de Agricultura, Chapingo, Mexico). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 65-75. 36 refs.

A79-11751 **American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings.** Falls Church, Va., American Society of Photogrammetry, 1978. 449 p. Members, $5.00; nonmembers, $10.00.

Papers are presented on the cost benefits of photobathymetry, the application of satellite remote sensing to local governments and urban technology projects, and computer stereographics. Consideration is given to a color strip recorder for remote sensing data and the digital processing of satellite imagery for geothermal prospecting. Analytical photogrammetry at a Greek archaeological site is described along with the Wetlands Analytical Mapping System and three-dimensional presentations of terrain data. Reviews are presented of the classification of wildland vegetation near Denail, Alaska on the basis of Landsat digital data and instruments for point transfer and marking. Procedures for aerotriangulation with the US-1 analytical plotter are described as well as interactive computations with a digitized stereoplotter. S.C.S.

A79-12036 **Holographic terrain displays.** M. M. McDonnell (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). In: Three-dimensional imaging; Proceedings of the Seminar, San Diego, Calif., August 25, 26, 1977. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 163-173. 22 refs.

Holographic terrain displays are discussed with reference to the holographic stereomodel and multiple recording procedures. Various types of holographic stereomodels are described, including: (1) a Fresnel hologram where laser light is used to record and reconstruct the image, (2) the Fourier-transform hologram, (3) the focused-image hologram, and (4) carrier frequency photography. Procedures are outlined for amplitude and phase encoding and color displays. The basic characteristics of common holographic stereomodels are compared along with selected parameters of thick and thin holograms. Applications such as holographic training aids in map compilation, map interpretation, and land navigation are noted. S.C.S.

A79-13795 **Texture-tone analysis for automated land-use mapping.** S.-Y. Hsu (New York, State University, Binghampton, N.Y.). *Photogrammetric Engineering and Remote Sensing*, vol. 44, Nov. 1978, p. 1393-1404. 20 refs.

The paper outlines the development of an image-processing technique with black-and-white photos on the basis of a texture analysis approach which should be applicable to other imaging systems. Two models of texture analysis are discussed. Model I with 17 spatial-tone measures derived from 3 by 3 data matrix is determined as very effective in classifying general land use types. With six additional waveform parameters, Model II is developed specifically to discriminate objects and scenes of subtle differences. The solution algorithms for Model I and Model II are programmed in FORTRAN language. In addition to the feature extractor and the classifier, the hit-rate and false alarm rate also depend on the factors regarding sample size, location, and number of training sets. A correct classification rate of 95% for the training set and 85-90% for the data property set is obtained with panchromatic images. S.D.

A79-14151 **Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Technische Universität Graz, Graz, Austria, October 3-5, 1977.** Symposium supported by the Austrian Solar and Space Agency, Federal Ministry for Science and Research, U.S. Army, et al. Edited by F. W. Leberl (Graz, Technische Universität, Graz, Austria). Graz, Technische Universität Graz (Geodätisches Institut, Mitteilungen, No. 29), 1978. 242 p. $10.00.

Papers are presented on such topics as the multitemporal analysis of Landsat data and change detection, multispectral classifi-

cation of tidal lands, the cadastral localizing of crop inventories obtained by remote sensing, information extraction from digital images of the earth and planets, and land-use mapping techniques. Consideration is also given to multitemporal analysis of Landsat data for the inventory of poplar groves in Northern Italy, digital detection of linear features in satellite imagery, and interactive digital image processing of Landsat data for geological analysis. B.J.

A79-14168 * # Computer-aided analysis of Landsat data for surveying Texas coastal zone environments. S. J. Kristof and R. A. Weismiller (Purdue University, West Lafayette, Ind.). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 107-115. 7 refs. Contracts No. NAS9-14016; No. NAS9-14970.

The feasibility of using machine-aided processing of Landsat data to inventory environmental units was studied by analyzing geometrically corrected and spatially registered Landsat data collected over the Matagorda Bay area of the Texas coastal estuarine system. A clustering algorithm (nonsupervised processor) was used to divide the data into groups of sample points of similar spectral characteristics, and correlation of spectral classes with reference data on a point-to-point basis showed the coastal features exhibit unique spectral variations. Use of a maximum likelihood algorithm permitted discrimination of 13 terrestrial and aquatic environments. M.L.

A79-14181 # Interdisciplinary application of the 'DIBIAS' digital image processing system to geological and maritime problems. K. A. Ulbricht (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Nachrichtentechnik, Oberpfaffenhofen, West Germany), P. Hoppe (Bundesanstalt für Geowissenschaften und Rohstoffe, Hanover, West Germany), and D. Schmidt (Deutsches hydrographisches Institut, Hamburg, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 215-218. 7 refs.

The digital image processing system DIBIAS has been developed for the evaluation of multispectral images, including those from Landsat. This paper discusses the application of the DIBIAS system to several examples of geological and maritime imagery of such areas as: (1) deserts in the Sudan and mountainous regions in Morocco, (2) Lake Constance and the Rhine estuary, and (3) the Baltic Sea. B.J.

A79-14197 A distortion-free map projection for analysis of satellite imagery. J. L. Junkins and J. D. Turner (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *Journal of the Astronautical Sciences*, vol. 26, July-Sept. 1978, p. 211-234. Research supported by the U.S. Geological Survey; Grant No. DAAG53-76-C-0067.

A formulated dynamic map projection is described and tested numerically. The satellite's subpoint trace (groundtrack) on the reference ellipsoid is the invariant line; in contrast, the invariant line in static map projections must be an equator, a meridian, or a parallel. A local sensing time is associated with each plot point in the satellite sensors' field of view. The formulation is valid for any continuous satellite orbit or orbit segment. Algorithms for projection of dense sets of remotely sensed data are efficient since the solution is analytical (except for some integrals). It is suggested that the continuous normal view provided by the space oblique Mercator projection has immediate applicability. M.L.

A79-16775 # Identification of descriptive parameters in MSS system by multivariate analysis and spline fitting. L. Alberotanza (CNR, Laboratorio per lo Studio della Dinamica delle Grandi Masse, Venice, Italy) and E. Martino (CNR, Istituto per le Applicazioni del Calcolo, Rome, Italy). In: Space in the service of man; International Scientific Conference on Space, 18th, Rome, Italy, March 15, 16, 1978, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1978, p. 283-290. 9 refs.

A correlative method based on multivariate analysis is applied to data of the corresponding series of Landsat pixels, simulated by an Exotech/mod. 100 radiometer. Sea surface optical reflectances concerning solid transport are considered. The aim of the work is devoted to state some functional relationships among several objects in different physical situations in order to achieve coherent classification parameters. (Author)

A79-18324 * Mapping ocean tides with satellites - A computer simulation. I. J. Won, J. T. Kuo, and R. C. Jachens (Lamont-Doherty Geological Observatory, Palisades, N.Y.). *Journal of Geophysical Research*, vol. 83, Dec. 10, 1978, p. 5947-5960. 7 refs. NSF Grant No. DES-75-16978; Contract No. NAS6-2455.

As a preliminary study for the future worldwide direct mapping of the open ocean tide with satellites equipped with precision altimeters we conducted a simulated study using sets of artificially generated altimeter data constructed from a realistic geoid and four pairs of major tides in the northeastern Pacific Ocean. Recovery of the original geoid and eight tidal maps is accomplished by a space-time, least squares harmonic analysis scheme. The resultant maps appear fairly satisfactory even when random noises up to + or - 100 cm are added to the altimeter data of sufficient space-time density. The method also produces a refined geoid which is rigorously corrected for the dynamic tides. (Author)

A79-18868 A conspectus of computer aided and air-photo interpretation techniques for the study of Landsat imagery. A. C. Armstrong (Ministry of Agriculture, Fisheries and Food, Trumpington, Cambs., England) and P. Brimblecombe (East Anglia, University, Norwich, England). *British Interplanetary Society, Journal (Space Technology)*, vol. 32, Jan. 1979, p. 3-8. 30 refs.

A basic dichotomy has emerged between those users who work with digital data such as that obtained from the Landsat CCTs and those who rely on the extension of conventional air-photointerpretation techniques. Differences between the two approaches are identified in terms of technological involvement, financial input, mathematical complexity, and data quality. The characteristics of the two techniques are evaluated against three areas of implementation: the 'one-off' investigation; global monitoring; and temporal monitoring. It is concluded that both techniques have merit and that progress lies in their integrated use. B.J.

A79-18951 A developmental program of satellite data collection. G. Forcina, K. Manning, and K. Singh (COMSAT General Corp., Washington, D.C.). *COMSAT Technical Review*, vol. 8, Fall 1978, p. 421-454.

The results of a developmental data collection system designed, implemented, and operated by COMSAT General are discussed. The objective of this experiment, which was initiated on October 28, 1977, and completed on June 19, 1978, was to demonstrate that this unique service using low bit rates and low-cost terminals can be incorporated into existing commercial communications satellites operating at C-band (4/6 GHz). The system consists of 13 specially designed data collection platforms (DCPs) transmitting environmental data to Telesat's Anik I satellite, which relays the data to COMSAT General's Southbury earth station. Two platforms were located in Canada and 11 in the U.S. at data collection sites instrumented and operated by the United States Geological Survey (USGS). The U.S. DCP data received at Southbury are processed and transmitted via telephone line both upon request and automatically to designated USGS offices. Telesat also participated in the program with an earth station located close to Ottawa and capable of performing basically the same functions as the Southbury earth station. During the eight months of operation, the system performed well, and all the program objectives were met. (Author)

N79-10812# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FEATURE SELECTION AND SAMPLE CLASSIFICATION ALGORITHMS OF INPE
R. Kumar Sep. 1977 13 p refs
(INPE-1120-PE/088) Avail: NTIS HC A02/MF A01

In the remote sensing of earth resources, the problem of feature selection is discussed. An algorithm for feature selection based on B-distance was developed. The algorithm is used for LANDSAT data, aircraft multispectral scanner (MSS) data, and SKYLAB MSS data. A branch and bound algorithm to select the best subset of n features from a set of N features without exhaustive search is developed. A sample classifier based on B-distance was developed. B-distance is computed between a test field and each of the training classes and classified into the class for which the B-distance is minimum. S.E.S.

N79-12533*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STATISTICAL SEPARABILITY AND CLASSIFICATION OF LAND USE CLASSES USING IMAGE-100
Nelson deJesusParada, Principal Investigator, R. Kumar, and M. Niero Sep. 1977 17 p refs Sponsored by NASA Submitted for publication ERTS
(E79-10022; NASA-CR-157911) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. The statistical separability of land use classes in the subsets of one to four spectral channels was investigated. Using ground observations and aerial photography, the MSS data of LANDSAT were analyzed with the Image-100. In the subsets of one to three spectral channels, channel 4, channel 4 & 7, and channels 4, 5, & 7 were found to be the best choices (ch.4 - 0.5 to 0.6 microns, ch. 5 - 0.6 to 0.7 microns, ch. 6 - 0.7 to 0.8 microns, and ch. 7 - 0.8 to 1.1 microns). For the single cell option of the Image-100, the errors of omission varied from 5% for the industrial class to 46% for the institutional class. The errors of commission varied from 11% for the commercial class to 39% for the industrial class. On the whole, the sample classifier gave considerably more accurate results compared to the single cell or multicell option.

N79-13421 Stanford Univ., Calif.
DESIGN AND IMPLEMENTATION OF DISTORTION-FREE COMPRESSION TECHNIQUES FOR LANDSAT DATA AND TELEVISION IMAGES Ph.D. Thesis
Patrice Jean-Marie Capitant deVillebonne 1978 79 p
Avail: Univ. Microfilms Order No. 782284

An original model of the digital image processing system is built with emphasis on the possible processing applications. Distortion-free compression techniques and compression techniques with distortion are positioned within the model. While usually compression is measured by a compression ratio, and application oriented study would measure it in terms of distortion. With this in mind, a review of the different compression techniques is made. Methods presently used to test the quality of the reconstructed images are also reviewed. Based on this analysis and using an original model for digital images, a fast distortion free compression technique is designed and the parameters are optimized for Landsat data and television images. Dissert. Abstr.

N79-13429*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT RONDONIA [NOTAS PREVIAS DO PROJETO RONDONIA]
Nelson deJesusParada, Principal Investigator and Sergio Monthezuma Santoianni Guerra Aug. 1978 12 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E79-10012; NASA-CR-157901; INPE-1329-PE/159) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13440*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
GENERATION OF UNIFORM CHROMATICITY SCALE IMAGERY FROM LANDSAT DATA
R. D. Juday, Principal Investigator, F. Johnson, R. A. Abotteen, and M. D. Pore Aug. 1978 42 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-15200)
(E79-10033; NASA-CR-151837; LEC-11867; JSC-14471)
Avail: NTIS HC A03/MF A01 CSCL 20F

N79-13442*# International Business Machines Corp., Gaithersburg, Md.
SAR/LANDSAT IMAGE REGISTRATION STUDY Final Report, Apr. 1977 - Sep. 1978
Stephen W. Murphrey, Principal Investigator Sep. 1978 164 p refs ERTS
(Contract NAS6-2827)
(E79-10035; NASA-CR-156847) Avail: NTIS HC A08/MF A01 CSCL 05B

The author has identified the following significant results. Temporal registration of synthetic aperture radar data with LANDSAT-MSS data is both feasible (from a technical standpoint) and useful (from an information-content viewpoint). The greatest difficulty in registering aircraft SAR data to corrected LANDSAT-MSS data is control-point location. The differences in SAR and MSS data impact the selection of features that will serve as a good control points. The SAR and MSS data are unsuitable for automatic computer correlation of digital control-point data. The gray-level data can not be compared by the computer because of the different response characteristics of the MSS and SAR images.

N79-13481*# *National Aeronautics and Space Administration.* Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 3 WORLD STANDARD CATALOG, 1-31 AUGUST 1978
Aug. 1978 270 p
(NASA-TM-79492; GSFC/LWC3-78/08; NTISUB/D/277-008)
Avail: NTIS HC A12/MF A01 CSCL 05B

Imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced month is listed. Data, such as data acquired, cloud cover, and image quality are given for each scene. The microfilm roll and frame on which the scene maybe found is also given. G.G.

N79-13482*# *National Aeronautics and Space Administration.* Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-31 AUGUST 1978
Aug. 1978 173 p
(NASA-TM-79491; GSFC/LWC2-78/08; NTISUB/D/276-008)
Avail: NTIS HC A08/MF A01 CSCL 05B

Imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced month is listed. 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. G.G.

N79-14474*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: DATA BASE DESIGN CONSIDERATIONS
L. Westberry, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 193-204 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14475*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: MAN-MACHINE INTERFACE IN LACIE ERIPS
B. Duprey, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 205-214 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14476*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: VERY HIGH SPEED PROCESSING AS RELATED TO PIXEL-DEPENDENT TASKS
J. Lyon, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 215-214 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14478*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: SOME COST PERFORMANCE CHARACTERISTICS OF SEVERAL DATA SYSTEM CONFIGURATIONS FOR PROCESSING REMOTELY SENSED DATA
P. Gregor, Principal Investigator (MITRE Corp.) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 235-248 EREP

Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14479*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: EQUIPMENT SELECTION CRITERIA FOR R AND D IMAGE PROCESSING
E. Poole, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 249-259 EREP
Avail: NTIS HC A11/MF A01 CSCL 02C

N79-14502*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 3 WORLD STANDARD CATALOG, 1-30 SEPTEMBER 1978
30 Sep. 1978 175 p
(NASA-TM-79887; GSFC/LWC/3-78/09; NTISUB/D/277-009) Avail: NTIS HC A08/MF A01 CSCL 05B
Imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced month is listed. 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. G.G.

N79-14503*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-30 SEPTEMBER 1978
30 Sep. 1978 92 p
(NASA-TM-79886; GSFC/LWC/2-78/09; NTISUB/D/276-009) Avail: NTIS HC A05/MF A01 CSCL 05B
Imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced month is listed. 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. G.G.

N79-15355*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
ANALYSIS OF PRINCIPAL COMPONENT TRANSFORMED LANDSAT DATA
R. A. Abotteen, Principal Investigator Aug. 1976 25 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-12200)
(E79-10076; NASA-CR-151861; LEC-9003) Avail: NTIS HC A02/MF A01 CSCL 02C

N79-15372*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT WORLD STANDARD CATALOG, LANDSAT-3 Monthly Report, 1 - 31 Oct. 1978
Oct. 1978 167 p
(NASA-TM-79968; GSFC/LWC3-78/10; NTISUB/D/277-010) Avail: NTIS HC A08/MF A01 CSCL 05B
Imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced month is listed. 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. G.G.

N79-15381*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-31 OCTOBER 1978
Oct. 1978 91 p
(NASA-TM-79900; NTISUB/D/276-010; GSFC/LWC2-78/10) Avail: NTIS HC A05/MF A01 CSCL 05B
The World Standard Catalog lists imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced period. Information such as cloud cover and image quality is given for each scene. The microfilms roll and frame on which the scene may be found is also given.
Author

N79-15382*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 3 WORLD STANDARD CATALOG, 1-30 NOVEMBER 1978
Nov. 1978 247 p
(NASA-TM-80018; NTISUB/D/277-011; GSFC/LWC3-78/11) Avail: NTIS HC A11/MF A01 CSCL 05B
The World Standard Catalog lists imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced period. Information such as cloud cover and image quality is given for each scene. The microfilm roll and frame on which the scene may be found is also given.
Author

N79-15383*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-30 NOVEMBER 1978
Nov. 1978 61 p
(NASA-TM-79899; NTISUB/D/276-011; GSFC/LWC2-78/11) Avail: NTIS HC A04/MF A01 CSCL 05B
The World Standard Catalog lists imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced period. Information such as cloud cover and image quality is given for each scene. The microfilm roll and frame on which the scene may be found is also given.
Author

08

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A79-10601 **Subsurface radar.** M. I. Finkel'shtein. *(Radiotekhnika,* vol. 32, Nov. 1977, p. 6-16.) *Telecommunications and Radio Engineering, Part 2 - Radio Engineering,* vol. 32, Nov. 1977, p. 18-26. 43 refs. Translation.

Various aspects of subsurface radar probing are considered with reference to studies of natural resources. The frequency properties of reflected subsurface signals are evaluated noting a single-layer homogeneous model. Probing depth is discussed and it is shown that probing signals require a range of low frequencies with a large bandwidth. Studies in the field of subsurface radar are outlined including probing fresh-water and low-salt-content ice, measurements of ice thickness, limestone probing, frozen rock probing, and studies of frozen ground and marsh. S.C.S.

A79-11272 **Synthetic aperture radar systems for remote sensing from space.** G. Dieterle and D. Maccoll (ESA, Paris, France). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-149.* 16 p.

The paper discusses the European needs for a synthetic-aperture radar (SAR) system for use in earth-observation satellite missions; in particular, land application and coastal monitoring. The European mission requirements, where the prime driver is all-weather capability with high spatial and radar resolution, are highlighted, and the latest results of studies on how to implement these requirements in a space system carried out under ESA contracts are presented. Space-system constraints such as launch vehicle performance and satellite class and their impact on sensor performance are discussed. The problem of image quality is addressed, and an evaluation of related technical and technological problems is presented. A brief outline is given of ESA activities in initiating SAR instrument development for future European earth-observation missions. (Author)

A79-11748 **Estimation of soil moisture and components by measuring the degree of spectral polarization with a remote sensing simulator.** H. Genda and H. Okayama (Chiba University, Chiba, Japan). *Applied Optics,* vol. 17, Nov. 1, 1978, p. 3439-3443. 9 refs.

A remote sensing simulator is used to measure the degree of spectral polarization of scattered light from CuSO4, CuCl2, Fe2O3, SiC, S, NiCl2, and CoCl2 as models of soil. Comparisons are made to measurements of volcanic ash and natural soil. Results are presented for the degree of spectral polarization of SiC, the degree of spectral polarization of volcanic ash from the crater on Mt. Usu and the Kinomi housing area, the degree of spectral polarization and absorbance of Fe2O3, and the degree of spectral polarization of red soil in several degrees of moisture content. It is found that Fe appears in natural soil and that Si appears in volcanic ash. S.C.S.

A79-11767 * # **Measurement of ocean wave heights using the Geos 3 altimeter.** C. L. Rufenach (NOAA, Wave Propagation Laboratory, Boulder, Colo.) and W. R. Alpers (Hamburg, Universität; Max-Planck-Institut für Meteorologie, Hamburg, West Germany). *Journal of Geophysical Research,* vol. 83, Oct. 20, 1978, p. 5011-5018. 13 refs. Grant No. NATO-SRG/AI.10; Contract No. NOAA-03-022-35163; NASA Contract No. 855-33-05-09-53.

Radar altimeter signals transmitted from the low-orbiting satellite Geos 3 were analyzed for two selected orbits over high seas associated with hurricane 'Caroline' in the Gulf of Mexico and a North Atlantic storm. The measured values of significant wave height are in reasonable agreement with surface measurements, provided that the altimeter data are properly edited. The internal consistency of estimated wave heights for the North Atlantic storm, a standard deviation of 0.6 m or less, and the good agreement with surface truth lend credence to the method. A statistical analysis of the pulse slope variation gives estimated values of significant wave height within + or - 1 m of the true values 75% of the time for spatial averaging over 70 km. (Author)

A79-12088 **Role of the USAF AN/AAD-5 Infrared Reconnaissance Set in pollution detection and fuel conservation.** R. Muenchow (USAF, Wright-Patterson AFB, Ohio). In: Modern utilization of infrared technology III: Civilian and military; Proceedings of the Third Seminar, San Diego, Calif., August 25, 26, 1977. Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 181, 182.

Two US Air Force-owned engineering development models of the AN/AAD-5 Infrared Reconnaissance Set were flight tested at Wright-Patterson Air Force Base during 1971. After a successful flight test, the next generation of this improved infrared sensor was built to undergo extensive qualification (bench) testing. The Environmental Protection Agency requested the use of the original models and in mid-1976 took possession of the sensors and peculiar support equipment. The equipment was slightly modified and adapted to a civilian aircraft, in which it is being used successfully to obtain data much needed by the Environmental Protection Agency. (Author)

A79-13834 # **The role of 'Smart' sensors in earth resources remote sensing programs.** L. P. Murphy (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.) and J. W. Jarman (U.S. Army, Office of Chief of Engineers, Washington, D.C.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1717.* 6 p. 9 refs.

In 1977, with the assistance of NASA, the Corps of Engineers has conducted two demonstrations of applications of the use of Landsat data and processing technology on the NASA Applications Systems Verification and Transfer system. The demonstrations showed that the automated extraction of land cover information from Landsat data is useful for Corps drainage basin and special project studies. Current and potential Landsat data uses are considered along with possible onboard processing procedures, taking into account water mapping, river flooding/coastal studies, snow shed runoff studies, and investigations regarding the use of Landsat data for planning the installation of large government facilities and for geological structure studies associated with planning the location of large dams. The suggested forms of onboard processing are related to enhancement processing, onboard data calibration processing, selectable band transmission, data compaction, river/coastline tracking, cloud detection, and multiresolution data. G.R.

A79-14155 # **Digital image processing experience at Hannover Institute for Photogrammetry /IPI/.** H. P. Bähr (Hannover, Technische Universität, Hanover, West Germany). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 19-25. 21 refs.

The paper describes the IPI image processing system for image enhancement and geometrical image processing: it consists of a large CDC-Cyber 73/76 computer, an Optronics-P 1700 digital read/write image plotter, and a modular software package. Emphasis is placed on the software package and the geometrical processing technique, and consideration is given to applications of the system to images from: (1) a metric camera; (2) the Hasselblad camera; (3) a multispectral scanner; and (4) Landsat (i.e., water pollution data and water-line-difference data). B.J.

A79-14178 # Evaluation of multispectral scanner data by hybrid methods. W. Schneider, R. Polak, and P. Schattschneider (SPACETEC Datengewinnungs GmbH und Co., Vienna, Austria). In: Image processing - Interactions with photogrammetry and remote sensing; Proceedings of the International Symposium, Graz, Austria, October 3-5, 1977. Graz, Technische Universität Graz, 1978, p. 185-188. 5 refs.

The paper describes hybrid automatic classification scheme for processing data from an analog multispectral scanner. The procedure involves visual inspection of film recordings of selected channels; electronic analog processing of the scanner data for the visually selected areas; sophisticated and flexible processing of the small quantity of data obtained after the analog averaging operations. The procedural steps following visual selection - extraction of spectral and textural descriptors; correction of the effects of varying scan angle, sun angle, and atmospheric conditions; and digital classification of each sample area by subdividing the descriptor space by hyperplanes - are described. (Author)

A79-15048 *Particulate pollutants - Real-time tracking and monitoring of their cloud nucleation characteristics.* V. K. Saxena (Denver, University, Denver, Colo.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 152-155. 10 refs. NSF Grants No. ENV-76-14221; No. ENV-72-03399.

This paper describes a cloud condensation nuclei (CCN) spectrometer that is capable of providing real-time measurement and display of the critical supersaturation spectrum of CCN within as short a time interval as 15 sec. It is shown how real-time monitoring of the CCN spectrum aids in characterizing and mapping power-plant and urban plumes, determining the spatial visibility of CCN upwind and downwind of pollution sources, investigating the growth and formation of CCN in a plume, and providing information required for evaluating the effect of particulate pollutants on cloud microstructure. Airborne urban-plume measurements performed for the METROMEX study in the St. Louis area are discussed, and it is noted that CCN may be used as a natural tracer of air-mass history. F.G.M.

A79-15083 Evaluation of instruments and measurement strategies for airborne remote sensing of regional air pollution measurement requirements. E. L. Keitz and E. J. Friedman (Mitre Corp., McLean, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 460-463.

This paper addresses the application of airborne remote sensors of air pollution to the regional problem. The performance of such instruments is contrasted with that expected from both ground-based monitors and airborne contact sensors. The study includes evaluation of measurement strategies for the long-range transport of both an urban oxidant plume and a fossil-fueled power plant sulfur dioxide/sulfate plume. Aspects of the problem which are dealt with include: measurement requirements, the current status of specific remote sensors and a five year outlook for selected techniques. It is concluded that several of the remote sensors should be capable of being used in a regional monitoring system within the next five years if development proceeds as expected. These include an infrared lidar, a gas filter correlator, and a laser absorption spectrometer. Evaluation of the measurement strategies shows that although an airborne remote-sensing system cannot provide significantly more required data than an airborne contact system, it does so with fewer aircraft, fewer instruments, and in a much less complex manner. (Author)

A79-15090 * Aircraft instrumentation system for the remote sensing of carbon monoxide. S. M. Beck, W. D. Hesketh, and R. T. Sherrill (NASA, Langley Research Center, Hampton, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 561-565. 6 refs.

A light twin-engine aircraft has been instrumented with a carbon monoxide remote gas sensor system and test flown over the Southern Lake Michigan basin during August, 1976. The remote sensor is based on the gas filter correlation technique. The radiance levels from the sensor along with the data on the surface temperature, air temperature, dewpoint, and altitude were digitized and recorded on seven-track magnetic tape. Air samples were collected at various altitudes over selected sites for later analysis of carbon monoxide concentration and comparison with the inferred concentration from the remote sensor. The values of carbon monoxide obtained from the air samples and the values inferred from the remote sensor for data collected over water are in good agreement. (Author)

A79-15104 Marine monitoring of natural oil slicks and man made wastes utilizing an airborne imaging Fraunhofer line discriminator. R. D. Watson, M. E. Henry, A. F. Theisen, T. J. Donovan (U.S. Geological Survey, Flagstaff, Ariz.), and W. R. Hemphill (U.S. Geological Survey, Reston, Va.). In: Joint Conference on Sensing of Environmental Pollutants, 4th, New Orleans, La., November 6-11, 1977, Proceedings. Washington, D.C., American Chemical Society, 1978, p. 667-671. 19 refs.

A described Fraunhofer line discriminator (FLD) operating in an imaging mode was used to obtain accurate measurements of the areal extent of oil slicks arising from seeps in Santa Barbara Channel, California. The FLD data are found to correlate well with data obtained by other techniques. Advantages of FLD include high sensitivity and real-time display of luminescence gray-level maps that include up to 94 gray levels. The relation between oil film thickness and luminescence for oils with specific gravities less than or greater than 0.875 is examined. Also considered is the use of FLD to measure other pollutants including lignin sulfonate, phosphate processing effluents, sewage effluents, feed lot effluent, sludge, and algae blooms. M.L.

A79-15464 Active microwave sensing of the earth's surface - A mini review. R. K. Moore (Kansas, University, Lawrence, Kan.). *IEEE Transactions on Antennas and Propagation,* vol. AP-26, Nov. 1978, p. 843-849. 67 refs.

The paper discusses the nature of radar backscatter, noting theoretical models including the physical-optics model based on the Kirchhoff-Huygens principle, the geometric-optics model, and the Rayleigh-Rice (small-perturbation) approach. Consideration is given to radar return from the ocean with reference to Skylab measurements, tank experiments, and real-aperture and synthetic-aperture systems. Observations of radar backscatter over land are described in terms of studying moisture content, mapping vegetation communities, geological reconnaissance mapping, and mineral exploration. Sensor systems are outlined such as the sidelooking airborne radar, scatterometer, radar altimeters, and spectrometers. S.C.S.

A79-15744 * # A system concept for wide swath constant incident angle coverage. J. P. Claassen (Texas A & M University, College Station, Tex.) and J. Eckerman (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Synthetic Aperture Radar Technology Conference, Las Cruces, N. Mex., March 8-10, 1978, Proceedings. Las Cruces, N. Mex., New Mexico State University, 1978, p. VI-4-1 to VI-4-19. 7 refs.

The multiple beam SAR system concept is developed and shown to readily overcome the radar ambiguity constraints associated with orbital systems, thus permitting imagery over swaths much wider than 100 km. The antenna technique permits imagery at nearly constant incidence angles. When frequency scanning is used, the center angle may be programmed. The redundant use of the antenna aperture during reception results in lower transmitted power and in shorter antenna lengths in comparison with conventional designs. B.J.

A79-18575 **Mini-format remote sensing for civil engineering.** O. W. Mintzer and D. Spragg (Ohio State University, Columbus, Ohio). *(American Society of Civil Engineers, Annual Convention, Exposition and Continuing Education Program, San Francisco, Calif., Oct. 17-21, 1977.) ASCE, Transportation Engineering Journal,* vol. 104, Nov. 1978, p. 847-858. 19 refs.

The miniformat remote sensing system is described and some examples of successful applications are presented. The system is intended to collect on-site data by exposures of both color and color infrared films for site condition identification and interpretation using two hand-held Nikon 35-mm cameras mounted with a mechanism to trip the cameras' shutters simultaneously. It is shown that the miniformat system is a practical means to identify and analyze vegetation vigor, disease or stress; drainage problems; slope stability; landslide susceptible terrain; reclaimed land progress; locations of abandoned mines and field tiles; pavement deterioration; water quality; and wetland and natural resource classification. S.D.

A79-18869 **The Seasat-A satellite radar altimeter spaceborne microcomputer.** J. A. Perschy (John Hopkins University, Laurel, Md.). *British Interplanetary Society, Journal (Space Technology),* vol. 32, Jan. 1979, p. 9-14.

A radar altimeter scheduled for flight in July 1978 on board the Seasat-A oceanographic satellite will be microcomputer controlled. The microcomputer performs return signal acquisition, range tracking, receiver gain control, calibration, ocean wave height estimation, telemetry formatting, and command decoding. This paper gives a brief description of the microcomputer functional performance, hardware and software. The microcomputer utilizes the 8080 microprocessor with 4096 bytes of program memory and 2048 bytes of scratch pad memory. It performs tasks on three interrupt levels. Eighty-five per cent of its maximum computing capability is utilized. (Author)

N79-10497*# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Remote Sensing Programs for Earth Resource Surveys.
MICROWAVE REMOTE SENSING FROM SPACE FOR EARTH RESOURCE SURVEYS
1977 141 p refs
(Contract NASw-3043)
(NASA-CR-157891) Avail: NTIS HC A07/MF A01 CSCL 05B

The concepts of radar remote sensing and microwave radiometry are discussed and their utility in earth resource sensing is examined. The direct relationship between the character of the remotely sensed data and the level of decision making for which the data are appropriate is considered. Applications of active and a passive microwave sensing covered include hydrology, land use, mapping, vegetation classification, environmental monitoring, coastal features and processes, geology, and ice and snow. Approved and proposed microwave sensors are described and the use of space shuttle as a development platform is evaluated. A.R.H.

N79-10498*# *National Air and Space Museum, Washington,* D. C.
EARTH OBSERVATIONS AND PHOTOGRAPHY EXPERIMENT: SUMMARY OF SIGNIFICANT RESULTS Final Report
Farouk El-Baz 30 Jun. 1978 26 p
(Contract NAS9-13831)
(NASA-CR-157780) Avail: NTIS HC A03/MF A01 CSCL 14E

Observation and photographic data from the Apollo Soyuz Test Project are analyzed. The discussion is structured according to the fields of investigation including: geology, desert studies, oceanography, hydrology, and meteorology. The data were obtained by: (1) visual observations of selected Earth features, (2) hand-held camera photography to document observations, and (3) stereo mapping photography of areas of significant scientific interest. S.B.S.

N79-11456# European Space Agency, Paris (France).
ANALYSIS OF A REMOTE SENSING PAYLOAD FOR THE SPACELAB D3 MISSION (PRELIMINARY PHASE A) Final Report
F. Schlude Jun. 1978 129 p refs Transl. into ENGLISH of 'Untersuch. zu einer Fernerkundungsnutzlast fuer die Spacelab-Mission D3', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-IB-551-77/8, Dec. 1977
(ESA-TT-482; DLR-IB-551-77/8) Avail: NTIS HC A07/MF A01

A remote sensing payload for atmospheric physics and earth sensing for the Spacelab D3 mission is proposed. Topics include scientific and technological objectives, experiment selection, experimental hardware, and mission-dependent equipment. The following equipment is discussed: metric camera focal length 30 or 60 cm; mechanical scanner, 7 channels, 17 deg aperture angle; push-broom scanner, 4 channels, 4.3 deg aperture angle; microwave experiment of the first Spacelab payload, 9.6 GHz; and SAR facility, 2 frequencies, 2 polarizations, fixed angle of depression. It is concluded that the mechanical accomodation can be achieved without any problems, the electrical primary powers can be supplied, the thermal balance sheet problems can be regarded as soluble, and the data handling, both aboard Spacelab and in the transition section, can be solved only by a reduction of the operating periods. ESA

N79-11458# European Space Agency, Paris (France).
COVERAGE BEHAVIOR OF ERDSAT FOR SOME SELECTED AREAS OF THE EARTH'S SURFACE
E. F. Jochim Aug. 1978 76 p refs Transl. into ENGLISH of 'Ueberdeckungsverhalten des ERDSAT fuer einige ausgewaehlte Gebiete auf der Erdoberflaeche', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-IB-552-78/1 Mar. 1978 Original report in GERMAN previously announced as N78-29548
(ESA-TT-494; DLR-IB-552-78/1) Avail: NTIS HC A05/MF A01

The coverage behavior of a proposed European remote sensing satellite was investigated for each of its onboard sensors for Europe, the Amazon basin, Indonesia, and Brazil. The proposed satellite will carry a multispectral scanner and a microwave sensor. It is concluded that the satellite orbit can be optimal only for one sensor for one region on the earth. ESA

N79-11639# Naval Research Lab., Washington, D. C.
GULF STREAM GROUND TRUTH PROJECT. RESULTS OF NRL AIRBORNE SENSORS Final Report
C. R. McClain, D. T. Chen, and D. L. Hammond Jun. 1978 101 p
(AD-A057420; NRL-MR-3779) Avail: NTIS HC A06/MF A01 CSCL 08/3

Results of ocean surface measurements by NRL active and passive sensors are summarized. The data set was collected during three flights over the Gulf Stream in the Spring of 1976 and coincided with in situ measurements taken from an oceanographic research vessel. The sensors were the NRL high flight radar, NRL wind-wave radar, a laser profilometer and a precision radiation thermometer. The quantities derived include sea state, ocean wave frequency spectra, surface wind speed and sea surface temperature. The remote determinations are found to agree very well with other data sources. In addition, experimental and theoretical results regarding the effects of ocean wave angular spreading on airborne profilometer determinations of wave frequency spectra are included as well as a detailed description of the data analysis algorithm. The spectral distortion is not severe for track angles within 15 degrees of the wind vector. These indicate that airborne profilometer data is still useful for wind-wave generation studies as long as close attention is given to the track angle relative to the dominate surface wave direction. Also, the proposition of using spectra from various track angles to infer the angular spreading function does not appear promising because the spectra do not show a substantial enough variation with the angular spreading function.
Author (GRA)

N79-12410 Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.

AN AIRBORNE X-BAND MICROWAVE RADIOMETER

I. J. Barton and R. E. Meyer 1978 15 p refs
(ISBN-0-643-00314-2; CSIRO-34) Copyright. Avail: Issuing Activity

A null-balancing X-band microwave radiometer is described. The instrument was installed in a light aircraft and used to remotely measure soil moisture content in the near surface layer of unvegetated terrain. Author

N79-12531*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

RADIOMETRIC CORRECTION OF LANDSAT DATA

Nelson deJesusParada, R. Kumar, Principal Investigator, and L. A. Cavalcanti Oct. 1977 14 p refs Presented at 3d Seminario Sobre Sistemas Espaciasis, Campos, Brazil, 26 Sep. - 4 Oct. 1977 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10017; NASA-CR-157906) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. The six independent sensors of the multispectral band scanner are supposed to be identical; however, in actual practice, they may have different gain settings and offset factors, which result in the effect known as stripping (black lines at regular intervals) of the imagery. A simple two parameter method to correct the gain settings and offset factors of each of the sensors with respect to one sensor, taken as reference, was developed. This method assumes: (1) the response of a detector varies linearly with the radiance of radiation received, and (2) the means, as well as the standard deviations, of a reasonably large number of pixels, in a given wavelength band, are equal for each of the detectors for the radiometrically corrected data.

N79-14438*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SEVERE STORM ENVIRONMENTS: A SKYLAB EREP REPORT Final Report

David E. Pitts (NASA. Johnson Space Center), Yoshikazu Sasaki (Oklahoma Univ., Norman), and J. T. Lee, Principal Investigators (National Severe Storms Lab., Norman, Okla.) Aug. 1978 141 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10027; NASA-TM-58184) Avail: NTIS HC A07/MF A01 CSCL 04B

The results from the severe storm experiment over Texas and Oklahoma are presented. Correlation of data, soil moisture, water temperature, and cloud characteristics were considered. The sensors used in this study were multispectral band cameras, multispectral band scanners, infrared spectrometers, radiometers, and scatterometers.

N79-14439*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SEVERE STORM EXPERIMENT SUMMARY Final Report

David E. Pitts, Principal Investigator *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 5 p ref EREP
Avail: NTIS HC A07/MF A01 CSCL 04B

The author has identified the following significant results. The S194 L-band radiometer was well suited for the remote sensing of synoptic soil moisture over large areas under a wide variety of weather and terrain conditions. The S193 K-band radiometer was also found to be well suited for remote sensing of soil moisture at near nadir look angles but was more sensitive to the deleterious effects of surface roughness, vegetation cover, and cloud cover. The S193 K-band scatterometer had a high correlation with soil moisture for near nadir look angles but exhibited no advantage over the passive measurements. Cloud street orientation was used in areas lacking radiosonde and surface meteorological observations as an indicator of low level wind flow. Cirrus clouds caused atmospheric effects on remote sensing of the earth surface in the visible, near infrared, and thermal infrared spectral regions. At times, these effects dominated both aerosol particulate scattering and gaseous absorption and reemission effects.

N79-14440*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DERIVED WATER TEMPERATURES USING S191 AND S192 DATA Final Report

David E. Pitts (NASA. Johnson Space Center) and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 11 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A07/MF A01 CSCL 08H

The author has identified the following significant results. There is evidence that the cirrus clouds in the June 11 EREP data had a significant effect on both the S191 and S192 visible and infrared data. For S191 data, the cirrus clouds appeared to cause a 4- to 10 K decrease in equivalent black body temperature for wavelengths from 10.3 to 13 micrometers. A secondary observation was also apparent. Within the relatively small view of a satellite sensor, the error variability was approximately 7 K. This emphasized that the variability of the absorbing medium was so great that no amount of radiosonde observation could predict it accurately. Even ground-operated sensors would be of limited value in defining the four dimensional variability of the cirrus layers, except in a highly instrumented experimental situation.

N79-14441*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

INVERSION OF S191 DATA INTO TEMPERATURE AND WATER VAPOR PROFILES Final Report

David E. Pitts (NASA. Johnson Space Center) and A. E. Dillinger, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 4 p ref EREP

Avail: NTIS HC A07/MF A01 CSCL 08H

N79-14442*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE VARIATIONAL ANALYSIS OF JUNE 11, 1973, METEOROLOGICAL DATA Final Report

J. T. Lee (National Severe Storms Lab., Norman, Okla.) and Yoshikazu Sasaki, Principal Investigators (Oklahoma Univ., Norman) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 29 p refs EREP

Avail: NTIS HC A07/MF A01 CSCL 04B

N79-14443*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE CORRELATION OF SKYLAB L-BAND BRIGHTNESS TEMPERATURES WITH ANTECEDENT PRECIPITATION Final Report

Marshall J. McFarland, Principal Investigator (Environmental Studies Service Center, College Station, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 15 p refs EREP
(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

N79-14444*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SOIL MOISTURE STUDY USING THE S193 RADIOMETER Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 14 p refs EREP

(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

N79-14445*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
S193 SCATTEROMETER CORRELATION WITH SOIL MOISTURE Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 6 p EREP

(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

N79-14446*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RECTIFICATION OF A WHOLE-SKY PHOTOGRAPH AS A TOOL FOR DETERMINING SPATIAL POSITIONING OF CUMULUS CLOUDS Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 10 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 04B

N79-14447*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SEVERE STORM CLOUD-TOP CHARACTERISTICS Final Report
David E. Pitts (NASA. Johnson Space Center), J. T. Lee (National Severe Storms Lab., Norman, Okla.), and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 33 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A07/MF A01 CSCL 04B
The author has identified the following significant results. The combination of the thermal infrared and the near infrared bands near 1.0 to 2.0 micrometers provided sufficient information to determine whether a cell was young and growing, was mature, or was decaying. This, together with areal measurements of the amount of water in each phase over growing thunderstorms, could provide key inputs of mesoscale energy budgets for both developing air mass thunderstorms and squall line type thunderstorms. This data must be available on the scales of a few hundred meters and tens of minutes.

N79-14448*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
***REMOTE SENSING OF ATMOSPHERIC WATER VAPOR* Final Report**
David E. Pitts (NASA. Johnson Space Center), J. T. Lee (National Severe Storms Lab., Norman, Okla.), and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 10 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

Avail: NTIS HC A07/MF A01 CSCL 04A

09
GENERAL

Includes economic analysis.

A79-11255 Applications of remote sensing from space in Canada. W. M. Strome (Department of Energy, Mines and Resources, Canada Centre for Remote Sensing, Ottawa, Canada). *International Astronautical Federation, International Astronautical Congress, 29th, Dubrovnik, Yugoslavia, Oct. 1-8, 1978, Paper 78-117.* 9 p. 21 refs.

Canada's vast land and water area and its relatively small population have suggested that satellite remote sensing might prove to be a valuable tool for the monitoring and management of the natural resources and environment. As a result of the wide availability of satellite data, a number of applications for satellite remote sensing have been developed in Canada. Applications being explored in Canada are described. Some of the applications are close to operational, while others require further research to meet the needs of resource management. Well-established applications include the use of meteorological satellites for weather forecasting and the use of Landsat for ice reconnaissance; however, others, such as major cereal crop information systems and forest inventory systems, call for much more research background. S.D.

A79-11376 Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose State University, San Jose, Calif., January 19-21, 1977, Proceedings. Conference sponsored by the San Jose State University. Edited by K. B. Craib (Resources Development Associates, Los Altos, Calif.) and T. H. Watkins (San Jose State University, San Jose, Calif.). San Jose, Calif., San Jose State University, 1977. 377 p. $15.

The economics of remote sensing information systems are considered along with recent political and legal developments with respect to the United Nations and remote sensing, refinements of the Hayami-Peterson estimates of the social returns to improved crop forecasts, a world food survey, the value of improved global crop information, an econometric approach to the measurement of benefits of information systems involving remotely sensed data, information and efficient market processes, remote sensing oceanographic and terrestrial information systems, and crop forecasting benefits of Landsat. Attention is also given to agricultural crop acreage estimates for small land areas using Landsat, the improvement of earth resource inventories utilizing remotely sensed data, and economic analysis in the Pacific Northwest Land Resources Project, characteristics and costs of selected projects using high altitude color infrared imagery, and a comparison of photointerpretive and digital production methods for four key remote sensing-based information products. G.R.

A79-11383 # Economic analysis in the Pacific Northwest Land Resources Project - Theoretical considerations and preliminary results. D. R. A. Morse and J. T. Sahlberg (Bureau of State Planning and Community Affairs, Div. of Budget, Policy Planning and Coordination, Boise, Idaho). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 171-193. 41 refs.

The Pacific Northwest Land Resources Inventory Demonstration Project is an attempt to combine a whole spectrum of heterogeneous geographic, institutional and applications elements in a synergistic approach to the evaluation of remote sensing techniques. This diversity is the prime motivating factor behind a theoretical investigation of alternative economic analysis procedures. For a multitude of reasons - simplicity, ease of understanding, financial constraints and credibility, among others - cost-effectiveness emerges as the most practical tool for conducting such evaluation determinations in the Pacific Northwest. Preliminary findings in two water resource application areas suggest, in conformity with most published studies, that Landsat-aided data collection methods enjoy substantial cost advantages over alternative techniques. The potential for sensitivity analysis based on cost/accuracy tradeoffs is considered on a theoretical plane in the absence of current accuracy figures concerning the Landsat-aided approach. (Author)

A79-11386 # The cost-effectiveness of operational remote sensing technology - A comparative analysis. K. B. Craib (Resources Development Associates, Los Altos, Calif.). In: Conference on the Economics of Remote Sensing Information Systems, 1st, San Jose, Calif., January 19-21, 1977, Proceedings. San Jose, Calif., San Jose State University, 1977, p. 229-244. 15 refs.

The objectives, advantages, and shortcomings of a cost-benefit analysis are considered. Cost-effectiveness analysis is concerned with comparing alternative methods to accomplish a given task or tasks, exogenously defined as required. The concept involved are illustrated with the aid of an example. In August 1973, an experiment was conducted for the U.S. Agency for International Development and the Government of Honduras to compare the relative cost, effectiveness, and efficiency of alternative remote sensing techniques for soils and land surveys in Honduras. As conducted in Honduras, the experiment included panchromatic color, color infrared and multispectral photography and Landsat imagery, manually interpreted with an additive color viewer and simple photointerpretation equipment. It was found that equally accurate soils survey interpretations could be achieved with stereo color infrared or color photography, followed closely by stereo panchromatic photography. G.R.

A79-11475 Prospecting by satellite. E. S. Owen-Jones (Welsh Industrial and Maritime Museum, Cardiff, Wales). *Physics in Technology,* vol. 9, Sept. 1978, p. 200-207.

The paper discusses the use of ultraviolet, visible, near-infrared, thermal infrared, and microwave band observations to detect resources from orbiting satellites. Sample data are presented, including, for example, the differences between the reflectance spectra for background balsam fir and fir containing high concentrations of copper and molybdenum. The future role of satellite prospecting is considered. M.L.

A79-11662 Internationalization of remote sensing technology. C. K. Paul (Agency for International Development, Washington, D.C.). In: American Society of Photogrammetry, Fall Technical Meeting, Little Rock, Ark., October 18-21, 1977, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1977, p. 57-64.

The Agency for International Development (AID) began sponsoring international activities in remote sensing in 1971, one year before the launch of Landsat-1, with the Smithsonian Symposium in Remote Sensing. From 1972 to the present, limited technical assistance has been provided to several countries which has led remote sensing investigators in developing countries to be selected by NASA for the Landsat investigation program. In addition, AID has sponsored four regional workshops in remote sensing technology and the U.S. Information Agency has sponsored two seminars in training image analysts to make appropriate choices in selecting those features of the technology suitable for their resource requirements. Recent earth resources problems and past global monitoring experiences with Landsat in the developing countries have maintained interest in the satellite. Attention is given to details regarding AID's program and an evaluation of the advantages of remote sensing technology for the developing countries. G.R.

A79-11753 # - **Cornell's remote sensing program - Remote sensing for the user.** W. R. Philipson, T. Liang, T. L. Erb, and B. L. Markham (Cornell University, Ithaca, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 44th, Washington, D.C., February 26-March 4, 1978, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1978, p. 64-73.

A survey of the NASA-sponsored Cornell Remote Sensing Program is presented noting the participating representatives, courses, and facilities available. Projects including assessments of the values of Landsat data for planning in the New York City area, mapping the soils and geology of New York State, and state-wide wetlands inventories are discussed. Brief consideration is given to county- and town-level projects, projects conducted for state agencies, and projects utilizing satellite data. S.C.S.

A79-12502 **The contribution of space observations to global food information systems; Proceedings of the W. Nordberg Memorial Symposium, Tel Aviv, Israel, June 7-18, 1977.** Symposium sponsored by COSPAR and International Association of Meteorology and Atmospheric Physics. Edited by E. A. Godby (Canada Centre for Remote Sensing, Ottawa, Canada) and J. Otterman (Tel Aviv University, Tel Aviv, Israel). Oxford, Pergamon Press, Ltd. (Advances in Space Exploration. Volume 2), 1978. 210 p. $25.

Space technology applications to the development of global food information systems are discussed for the purpose of informing potential end users. Topic classifications include range monitoring and management, food information systems (crop observations, growing conditions, and modeling), the influence of climatic change on crop production, and marine food resources. Information obtained from satellites is described, and the organization and application of this information is considered. M.L.

A79-13383 **A review of space research, 1976-1977.** C. de Jager (Utrecht, Rijksuniversiteit, Utrecht, Netherlands). In: Space research XVIII; Proceedings of the Open Meetings of the Working Groups on Physical Sciences, Tel Aviv, Israel, June 7-18, 1977. Oxford, Pergamon Press, Ltd., 1978, p. 3-28.

Various remote sensing projects are discussed noting the Fourier spectrometer and a high-resolution multispectral scanner camera. Projects involving the determination of crop species and measurements of atmospheric absorption lines are discussed. Studies of the upper atmosphere are considered including the ozone layer, the influx of energetic solar protons, and density and pressure profiles. Rocket sounding for ionospheric and magnetospheric observations is described along with determinations of the total solar radiation flux and X-ray emissions from solar flares. Data concerning the solar wind are assessed and the Viking and Luna-24 missions are outlined. The U.S.-Netherlands balloon-borne ultraviolet stellar spectrograph device and its applications are reviewed. S.C.S.

A79-13833 # **Current and potential uses of aerospace technology by the U.S. Department of the Interior.** G. A. Thorley and C. J. Robinove (U.S. Geological Survey, Reston, Va.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1716.* 8 p.

A79-13836 # **Techniques for acquiring earth resource data that will be acceptable and useful to program managers.** W. E. Kibler (U.S. Department of Agriculture, Washington, D.C.). *American Institute of Aeronautics and Astronautics and NASA, Conference on 'Smart' Sensors, Hampton, Va., Nov. 14-16, 1978, AIAA Paper 78-1720.* 10 p.

To ensure that newly developed remote sensing technology would fit specific user needs, the U.S. Department of Agriculture established a Remote Sensing User Requirements Task Force made up of representatives from eight Department agencies having significant requirements for earth resource data and information. The Task Force identified and cataloged over 3,000 data elements - basic information needed for the lowest level of discrete decisions. Data elements were described in terms of agency standards for accuracy and time constraints, and requirements for geographic coverage. Agency data needs were consolidated noting identical as well as 'linked' (similar) requirements. Requirements were evaluated by panels of experts as having immediate potential for being satisfied by remote sensing or potential based on additional research and development. The detailed work involving actual users has enabled the Department to establish priority areas of concern and has laid the groundwork for a balanced remote sensing program. (Author)

A79-16178 **Information requirements for natural resource inventories.** W. J. Bonner (Bureau of Land Management, Denver, Colo.). In: National Computer Conference, Anaheim, Calif., June 5-8, 1978, Proceedings. Montvale, N.J., AFIPS Press, 1978, p. 87-91.

The Wildland Vegetation Resource Inventory Project is managed by the Bureau of Land Management in cooperation with NASA and the EROS Data Center. Landsat data is used for purposes of: (1) vegetation classification, (2) timber estimation, (3) the mapping of physical change from wildfire and mining activities, and (4) geological mapping. Products are evaluated and interpreted by qualified resource specialists who have also received intensive training in remote sensing. The result is the development within BLM of information requirement guidelines defining platform levels suitable for selected resource inventory tasks. B.J.

A79-16180 **Digital image analysis applications in state natural resource agencies.** P. A. Tessar. In: National Computer Conference, Anaheim, Calif., June 5-8, 1978, Proceedings. Montvale, N.J., AFIPS Press, 1978, p. 107-112.

The paper discusses the experiences of two state programs in developing or acquiring and applying digital Landsat analysis capabilities, i.e., (1) the North Dakota Regional Environmental Assessment Program's state land cover analysis, and (2) the South Dakota Land Use Inventory. The implications of the two programs for the computerized processing of Landsat data are briefly considered. B.J.

A79-16187 * **Remote sensing program in earth resources.** F. C. Billingsley (NASA, Washington, D.C.) and D. T. Lauer (U.S. Geological Survey, Sioux Falls, S. Dak.). In: National Computer Conference, Anaheim, Calif., June 5-8, 1978, Proceedings. Montvale, N.J., AFIPS Press, 1978, p. 173, 174.

The basic features of the NASA remote sensing program are briefly outlined. Consideration is given to physical data acquisition and preprocessing, archiving for bulk retrieval, availability of Landsat data, and the role of foreign ground stations. B.J.

A79-16554 * **Cost benefit assessment of NASA remote sensing technology transferred to the State of Georgia.** D. L. Kelly, R. P. Zimmer, and R. D. Wilkins (Georgia Institute of Technology, Atlanta, Ga.). In: SOUTHEASTCON '78; Proceedings of the Southeast Region 3 Conference, Atlanta, Ga., April 10-12, 1978. Piscataway, N.J., Institute of Electrical and Electronics Engineers, Inc., 1978, p. 430-433. Contract No. NAS9-15283.

The benefits involved in the transfer of NASA remote sensing technology to eight Georgia state agencies are identified in quantifiable and qualitative terms, and a value for these benefits is computed by means of an effectiveness analysis. The benefits of the transfer are evaluated by contrasting a baseline scenario without Landsat and an alternative scenario with Landsat. The net present value of the Landsat technology being transferred is estimated at 9.5 million dollars. The estimated value of the transfer is most sensitive to discount rate, the cost of photo acquisition, and the cost of data digitalization. It is estimated that, if the budget is constrained, Landsat could provide data products roughly seven times more frequently than would otherwise be possible. M.L.

A79-17076 **Space Shuttle and Spacelab utilization: Near-term and long-term benefits for mankind; Proceedings of the Twenty-fourth Annual Meeting and Sixteenth Goddard Memorial Symposium, Washington, D.C., March 8-10, 1978. Parts 1 & 2.** Meeting and Symposium sponsored by the American Astronautical Society and Deutsche Gesellschaft für Luft- und Raumfahrt. Edited by G. W. Morgenthaler (Martin Marietta Aerospace, Bethesda, Md.) and M. Hollstein (Dornier GmbH, Friedrichshafen, West Germany). San Diego, Calif., American Astronautical Society (Advances in the Astronautical Sciences. Volume 37, Pts. 1 & 2); Univelt, Inc., 1978. Pt. 1, 399 p.; pt. 2, 455 p. Price of two parts, $70.

Consideration is given to such aspects of Shuttle/Spacelab utilization as advanced missions for X-ray astronomy, life sciences programs, materials research and space processing experiments, solar power satellite developments, and space experiments related to earth resources technology. Particular papers are presented on a Spacelab payload for communication and navigation experiments, utilization of thin silicon solar cells in space, and crystal growth experiments on Spacelab. B.J.

A79-17078 * **Landsat missions.** H. Mannheimer and S. Derdeyn (NASA, Washington, D.C.). In: Space Shuttle and Spacelab utilization: Near-term and long-term benefits for mankind; Proceedings of the Twenty-fourth Annual Meeting and Sixteenth Goddard Memorial Symposium, Washington, D.C., March 8-10, 1978. Part 1. San Diego, Calif., American Astronautical Society; Univelt, Inc., 1978, p. 257-272. (AAS 78-019)

This paper gives a description and present status of NASA's Landsat program, including the orbital coverage, payload, data processing, and data products. Data uses are discussed in general terms. Also discussed are NASA's plans for the Landsat-3 and Landsat-D missions and the improved capabilities represented by these missions. The Shuttle retrieval of Landsat-D and the Shuttle launch of future Landsat satellites are discussed conceptually. (Author)

N79-10096*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POST LANDSAT D ADVANCED CONCEPT EVALUATION
F. S. Flatow and L. D. Alexander (GE Co.) *In* NASA. Langley Res. Center Large Space Systems Technol., Vol. 1 1978 p 533-567
(Contract NAS2-9580)
Avail: NTIS HC A23/MF A01 CSCL 22B

Preliminary results of a past LANDSAT D advanced concept evaluation study to forecast and identify key technologies required for earth resources satellite systems in the 1985 to 2000 time period are presented. Mission categories discussed include agriculture, range management, forestry, geological resources, land use, water resources, environmental quality, and disaster assessment. Sensor and system concepts are described for a passive L-band radiometer (microsat), a texturometer to measure ground surface texture, and a ferris wheel radar configuration that relies on cable tension for support. A.R.H.

N79-11454# Petroleum Industry Research Foundation, Inc., New York.
OUTLOOK FOR WORLD OIL INTO THE 21ST CENTURY WITH EMPHASIS ON THE PERIOD TO 1990 Final Report
John H. Lichtblau and H. J. Frank May 1978 180 p refs Sponsored by Electric Power Research Inst. Prepared in cooperation with Arizona Univ.
(EPRI-EA-745; SOA-76-328) Avail: NTIS HC A09/MF A01

A forecast is presented of oil supply and demand in the non-Communist world for two periods: 1976 to 1990 and 1990 to 2005. Oil is treated as the energy supply of last resort, the balancing item, with special emphasis on oil from the Organization of Petroleum Exporting Countries (OPEC). Energy demand, based on forecast economic growths and energy/economic growth relationships is projected. This demand is assumed to be met to the maximum feasible extent from non-oil energy supplies (coal, gas, nuclear power, hydro and geothermal power, and other sources). The resultant total oil demand is then met first from non-OPEC oil supplies, in order to test the demand for and adequacy of OPEC oil supplies under different energy demand scenarios. The findings are that a gradual transition to non-oil sources of energy over the next 25 to 30 years is more likely than an extended oil shortage of crisis proportions. DOE

N79-11940# Swedish Board for Space Activities, Solna.
SWEDISH SPACE ACTIVITIES DURING 1977
25 Jan. 1978 9 p
Avail: NTIS HC A02/MF A01

National and international space activities in Sweden are summarized. Projects described include remote sensing of earth resources; meteorology; communications; satellites; sounding rockets; balloons and aeroplanes; and telemetry. ESA

N79-12131# National Environmental Satellite Center, Washington, D. C.
SATELLITE ACTIVITIES OF NOAA 1977
Apr. 1978 22 p
Avail: NTIS HC A02/MF A01

To make sure the earth will continue to serve and sustain its people, NOAA pursues a variety of programs. These include operating, maintaining, and improving the operational environmental satellite systems; providing data to assess the impact of natural and people-induced factors on such things as global food supplies, national energy problems, and environmental quality; conducting fundamental research to improve our understanding of the environment; using satellite data and aerial photography for charting, coastal mapping, and geodetic research; improving weather services through the automation of forecast and observation stations, better radar systems, and continued atmospheric research; and improving the assessment and conservation of all living marine resources. J.A.M.

N79-13434*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OVERVIEW OF BRAZILIAN REMOTE SENSING ACTIVITIES
Nelson deJesusParada, Principal Investigator and Claudio Roland Sonnenburg Aug. 1978 24 p refs Sponsored by NASA ERTS
(E79-10023; NASA-CR-157912; INPE-1323-NTE/126) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-13443*# Servicio Geologico de Bolivia, La Paz.
[BOLIVIAN PROGRAM OF SATELLITE TECHNOLOGY OF EARTH RESOURCES, ERTS] [PROGRAMA DEL SATELITE TECHNOLOGICO DE RECURSOS NATURALES ERTS, BOLIVIA]
Carlos E. Brockmann, Principal Investigator Aug. 1978 127 p refs In SPANISH and ENGLISH Sponsored by NASA Original contains color illustrations ERTS
(E79-10036; NASA-CR-157919; Rept-2) Avail: NTIS HC A07/MF A01 CSCL 05B

N79-13468*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INPE REMOTE SENSING PROGRAM [PROGRAMA DE SENSORIAMENTO REMOTO DO INPE]
Nelson deJesusParada, Principal Investigator and Claudio Roland Sonnenburg Aug. 1978 10 p In PORTUGUESE Sponsored by NASA ERTS
(E79-10061; NASA-CR-157929; INPE-1345-AMD/001) Avail: NTIS HC A02/MF A01 CSCL 05B

N79-14455*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TECHNOLOGY TRANSFER: CONCEPTS, USER REQUIREMENTS, AND A PRACTICAL APPLICATION
J. D. Murphy (USDA Agricultural Stabilization and Conservation Service, Houston, Tex.), F. C. David (USDA Economics, Statistics, and Cooperatives Service, Houston, Tex.), R. E. Hatch (USDA Foreign Agricultural Service, Houston, Tex.), R. L. Packard (USDA Foreign Agricultural Service, Washington, D. C.), and D. Durica,

Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 105-118 refs EREP

Avail: NTIS HC A07/MF A01 CSCL 02C

N79-15118*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OAST SPACE THEME WORKSHOP. VOLUME 2: THEME SUMMARY. 5: GLOBAL SERVICE (NO. 11). A. STATEMENT. B. 26 APRIL 1976 PRESENTATION. C. SUMMARY
1976 45 p Workshop held at Langley Station, Va., 26-30 Apr. 1976 17 Vol.
(NASA-TM-80006) Avail: NTIS HC A03/MF A01 CSCL 22A

The benefits to be obtained from cost-effective global observation of the earth, its environment, and its natural and man-made features are examined using typical spacecraft and missions which could enhance the benefits of space operations. The technology needs and areas of interest include: (1) a ten-fold increase in the dimensions of deployable and erectable structures to provide booms, antennas, and platforms for global sensor systems; (2) control and stabilization systems capable of pointing accuracies of 1 arc second or less to locate targets of interest and maintain platform or sensor orientation during operations; (3) a factor of five improvements in spacecraft power capacity to support payloads and supporting electronics; (4) auxiliary propulsion systems capable of 5 to 10 years on orbit operation; (5) multipurpose sensors; and (6) end-to-end data management and an information system configured to accept new components or concepts as they develop. A.R.H.

N79-15354*# California Univ., Berkeley. Space Sciences Lab.
APPLICATION OF REMOTE SENSING TO SELECTED PROBLEMS WITHIN THE STATE OF CALIFORNIA Annual Report
Robert N. Colwell, Andrew S. Benson, John E. Estes, and Leonard W. Bowden, Principal Investigators 1 May 1978 193 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NsG-7220)
(E79-10075; NASA-CR-157968; SSL-Ser-19-Issue-64) Avail: NTIS HC A09/MF A01 CSCL 05B

N79-15361*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES Annual Progress Report
Robert N. Colwell, Ralph Algazi, Leonard W. Bowden, John E. Estes, Ida R. Hoos, and Siamak Khorram, Principal Investigators 1 May 1978 220 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NGL-05-003-404)
(E79-10082; NASA-CR-157975; SSL-Ser-19-Issue-53-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 08F

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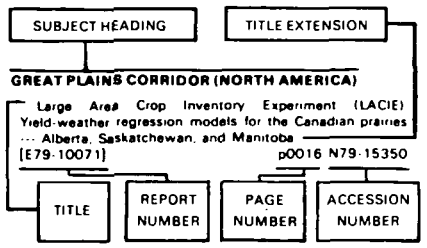

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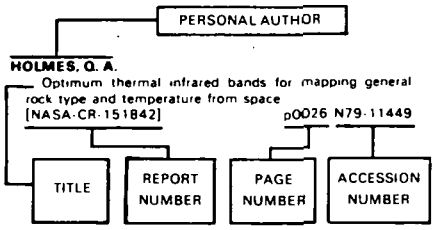

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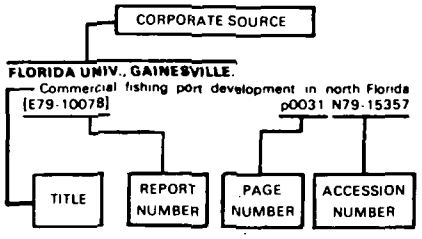

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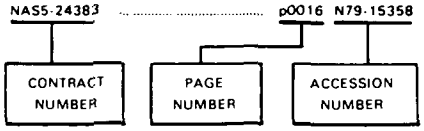

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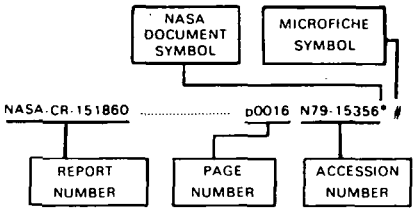

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7. Author(s)	8. Performing Organization Report No.
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9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D. C. 20546	11. Contract or Grant No.
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16. Abstract

This bibliography lists 369 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1979 and March 31, 1979. 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 and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
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