NASA SP-7041 (07)

EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

ISSUE 7

FEBRUARY 1976

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7041(07) Earth Resources Pages 151-215 FEBRUARY 1976

PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES

Remote Sensing of Earth Resources	(NASA SP-7036(01))
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NASA SP-7041 (07)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 7

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between July 1975 and September 1975 in

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

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FEBRUARY 1976
Washington, D.C.

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INTRODUCTION

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

This literature survey lists 492 reports, articles, and other documents announced between July and September 1975 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 A75-10,000 in ascending accession number order;

STAR entries identified by accession number series N75-10,000 in ascending accession number order.

After the abstract section, there are five indexes:

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

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A75-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g. (A75-10763), when requesting publications.

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Microfiche [1] are available at a standard price of $2.25 (plus $1.50 for non-U.S. customers) regardless of source or the quality of the fiche for those accessions followed by a # symbol. Accession numbers followed by a + sign are not available as microfiche because of size or reproducibility.

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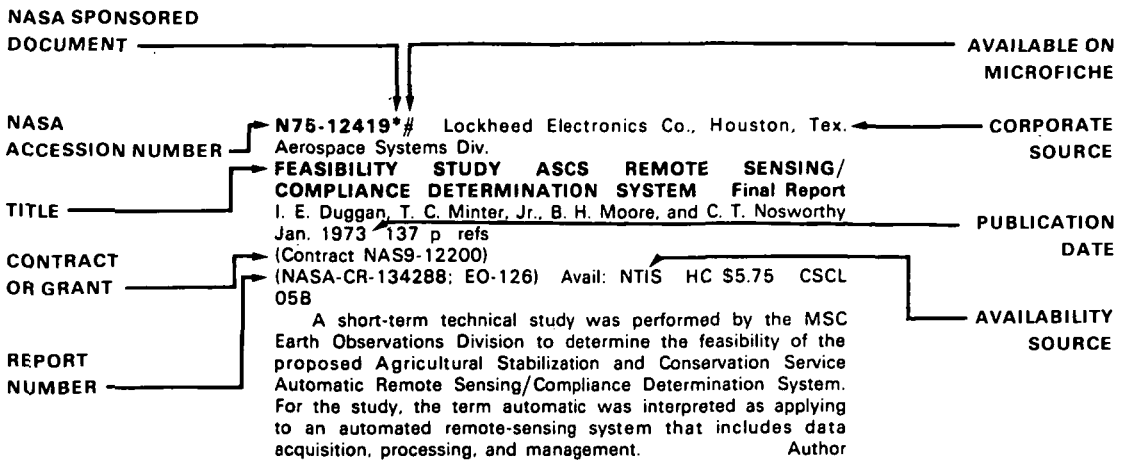

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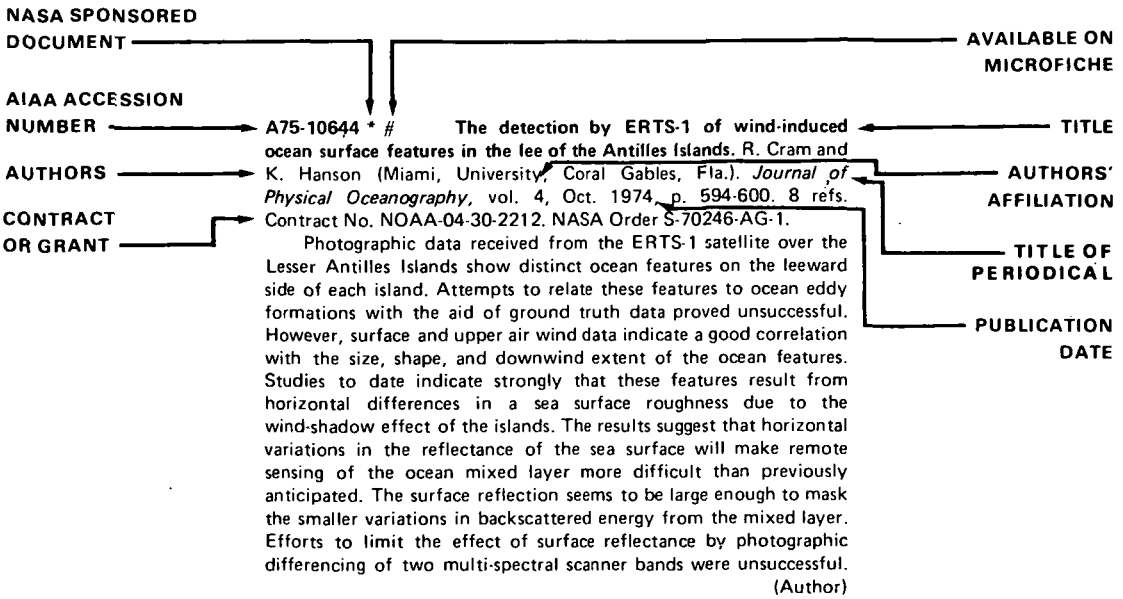

EARTH RESOURCES

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FEBRUARY 1976

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.

A75-29721 * **Separation of man-made and natural patterns in high-altitude imagery of agricultural areas.** A. S. Samulon (TRW Systems Group, Redondo Beach, Calif.). *IEEE Transactions on Circuits and Systems,* vol. CAS-22, May 1975, p. 450-463. 39 refs. Grant No. NGR-05-003-404.

A nonstationary linear digital filter is designed and implemented which extracts the natural features from high-altitude imagery of agricultural areas. Essentially, from an original image a new image is created which displays information related to soil properties, drainage patterns, crop disease, and other natural phenomena, and contains no information about crop type or row spacing. A model is developed to express the recorded brightness in a narrow-band image in terms of man-made and natural contributions and which describes statistically the spatial properties of each. The form of the minimum mean-square error linear filter for estimation of the natural component of the scene is derived and a suboptimal filter is implemented. Nonstationarity of the two-dimensional random processes contained in the model requires a unique technique for deriving the optimum filter. Finally, the filter depends on knowledge of field boundaries. An algorithm for boundary location is proposed, discussed, and implemented. (Author)

A75-30549 # **Results of agricultural experimental interpretation of black-and-white and spectral-band aerial photographs (Rezul'taty eksperimental'nogo sel'skokhoziaistvennogo deshifrirovaniia cherno-belykh i spektrozonal'nykh aerosnimkov).** I. N. Rychkov. *Geodeziia i Kartografiia,* Mar. 1975, p. 56-58. In Russian.

A75-31249 * **Multispectral sensing of citrus young tree decline.** G. J. Edwards, E. P. DuCharme (Florida, University, Lake Alfred, Fla.), and T. Schehl (Florida, University, Lake Alfred; NASA, Kennedy Space Center, Fla.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, May 1975, p. 653-657. 5 refs.

Computer processing of MSS data to identify and map citrus trees affected by young tree decline is analyzed. The data were obtained at 1500-feet altitude in six discrete spectral bands covering regions from 0.53 to 1.3 millimicrons as well as from instrumental ground truths of tree crowns. Measurable spectral reflectance intensity differences are observed in the leaves of healthy and diseased trees, especially at wavelengths of 500 to 600 nm and 700 to 800 nm. The overall accuracy of the method is found to be 89%. F.G.M.

A75-31586 # **Observation of desertification in the Israeli ERTS-1 Program.** J. Otterman and Y. Waisel (Tel Aviv University, Tel Aviv, Israel). In: Meteorological and earth-resources satellites - Special Technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 197, 199-205. 6 refs.

ERTS-1 data are reported which show lower albedo in Israeli-occupied Western Negev than in the Sinai and Gaza Strip areas inhabited by Egyptians from 1948 to 1967. Desertification on the formerly Egyptian side of the border is attributed to overgrazing and to Bedouin shrub harvesting for the construction of huts. Absorptivity of the dark side is 20% higher than that of the bright side, and ground temperatures are 4-5 C higher in the former than in the latter region. More rain would be expected to fall over the warmer terrain. Ground observations of vegetation are also presented which correlate with the satellite results. S.J.M.

A75-33103 # **Observing cold-night temperatures of agricultural landscapes with an airplane-mounted radiation thermometer.** P. R. Nixon (Agricultural Research Service, Weslaco, Tex.) and T. A. Hales (Texas A & M University, Weslaco, Tex.). *Journal of Applied Meteorology,* vol. 14, June 1975, p. 498-505. 15 refs.

A75-33114 * # **Evaluation of an ERTS-1 data collection platform installed in the Alpine Tundra, Colorado.** R. G. Barry and J. M. Clark (Colorado, University, Boulder, Colo.). *Journal of Applied Meteorology,* vol. 14, June 1975, p. 622-626. Contract No. NAS5-21880.

The communication of data in real-time to users from ground stations in remote areas is a major objective of recent space technology. The data collection system considered uses small battery-operated ground-based transmitters called data collection platforms (DCP). The feasibility of collecting environmental data in extreme cold and windy environments using the ERTS DCP, has been investigated. A summary of the results of an evaluation of the system used is presented. G.R.

A75-33197 # **Helicopters in forestry (Vertolety v lesnom khoziaistve).** A. U. Karmazin and N. K. Talantsev. Moscow, Izdatel'stvo Lesnaia Promyshlennost', 1974. 120 p. 34 refs. In Russian.

The present work gives information on the use of helicopters in valuation surveys of forests, glades, insect-destroyed areas, burnt-out areas, weather-destroyed areas, and nurseries. The reliability of various valuation indices is examined for different types and scales of aerial photographs. Economical aspects of aerial valuation by helicopter are studied. P.T.H.

A75-33862 * # **Microwave signatures of snow, ice and soil at several wavelengths.** P. Gloersen, T. J. Schmugge, and T. C. Chang (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 101-111.

Analyses of data obtained from aircraft-borne radiometers have shown that the microwave signatures of various parts of the terrain depend on both the volume scattering cross-section and the dielectric loss in the medium. In soil, it has been found that experimental data fit a model in which the scattering cross section is negligible compared to the dielectric loss. On the other hand, the volume scattering cross-section in snow and continental ice was found, from analyzing data obtained with aircraft- and spacecraft-borne radiom-

eters, to be more important than the dielectric loss or surface reflectivity in determining the observed microwave emissivity. A model which assumes Mie scattering of ice particles of various sizes was found to be the dominant volume scattering mechanism in these media. Both spectral variation in the microwave signatures of snow and ice fields, as well as the variation in the emissivity of continental ice sheets such as those covering Greenland and Antarctica appear to be consistent with this model. (Author)

A75-33863 # **Microwave radiation properties of thermal and moist land areas.** N. A. Armand, A. E. Basharinov, L. F. Borodin, and A. M. Skutko (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 123-130.

Microwave radiation measurements over regions of thermal activity such as volcanoes, fumarol fields, burning areas of forests, peat-piles, and moist regions have been performed from aircraft in the 0.8-2.0 cm wavelength range from 1972-1974. The data obtained give a representation of positive and negative brightness temperature contrasts, caused by heating and moistening respectively. (Author)

A75-33864 # **Passive microwave sensing of moist soils.** A. E. Basharinov, L. F. Borodin, and A. M. Shutko (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 131-135. 5 refs.

Some microwave radiation data at the wavelengths of 0.8, 3.4, 10, and 20 cm obtained from aircraft measurements over bare fields and regions with vegetation are presented in this paper. A comparison is made with ground truth moisture content data. The *brightness temperature-moisture content dependences are observed* with some peculiarities due to the wavelength range and an influence of vegetation. The data obtained indicate the possibility of moisture content determination by means of microwave radiometry. (Author)

A75-33865 # **Estimation of the apparent temperatures of local objects and some earth's covers in the range of 6.66-25 reciprocal cm.** I. A. Iskhakov, A. V. Sokolov, and E. V. Sukhonin (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki, Moscow, USSR). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 137-139.

A75-33866 # **Scattering, emission and penetration of three millimeter waves in soil.** E. Schanda and R. Hofer (Bern, Universität, Berne, Switzerland). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 141-149.

Controlled experiments on the emission behavior of various natural and man-made types of soil at 3.2 mm wavelength have been performed. Additional forward scatter measurements on the same materials allow the elimination of the atmospheric contributions and an approximate determination of the effective permittivities. By the use of a metal plate underneath soil-layers of various thicknesses, the penetration depth of 3 mm waves in a few specific soils has been determined. The effects of humidity and polarization have been studied and a comparison to earlier measured emissivities at 3 cm wavelength has been established. The investigated media are: humus, lawn, gravel, fine-grained sand, concrete, road asphalt cover, board, and eternit. (Author)

A75-33869 * # **Vegetation and soil backscatter over the 4-18 GHz region.** F. T. Ulaby (University of Kansas Center for Research, Inc., Lawrence, Kan.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 163-175. 10 refs. Contract No. NAS9-10261.

Using an FM-CW radar mounted atop a truck-mounted boom, 4-8 GHz backscatter spectral data was gathered during the 1972 growing season at incidence angles of 0-70 deg in 10 deg steps for each of the four linear polarization combinations. The data covers four mature crop types (corn, milo, soybeans and alfalfa) and bare ground taken under a wide range of soil and plant moisture contents. To insure statistical representation of the results, measurements were conducted over 147 fields corresponding to a total of about 50,000 data points. During 1973, a higher frequency version of the above system was used to collect additional data over the 8-18 GHz frequency region. This paper presents a summary of the results and suggests design criteria for future radar remote sensing missions. (Author)

A75-33870 # **Short range vegetation scatterometry.** E. P. W. Attema (Delft, Technische Hogeschool, Delft, Netherlands) and J. van Kuilenburg (Netherlands Interdepartmental Working Community for the Application of Remote Sensing Techniques, Delft, Netherlands). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 177-184. 7 refs.

Some results of short-range scatterometry of vegetation are presented. The observations are compared to the existing model predictions based on actual measured vegetation parameters. Measurement precision has been analyzed, and the predicted precision has been compared to that actually observed. (Author)

A75-33871 # **Measurements of radar ground returns.** G. P. de Loor (Physisch Laboratorium RVO-TNO, The Hague, Netherlands). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 185-195. 9 refs. Research supported by the Netherlands Interdepartmental Working Community for the Application of Remote Sensing Techniques.

The ground-based measurement techniques for the determination of the radar backscatter of vegetation and soils as used in the Netherlands are described. Two techniques are employed: one covering a large sample area (greater than 1000 sq m) but working at low grazing angles only and one (short-range) covering a small sample area of about 1 sq m, but working at higher grazing angles. Results of measurements are reported. They include measurements on coniferous trees, selected agricultural crops, grass and bare soils. The radar return parameter gamma as a function of wavelength and polarization is a useful classifier. Within the full dynamic range of gamma as met in nature its total variation for vegetation is 20 dB. The radar backscatter coefficient as a function of frequency and polarization seems to be the only possible classifier for vegetation species. (Author)

A75-33873 * # **Soil moisture detection by Skylab's microwave sensors.** F. T. Ulaby, J. Barr, A. Sobti, and R. K. Moore (University of Kansas Center for Research, Inc., Lawrence, Kan.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 205-208. 8 refs. Contract No. NAS9-13331.

Terrain microwave backscatter and emission response to soil moisture variations are investigated using Skylab's 13.9 GHz RADSCAT (Radiometer-Scatterometer) system. Data acquired on June 5, 1973 over a test site in west-central Texas indicates a fair degree of correlation with composite rainfall. The scan mode was cross-track contiguous (CTC) with a pitch of 29.4 deg and no roll offset. Vertical polarization was employed with both radiometer and scatterometer. The composite rainfall was computed according to the flood prediction technique using rainfall data supplied by weather reporting stations. (Author)

A75-33923 * **Seasonal vegetation differences from ERTS imagery.** M. D. Ashley and J. Rea (Maine, University, Orono, Me.).

Photogrammetric Engineering and Remote Sensing, vol. 41, June 1975, p. 713-719. 7 refs. Contract No. NAS5-21781.

Knowledge of the times when crop and forest vegetation experience seasonally related changes in development is important in understanding growth and yield relationships. This article describes how densitometry of earth resources technology satellite (ERTS-1) multispectral scanner (MSS) imagery can be used to identify such phenological events. Adjustments for instrument calibration, aperture size, gray-scale differences between overpasses, and normalization of changing solar elevation are considered in detail. Seasonal vegetation differences can be identified by densitometry of band 5 (0.6-0.7 microns) and band 7 (0.8-1.1 microns) MSS imagery. Band-to-band ratios of the densities depicted the changes more graphically than the individual band readings. (Author)

A75-35390 # **Dependence of the polarization of radiation reflected by natural formations on index properties.** C. R. N. Rao (California, University, Los Angeles, Calif.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 208-215. 19 refs. Army-supported research; NSF Grant No. GA-16617.

A detailed laboratory investigation of the dependence of the polarization of radiation reflected by selected soil samples on their texture and moisture content has been completed. Efforts were mainly directed toward correlation of moisture with radiation characteristics. It is noted that in this connection, the most significant plane of observation is the specular plane. Further studies on the competing effects of soil type and atmospheric dispersion must follow before the method can be perfected. S.J.M.

A75-35438 **Helium survey, a possible technique for locating geothermal reservoirs.** A. A. Roberts, I. Friedman, T. J. Donovan, and E. H. Denton (U.S. Geological Survey, Denver, Colo.). *Geophysical Research Letters,* vol. 2, June 1975, p. 209, 210.

Measurements were made of the helium concentration in the soil gases surrounding the Indian Hot Springs, Idaho Springs, Colorado. The helium concentration was shown to vary in a regular manner from the background level of 5.2 ppm to a high of more than 100 ppm near a warm (26 C) water seep, and more than 1000 ppm near a hot (40 C) water seep. Such an association of helium in the soil gas with these hot waters near the earth's surface suggests the possible utility of helium surveys in locating hidden geothermal reservoirs. (Author)

A75-36807 **The significance of remote sensing techniques for agricultural, forestry, and rangeland management.** R. H. Miller (U.S. Department of Agriculture, Agricultural Research Service, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 199-206.

A75-36812 **Mapping vegetation in the Great Basin from ERTS-1 imagery.** P. T. Tueller, G. Lorain, R. Halvorson (Nevada, University, Reno, Nev.), and J. M. Ratliff (Natural Resources Consultants, Inc., Sparks, Nev.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 338-370. 34 refs.

ERTS-1 resolution capabilities and repetitive coverage have allowed the mapping of the natural vegetation of Nevada by the following categories: southern desert shrub, salt desert shrub, northern desert shrub, pinyon/juniper woodland, mountain brush, aspen, meadows and marshlands, wheatgrass seedings, phreatophytes and cropland. Familiarity with landform, tone pattern, and other converging factors, along with multidate imagery, has been required. Color composites and winter scenes were particularly useful. A key to the vegetation on Nevada has been prepared for use with ERTS-1 color composites. (Author)

A75-38513 # **Evaluation of heat balance measurements to determine the evapotranspiration of tree reserves (Auswertung von Wärmehaushaltsmessungen zur Ermittlung der Verdunstung von Waldbeständen).** W. Golf (Dresden, Technische Universität, Dresden, East Germany). *Zeitschrift für Meteorologie,* vol. 25, no. 2, 1975, p. 112-116. 15 refs. In German.

N75-21703 Joint Publications Research Service, Arlington, Va.
HYDRAULIC CONDUCTIVITY OF SOME SOILS OF THE DON-ARCHEDA SAND MASSIF
N. A. Muromtsev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 87-93 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 70-75

By using the sonde method and the method of synchronous moisture profiles and the moisture potential, the hydraulic conductivity coefficient was determined for two different soils with respect to mechanical composition in their moisture range from capillary moisture capacity to maximum hygroscopicity. It is demonstrated that with a reduction in the moisture potential from 0 to -55 atmospheres the hydraulic conductivity coefficient decreased from 1 x 10 to 1 x 10 to the minus 14 power cu cm x sec/q for the chernozem loamy soil and from 6 x 10 to the minus 10 power to 4 x 10 to the minus 15 power cu cm x sec/q. Author

N75-21704 Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF FORECASTING THE GREEN TEA LEAF HARVEST BY THE METHOD OF PARAMETRIC SIMULATION
G. A. Arveladze *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 94-105 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 76-84

A procedure for forecasting the tea leaf harvest was developed on the basis of the specific laws of shoot formation of the tea shrub. The harvest data for individual varieties are considered as a nonstationary discrete time series. In predicting this series it is proposed that the method of parametric simulation be used which was developed by Box and Jenkins. Author

N75-21705 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS OF IDENTIFYING VEGETATION
V. I. Rachkulik and M. V. Sitnikova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 106-110 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 85-88

The effects of soil and green mass on the curves for the spectral brightness coefficients of the soil vegetation system are studied. It is demonstrated that the nature of these curves is determined by the amount of green mass of the vegetation and the reflecting properties of the soil under the plants. Author

N75-21722*# California Univ., Davis. Dept. of Soils and Plant Nutrition.
USE OF ERTS-1 DATA IN IDENTIFICATION, CLASSIFICATION, AND MAPPING OF SALT-AFFECTED SOILS IN CALIFORNIA Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, Gordon L. Huntington, Principal Investigators, James Thayer, Eugene L. Begg, Fred W. Herbert, Jack K. Clark, William E. Wildman, and Hays Fisher 14 Jul. 1973 18 p
Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
ERTS
(Contract NAS5-21827)
(E75-10197; NASA-CR-142383) Avail: NTIS HC $3.25 CSCL 08B

N75-21723*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING, AND SOIL

SALINITY DETECTING Monthly Progress Report, Mar. 1975
Craig L. Wiegand, Principal Investigator Apr. 1975 5 p EREP (NASA Order T-4105-B)
(E75-10198; NASA-CR-142384; MPR-15) Avail: NTIS HC $3.25 CSCL 02C

N75-21727*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1 Mar. - 31 Mar. 1975
K. J. Savastano, Principal Investigator 31 Mar. 1975 3 p EREP
(NASA Order T-8217-B)
(E75-10202; NASA-CR-142388; PR-15) Avail: NTIS HC $3.25 CSCL 08A

N75-21735*# Mississippi State Univ., State College. Inst. for Environmental Studies.
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Final Report, Oct. 1972 - Sep. 1974
C. W. Bouchillon, Principal Investigator, F. M. Ingels, R. W. Boyd, G. Tupper, C. Baskin, and J. Therral 20 Dec. 1974 78 p refs ERTS
(Contract NAS5-21881)
(E75-10210; NASA-CR-142396) Avail: NTIS HC $4.75 CSCL 02C

N75-21743*# California Univ., Davis. Dept. of Soils and Plant Nutrition.
USE OF ERTS-1 DATA IN THE EDUCATIONAL AND APPLIED RESEARCH PROGRAMS OF AGRICULTURAL EXTENSION Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, William E. Wildman, Principal Investigators, Jack Clark, Hays Fisher, Richard Pelton, and James Thayer 14 Jul. 1973 24 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10218; NASA-CR-142404) Avail: NTIS HC $3.25 CSCL 02C

N75-21755*# Bureau of Indian Affairs, Washington, D.C.
TIMBER RESOURCES INFORMATION SYSTEM Final Report, 30 Jun. 1972 - 23 Mar. 1974
Arthur M. Woll, Principal Investigator 19 Jun. 1974 76 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10230; NASA-CR-142416) Avail: NTIS HC $4.75 CSCL 02F

N75-21756*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Jan. - 15 Mar. 1975
Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 Mar. 1975 8 p
(NASA Order T-4106-B)
(E75-10231; NASA-CR-142417; BMPR-16) Avail: NTIS HC $3.25 CSCL 02F

N75-21757*# Helsinki Univ. (Finland). Dept. of Geophysics.
ON THE POSSIBILITIES OF DETERMINING THE BASIN CHARACTERISTICS BY MEANS OF SATELLITE IMAGES Final Report
Erkki Palosuo and Risto Kuittinen, Principal Investigators (National Board of Waters, Helsinki, Finland) 7 Jan. 1974 25 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10232; NASA-CR-142418) Avail: NTIS HC $3.25 CSCL 08E

N75-21758*# Polytechnical Univ. of Madrid (Spain). Escuala Tecnica Superior de Ingenieros Agronomos.
IDENTIFICATION OF LARGE MASSES OF CITRUS FRUIT AND RICE FIELDS IN EASTERN SPAIN
Fernando de Sagredo Lopez, Principal Investigator 1974 6 p Sponsored by NASA ERTS
(E75-10233; NASA-CR-142419) Avail: NTIS HC $3.25 CSCL 02C

N75-21759*# Forest Research Inst., Helsinki (Finland).
DEMONSTRATION OF THE APPLICABILITY OF SATELLITE DATA TO FORESTRY Final Report, Dec. 1972 - Apr. 1974
Kullervo Kuusela, Principal Investigator Apr. 1974 31 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10234; NASA-CR-142420) Avail: NTIS HC $3.75 CSCL 20F

N75-21760*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Final Report, 19 Jun. 1972 - 27 Nov. 1974
Craig L. Wiegand, Principal Investigator, H. W. Gausman, R. W. Leamer, A. J. Richardson, A. H. Gerbermann, R. J. Torline, M. R. Gautreaux, J. H. Everitt, J. A. Guellar, R. R. Rodriguez et al Nov. 1974 89 p refs Original contains color illustrations ERTS
(NASA Order S-70251-AG)
(E75-10235; NASA-CR-142423) Avail: NTIS HC $4.75 CSCL 20F

The author has identified the following significant results. Bands 4, 5, and 7 and 5, 6, and 7 were best for distinguishing among crop and soil categories in ERTS-1 SCENES 1182-16322 (1-21-73) and 1308-16323 (5-21-73) respectively. Chlorotic sorghum areas 2.8 acres or larger in size were identified on a computer printout of band 5 data. Reflectance of crop residues was more often different from bare soil in band 4 than in bands 5, 6, and 7. Simultaneously acquired aircraft and spacecraft MSS data indicated that spacecraft surveys are as reliable as aircraft surveys. ERTS-1 data were successfully used to estimate acreage of citrus, cotton, and sorghum as well as idle crop land.

N75-21777*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ERTS-1 INVESTIGATION (ER-600): A COMPENDIUM OF ANALYSIS RESULTS OF THE UTILITY OF ERTS-1 DATA FOR LAND RESOURCES MANAGEMENT
R. Bryan Erb Nov. 1974 170 p Original contains color illustrations
(NASA-TM-X-58156; JSC-08455) Avail: NTIS HC $6.25 CSCL 08F

The results of the ERTS-1 investigations conducted by the Earth Observations Division at the NASA Lyndon B. Johnson Space Center are summarized in this report, which is an overview of documents detailing individual investigations. Conventional image interpretation and computer-aided classification procedures were the two basic techniques used in analyzing the data for detecting, identifying, locating, and measuring surface features related to earth resources. Data from the ERTS-1 multispectral scanner system were useful for all applications studied, which included agriculture, coastal and estuarine analysis, forestry, range, land use and urban land use, and signature extension. Percentage classification accuracies are cited for the conventional and computer-aided techniques. Author

N75-21778*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE ERTS-1 INVESTIGATION (ER-600). VOLUME 1: ERTS-1 AGRICULTURAL ANALYSIS Progress Report, Jul. 1972 - Jun. 1973
R. Bryan Erb Nov. 1974 209 p Original contains color illustrations 7 Vol.
(NASA-TM-X-58117; JSC-08456-Vol-1) Avail: NTIS HC $7.25 CSCL 02C

The Agriculture Analysis Team of the Johnson Space Center conducted a 1-year-long investigation of ERTS-1 multispectral data to evaluate how well features of agricultural importance could be detected, identified, and located; and their areal extent measured. Six study areas were selected in cooperation with the U.S. Department of Agriculture. Two basic analytical approaches were used to meet the objectives. The conventional image interpretation technique revealed that a particular color was an indication of the density of vegetative cover, not an indication of crop classification. Computer-aided techniques were used to classify crop types (i.e., small grains, truck farm crops, grasses, summer fallow) to accuracies as high as 95 percent on large (12 hectares or more) well-defined fields. A further breakdown into crop species (wheat, barley, soybeans, oats, corn) reduced the accuracy to 70 to 80 percent for single-date observations. *Author*

N75-22861*# Earth Satellite Corp., Berkeley, Calif.
EVALUATION OF USEFULNESS OF SKYLAB EREP S-190 AND S-192 IMAGERY IN MULTISTAGE FOREST SURVEYS Progress Report, 1 Jul. 1974 - Feb. 28 1975
Philip G. Langley, Principal Investigator 28 Feb. 1975 5 p EREP
(Contract NAS9-13289)
(E75-10244; NASA-CR-142537) Avail: NTIS HC $3.25 CSCL 02F

N75-22874*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Apr. 1975
Craig L. Wiegand, Principal Investigator May 1975 15 p refs EREP
(NASA Order T-4105-B)
(E75-10263; NASA-CR-142638; MPR-16) Avail: NTIS HC $3.25 CSCL 02C

N75-22885*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Mar. 1975
Victor I. Myers, Principal Investigator 20 Apr. 1975 2 p EREP
(Contract NAS9-13337)
(E75-10274; NASA-CR-142683) Avail: NTIS HC $3.25 CSCL 08F

N75-22887*# Wyoming Univ., Laramie. Dept. of Geology.
MAPPING OF SELENIFEROUS VEGETATION AND ASSOCIATED SOILS IN THE LOWER WASATCH FORMATION, POWER RIVER BASIN, WYOMING
Kenneth E. Kolm Mar. 1975 25 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13298)
(E75-10276; NASA-CR-142685; EREP-S-75-1) Avail: NTIS HC $3.25 CSCL 08B

N75-24052 Institut National de la Recherche Agronomique, Paris (France). Service de Metrologie.
MULTISPECTRAL AERIAL RECONNAISSANCE OF PARASITIC ATTACKS IN FORESTS: REMOTE SENSING Final Report [RECONNAISSANCE MULTISPECTRALE PAR SURVOL D'ATTAQUES PARASITAIRES EN FORET 'REMOTE SENSING' (SURVEILLANCE FORESTIERE)]
Charles Goillot and Charles Rossetti Jul. 1974 17 p In FRENCH
(Contract DGRST-71-7-2624)
Avail: Issuing Activity

The remote sensing technique was applied to phytosanitary problems caused by the attack of cochineals on the sea pine in various regions in France. The objective was to find the spectral signature of the trees attacked by the cochineal in the Maures and Esterel Massives and to recognize this signature in the Landes Massif. Both optical and thermal multispectral band scanners were used in the reconnaissance flights. ESRO

N75-24054*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB EREP SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Apr. 1975
David S. Gilmer, Principal Investigator Apr. 1975 2 p EREP
(NASA Order T-4114-B; DI-14-16-0008-802)
(E75-10281; NASA-CR-142718) Avail: NTIS HC $3.25 CSCL 06C

The author has identified the following significant results. Surface water statistics using data obtained by supporting aircraft were generated. Signature extraction and refinement preliminary to wetland and associated upland vegetation recognition were accomplished, using a selected portion of the aircraft data. Final classification mapping and analysis of surface water trends will be accomplished.

N75-24058*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, May 1975
Craig L. Wiegand, Principal Investigator May 1975 17 p refs EREP
(NASA Order T-4105-B)
(E75-10285; NASA-CR-142722; MPR-17) Avail: NTIS CSCL 02C

The author has identified the following significant results. Correlations of multispectral scanner (MSS) digital data differences between vegetated and bare soil areas with salinity levels from the eight saline areas using MSS bands seven and ten in the infrared region were significant. Correlations were derived for Cameron County, Texas. Detection of saline soils may be possible, using either film density readings or multispectral scanner data, when the lower reflectance of vegetation on highly saline soil and the higher reflectance of vegetation on lower saline soil are considered by using film on MSS contrasts between vegetation and bare soil.

N75-24066*# Bittinger (M. W.) and Associates, Inc., Fort Collins, Colo.
GROUND TRUTH PROCEDURES, PHOENIX SOIL MOISTURE Mission Report, 19-22 Mar. 1975
E. Bruce Jones Apr. 1975 11 p
(Contract NAS5-22312)
(NASA-CR-143795) Avail: NTIS HC $3.25 CSCL 08M

Procedures used for collection of ground truth, in connection with passive gamma and microwave remote sensing are summarized. Soil moisture and vegetation sampling procedures are described. J.M.S.

N75-24071# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MANGANESE IN VIRGINIA SOILS AND CORRECTION OF MANGANESE DEFICIENCY IN SOYBEANS (GLYCINE MAX L.) Ph.D. Thesis
Marcus M. Alley Mar. 1975 119 p refs
Avail: NTIS HC $5.25

Manganese concentration in Virginia soils was studied. Soil profile samples were analyzed from catenas representing the Appalachian, Piedmont, and Coastal Plain regions. It was found that Mn concentration is higher in the Appalachian soils. Various methods of Mn application to correct Mn deficiency in soybeans were investigated in greenhouse and field research. Results are presented. Author

N75-24087# Earth Satellite Corp., Washington, D.C.
REMOTE SENSING APPLICATIONS TO RESOURCE MANAGEMENT PROBLEMS IN THE SAHEL
J. B. Bale, D. Conte, D. Geohring, and D. S. Simonett Jul. 1974 264 p refs
(Contract AID-afr/c-1058)
(PB-239867/5) Avail: NTIS HC $8.50 CSCL 02D

An economic and managerial setting is given for the use of remote sensing for resource management in the Sahelian environment. Remote sensing systems and alternative costs are described. Remote sensing applications to specific resource management problems are presented. GRA

N75-25241*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1 Apr. - 30 Apr. 1975
K. J. Savastano, Principal Investigator 30 Apr. 1975 3 p EREP
(NASA Order T-8217-B)
(E75-10294; NASA-CR-142838; PR-16) Avail: NTIS HC $3.25 CSCL 08A

N75-25244*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Nov. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, and Richard F. Nalepka Nov. 1974 4 p Prepared in cooperation with Environmental Research Inst. of Michigan EREP
(Contract NAS9-13332)
(E75-10297; NASA-CR-142841; ERIM-104600-28-L) Avail: NTIS HC $3.25 CSCL 09D

N75-25245*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Apr. 1975
Victor I. Myers, Principal Investigator 20 May 1975 2 p EREP
(Contract NAS9-13337)
(E75-10298; NASA-CR-142842) Avail: NTIS HC $3.25 CSCL 12A

N75-25247*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Oct. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators (Environ. Res. Inst. of Mich.), and Richard F. Nalepka (Environ. Res. Inst. of Mich.) Oct. 1974 4 p EREP
(Contract NAS9-13332)
(E75-10300; NASA-CR-142844; ERIM-104600-25-L) Avail: NTIS HC $3.25 CSCL 09D

N75-25248*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Jan. 1975
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern Jan. 1975 5 p Prepared in cooperation with Environ. Res. Inst. of Mich. EREP
(Contract NAS9-13332)
(E75-10301; NASA-CR-142845; ERIM-104600-32-L) Avail: NTIS HC $3.25 CSCL 09D

N75-25249*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Dec. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern Dec. 1974 6 p Prepared in cooperation with Environ. Res. Inst. of Mich. EREP
(Contract NAS9-13332)
(E75-10302; NASA-CR-142846; ERIM-104600-30-L) Avail: NTIS HC $3.25 CSCL 09D

N75-25256*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, May 1975
Roger M. Hoffer, Principal Investigator May 1975 10 p EREP
(Contract NAS9-13380)
(E75-10309; NASA-CR-142910) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. MSS data on the area near Lake Hope and San Miguel on the Ophir and Mt. Wilson quadrangles were classified. Two vein-like areas of alteration were apparent, along with the hill wash composed primarily of altered rock. These areas were quite delineated. A small oval patch of shadowed alteration was classified in a location in which alteration was previously unnoticed during an airphoto study.

N75-25257*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Mar. - 15 May 1975
Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 May 1975 6 p EREP
(NASA Order T-4106-B)
(E75-10310; NASA-CR-142853; BMPR-17) Avail: NTIS HC $3.25 CSCL 08F

N75-25258*# Massachusetts Univ., Amherst. Dept. of Geology.
MAPPING AND ANALYSIS OF SAND DUNE FIELDS AND RELATED EOLIAN EROSIONAL FEATURES IN RELATIVELY INACCESSIBLE REGIONS Final Report
Donald O. Doehring, Principal Investigator Jun. 1975 19 p refs ERTS
(Contract NAS5-21871)
(E75-10311; NASA-CR-142854) Avail: NTIS HC $3.25 CSCL 08B

The results of experimental studies on the backscattering properties of corn, milo, soybeans and alfalfa are presented. The measurements were made during the summer of 1973 over the 8 to 18 GHz frequency band. The data indicate that soil moisture estimation is best accomplished at incidence angles near nadir with lower frequencies, while crop discrimination is best accomplished using two frequencies at incidence angles ranging from 30 deg to 65 deg. It is also shown that temporal plant morphology variations can cause extreme variations in the values of the scattering coefficients. These morphological changes can be caused by growth, heavy rain and in the case of alfalfa, harvesting. Author

N75-25260*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE EFFECTS OF SOIL MOISTURE AND PLANT MORPHOLOGY ON THE RADAR BACKSCATTER FROM VEGETATION
Fawwaz T. Ulaby, Thomas F. Bush, Percy P. Batlivala, and Josef Cihlar Jul. 1974 101 p refs
(Contract NAS9-10261)
(NASA-CR-141684; RSL-TR-177-51) Avail: NTIS HC $5.25 CSCL 17I

N75-25287# Missouri Univ., Rolla. Dept. of Chemistry.
USE OF A MICROWAVE REMOTE SENSOR FOR DETERMINATION OF WATER IN SUBSOILS
Byong Ki Park, James E. Adair, and C. McDowell Aug. 1974 46 p refs
(Contract DI-14-31-0001-4025)
(PB-239255/3; W75-04149; OWRT-A-070-MO(1)) Avail: NTIS HC $3.75 CSCL 08M

Laboratory equipment using a microwave remote sensor was developed for measuring the amount of moisture in different soil materials. A technique based on the measurement of the *microwave transmission properties of samples located within a* waveguide was used, and the frequency used was 10.525 GHz. Input impedance was measured by slotted line techniques. Calculations of the complex dielectric constant were made for each measured value of the complex propagation constant to provide a comparison with measured values of various soils. Evaluations were made for the use of passive and active microwave remote sensing devices for water content of soils under different conditions. GRA

N75-26480*# Texas A&M Univ., College Station. Dept. of Mathematics.
OPTIMAL SELECTION OF PASSES
L. F. Guseman, Jr. and Bruce P. Marion Jan. 1975 19 p ref
(Contract NAS9-13894)
(NASA-CR-141877) Avail: NTIS HC $3.25 CSCL 05B

Preliminary numerical results obtained from the application of a linear feature selection technique to the determination of combinations of passes which best discriminate between a given set of crops in a given area of interest, are reported. The results obtained are not purported to hold in a general situation, but only for the given set of crops and the given, but unknown, levels of several factors-such as soil type, and fertilizer practice, holding in the area of interest. However, by identifying the various factors affecting the spectral signatures, and by formulating a regression model one could use the feature selection technique to determine the regression coefficients for predicting optimal passes for a given set of crops. Another use of the feature selection technique as applied to multiple pass registered data is the generation of enhanced grey scale displays by using a single linear combination of all channels of all designated passes as opposed to a single channel within a single pass. Author

N75-26555*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
DIELECTRIC PROPERTIES OF SOILS AS A FUNCTION OF MOISTURE CONTENT
Josef Cihlar and Fawaz T. Ulaby, Nov. 1974 61 p refs
(Contract NAS9-10261)
(NASA-CR-141868; RSL-TR-177-47) Avail: NTIS HC $4.25 CSCL 08M

Soil dielectric constant measurements are reviewed and the dependence of the dielectric constant on various soil parameters is determined. Moisture content is given special attention because of its practical significance in remote sensing and because it represents the single most influential parameter as far as soil dielectric properties are concerned. Relative complex dielectric constant curves are derived as a function of volumetric soil water content at three frequencies (1.3 GHz, 4.0 GHz, and 10.0 GHz) for each of three soil textures (sand, loam, and clay). These curves, presented in both tabular and graphical form, were chosen as representative of the reported experimental data. Calculations based on these curves showed that the power reflection coefficient and emissivity, unlike skin depth, vary only slightly as a function of frequency and soil texture. Author

N75-27514*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL Final Report, 1 Aug. 1972 - 17 Mar. 1974
Robert M. Haralick, Principal Investigator 12 Feb. 1975 32 p ERTS
(Contract NAS5-21822)
(E75-10326; NASA-CR-143063) Avail: NTIS HC $3.75 CSCL 08F

N75-27523*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Jun. 1975
David S. Gilmer, Principal Investigator Jun. 1975 2 p EREP
(NASA Order T-4114-B; Contract DI-14-16-0008-802)
(E75-10335; NASA-CR-143072) Avail: NTIS HC $3.25 CSCL 06C

N75-27524*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1 May - 31 May 1975
K. J. Savastano, Principal Investigator 31 May 1975 3 p EREP
(NASA Order T-8217-B)
(E75-10336; NASA-CR-143073; PR-17) Avail: NTIS HC $3.25 CSCL 08A

N75-27527*# Environmental Research Inst. of Michigan, Ann Arbor. Information Systems and Analysis.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, May 1975
Richard F. Nalepka, Principal Investigator, William A. Malila, and James P. Morgenstern 12 Jun. 1975 11 p EREP
(Contract NAS9-13280)
(E75-10339; NASA-CR-143075; ERIM-101900-57-L) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. The effects of misregistration and the scan-line-straightening algorithm on multispectral data were found to be: (1) there is greatly increased misregistration in scan-line-straightening data over conic data; (2) scanner caused misregistration between any pairs of channels may not be corrected for in scan-line-straightened data; and (3) this data will have few pure field center pixels than will conic data. A program SIMSIG was developed implementing the signature simulation model. Data processing stages of the experiment were carried out, and an analysis was made of the effects of spatial misregistration on field center classification accuracy. Fifteen signatures originally used for classifying the data were analyzed, showing the following breakdown: corn (4 signatures), trees (2), brush (1), grasses, weeds, etc. (5), bare soil (1), soybeans (1), and alfalfa (1).

N75-27529*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
VEGETATIONAL ANALYSIS WITH SKYLAB-3 IMAGERY
Charles W. Welby, Principal Investigator and Robert E. Holman [1975] 27 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13321)
(E75-10341; NASA-CR-143077) Avail: NTIS HC $3.75 CSCL 08F

The author has identified the following significant results. Color infrared photography from Skylab 3 appeared to be superior to ERTS imagery in a vegetational study of northeastern North Carolina. An accuracy of 87% was achieved in delimiting species composition and zonation patterns of three coastal, vegetation classes. A vegetation map of Perquimans County, North Carolina,

seemed to have a high degree of correlation with information provided by high altitude U-2 photography. Random verification sites revealed an overall interpretation accuracy above 84%. Comparison of maps drawn utilizing Skylab photography with North Carolina Dept. of Agriculture estimates of crop acreage revealed some marked discrepancies. The chief difference lies in the nonagricultural category in which there is a 30% discrepancy. This fact raised some questions as to the definition of nonagricultural land uses and methods used by the State Dept. of Agriculture to determine actual percentages of crops grown.

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.

A75-30010 **Simultaneous measurements of NO and NO2 in the stratosphere.** M. Ackerman, D. Frimout, C. Muller (Institut d'Aéronomie Spatiale de Belgique, Brussels, Belgium), J. C. Fontanella, A. Girard, and N. Louisnard (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *Planetary and Space Science,* vol. 23, Apr. 1975, p. 651-660. 28 refs. Research supported by the Comité d'Etudes des Conséquences des Vols Stratosphériques; Contract No. N00014-73-C-0076.

NO and NO2 were measured by infrared absorption in the stratosphere, using the sun as a light source, in the 5.2 and 6.2 micron bands respectively. These measurements lead to a composite picture of NOx distribution. The composition reaches a peak at 26 km, where it equals (4.2 plus or minus 1) times 10 to the ninth power per cu cm. The volume mixing ratio of NOx varied from 1.3 times 10 to the minus ninth power at 20 km to 1.3 times 10 to the minus eighth power at 34 km. S.J.M.

A75-30475 **Systems analysis and modelling approaches in environment systems; Proceedings of IFAC/UNESCO Workshop, Zakopane, Poland, September 17-22, 1973.** Edited by R. M. Dmowski (Polska Akademia Nauk, Instytut Cybernetyki Stosowanej, Warsaw, Poland). Warsaw, Instytut Cybernetyki Stosowanej PAN, 1974. 611 p.

Various global, ecological, and social models of environment-related problems are presented. The behavior of pollution in Forrester's world model, a dynamic model of conflict, mathematical modeling of critical situations in environmental problems, an optimization of the exploitation strategy for a natural population with overlapping generations, a large-scale research project in progress on environmental pollution in Japan, and optimal reservoir operating policies via search methods are some of the topics discussed. S.J.M.

A75-31332 # **Experiment in comparison of satellite and ground cloudiness data (Opyt sopostavleniia sputnikovykh i nazemnykh dannykh ob oblachnosti).** A. F. Diubiuk, V. M. Berezin, T. N. Bibikova, and E. V. Zhurba (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Meteorologiia i Gidrologiia,* Mar. 1975, p. 101-104. In Russian.

The present work discusses some aspects of comparing satellite-obtained photographs of cloud cover (in both the visible and near IR ranges) with those obtained on the ground for the purpose of testing the correctness of the interpretation of the satellite photographs. Results of such comparisons made with photographs of cloud formations over the Crimea are discussed, where generally adequate agreement between satellite and ground pictures was found, although ground pictures were more detailed. P.T.H.

A75-31594 * # **Satellite determination of nature and microstructure of atmospheric aerosols.** A. L. Fymat (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 325, 327-345. 14 refs. Contract No. NAS7-100.

A method is presented for the determination of aerosol physical parameters on the basis of scattered radiance measurements. The reconstruction of aerosol particle size distribution in the case of a spectral forward scattering method is considered, taking into account an inverse diffraction integral expression, a model cloud, the effect of lower wavenumber cut-off, the effect of higher wavenumber cut-off, the effect of spectral resolution, and the effects of multiple scattering and background noise. The determination of the aerosol complex refractive index with the aid of a minimization search method is also discussed. G.R.

A75-31598 # **Realization of a geothermal measuring station in the craters of Mt. Vesuvius (Realizzazione di una stazione per misure geotermiche nel cratere del vulcano Vesuvio).** P. G. Berardi, G. M. Carlomagno, and L. G. Napolitano (Napoli, Università, Naples, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 387, 389-401. 9 refs. In Italian.

An automatic ground facility has been realized and installed in the first intracrateric yellow macula of the Vesuvius volcano in order to make geothermal measurements. The test apparatus permits both underground temperature and microclimatic (local air temperature, humidity, and wind velocity) measurements over a period of up to one week. Some of the experimental results obtained are presented and analyzed. S.J.M.

A75-31599 # **Classification of certain areas in the Lazio region by means of data transmitted from ERTS-1 (Classificazione di alcune aree laziali mediante dati trasmessi dall'ERTS-1).** F. Capozza (Telespazio S.p.A., Rome, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 403, 405-414. In Italian.

The present work deals with digital processing work carried out on ERTS-1 imagery for an area centered near Rome, Italy. Two kinds of digital processing methods were applied: contrast enhancement for water pollution detection in the Tiber River delta and 'unsupervised' classification into twelve classes of a region approximately 1000 kilometers square. The results were very encouraging and show the potential utility of digital processing of satellite images in earth resources management and environmental control applications. S.J.M.

A75-32318 * **Remote air pollution measurement.** R. L. Byer (Stanford University, Stanford, Calif.). *Optical and Quantum Electronics,* vol. 7, May 1975, p. 147-177. 133 refs. NSF-NASA-supported research.

This paper presents a discussion and comparison of the Raman method, the resonance and fluorescence backscatter method, long path absorption methods and the differential absorption method for remote air pollution measurement. A comparison of the above remote detection methods shows that the absorption methods offer the most sensitivity at the least required transmitted energy. Topographical absorption provides the advantage of a single ended measurement, and differential absorption offers the additional advantage of a fully depth resolved absorption measurement. Recent experimental results confirming the range and sensitivity of the methods are presented. (Author)

A75-32530 # **The influence of the atmosphere on remote-sensing measurements.** J. B. Farrow (Hawker Siddeley Dynamics, Ltd., Stevenage, Herts., England). *Revue Scientifique et Technique CECLES/CERS,* vol. 7, Jan.-Mar. 1975, p. 1-28. 23 refs. European Space Research Organization Contracts No. 1837/72; No. 1838/72.

Information is provided on the basic physics of atmospheric processes that influence remote-sensing measurements. A description is given of standard atmospheric conditions and variations that can occur in the mean state. The influences of the atmosphere on incident and reflected solar radiation and on emitted scene radiation are then described, with particular reference to the major types of earth-resources sensors. Finally, various possible means of correcting atmospherically degraded data are reviewed. (Author)

A75-32544 # **Investigation of the petroleum contaminations, salinity, and other factors on the optical properties of water in the infrared region of the spectrum (Issledovanie vliianiia neftianykh zagriaznenii, solenosti i nekotorykh drugikh faktorov na opticheskie svoistva vody v infrakrasnoi chasti spektra).** V. V. Bogorodskii, M. A. Kropotkin, and T. Iu. Sheveleva (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR). *Meteorologiia i Gidrologiia,* Dec. 1974, p. 3-9. 8 refs. In Russian.

A75-32900 # **Remote sensing of smokestack exit velocities using a laser Doppler velocimeter.** T. R. Lawrence, M. C. Krause, C. E. Craven (Lockheed Missiles and Space Co., Inc., Huntsville, Ala.), and W. F. Herget (U.S. Environmental Protection Agency, Research Triangle Park, N.C.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-684.* 8 p. 5 refs. Research supported by the Lockheed Independent Development Funds and U.S. Environmental Protection Agency.

A laser Doppler instrument capable of remotely sensing the velocity structure of atmospheric phenomena is described. It is of monostatic design and utilizes a carbon dioxide laser as the illuminator. The technique involves the coherent detection of laser radiation backscattered by the ambient particulate matter in the flow field. Its application to the monitoring of the flow emanating from a smokestack is described with the resulting data comparing very favorably with conventional in-stack measurements utilizing pitot tubes. The results of the investigation indicated the laser Doppler approach could be the basis of a dedicated smokestack exit velocity sensor. Scattered laser radiation level (which translates to system output level) being a function of the particulate level in the flow field correlated with the power station output power. The instrument is a breadboard version of a device that could be used in conjunction with other remote sensors of specific gaseous pollutant concentrations to yield pollutant mass flow rate estimates for the stack. (Author)

A75-32901 # **Use of remote sensing to study the dispersion of stack plumes.** K. E. Tempelmeyer (Tennessee, University, Tullahoma, Tenn.) and D. Ey. *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-685.* 7 p. 10 refs.

Plume dispersion at great distances downwind of a source may vary considerably because local meteorological and topographical effects change with increasing distance from the sources. ERTS-1, hyper- and conventional altitude images provide a cheap and convenient way to monitor a plume. By use of an I.S.I. image analyzer it was possible to obtain particulate profiles of the plume from a smelter and those of electrical power plants. This information can be used to estimate (1) the effects of fall-out from the plume, (2) changes in plant operation, (3) height of the plume above the ground, (4) lateral diffusion coefficients, and (5) fumigations. This paper represents this type of plume dispersion analysis for several stack configurations. (Author)

A75-33597 Detection of atmospheric pollutants - A correlation technique. H. Walter, Jr. (California Institute of Technology, Pasadena, Calif.) and D. Flanigan (U.S. Army, Development and Engineering Directorate, Aberdeen Proving Ground, Md.). *Applied Optics,* vol. 14, June 1975, p. 1423-1428. 9 refs.

Correlation functions for atmospheric pollution monitoring are derived by the Passive LOPAIR (Long Path InfraRed) remote IR sensing instrument. This detection system consists of a spectroradiometer and a discriminator (correlator), and uses natural background as a source. The correlation function for the dimethylmethylphosphonate pollutant is calculated by the simplex optimization method. This technique constrains the response of the gas detection system to less than some arbitrary constraint limit for background changes while optimizing system response to the pollutant under study. S.D.

A75-33726 Status of laser applications technology in the field of air-purity preservation; Laser Meeting, Essen, West Germany, October 9-11, 1974, Lectures (Stand der Anwendungstechnik von Lasern auf dem Gebiet der Luftreinhaltung; Laser-Tagung, Essen, West Germany, October 9-11, 1974, Vorträgung). Meeting sponsored by the Nordrheim-Westfalen Landesanstalt für Immissions- und Bodennutzungsschutz. Essen, Landesanstalt für Immissions- und Bodennutzungsschutz, 1974. 308 p. In German.

Requirements of measurement technology in the case of optical radar systems for the surveillance of pollutant emissions into the atmosphere are considered along with questions regarding the quantitative determination of particles in the atmosphere, experience obtained in the operation of optical radar, and the effects of multiple backscattering in the study of atmospheric parameters by remote sensing. Attention is also given to the use of optical radar in meteorology, the employment of optical radar for the measurement of visibility, the use of optical radar in the determination of slant range visibility for aircraft, and the possibilities concerning the use of a Spacelab-borne optical radar. G.R.

A75-33739 # **Remote analysis of gases by means of comparative absorption measurements with a laser (Gas-Fernanalyse durch vergleichende Absorptionsmessung mit Laser).** K. Gürs (Battelle-Institut, Frankfurt am Main, West Germany). In: Status of laser applications technology in the field of air-purity preservation; Laser Meeting, Essen, West Germany, October 9-11, 1974, Lectures. Essen, Landesanstalt für Immissions- und Bodennutzungsschutz, 1974, p. 207-229. 9 refs. In German.

A description is given of various approaches utilizing a laser for the remote analysis of gases, taking into account the laser Raman radar, a method employing fluorescence processes, and a gas analysis based on direct or comparative absorption measurements. Investigations regarding a continuously operating carbon-dioxide laser system for atmospheric studies are discussed. It is concluded that a satellite-borne system utilizing an approach based on comparative absorption measurements would make it possible to conduct air-pollution studies on a global basis. G.R.

A75-33743 # **Lidar measurements concerning nitrogen-dioxide pollution and their evaluation (Lidar-Messungen an NO2-Verunreinigungen und deren Auswertung).** K. W. Rothe (Köln, Universität, Cologne, West Germany). In: Status of laser applications technology in the field of air-purity preservation; Laser Meeting, Essen, West Germany, October 9-11, 1974, Lectures. Essen, Landesanstalt für Immissions- und Bodennutzungsschutz, 1974, p. 265-271. In German.

The use of a pulsed dye laser in the determination of the atmospheric nitrogen-dioxide concentration above Cologne, West Germany, is discussed. Attention is also given to the measurement of nitrogen-dioxide concentrations in the environment of a chemical factory. The investigation shows the potential of an approach based on differential absorption measurements for the remote determination of gaseous atmospheric pollutants. G.R.

A75-33786 * **Haze and sun angle effects on automatic classification of satellite data-simulation and correction.** J. F. Potter

(Lockheed Electronics Co., Inc., Houston, Tex.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 73-83. 8 refs. Contract No. NAS9-12200.

Variations in sun angle and haze level change the spectral signatures collected by multispectral scanners (MSS). This paper describes methods and computer programs that have been developed to simulate the effect of such variations and to correct for them. A basic program, Prediction of the Response of Earth Pointed Sensors (PREPS), is used to calculate the response of the sensor as a function of solar angle, atmospheric haze level, and target reflectance. It is then simply a matter of interpolating these results to simulate changes in haze level or solar angle. In principle, this can be done for any sensor, although at the present time it has been completed for only one - the ERTS-1 MSS. (Author)

A75-33787 * **Atmospheric corrections for satellite water quality studies.** K. R. Piech and J. R. Schott (Calspan Corp., Buffalo, N.Y.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 84-89. 5 refs. NASA-supported research; NSF Grants No. GA-37768; No. GA-32207.

Variations in the relative value of the blue and green reflectances of a lake can be correlated with important optical and biological parameters measured from surface vessels. Measurement of the relative reflectance values from color film imagery requires removal of atmospheric effects. Data processing is particularly crucial because: (1) lakes are the darkest objects in a scene; (2) minor reflectance changes can correspond to important physical changes; (3) lake systems extend over broad areas in which atmospheric conditions may fluctuate; (4) seasonal changes are of importance; and, (5) effects of weather are important, precluding flights under only ideal weather conditions. Data processing can be accomplished through microdensitometry of scene shadow areas. Measurements of reflectance ratios can be made to an accuracy of plus or minus 12%, sufficient to permit monitoring of important eutrophication indices. (Author)

A75-33788 * **Spectral measurements and analyses of atmospheric effects on remote sensor data.** R. L. Hulstrom (Martin Marietta Aerospace, Denver, Colo.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 90-100. 11 refs. Contract No. NAS8-24000.

The radiance as measured by a satellite remote sensor is determined by a number of different factors, including the intervening atmosphere, the target reflectivity characteristics, the characteristics of the total incident solar irradiance, and the incident solar irradiance/sensor viewing geometry. Measurement techniques and instrumentation are considered, taking into account total and diffuse solar irradiance, target reflectance/radiance, atmospheric optical depth/transmittance, and atmospheric path radiance. G.R.

A75-33789 * ***Influence of the atmosphere on remotely* sensed data.** R. E. Turner, W. A. Malila, R. F. Nalepka, and F. J. Thomson (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 101-114. 9 refs. Contracts No. NAS9-9784; No. NAS9-14123; No. NAS5-21783.

Factors which influence the effects of the atmosphere on the data of remote sensing are examined. A radiative-transfer model is considered and effects of varied optical thickness of the atmosphere are investigated. Effects of varied surface albedo are discussed along with the effects of the sun angle, the effects of the scan angle, and questions regarding the atmospheric effects on the recognition performance. It is found that a multiplicative factor involving the sun angle alone is not sufficient for the correction of space data. G.R.

A75-33851 Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Meeting sponsored by the International Union of Radio Science. Edited by E. Schanda (Bern, Universität, Berne, Switzerland). Berne, Universität Bern, 1974. 329 p. $11.80.

The use of artificial satellites for making surveys of the surface and underground features of the earth is discussed, particularly as regards microwave emission from water, sea-ice, land-ice, snow, soil, vegetation, and certain geological features. Some of the topics treated concern spectral variation in the microwave emissivity of the roughened seas, variation microwave signatures of snow, ice and soil and several wavelengths, scattering, emission and penetration of three-millimeter waves in soil, directional spectra of ocean waves from microwave backscatter, and portable radar for measurements in snow and for the search of avalanche victims. S.J.M.

A75-33855 # **False-alarm risks at radar detection of oil spill.** F. Eklund, J. Nilsson, and A. Blomquist (National Defence Research Institute, Stockholm, Sweden). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 39-45. 5 refs.

The generation and attenuation of capillary and short gravity waves at sea, possible false oil spill alarm causes, and some results of an experimental evaluation of false alarm risks are discussed. Wind speed variations and sea surface temperature effects are the major possible false alarm causes considered. The experiment mentioned dealt with the influence of variations in wind field only. A local reduction of the normalized radar backscatter cross section on the order of 5 dB was deemed reasonable as an oil spill alarm threshold. S.J.M.

A75-33922 Population estimates from satellite imagery. C. E. Ogrosky (Washington, University, Seattle, Wash.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, June 1975, p. 707-712. 6 refs.

The suitability of medium-ground-resolution, high-altitude satellite imagery as a data source for intercensal population estimates was evaluated. Four variables representing urban size and relative dominance were measured directly from unmagnified high-altitude, color-infrared transparencies for each of 18 urban test sites in the Puget Sound region. Linear relationships between each variable and the population of the test sites were established, the strongest association being between the logarithm of the area of the site (Y), r squared = 0.964. Use of all four independent variables in a multiple linear regression equation resulted in a slight increase in the r squared value, to 0.973. The high degree of association indicated that relatively low-ground-resolution images may be useful for certain intercensal estimating purposes. Further research is needed to define additional variables which may be useful for predictive purposes. (Author)

A75-33924 Trend-surface analysis of ocean outfall plumes. N. P. Psuty (Rutgers University, New Brunswick, N.J.) and J. R. Allen (Northeastern University, Boston, Mass.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, June 1975, p. 721-730. 9 refs.

Measures of water quality associated with ocean outfall effluent plumes are approached through the use of standard photographs which are transformed into numerical data sets and handled by the statistical technique of trend-surface analysis. The solutions for the trend surfaces are presented and the residuals are analyzed to discern their covariation with water-quality variables. A high correlation is

indicated for the measures of dissolved oxygen and the values derived from the photographic images. (Author)

A75-34901 Applications of ERTS data to land use planning on the Mississippi Gulf Coast. R. Boyd, F. Ingels, E. Bryant, R. Chapin, and R. Jones (Mississippi State University, State College, Miss.). In: Inventing the model of the future; Proceedings of the Southeast Region 3 Conference, Orlando, Fla., April 29-May 1, 1974. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 478, 479.

A75-34926 Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1 - Energy and the environment: Nuclear, fossil, seismic and unconventional energy. Volume 2. Mount Prospect, Ill., Institute of Environmental Sciences, 1975. Vol. 1, 260 p.; vol. 2, 204 p. Price of two volumes, $20.

Studies are presented dealing with the design of energy systems with consideration of their environmental impact. Some of the topics covered include risks to nuclear plants due to natural gas pipelines, ecological effects of local soil cooling or heating, energy analysis of the milling process in the nuclear fuel cycle, the effects of discharge design on the thermal mixing zone in waterways, wind energy utilization prospects, solar air conditioning systems using Rankine power cycles, and an ecologic solar heated and cooled home. P.T.H.

A75-34927 * Study of a water quality imager for coastal zone missions. W. F. Staylor, E. F. Harrison (NASA, Langley Research Center, Mission Analysis Section, Hampton, Va.), and V. W. Wessel (LTV Aerospace Corp., Hampton, Va.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 64-72. 7 refs.

The present work surveys water quality user requirements and then determines the general characteristics of an orbiting imager (the Applications Explorer, or AE) dedicated to the measurement of water quality, which could be used as a low-cost means of testing advanced imager concepts and assessing the ability of imager techniques to meet the goals of a comprehensive water quality monitoring program. The proposed imager has four spectral bands, a spatial resolution of 25 meters, and swath width of 36 km with a pointing capability of 330 km. Silicon photodetector arrays, pointing systems, and several optical features are included. A nominal orbit of 500 km altitude at an inclination of 50 deg is recommended. P.T.H.

A75-34953 Utilization of mathematical models and meteorological data in the assessment of air quality for fossil fueled electric power plants. A. Roffman (Westinghouse Electric Corp., Pittsburgh, Pa.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 2. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 145-151. 21 refs.

Air quality assessment is discussed as related to environmental studies. The discussion covers the available climatological and diffusion meteorology data along with their interpretation and utilization in most effective ways, and the calculation scheme which includes mathematical equations and diffusion models for predicting ground-level concentrations of airborne pollutants under various atmospheric conditions with allowance for terrain features. Also examined are special studies intended to determine optimum plant design while meeting the standards for ambient air quality. S.D.

A75-34954 Animal indicators of air pollution. J. R. Newman (Western Washington State College, Bellingham, Wash.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 2. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 152-154. 5 refs. Research supported by the U.S. Environmental Protection Agency.

The current work presents the highlights of an analysis of the feasibility and suitability of using animals as biological indicators of air pollution. Four types of response were found to give specific information on particular pollutants: physiological changes observed in autopsy or histology, residue accumulation, changes in blood chemistry and physiology, and changes in appearance or morphology. Other responses gave more general information as to their causes: cellular enzyme changes, abnormal behavior, and changes in abundance or distribution of animals. Certain pollutants are sufficiently understood for this kind of study, whereas others require more research. S.J.M.

A75-34955 Remote measurements of sulfur dioxide emitted from stationary sources. E. R. Bartle (Science Applications, Inc., Arlington, Va.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 2. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 155-159. 5 refs. U.S. Environmental Protection Agency Contract No. 68-02-1208.

A portable prototype passive infrared sensor is developed for measuring SO2 emissions from stationary sources. The sensor makes use of the GFC (Gas Filter Correlation) dual channel remote technique to determine quantitatively SO2 concentrations in hot plumes with only minimal effects due to plume temperature and sky background. The specifications and performance characteristics of the device are presented. Comparison between field testing results at both oil and coal burning power plants and extractive sample data shows that remote measurements agree with extractive data within + or - 25% for SO2 concentrations ranging from 150 to 1300 ppm from slant ranges of 130 to 400 m. S.D.

A75-35249 * Radar for small-scale land-use mapping. F. M. Henderson (New York, State University, Albany, N.Y.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Mar. 1975, p. 307-319. 8 refs. Contract No. NAS9-10261.

Small-scale (1:250,000 and smaller) land-use maps are a major concern not only to geographers but also to national and regional planners. Unfortunately, such maps are usually out of date by the time they are printed. An interpretation key consisting of five physical and cultural characteristics of the environment evident on radar imagery is used to create land-use regions. Regions and borders interpreted from radar are compared with those found on two existing land-use maps created by traditional methods. Radar imagery can be used to create a small-scale land-use map with regions comparable to those found on existing land-use maps. However, the radar regions depict something more than land use and should be termed rural landscape regions. (Author)

A75-35351 Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Conference sponsored by the American Meteorological Society. Boston, Mass., American Meteorological Society, 1974. 493 p. Members, $15.; nonmembers, $20.

Papers are presented dealing with the impact of Space Shuttle operation on environment; natural environment test support for aerospace vehicles; atmospheric pollution related to aviation; aircraft wake turbulence; meteorological instrumentation for aviation; and the impact of satellites on meteorology. Some of the topics covered include washout coefficients for scavenging of rocket exhaust HCl, atmospheric effects on Space Shuttle approach and landing; microstructure of cirrus layers; wind flow over simulated structures for Martian and terrestrial atmosphere; derivation of cloud water content from satellites; electrogasdynamic airport fog dispersal; influence of wind shear on aerodynamic coefficients; a predictive model of wake

vortex transport; and lidar techniques for measuring slant visibility. P.T.H.

A75-35361 * # Environmental observations of the Great Salt Lake Basin from ERTS-1. A. F. Smith (General Electric Co., Beltsville, Md.), V. V. Salomonson, A. T. Anderson, and A. Rango (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 49-52.

Some ERTS-1 observations of snowcover, turbidity variations in the major lakes, surface water area changes, land use features, and phenomena associated with industrial emissions are described. Turbidity patterns in the major water bodies can be observed that appear to be related to the general wind flow, or to lake circulation patterns, and the chemical or biological constituents in the water. Monthly, seasonal, and annual changes in surface water extent can be monitored and serve as indicators of water availability. Time and space variations in snowcover that are a function of exposure or time of year were observed in some regions. Specific measurements of snowline altitude during the major snowmelt period of 1973 were obtained. The existence and effect of industrial emission on vegetation were found to be detectable. P.T.H.

A75-35362 # Remote sensing through Nimbus and ERTS. J. J. Horan (General Electric Co., Space Div., Valley Forge, Pa.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 53-61.

The present work reviews the growth of the Nimbus meteorological satellite system and its outgrowth, the ERTS spacecraft, summarizing the main characteristics of all the Nimbus experiments and tracing the growth of sensor complexity, culminating in the multispectral scanning and high-resolution TV capacity of the ERTS satellite. Some geoscientific benefits from the Nimbus meteorological system and some meteorological findings from ERTS are discussed. P.T.H.

A75-35373 * # The Skylab concentrated atmospheric radiation project - An overview. V. S. Whitehead (NASA, Johnson Space Center, Houston, Tex.), P. M. Kuhn (NOAA, Environmental Research Laboratories, Boulder, Colo.), W. E. Marlatt (Colorado State University, Fort Collins, Colo.), and L. E. Williamson (U.S. Army, Atmospheric Sciences Laboratory, White Sands Missile Range, N. Mex.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 117-119.

An overview is presented of the Skylab Concentrated Atmospheric Radiation Project (SCARP), which was conducted to determine the accuracy and applicability of different models of radiation transfer through air masses of differing characteristics including varying amounts of wet and dry aerosols. Sites surveyed included onshore and offshore areas in the vicinity of Houston, Texas, the White Sands Missile Range in New Mexico, and Phoenix, Arizona, which provided a variety of warm, hot, dry, wet, clean, and dirty atmospheres. A typical exercise is described, and problems encountered during the experiment are discussed. It is noted that ten models of atmospheric scattering were utilized and that available data is being compared with the models. F.G.M.

A75-35375 # The ground level data collection experiment - Project SCARP. L. E. Williamson (U.S. Army, Atmospheric Sciences Laboratory, White Sands Missile Range, N. Mex.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 125, 126.

The ground data collection effort of Project SCARP is described. Target sites included the Houston, Texas, area and the four corners area of New Mexico. Measurements were made of the wind, air temperature, humidity, pressure, and incoming and outgoing visible and thermal fluxes. The albedoes of various surfaces are plotted, and it is noted that Skylab data will be used to derive similar albedoes for each surface at satellite levels. It is expected that the effects of industrial pollutants on the vertical transmittance of reflected solar visible radiation through the atmosphere will be derived from the composite ground/satellite data. F.G.M.

A75-35376 # A comparison of several atmospheric infrared radiation transfer models. D. S. Renne and W. E. Marlatt (Colorado State University, Fort Collins, Colo.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 127-132. 12 refs. Contract No. NOAA-03-3-022-85.

Three commonly used infrared radiation transfer models (Boudreau's model and the RADIANC and RADIANV models) are compared directly with observed upward and downward radiation transfer in the 8-14 micron range over various surfaces and through different atmospheres. The radiosonde launch made near the target within a couple of hours of the aircraft profile provided the vertical temperature and humidity profile required for computation of the radiative transfer models. Two major factors are found to contribute to a failure of agreement between observations and models: thermal nonuniformity of the test sites and changes in target temperature with time. It is shown that each model predicts more atmospheric attenuation than is actually observed. S.D.

A75-35378 # The NOAA operational environmental satellite system - Status and plans. G. H. Ludwig (NOAA, National Environmental Satellite Service, Washington, D.C.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974. p. 137-145.

Various satellites in the NOAA environmental satellite system are described, and the missions planned for them are outlined. The TOS/ESSA polar satellite, the ITOS/NOAA polar satellites, the ATS geostationary satellites, and the SMS/GOES geostationary satellites are discussed. Missions described include atmospheric temperature sounding, high-resolution radiometry, data collection and platform location, a satellite bus, vertical temperature profile radiometry, scanning radiometry, very-high-resolution radiometry, and solar proton monitoring. An attempt is made to highlight the complementary nature of the polar orbiting and geostationary data sources. Both of these satellite classes have unique and essential contributions to make. S.J.M.

A75-35381 * # The Synchronous Meteorological Satellite /SMS/ system. D. V. Fordyce, R. J. Wirth, and W. E. Shenk (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 158-164.

The Synchronous Meteorological Satellite (SMS) system is described which is being utilized in a program to obtain day and night information on the earth's weather by means of earth imaging, retransmission of imaged data, meteorological data collection and relay, and space environment monitoring. The components and functions of the ground system are discussed together with the basic satellite payloads. The launch and orbit of SMS-A are reviewed, and the functions of the visible IR spin-scan radiometer are described in detail. Other systems and units discussed include the data collection system, solar environment monitor, weather-facsimile unit, and central data distribution system. It is noted that SMS-A was used to support the Global Atlantic Tropical Experiment and that the SMS system will be complemented by geostationary environmental satellites from ESRO, Japan, and the USSR. F.G.M.

A75-35386 # **A bi-spectral method for inferring cloud amount and cloud-top temperature using satellite data.** T. H. Vonder Haar and D. W. Reynolds (Colorado State University, Fort Collins, Colo.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 190-193. 5 refs.

A75-35400 # **A global atmospheric monitoring program.** R. E. Johnson (United Air Lines, Inc., San Francisco International Airport, Calif.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 259, 260.

General aspects are discussed of the use of commercial aircraft in NASA's Global Air Sampling Program. Reasons for using commercial aircraft are outlined, and the equipment installed on one aircraft is described. The latter includes a dual inlet probe, an on-board computer for system management and data processing, ozone and CO2 monitors, a water vapor sensor, and a counter to measure airborne particles in five ranges down to 0.3 microns. F.G.M.

A75-35404 * # **Interpretation of air pollution data as measured by an airborne remote sensor.** G. L. Smith, G. R. Young, and R. N. Green (NASA, Langley Research Center, Hampton, Va.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 281-288. 8 refs.

The investigation described is a continuation of the work reported by Smith et al. (1974) in which a single source was studied. In the current study, multiple sources of known location are considered. The study is concerned with the strength of each source and the resulting pollution concentration field. The characteristics of the remotely sensed data are discussed along with the parameter estimation procedure, the estimation of pollution parameters, and a numerical example. G.R.

A75-35405 # **The computation of nuclear fallout winds from meteorological satellite observations.** L. D. Duncan (U.S. Army, Atmospheric Sciences Laboratory, White Sands Missile Range, N. Mex.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 289-292. 6 refs.

A75-35459 * # **Satellite detection of air pollutants.** W. A. Lyons (Wisconsin, University, Milwaukee, Wis.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S5-3 to S5-32. 19 refs. Research supported by the University of Wisconsin; U. S. Environmental Protection Agency Grant No. R-800873; NSF Grant No. GA-32208; Contract No. NAS5-21736.

NASA's ERTS-1 satellite, with its high resolution and multispectral capabilities, has been found useful in the detection and analysis of smoke from large point sources (power plants, steel mills, etc.), and widespread atmospheric turbidity associated with atmospheric stagnations. Smoke plumes from the Chicago-Northern Indiana industrial complex have been tracked over Lake Michigan for over 100 km. Experience has shown that smoke plumes are relatively easy to detect over water (in the 0.6-0.7 micrometer band) but much more difficult over land surfaces. Pattern recognition techniques (cluster analysis) were applied to the digital ERTS data, and it was found that the smoke plumes indeed had a unique spectral signature. Studies are currently underway to use measured plume geometries to obtain quantitative estimates of diffusion over water surfaces. (Author)

A75-35460 # **Remote sensing applied to thermal pollution.** S. S. Lee, T. N. Veziroglu, S. Sengupta, and N. L. Weinberg (Miami, University, Coral Gables, Fla.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S5-33 to S5-70. 47 refs.

Basic principles and relations involved in the use of infrared imaging for water surface temperature measurements are studied. The basic relationship between a black body's temperature and its radiance in the 8 to 14 micron band is discussed, and various methods of correcting for nonblackness and atmospheric absorption are studied. The basic characteristics of some airborne and satellite infrared remote sensing systems are described. P.T.H.

A75-35466 * # **The use of lidar for atmospheric measurements.** M. P. McCormick (NASA, Langley Research Center, Hampton, Va.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-119 to A-144. 9 refs.

The present work discusses basic lidar theory and the analysis of lidar return signals in tropospheric and stratospheric measurements. An example of the determination of water vapor mixing height through aerosol and molecular scattering functions is given. P.T.H.

A75-35584 * # **Atmospheric microphysical experiments on an orbital platform.** L. R. Eaton (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *American Meteorological Society and American Institute of Aeronautics and Astronautics, Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., Nov. 12-14, 1974, Paper.* 40 p. 33 refs. Contract No. NAS8-30272. (MDAC-WD-2488)

The Zero-Gravity Atmospheric Cloud Physics Laboratory is a Shuttle/Spacelab payload which will be capable of performing a large range of microphysics experiments. This facility will complement terrestrial cloud physics research by allowing many experiments to be performed which cannot be accomplished within the confines of a terrestrial laboratory. This paper reviews the general Cloud Physics Laboratory concept and the experiment scope. The experimental constraints are given along with details of the proposed equipment. Examples of appropriate experiments range from three-dimensional simulation of the earth and planetary atmosphere and of ocean circulation to cloud electrification processes and the effects of atmospheric pollution materials on microphysical processes. (Author)

A75-35872 * # **Air pollution source identification.** J. S. Fordyce (NASA, Lewis Research Center, Cleveland, Ohio). *Interagency Committee on Marine Science and Engineering Conference on the Great Lakes, 2nd, Argonne, Ill., Mar. 25-27, 1975, Paper.* 34 p. 56 refs.

Techniques for air pollution source identification are reviewed, and some results obtained with them are evaluated. Described techniques include remote sensing from satellites and aircraft, on-site monitoring, and the use of injected tracers and pollutants themselves as tracers. The use of a large number of trace elements in ambient airborne particulate matter as a practical means of identifying sources is discussed in detail. Sampling and analysis techniques are described, and it is shown that elemental constituents can be related to specific source types such as those found in the earth's crust and those associated with specific industries. Source identification sytems are noted which utilize charged particle X-ray fluorescence analysis of original field data. F.G.M.

A75-36050 # **Remote sensing of earth resources - A European point of view.** J. Plevin (ESRO, Department of Future Applications Programmes, Neuilly-sur-Seine, Hauts-de-Seine, France). *(Impact of Science on Society,* vol. 24, no. 3, 1974.) *ESRO/ELDO Bulletin,* Apr. 1975, p. 8-16, 29, 30.

The available techniques, current European experimental programs and future applications of the data collected from remote sensing of earth resources are outlined. The main elements comprising an earth resources survey are discussed initially, and the spectral characteristics of the sun's radiant energy in the visible and near infra-red bands are shown in addition to sensor devices with their operating wavelengths, and examples of their typical applications. Metric and multi-spectral cameras, single and multichannel line scanning instruments, radiometers, scatterometers, side-looking radar, lasers and various platforms on which these sensors are mounted are discussed. Use of the Earth Resources Technology Satellite by European communities is noted. M.G.

A75-36082 # Influence of the atmosphere on spectral brightnesses and contrasts of natural formations for spectrophotometric measurements of the earth from space (Vliianie atmosfery na spektral'nye iarkosti i kontrasty prirodnykh obrazovanii pri spektrofotometrirovanii zemli iz kosmosa). K. Ia. Kondrat'ev, A. A. Buznikov, O. B. Vasil'ev, and O. I. Smoktii (Leningradskii Gosudarstvennyi Universitet; Leningradskii Gidrometeorologicheskii Institut, Leningrad, USSR). *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol. 11, Apr. 1975, p. 348-361. 21 refs. In Russian.

The influence of the atmosphere on spectral brightnesses and contrasts of natural formations during spectrophotometric measurements of the earth from space in the visible spectral region is considered. The problem of theoretical and experimental determination of the atmospheric transfer function for the cases of practical interest is stated and solved. The technique for the determination of transfer functions and their components from the results of combined subsatellite experiments is discussed. A detailed comparison of the experimental data obtained on Soyuz-7 and Soyuz-9 spacecrafts and of the corresponding theoretical calculations is made. Considerable influence of the nonuniformity of the underlying surface near the boundary of two media (sand - sea, sand - cloudiness) on the transformation of brightnesses and contrasts to the level of the upper atmospheric boundary is shown. (Author)

A75-36803 Statewide land cover mapping using ERTS imagery. R. W. Kiefer, B. E. Frazier, and A. H. Miller (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 141-151. Research supported by the Madison Department of Administration State Planning Office.

Wisconsin land cover maps were prepared at a 1:500,000 scale from ERTS imagery. Four classes of terrain were discerned: forest-brushland, structure-barren land, surface water, and agricultural-open land. Data extraction was accomplished at the above scale using an International Imaging Systems Model 6040 PT additive color viewer that used 70 mm ERTS transparencies and had the capability to optically overlay as many as four bands, with different filters and illumination intensities accessible for each band. S.J.M.

A75-36804 Using aerial photography to estimate urban socio-economic conditions. F. M. Henderson and J. J. Utano (New York, State University, Albany, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 152-159. 12 refs.

Conventional black-and-white photos have long played a significant role in urban area analysis. However, little has been done with regard to the photo sociometric value of such imagery in describing economic and social values of urban life. The Albany, New York urban area is used to examine the potential of 1:24,000 black-and-white photography in assessing socio-economic housing conditions. Regression analyses are employed to determine the reliability of using housing density as a surrogate for housing quality in single-family dwelling units. Based on results from a sample of three hundred and nineteen blocks a linear relationship was found to exist between housing density and the following four socio-economic variables: average house value, average contract rent, median family income, and average number of rooms per unit. (Author)

A75-36806 The technologies of remote sensing of the environment. G. J. Zissis (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 179-198. 23 refs. NSF Grant No. GI-34899.

The present study had as object: (1) structuring the technology assessment of environmental remote sensing; (2) initiation of impact identification; (3) creation of a data base for an in-depth, comprehensive technology assessment; and (4) completion of pilot analyses to test the merits of the methodologies used. Emphasis is on the physical and social characteristics of the technology under study. S.J.M.

A75-36808 * Remote sensing applications for urban planning - The LUMIS project. C. K. Paul, A. J. Landini, and C. Diegert (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 225-241. 9 refs. Contract No. NAS7-100.

The Santa Monica mountains of Los Angeles consist primarily of complexly folded sedimentary marine strata with igneous and metamorphic rocks at the eastern end of the mountains. With the increased development of the Santa Monicas, a study was conducted to determine the critical land use data items in the mountains. Two information systems developed in parallel are described. One capitalizes on the City's present computer line printer system, and the second utilizes map overlay techniques on an interactive computer terminal. Results concerning population, housing, and land improvement illustrate the successful linking of ordinal and nominal data files in the interactive system. V.P.

A75-36809 Remote sensing applied to mine subsidence - Experience in Pennsylvania and the Midwest. T. V. Leshendok, R. V. Amato, and O. R. Russell (Earth Satellite Corp., Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 298-307.

Results of investigations are presented concerning the analysis of small- and large-scale color, color infrared, and black-and-white aerial photographs, as well as ERTS-1, side looking airborne radar, and multispectral imagery in order to detect mine subsidence and to correlate geological features with subsidence occurrence. Three types of surface expressions of mine subsidence are recognized: regional or areal subsidence; small, discrete subsidences called photoholes; and linear subsidence. It is shown that analysis of aerial remote sensing data makes it possible to identify surface subsidence features in hardly detectable areas, to determine linear geological features related to past or future subsidence occurrence, to establish relationships between subsidence and underground mine patterns, and to identify subsidence-prone areas for regional and local planning. S.D.

A75-36810 The use of remote sensing in transmission line route selection. M. C. Sullivan (Commonwealth Associates, Inc., Jackson, Mich.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 308-321.

The applications of sensor/scale systems to the selection of a transmission line route between Wyoming and eastern South Dakota are described. ERTS imagery is visually mapped for an area covering

two and a half states, mapping out land use and certain physiographic features. These data are combined with other data at a 1:1,000,000 scale to select a potential corridor. Following the corridor selection, topographic and country highway maps are combined with field work to determine actual line locations. These routes are then photographed with color infrared aerial photography both for detailed evaluation and for line route modification. The key aspect in this study is maximum use of imagery during the route selection process. S.D.

A75-36814 Investigations of coastal land use and vegetation with ERTS-1 and Skylab-EREP. D. Bartlett, V. Klemas (Delaware, University, Newark, Del.), and R. Rogers (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 378-392.

Digital ERTS-1 MSS scanner data and Skylab-EREP photographs have been used in an attempt to inventory and monitor significant natural and man-made cover types in Delaware's coastal zone. Automatic classification of ERTS data yielded classification accuracies of over 80% for all categories tested. Visual interpretation of EREP Earth Terrain photographs distinguished a minimum of 10 categories with classification accuracies ranging from 75% to 99%. Noise problems prevented analysis of EREP-S192 scanner data. Most noise sources have been identified and filtered. (Author)

A75-36816 Computer mapping of turbidity and circulation patterns in Saginaw Bay, Michigan /Lake Huron/ from ERTS data. R. H. Rogers, L. E. Reed (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), and V. E. Smith (Cranbrook Institute of Science, Bloomfield Hills, Mich.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 415-429. 8 refs.

A75-37370 Laser applications in remote sensing. H. Tannenbaum (U.S. Army, Edgewood Arsenal, Aberdeen Proving Ground, Md.). In: Impact of lasers in spectroscopy; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974.
Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 81-85.

The present work reviews some laser techniques for the monitoring of atmospheric pollutants and contaminants, including Raman scatter techniques (primarily backscatter), resonance fluorescence, and absorption with (1) cooperative reflector, (2) topographic reflectors, or (3) by differential backscatter. P.T.H.

A75-37445 Problems in atmospheric diffusion and air pollution (Voprosy atmosfernoi diffuzii i zagriazneniia vozdukha). Edited by M. E. Berliand. Leningrad, Gidrometeoizdat (Glavnaia Geofizicheskaia Observatoriia imeni A. I. Voeikova, Trudy, No. 314), 1974. 224 p. In Russian.

Studies on the measurement and dispersion of air pollutants from both natural and human sources are presented. Some of the topics covered include theory of scattering and absorption of radiation and estimation of global atmospheric pollution on the basis of actinometric data, aerial photography and the surveillance of volcanic and geothermal activity, a statistical method of evaluating the effect of meteorological conditions on atmospheric impurity content, and the determination of NO2 in air by a coulometric method with preliminary reaction.

P.T.H.

A75-37447 # Geophysical aerial photography for studying objects on the earth's surface and atmospheric impurities of natural origin (Aerogeokhimicheskaia s'emka dlia izucheniia ob'ektov zemnoi poverkhnosti i atmosfernykh primesei estestvennogo proiskhozhdeniia). M. E. Berliand, S. A. Kon'kov, and B. V. Shilin. In: Problems in atmospheric diffusion and air pollution. Leningrad, Gidrometeoizdat, 1974, p. 52-71. 16 refs. In Russian.

Some results of investigations into the flight of gas halos emanating from objects on the earth's surface are discussed. SO2 and H2S halos from an active volcano and of geothermal origin were studied. The feasibility of recording gas halos in flight is demonstrated and an optimal measuring method is described. Essential differences in the nature of halos above volcanic and geothermal activity were revealed. P.T.H.

A75-37715 Remote environmental monitoring. J. D. Koutsandreas, B. H. Manns, and S. H. Melfi (U.S. Environmental Protection Agency, Washington, D.C.). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 734-743.

Remote monitoring of air, water, and land quality is discussed. Air monitoring techniques include lidar, earth-reflected IR absorption, differential absorption, long-path IR absorption, IR emission spectrometry, resonance lidar, Raman lidar, gas filter analysis, and high-speed interferometry. The multispectral scanner, passive microwave radiometer, multiwavelength lidar, Raman lidar, multifrequency radiometer, and laser fluorosensor are instruments to be used in water monitoring. Land quality monitoring will rely primarily on the multispectral scanner. Remote environmental monitoring is needed to determine the representativeness of point measurements; to design optimum nonremote monitoring networks; to locate 'hot spots' of pullution; to assess site selections for new sources; to respond quickly to pollution episodes; to measure the dispersion of pollutants; to verify and develop pollution models; to enforce laws against noncompliants; to evaluate degradiation over large areas due to energy-related activities; and to monitor wilderness. S.J.M.

A75-37997 Local climatologic interpretation of thermal aerial photographs (Lokalklimatologische Interpretation von Thermalluftbildern). F. Fezer. *Bildmessung und Luftbildwesen*, vol. 43, July 1, 1975, p. 152-158. 21 refs. In German.

An investigation was undertaken regarding the feasibility to conduct climatological studies with the aid of an approach involving the recording of the thermal surface radiation of an area with the aid of aircraft-borne instrumentation. The thermal data were recorded during the first third of the night, using the wavelength range from 8 to 13 micrometers. The interpretation of the data is discussed. Only areas with the same surface properties can be climatologically compared. G.R.

N75-21693# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 1, 1975
31 Mar. 1975 182 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 1-113
(JPRS-64448) Avail: NTIS HC $7.00

Hydrometeorological aspects of weather forecasting, microclimate and agricultural meteorology are discussed.

N75-21706 Joint Publications Research Service, Arlington, Va.
CLOUDINESS IN THE TROPICAL ZONE OF THE NORTH ATLANTIC (GATE AREA)
I. V. Morozova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 111-120 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 89-96

The form of the correlation between the mean monthly amounts of clouds determined by the satellite data and ground measurements is established. Results are presented from generalizing the data of satellite observations of the amount and form of clouds over the North Atlantic. Author

N75-21721*# Alaska Univ., Palmer. Inst. of Agricultural Sciences.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Final Report, Jul. 1972 - May 1974
Jay D. McKendrick, Principal Investigator, Peter C. Scorup, William W. Mitchell, and C. Ivan Branton 26 Jul. 1974 105 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10196; NASA-CR-142375) Avail: NTIS HC $5.25 CSCL 08F

N75-21725*# Institut Francais du Petrole, Rueil-Malmaison.
STUDY OF POLLUTION AT SEA Final Report, Sep. 1972 - May 1974
A. Fontanel, Principal Investigator May 1974 33 p Presented at the Symp. on Significant Results, Greenbelt, Md., 5-9 Mar. 1973 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10200; NASA-CR-142386) Avail: NTIS HC $3.75 CSCL 08J

N75-21726*# Environmental Research Inst. of Michigan, Ann Arbor.
DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA Quarterly Progress Report, Nov. 1974 - Feb. 1975
Robert E. Turner, Principal Investigator 2 Apr. 1975 2 p EREP
(Contract NAS9-13279)
(E75-10201; NASA-CR-142387; ERIM-102200-16-L) Avail: NTIS HC $3.25 CSCL 03B

N75-21734*# Minnesota State Planning Agency, St. Paul.
APPLICATION OF ERTS-1 IMAGERY TO STATE WIDE LAND INFORMATION SYSTEM IN MINNESOTA Final Report, 1 Jul. 1972 - 31 Dec. 1974
Joseph E. Sizer, John R. Borchert, Principal Investigators, Dwight A. Brown, Merle P. Meyer, Richard Rust, Richard H. Skaggs, Deborah Pile, John M. Smiley, and Eliahu Stern 16 Jan. 1975 88 p refs Prepared in cooperation with Minnesota Univ., Minneapolis ERTS
(Contract NAS5-21801)
(E75-10209; NASA-CR-142395) Avail: NTIS HC $4.75 CSCL 08B

N75-21739*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
WATER QUALITY MONITORING USING ERTS-1 DATA Final Report, Jun. 1972 - Aug. 1974
C. T. Wezernak, Principal Investigator Mar. 1975 85 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10214; NASA-CR-142400) Avail: NTIS HC $4.75 CSCL 08H

N75-21741*# California Univ., Santa Barbara. Dept. of Geography.
USE OF ERTS-1 DATA TO ACCESS AND MONITOR CHANGE IN THE WEST SIDE OF THE SAN JOAQUIN VALLEY AND CENTRAL COASTAL ZONE OF CALIFORNIA Final Report, Jul. 1972 - Jul. 1973
Robert N. Colwell, John E. Estes, Principal Investigators, L. W. Senger, R. R. Thaman, D. Brunelle, D. Cottrell, F. Evanisko, S. P. Kraus, B. Palmer, J. M. Ryerson et al Jul. 1973 70 p Orginal contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10216; NASA-CR-142402) Avail: NTIS HC $4.25 CSCL 08F

N75-21742*# California Univ., Riverside. Dept. of Geography.
USE OF ERTS-1 DATA TO ASSESS AND MONITOR CHANGE IN THE SOUTHERN CALIFORNIA ENVIRONMENT Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, Leonard W. Bowden, Principal Investigators, J. Viellenave, C. Johnson, J. Bale, J. Huning, R. Pease, R. Petersen, R. Minnich, A. Sullivan et al 14 Jul. 1973 84 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10217; NASA-CR-142403) Avail: NTIS HC $4.75 CSCL 04A

N75-21747*# Nuclear Research Center, Athens (Greece).
APPLICATION OF ERTS-1 IMAGERY TO LAND USE, FOREST DENSITY AND SOIL INVESTIGATIONS Final Report
Nicholas J. Yassoglou, Principal Investigator 26 Apr. 1974 32 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10222; NASA-CR-142408) Avail: NTIS HC $3.75 CSCL 02F

N75-21748*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 1 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 390 p ERTS
(Contract NAS5-21876)
(E75-10223; NASA-CR-142411) Avail: NTIS HC $10.25 CSCL 08F

N75-21749*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 2 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 596 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21876)
(E75-10224; NASA-CR-142410) Avail: NTIS HC $13.25 CSCL 08F

N75-21750*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 3 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 641 p refs ERTS
(Contract NAS5-21876)
(E75-10225; NASA-CR-142409) Avail: NTIS HC $15.25 CSCL 08F

N75-21751*# Aerospace Corp., Los Angeles, Calif. Space Physics Lab.
STUDY TO DEMONSTRATE THE FEASIBILITY OF AND DETERMINE THE OPTIMUM METHOD FOR REMOTE HAZE MONITORING BY SATELLITE Final Report
Ernest H. Rogers, Principal Investigator, D. F. Nelson, and C. M. Randall Dec. 1974 103 p refs Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21719)
(E75-10226; NASA-CR-142412) Avail: NTIS HC $5.25 CSCL 04B

N75-21752*# Ohio Dept. of Economic and Community Development, Columbus.
THE RELEVANCE OF ERTS-1 DATA TO THE STATE OF OHIO Final Report, Jul. 1972 - Oct. 1974
David C. Sweet, P. G. Pincura, G. E. Wukelic, Principal Investigators (Battelle Columbus Labs., Ohio), C. J. Meier (Ohio Dept. of Natural Resources), T. L. Wells (Ohio Dept. of Natural Resources), L. O. Herd (Ohio Dept. of Transportation), G. B. Garrett (Ohio Environmental Protection Agency), B. G. Stamm, J. M. Dowdy (Ohio State Univ.), J. G. Stephan (Battelle Columbus Labs., Ohio) et al 10 Oct. 1974 150 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21782)
(E75-10227; NASA-CR-142413) Avail: NTIS HC $5.75 CSCL 08F

N75-21763*# National Environmental Satellite Service, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Jan. - Mar. 1975
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Mar. 1975 6 p EREP
(NASA Order T-4715-B)
(E75-10238; NASA-CR-142426; QPR-8) Avail: NTIS HC $3.25 CSCL 04B

N75-21765*# Bureau of Reclamation, Denver, Colo.
USE OF ERTS-1 SATELLITE DATA COLLECTION SYSTEM IN MONITORING WEATHER CONDITIONS FOR CONTROL OF CLOUD SEEDING OPERATIONS Final Report, Sep. 1972 - 30 Jun. 1974
Archie M. Kahan, Principal Investigator Jul. 1974 107 p refs ERTS
(NASA Order S-70243-AG)
(E75-10240; NASA-CR-142533) Avail: NTIS HC $5.25 CSCL 04B

N75-21767*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSIS UTILIZING ERTS-1 IMAGERY Final Report, Jun. 1972 - Feb. 1974
Duwayne M. Anderson, Principal Investigator, Harlan L. McKim, Lawrence W. Gatto, Richard K. Haugen, William K. Crowder, Charles W. Slaughter, and Thomas L. Marlar 26 Feb. 1974 128 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70253-AG)
(E75-10245; NASA-CR-142538) Avail: NTIS HC $5.75 CSCL 08L

The author has identified the following significant results. ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. Physical boundaries mapped from ERTS-1 imagery in combination with ground truth obtained from existing small scale maps and other sources resulted in improved and more detailed maps of permafrost terrain and vegetation for the same area. Snowpack cover within a research watershed has been analyzed and compared to ground data. Large river icings along the proposed Alaska pipeline route from Prudhoe Bay to the Brooks Range have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska have been measured during a four day period in March and shore-fast ice accumulation and ablation along the west coast of Alaska have been mapped for the spring and early summer seasons.

N75-21768*# Consejo de Recursos Naturales no Renovables, Mexico City.
TO MAKE A LAND USE INVENTORY AND ITS CHANGE WITH TIME AND DEVELOPMENT. TO INVESTIGATE HOW THIS AREA IN THE SEMI-ARID CLIMATE IS DEVELOPING, AND THE ECOLOGICAL IMPACT WITH THE CONSTRUCTION OF SEVERAL GOVERNMENT PROJECTS IN CENTRAL MEXICO Final Report, May - Sep. 1974
Carlos AcoustaDelCampo, Principal Investigator Oct. 1974 32 p Sponsored by NASA Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10246; NASA-CR-142539) Avail: NTIS HC $3.75 CSCL 08B

The author has identified the following significant results. Comparison between ERTS-1 image scale 1:1,000,000 and CETENAL's charts scale 1:50,000 in irrigated land surface determination in one selected spot gave the following results: Surface on CETENAL's charts 129,900 Has. and arbitrarily we gave 100 percent to this value. Surface on image 122,400 Has., 94.5 percent of the first value. It is necessary to use all four bands to have optimum results on the interpretation. The Principal Investigator made use of photointerpretation techniques only, mostly monoscopically.

N75-21772*# Louisiana State Univ., Baton Rouge. Dept. of Mechanical, Aerospace and Industrial Engineering.
INVESTIGATION OF LAND-USE SPECTRAL SIGNATURES Ph.D. Thesis. Final Report
John F. Hagewood Mar. 1975 378 p refs
(Contract NAS8-30620)
(NASA-CR-120724) Avail: NTIS HC $10.25 CSCL 20F

A technique was developed to obtain bidirectional reflectance data from natural surfaces by using a folding mirror to transfer the reflected energy from the test surface to a spectroradiometer. The folding mirror was a first surface reflector made by stretching Mylar vacuum coated with aluminum over a light weight frame. The optically folding mirror was positioned over the test surfaces with a moveable platform for both laboratory and field tests. Field tests were conducted using a tethered balloon system to position the folding mirror. A spectroradiometer was designed and built specifically for this investigation. The spectroradiometer had an angular field of view of twenty-four minutes in one axis and ten minutes in the other axis. The radiometer was capable of detecting energies in small bandwidths throughout the electromagnetic spectrum from 0.3 microns to 3.0 microns. Bidirectional reflectance data and variations in the data with source angles were obtained for Saint Augustine grass, Bermuda grass, and a black alluvium soil from the Mississippi River Delta. Author

N75-21779*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ERTS-1 INVESTIGATION (ER-600). VOLUME 5: ERTS-1 URBAN LAND USE ANALYSIS Report, Jul. 1972 - Jun. 1973
R. Bryan Erb Oct. 1974 121 p refs Original contains color illustrations
(NASA-TM-X-58121; JSC-08460) Avail: NTIS HC $5.75 CSCL 08B

The Urban Land Use Team conducted a year's investigation of ERTS-1 MSS data to determine the number of Land Use categories in the Houston, Texas, area. They discovered unusually low classification accuracies occurred when a spectrally complex urban scene was classified with extensive rural areas containing spectrally homogeneous features. Separate computer processing of only data in the urbanized area increased classification accuracies of certain urban land use categories. Even so, accuracies of urban landscape were in the 40-70 percent range compared to 70-90 percent for the land use categories containing more homogeneous features (agriculture, forest, water, etc.) in the nonurban areas. Author

N75-21785# Applied Scientific Research Corp. of Thailand, Bangkok.
ANALYSIS OF ENVIRONMENTAL RESOURCES OF SELECT-

ED REGIONS OF THAILAND: CENTRAL THAILAND Annual Report, 7 Jun. 1973 - 6 Jun. 1974
Khid Suvarnasuddhi 4 Sep. 1974 36 p
(Grant DA-RDRF-S92-544-73-G199; DA Proj. 2M0-61102-B-52B)
(AD-A002795) Avail: NTIS CSCL 08/7

An adequate knowledge of the physical and human resources of a country is essential for the difficult and complex task of effective security and development planning. The report analyzes, evaluates, assembles, and portrays the resources data of central Thailand in a coordinated manner. GRA

N75-21831*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIR POLLUTION SOURCE IDENTIFICATION
J. Stuart Fordyce [1975] 35 p refs Presented at the Sources and Emissions Workshop of the 2d Interagency Comm. on Marine Sci. and Eng. Conf., Argonne, Ill., 25-27 Mar. 1975
(NASA-TM-X-71704; E-8313) Avail: NTIS HC $3.75 CSCL 13B

The techniques available for source identification are reviewed: remote sensing, injected tracers, and pollutants themselves as tracers. The use of the large number of trace elements in the ambient airborne particulate matter as a practical means of identifying sources is discussed. Trace constituents are determined by sensitive, inexpensive, nondestructive, multielement analytical methods such as instrumental neutron activation and charged particle X-ray fluorescence. The application to a large data set of pairwise correlation, the more advanced pattern recognition-cluster analysis approach with and without training sets, enrichment factors, and pollutant concentration rose displays for each element is described. It is shown that elemental constituents are related to specific source types: earth crustal, automotive, metallurgical, and more specific industries. A field-ready source identification system based on time and wind direction resolved sampling is described. Author

N75-22834# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 2, 1975
1 May 1974 177 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 3-118
(JPRS-64670) Avail: NTIS HC $7.00

Articles are presented on microclimatology, agricultural meteorology, weather forecasting, climate control, hydrological forecasting, atmospheric circulation, hydrology, cloud formation, water pollution, air pollution, and long range weather forecasting.

N75-22865*# Oklahoma Univ., Norman. Atmospheric Research Lab.
RECTIFICATION OF A WHOLE-SKY PHOTOGRAPH AS A TOOL FOR DETERMINING SPATIAL POSITIONING OF CUMULUS CLOUDS
Bob E. Stucky, Principal Investigator Apr. 1975 22 p refs EREP
(Contract NAS9-13360)
(E75-10253; NASA-CR-141783; WEAT-18) Avail: NTIS HC $3.25 CSCL 14E

N75-22868*# Cornell Univ., Ithaca, N.Y. Coll. of Agriculture.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, Mar. 1975
Ernest E. Hardy, Principal Investigator 31 Mar. 1975 2 p EREP
(Contract NAS9-13364)
(E75-10256; NASA-CR-142631) Avail: NTIS HC $3.25 CSCL 08B

N75-22873*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ANALYSIS OF RECREATIONAL LAND AND OPEN SPACE USING ERTS-1 DATA Final Report, Jun. 1972 - Nov. 1974
Irvin J. Sattinger, Principal Investigator, Robert D. Dillman, and Norman E. G. Roller Apr. 1975 42 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10262; NASA-CR-142637; ERIM-193300-60-F) Avail: NTIS HC $3.75 CSCL 08B

N75-22875*# Maryland Dept. of State Planning, Baltimore.
APPLICATION OF ERTS-1 DATA TO INTEGRATED STATE PLANNING IN THE STATE OF MARYLAND Final Report
Edwin L. Thomas, David S. Simonett, Principal Investigators, John C. Antenucci, William G. Brooner, and Darryl R. Goehring Dec. 1974 182 p refs Prepared in cooperation with Earth Satellite Corp., Washington, D. C. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21779)
(E75-10264; NASA-CR-142639) Avail: NTIS HC $7.00 CSCL 05B

N75-22879*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Apr. 1975
Robert Alexander, Principal Investigator, Harry F. Lins, Jr., and D. B. Gallagher 20 Apr. 1975 4 p EREP
(NASA Order T-5290-B)
(E75-10268; NASA-CR-142643) Avail: NTIS HC $3.25

N75-23956# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
INFRARED GAS FILTER CORRELATION INSTRUMENT FOR IN-SITU MEASUREMENT OF GASEOUS POLLUTANTS Final Report, Jul. 1972 - Jun. 1974
E. E. Burch and D. A. Gryvnak Dec. 1974 64 p refs
(Contract EPA-68-02-0575)
(PB-239467/4; U-6121; EPA-650/2-74-094) Avail: NTIS HC $4.25 CSCL 07D

An infrared analyzer employing gas cell correlation techniques was designed and constructed to measure the concentrations of carbon monoxide, nitric oxide, sulfur dioxide, hydrogen chloride, and hydrogen fluoride in the effluent of stationary sources. An infrared beam is directed across the stack to a retroreflector and back so that the instantaneous average concentration is measured continuously without disturbing the constituents of the effluent. A small, removable, fixed-position grating monochromator acts as a unique optical filter that passes narrow spectral intervals that are centered at wavelengths where the gas to be detected will absorb. GRA

N75-24053*# Wisconsin Univ., Madison. Inst. for Environmental Studies.
EVALUATION OF THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS Final Report, Jun. 1972 - Apr. 1974
James L. Clapp, Principal Investigator, Theodore Green, III, George F. Hanson (Wisconsin State Geological and Natural History Survey), Ralph W. Kiefer, and Bernard J. Niemann, Jr. 23 Apr. 1974 315 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21754)
(E75-10280; NASA-CR-142708) Avail: NTIS HC $9.25 CSCL 08B

The author has identified the following significant results. Employing simple and economical extraction methods, ERTS can provide valuable data to the planners at the state or regional level with a frequency never before possible. Interactive computer methods of working directly with ERTS digital information show much promise for providing land use information at a more specific level, since the data format production rate of ERTS justifies improved methods of analysis.

N75-24056*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, Feb. - Apr. 1975
David T. Chang, Principal Investigator Apr. 1975 4 p EREP
(Contract NAS9-13343)
(E75-10283; NASA-CR-142720; QPR-8) Avail: NTIS HC $3.25 CSCL 05B

N75-24069*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
STUDY OF USGS/NASA LAND USE CLASSIFICATION SYSTEM Final Report
G. William Spann Mar. 1975 40 p refs
(Contract NAS8-30653)
(NASA-CR-120763; GIT-A-1621) Avail: NTIS HC $3.75 CSCL 08B

The results of a computer mapping project using LANDSAT data and the USGS/NASA land use classification system are summarized. During the computer mapping portion of the project, accuracies of 67 percent to 79 percent were achieved using Level II of the classification system and a 4,000 acre test site centered on Douglasville, Georgia. Analysis of response to a questionaire circulated to actual and potential LANDSAT data users reveals several important findings: (1) there is a substantial desire for additional information related to LANDSAT capabilities; (2) a majority of the respondents feel computer mapping from LANDSAT data could aid present or future projects; and (3) the costs of computer mapping are substantially less than those of other methods. Author

N75-24080# Clemson Univ., S.C. Water Resources Research Inst.
DETERMINING LAND USE CHANGES IN WATERSHEDS BY AERIAL PHOTOGRAPHIC MEASUREMENTS Partial Completion Report
M. Eugene Nettles and Donald B. Stafford Jun. 1974 63 p refs
(Contract DI-14-01-0001-4041)
(PB-239192/8; WRRI-47W75-04051; OWRT-A-024-SC(4)) Avail: NTIS HC $4.25 CSCL 13B

Techniques are described for using aerial photographs to investigate land use changes in watersheds. Land use changes in two watersheds in western South Carolina were examined. The North Tyger River watershed near Spartanburg, SC has experienced significant changes in agricultural land use over the past 26 years. The Reedy River watershed, within which most of the city of Greenville, SC, is located, has experienced rapid urbaniastion over the past 27 years. Aerial photographs taken at approximately five-year intervals were used to delineate, classify, code, and measure the areas of various land use classes in the watersheds. The land use classes employed were those that had different runoff characteristics. GRA

N75-24084# California Univ., Los Angeles. Dept. of Geography.
FIELD STUDIES AND REMOTE SENSING ALONG THE NATAL COAST, SOUTH AFRICA Final Report, 1 Apr. 1971 - 30 Jun. 1974
Antony R. Orme Aug. 1974 24 p refs
(Contract N00014-69-A-0200-4035; NR Proj. 388-102)
(AD-A007285) Avail: NTIS CSCL 08/6

The research investigated coastal terrain and related processes along the humid subtropical coast of Natal, South Africa, by combining field sampling with remote sensing data. The objectives and methods of the research are described. Seven professional papers were presented in connection with the contract. The five Technical Reports published under the contract are summarized. GRA

N75-24120*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION Annual Report, 1 Jun. 1974 - 31 May 1975
Earl C. Kindle, Earl C. Bandy, Gary Copeland, Roger Blais, Gerald Levy, and Daniel Sonenshine May 1975 43 p refs
(Grant NGL-47-003-067)
(NASA-CR-142820) Avail: NTIS HC $3.75 CSCL 01A

Past research projects for the year 1974-1975 are listed along with future research programs in the area of air pollution control, remote sensor analysis of smoke plumes, the biosphere component, and field experiments. A detailed budget analysis is presented. Attachments are included on the following topics: mapping forest vegetation with ERTS-1 MSS data and automatic data processing techniques, and use of LARS system for the quantitative determination of smoke plume lateral diffusion coefficients from ERTS images of Virginia. M.J.S.

N75-24522*# Texas Univ. Health Science Center, Houston.
URBAN ENVIRONMENTAL HEALTH APPLICATIONS OF REMOTE SENSING
Marjorie Rush, Janice Goldstein, Bartholomew P. Hsi, and Calvin B. Olsen Nov. 1974 245 p refs
(Contract NAS9-12823)
(NASA-CR-141796) Avail: NTIS HC $7.50 CSCL 06F

An urban area was studied through the use of the inventory-by-surrogate method rather than by direct interpretation of photographic imagery. Prior uses of remote sensing in urban and public research are examined. The effects of crowding, poor housing conditions, air pollution, and street conditions on public health are considered. Color infrared photography was used to categorize land use features and the grid method was used in photo interpretation analysis. The incidence of shigella and salmonella, hepatitis, meningitis, tuberculosis, myocardial infarction and veneral disease were studied, together with mortality and morbidity rates. Sample census data were randomly collected and validated. The hypothesis that land use and residential quality are associated with and act as an influence upon health and physical well-being was studied and confirmed. L.B.

N75-24543*# Texas Univ., Houston. Health Science Center.
URBAN ENVIRONMENTAL HEALTH APPLICATIONS OF REMOTE SENSING, SUMMARY REPORT
Marjorie Rush, J. Goldstein, B. P. Hsi, and Calvin. B. Olsen Jan. 1975 66 p refs Original contains color illustration
(Contract NAS9-12823)
(NASA-CR-141788) Avail: NTIS HC $4.25

Health and its association with the physical environment was studied based on the hypothesis that there is a relationship between the man-made physical environment and health status of a population. The statistical technique of regression analysis was employed to show the degree of association and aspects of physical environment which accounted for the greater variation in health status. Mortality, venereal disease, tuberculosis, hepatitis, meningitis, shigella/salmonella, hypertension and cardiac arrest/myocardial infarction were examined. The statistical techniques were used to measure association and variation, not necessarily cause and effect. Conclusions drawn show that the association still exists in the decade of the 1970's and that it can be successfully monitored with the methodology of remote sensing. Author

N75-25242*# Environmental Research Inst. of Michigan, Ann Arbor. Information Systems and Analysis.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Apr. 1975
Richard F. Nalepka and William A. Malila, Principal Investigators 21 May 1975 12 p EREP
(Contract NAS9-13280)
(E75-10295; NASA-CR-142839; ERIM-101900-55-L) Avail: NTIS HC $3.25 CSCL 09F

The author has identified the following significant results. An analysis of the conic data was completed for the spatial misregistration study. The effects of misregistration on classification and acreage estimation accuracy are being studied. Signatures were extracted for the primary ground covers in the test area.

N75-25251*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Apr. 1975
Irvin J. Sattinger, Principal Investigator 13 May 1975 3 p EREP

(Contract NAS9-13283)
(E75-10304; NASA-CR-142848; ERIM-103300-50-L) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. A preliminary analysis of the Gratiot-Saginaw game area was conducted for the matrix probabilities of misclassification for both multispectral scanner signatures and the ERTS signatures. This analysis indicated that certain signatures of similar vegetation types had relatively high probabilities of misclassification and should logically be combined into a single signature for each major class. This would result in a single class of trees having a broad range of crown densities and two or three types of wetlands. It was clear that substantially different terrain classes could be reliably discriminated. It was also noted that areas of pine and regenerated aspen could be discriminated from other surface types.

N75-25252*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Mar. 1975
Irvin J. Sattinger, Principal Investigator 14 Apr. 1975 3 p EREP
(Contract NAS9-13283)
(E75-10305; NASA-CR-142849; ERIM-103300-47-L) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. The data quality, production of photographic enlargements, and digital printout that displayed the Gratiot-Saginaw game area were assessed, using histogramming of each spectral channel. Results showed some dissimilarities in the ranges of data values for even and odd numbered SDO's in order to depict many of the major scene classes. Major cover types were identified and located on aerial photos and maps.

N75-25268*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
THE CITARS EFFORT BY THE ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN Final Report, 15 May 1974 - 15 Feb. 1975
William A. Malila, Daniel P. Rice, and Richard C. Cicone Apr. 1975 129 p refs
(Contract NAS9-14123)
(NASA-CR-141851; ERIM-109600-12-F) Avail: NTIS HC $5.75 CSCL 02C

The objectives of the research task for crop identification technology assessment for remote sensing are outlined. Data gathered by the Landsat 1 multispectral scanner over the U.S. Corn Belt during 1973 is described, and procedures for recognition processing of the data is discussed in detail. The major crops of prime interest were corn and soybeans; they were recognized with different levels of accuracy throughout the growing season, but particularly during late August. Wheat was the major crop of interest in early June. Author

N75-25400*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN OPERATIONAL SATELLITE SCATTEROMETER FOR WIND VECTOR MEASUREMENTS OVER THE OCEAN
W. L. Grantham, E. M. Bracalente, W. L. Jones, J. H. Schrader, L. C. Schroeder, and J. L. Mitchell (LTV Aerospace Corp., Hampton, Va.) 18 Mar. 1975 169 p refs
(NASA-TM-X-72672) Avail: NTIS HC $6.25 CSCL 14B

Performance requirements and design characteristics of a microwave scatterometer wind sensor for measuring surface winds over the oceans on a global basis are described. Scatterometer specifications are developed from user requirements of wind vector measurement range and accuracy, swath width, resolution cell size and measurement grid spacing. A detailed analysis is performed for a baseline fan-beam scatterometer design, and its performance capabilities for meeting the SeaSat-A user requirements. Various modes of operation are discussed which will allow the resolution of questions concerning the effects of sea state on the scatterometer wind sensing ability and to verify design boundaries of the instrument. Author

N75-25407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS
T. T. Wilheit, M. S. V. Roa (Environ. Res. and Technol., Inc., Concord, Mass.), T. C. Chang, E. B. Rodgers, and J. S. Theon Mar. 1975 30 p refs Submitted for publication
(NASA-TM-X-70904; X-911-75-72) Avail: NTIS HC $3.75 CSCL 04B

A theoretical model for calculating microwave radiative transfer in raining atmospheres is developed. These calculations are compared with microwave brightness temperatures at a wavelength of 1.55 cm measured on the Nimbus-5 satellite and rain rates derived from WSR-57 meteorological radar measurements. A specially designed ground based verification experiment was also performed wherein upward viewing microwave brightness temperature measurements at wavelengths of 1.55 cm and 0.81 cm were compared with directly measured rain rates. Author

N75-25494# Naval Research Lab., Washington, D.C.
WIND WAVE STUDIES. PART 2: THE PARABOLIC ANTENNA AS A WAVE PROBE
Tyrone R. Larson and John W. Wright 31 Dec. 1974 24 p refs
(NRL Proj. R07-17; WR02101002)
(AD-A006554; NRL-7850) Avail: NTIS CSCL 08/3

Coherent microwave backscatter is the basis of a probe technique useful for studying surface water waves in a laboratory tank. A parabolic antenna is focussed to give a plane wave at short range, typically 1.2 m, and an illuminated area of controllable size. The technique strongly discriminates against all water waves except those which have a particular Bragg resonant wavelength ranging between 0.25 cm and 10 cm and propagate parallel to the plane of incidence. The resulting doppler spectra provide a powerful tool for wind wave, breaking, and spray studies. A unique method for directly measuring the water wavenumber resolution is described, together with a technique for absolute calibration of the backscattered power in terms of wave height. GRA

N75-26464*# American Univ., Washington, D.C. Dept. of Biology.
ERTS-1 INVESTIGATION OF WETLANDS ECOLOGY Final Report
Richard R. Anderson, Principal Investigator, Virginia Carter, and John McGinness 15 Jun. 1975 113 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21752)
(E75-10320; NASA-CR-142922) Avail: NTIS HC $5.25 CSCL 08H

The author has identified the following significant results. Data from aircraft can be used for large scale mapping where detailed information is necessary, whereas Landsat-1 data are useful for rapid mapping of gross wetland boundaries and vegetative composition and assessment of seasonal change plant community composition such as high and low growth forms of Spartina alterniflora, Juncus roemarianus, and Spartina cynosuroides. Spoil disposal and wetland ditching activities may also be defined. Wetland interpretation is affected by tidal stage; drainage patterns are more easily detected at periods of low water. Species discrimination is easier at periods of high water during the growing season; upper wetland boundaries in fresh water tidal marshes are more easily delineated during the winter months when marsh vegetation is largely dead or dormant. Fresh water discharges from coastal streams may be inferred from the species composition of contiguous wetlands.

N75-26466*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
ENVIRONMENTAL MONITORING FROM SPACECRAFT DATA

Robert H. Rogers, Principal Investigator, C. L. Wilson, L. E. Reed, N. J. Shah, R. Akeley, T. G. Mara (Ohio-Kentucky-Indiana Reg. Council of Govt., Cincinnati), and V. Elliot Smith (Cranbrook Inst. of Sci.) Jun. 1975 11 p refs Presented at the Symp. on Machine Processing of Remotely Sensed Data, Lafayette, Ind., Jun. 1975 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10322; NASA-CR-142924; BSR-4183) Avail: NTIS HC $3.25 CSCL 13B

The author has indentified the following significant results. LANDSAT was used as a basis for inventorying land use within each of the Ohio-Kentucky-Indiana regional commissions, 225 drainage areas, and nine counties. Computer tabulations were produced to obtain the area covered by each of 16 land use categories within 225 drainage areas. The 16 categories were merged into ten categories and mapped at a scale of 1 inch = 5,000 ft, with detail to 0.44 hectares for the 2,700 sq mi region. These products were produced in less than 90 days, at a cost of $20,000.

N75-26468*# Wyoming Univ., Laramie. Dept. of Geology.
ANALYSIS OF ERTS-1 IMAGERY OF WYOMING AND ITS APPLICATION TO EVALUATION OF WYOMING'S NATURAL RESOURCES Final Report, Jul. 1972 - Dec. 1974
Robert S. Houston, Principal Investigator, Ronald W. Marrs, Leon E. Borgman, S. S. Agard, R. Barton, D. L. Blackstone, R. M. Breckenridge, E. R. Decker, J. Earle, and M. A. Evans Jan. 1975 303 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E75-10324; NASA-CR-142926) Avail: NTIS HC $9.25 CSCL 08F

The author has identified the following significant results. The Earth Resources Technology Satellite data included the following successful applications: (1) general geologic mapping, (2) structural and tectonic studies, (3) landforms and surface processes, (4) mineral exploration, (5) land use inventories, (6) hydrologic studies, (7) investigations in agriculture and forestry, and (8) environmental quality and ecology. The chief advantages of ERTS-1 data for geologic studies are synoptic view, spectral information, and seasonal coverage. The spectral data and repetitive aspect are also important for land use and vegetation studies. Low resolution and lack of steoscopic coverage were found to be the main limitations of ERTS data.

N75-26474*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ATMOSPHERIC EFFECTS IN MULTISPECTRAL REMOTE SENSOR DATA Final Technical Report, 15 May 1974 - 14 Mar. 1975
Robert E. Turner May 1975 120 p refs
(Contract NAS9-14123)
(NASA-CR-141863; ERIM-109600-15-F) Avail: NTIS HC $5.25 CSCL 04A

The problem of radiometric variations in multispectral remote sensing data which occur as a result of a change in geometric and environmental factors is studied. The case of spatially varying atmospheres is considered and the effect of atmospheric scattering is analyzed for realistic conditions. Emphasis is placed upon a simulation of LANDSAT spectral data for agricultural investigations over the United States. The effect of the target-background interaction is thoroughly analyzed in terms of various atmospheric states, geometric parameters, and target-background materials. Results clearly demonstrate that variable atmospheres can alter the classification accuracy and that the presence of various backgrounds can change the effective target radiance by a significant amount. A failure to include these effects in multispectral data analysis will result in a decrease in the classification accuracy. Author

N75-26540# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
REMOTE SENSING OF POLLUTANTS. COMPUTERIZED REDUCTION OF LONG PATH ABSORPTION DATA Final Report
V. E. Derr, M. H. Ackley, M. J. Post, and R. F. Calfee Jul. 1974 201 p refs
(Contract EPA-IAG-077(D))
(PB-240168/5; EPA-650/2-74-113) Avail: NTIS HC $7.25 CSCL 07D

The physical, mathematical, and calculational principles and procedures are described for the use of a digital computer program to determine concentrations of atmospheric gases in a path of a few kilometers. Detailed instructions for the computer program and a library of spectra are provided. GRA

N75-27466# World Meteorological Organization, Geneva (Switzerland).
PRELIMINARY SCIENTIFIC RESULTS OF THE GARP ATLANTIC TROPICAL EXPERIMENT, VOLUME 1
Jan. 1975 386 p refs Prepared jointly with Intern. Council of Sci. Unions
(GATE-14) Avail: NTIS HC $10.25; WMO, Geneva

During the period 15 June to 23 September 1974 the GARP Atlantic Tropical Experiment GATE was carried out in the predetermined area extending across the tropical zones of Africa, the Atlantic Ocean, and South and Central America. Studies are presented under the following headings: synoptic; convection; boundary layer; radiation; and oceanography.

N75-27487 GATE Operational Control Centre, Dakar (Senegal).
AIRCRAFT OBSERVATIONS OF ITCZ STRUCTURE ON 4 AUGUST 1974
Richard J. Reed (Washington Univ., Seattle), Noel E. LaSeur (Florida State Univ.), and David Berrill (London Univ.) *In* WMO Prelim. Sci. Results of the GARP Atlantic Trop. Expt., Vol. 1 Jan. 1975 p 211-216

The characteristics, especially wind and temperature variations, of a moderately active ITCZ as observed by aircraft are described. ESRO

N75-27518*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Mar. - May 1975
Charles W. Welby, Principal Investigator 6 Jun. 1975 2 p EREP
(Contract NAS9-13321)
(E75-10330; NASA-CR-143067) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Skylab imagery was evaluated, compiling vegetational and land use information in conjunction with a potential state park site fin along the Eno River in Durham County. Preliminary evaluation indicates that accuracy of identification was at the 90% level. Attempts at distinguishing between rock types in the Piedmont have proved generally unsuccessful, and recognition of linear features seems the best geologic use which the imagery can be put. The study concentrated on the High Rock Lake area of Davidson County. A study evaluating Skylab photographs for land use mapping in urban and rural areas of Piedmont North Carolina shows that S190A and S190B as well as U-2 imagery have almost the same accuracy when the interpretations are assessed with the square grid sampling method, even though the S190B imagery basically has a greater resolution.

N75-27526*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, May 1975
Irvin J. Sattinger, Principal Investigator 11 Jun. 1975 9 p EREP

(Contract NAS9-13283)
(E75-10338; NASA-CR-143078; ERIM-103300-51-L) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. An analysis of the statistical uniqueness of each of the signatures of the Gratiot-Saginaw State Game Area was made by computing a matrix of probabilities of misclassification for all possible signature pairs. Within each data set, the 35 signatures were then aggregated into a smaller set of composite signatures by combining groups of signatures having high probabilities of misclassification. Computer separation of forest denisty classes was poor with multispectral scanner data collected on 5 August 1973. Signatures from the scanner data were further analyzed to determine the ranking of spectral channels for computer separation of the scene classes. Probabilities of misclassification were computed for composite signatures using four separate combinations of data source and channel selection.

N75-27530*# Army Construction Engineering Research Lab., Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 1 Apr. - 30 Jun. 1975
Ravinder K. Jain, Principal Investigator 7 Jul. 1975 3 p ERTS
(NASA Order S-70255-AG)
(E75-10342; NASA-CR-143079) Avail: NTIS HC $3.25 CSCL 08H

N75-27531*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Jun. 1975
Roger M. Hoffer, Principal Investigator Jun. 1975 6 p EREP
(Contract NAS9-13380)
(E75-10343; NASA-CR-143080) Avail: NTIS HC $3.25 CSCL 08F

N75-27538*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRELIMINARY DATA FOR THE 20 MAY 1974, SIMULTANEOUS EVALUATION OF REMOTE SENSORS EXPERIMENT
Robert W. Johnson, Carman E. Batten, David E. Bowker, Walter E. Bressette, and Gary W. Grew Jun. 1975 61 p
(NASA-TM-X-72676) Avail: NTIS HC $4.25 CSCL 14B

Several remote sensors were simultaneously used to collect data over the tidal James River from Hopewell to Norfolk, Virginia. Sensors evaluated included the Multichannel-Ocean Color Sensor, multispectral scanners, and multispectral photography. Ground truth measurements and remotely sensed data are given. Preliminary analysis indicates that suspended sediment and concentrated industrial effluent are observable from all sensors.
Author

N75-27555# Massachusetts Inst. of Tech., Cambridge. Urban Systems Lab.
A SURVEY OF NATIONAL GEOCODING SYSTEMS Final Report, Oct. 1973 - Jun. 1974
Pamela A. Werner Nov. 1974 356 p refs
(Contract DOT-TSC-692)
(PB-239601/8; DOT-TSC-OST-74-26) Avail: NTIS HC $10.00 CSCL 08F

Major geocoding systems are described. Emphasis is placed on the following systems: geopolitical systems that provide general reference coding structures for administrative or other purposes; systems that reference either special significance locations or a combination of geopolitical, geostatistical, and special significance locations; systems that reference areas delineated according to special criteria, such economic or postal distribution patterns; and systems based on grid networks. GRA

N75-27640# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE, NO. 2, SUMMARY REPORT 1973
John M. Miller Dec. 1974 110 p refs
(COM-75-10354/9; NOAA-75022603) Avail: NTIS HC $5.25 CSCL 04A

Developments which occurred in 1973 in the Geophysical Monitoring for Climatic Change observatory network are described. The amount of data increased and this led to the design of centralized data handling methods to cope with the flood of information expected in 1974 and 1975. Major physical changes within the observatory network occurred with the completion of the total ozone observational dome at Point Barrow, preparatory design work for major additions to the South Pole program, and construction of a sampling tower at Samoa. Details of augmented programs are included such as measurement programs, flask sampling for freon and carbon tetrachloride, lidar system development, Aitken data collection, and solar radiation monitoring programs. The year saw staff assigned to 3 new observatories; acquisition and installation of new measurement programs; and establishment of initial support facilities and staff for data quality control and processing and for analyses. GRA

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03

GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A75-30548 # **The use of perspective aerial photography for large-scale mapping and in geologic-geographic investigations (Primenenie perspektivnoi aerofotos'emki dlia krupnomasshtabnogo kartografirovaniia i pri geologo-geograficheskikh issledovaniiakh).** R. N. Gel'man and Iu. F. Knizhnikov. *Geodeziia i Kartografiia,* Mar. 1975, p.52-56. In Russian.

A75-31248 **Geometric and cartographic accuracy of ERTS-1 imagery.** K. W. Wong (Illinois, University, Urbana, Ill.). *Photogrammetric Engineering and Remote Sensing,* vol. 41, May 1975, p. 621-635. 11 refs. Research supported by the U.S. Geological Survey.

Results are presented for a research study on the geometric and cartographic accuracy of RBV and MSS images from ERTS-1. Four frames of bulk RBV images and two frames of MSS images are analyzed using reseau images and photo-identified ground points, high-order polynomials are employed to model the distortions in the images, and the geometric fidelity and cartographic accuracy of the two systems are compared. It is shown that the geometric fidelity of the RBV system is excellent while its geographic positioning accuracy is reduced by its low resolution, and it is suggested that a different reseau pattern be developed to replace the 81-point pattern used in ERTS-1. The geometric fidelity of the MSS system is found to be considerably inferior to that of the RBV system, but use of four or more photo-identified control points can correct an image to meet the NMAS requirement for mapping at a scale of 1:5,000,000. F.G.M.

A75-31477 # **On the exploiting of Doppler observations of artificial earth satellites in physical geodesy.** J. Dostal and B. Chan (Ceskoslovenska Akademie Ved, Geofysikalni Ustav, Prague, Czechoslovakia). *Geofysikalni Sbornik,* vol. 20 (1972), no. 363-396, 1974, p. 169-176. 9 refs.

Fundamental Doppler shift formulas are considered and attention is given to the possibility to utilize Doppler observations of artificial earth satellites for the study of gravimetric and geodetic problems. The theoretical evaluation is supplemented by an experimental investigation. In the experiments use is made of the U.S. satellite Solrad 9 which is equipped with a transmitter employing a frequency of 136.512 MHz. G.R.

A75-31600 # **Study of volcanic areas in southern Italy by means of airborne thermal-infrared scanners - Comparison of the various studies made and the future possibility offered by space platforms (Rilevamenti sulle aree vulcaniche del sud-Italia per mezzo di scanners aerotrasportati operanti nell'infrarosso termico - Confronto fra i diversi rilievi effettuati e possibilità future offerte dalle piattaforme spaziali).** G. M. Lechi and A. M. Tonelli (CNR, Laboratorio per la Geofisica della Litosfera, Milan, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 415, 417-426. 8 refs. In Italian.

A75-31602 # **Mapping of oil slicks from the ERTS-1 imagery by a two-dimensional densitometer.** N. W. Rosenberg (USAF, Cambridge Research Laboratories, Bedford, Mass.) and J. Otterman (Tel Aviv University, Tel Aviv, Israel). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 435, 437-443.

A computer-controlled two-dimensional densitometer and display has been used to prepare a map of oil slicks from low-contract ERTS-1 micron-band sea imagery. The densitometer system consists of a vidicon camera that scans the film placed over a light table, a computer that receives and processes the scanned image after analog-to-digital conversion, magnetic containing all the computer programs, a disk unit that can store either the original digitized image or a computer-processed digitized image, and a TV display that can be ordered to monitor the image stored in the disk unit. S.J.M.

A75-31961 **The topology of the auroral oval as seen by the Isis 2 scanning auroral photometer.** A. T. Y. Lui, C. D. Anger, D. Venkatesan, W. Sawchuk (Calgary, University, Calgary, Alberta, Canada), and S.-I. Akasofu (Alaska, University, Fairbanks, Alaska). *Journal of Geophysical Research,* vol. 80, May 1, 1975, p. 1795-1804. 39 refs. National Research Council of Canada Grant No. A-7; NSF Grants No. GA-363873X; No. GA-37094.

Auroral distributions in the polar region viewed by the Isis 2 scanning auroral photometer are studied to examine the topology of the auroral oval. It is shown that a single continuous oval-shaped belt can be defined in which both discrete and/or diffuse auroras lie. In addition to the above, a second belt of diffuse auroras is frequently observed in the day sector. It is less eccentric with respect to the magnetic pole than the auroral oval. This diffuse auroral belt appears to be separated from the auroral oval emission in the day sector. It probably corresponds to the mantle aurora and represents the optical component of the hard precipitation zone. (Author)

A75-32156 # **Analysis of ISAGEX results and their application in European geodesy (Analiz rezul'tatov ISAGEX i ikh ispol'zovanie v evropeiskoi geodezii).** J. Kovalevský. *Nabliudeniia Iskusstvennykh Sputnikov Zemli,* no. 12 (1972), 1973, p. 57-62. In Russian.

The first analysis of the ISAGEX observational results allows us to state that the experiment has been successful with respect to the established objectives in dynamical geodesy; thanks to a great number of laser observations, it will be possible to construct a dynamical model of the earth, the precision of which will be higher than that of the Standard Earth II. The importance of the ISAGEX observations for geometrical geodesy is examined with emphasis on European geodesy. In comparison to the results obtained previously by means of satellite methods, the significance of ISAGEX is great and allows one to include more stations into the existing system and to improve the internal precision of the network established by the GEOS and D1 programs. (Author)

A75-32158 # **On the importance of geometric procedures used in satellite geodesy.** K. Rinner. *Nabliudeniia Iskusstvennykh Sputnikov Zemli,* no. 12 (1972), 1973, p. 72-94. 11 refs.

Questions concerning the efficiency of geometric techniques are examined, taking into account observation data and nets in which satellites are used as nodal points. Attention is given to direction-nets, distance-nets, combined nets, and the optimization of net types. The geodetic applications of geometric techniques are discussed along with aspects regarding the importance of geodetic research. The objectives of geodesy include the determination of the geometric shape of the earth and the determination of the main parameters of the gravity field on the earth's surface and in outer space. G.R.

A75-32160 # **Results of chord 9004-9091 determination by means of Geos B flashes.** W. Dobaczewska. *Nabliudeniia Iskusstvennykh Sputnikov Zemli,* no. 12 (1972), 1973, p. 129-133. 5 refs.

The determination of the distance between the Baker-Nunn stations 9004 and 9091 by the tetrahedron method are presented.

Geos B flashes for 13 passes in 1968 have been used. This method could be used in determination of chord lengths in the traverse Arctic-Antarctic. (Author)

A75-32165 # **Determination of the geodetic coordinates of points in remote regions of Mongolia from the results of observations with artificial earth satellites (Opredelenie geodezicheskikh koordinat punktov trudnodostupnykh raionov Mongolii po rezul'tatam nabliudenii ISZ).** P. Galsan. *Nabliudeniia Iskusstvennykh Sputnikov Zemli,* no. 12 (1972), 1973, p. 174-180. 14 refs. In Russian.

A75-32985 # **Metric of a two-dimensional space for which the geodesic lines are given (Metrika jednog dvodimenzionog prostora cije su geodezijske linije date).** M. D. Leko. *Jugoslovensko Drustvo za Mehaniku, Yugoslav Congress of Rational and Applied Mechanics, 12th, Ohrid, Yugoslavia, June 3-8, 1974, Paper.* 4 p. In Serbo-Croatian.

A metric tensor is found for a two-dimensional space whose geodesic lines are given by parametric equations in which the arc of the geodesic line is a parameter. The tensor is obtained in matrix form as a function of the coordinates. P.T.H.

A75-33423 # **The three-dimensional geodesic vector network (Prostranstvennaia geodezicheskaia vektornaia set').** O. S. Razumov. Moscow, Izdatel'stvo Nedra, 1974. 160 p. 105 refs. In Russian.

The present work considers theoretical prerequisites for the construction of a reference geodesic network in the form of a system of vectors joining observation stations for movable objects such as artificial satellites, rockets, and pilot balloons. The use of satellite observations for geodesic purposes is examined. The determination, levelling, and accuracy evaluation of the component vectors of a network are studied. P.T.H.

A75-35248 **Variable flight parameters for SLAR.** B. N. Koopmans (International Institute for Aerial Survey and Earth Sciences, Enschede, Netherlands). *Photogrammetric Engineering and Remote Sensing,* vol. 41, Mar. 1975, p. 299-305. 10 refs.

Some variable flight-parameters for a SLAR survey such as flight altitude, scan direction, sidelap for monoscopic or stereoscopic viewing and complementary aerial photography are treated with respect to the terrain type to be surveyed. The need in developing countries for fast information over extensive areas is met by the SLAR imaging system by providing small-scale images with clear relief expression on a 24-hour-per-day basis. (Author)

A75-35825 **Digital detection of pits, peaks, ridges, and ravines.** E. G. Johnston (Computer Sciences Corp., Silver Spring, Md.) and A. Rosenfield (Maryland, University, College Park, Md.). *IEEE Transactions on Systems, Man, and Cybernetics,* vol. SMC-5, July 1975, p. 472-480. Contract No. F44620-72-C-0062.

A method of detecting pits, peaks, ridges, and ravines on a digital array of terrain elevation data is described. The methods used are based on algorithms designed to detect bright and dark spots or streaks in pictures. (Author)

A75-35914 **The calculation of the spectral reflection factor of natural surfaces on the basis of ERTS pictures (Berechnung des spektralen Reflexionsgrades natürlicher Oberflächen aus ERTS-Aufnahmen).** G. Kritikos (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Satellitenelektronik, Oberpfaffenhofen, West Germany) and M. Schroeder (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Abteilung für extraterrestrische Sensortechnik, Oberpfaffenhofen, West Germany). *(Deutsche Gesellschaft für Luft- und Raumfahrt, Jahrestagung, 7th, Kiel, West Germany, Sept. 17-19, 1974.) Raumfahrtforschung,* vol. 19, May-June 1975, p. 111-116. In German.

The ERTS scanner measures in four spectral ranges from a distance of about 915 km the radiance which is reflected by a surface element of the earth. Investigations were conducted to study the feasibility of a use of the spectral reflection factor for a transformation of the obtained data into illumination-independent pictures. The first results obtained in this connection concerning a calculation of the spectral reflection factor are discussed, giving attention to the relation between reflected and incident radiation, aspects of atmospheric transparency, and computational details. G.R.

A75-36801 **American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings.** Falls Church, Va., American Society of Photogrammetry, 1975. 810 p. Members, $2.50; nonmembers, $5.00.

Papers are presented dealing with the acquisition, processing, and interpreting of data obtained by remote sensing. Some of the topics covered include applicability of Skylab orbital photography to coastal wetland mapping, interactive radar image processing and interpretation system, analytical triangulation with ERTS, tectonic implication of ERTS lineaments in mid-Atlantic coastal plain, and diplomatic and legal aspects of remote sensing. P.T.H.

A75-36819 **Geometric and cartographic accuracy of ERTS-1 images.** K. W. Wong (Illinois, University, Urbana, Ill.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 464-489. 11 refs. Research supported by the U.S. Department of the Interior.

The potential application of the RBV and MSS images in cartographic mapping is limited by resolution rather than by geometric fidelity. A bulk RBV image from ERTS-1 should have sufficient geometric fidelity to meet the National Map Accuracy Standards for mapping at 1:500,000 scale. With four or more control points for distortion correction, a bulk MSS frame could also be processed to meet the NMAS requirement for 1:500,000-Scale mapping. In digital processing, a relative positioning accuracy of plus or minus 55 m should be attainable for both RBV and MSS images. High-order polynomials were found to be very effective in modeling the total geometric distortions in both the RBV and MSS systems. (Author)

A75-38110 # **Transformation of continental geodetic grids (Transformacja kontynentalnych sieci geodezyjnych).** K. A. Czarnecki. *Geodezja i Kartografia,* vol. 24, no. 2, 1975, p. 125-138. 7 refs. In Polish.

A method and algorithm are proposed for transforming continental grids to the global reference ellipsoid. The algorithm described by a TRANSPACE procedure is written in ALGOL-60. The method is applicable also to the transformation of classical geodetic grids covering smaller territories. V.P.

N75-21724*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Mar. - 31 Mar. 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 14 Apr. 1975 13 p refs EREP (Contract NAS9-13276)
(E75-10199; NASA-CR-142385; PR-21) Avail: NTIS HC $3.25 CSCL 08E

N75-21736*# Alaska Univ., Fairbanks. Geophysical Inst.
FEASIBILITY STUDY FOR LOCATING ARCHAEOLOGICAL VILLAGE SITES BY SATELLITE REMOTE SENSING TECHNIQUES Final Report, Jul. 1972 - Jan. 1974
J. P. Cook, Principal Investigator and W. J. Stringer 17 Oct. 1974 75 p refs Original contains color imagery. Original

photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10211; NASA-CR-142397) Avail: NTIS HC $4.25 CSCL 08B

N75-21740*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MAPPING OF THE MAJOR STRUCTURES OF THE AFRICAN RIFT SYSTEM Final Report
Paul A. Mohr, Principal Investigator Jul. 1974 88 p refs ERTS
(Contract NAS5-21748)
(E75-10215; NASA-CR-142401) Avail: NTIS HC $4.75 CSCL 08B

N75-21746*# Nevada Univ., Reno. Mackay School of Mines.
[ANALYSIS OF AERIAL PHOTOGRAPHY AND MULTISPECTRAL DATA FOR CARTOGRAPHY AND GEOMORPHOLOGY OF NEVADA] Final Report
Joseph Lintz, Jr., Principal Investigator 29 Sep. 1973 15 p ERTS
(Contract NAS5-21864)
(E75-10221; NASA-CR-142407) Avail: NTIS HC $3.25 CSCL 08B

N75-21781# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE
R. J. Lytle, R. M. Bevensee, and D. L. Lager 18 Oct. 1974 17 p refs
(Contract W-7405-eng-48)
(UCRL-51685) Avail: NTIS HC $3.25

The combination of a standard experimental procedure (four-probe electrical resistivity), a novel analytical technique (probabilistic potential theory), and a powerful inversion algorithm (optimization /generalized linear inverse) is proposed as a method for determining the subsurface electrical profile. It is proposed that the feasibility of the procedure be tested by analysis of field experiments in conjunction with scale-model laboratory experiments to validate the algorithms for general structure. The procedure should have great practical value in a wide variety of applications: hydrology, location and definition of the shape and extent of underground resources (e.g., geothermal reservoirs, ore bodies, or deposits of coal, sand, or gravel), faultline definition, and monitoring of changes in subsurface conditions (e.g., as in earthquake studies, in situ coal gasification, and burn-front studies of oil-shale gasification). Author (NSA)

N75-21782# Army Engineer Topographic Labs., Fort Belvoir, Va.
TERRAIN DATA OF MOUNT HAYES D-4 QUADRANGLE, FORT GREELY, ALASKA
T. R. Currin and J. W. Ingram, Jr. Aug. 1974 129 p refs
(DA Proj. 4A7-62707-A-854)
(AD-A002627; ETL-TR-74-7) Avail: NTIS CSCL 08/2

This report discusses a field investigation at Fort Greely, Alaska, conducted by the Geographic Sciences Laboratory (GSL) of the U.S. Army Engineer Topographic Laboratories (USAETL) as part of the Test and Analyze Experimental Color and Multiband Photography project. Field teams were deployed to collect terrain information in the areas of soils, vegetation, hydrology, and cultural features; various types of aerial imagery missions were flown coincident with the acquisition of ground data. A discussion of each of the areas of terrain data is presented. GRA

N75-21871# Army Foreign Science and Technology Center, Charlottesville, Va.
DEVELOPMENT TRENDS IN GEODESY AND TOPOGRAPHY
I. A. Kutuzov 28 Mar. 1974 10 p Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 12, 1972 p. 1-4
(AD-A002759; FSTC-HT-23-0212-74) Avail: NTIS CSCL 08/5

The report discusses trends in geodesy and topography on the approach of the 50th anniversary of the U.S.S.R.. In the future there will be an increase of automation and the use of computers will bring about more accurate and timely production. GRA

N75-22866 California Univ., San Diego.
THE HAWAIIAN-EMPEROR SEAMOUNT CHAIN: ITS ORIGIN, PETROLOGY, AND IMPLICATIONS FOR PLATE TECTONICS Ph.D. Thesis
David Alan Clague 1974 337 p
Avail: Univ. Microfilms Order No. 75-8253

A magnetic anomaly map of the Mesozoic Hawaiian lineations which demonstrates that the Hawaiian Ridge and southern Emperor Seamounts cut obliquely across underlying crustal structure is revised. Samples from seamounts in the western Hawaiian Ridge and southern Emperor Seamount were dredged and analyzed. Results show that (1) the bend between the chains is 41 to 43 million years old; (2) the volume of magna erupted per unit time is a function of the rate of volcanic migration along the chain; (3) the magna generation is due to shear melting rather than a deep mantle plume; and (4) tholeitic basalts found on seamounts in the Emperor Seamount chain support the hypothesis that the Hawaiian-Emperor chain is a single feature with a common origin. Pacific plate motion relative to underlying melting spots is modeled by rotation about a pole, indicating that Pacific equatorial sedimentation patterns and paleomagnetic data are consistent with the assumption that Pacific plate melting spots are fixed with respect to the equator and earth's spin axis. Dissert. Abstr.

N75-22859*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Progress Report, 1 Mar. 31 Mar. 1975
Charles E. Poulton, Principal Investigator 31 Mar. 1975 4 p EREP
(Contract NAS9-13286)
(E75-10242; NASA-CR-142535) Avail: NTIS HC $3.25 CSCL 08B

N75-24091# Ohio Dept. of Highways, Columbus.
INVESTIGATION OF THE ANALYTICAL STEREOPLOTTER AP/C (OP/C PHASE) IN APPLICATION TO HIGHWAY ENGINEERING PROJECTS Final Report
L. O. Hard, T. N. OBrien, C. Clipp, and K. Jeyapalan Oct. 1974 47 p refs
(PB-238461/8; OHIO-DOT-14-74) Avail: NTIS HC $3.75 CSCL 13B

The objective of the report is to study the feasibility of orthophoto mapping, in highway engineering using the AP/C - OP/C. It was found that the most valuable use of orthophoto mapping in highway engineering is as base maps on which overlays of land use maps, line maps, and geological survey maps can be made. The disadvantages are the existence of height distortion within the slit width and the consumption of AP/C time which could be used more profitably for aerial triangulation. GRA

N75-24203 Pennsylvania State Univ., University Park.
THEORY AND PRACTICE OF GEOPHYSICAL SURVEY DESIGN Ph.D. Thesis
Thomas M. Davis 1974 147 p
Avail: Univ. Microfilms Order No. 75-9770

A theory for designing parallel track-type geophysical surveys, as well as the necessary numerical algorithms for implementing the theory, is developed and applied to various sampling problems. The basic procedures of survey design are based upon one and two-dimensional Fourier transforms applied to appropriate

numerical models of the sampling process in order to estimate the variance or mean square error as well as the spectral content of the sampling error. These error estimates are computed in the spatial frequency domain, and application of the convolution theorem is shown to produce a particularly efficient process for propagating the error estimates through a variety of linear operations performed upon the survey data. The following applications are presented to illustrate the adaptability of the theory: the near real-time design of hydrographic surveys utilizing a small scale computer; the design of gravity surveys from which estimates of vertical deflection and geoid undulation may be derived to a specified accuracy; and the design of oceanic sound speed surveys which illustrates the application of the theory to three-dimensional fields. Dissert. Abstr.

N75-25254*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
MAPPING OF SNOW COVER AND FREEZE THAW LINE Progress Report, May 1975
Joe R. Eagleman and Ernest Pogge, Principal Investigators May 1975 4 p EREP
(Contract NAS9-13273)
(E75-10307; NASA-CR-142851; TR-239-22) Avail: NTIS HC $3.25 CSCL 08B

N75-25262*# Kanner (Leo) Associates, Redwood City, Calif.
FUNDAMENTALS OF SATELLITE GEODESY
A. A. Izotov, V. I. Zubinsky, N. L. Makarenko, and A. M. Mikisha Washington NASA Jun. 1975 330 p refs Transl. into ENGLISH from the book "Osnovy Sputnikovoy Geodezii" Moscow, Nedra Press, 1974 p 1-317
(Contract NASw-2481)
(NASA-TT-F-16222) Avail: NTIS HC $9.50 CSCL 08E

The geometric and dynamic methods of satellite geodesy are presented along with problems of photographic astrometry, celestial mechanics, and higher geodesy upon which satellite geodesy is based. Methods and apparatus for observation of artificial earth satellites are given plus the principles and methods of processing of the results of observations. Author

N75-25289# Environmental Research and Technology, Inc., Lexington, Mass.
SNOW MAPPING APPLICATIONS OF THERMAL INFRARED DATA FROM THE NOAA SATELLITE VERY HIGH RESOLUTION RADIOMETER (VHRR) Final Report
James C. Barnes, Clinton J. Bowley, and James L. Cogan Nov. 1974 80 p refs
(Grant NOAA-3-35385)
(COM-75-10273/1; ERT-0438-F; NOAA-75021202) Avail: NTIS HC $4.75 CSCL 04B

The application of the NOAA satellite VHRR (Very High Resolution Radiometer) thermal infrared data for mapping snow cover was investigated. A sample of VHRR data from the 1973 to 1974 winter and spring seasons is analyzed for mountainous terrain areas in the western United States and for relatively flatter areas in the Midwest Southeast, and Northeast. The thermal patterns displayed in the infrared data are compared with snow cover patterns mapped from corresponding VHRR visible imagery, ERTS-1 imagery, and reported snow amounts. GRA

N75-25491*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETAILED GRAVIMETRIC GEOID CONFIRMATION OF SHORT WAVELENGTH FEATURES OF SEA SURFACE TOPOGRAPHY DETECTED BY THE SKYLAB S-193 ALTIMETER IN THE ATLANTIC OCEAN
J. G. Marsh, S. Vincent (Wolf R and D Corp., Riverdale, Md.), A. T. McClinton (Wolf R and D Corp., Riverdale, Md.), and E. S. Chang (Wolf R and D Corp., Riverdale, Md.) May 1975 20 p refs Submitted for publication
(NASA-TM-X-70905; X-921-75-110) Avail: NTIS HC $3.25 CSCL 08J

A detailed gravimetric geoid was computed for the Northwest Atlantic Ocean and Caribbean Sea area in support of the calibration and evaluation of the GEOS-C altimeter. This geoid, computed on a 15 ft. x 15 ft. grid was based upon a combination of surface gravity data with the GSFC GEM-6 satellite derived gravity data. A comparison of this gravimetric geoid with 10 passes of SKYLAB altimeter data is presented. The agreement of the two data types is quite good with the differences generally less than 2 meters. Sea surface manifestations of numerous short wavelength (approximately 100 km) oceanographic features are now indicated in the gravimetric geoid and are also confirmed by the altimetry data. Author

N75-26459*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, May 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 16 Jun. 1975 3 p EREP
(Contract NAS9-13276)
(E75-10315; NASA-CR-142917; PR-23) Avail: NTIS HC $3.25 CSCL 08E

N75-26460*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Progress Report, May 1975
Charles E. Poulton, Principal Investigator 6 Jun. 1975 3 p EREP
(Contract NAS9-13286)
(E75-10316; NASA-CR-142918; MPR-20) Avail: NTIS HC $3.25 CSCL 08B

N75-26582# Ohio State Univ., Columbus. Dept. of Geodetic Science.
NON-GLOBAL RECOVERY OF GRAVITY ANOMALIES FROM A COMBINATION OF TERRESTRIAL AND SATELLITE ALTIMETRY DATA
S. Gopalapillai Jul. 1974 108 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-A003686; AFCRL-TR-74-0333; SR-16) Avail: NTIS CSCL 08/5

Two methods for recovery of gravity anomalies are described. Of those, the indirect method, based on the use of the Stokes' formula is chosen for its flexibility in combining any a priori information available on the anomalies and in filtering out any systematic error that may be inherent in the observations. GRA

04
GEOLOGY AND MINERAL RESOURCES

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

A75-32609 # **Morphostructural interpretation of spaceborne photography of the Lake Balkhash region (O morfostrukturnoi interpretatsii kosmicheskoi fotografii Pribalkhash'ia).** S. M. Aleksandrov and B. V. Vinogradov (Akademiia Nauk SSSR, Institut Geografii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 219, Dec. 11, 1974, p. 1185-1188. 9 refs. In Russian.

An analysis is made of a photograph taken by the crew of Salyut 11 on June 6, 1971, of areas to the north and south of Lake Balkhash. Analysis of the photograph, along with the investigation of geological and geophysical materials and direct observations using aerial photography, reveals the overall nodal-line pattern of fractures defining the differential movements of morphological structures whose decipherability is determined by their different activities. A.T.S.

A75-33474 **New techniques in geophysical exploration for minerals.** D. W. Strangway (Toronto, University, Toronto, Canada). *Technology Review,* vol. 77, May 1975, p. 34-37.

Developments in mineral exploration techniques are described, and their impact on the understanding of mineral resources is considered. The described techniques include the use of airborne magnetometers, airborne electromagnetic surveys, detection by means of Josephson junctions and VLF radio waves, and the magnetotelluric method. The use of superconducting transmitting coils in electromagnetic surveys is discussed, and it is proposed that a better understanding of geological formations can improve the chances of detecting stratiform mineral deposits. F.G.M.

A75-33859 * # **Remote sensing of surface parameters using Skylab S-193 radiometer/scatterometer data.** K. Krishen (Lockheed Electronics Co., Inc., Houston, Tex.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings.
Berne, Universität Bern, 1974, p. 77-84. 10 refs. Contract No. NAS9-12200.

This paper presents the results of the interpretation of Skylab S-193-acquired radiometer and scatterometer data in terms of the total root-mean-square slope and the dielectric constant of the surface. The location of the S-193 field of view and existing geophysical data has been used as a background. The dielectric constant and surface roughness for the Great Salt Lake Desert are predicted using a computer fit to the S-193 scatterometer data. The S-193 and S-194 radiometer data have also been used to compute the dielectric constant. The results were compared with measurements given for similar sites; a reasonable agreement was found. (Author)

A75-33875 # **Method of deep radar sounding in geological research.** M. I. Finkel'shtein, O. P. Vlasov, V. I. Gornyi, V. A. Kutev, V. A. Morozov, and B. V. Shilin (Ministry of Geology of the USSR, Laboratory of Air Methods, USSR). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings.
Berne, Universität Bern, 1974, p. 215-224. 13 refs.

Basic principles of deep radar sounding are considered, data bearing on the feasibility of certain prospective applications of this method are presented, and results of sounding a sand mass by airborne radar equipment to a 30-m depth are reviewed. The practicality of radar sounding of sand bottoms at a depth of several tens of meters is established; resolution of discontinuities equal to a few meters is attainable. Interpretations of the soundings are in agreement with available geological sections. S.J.M.

A75-34784 **The use of propagation data in earth resource studies.** K. V. Paulson (Saskatchewan, University, Saskatoon, Canada). In: ELF-VLF radio wave propagation; Proceedings of the Advanced Study Institute, Spatind, Norway, April 17-27, 1974. Dordrecht, D. Reidel Publishing Co., 1974, p. 399-412. 20 refs.

It is pointed out that in the field of ELF and VLF radio wave propagation, there are opportunities for innovative research which could lead to improved methods of locating earth resources. The electrical and magnetic properties of earth materials are considered along with the approaches of electromagnetic prospecting, details of transverse wave interaction theory, and questions regarding the existing ELF and VLF exploration methods. G.R.

N75-21753*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
GEOLOGICAL INVESTIGATION USING ERTS ORBITAL IMAGES IN THE PORTUGAL REPUBLIC AND WESTERN SPAIN Final Report, Jul. 1972 - Apr. 1974
Guy Weecksteen, Principal Investigator and J. Y. Scanvic Apr. 1974 40 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10228; NASA-CR-142414) Avail: NTIS HC $3.75 CSCL 08G

N75-21761*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
GEOLOGICAL STUDY OF THE SOUTHERN PART OF THE MALAGASY REPUBLIC USING ERTS ORBITAL IMAGES Final Report, Oct. 1973 - Mar. 1974
Guy Weecksteen, Principal Investigator, J. Y. Scanvic, and B. Koch Mar. 1974 46 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10236; NASA-CR-142424) Avail: NTIS HC $4.75 CSCL 08G

The author has identified the following significant results. The Malagasy stratigraphy and tectonic are very complex, but the results obtained using ERTS-1 images interpretation make credible some hypothesis recently proposed by geologists. Most of known fractures are identified and numerous new observations are made on these images in the field of linear fractures. Some of them extend or relay known fractures and many others are totally new even if scattered field observations make it possible to assume that they correspond to reality. In the domain of lithology different types of rocks are distinguished, but the results are better in sedimentary formations than in the basement.

N75-21762*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
STRUCTURAL GEOLOGY INVESTIGATION IN THE REPUBLICS OF DAHOMEY AND TOGOLAND, AFRICA, USING ERTS-1 MULTI-SPECTRAL IMAGES Final Report, Jul. 1973 - Apr. 1974
Guy Weecksteen, Principal Investigator Apr. 1974 22 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10237; NASA-CR-142425) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Recent geological studies in the Republics of Dahomey and Togoland put in light a new chronology and propose a schema indicating that the structural geology of this region is very complicated. The new observations made possible by the ERTS images concern the main orientations, the folded units, and the lithology. The correlation between different types of laterite and the petrology of the basement seems possible, and is the most significant result of this investigation but unfortunately conducted with poor quality images because of atmospheric haze.

N75-21764*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Mar. 1975
Paul M. Merifield, Principal Investigator 5 Apr. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10239; NASA-CR-142532; MPR-22) Avail: NTIS HC $3.25 CSCL 08E

N75-21766*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Mar. - 31 Mar. 1975
Monem AbdelGawad, Principal Investigator 14 Apr. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10241; NASA-CR-142534) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. The fault pattern in the southern Nevada tectonic intersection and adjacent Mojave block was found to be consistent with a model partly suggested by Hamilton and Myers (1966). The model has the following basic elements: (1) a major Laramide left-lateral shear on the Texas Zone, (2) counterclockwise rotation of the Sierra Nevada-Klamath Mountain block, (3) clockwise rotation of the Colorado Plateau, and (4) crustal extension and intrusion of volcanics in Nevada.

N75-21780# California Earth Science Corp., Santa Monica.
ENHANCEMENT OF GEOLOGIC FEATURES NEAR MOJAVE, CALIFORNIA BY SPECTRAL BAND RATIOING OF ERTS MSS DATA
P. M. Merifield, D. L. Lamar, J. R. Keaton (Calif. Univ., Los Angeles), and J. V. Lamar (RAND Corp., Santa Monica, Calif.) Dec. 1974 21 p refs
(Contract DI-14-08-0001-13911)
(TR-74-4) Avail: NTIS HC $3.25

Spectral band ratioing of ERTS multispectral scanner subsystem (MSS) data was performed as a portion of a broader investigation to apply ERTS imagery to the analysis of fault tectonics and earthquake hazards of southern California. A number of geologic features in the western Mojave Desert were enhanced in spectral ratio images of ERTS MSS data, especially in the Band 5 to Band 4 ratio. Alluvial fans of different ages, which are indistinguishable in single spectral band images, are readily differentiated. Subtle differences in soil color are apparently enhanced on the ratio images, and differences in the density and type of vegetation may also be reflected on the images. Other geologic features enhanced relative to their surroundings include an iron oxide gossan around the once productive Middle Butte mining area, and a marble unit presently being quarried for the manufacture of cement. Calcareous and alkaline soils of low fertility are also easily distinguished because of their relatively dark appearance on the Band 5 to Band 4 ratio image. Author

N75-22852 Joint Publications Research Service, Arlington, Va.
REFLECTIVITY OF CERTAIN MATERIALS IN THE SPECTRAL REGION OF 1-13 MICRONS
O. I. Popov, V. I. Semenova, and Ye. O. Fedorova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 140-144 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 111-113

The results are presented of spectral reflectivity measurements of some natural and artificial materials in the 1-13 spectral range, which were obtained on an IKS-11 spectrometer. It is shown that the reflectivity data obtained agree with individual results available in literature. The materials examined included concrete, yellow sand of medium grain size, bitumen, green and red PVC paint on a metal backing, tar paper, gravel (limestone), spruce needle, fresh snow, coarse-grained thawing snow, wet concrete, wet gravel, and sand with 45% moisture. Author

N75-22862*# Environmental Research Inst. of Michigan, Ann Arbor. Resources and Technology Div.
MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM Quarterly Report, 8 Sep. - 8 Dec. 1974
Frederick J. Thomson, Principal Investigator 6 Mar. 1975 3 p EREP
(Contract NAS9-13317)
(E75-10250; NASA-CR-142625; ERIM-102000-32-L) Avail: NTIS HC $3.25 CSCL 08B

N75-22863*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM Quarterly Report, 8 Dec. 1974 - 8 Mar. 1975
Frederick J. Thomson, Principal Investigator 12 Mar. 1975 7 p ref EREP
(Contract NAS9-13317)
(E75-10251; NASA-CR-142626; ERIM-102000-33-L) Avail: NTIS HC $3.25 CSCL 08B

N75-22864*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Mar. - Apr. 1975
Keenan Lee, Principal Investigator 7 May 1975 5 p EREP
(Contract NAS9-13394)
(E75-10252; NASA-CR-142627) Avail: NTIS HC $3.25 CSCL 08F

N75-22866*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Mar. 1975
Roger M. Hoffer, Principal Investigator Mar. 1975 11 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13380)
(E75-10254; NASA-CR-142629) Avail: NTIS HC $3.25 CSCL 08F

The author has reported the following significant results. A data set containing SKYLAB, LANDSAT, and topographic data has been overlayed, registered, and geometrically corrected to a scale of 1:24,000. After geometrically correcting both sets of data, the SKYLAB data were overlayed on the LANDSAT data. Digital topographic data were then obtained, reformatted, and a data channel containing elevation information was then digitally overlayed onto the LANDSAT and SKYLAB spectral data. The 14,039 square kilometers involving 2,113, 776 LANDSAT pixels represents a relatively large data set available for digital analysis. The overlayed data set enables investigators to numerically

analyze and compare two sources of spectral data and topographic data from any point in the scene. This capability is new and it will permit a numerical comparison of spectral response with elevation, slope, and aspect. Utilization of the spectral and topographic data together to obtain more accurate classifications of the various cover types present is feasible.

N75-22888*# Alaska Univ., Fairbanks.
TECTONIC STRUCTURE OF ALASKA AS EVIDENCED BY ERTS IMAGERY AND ONGOING SEISMICITY Progress Report
Larry D. Gedney, Principal Investigator 4 Apr. 1975 17 p refs ERTS
(Contract NAS5-20803)
(E75-10277; NASA-CR-142686) Avail: NTIS HC $3.25 CSCL 08G

N75-24057*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES,SOUTHERN CALIFORNIA Monthly Progress Report, Apr. 1975
Paul M. Merifield, Principal Investigator 5 May 1975 2 p EREP
(Contract NAS2-7698)
(E75-10284; NASA-CR-142721; MPR-23) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Images of SL2 EREP Pass 2, S192 channels were generated, with six channels usable. Analysis of SL4 photographs of the Mojave Desert were continued. An overflight was made along several active faults. A number of topographic indicators of recent faulting are identifiable in Skylab photos, particularly S190B photos.

N75-24061*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, Apr. 1975
Monem Abdel-Gawad, Principal Investigator 15 May 1975 2 p EREP
(Contract NAS9-14440)
(E75-10288; NASA-CR-142723; SC5007.12MR) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Surface indications of recent faulting are generally observed in EREP S190B photographs. Comparison of secondary roads (asphalt and dirt) registered in EREP and U-2 photographs together with field measurements shows that dirt and asphalt roads about seven meters wide can be detected in EREP S190B photographs where sufficient contrast exists between the tone of the road surface and surrounding terrain. In low contrast cases, roads more than ten meters wide could not be detected.

N75-24083# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MID-INFRARED SPECTRAL BEHAVIOR OF IGNEOUS ROCKS Environmental Research Papers
Graham R. Hunt and John W. Salisbury 23 Dec. 1974 141 p refs
(ILIR Proj. 4A-01)
(AD-A007680; AFCRL-TR-74-0625; AFCRL-ERP-496) Avail: NTIS CSCL 08/7

Midinfrared (6 to 40 micrometers) spectra of igneous rocks and rock-forming minerals are presented. Molecular vibration bands are identified, and the extent of spectral scatter among different samples of the same rock type is illustrated. Conclusions are drawn concerning the extent to which midinfrared spectral behavior of igneous rocks is diagnostic of composition. GRA

N75-24085# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW
Harold W. OBrien and Richard H. Munis Mar. 1975 22 p refs Sponsored in part by NOAA, Washington, D. C.
(DA Proj. 1T1-61102-B-52A)
(AD-A007732; CRREL-RR-332) Avail: NTIS CSCL 08/12

The spectral reflectance of snow in the range of 0.60 to 2 50 micrometers wavelengths was studied in a cold laboratory using natural snow and simulated preparations of snow. A white barium sulfate powder was used as the standard for comparison. The high reflectance (usually nearly 100%) of fresh natural snow in the visible wavelength declines rapidly at wavelengths near and beyond 0.80 micrometers, as the spectral absorption coefficients of ice increase. The rate of decline of near-infrared reflectance due to aging is strongly affected by the history of the snow during aging. Snow aged under certain conditions may retain 90% or so of its reflectance in the visible red, yet may be only about 10% as reflective as the original fresh snow beyond 2.2 micrometers. Several environmental factors such as ambient temperature and wind effects which contribute to the variability in snow reflectance are discussed. GRA

N75-25239*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM ERTS-1 IMAGERY: SOUTHWESTERN NORTH AMERICA AND THE RED SEA AREA Final Report, 30 May 1972 - 11 Feb. 1975
Monem Abdel-Gawad, Principal Investigator and Linda Tubbesing 5 May 1975 182 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21767)
(E75-10291; NASA-CR-142835; SC543.16FR) Avail: NTIS HC $7.00 CSCL 08G

The author has identified the following significant results. The ERTS-1 imagery was utilized to study major fault and tectonic lines and their intersections in southwestern North America. A system of transverse shear faults was recognized in the California Coast Ranges, the Sierra Nevada, the Great Basin, and Mexico. They are interpreted as expressions of a major left-lateral shear which predated the San Andreas system, the opening of the Gulf of California and Basin and Range rift development. Tectonic models for Basin and Range, Coast Ranges, and Texas-Parras shears were developed. Geological structures and Precambrian metamorphic trend lines of schistosity were studied across the Red Sea rift.

N75-25259*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SURFACE COMPOSITIONAL MAPPING BY SPECTRAL RATIOING OF ERTS-1 MSS DATA IN THE WIND RIVER BASIN AND RANGE, WYOMING Final Report, Sep. 1972 - Sep. 1974
Robert K. Vincent, Principal Investigator, B. C. Salmon, W. W. Pillars, and J. E. Harris Jun. 1975 72 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10312; NASA-CR-142855; ERIM-193300-32-F) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. ERTS data collected in August and October 1972 were processed on digital and special purpose analog recognition computers using ratio enhancement and pattern recognition. Ratios of band-averaged laboratory reflectances of some minerals and rock types known to be in the scene compared favorably with ratios derived from the data by ratio normalization procedures. A single ratio display and density slice of the visible channels of ERTS MSS data, Channel 5/Channel 4 (R5,4), separated the Triassic Chugwater formation (redbeds) from other formations present and may have enhanced iron oxide minerals present at the surface in abundance. Comparison of data sets collected over the same area at two different times of the year by digital processing

indicated that spectral variation due to environmental factors was reduced by ratio processing.

N75-26458*# Maryland Geological Survey, Baltimore.
RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND Final Report
Kenneth N. Weaver, Principal Investigator, William P. Crowley, Jonathan Edwards, Jr., Randall T. Kerhin, and Turbit H. Slaughter Sep. 1974 107 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21848)
(E75-10314; NASA-CR-142916) Avail: NTIS HC $5.25 CSCL 08G

The authors have identified the following significant results. Field work in Baltimore County revealed that the signature returns of serpentinitic and nonserpentinitic rocks correlates with the vegetation cover and land use pattern. In Maryland Piedmont, bedrock lithology and structure are enhanced only to the extent that land use is geologically dictated. Two prominent sets of linear features are detected on ERTS-1 imagery at N 45 deg E and N 20 deg E. Beaches of Chesapeake Bay are classified as broad and narrow beaches based on the width of the backshore zone. It is shown by comparing historical shorelines of Ocean City, from the inlet to the Maryland-Delaware line that reversal zones of erosion and accretion occur at different locations for different periods. High reflectance levels (high marsh-high topographic areas) for the lower Eastern Shore are found to be distributed as two distinct trending linear ridge systems. Observations of MSS band 5 dated 9 April 1974 exhibited an unique sedimentation pattern for Chesapeake Bay. Following a 1.5 inch rainfall, heavy concentration of suspended sediments is observed on the imagery, particularly in the area of the turbidity maximum.

N75-26462*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, May 1975
Paul M. Merifield, Principal Investigator 5 Jun. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10318; NASA-CR-142920; MPR-24) Avail: NTIS CSCL 08E

The author has identified the following significant results. Thin sections of rock exposed along the San Diego River linear were prepared and determined to be fault breccia. Single band and ratio images of the western Mojave Desert were prepared from the multispectral scanner digital tapes. Subtle differences in color of soil and rock are enhanced on the ratio images. Two north-northeast trending linears (Horsethief Canyon and Pine Valley Creek) and an east-west linear (Pine Creek) were concluded to have resulted from erosion along well-developed foliation in crystalline basement rocks.

N75-26478*# Kansas Univ. Center for Research, Inc., Lawrence.
ROUGH SURFACE SCATTERING BASED ON FACET MODEL
H. R. Khamsi, A. K. Fung, and F. T. Ulaby Nov. 1974 158 p refs
(Contract NAS9-10261)
(NASA-CR-141869; RSL-TR-177-52) Avail: NTIS HC $6.25 CSCL 20F

A model for the radar return from bare ground was developed to calculate the radar cross section of bare ground and the effect of the frequency averaging on the reduction of the variance of the return. It is shown that, by assuming that the distribution of the slope to be Gaussian and that the distribution of the length of the facet to be in the form of the positive side of a Gaussian distribution, the results are in good agreement with experimental data collected by an 8- to 18-GHz radar spectrometer system. It is also shown that information on the exact correlation length of the small structure on the ground is not necessary; an effective correlation length may be calculated based on the facet model and the wavelength of the incident wave. Author

N75-26482*# Colorado School of Mines, Golden. Dept. of Geology.
APPLICATION OF REMOTE SENSOR DATA TO GEOLOGIC ANALYSIS OF THE BONANZA TEST SITE COLORADO Semiannual Progress Report, 1 Oct. 1974 - 31 Mar. 1975
Keenan Lee, comp. Apr. 1975 20 p refs
(Grant NGL-06-001-015)
(NASA-CR-143082; RSR-75-2) Avail: NTIS HC $3.25 CSCL 08G

Selected samples of anomalous surface features commonly associated with the various types of uranium deposits are presented and recommendations for sensor applications are given. The features studied include: epigenetic uranium ore roll type; precambrian basal conglomerate type; vein-type uranium deposits; pipe-structure or diatreme deposits; evaporitic uranium deposits. The hydrogeology of the Mosquito Range and the San Luis Valley is also examined. Author

N75-27519*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPLICATION OF ERTS IMAGES AND IMAGE PROCESSING TO REGIONAL GEOLOGIC PROBLEMS AND GEOLOGIC MAPPING IN NORTHERN ARIZONA
A. F. H. Goetz, Principal Investigator, F. C. Billingsley, A. R. Gillespie, M. J. Abrams, R. L. Squires, E. M. Shoemaker (Calif. Inst. of Tech.), I. Lucchitta (Geol. Survey, Flagstaff, Ariz.), and D. P. Elston (Geol. Survey, Flagstaff, Ariz.) 15 May 1975 203 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS7-100)
(E75-10331; NASA-CR-143068; JPL-TR-32-1597) Avail: NTIS HC $7.25 CSCL 08B

The author has identified the following significant results. Computer image processing was shown to be both valuable and necessary in the extraction of the proper subset of the 200 million bits of information in an ERTS image to be applied to a specific problem. Spectral reflectivity information obtained from the four MSS bands can be correlated with in situ spectral reflectance measurements after path radiance effects have been removed and a proper normalization has been made. A detailed map of the major fault systems in a 90,000 sq km area in northern Arizona was compiled from high altitude photographs and pre-existing published and unpublished map data. With the use of ERTS images, three major fault systems, the Sinyala, Bright Angel, and Mesa Butte, were identified and their full extent measured. A byproduct of the regional studies was the identification of possible sources of shallow ground water, a scarce commodity in these regions.

N75-27528*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Jun. 1975
Paul M. Merifield, Principal Investigator 5 Jul. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10340; NASA-CR-143076; MPR-25) Avail: NTIS HC $3.25 CSCL 05B

05

OCEANOGRAPHY AND MARINE RESOURCES

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

A75-29701 **The use of artificial earth satellites to measure ocean waves.** A. A. Zagorodnikov. *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana,* vol. 10, July 1974, p. 791-798.) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics,* vol. 10, July 1974, p. 487-491. 20 refs. Translation.

A75-31597 # **Sea ice mapping of the Labrador pack from satellite imagery.** D. Bajzak and C. J. Langford (Newfoundland, Memorial University, St. John's, Canada). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 375, 377-386.

An investigation is conducted concerning the feasibility to develop a system for mapping pack ice conditions on the basis of satellite photography. The information obtained with the aid of such a system would be useful to vessels which have to navigate in or near the Labrador pack. Questions regarding the satellite imagery needed for such a system are considered along with details concerning the interpretation techniques, a classification of ice concentration and type, and problems of image interpretation. Attention is given to ice movement and ice field structure. G.R.

A75-33852 * # **Spectral variation in the microwave emissivity of the roughened seas.** P. Gloersen, W. J. Webster, Jr., T. T. Wilheit, T. C. Chang (NASA, Goddard Space Flight Center, Greenbelt, Md.), and D. B. Ross (NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, Fla.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 11-15.

Recently acquired microwave data obtained from the NASA CV 990 research aircraft have yielded variation of sea surface emissivity as a function of various parameters. Data acquired at a wavelength of 1.5 cm, horizontal polarization, agree with data obtained earlier by Nordberg et al. and Hollinger at nadir and 50 deg viewing angles respectively; the ratio of brightness temperature change to wind speed change was found to be approximately 1 K per meter per second over a wind speed range of 5 to 26 meters per second. Combining these recent measurements with the earlier measurements, it is evident that microwave radiometry can be used as a remote-sensing anemometer over all wind speed ranges of interest. Data analysis revealed that for nadir-viewing instruments, the ratio of brightness temperature change to wind speed change was approximately constant for the 0.8-2.8 cm wavelength range, about three-quarters of that value at 6 cm, and nearly zero at 21 cm. A model is proposed that is consistent with observations. (Author)

A75-33857 * # **A dual frequency radar for ocean roughness sampling.** D. E. Weissman (Hofstra University, Hempstead, N.Y.), C. T. Swift, W. L. Jones, Jr., J. W. Johnson, W. L. Grantham, J. O. Howell, J. C. Fedors, and J. J. Davis (NASA, Langley Research Center, Hampton, Va.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 55-65. 6 refs.

A microwave technique for determining the roughness (rms wave height) of a randomly varying air-water interface has been developed theoretically, verified with laboratory wavetank studies and is currently being implemented for ocean surface measurements in a series of applications flight experiments. These aircraft observations will be near the Chesapeake Light Tower and will include a range of altitudes and sea conditions. The measurement concept involves cross-correlating the envelope fluctuations on two received carriers that are monochromatic when transmitted in a normal direction to the interface and are observed in a backscatter direction after reflection by the large number of randomly distributed specular points on the surface. The measured correlation coefficient (normalized covariance) as a function of carrier frequency separation will depend on the surface roughness, specifically the probability density function of the specular point height. Details of the flight system are discussed, and preliminary flight results are presented. (Author)

A75-33858 * # **Monitoring the sea surface with a short pulse radar.** D. M. Le Vine (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 67-75. 7 refs.

A solution is presented for the scattering of short pulses from a stochastic, corrugated surface relative to the sea for the case of a narrow-beam transmitting antenna pointing near nadir. The spectrum of the received power and its time history are calculated and this solution is used to show that a measure of the variance of the surface ordinant can be obtained from the backscattered power. Included explicitly in the analysis is the finite nature of the source and the role of the small-scale wave structure (capillary wave range). It is shown that when sufficiently short pulses are transmitted, one can obtain a measure of the variance of the large scale surface ordinant from either the temporal spacing of the peaks in the returned power or from the envelope of the spectrum of the received power. Assuming an appropriate model for the statistics and spectrum of the surface ordinate, the variance can be used to compute the wind speed and the significant wave height of the surface. (Author)

A75-33860 * # **Variation in the microwave emissivity of sea ice in the Beaufort and Bering sea.** R. O. Ramseier (Department of the Environment, Ottawa, Canada), P. Gloersen (NASA, Goddard Space Flight Center, Greenbelt, Md.), and W. J. Campbell (U.S. Geological Survey, Tacoma, Wash.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 87-93.

A75-33861 # **Experiments on remote sensing of sea ice using a microwave radiometer.** M. Tiuri, M. Hallikainen, and K. Kaski (Helsinki Technical University, Otaniemi, Finland). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 95-100. 7 refs.

Investigations have been started in Finland to find out if microwave radiometers can be used in surveying sea ice for controlling icebreakers in the Baltic Sea. Based on theoretical calculations of the brightness temperature of sea ice, the frequency of the radiometer was selected to be 4.7 GHz. The radiometer uses a novel traveling wave antenna with beam direction dependent on frequency. A three-channel radiometer carried by a helicopter measures the brightness temperatures of three adjacent ice strips. An auxiliary radiometer at 605 MHz is used for checking purposes. During the winter of 1974 several measurements of different ice types were made, the results of which are described and discussed. (Author)

A75-33877 # **A theory of wave scatter from an inhomogeneous medium with a slightly rough boundary and its application to sea ice.** S. K. Parashar, A. K. Fung, and R. K. Moore (Kansas,

University, Lawrence, Kan.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 245-255.

A75-33878 * # **Directional spectra of ocean waves from microwave backscatter.** F. C. Jackson (General Electric Co., Space Div., Philadelphia, Pa.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 257-272. 17 refs. Contract No. NAS5-24021.

The paper presents an analysis of two proposed microwave radar techniques for measuring ocean wave directional spectra. Tomiyasu's (1971) short pulse idea and Barrick's (1972) two-frequency correlation idea are regarded - independent of transmitted waveform - as essentially two alternative detection systems for modulated noise. Together, the two systems constitute a general detection system for modulated noise described some years ago by Parzen and Shiren (1956). A frequency domain analysis for backscatter on arbitrary incident waveform is given, and an interesting physical optics solution for the generalized fourth-order moments of the scattering matrix is obtained. It is shown that the present narrowband version of Barrick's two-frequency idea is impractical, and that the proper application of Barrick's idea is to wide band signals. (Author)

A75-35453 # **SEASAT-A spacecraft views the marine environment with microwave sensors.** John R. Apel (NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, Fla.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S2-3 to S2-24.

SEASAT-A is a new NASA satellite dedicated to oceanographic measurements of interest to a broad spectrum of the marine community. It consists of an array of active and passive microwave instruments that give it the ability to view surface features on a day-night, near-all-weather basis. It will measure such features as wave heights, lengths, and directions; surface wind velocities; currents; temperatures; ice cover; and the marine geoid. Sensor capabilities and examples of their data output will be given, and the usefullness of these data for understanding the coastal marine environment will be discussed. (Author)

A75-35454 # **Remote sensing of oceans using microwave sensors.** K. Krishen (Lockheed Electronics Co., Inc., Houston, Tex.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S2-25 to S2-57. 57 refs.

This paper presents a review of the results of a study of the ocean surface phenomena. The use of active and passive microwave sensors to detect ocean surface waves, temperature, salinity, storm cells, and oil slicks is demonstrated. The aircraft- and spacecraft-acquired microwave data are presented. The radar backscattering cross section data shows strong correlation between ocean surface winds/waves, storm regions, and oil slicks. A strong dependence upon these parameters has been shown in the Ku-band at a radar frequency of 13.9 GHz. The relationship between radiometric brightness temperature and ocean surface temperature, salinity, and sea state are set forth. Evidence of the suitability of microwave sensors in providing data independent of sunlight under almost all weather conditions is provided. (Author)

A75-35456 * # **Laser measure of sea salinity, temperature and turbidity in depth.** J. G. Hirschberg, A. W. Wouters, and J. D. Byrne (Miami, University, Coral Gables, Fla.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S3-13 to S3-27. 6 refs. Contract No. NAS10-8600.

A method is described in which a pulsed laser is used to probe the sea. Backscattered light is analyzed in time, intensity and wavelength. Tyndall, Raman and Brillouin scattering are used to obtain the backscatter turbidity, sound velocity, salinity, and the temperature as a function of depth. (Author)

A75-35905 # **Large area assessment of water temperature, chlorophyll concentration and transparency.** F. C. Polcyn and C. T. Wezernak (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-686.* 4 p. NOAA-supported research.

The era of a multispectral scanner aboard satellites and aircraft offers the promise of measurement of large scale water movements and the simultaneous quantitative assessment of several important water quality parameters. Recent data collection and analysis of multispectral aircraft data for two points of the tidal cycle (outgoing and incoming tides) has been completed for the New York Bight. Eight lines at 10,000 ft altitude each covering 3 miles by 24 miles were flown on 7 April 1973. Fifteen channels of multispectral data were collected. Surface Temperature maps ranging from 6 C to 13 C were produced which show the pattern of out flow and return over the area. Ocean fronts, upwellings, and eddies and general surface circulation was delineated. Simultaneous spectral data in the visible region were also collected. Techniques for delineating surface chlorophyll concentrations and Secchi disk transparency were demonstrated and regional maps produced. The use of remote sensing in providing information vital to studies of the highly complex and dynamic estuarine and coastal environment, as represented by the New York Bight, is demonstrated. (Author)

A75-35913 # **Determining the temperature of the surface layer of the Barents Sea from data of airborne thermal surveys (Opredelenie temperatury poverkhnostnogo sloia Barentseva Moria po dannym aviatermicheskikh s'emok).** G. V. Girdiuk, G. G. Zykova, and F. S. Terziev (Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby SSSR, Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Murmansk, USSR). *Meteorologiia i Gidrologiia,* Apr. 1975, p. 109-112. 14 refs. In Russian.

A75-36463 * **Satellite altimetry applications.** J. T. McGoogan (NASA, Wallops Flight Center, Wallops Island, Va.). In: Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 23-25. 6 refs.

In satellite altimetry the highly stable platform provided by a satellite is utilized as a moving reference system from which vertical measurements to the ocean surface are made. Satellite altimetry applications are related to geoid determination, questions concerning the consideration of local topography, geological-structure studies, investigations regarding the distribution of wave heights, current detection, and the mapping of land topography. G.R.

A75-36464 * **Microwave scattering from the ocean surface.** W. L. Jones, W. L. Grantham, L. C. Schroeder, J. W. Johnson, and C. T. Swift (NASA, Langley Research Center, Hampton, Va.). In: Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 26-28. 18 refs.

This paper is a review of current aircraft and satellite microwave remote sensing programs concerned with the measurement of ocean wave and surface wind conditions. These particular measurements have been identified by the user community as offering significant economic and technological benefits. Active microwave remote sensing techniques for these applications have been described theoretically and verified experimentally. The results of recent aircraft and satellite experimental programs are presented herein along with plans for the SeaSat-A Satellite Scatterometer. (Author)

A75-36824 **Application of GEOS-C to ocean science.** V. E. Noble (U.S. Navy, Naval Research Laboratory, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. (A75-Falls Church, Va., American Society of Photogrammetry, 1975, p. 539-555. 16 refs. Research supported by the U.S. Defense Mapping Agency and U.S. Navy.

Short-pulse measurements with the GEOS-C radar altimeter will provide the capability for measurement of ocean surface topography to a precision of 30 cm. Dynamic oceanographic processes contributing to variations of ocean surface elevation with respect to the reference geoid include atmospheric pressure loading (maximum effect 1 meter), currents (1 meter), tides (1 meter), storm surges and pile-up (1 meter to 10 meters), and sea state. Measurement of the ocean surface topography, and analysis of the data with respect to theoretical oceanographic prediction models, accurate geoid models, and accurate orbital tracking data will contribute to evaluation of the oceanographic models and improvement in determination of the marine geoid. (Author)

A75-36825 * **Preliminary results on ocean dynamics from Skylab and their implications for future spacecraft.** J. Hayes (City College, New York, N.Y.; Rutgers University, New Brunswick, N.J.), W. J. Pierson, and V. J. Cardone (City College, New York, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 556-576. 13 refs. NASA-supported research.

The instrument aboard Skylab designated S193 - a combined passive and active microwave radar system acting as a radiometer, scatterometer, and altimeter - is used to measure the surface vector wind speeds in the planetary boundary layer over the oceans. Preliminary results corroborate the hypothesis that sea surface winds in the planetary boundary layer can be determined from satellite data. Future spacecraft plans for measuring a geoid with an accuracy up to 10 cm are discussed. S.D.

A75-36826 **Recent advances in the application of data from NOAA operational environmental satellites to oceanography.** E. P. McClain and A. E. Strong (NOAA, National Environmental Satellite Service, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 577-587. 20 refs.

Data from the NOAA series of polar-orbiting satellites, particularly those from its Very High Resolution Radiometer (VHRR), are receiving rapidly increasing and more quantitative use both in oceanographic research and, recently, for operational marine purposes. The thermal infrared observations are being used to detect, map, measure, and monitor ocean and Great Lakes' thermal contrasts associated with currents, upwelling, and river outflow. The visible-band data have found their greatest use in the monitoring of sea ice features, motions and conditions. Visible-band data are also valuable for filtering clouds from infrared scenes and in some studies of ocean roughness. (Author)

N75-21737*# Wolf Research and Development Corp., Riverdale, Md.

THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA Final Report, May 1972 - Sep. 1974

Allan J. Jelacic, Principal Investigator Oct. 1974 212 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21761)

(E75-10212; NASA-CR-142398) Avail: NTIS HC $7.25 CSCL 04A

N75-21745*# Oceanographic Services, Inc., Santa Barbara, Calif.

CORRELATION OF OCEAN TRUTH DATA WITH ERTS-1 IMAGERY: CALIFORNIA COASTAL SITES IN MONTEREY BAY, SANTA BARBARA CHANNEL, AND SANTA MONICA BAY Final Report

William A. Anikouchine, Principal Investigator Oct. 1974 396 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21877)

(E75-10220; NASA-CR-142406) Avail: NTIS HC $10.25 CSCL 08J

N75-21754*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.

REMOTE SENSING OF OCEAN CURRENTS WITH ERTS-1 Final Report, May 1972 - Aug. 1974

George A. Maul, Principal Investigator Aug. 1974 84 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(NASA Order S-70246-AG)

(E75-10229; NASA-CR-142415) Avail: NTIS HC $4.75 CSCL 08C

N75-21776*# National Aeronautics and Space Administration, Wallops Station, Wallops Island, Va.

SUMMARY OF SKYLAB S-193 ALTIMETER ALTITUDE RESULTS

J. T. McGoogan, C. D. Leitao, and W. T. Wells (Wolf Research and Development Corp., Riverdale, Md.) Feb. 1975 324 p refs

(NASA-TM-X-69355) Avail: NTIS HC $9.25 CSCL 05B

The SKYLAB S-193 altimeter altitude results are presented in a concise format for further use and analysis by the scientific community. The altimeter mission and instrumentation is described along with the altimeter processing techniques and values of parameters used for processing. The determination of reference orbits is discussed, and the tracking systems utilized are tabulated. Techniques for determining satellite pointing are presented and a tabulation of pointing for each data mission included. The geographical location, the ocean bottom topography, the altimeter-determined ocean surface topography, and the altimeter automatic gain control history is presented. Some typical applications of this data are suggested. Author

N75-21914# Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.

THE OCEANS: PLANETARY ENGINEERING AND INTERNATIONAL MANAGEMENT. ANNUAL SEA GRANT LECTURE AND SYMPOSIUM (3RD)

Robert A. Frosch, Judith T. Kildow, and Richard R. Baxter 3 Oct. 1974 45 p refs Conf. held in Cambridge, Mass. Sponsored by NOAA

(COM-75-10086/7; MITSG-75-3; NOAA-74120409) Avail: NTIS HC $3.75 CSCL 08J

The collection of three papers constitutes the third annual sea grant lecture and symposium. The papers are: The oceans: Planetary engineering and international management; Alternatives for an international sea grant effort: and The law of the sea conference; Where we stand now. GRA

N75-22860*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.

REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Mar. 1975

George A. Maul, Principal Investigator 17 Apr. 1975 2 p EREP

(NASA Order T-4713-B)

(E75-10243; NASA-CR-142536) Avail: NTIS HC $3.25 CSCL 08C

N75-22883*# Environmental Research and Technology, Inc., Lexington, Mass.

THE APPLICATION OF ERTS IMAGERY TO MONITORING

ARCTIC SEA ICE: SUPPLEMENTAL REPORT Final Report, May - Dec. 1974
James C. Barnes, Principal Investigator, Clinton J. Bowley, and Michael D. Smallwood Jan. 1975 51 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21802)
(E75-10272; NASA-CR-142681; ERT-P-408-S) Avail: NTIS HC$4.25 CSCL 08L

N75-22884*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Apr. 1975
George A. Maul, Principal Investigator 5 May 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10273; NASA-CR-142682) Avail: NTIS HC $3.25 CSCL 08J

N75-23066# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL METHODS FOR STUDYING THE OCEAN
S. M. Zverev, ed. 28 Apr. 1975 82 p refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 66 p
(JPRS-64644) Avail: NTIS HC $4.75
Methods used to study the sedimentary stratum at sea and to determine the changes of the force of gravity at sea are reviewed.

N75-23070 Joint Publications Research Service, Arlington, Va.
MARINE GRAVIMETRIC OBSERVATIONS
V. A. Tulin *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 43-59 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 90-102
Automation of marine gravimetric observations is discussed. A gravimeter consisting of a sensor and an analog-to-digital readout converter based on the time-pulse coding method is described along with the processing of the signals on a digital computer. The performance of the gravimeter was investigated in the laboratory and on the sea, on submarines and surface ships. Results are discussed. J.M.S.

N75-23071 Joint Publications Research Service, Arlington, Va.
INTERPRETING MARINE GRAVIMETRIC OBSERVATIONS
A. G. Gaynonov *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 60-80 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 103-120
14-48)
Various methods used to interpret marine gravimetric observations are discussed. It is indicated that automation of the reduction operations and the interpretation of gravity anomalies is required due to the use of shipborne gravimeters featuring continuous registration of changes in the force of gravity. The Bouger reduction with allowances for bottom topography is preferred when studying the deep structure of ocean bottoms and deriving the quantitative characteristics of anomalous masses. Methods of evaluating the parameters of anomaly-forming bodies by determining the depths of specific points in the anomalous masses and the statistical characteristics of the gravitational fields are recommended. Author

N75-23919*# Battelle Columbus Labs., Ohio.
BISTATIC RADAR SEA STATE MONITORING FIELD TEST
G. T. Ruck, G. K. Kirchbaum, and J. O. Everly Mar. 1975 59 p refs
(Contract NAS6-2006)
(NASA-CR-141394) Avail: NTIS HC $4.25 CSCL 08C
Recent advances in understanding the physical phenomena *controlling the interaction of electromagnetic energy with the* ocean surface have revealed the possiblity of remote measurement of the two-dimensional surface wave height spectrum of the ocean using bistatic radar techniques. The basic feasibility of such a technique operating at frequencies in the HF region (3 to 30 MHz) was examined during previous studies and hardware for an experimental verification experiment was specified. The activities have resulted in a determination of the required hardware and system parameters for both satellite and aircraft systems, the development, assembly, and testing of hardware for an experimental aircraft system, the development and initial testing of data processing procedures, and the conduct of an initial flight test experiment. Activities were devoted to completing the assembly and testing of the experimental hardware, completing the experiment planning, conducting a field test experiment, and the processing and analysis of the experimental data. Even though directional spectrum maps of the test area cannot be generated from the measured data, the hardware concept employed appears viable, and solutions to the problems encountered have been identified. Author

N75-24282# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
ANALYSIS OF ERTS-A SATELLITE PHOTOS FOR NOAA-AOML STUDY TO DETECT OCEAN EDDIES (SIC) Final Report
E. B. Kraus Oct. 1974 20 p refs
(Grant NOAA-04-3-022-12)
(COM-75-10192/3; NOAA-75012702) Avail: NTIS HC $3.25 CSCL 08C
Photographic data from Landsat 1 of the Lesser Antilles Island arc were studied. It is shown that changes in sea state have a large effect on the amount of backscattered solar radiation reaching a satellite sensor. Preliminary attempts to remove the surface reflectance by photographic differences have not yielded positive results. GRA

N75-24283# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
COLLECTED REPRINTS: 1973. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORIES Annual Report
Jul. 1974 797 p refs
(COM-75-50164/3; NOAA-75012407; AR-8) Avail: NTIS MF $2.25; SOD HC CSCL 08T
The results of research of NOAA's Atlantic Oceanographic and Meteorological Laboratories and of AOML laboratory, the Ocean Remote Sensing Laboratory, are presented under the following headings: general, physical, oceanography, marine geology and geophysics, ocean remote sensing, and sea-air interaction. GRA

N75-25250*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, May 1975
George A. Maul, Principal Investigator May 1975 2 p EREP (NASA Order T-4713-B)
(E75-10303; NASA-CR-142847) Avail: NTIS HC $3.25 CSCL 08C

N75-25495# Coastal Engineering Research Center, Fort Belvoir, Va.
THE USE OF AERIAL PHOTOGRAPHY IN THE STUDY OF WAVE CHARACTERISTICS IN THE COASTAL ZONE
Cecil M. McClenan and D. Lee Harris Jan. 1975 73 p refs (DA Proj. C-31180)
(AD-A008011; CERC-TM-48) Avail: NTIS CSCL 08/3

Good aerial photos of waves show that multiple wave trains are common in the coastal zone. The relative importance of the various wave trains is changed by refraction and shoaling. The breakers, most prominent in the shore zone, often result from long, low swell, which is hardly discernable against the background of shorter waves a few hundred meters from shore. The generation of solitions and the regeneration of breakers which have crossed bars may lead to a breaker which is shorter than the period of the swell responsible for the breakers. Cylindrical waves radiating outward from rocks or shoals which penetrate the surface are formed from long-crested waves coming from the open sea. A wave pattern which appears random and chaotic when viewed on photos taken at a low elevation may appear to be highly organized when viewed at an elevation over 5,000 feet. GRA

N75-25498# RAND Corp., Santa Monica, Calif.
MONTHLY AVERAGE SEA-SURFACE TEMPERATURES AND ICE-PACK LIMITS ON A 1 DEGREE GLOBAL GRID
R. C. Alexander and R. L. Mobley Dec. 1974 39 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-A008575; R-1310-ARPA) Avail: NTIS CSCL 04/2

Climatological monthly ocean-surface temperatures obtained from the National Center for Atmospheric Research and from Fleet Numerical Weather Central are merged and interpolated onto a 1 degree global grid. Monthly distributions of the main ice packs of the Arctic and Antarctic are digitized from Fleet Weather Facility ice charts and Navy Atlases and then incorporated into the global arrays. Machine-analyzed maps show the 12 monthly distributions, and maps and tabulations of averages of these data for the months of February and August are shown on a global grid of 4 degrees latitude x 5 degrees longitude. GRA

N75-25499# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
CLASSIFICATION OF COASTAL ENVIRONMENT OF THE WORLD Final Report
Bruce Hayden and Robert Dolan Feb. 1975 166 p refs
(Contract N00014-69-A-0060-0006; NR Proj. 389-158)
(AD-A008578) Avail: NTIS CSCL 08/6

The final report summarizes the products of more than four years of research in the classification of coastal environments and includes three manuscripts detailing the results and conclusions of three studies not issued in technical report form. The three studies included are titled Coastal Wave Climates of the Americas, Coastal Marine Fauna and Marine Climates of the Americas, and An Assessment of Remote Sensing as a Tool in Classifying Coastal Landscape Elements. In addition, an evaluation of data quality, quantity, availability, and suitability for the purposes of classifying coastal environments is included. GRA

N75-25501# Scripps Institution of Oceanography, La Jolla, Calif.
[DEVELOPMENT OF TWO-WAVELENGTH RADIOMETER FOR MEASUREMENT OF SEA SURFACE HEAT FLUX] Final Report, 15 Nov. 1967 - 14 Nov. 1974
Theodore D. Foster Apr. 1975 7 p refs
(Contract N00014-69-A-0200-6009)
(AD-A008420; SIO-Ref-75-12) Avail: NTIS CSCL 08/10

Research was conducted on the development of a two-wavelength radiometer for the measurement of the total heat flux from the sea surface and on convective processes in the ocean. GRA

N75-26456 Miami Univ., Coral Gables, Fla.
AN EVALUATION OF THE USE OF THE EARTH RESOURCES TECHNOLOGY SATELLITE FOR OBSERVING OCEAN CURRENT BOUNDARIES Ph.D. Thesis
George August Maul 1974 117 p
Avail: Univ. Microfilms Order No. 75-12860

Remote sensing of ocean color to locate current boundaries was tested in the eastern Gulf of Mexico. A one year time history of the Gulf Loop Current was made by ship in synchronization with the LANDSAT satellite. The LANDSAT images indicate that the current's boundary can be detected by changes in either color or sea state. Theoretical spectra of upwelling irradiance confirm that surface reflectance changes due to meteorological conditions spectrally alter LANDSAT radiances. The gain settings for the satellite are not optimized for ocean radiances and computer enhancement of the data are required. The ship data demonstrate an annual cycle of growth, eddy separation, and decay of the Gulf Loop Current, which could not be reproduced with LANDSAT due to the 18 day orbit cycle and because the sensors were not designed for ocean radiance levels or spectral distributions. It is shown that a visible multispectral scanner, which supplies at least daily observations, is capable of providing tri-weekly pathlines of the Gulf Loop Current. Dissert. Abstr.

N75-26467*# National Environmental Satellite Service, Suitland, Md.
AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKES STUDIES Final Report
A. E. Strong, Principal Investigator and H. G. Stumpf Dec. 1974 254 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E75-10323; NASA-CR-142925) Avail: NTIS HC $8.50 CSCL 08H

The author has identified the following significant results. Prevailing wind direction on Lake Michigan is southwesterly, although during winter northwesterly stresses are common. Along the western shore the current favors a northward direction. ERTS-1 observations indicate that the southward-flowing current along the Michigan shoreline of the thumb is only reversed by southerly resultant wind stress. Along the Canadian shoreline, a northward current was observed north of Kettle Point. ERTS-1 data also reveal that a preferred southward-flowing current is found along the Detroit shoreline of Lake St. Clair. Eastward flow of surface water from the shallow western basin of Lake Erie into the middle basin is most obvious during northwesterly and northerly wind stresses. The reverse wind direction especially east and southeasterly, appear to hold the effluents from the Detroit and Maumee Rivers in the western basin. Across-lake winds from the north and south induce eddy-like circulation in surface waters of Lake Ontario. Counterclockwise alongshore flow persists in the western basin under most wind conditions.

N75-26616# Delaware Univ., Newark. Coll. of Marine Studies.
RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT Annual Status Report
William S. Gaither and Vytautas Klemas Nov. 1974 45 p refs
(Contract N00014-69-A-0407)
(AD-A003597; TR-32) Avail: NTIS CSCL 08/3

Progress during the fifth year of a multidisciplinary study of coastal processes has been directed toward the development and perfection of a dynamic prediction model with two distinct and mutually complementary approaches. The first is concentrated on the understanding and application of the basic physical mechanism in coastal processes. The second is the realistic definition and prediction of the random aspects of the coastal environment, primarily waves and tides, so that when these random inputs are used together with field measurements by remote sensing and other techniques, the output predictions can be truly realistic and highly reliable. The end product of this research will provide real-time prediction of coastal changes with a minimum of input requirements. The results will be displayed on a screen or quick-copied tactical maps. GRA

N76-26625# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MATHEMATICAL METHODS APPLIED TO OCEAN SURFACE TOPOGRAPHY AND SATELLITE GEODESY Final Report
Sep. 1974 32 p refs
(Contract N00014-71-A-0110-0004)
(AD-A003937; SAO-409-090) Avail: NTIS CSCL 08/5

This report summarizes the results of research carried out at Smithsonian Astrophysical Observatory during the period 1 June 1972 through 30 June 1974. Emphasis is given to topics of investigation for the period 1 July 1973 through 30 June 1974. A fundamental problem with the mathematical method encompassed is identified, and a modified approach of spherical sampling discussed. GRA

N75-27445 Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF ANTARCTIC SEA ICE DETERMINED USING SATELLITE OBSERVATIONS
V. V. Yevseyev *In its* Soviet Antarctic Inform. Bull. (JPRS-64980) 11 Jun. 1975 p 1-5 Transl. into ENGLISH from Inform. Byull. Sov. Antarkt. Eksped. (Leningrad), no. 90, 1975 p 14-17

From 1970 through 1971 satellite information was used for studying the peculiarities of the distribution of Antarctic sea ice during the entire year. As a result of analysis of television photographs it became clear that in late February-early March only residual ice was observed in Eastern Antarctica. Young ice appears in mid-March in many regions. In April an ice cover was observed along the entire coast of eastern Antarctica. During the month its outer boundary was shifted an average of 75 miles to the north. It was displaced approximately the same distance in May. Results of other monthly observations are also presented. Author

N75-27448 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN USING SATELLITE DATA IN TRAVERSING ANTARCTIC DRIFT ICE DURING THE 1970-1971 NAVIGATION SEASON
V. V. Yevseyev *In its* Soviet Antarctic Inform. Bull. (JPRS-64980) 11 Jun. 1975 p 20-22 Transl. into ENGLISH from Inform. Byull. Sov. Antarkt. Eksped. (Leningrad), no. 90, 1975 p 102-104

Characteristics of ice conditions during 1970 through 1971 are given, based on an analysis of satellite information and its use in conducting ships through drifting ice. A diesel-electric ship was provided with information from the Molodezhnaya station concerning the nature and distribution of a large zone of continuous drift ice. Satellite information was transmitted directly shipboard, and recommendations on the most advantageous region for traversing the drifting ice were received and successfully followed. Author

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.

A75-29451 # **Use of remote sensing for mapping wetlands.** R. J. Reimold and R. A. Linthurst (Georgia, University, Sapelo Island and Athens, Ga.). *(American Society of Civil Engineers, Water Resources Engineering Meeting, Los Angeles, Calif., Jan. 21-25, 1974, Preprint 2143.) ASCE, Transportation Engineering Journal,* vol. 101, May 1975, p. 189-198. 14 refs. U.S. Department of Commerce Grant No. 04-3-158-6.

Applications of remote sensing for wetland boundary mapping are considered and approaches for vegetation differentiation are described. Multiple uses of photography and infrared imagery of wetlands are discussed, giving attention to production patterns, water movement, location and field orientation, comparative analyses, landform analysis, water pollution analyses, and baseline conditions. G.R.

A75-32268 # **Contactless radar survey of warm mountain glaciers - Transformations of radar coordinates (Nekontaktnaia radiolokatsionnaia s'emka teplykh gornykh lednikov - Preobrazovaniia radiokoordinat).** V. S. Luchininov (Leningradskii Elektrotekhnicheskii Institut, Leningrad, USSR). *Zhurnal Tekhnicheskoi Fiziki,* vol. 45, Apr. 1975, p. 883-891. 6 refs. In Russian.

A75-33876 * # **Microwave remote sensing of ice and snow.** J. A. Kong (MIT, Cambridge, Mass.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings.
Berne, Universität Bern, 1974, p. 239-243. Contract No. JPL-953524.

A composite theoretical model is proposed to account for effects on emissivity caused by layering, absorption, anisotropy, surface roughness, inhomogeneities and subsurface scattering. The emissivity as a function of frequency is calculated for a two layer model simulating ice or snow covered water or land. The theoretical results are compared with experimental data. (Author)

A75-33879 # **The effect upon microwave emissivity of volume scattering in snow, in ice, and in frozen soil.** A. W. England (U.S. Geological Survey, Denver, Colo.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings.
Berne, Universität Bern, 1974, p. 273-287. 26 refs.

Radiative transfer theory has been applied to volume scattering in relatively low loss dielectric media. The theory and its inherent assumptions are reviewed. Conclusions are that volume scattering dominates the microwave emissive properties of dry snow, but that scattering will, in general, be irrelevant to longer wavelength emission from ice over freshwater and from frozen soil. Consequently, the variation of emissivity with wavelength probably cannot be used to infer the thickness of a dry snowpack but can be used to infer thicknesses of ice over freshwater and of seasonally frozen soil. (Author)

A75-35247 * **Remote sensing and snowpack management.** W. I. Linlor (NASA, Ames Research Center, Moffett Field, Calif.). *American Water Works Association, Journal,* vol. 66, Sept. 1974, p. 553-558. 18 refs. Research supported by the U.S. Geological Survey.

The present work describes the use of an airborne electromagnetic sensing system for measuring snowpack depth, density, and water content. A transmitter sends a sequence of pulses of stepped frequencies, and the reflections are measured by a sensitive receiver. The combination of the snowpack and the earth interacts with the electromagnetic wave so as to modify the characteristics of the reflected signals. The variation of the reflected intensity with frequency provides the desired data. A theoretical analysis of return signal and snowpack parameter relationships is given, and the results of experimental verification of the theory are discussed. P.T.H.

A75-36768 # **Remote sensing of water resources in Bangladesh through Earth Resources Technology Satellite programme.** S. M. Mansur (Bangladesh Water Development Board, Water Resource Sector, Dacca, Bangladesh.). *Institution of Engineers (Bangladesh), Journal,* vol. 2, Jan. 1975, p. 113-116.

The proposed Water Resource Sector project of the ERTS-B program is described. Three objectives have been stipulated for the project: (1) mapping of flooded areas and sand deposits on arable land, as well as local strong soil erosion; (2) inland salinity intrusion distribution studies; and (3) dry season surface water inventory. S.J.M.

A75-36805 * **Hydrologic land use classifications of the Patuxent river watershed using ERTS-1 digital data.** W. C. Dallam (General Electric Co., Space Div., Beltsville, Md.) and A. Rango (NASA, Goddard Space Flight Center, Hydrology and Oceanography Branch, Greenbelt, Md.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 160-169. 5 refs.

A75-36813 **Applicability of Skylab orbital photography to coastal wetland mapping.** R. R. Anderson, L. Alsid (American University, Washington, D.C.), and V. Carter (U.S. Geological Survey, Reston, Va.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 371-377. 11 refs.

Wetland maps depicting marsh boundaries and species are obtained at a 1:125,000 scale by making direct overlays on enlarged transparencies of Skylab S190A color IR photography. Marsh boundaries, five major vegetation types, and individual species identified in certain areas are described. The field checking of areas mapped in the laboratory shows that tonal and textural differences on satellite photography have real meaning on the ground and that high reliance may be placed on boundaries for use in marshland evaluation and management. S.D.

A75-36815 * **The trophic classification of lakes using ERTS multispectral scanner data.** R. J. Blackwell (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) and D. H. Boland (U.S. Environmental Protection Agency, Corvallis, Ore.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 393-414. 13 refs. Contract No. NAS7-100.

Lake classification methods based on the use of ERTS data are described. Preliminary classification results obtained by multispectral and digital image processing techniques indicate satisfactory correlation between ERTS data and EPA-supplied water analysis. Techniques for determining lake trophic levels using ERTS data are examined, and data obtained for 20 lakes are discussed. V.P.

N75-21717 Texas A&M Univ., College Station.
THE DELINEATION OF FLOOD PLAINS USING AUTOMATICALLY PROCESSED MULTISPECTRAL DATA Ph.D. Thesis
George Randall Harker 1974 240 p
Avail: Univ. Microfilms Order No. 75-2858

The application of a remote sensing technique to the determination of flood plain areas is investigated. Optical mechanical multispectral scanner data was simulated utilizing the density differences in a color infrared transparency for a section of the Navasota River. The simulated data was processed utilizing an automatic classification technique previously developed in the remote sensing field. The technique used involves the application of the maximum likelihood rule to categorize the data being processed. An attempt was made to distinguish between areas known to be in the flood plain and those without. A reasonable correlation was found between boundaries based on computer processed multispectral data and those produced by established techniques. Dissert. Abstr.

N75-21720*# Zurich Univ. (Switzerland). Dept. of Geography.
SNOW SURVEY AND VEGETATION GROWTH IN HIGH MOUNTAINS (SWISS ALPS) AND ADDITIONAL ERTS INVESTIGATIONS IN SWITZERLAND Final Report
Harold Haefner, Principal Investigator [1975] 44 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10195; NASA-CR-142340) Avail: NTIS HC $3.75 CSCL 08F

The author has identified the following significant results. Two different methods, an analog and a digital one, have been developed for rapid and accurate mapping of the areal extent and changes in snow cover in high mountains. The quick-look method is based on individual visual control of each image using a photo quantizer which provides exact references for density slicing with high resolution lith-film. The digital snow classification system is based on discriminant analysis with the data of the four multispectral bands as variables and contains all preprocessing, feature extraction, and mapping steps for an operational application. Two different sets of sampling groups were established which apply to different conditions of snow cover. The first one serves for the normal situation with a uniform dry and new cover. The second one serves for situations with partly thawing and/or frozen snow.

N75-21728*# Geological Survey, Reston, Va.
THE UTILIZATION OF ERTS-1 GENERATED IMAGES IN THE EVALUATION OF SOME IRANIAN PLAYAS AS SITES FOR ECONOMIC AND ENGINEERING DEVELOPMENT, PART 1 Final Report, 1 Jul. 1972 - 28 Feb. 1974
Daniel B. Krinsley, Principal Investigator 30 Apr. 1974 48 p refs ERTS
(NASA Order S-70243-AG)
(E75-10203; NASA-CR-142389) Avail: NTIS HC $3.75 CSCL 08H

N75-21729*# Geological Survey, Reston, Va.
THE UTILIZATION OF ERTS-1 GENERATED IMAGES IN THE EVALUATION OF SOME IRANIAN PLAYAS AS SITES FOR ECONOMIC AND ENGINEERING DEVELOPMENT, PART 2 Final Report, 1 Jul. 1972 - 28 Feb. 1974
Daniel B. Krinsley, Principal Investigator 30 Apr. 1974 54 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10204; NASA-CR-142390) Avail: NTIS HC $4.25 CSCL 08H

N75-21732*# Texas Technological Univ., Lubbock.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS Final Report
C. C. Reeves, Jr., Principal Investigator 31 Aug. 1974 151 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21720)
(E75-10207; NASA-CR-142393) Avail: NTIS HC $6.25 CSCL 08H

N75-21733*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES Final Report, Sep. 1972 - Nov. 1974
Robert H. Rogers and V. Elliott Smith, Principal Investigators (Cranbrook Inst. of Science) Nov. 1974 124 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21810)
(E75-10208; NASA-CR-142394) Avail: NTIS HC $5.25 CSCL 08H

N75-21738*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
COMPARISON OF ERTS-1 AND SLAR DATA FOR THE STUDY OF SURFACE WATER RESOURCES Final Report, 1 Jul. 1972 - 30 Aug. 1974
M. Leonard Bryan, Principal Investigator Jan. 1975 102 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10213; NASA-CR-142399; ERIM-193300-59-F) Avail: NTIS HC $5.25 CSCL 08H

N75-21744*# Alaska Univ., Fairbanks. Geophysical Inst.
GLACIOLOGICAL AND VOLCANOLOGICAL STUDIES IN THE WRANGELL MOUNTAINS, ALASKA Final Report, Jul. 1972 - Sep. 1974
Carl S. Benson, Principal Investigator and Lewis H. Shapiro 20 Sep. 1974 58 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10219; NASA-CR-142405) Avail: NTIS HC $4.25 CSCL 08F

N75-21770*# Agricultural Research Service, Chickasha, Okla.
INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY Final Report, 1 Jul. 1972 - 1 Jul. 1974
Bruce J. Blanchard, Principal Investigator 25 Jan. 1975 127 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70251-AG)
(E75-10248; NASA-CR-142541) Avail: NTIS HC $5.75 CSCL 08H

The author has identified the following significant results. Digital data from the ERTS multispectral scanner were used to investigate the feasibility of identifying differences in watershed runoff capability with spaceborne sensors. Linear combinations of the two visible light bands and a combination of the four visible and near infrared bands were related to a coefficient used in the Soil Conservation Service storm runoff equation. Good relationships were found in two scenes, both with dry surface conditions, over the same watersheds. The relationships defined by both combinations of digital data were tested on a independent set of 10 watersheds and on an additional 22 subwatersheds. Coefficients predicted with the ERTS data proved better than coefficients developed with conventional methods.

N75-21771*# National Environmental Satellite Service, Suitland, Md.
EVALUATION OF ERTS-1 DATA FOR CERTAIN HYDROLOGICAL USES Final Report, Jul. 1972 - Nov. 1974
Donald R. Wiesnet, Principal Investigator, David F. McGinnis, and Michael C. McMillan 30 Nov. 1974 94 p refs Original

contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E75-10249; NASA-CR-142542) Avail: NTIS HC $4.75 CSCL 08H

The author has identified the following significant results. ERTS-1 MSS data have been used in a variety of hydrologic research including snow-extent mapping; studies of snowmelt, snowmelt runoff, spectral reflectance of snow for assessing snowpack conditions, and snow albedo; lake ice formation, breakup, and migration; lake current measurements; multispectral studies of lake ice; and flood studies. MSS sensing of soil moisture over a well-vegetated test site was unsuccessfully attempted. Although a powerful research tool, ERTS-1 has very limited use as an operational system for hydrologic communities because of its 18-day revisit cycle and its lack of a quick look capability.

N75-21775*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE EMISSION FROM SNOW AND GLACIER ICE
T. C. Chang, P. Gloersen, T. Schmugge, T. T. Wilheit, and H. J. Zwally Feb. 1975 31 p refs Submitted for publication
(NASA-TM-X-70871; X-910-75-36) Avail: NTIS HC $3.75 CSCL 08L

The microwave brightness temperature for snow fields was studied assuming that the snow cover consists of closely packed scattering spheres which do not interact coherently. The Mie scattering theory was used to compute the volume scattering albedo. It is shown that in the wavelength range from 0.8 to 2.8 cm, most of the micro-radiation emanates from a layer 10 meters or less in thickness. It is concluded that it is possible to determine snow accumulation rates as well as near-surface temperature. F.O.S.

N75-21916# Sparcom, Inc., Alexandria, Va.
AIRBORNE LASER SHALLOW WATER BATHYMETRIC SYSTEM
G. D. Hickman, A. Ghovanlou, J. E. Hogg, C. S. Gault, and E. J. Friedman Jun. 1974 48 p refs
(Contract N00014-71-C-0202)
(AD-A003016; TR-4) Avail: NTIS CSCL 08/10

Field tests using a pulsed nitrogen/neon dye laser to measure water depths in shallow waters have been completed. These measurements, which were conducted from fishing piers, boats and airplanes were made for the purpose of verifying the empirical model which was developed during the laboratory phase of this program. In nearly all cases, good correlation was found to exist between these field measurements and the empirical model. A summary of the salient laser and system parameters for an airborne laser bathymetry system is included. Laboratory measurements were conducted on laser induced dye fluorescence. The results of these experiments showed that both the depth of a dye cloud (composed of two or more dyes) and its temperature could be determined using ratio detection techniques. GRA

N75-22843 Joint Publications Research Service, Arlington, Va.
REDUCTION OF THE MAXIMUM RAIN RUNOFF MODULES WITH RESPECT TO AREA
Ye. D. Gopchenko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 79-85 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 66-71

Bases for the reduction of the maximum rain flood moduli are the phenomena of splitting of the flood waves into layers during the lag process before the calculation sections, the time-space nonuniformity of the flood forming precipitation fields, and the transforming peculiarities of the underlying surfaces. The reduction coefficients were determined on the basis of solving the inverse problem within the framework of the Befani genetic scheme. Single-step iteration was used to solve the operator equations, and the reduction coefficients (with an increase in the size of the watershed areas) were determined for various districts of the U.S.S.R. M.J.S.

N75-22844 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MAXIMUM SNOW RESERVES BY THE AEROVISUAL OBSERVATIONS IN THE EXPERIMENTAL BASIN OF THE VARZOB RIVER
A. V. Kalachev, V. P. Kanushin, and G. A. Kernosov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 72-77

Remote stakes installed in hard-to-reach high altitude regions of the basin were observed from helicopters in order to determine the depth of the snow cover. A stable snow density gradient was obtained for the period of maximum snow reserves, and by using the snow density gradient, the water reserve in high altitude snow regions was calculated. Author

N75-22867*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Mar. 1975
LeRoy F. Silva, Principal Investigator Mar. 1975 3 p EREP
(Contract NAS9-13301)
(E75-10255; NASA-CR-142630) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. The results so far indicate that filtering the S192 data helped improve the data for machine processing. Bands 1 and 2 improved considerably. Since bands 4, 5, 6, and 12 were unavailable, no conclusions can be drawn for those bands. Little change has been shown so far in the other bands.

N75-22869*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Mar. - May 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Jun. 1974 10 p EREP
(Contract NAS9-13406)
(E75-10258; NASA-CR-142634) Avail: NTIS HC $3.25 CSCL 08F

N75-22870*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Jun. - Aug. 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Sep. 1974 6 p EREP
(Contract NAS9-13406)
(E75-10259; NASA-CR-142635) Avail: NTIS HC $3.25 CSCL 08F

N75-22871*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Sep. - Nov. 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Dec. 1974 5 p EREP
(Contract NAS9-13406)
(E75-10260; NASA-CR-142633) Avail: NTIS HC $3.25 CSCL 08F

N75-22872*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
REMOTE BATHYMETRY AND SHOAL DETECTION WITH ERTS: ERTS WATER DEPTH Final Report, Jun. 1972 - Jun. 1974

Fabian C. Polcyn, Principal Investigator and David R. Lyzenga Apr. 1975 49 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10261; NASA-CR-142636; ERIM-193300-51-F) Avail: NTIS HC $3.75 CSCL 08J

N75-22877*# Geological Survey, Menlo Park, Calif.
PRINCIPAL SOURCES AND DISPERSAL PATTERNS OF SUSPENDED PARTICULATE MATTER IN NEARSHORE SURFACE WATERS OF THE NORTHEAST PACIFIC OCEAN Final Report, 1 Sep. 1972 - 1 Jan. 1974
Paul R. Carlson, Principal Investigator, T. John Conomos, Richard J. Janda, and David H. Peterson 10 Feb. 1975 145 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-7)
(E75-10266; NASA-CR-142641) Avail: NTIS HC $5.75 CSCL 08J

N75-22878*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Apr. 1975
Leroy F. Silva, Principal Investigator Apr. 1975 3 p EREP
(Contract NAS9-13301)
(E75-10267; NASA-CR-142642) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Information was obtained during the meeting with the Allen County Plan Commission which indicates that the SL/4 S192 analysis results over the Allen County area are much more accurate than the figures that were given in the paper to be presented at the Purdue Symposium.

N75-22880*# Wyoming Univ., Laramie. Dept. of Geology.
THE USE OF SKYLAB AND ERTS IN A GEOHYDROLOGICAL STUDY OF THE PALEOZOIC SECTION, WEST-CENTRAL BIGHORN MOUNTAINS, WYOMING
Barbara J. Tomes Mar. 1975 23 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13298)
(E75-10269; NASA-CR-142644) Avail: NTIS HC $3.25 CSCL 08G

N75-22882*# Environmental Research and Technology, Inc., Lexington, Mass.
THE APPLICATION OF ERTS IMAGERY TO MAPPING SNOW COVER IN THE WESTERN UNITED STATES: SUPPLEMENTAL REPORT Final Report, Jun. 1974 - Jan. 1975
James C. Barnes, Principal Investigator and Clinton J. Bowley Feb. 1975 48 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21803)
(E75-10271; NASA-CR-142680; ERT-P-407-S) Avail: NTIS HC $3.75 CSCL 08L

N75-22886*# Environmental Research Inst. of Michigan, Ann Arbor.
SKYLAB: WATER DEPTH DETERMINATION Quarterly Progress Report, 1 Dec. 1974 - 28 Feb. 1975
Fabian C. Polcyn and D. R. Lyzenga, Principal Investigators 25 Mar. 1975 3 p EREP
(Contract NAS9-13278)
(E75-10275; NASA-CR-142684; ERIM-102100-18-L) Avail: NTIS HC $3.25

N75-24067*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS
Carl D. Ealy (Md. Univ., College Park), Robert F. Mueller, and Jerry R. Weider (Md. Univ., College Park) Nov. 1973 49 p refs
(NASA-TM-X-70888; X-644-73-352) Avail: NTIS HC $3.75 CSCL 08H

The effects of urbanization and highway construction on run-off, erosion and siltation on the Anacostia watershed was analyzed. The analysis was based on changes in land use patterns demonstrated by aerial photographs, geologic and hydrologic data. Subwatersheds were studied in terms of three hypothetical storms of different magnitudes. An approximately 10 percent increase in impervious surface can cause a 12 percent increase in peak discharge for storms of the magnitude of tropical storm Agnes, a 20 percent increase for a 10 hour storm and a 150 percent increase for a thunderstorm. The early discharge from a storm of Agnes' magnitude can be increased by 100 percent. Corresponding effects were observed in soil erosion and siltation from bare construction sites. These effects are interrelated with sewage, oil, and chemical pollution and inadequate public transportation. The net result is steady degradation of the local environment, the estuary and the bay. Author

N75-24068*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BROADBAND SPECTRAL PHOTOGRAPHY OF THE JAMES RIVER
Walter E. Bressette Apr. 1975 25 p refs
(NASA-TM-X-72689) Avail: NTIS HC $3.25 CSCL 08H

On May 28, 1974, a photographic mission from 5.3 kilometers altitude was flown over the James River from Norfolk to Hopewell. During the mission 252 photographs were exposed over the river. The photographs are divided into four simultaneously exposed groups with each group exposed through a different broadband optical filter. The four filters isolated blue-green, green, yellow, and near-infrared radiation from the water body. The document summarizes the mission photography in relation to flight altitude, sunglint, and photographic exposure. Author

N75-24072*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF REMOTE SENSING TO WATERSHED MANAGEMENT
Albert Rango Apr. 1975 20 p refs Presented for presentation at Symp. on Watershed Management, Am. Soc. of Civil Engr., Logan, Utah, 11-13 Aug. 1975 Submitted for publication
(NASA-TM-X-70896; X-913-75-86) Avail: NTIS HC $3.25 CSCL 08H

Aircraft and satellite remote sensing systems which are capable of contributing to watershed management are described and include: the multispectral scanner subsystem on LANDSAT and the basic multispectral camera array flown on high altitude aircraft such as the U-2. Various aspects of watershed management investigated by remote sensing systems are discussed. Major areas included are: snow mapping, surface water inventories, flood management, hydrologic land use monitoring, and watershed modeling. It is indicated that technological advances in remote sensing of hydrological data must be coupled with an expansion of awareness and training in remote sensing techniques of the watershed management community. Author

N75-24093# Clemson Univ., S.C. Water Resources Research Inst.
CORRELATION OF HYDROLOGIC MODEL PARAMETERS WITH CHANGING LAND USE AS DETERMINED FROM AERIAL PHOTOGRAPHS Final Completion Report, Jul. 1971 - Jun. 1974
James T. Ligon and Donald B. Stafford Dec. 1974 84 p refs
(Contracts DI-14-31-0001-3541; DI-14-31-0001-3841)
(PB-239407/0; OWRT-A-024-SC(5)) Avail: NTIS HC $4.75 CSCL 08H

The effects of progressive land use changes in watersheds on the hydrologic response of the watersheds were investigated. Watersheds were examined which have experienced significant changes in agricultural land use practices and in which rural land is being converted rapidly to urban land use. The distribution of land use in each watershed was determined at six intervals over the past 30 years from measurements on aerial photographs. A computer program was used to simulate streamflow in the watershed. The optimized model parameters and the watershed land use were correlated to examine the relationship between watershed hydrologic response and land use changes. Results are presented. GRA

N75-25238*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS Final Report, Jul. 1972 - Jan. 1974
Edward F. Yost, Principal Investigator, Rudolph Hollman, James Alexander, and Robert Nuzzi Apr. 1974 183 p refs Prepared in cooperation with New York Ocean Sci. Lab., Montauk Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21792)
(E75-10290; NASA-CR-142834; TR-20) Avail: NTIS HC $7.00 CSCL 08J

The author has identified the following significant results. Photo-optical additive color quantitative measurements were made of ERTS-1 reprocessed positives of New York Bight and Block Island Sound. Regression of these data on almost simultaneous ship sample data of water's physical, chemical, biological, and optical properties showed that ERTS bands 5 and 6 can be used to predict the absolute value of the total number of particles and bands 4 and 5 to predict the relative extinction coefficient in New York Bight. Water masses and mixing patterns in Block Island Sound heretofore considered transient were found to be persistent phenomena requiring revision of existing mathematical and hydraulic models.

N75-25246*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Apr. 1975
Roger M. Hoffer, Principal Investigator Apr. 1975 6 p EREP
(Contract NAS9-13380)
(E75-10299; NASA-CR-142843) Avail: NTIS HC $3.25 CSCL 09B

N75-25263*# Ecosystems International, Inc., Gambrills, Md.
IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES Final Report, Jun. 1974 - Jun. 1975
P. A. Castruccio, H. L. Loats, T. R. Fowler, and S. L. Frech May 1975 100 p refs
(Contract NAS5-20567)
(NASA-CR-143810; ECO-75:C-3) Avail: NTIS HC $4.75 CSCL 08H

Principal water resources users were surveyed to determine the impact of remote data streams on hydrologic computer models. Analysis of responses demonstrated that: most water resources effort suitable to remote sensing inputs is conducted through federal agencies or through federally stimulated research; and, most hydrologic models suitable to remote sensing data are federally developed. Computer usage by major water resources users was analyzed to determine the trends of usage and costs for the principal hydrologic users/models. The laws and empirical relationships governing the growth of the data processing loads were described and applied to project the future data loads. Data loads for ERTS CCT image processing were computed and projected through the 1985 era. Author

N75-25264*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING. VOLUME 1: EXECUTIVE SUMMARY Final Report
Mar. 1975 23 p refs
(Contract NAS8-29880)
(NASA-CR-143858; IBM-75W-00056-Vol-1) Avail: NTIS HC $3.25 CSCL 08H

A project is described whose goal was to define, implement and evaluate a pilot demonstration test to show the practicability of applying remotely sensed data to operational river forecasting in gaged or previously ungaged watersheds. A secondary objective was to provide NASA with documentation describing the computer programs that comprise the streamflow forecasting simulation model used. A computer-based simulation model was adapted to a streamflow forecasting application and implemented in an IBM System/360 Model 44 computer, operating in a dedicated mode, with operator interactive control through a Model 2250 keyboard/graphic CRT terminal. The test site whose hydrologic behavior was simulated is a small basin (365 square kilometers) designated Town Creek near Geraldine, Alabama. Author

N75-25265*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING. VOLUME 2: DETAILED TECHNICAL REPORT, NASA-IBM STREAMFLOW FORECAST MODEL USER'S GUIDE Final Report
Mar. 1975 411 p refs
(Contract NAS8-29880)
(NASA-CR-143859; IBM-75W-00056-Vol-2) Avail: NTIS HC $10.50 CSCL 08H

The Model is described along with data preparation, determining model parameters, initializing and optimizing parameters (calibration) selecting control options and interpreting results. Some background information is included, and appendices contain a dictionary of variables, a source program listing, and flow charts. The model was operated on an IBM System/360 Model 44, using a model 2250 keyboard/graphics terminal for interactive operation. The model can be set up and operated in a batch processing mode on any System/360 or 370 that has the memory capacity. The model requires 210K bytes of core storage, and the optimization program, OPSET (which was used previous to but not in this study), requires 240K bytes. The data band for one small watershed requires approximately 32 tracks of disk storage. Author

N75-25275# Washington Univ., St. Louis, Mo.
AIRPHOTO INTERPRETATION OF THE FORM AND BEHAVIOR OF ALLUVIAL RIVERS Final Report, 1 Jul. 1970 - 31 Dec. 1974
James C. Brice 25 Jan. 1975 12 p refs
(Grant DA-ARO(D)-31-124-70-G89)
(AD-A008108; ARO-8623-4-EN) Avail: NTIS CSCL 08/2

A scheme for the classification of alluvial rivers, according to form properties observable on vertical black and white airphotos, is presented. The scheme was developed by analysis of about 250 river reaches, which occur in climatic conditions ranging from arctic to equatorial and which probably represent the full range of types. Most reaches are in the U.S. where, in addition to sequential aerial photography, large-scale maps and gaging station records were obtained for 200 reaches. Use was made of maps and ERTS imagery for foreign rivers. According to the scheme, a river reach is classified additively according to its degree and character of sinuosity, braiding, and anabranching. A total of 3120 river types can be distinguished and designated by numbers and letters, such that no designation is longer than 6 spaces. Aspects of river behavior that have been reported on during the investigation include the evolution and classification of meander loops, rates of lateral migration for specific rivers, and the size-frequency distribution and succession of meander loops. GRA

N75-26457*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, May 1975
LeRoy F. Silva, Principal Investigator May 1975 3 p ref EREP
(Contract NAS9-13301)
(E75-10313; NASA-CR-142915) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Analysis of the digitized SL/4 S190A color IR photography proved very difficult. An area within Allen County, including Ft. Wayne, was studied. Eight segments of the study area were clustered separately and the cluster maps were then compared with the photography and maps available. The training areas for the land use classes were selected from the cluster maps. The separability measures (transformed divergence) of the classes indicated that many of the land use classes were not spectrally separable. The classification results bore this out. Visually the resulting classification map was poor, with 67 percent correct data. These results were of significantly lower quality than those obtained for the summertime SL/2 data near Lake Monroe, Indiana. Low contrast between land use classes during the wintertime and the limited spectral range and resolution are the *major causes for the poor performance.*

N75-26461*# Delaware Univ., Newark. Coll. of Marine Studies.
MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH
V. Klemas, Principal Investigator, G. Davis, and H. Wang 13 Jun. 1975 2 p ERTS
(Contract NAS5-20983)
(E75-10317; NASA-CR-142919) Avail: NTIS HC $3.25 CSCL 13B

The author has identified the following significant results. An integrated satellite-aircraft-drogue approach was developed which employs remotely tracked expendable drogues together with satellite and aircraft observations of oil slicks, waste plumes, and natural tracers, such as suspended sediment. Tests conducted on the Continental Shelf and in Delaware Bay indicate that the system provides a cost effective means of monitoring current circulation and verifying oil slick and ocean waste dispersion models even under severe environmental conditions.

N75-26465*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
COMPUTER MAPPING OF TURBIDITY AND CIRCULATION PATTERNS IN SAGINAW BAY, MICHIGAN FROM LANDSAT DATA
Robert H. Rogers, Principal Investigator, Larry E. Reed, and V. Elliot Smith (Cranbrook Inst. of Sci.) Mar. 1975 16 p refs Presented at the 41st Ann. Meeting of the Amer. Soc. of Photogrammetry, Washington, D. C., Mar. 1975 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10321; NASA-CR-142923; BSR-4183) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. LANDSAT was used as a basis for producing geometrically-corrected, color-coded imagery of turbidity and circulation patterns in Saginaw Bay, Michigan (Lake Huron). This imagery shows nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. The categorized imagery provided an economical basis for extrapolating water quality parameters from point samples to unsample areas. LANDSAT furnished a synoptic view of water mass boundaries that no amount of ground sampling or monitoring could provide.

N75-26469*# Norwegian Water Resources and Electricity Board, Oslo.
EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS
Final Report
Gunnar Oestrem, Principal Investigator 1974 11 p refs Sponsored by NASA ERTS
(E75-10325; NASA-CR-142927) Avail: NTIS HC $3.25 CSCL 08L

The author has identified the following significant results. The transient snowline on five outlet glaciers from the Jostedalsbreen ice cap in southwestern Norway could be determined from ERTS image no. 1336-102060, when bands MSS 5, 6, and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (24 June 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: less melt water in the streams could be expected. The use of ERTS imagery in snowline determinations proved realistic and relatively easy to apply in practice.

N75-27444# Joint Publications Research Service, Arlington, Va.
SOVIET ANTARCTIC INFORMATION BULLETIN
11 Jun. 1974 28 p refs Transl. into ENGLISH from Inform. *Byull. Sov. Antarkt. Eksped. (Leningrad), no.* 90, 1975 p 14-17, 29-34, 59-64, 102-109
(JPRS-64980) Avail: NTIS HC $3.75

Studies were performed in the Antarctic region and results are presented for the following topics: the distribution of sea ice; the propagation of short radio waves between Antarctic stations; photogrammetric studies of the Seventeenth Soviet Antarctic Expedition; glaciological-geodetic investigations on the Hays Glacier; the use of satellite data in transversing drift ice; observations using French electronic equipment and the EOLE satellite.

N75-27447 Joint Publications Research Service, Arlington, Va.
GLACIOLOGICAL-GEODETIC INVESTIGATIONS ON HAYS GLACIER IN 1972
Z. Meyer *In its* Soviet Antarctic Inform. Bull. (JPRS-64980) 11 Jun. 1975 p 15-19 refs Transl. into ENGLISH from Inform. Byull. Sov. Antarkt. Eksped. (Leningrad), no. 90, 1975 p 61-64

The Hays glacier, a tongue formation situated 15 km to the east of Molodezhnaya station, was examined from December 1971 through March 1973. The glacier was studied at portable camp sites and through aerial photographic survey for: morphology (its thickness and productivity): determination of the form and parameters of glacier movement; structure and physical-mechanical properties of surface layers of the glacier thickness; and, refraction. The Hays glacier was found to be a small, active glacier which most likely favors melting at the lower boundary of the ice. Annual runoff, snow accumulation, and the effects of winds and other meterological occurrences were also determined. Author

N75-27460 Joint Publications Research Service, Arlington, Va.
FREEZING OF RIVERS WITH AND WITHOUT THE FORMATION OF JAMS
I. Ya. Liser *In its* Meteorol. and Hydrol., No. 4, 1975 (JPRS-65174) 9 Jul. 1975 p 93-111 refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 4, 1975 p 77-83

A study is made of the basic factors determining the type of freezing of rivers, and quantitative relations are proposed for estimating the type. A method of calculating the current velocity in front of the edge of the freeze-up is recommended. The different nature of freezing causes significant differences in the hydrologic regime of the river during this period. A rise in water level during the freeze-up, the speed at which the edge advances, the initial thickness of the ice, and other characteristics differ sharply when freeze-up takes place with and without jam formation. The differences in the ice conditions during the freeze-up make an impression on the regime of the following period, to opening of the river. Author

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07

DATA PROCESSING AND DISTRIBUTION SYSTEMS

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

A75-30832 # **Principles of optical scanning systems.** W. R. Bradford (EMI Electronics, Ltd., Feltham, Middx., England). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Birmingham, University of Aston, 1974, p. 47-65.

Multispectral scanning systems operating from aircraft or from earth satellites make it possible to observe the earth's surface radiance pattern simultaneously in a number of wavebands. Questions related to the optical radiation of the earth are discussed, taking into account propagation losses in the atmosphere due to scattering loss and molecular absorption, aspects of atmospheric emission, and various atmospheric effects. A description is presented of the instrumentation employed in the investigations, giving attention to mechanical scanning methods, spectral selection, detectors, the Vidicon camera, and a number of instrumentation features. G.R.

A75-30833 # **Radar terrain properties.** A. R. Domville (EASAMS, Ltd., Camberley, Surrey, England). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Birmingham, University of Aston, 1974, p. 67-86. 8 refs.

Sideways looking radar (SLR) produces images formed of overlapping lines perpendicular to the direction of aircraft motion, each line corresponding to one pulse from the radar. The images produced bear a resemblance to aerial photography. However, whereas the surface properties which cause the tonal variation in photography are a matter of common experience, the corresponding properties causing tonal variation on SLR images are less well known. These include the ground slope, the surface roughness, the material of the terrain and the shape of surface objects. These properties and the way they interact with the radar characteristics such as wavelength, resolution, polarisation and monochromocity, are described. (Author)

A75-30996 **Further development of the program /evaluation of digital terrain models/ (Weiterentwicklung des Programmes /Auswertung Digitales Geländemodell/).** L. Rapior (Hessische Zentrale für Datenverarbeitung, Wiesbaden, West Germany) and D. Bopp (IBM Deutschland GmbH, Bad Godesberg, West Germany). *Bildmessung und Luftbildwesen*, vol. 43, May 1, 1975, p. 108-114. In German.

Since 1970 the program 'evaluation of digital terrain models' forms a part of the IBM program system for road construction applications. It was found that the program contained a number of imperfections which made its use uneconomical in a number of applications. An investigation was, therefore, conducted with the objective to improve the program and eliminate its weaknesses. A description is given of the new program version, giving attention to the requirements for its use, the interpolation procedure employed, the selection of terrain points, and the time of computation involved. G.R.

A75-31577 # **Contribution of space platforms /ERTS-1 and Skylab/ to the research program of the Laboratorio per la Geofisica della Litosfera of C.N.R. (Contributo delle piattaforme spaziali /ERTS-1 e Skylab/ al programma di ricerca del Laboratorio per la Geofisica della Litosfera del C.N.R.).** R. Cassinis (CNR, Laboratorio per la Geofisica della Litosfera, Milan, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 31, 33-43. 6 refs. In Italian.

An outline of activities in the field of remote sensing is presented, giving particular attention to programs which use space, airborne, and ground platforms. The preparation of test sites on Italian territory is considered, taking into account the various test objectives. The analysis of ERTS-1 imagery over the environment of Italian active volcanoes is discussed along with the techniques of data enhancement and interpretation. G.R.

A75-31582 # **The use of spatial information in the computer-aided interpretation of earth resource imagery.** Q. S. Earl (Plessey Radar, Ltd., Slough, Bucks., England). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 141, 143-151.

The theoretical basis of spectral recognition is considered, taking into account aspects of accuracy, limitations concerning the possible information content, and possibilities of improvement. A description is given of a hierarchical classifier. Questions concerning the use of the spatial neighborhood are discussed along with details regarding the spatial characteristics. G.R.

A75-31585 # **Additive viewing as an interpretative technique.** J. A. Howard and R. B. de Kock (United Nations, Food and Agriculture Organization, Rome, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 187, 189-192.

The additive viewer is a device which is particularly useful in the evaluation of ERTS satellite data by small, specialized user groups and by persons working in developing areas. The device combines color coded passband images of the same ground scene by simple superimposition. It uses photographic renditions of the data as input. Color coding is performed by including filters in the optical path. G.R.

A75-31595 # **The dual channel METEOSAT radiometer.** A. Peraldi (Engins Matra, S.A., Vélizy-Villacoublay, Yvelines, France). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 351, 353-362.

A high-resolution dual-channel radiometer is described which will constitute the main payload of the European METEOSAT and provide a full-time cloud and earth mapping capability with a ground resolution of about 5 km on the IR channel and 2.5 km on the optical channel. Development of the instrument is briefly outlined, and detailed descriptions are presented of the scanning process, thermal channel, optical system, and electronics packages. The thermal channel is capable of measuring the radiance of cold clouds and hot ground with a noise equivalent temperature difference no greater than 0.4 K for an image at 300 K or 1.2 K at 200 K. A proposed water vapor channel is described which will replace one optical channel at night and whose data will be multiplexed with the optical channel outputs. F.G.M.

A75-32895 * # **Cooling systems for satellite remote sensing instrumentation.** R. J. Copeland and J. A. Oren (LTV Aerospace Corp., Dallas, Tex.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-679.* 8 p. 7 refs. Contracts No. NAS1-10900; No. NAS1-13500.

The current and developing state-of-the-art in cryogenic coolers for satellite sensors was studied for earth oriented satellites. Six representative sensor categories in the 77 K to 300 K range were defined. Cooling capacities were 50 to 1000 mw; both continuous and intermittent duty cycles were considered; lifetimes were one to two years. Conceptual designs were prepared for the most promising coolers in each category. These coolers are Joule-Thomson, Solid Cryogen, Vuilleumier, Thermoelectric, Shielded Radiator, Optical Solar Reflector Radiator and Unshielded Radiator. Weight, envelope, power requirements and operating characteristics of each cooler are described. Scaling data for each cooler are included. (Author)

A75-33776 **Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974.** Seminar sponsored by the Society of Photo-optical Instrumentation Engineers. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Proceedings. Volume 51), 1975. 150 p. $32.

Subjects related to atmospheric inversion are considered, taking into account limitations and prospects for atmospheric sounding, limb radiance inversion techniques, and the feasibility of an instrument for 15 micrometer mesoscale geosynchronous inversion. Scanning systems for the earth observation satellite era are discussed along with atmospheric effects on remotely sensed data. A description is also given of scanning systems for the shuttle era, giving attention to the requirements for a synchronous earth observation satellite, the application of visible linear array technology to earth observation sensors, silicon solid-state linear arrays for multispectral high resolution imaging systems, and questions of sensor development. G.R.

A75-33780 **The continuing role of aircraft in earth observation projects.** P. G. Hasell, Jr. (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 31-35; Comment, p. 36.

The history of earth observations is discussed, taking into account developments which led from ground-based studies to airborne measurements and to space-borne sensors. The aircraft's role in remote sensing is examined, giving attention to the spatial resolution requirements involved and to aspects of timing in the collection of data. Data concerning typical multispectral sensor coverage are presented in a table. G.R.

A75-33791 * **Application of visible linear array technology to earth observation sensors.** R. E. Noll and R. A. Tracy (Westinghouse Electric Corp., Baltimore, Md.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 124-131. 5 refs. NASA-supported research.

The present paper identifies the systems engineering aspects of applying solid-state technology to earth observations applications being traditionally performed by point (or multiple-point) detector line scanned mechanisms. It is shown that the translation from a basically serial data flow point-detector mechanically-scanned sensor to a solid state highly parallel linear-array pushbroom sensor results in minimizing mechanical complexity and maximizing electronics complexity, with increased demands upon optical performance in some applications. Technical aspects relevant to highly parallel photodiode linear-array pushbroom applications are discussed. Examples of systems engineering applications are provided. S.D.

A75-33792 * **Silicon solid/state linear arrays for multispectral high resolution imaging systems.** L. L. Thompson (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Scanners and imagery systems for earth observation; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1975, p. 132-135.

Solid-state, electronically scanned, linear detector arrays are now available which can be used in a pushbroom scan mode imaging system for high-resolution multispectral earth resource survey applications. These arrays provide high performance in the visible to near-IR region. Two performance criteria must be assessed in the choice of a detector array: signal-to-noise ratio and spectral response. Consideration of diffraction limitations shows that optics size cannot be significantly reduced by using very low-noise detectors. The required spectral response for a viable detector array should not have spectral ripples that cause a low-level, but significant, error in the detected effective reflectance of the target. S.J.M.

A75-33856 # **Preliminary analysis of Skylab radscat results over the ocean.** R. K. Moore, J. P. Claassen, J. D. Young (University of Kansas Center for Research, Inc., Lawrence, Kan.), W. J. Pierson, Jr., and V. J. Cardone (New York, City University, New York, N.Y.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 47-53.

Preliminary observations at 13.9 GHz of the radar backscatter and microwave emission from the sea have been analyzed using data obtained by the radiometer-scatterometer on Skylab. Results indicate approximately a square-law relationship between differential scattering coefficient and windspeed at angles of 40 deg to 50 deg, after correction for directional effects, over a range from about 4 up to about 25 meters/sec. The brightness temperature response was also observed, and considerable success was achieved in correcting it for atmospheric attenuation and emission. (Author)

A75-33874 # **Initial results of Skylab altimeter observations over terrain.** A. Shapiro (U.S. Navy, Space Science Div., Washington, D.C.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 209-214.

The Skylab radar altimeter (S-193) was operated over land areas to evaluate the capability of an altimeter as a sensor of topographic and physical properties of sub-satellite solid reflecting surfaces. From the preliminary results, it appears that a satellite radar altimeter can provide a two-dimensional array of reflectivity and range both in the z and x direction as the sub-satellite point travels along the x dimension. (Author)

A75-33880 # **Viewpoints on passive microwave remote sensing.** M. Vogel (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 291-298.

Several critical viewpoints on the present and future utility of passive microwave remote sensing are discussed. Basic problems and limitations in current technology, and proposed means of overcoming them, are described. Principal difficulties treated are the ambiguity problem, the calibration problem, the data rate problem, and the sensor-man interface problem. It is concluded that microwave sensors can be applied with advantage to remote sensing. S.J.M.

A75-33881 * # **Multispectral microwave imaging radar for remote sensing applications.** R. W. Larson, R. Rawsón, D. Ausherman, L. Bryan, and L. Porcello (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 305-315. 9 refs. Contract No. NAS3-18239.

A multispectral airborne microwave radar imaging system, capable of obtaining four images simultaneously is described. The system has been successfully demonstrated in several experiments and one example of results obtained, fresh water ice, is given. Consideration of the digitization of the imagery is given and an image digitizing system described briefly. Preliminary results of digitization experiments are included. (Author)

A75-35250 **Accurate photogrammetry and photographic nonlinearities.** R. A. Jones (Perkin-Elmer Corp., Norwalk, Conn.). *Photogrammetric Engineering and Remote Sensing*, vol. 41, Mar. 1975, p. 331-335. 6 refs.

A computer simulation showed that significant errors could be introduced by photographic nonlinearities in otherwise accurate photogrammetric procedures. A technique was developed to determine automatically dimensions from photographic images. This procedure functions in the presence of linear and nonlinear degradations and photographic granularity, and has produced accurate measurements for laboratory and operational cases. (Author)

A75-35396 # **Direct application of VTPR data.** F. R. Valovcin (USAF, Cambridge Research Laboratories, Bedford, Mass.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints.
Boston, Mass., American Meteorological Society, 1974, p. 241-244.

A technique has been developed for obtaining useful information from the direct use of VTPR radiance data in clear and cloudy synoptic situations. Both statistical and analytical investigations were performed on radiance measurements in order to derive this operational technique. The technique is found to be very accurate in stratospheric layer thickness determination and relatively free of cloud contamination. S.J.M.

A75-35452 * # **Machine processing for remotely acquired data.** D. A. Landgrebe (Purdue University, West Lafayette, Ind.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974.
Coral Gables, Fla., University of Miami, 1974, p. S1-5 to S1-51. 28 refs. Grant No. NGL-15-005-112.

This paper is a general discussion of earth resources information systems which utilize airborne and spaceborne sensors. It points out that information may be derived by sensing and analyzing the spectral, spatial and temporal variations of electromagnetic fields emanating from the earth surface. After giving an overview system organization, the two broad categories of system types are discussed. These are systems in which high quality imagery is essential and those more numerically oriented. Sensors are also discussed with this categorization of systems in mind. The multispectral approach and pattern recognition are described as an example data analysis procedure for numerically-oriented systems. The steps necessary in using a pattern recognition scheme are described and illustrated with data obtained from aircraft and the Earth Resources Technology Satellite (ERTS-1). (Author)

A75-35463 # **Locating remotely sensed data on the ground.** R. C. Malhotra and M. L. Rader (Lockheed Electronics Co., Inc., Houston, Tex.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-27 to A-34.

The present work examines briefly some aspects in determining the earth location of remotely sensed data and the resultant products. Location of sensor data may be achieved by recording the *sensor earth location, its attitude, and/or other data with respect to* time. With a time recorded for each data sample, it is possible to locate this data by using the sensor location data in a dynamic math model of the sensor and vehicle motion. Ground control points and/or ephemeris data can be used to solve for the parameters associated with the dynamic math model. P.T.H.

A75-35513 # **A common U.K. format for ERTS digital tapes.** A. C. Armstrong and I. E. Hill (East Anglia, University, Norwich, England). *British Interplanetary Society, Journal*, vol. 28, July 1975, p. 473-476. Research supported by the Natural Environment Research Council and Department of Trade and Industry.

Reformatting of ERTS digital data for British use is discussed. The present NASA format is considered awkward in that scan lines are segmented into quarters which are stored on physically separate tapes and spectral data is interleaved using adjacent pairs of pixels. Suggested changes to the data format include reconstitution of the scan lines, reformatting of the interleaved data pixel by pixel or band by band, and repacking of the annotation block. Advantages and disadvantages of each change are considered, including increased costs and the greater storage space needed for the reformatted data. F.G.M.

A75-36461 **Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers.** Symposium sponsored by the Institute of Electrical and Electronics Engineers. Edited by J. H. Lepoff. New York, Institute of Electrical and Electronics Engineers, Inc., 1975. 377 p. $20.

Topics in the area of microwaves in earth sensing are considered along with subjects in the fields of microwaves in communication, microwave filters and components, microwave generation and amplification, microwave measurements, microwave integrated circuits, microwave diode control devices, computer aided microwave practices, and millimeter wave communications in Japan. Attention is also given to technology forecasting, microwave ferrite control devices, millimeter wave systems, microwaves in medicine, noise in microwave transmission, applications of Gunn/IMPATT diodes, the reduction and the measurement of noise, microwaves in transportation and navigation, and microwave acoustics and delay lines. G.R.

A75-36462 * **Passive microwave sensing of the earth.** D. H. Staelin (MIT, Cambridge, Mass.). In: Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 20-22. 9 refs. Contract No. NAS5-21980.

The natural thermal radio radiation emitted by the terrestrial atmosphere and surface can be measured by passive microwave sensors. The receivers and antennas for the required sensing systems are briefly considered along with questions regarding the geophysical information obtainable. Satellite, aircraft, and ground-based observations are discussed. Attention is given to the possibility to monitor continually the evolution of the ice caps in polar regions. G.R.

A75-36465 * ***Imaging radar potentials for earth resources.*** W. E. Brown, Jr. and C. Elachi (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers.
New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 29-31. Contract No. NAS7-100.

The potentials of airborne and spacecraft borne imaging radars in earth resources applications are reviewed and discussed. The areas

specifically addressed are: oceanography, coastal regions studies, glaciology, polar ice studies, geology, geomorphology and agriculture. The paper also addresses the main areas of emphasis for the next ten years. (Author)

A75-36820 Analytical triangulation with ERTS. R. B. McEwen (U.S. Geological Survey, Reston, Va.) and T. A. Asbeck (U.S. Geological Survey, Rolla, Mo.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 490-503. 14 refs.

Experiments aimed at evaluating the geometrical accuracy of ERTS images. With 10 to 15 ground control points per image, the residuals after conformal transformation of single images are generally 150 to 300 m rms and occasionally larger. Large numbers of control points have usually indicated a systematic residual pattern, while high-order transformations have modeled the distortion, leaving residuals of 50 to 100 m rms. Some new results from the adjustment of groups of adjoining images are examined. V.P.

A75-36823 * Sequential and simultaneous SLAR block adjustment. F. Leberl (California Institute of Technology, Jet Propulsion Laboratory, Space Sciences Div., Pasadena, Calif.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 528-538.

Two sequential methods of planimetric SLAR (Side Looking Airborne Radar) block adjustment, with and without splines, and three simultaneous methods based on the principles of least squares are evaluated. A limited experiment with simulated SLAR images indicates that sequential block formation with splines followed by external interpolative adjustment is superior to the simultaneous methods such as planimetric block adjustment with similarity transformations. The use of the sequential block formation is recommended, since it represents an inexpensive tool for satisfactory point determination from SLAR images. S.D.

A75-36828 Simple high-speed digital image processing to remove quasi-coherent noise patterns. P. Chavez, Jr. (U.S. Geological Survey, Computer Center Div., Flagstaff, Ariz.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 595-600.

Simple, high-speed techniques are developed for removal of two-dimensional noise patterns from digital imagery. Such noise patterns, when not removed, are strongly amplified by most image enhancement techniques. Examples of noise in Mariner 9 Mars imagery and ERTS-1 images are described with techniques for their suppression. These patterns are caused by spurious electronic signals, imperfections in the imaging system, or incomplete decalibration of the data. The technique is applied entirely in image space and is simple, fast, and requires a small amount of core as compared to other methods which rely on transforms. (Author)

A75-36829 A versatile interactive graphics analysis program for multispectral data. L. T. Fisher and F. L. Scarpace (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 601-612.

A large interactive computer program has been developed and is now in production use to provide highly versatile interactive data extraction and analysis capabilities for ERTS or other multispectral data. It makes use of an interactive graphics terminal which can produce graphic or line-drawing output and which allows operator specification of coordinate positions. Efforts to maximize versatility, minimize effects of operator errors, and simplify operation have succeeded and produced a method of access to remotely sensed data that will prove operationally and economically attractive to a wide body of potential users. S.J.M.

A75-36830 Interactive radar image processing and interpretation system. C. A. Bay, Jr., C. R. Bright (Raytheon Co., Arlington, Va.), and D. W. Kerr. In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 613-641.

An image processing and interpretation system is described which is designed to explore solutions to specific identified problems and to provide means of further research and development in the field of synthetic antenna radar (SAR) data. The system accepts a variety of input sources which may be either compressed (correlated) images or the raw signal phase histories. Images can be optically compressed on an optical correlator from film-recorded signal phase histories and recorded on magnetic tape in quantitized form for further processing within the system. The greatest advantage of the system designed is that it operates in an interactive mode so that the interpreter or analyst can heuristically input some set of parameters, observe their effects, and iterate the processing with altered parameters until he judges the results satisfactory. S.D.

A75-36833 Radiometric calibration for earth resources identification. F. L. Scarpace (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 697-702.

A different method of calculating radiometric exposure for black and white films is suggested. This method involves deriving an Equivalent Exposure which is dependent on the film sensitivity and spectral distribution of the calibrating light source. For some quantitative applications of photography, the analysis scheme presented will give more meaningful results. The scheme is particularly well suited for making comparisons among film types and between film imagery and electro-optical sensor imagery. (Author)

A75-36838 * A hybrid classifier using the parallelepiped and Bayesian techniques. J. D. Addington (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 772-784.

A versatile classification scheme is developed which uses the best features of the parallelepiped algorithm and the Bayesian maximum likelihood algorithm. The parallelepiped technique has the advantage of being very fast, especially when implemented into a table look-up scheme; its disadvantage is its inability to distinguish and classify spectral signatures which are similar in nature. This disadvantage is eliminated by the Bayesian technique which is capable of distinguishing subtle differences very well. The hybrid algorithm developed reduces computer time by as much as 90%. A two- and n-dimensional description of the hybrid classifier is given. S.D.

A75-37081 Line-grating diffraction in image analysis - Enhanced detection of linear structures in ERTS images, Colorado Front Range. T. W. Offield (U.S. Geological Survey, Denver, Colo.). *Modern Geology*, vol. 5, Feb. 1975, p. 101-107. 10 refs.

Analysis for linear geologic structures on photographs can be facilitated by use of a Ronchi ruling, a device consisting of closely-spaced black lines on glass and serving as a coarse diffraction grating. When the grating is slowly rotated in front of an image, diffraction diffuses linear elements that are parallel to the grating lines and enhances linear elements that are perpendicular to the

grating lines. This enhancement technique is demonstrated in a preliminary analysis of ERTS images of the Colorado Front Range. Several sets of linears become readily apparent in the enhanced images, providing a basis for definition of major structural zones and, potentially, for subdivision of the range into domains of uniform fracture character. Three zones of northeast-trending linears are the main features defined. One of these is the mineral belt, which is bounded by conspicuous narrow zones of linears. North of the mineral belt, Laramide intrusive rocks and mineral showings are limited to a second northeast-trending zone of linears. The third zone, to the south, includes three mineral districts. (Author)

A75-37118 Coherent optics in mapping. N. Balasubramanian (Spectra-Physics Corp., Mountain View, Calif.) and R. D. Leighty (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). *Optical Engineering,* vol. 14, May-June 1975, p. 211-216. 22 refs.

Potential applications of coherent optics in the field of topographic mapping are reviewed, including optical correlators for mensuration, measurements in holographic stereomodels, holographic memories, pattern recognition, optical modulators, and image processing. The motivation for applying coherent optics to topographic mapping is outlined. V.P.

A75-37152 * Digital registration of ERTS-1 imagery. L. O. Bonrud (Control Data Corp., Minneapolis, Minn.) and P. J. Henrikson (Aerospace Corp., Los Angeles, Calif.). In: Conference on Decision and Control, 5th and Symposium on Adaptive Processes, 13th, Phoenix, Ariz., November 20-22, 1974, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 778-782. Contract No. NAS9-13114.

Two requirements for the registration of Earth Resources Technology Satellite (ERTS) data are discussed. These requirements are registration of ERTS data acquired on separate passes and registration of ERTS data to a ground reference. Performances of a semi-automatic warp algorithm and an automatic pipeline processing algorithm demonstrate that either procedure is useful, depending upon the user's requirements. In two cases where the time lapse between passes of the satellite were 90 days and 18 days the automatic pipeline processor reduced the mean radial registration error to 0.28 and 0.58 pixel, respectively. It is concluded that this technique is promissing for high-volume production processing. (Author)

A75-37360 Impact of lasers in spectroscopy; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 49), 1975. 163 p. $32.

Recent developments in laser technology are reported, and the application of lasers to spectroscopy, environmental monitoring, and other areas is studied in a number of papers. Some of the topics covered include opto-acoustic spectroscopy, Fourier transform spectroscopy as a step to laser spectroscopy, fixed frequency lasers, advances in remote gas analysis using Fabry-Pérot techniques, Raman and fluorescence measurements of combustion emissions, and precision measurement of hyperfine structure in I2. P.T.H.

A75-37364 Fourier transform spectroscopy as a step to laser spectroscopy. H. L. Buijs (Université Laval, Quebec, Canada). In: Impact of lasers in spectroscopy; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 31-34. 12 refs. Research sponsored by the Defence Research Establishment Valcartier.

The present work describes the development and performance of a Fourier transform spectrometer system for solar spectroscopy. The system consists of a Michelson interferometer with movable mirror displacement of up to 85 cm and a servo-controlled alignment system. Three corners of the optics are illuminated with a frequency stabilized He-Ne laser. Frequency calibration is about 1 part in 10 million in absolute vacuum frequency for any spectral region. The instrument is employed for line shape studies and the analysis of molecules having very dense spectral structure. P.T.H.

A75-37635 Stereoscopic synthetic array application in earth resource monitoring. L. C. Graham (Goodyear Aerospace Corp., Litchfield Park, Ariz.). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 125-132.

Terrain imaging radar, particularly fine-resolution, synthetic aperture radar, may be operated in a stereo mode to provide a visual three-dimensional model of terrain. This is accomplished by imaging a given strip of terrain from two different flightpaths and by subsequently viewing the two strips separately, one with each eye. The terrain model is studied by earth scientists to locate areas in which geologic considerations indicate a potential for mineralization. Field studies are finally used to identify and locate new resources. Principles of synthetic aperture stereo operation and examples of resource surveys are described. (Author)

A75-37636 A dual frequency and dual polarization synthetic aperture radar system and experiments in agriculture assessment. R. A. Shuchman, R. F. Rawson, and B. Drake (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 133-140.

A75-37994 The rectification of multispectral images (Die Entzerrung von Multispektralbildern). K. Kraus (Wien, Technische Hochschule, Vienna, Austria). *Bildmessung und Luftbildwesen,* vol. 43, July 1, 1975, p. 129-134. 13 refs. In German.

Multispectral scanning systems make it possible to record the radiation characteristics of the scanned terrestrial surface in several spectral ranges. The radiation-intensity data which are first recorded on magnetic tape, are subsequently represented in the form of photographic pictures. Current limitations regarding the utilization of these pictures could be overcome with the aid of a suitable correction procedure. Details for such a procedure are discussed, taking into account its application in a specific example. The described procedure involves a digital optical differential process. G.R.

A75-37995 Digital rectification of the data of line scanners (Digitale Entzerrung der Daten von Zeilen-Abtastern). G. Konecny and W. Schuhr (Hannover, Technische Universität, Hanover, West Germany). *Bildmessung und Luftbildwesen,* vol. 43, July 1, 1975, p. 135-143. 9 refs. In German.

The methods of remote sensing make more and more use of digital image processing techniques. The processing of the data includes densitometric digital image processing, geometric image processing, and procedures related to the classification of various objects. Correction processes required for ERTS data recorded on magnetic tape are discussed along with the determination of image-point coordinates, the computation of rectification parameters, details regarding the digital rectification process, and the representation of the rectified image. G.R.

A75-37996 Interpretation of thermal images of the urban area of Dortmund (Interpretation von Thermalbildern der Stadtregion Dortmund). P. Stock (Siedlungsverband Ruhrkohlenbezirk, Essen, West Germany). *Bildmessung und Luftbildwesen,* vol. 43, July 1, 1975, p. 144-151. 12 refs. In German.

The investigation considered is concerned with an evaluation of data obtained in a study of a West German area with a high degree of industrialization. The study involved the use of an aircraft-borne infrared line scanner (IRLS). The design, performance, and resolution of the IRLS are briefly considered. The evaluation procedure is described, taking into account an examination of a black-white representation of the temperatures and the use of a densitometer, the VP-8 Image Analyzer. Details of thermal-data recording are also discussed along with the surface-temperature pattern observed for the City of Dortmund. G.R.

A75-38120 **Some results of the use of an airborne infrared imaging device for photographing forest fires.** E. Ia. Karizhenskii, M. M. Miroshnikov, B. V. Shilin, and E. N. Zelenov. *(Optiko-Mekhanicheskaia Promyshlennost', vol. 41, Sept. 1974, p. 29-32.) Soviet Journal of Optical Technology,* vol. 41, Sept. 1974, p. 402-406. 7 refs. Translation.

N75-21718 Kansas Univ., Lawrence.
CLUSTER ANALYSIS AND ITS APPLICATION TO IMAGERY DATA Ph.D. Thesis
Itshak Dinstein 1974 219 p
Avail: Univ. Microfilms Order No. 75-6176

The application of cluster analysis to areas of research involving geosciences, social sciences, and natural sciences is discussed. Cluster analysis enables the researcher to make some generalization about the data, to learn about the structure of the data set and the characteristics of the data elements, and to reduce the dimensionality of the data. Two clustering procedures which are applicable to imagery data are described. The first procedure defines clustering and inverse clustering functions which are iteratively improved. The second procedure takes into account the spatial distribution of the measurement as well as the distribution in measurement space. Specific use of the clustering analysis with ERTS data is reported. Dissert. Abstr.

N75-21730*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL RESOLUTION IN PHOTOGRAPHIC FORM Final Report
P. N. Slater, Principal Investigator and R. A. Schowengerdt Jan. 1975 93 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21849)
(E75-10205; NASA-CR-142391) Avail: NTIS HC $4.75 CSCL 05B

The author has identified the following significant results. The digital Optical Transfer Function (OTF) measurements showed the following: (1) there are no significant differences in optical performance, in terms of OTF, among all four bands of the multispectral scanner, (2) no substantial changes in the OTF's of bands 4, 5, and 6 during the period November 1972 to May 1973, and (3) comparison between the photographic and digital (CCT) two-dimensional OTF's indicated a strong asymmetry in the photographic product OTF between the MSS scan direction and across scan direction. The coherent light Fourier analysis program showed the following: (1) for agricultural areas, bands 5 and 7 of the MSS are superior in terms of image definition, and therefore mapping and acreage estimation, (2) amplitude modulation in imagery from MSS bands 4 and 5 is between 65 to 90 percent of that in corresponding bands of Apollo 9 imagery (SO65), and (3) MSS band 5 imagery has a ground resolution between 55 to 75 percent of that exhibited in the corresponding band of Apollo 9 imagery (SO65).

N75-21731*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
GEOLOGIC ANALYSIS OF ERTS-1 IMAGERY FOR THE STATE OF NEW MEXICO Final Report, Aug. 1972 - Mar. 1974
Frank E. Kottlowski, Principal Investigator, Sandra Feldman, Michael Inglis, Karl VonderLinden, Charles E. Chapin, and Rodney C. Rhodes Aug. 1974 105 p refs Prepared in cooperation with New Mexico Univ., Albuquerque Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21861)
(E75-10206; NASA-CR-142392) Avail: NTIS HC $5.25 CSCL 08G

N75-22876*# Hunting Surveys, Ltd., Boreham Wood (England).
STUDY OF TECHNIQUES AND APPLICATIONS OF SATELLITE IMAGERY TO SMALL SCALE MAPPING Final Report
P. G. Mott, Principal Investigator, H. Fullard (Phillip (George) and Son, Ltd.), J. C. Bartholomew (Bartholomew (John) and Son, Ltd.), J. D. Leatherdale, H. J. Chisom, and J. K. Wilcox 1 Mar. 1975 57 p Sponsored by NASA Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10265; NASA-CR-142640) Avail: NTIS HC $4.25 CSCL 08B

N75-24059*# Corps of Engineers, Waltham, Mass.
THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Final Report
Saul Cooper, Principal Investigator, Paul Bock (Connecticut Univ.), Joseph Horowitz (Connecticut Univ.), and Dennis Foran Mar. 1975 118 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70256-AG)
(E75-10286; NASA-CR-142709) Avail: NTIS HC $5.25 CSCL 08H

The author has identified the following significant results. Real time data collection by orbiting satellite relay was found to be both reliable and feasible. ERTS imagery was assessed and it was shown that in most cases better spatial resolution and/or additional spectral bands would be required to satisfy NED's needs. A man-computer interactive system, using cathode ray tube display could solve the problem of an unwieldy mass of data for interpretation.

N75-24062*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Mar. 1975
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 21 Apr. 1975 10 p ref EREP
(Contract NAS9-13280)
(E75-10289; NASA-CR-142724; ERIM-101900-52-L) Avail: NTIS HC $3.25 CSCL 05B

N75-24064*# Michigan Univ., Ann Arbor. Radar and Optics Div.
THE APPLICATION OF AIRBORNE IMAGING RADARS (L AND X-BAND) TO EARTH RESOURCES PROBLEMS Executive Summary Report, 1 Jun. 1973 - 30 Apr. 1974
Ben Drake, Robert A. Shuchman, M. Leonard Bryan, Richard W. Larson, Charles L. Liskow, and Robert A. Rendleman May 1974 38 p
(Contract NAS10-8333)
(NASA-CR-139385-1; ERIM-104000-1-F) Avail: NTIS HC $3.75 CSCL 08H

A multiplexed synthetic aperture Side-Looking Airborne Radar (SLAR) that simultaneously images the terrain with X-band (3.2 cm) and L-band (23.0 cm) radar wavelengths was developed. The Feasibility of using multiplexed SLAR to obtain useful information for earth resources purposes. The SLAR imagery, aerial photographs, and infrared imagery are examined to determine the qualitative tone and texture of many rural land-use features imaged. The results show that: (1) Neither X- nor L-band SLAR at moderate and low depression angles can directly or indirectly detect pools of water under standing vegetation. (2) Many of the urban and rural land-use categories present in the

test areas can be identified and mapped on the multiplexed SLAR imagery. (3) Water resources management can be done using multiplexed SLAR. (4) Drainage patterns can be determined on both the X- and L-band imagery. Author

N75-24065*# Michigan Univ., Ann Arbor. Radar and Optics Div.
THE APPLICATION OF AIRBORNE IMAGING RADARS (L AND X-BAND) TO EARTH RESOURCES PROBLEMS Detailed Technical Report, 1 Jun. 1973 - 30 Apr. 1974
Ben Drake, M. Leonard Bryan, Charles L. Liskow, Robert A. Shuchman, Richard W. Larson, and Robert A. Rendleman May 1974 83 p refs
(Contract NAS10-8333)
(NASA-CR-139385-2; ERIM-104000-1-F) Avail: NTIS HC $4.75 CSCL 08H
For abstract, see N75-24064.

N75-24985*+ Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
APPLICATIONS OF IMAGING RADAR: A BIBLIOGRAPHY Interim Report
Louis F. Dellwig, Norman E. Hardy, Richard K. Moore, Surendra K. Parashar, and Mary Alice Soule Sep. 1974 244 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-141849; RSL-TR-265-2) Avail: NTIS HC $7.50 CSCL 17I
A bibliography is presented which gives an annotated listing of the reports and papers produced in the first decade of earth-resource imaging radar study (plus a few earlier works) and summarizes the current state of knowledge as represented by publications. An extensive cross-reference index was provided to facilitate the identification of all entries even in small part pertinent to any discipline or aspect of investigation. Identification is made of the affiliation of the authors at the time of their research and, when available, at the present time (1974). In each case where a particular radar was used at a particular place and time, these items were identified. Author

N75-25243*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Sep. 1974
Lester V. Manderscheid, Principal Investigators Sep. 1974 2 p EREP
(Contract NAS9-13332)
(E75-10296; NASA-CR-142840) Avail: NTIS HC $3.25 CSCL 12A

N75-25253*# Boeing Co., Kent, Wash.
ANALYSIS PROBLEMS OF MULTISPECTRAL SCANNER DATA Monthly Report, Apr. - May 1975
David L. Tingey, Principal Investigator May 1975 5 p EREP (Contract NAS9-13303)
(E75-10306; NASA-CR-142850) Avail: NTIS HC $3.25 CSCL 09D

N75-25261*# Stanford Univ., Calif. Computer Science Dept.
STANFORD AUTOMATIC PHOTOGRAMMETRY RESEARCH
Lynn H. Quam and Marsha Jo Hannah Dec. 1974 17 p refs
(Contract NAS1-9682; Contract DAHC-15-73-0435)
(NASA-CR-132661; SU-Memo-AIM-254; SU-STAN-CS-74-472) Avail: NTIS HC $3.25 CSCL 08B
A feasibility study on the problem of computer automated aerial/orbital photogrammetry is documented. The techniques investigated were based on correlation matching of small areas in digitized pairs of stereo images taken from high altitude or planetary orbit, with the objective of deriving a 3-dimensional model for the surface of a planet. Author

N75-25266*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
WALLOPS GEOS-C ALTIMETER PREPROCESSING REPORT
C. D. Leitao, C. L. Purdy, and R. L. Brooks (Wolf Res. and Develop. Corp., Pocomoke City, Md.) May 1975 121 p refs
(Contract NAS6-2173)
(NASA-TM-X-69357) Avail: NTIS HC $5.25 CSCL 05B
The procedures used to process the GEOS-C radar altimeter data from raw telemetry data to a final user data product are described along with the radar altimeter hardware design and operating parameters. Author

N75-26470*# TRW Systems Group, Redondo Beach, Calif.
TRADE-OFF ANALYSIS OF MODES OF DATA HANDLING FOR EARTH RESOURCES (ERS), VOLUME 1 Final Report
28 Mar. 1975 266 p refs
(Contract NAS5-21927)
(NASA-CR-143804; TRW-22591-6001-RU-00-Vol-1) Avail: NTIS HC $8.50 CSCL 05B
Data handling requirements are reviewed for earth observation missions along with likely technology advances. Parametric techniques for synthesizing potential systems are developed. Major tasks include: (1) review of the sensors under development and extensions of or improvements in these sensors; (2) development of mission models for missions spanning land, ocean, and atmosphere observations; (3) summary of data handling requirements including the frequency of coverage, timeliness of dissemination, and geographic relationships between points of collection and points of dissemination; (4) review of data routing to establish ways of getting data from the collection point to the user; (5) on-board data processing; (6) communications link; and (7) ground data processing. A detailed synthesis of three specific missions is included. Author

N75-26471*# TRW Systems Group, Redondo Beach, Calif.
TRADE-OFF ANALYSIS OF MODES OF DATA HANDLING FOR EARTH RESOURCES (ERS), VOLUME 2 Final Report
28 Mar. 1975 286 p refs
(Contract NAS5-21927)
(NASA-CR-143806; TRW-22591-6001-RU-00-Vol-2) Avail: NTIS HC $8.75 CSCL 05B
For abstract, see N75-26470.

N75-26473*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ESTIMATING PROPORTIONS OF OBJECTS FROM MULTISPECTRAL SCANNER DATA Final Technical Report, 15 May 1974 - 14 Mar. 1975
H. M. Horwitz, J. T. Lewis, and A. P. Pentland May 1975 117 p refs
(Contract NAS9-14123)
(NASA-CR-141862; ERIM-109600-13-F) Avail: NTIS HC $5.25 CSCL 05B
Progress is reported in developing and testing methods of estimating, from multispectral scanner data, proportions of target classes in a scene when there are a significiant number of boundary pixels. Procedures were developed to exploit: (1) prior information concerning the number of object classes normally occurring in a pixel, and (2) spectral information extracted from signals of adjoining pixels. Two algorithms, LIMMIX and nine-point mixtures, are described along with supporting processing techniques. An important by-product of the procedures, in contrast to the previous method, is that they are often appropriate when the number of spectral bands is small. Preliminary tests on LANDSAT data sets, where target classes were (1) lakes and ponds, and (2) agricultural crops were encouraging. Author

N75-26479*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ADAPTIVE PROCESSING FOR LANDSAT DATA Final Report, 15 May 1974 - 14 Mar. 1975
Robert B. Crane and James F. Reyer May 1975 66 p refs
(Contract NAS9-14123)
(NASA-CR-141894; ERIM-109600-14-F) Avail: NTIS CSCL 05B

Analytical and test results on the use of adaptive processing on LANDSAT data are presented. The Kalman filter was used as a framework to contain different adapting techniques. When LANDSAT MSS data were used all of the modifications made to the Kalman filter performed the functions for which they were designed. It was found that adaptive processing could provide compensation for incorrect signature means, within limits. However, if the data were such that poor classification accuracy would be obtained when the correct means were used, then adaptive processing would not improve the accuracy and might well lower it even further. Author

N75-27194* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION OF VERY LONG BASELINE INTERFEROMETRY TO ASTROMETRY AND GEODESY: EFFECTS OF FREQUENCY STANDARD INSTABILITY ON ACCURACY
T. A. Clark, A. R. Whitney (Northeast Radio Observatory Corp.), A. E. E. Rogers (Northeast Radio Observatory Corp.), H. F. Hinteregger (Northeast Radio Observatory Corp.), L. B. Hanson (Northeast Radio Observatory Corp.), C. C. Counselman, III (Mass. Inst. of Tech., Cambridge), and I. I. Shapiro (Mass. Inst. of Tech.) *In* Its Proc. of the Sixth Ann. Precise Time and Time Interval (PTTI) Planning Meeting 1974 p 349-359 refs

CSCL 08E

The accuracy of geodetic and astrometric information obtained from very long baseline interferometry (VLBI) observations is dependent upon the stability of the frequency standard, or clock, used at each site of VLBI array. The sensitivities of two hydrogen maser frequency standards of different design to pressure, temperature, and magnetic field variations were measured; and, for one of the standards, sensitivity was found to be severe enough to degrade the information content of VLBI measurements. However, the effect on the geometric and astrometric information of such clock instabilities, with time scales of hours or greater, can be sharply reduced through the use of differencing techniques. Author

N75-27449 Joint Publications Research Service, Arlington, Va.
OBSERVATIONS USING FRENCH ELECTRONIC EQUIPMENT AND THE EOLE SATELLITE
I. V. Farengolts *In its* Soviet Antarctic Inform. Bull. (JPRS-64980) 11 Jun. 1975 p 23-27 refs Transl. into ENGLISH from Inform. Byull. Sov. Antarkt. Eksped. (Leningrad), no. 90, 1975 p 105-109

On August 16, 1971 a meteorological satellite was launched from Wallops Island to study the atmosphere over the Southern Hemisphere, to collect information on pressure and temperature, and to observe glaciology, geodesy, oceanography, and interaction between the atmosphere and ocean. Through cooperation with Argentina, Great Britain, U.S.S.R., U.S., France, Australia, and Japan, the satellite tracking of iceberg drift was accomplished using electronic buoys. Continuous information on the Antarctic circumpolar current was obtained for use in polar expeditions. Author

N75-27521*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, May 1975
David S. Gilmer, Principal Investigator May 1975 2 p EREP (NASA Order T-4114-B; Contract DI-14-16-0008-802)
(E75-10333; NASA-CR-143070) Avail: NTIS HC $3.25 CSCL 06C

N75-27525*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
IMAGE ENHANCEMENT AND ADVANCED INFORMATION EXTRACTION TECHNIQUES FOR ERTS-1 DATA Final Report, 12 Jun. 1972 - 31 Oct. 1974
William A. Malila, Principal Investigator, Richard F. Nalepka, and Jane E. Sarno Jun. 1975 141 p refs ERTS
(Contract NAS5-21783)
(E75-10337; NASA-CR-143074; ERIM-193300-66-F) Avail: NTIS HC $5.75 CSCL 05B

The author has identified the following significant results. It was demonstrated and concluded that: (1) the atmosphere has significant effects on ERTS MSS data which can seriously degrade recognition performance; (2) the application of selected signature extension techniques serve to reduce the deleterious effects of both the atmosphere and changing ground conditions on recognition performance; and (3) a proportion estimation algorithm for overcoming problems in acreage estimation accuracy resulting from the coarse spatial resolution of the ERTS MSS, was able to significantly improve acreage estimation accuracy over that achievable by conventional techniques, especially for high contrast targets such as lakes and ponds.

N75-27533*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MULTISPECTRAL PROCESSING BASED ON GROUPS OF RESOLUTION ELEMENTS Final Report, 15 May 1974 - 14 Mar. 1975
Wyman Richardson and James M. Gleason May 1975 120 p refs
(Contract NAS9-14123)
(NASA-CR-141895; ERIM-109600-18-F) Avail: NTIS HC $5.25 CSCL 08B

Several nine-point rules are defined and compared with previously studied rules. One of the rules performed well in boundary areas, but with reduced efficiency in field interiors; another combined best performance on field interiors with good sensitivity to boundary detail. The basic threshold gradient and some modifications were investigated as a means of boundary point detection. The hypothesis testing methods of closed-boundary formation were also tested and evaluated. An analysis of the boundary detection problem was initiated, employing statistical signal detection and parameter estimation techniques to analyze various formulations of the problem. These formulations permit the atmospheric and sensor system effects on the data to be thoroughly analyzed. Various boundary features and necessary assumptions can also be investigated in this manner. Author

N75-27534*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDIES OF RECOGNITION WITH MULTITEMPORAL REMOTE SENSOR DATA Final Technical Report, 15 May 1974 - 14 Mar. 1975
William A. Malila, Ross H. Hieber, and Richard C. Cicone May 1975 99 p refs
(Contract NAS9-14123)
(NASA-CR-141896; ERIM-109600-19-F) Avail: NTIS HC $4.75 CSCL 08B

N75-27536*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 4 PHOTGRAPHIC INDEX AND SCENE IDENTIFICATION
Richard W. Underwood and John W. Holland Jun. 1974 335 p
(NASA-TM-X-72440; JL12-603) Avail: NTIS HC $9.50 CSCL 08B

A quick reference guide to the photographic imagery obtained on Skylab 4 is presented. Place names and descriptors used give sufficient information to identify frames for discussion purposes and are not intended to be used for ground nadir or geographic coverage purposes. Author

08

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A75-29453 # **Civil engineering applications of remote sensing.** D. J. Barr (Missouri, University, Rolla, Mo.) and W. P. James (Texas A & M University, College Station, Tex.). *(American Society of Civil Engineers, National and Annual Environmental Engineering Meeting, New York, N.Y., Oct. 29-Nov. 1, 1973, Preprint 2072.) ASCE, Transportation Engineering Journal,* vol. 101, May 1975, p. 279-295. 60 refs.

The characteristics of remote sensing instrumentation are discussed and general data analysis techniques are examined. A summary is given of a number of project-oriented civil engineering applications of remote sensing technology, taking into account environmental and sanitary engineering, water resources, transportation engineering, and geological engineering and soil mechanics. The significance of aerial monitoring in water quality management is considered. Attention is given to the criteria for evaluating water quality, details of the monitoring program, and the effects of waste discharges on common water quality parameters. G.R.

A75-29720 **A spatial clustering procedure for multi-image data.** R. M. Haralick (Kansas, University, Lawrence, Kan.) and I. Dinstein (Communications Satellite Corp., Clarksburg, Md.). *IEEE Transactions on Circuits and Systems,* vol. CAS-22, May 1975, p. 440-450. 29 refs.

A spatial clustering procedure applicable to multi-spectral image data is discussed. The procedure takes into account the spatial distribution of the measurements as well as their distribution in measurement space. The procedure calls for the generation and then thresholding of the gradient image, cleaning the threshold image, labeling the connected regions in the cleaned image, and clustering the labeled regions. An experiment was carried out on ERTS data in order to study the effect of the selection of the gradient image, the threshold, and the cleaning process. Three gradients, three gradient thresholds, and two cleaning parameters yielded 18 gradient-thresholds combinations. The combination that yielded connected homogeneous regions with the smallest variance was Robert's gradient with distance 2, threshold by its running mean, and a cleaning process that considered a resolution cell to be homogeneous if and only if at least 7 of its nearest neighbors were homogeneous. (Author)

A75-29722 **Image filtering - A context dependent process.** R. Bajcsy and M. Tavakoli (Pennsylvania, University, Philadelphia, Pa.). *IEEE Transactions on Circuits and Systems,* vol. CAS-22, May 1975, p. 463-474. 19 refs.

The present paper presents a novel approach to image filtering from the computer scene analysis point of view. It is argued that in order to build meaningful image filters, a world model is needed that includes a model of the scene, of the eye (a camera), and of the illumination. Using this description, one must recognize objects in the scene which match the description before one filters them out. It is shown that the procedure sequencing strategy is guided by the world model and by the visibility of objects on the scene. Since the filtering process involves recognition of the visual concepts of objects, it is designated 'conceptual filtering.' Similarly, since the guided strategy of the scene analysis depends on partial recognition of the scene, it is called 'conceptual focusing.' The above approach is illustrated by an example of computer recognition of bridges, rivers, lakes, and islands from ERTS satellite photographs. S.J.M.

A75-30451 * **The development of an L-band radiometer dual-mode horn.** M. C. Bailey (NASA, Langley Research Center, Hampton, Va.). *IEEE Transactions on Antennas and Propagation,* vol. AP-23, May 1975, p. 439-441.

An antenna was developed for the remote microwave measurement of ocean surface temperature during a flight test in a C54 aircraft. The basic antenna is a conical dual-mode horn similar to the dual-mode horn described by Potter (1963). The pertinent internal dimensions of the horn are given. The measured E and H plane patterns for the linearly polarized horn for a range of frequencies are shown in a graph. G.R.

A75-30500 **Environmental earth satellites for oceanographic-meteorological studies of the Bering Sea.** E. P. McClain (NOAA, Washington, D.C.). In: Oceanography of the Bering Sea: With emphasis on renewable resources. Fairbanks, University of Alaska Press, 1974, p. 579-593. 17 refs.

Present-day operational earth satellites already provide much information useful to the oceanographer and meteorologist in the Bering Sea area. Near-future operational and development satellites will make available more types of data and higher-resolution coverage. Because the Bering Sea is a relatively remote and inaccessible part of the world, subject moreover to incursions of polar ice, comprehensive and repetitive survey by surface vessels or aircraft would be costly, time-consuming, very difficult and to some extent hazardous. The polar-orbiting environmental earth satellite is thus in many ways an ideal sensor platform for areas such as the Bering Sea. Remote sensing does entail certain limitations, however, and it is in such areas of weakness that the data collection and relay capabilities of sun-synchronous polar satellites and earth-synchronous equatorial satellites are important. (Author)

A75-30546 # **The current status of spatial analytical phototriangulation and its developmental prospects (Sovremennoe sostoianie analiticheskoi prostranstvennoi fototrianguliatsii i perspektivy ee razvitiia).** V. A. Poliakova. *Geodeziia i Kartografiia,* Mar. 1975, p. 36-46. In Russian.

Analysis of mathematical models of modern technological processes involved in spatial phototriangulation represented by analytical photogrammetric systems. The discussion covers characterization of the variety and organization level of these systems for conventional conditions of aerial photography and plotting of partitioned networks. The existing analytical photogrammetric systems are categorized, and the most promising developmental trends in spatial analytical phototriangulation are discussed. S.D.

A75-30547 # **Determination of systematic errors in aerial photographs by means of photogrammetric plots (Ob opredelenii sistematicheskikh oshibok aerosnimkov putem fotogrammetricheskikh postroenii).** V. V. Pogorelov and G. N. Popova. *Geodeziia i Kartografiia,* Mar. 1975, p. 46-52. In Russian.

A75-30834 # **Passive microwave radiometry and its potential application to earth resources survey.** J. Plevin (ESRO, Space Applications Div., Neuilly-sur-Seine, Hauts-de-Seine, France). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974.
Birmingham, University of Aston, 1974, p. 87-106. 9 refs.

The spectral region of interest for passive microwave radiometry lies in the wavelength range from 3 mm to 30 cm. Basic physical relationships are examined along with atmospheric effects and technological aspects. The applications of passive microwave radiometry are considered, taking into account questions of interaction between user requirements and system parameters. It is pointed out that the described applications are at present experimental. Carefully controlled programmes relating remotely sensed data to ground based measurements are necessary in order to evaluate properly the potential of microwave radiometry. G.R.

A75-30835 # **Non-imaging remote sensing systems.** D. B. Morris (Hunting Geology and Geophysics, Ltd., Boreham Wood,

Herts., England). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Birmingham, University of Aston, 1974, p. 107-133. 25 refs.

The special characteristics of nonimaging systems are examined, taking into account hardware development stages, restrictions on use, navigational problems, flight path recovery, and aspects of data presentation. Airborne geophysical systems considered include magnetometers of different types, gamma ray spectrometers, and gravity meters. The nonimaging optical systems described are the correlation spectrometer, lidar, laser profilers, and the Fraunhofer line discriminator. Nonimaging infrared systems are related to the Barnes PRT-5 *radiometer and the filter wheel spectrometer. Nonimaging electro*magnetic systems are also discussed. G.R.

A75-30836 # **The camera's role in remote sensing from space.** H. J. P. Arnold (Kodak, Ltd., Hempstead, Herts., England). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Birmingham, University of Aston, 1974, p. 135-149. 37 refs.

The use of spaceborne cameras in studies of the terrestrial surface is considered, giving attention to early Mercury missions, the Gemini program, the Apollo project, the Skylab mission, and investigations using the Skylark rocket. Studies of the lunar surface are discussed, taking into account certain difficulties encountered and technological advances made to overcome these difficulties. A review is given of the present state of the art regarding the use of the photographic camera as a remote sensor. G.R.

A75-30995 The construction of a digital altitude model (Herstellung eines digital Höhenmodells). H.-J. Gottschalk and H. G. Neubauer (Institut für angewandte Geodäsie, Frankfurt am Main, West Germany). *Bildmessung und Luftbildwesen,* vol. 43, May 1, 1975, p. 92-95. In German.

The procedure employed in the photogrammetric determination of model data is discussed along with the method used in the construction of a model on the basis of the contour lines of a topographic map. Attention is given to the times required for preparation, measurement, and auxiliary operations in the case of both approaches. The time needed for the computations has not been reported because it depends on the characteristics of the computational devices employed. An evaluation of the accuracy obtained shows that the given accuracy requirements are satisfied by both methods. G.R.

A75-30997 Remote sensing methods for objective evaluation. II (Fernerkundungsverfahren für objektive Auswertung. II). D. Lorenz. *Bildmessung und Luftbildwesen,* vol. 43, May 1, 1975, p. 117-120. 6 refs. In German.

The advantages of inclined line scanning and conical scanning are considered, taking into account a number of examples involving multispectral scanners of ERTS 1 and Skylab. Questions of stereoscopic interpretation are discussed, giving attention to certain difficulties and an approach for overcoming them. A use of the considered scanning method in the infrared range at a wavelength of about 10 micrometers has advantages for meteorological applications. G.R.

A75-31226 Possibility of measuring geomagnetic elements from drifting balloons. Iu. P. Tsvetkov (Akademiia Nauk SSSR, Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln, Krasnaya Pakhra, USSR). *(Geomagnetizm i Aeronomiia,* vol. 14, July-Aug. 1974, p. 721-724.) *Geomagnetism and Aeronomy,* vol. 14, no. 4, 1974, p. 613-615. Translation.

A75-31503 Laser line-scanning sensors. W. F. Matthews and R. F. Jung (Perkin-Elmer Corp., South Wilton, Conn.). *Optical Engineering,* vol. 14, Mar.-Apr. 1975, p. 116-119.

A brief review is presented of developments in the area of laser line-scanning sensors since 1963, taking into account early systems recording directly onto photographic film and present versions which employ magnetic video tape with the possibility of a real-time data link transmission to ground. The KA-98 line-scanning camera is discussed. The camera can be used for covert, high-resolution, day or nighttime mapping of terrain from aircraft flying at varying altitudes and speeds. At night, the ground scene is illuminated by an invisible beam derived from a liquid-nitrogen-cooled GaAs laser. G.R.

A75-31578 # **Design and organization of an aerial survey of the national territory for earth resources studies and pollution control (Progettazione e organizzazione della sorveglianza aerea del territorio nazionale per lo studio delle risorse terrestri e la lotta antiinquinamento).** G. Cortellessa (Istituto Superiore di Sanità, Rome, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 45, 47-51. In Italian.

An aerial survey of the Italian territory has been conducted as a basis for an earth resources study and an investigation related to the control of pollution. Attention is given to the significance of the aerial measurements and to cost estimates. G.R.

A75-31579 # **Italian ground facility for the reception and processing of earth resources survey data - The T.E.R.R.A. Project by Telespazio.** B. Ratti and G. Bressanin (Telespazio S.p.A., Rome, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 71, 73-83.

It is the objective of the TERRA project to demonstrate the validity of remote sensing techniques as applied in an operational context for the purpose of the management of earth resources. System features and capabilities of the TERRA pilot facility are discussed and a basic description of the pilot facility is presented, giving attention to the data acquisition subsystem, the data storage, processing, and retrieval subsystem, and the data editing and distribution subsystem. G.R.

A75-31584 # **Digital evaluation of ERTS-1 data over the Italian peninsula.** J. Bodechtel (Zentralstelle für Geo-Photogrammetrie und Fernerkundung, Munich, West Germany). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 175, 177-186.

Basic aspects concerning an automatic evaluation of multispectral data are examined, taking into account the requirements for the detection and description of surface phenomena by means of remote sensing techniques. Examples of digital and analog evaluation of ERTS multispectral data are discussed, giving attention to the digital evaluations on two small test site each covering 40,000 image points. G.R.

A75-31587 # **Extracts from the January, 1974 report of the United Nations Work Group on Remote Sensing of the Earth's Surface by Satellite (Estratti del notiziario del Gennaio 1974 del Gruppo di Lavoro delle Nazioni Unite sui Telerilevamenti della Superficie Terrestre da Satelliti).** F. Fiorio (United Nations, New York, N.Y.). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale

Elettronica Nucleare ed Aerospaziale, 1974, p. 225, 227-235. In Italian.

The present work discusses in general terms the prospects for the development of solar energy in the near future. The main results of studies conducted on the development of technology for production and conversion of solar energy are discussed. The impact of solar energy development on the environment is examined, and its consequences for various industrial sectors are discussed. P.T.H.

A75-31601 # Italy scanned by automatic /ERTS-1/ and manned /Skylab/ satellites - Analysis of the operational characteristics of the two platforms as a basis for studying the areas observed by both systems (L'Italia ripresa da satelliti automatici /ERTS-1/ e abitati /Skylab/ - Analisi delle caratteristiche operative delle due plattaforme in base allo studio di aree osservate da entrambi i sistemi). C. M. Marino (Milano, Università, Milan, Italy). In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 427, 429-434. In Italian.

A75-33868 # Airborne microwave radiometric measurements at DFVLR, Oberpfaffenhofen. J. Preissner (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 159-162.

In the last years some results were obtained by airborne passive microwave measurements at 11, 32 and 90 GHz. The radiometers were tested in several flights under various weather conditions. Radiometric maps were obtained at 32 and 90 GHz with specially built scanning antennas. Results are presented. At the end of 1974 a flight program will start using an aircraft of the type 'Canberra', where the three radiometers will operate simultaneously from the bomb bay. In addition to the radiometers video- and photo cameras and equipment for periphery data registration (temperature, aircraft attitude, etc.) will be installed. Reproducible flight paths at various weather conditions will be achieved by tracking radar control. The aims of the program are measurements on different objects and classes of terrain, simultaneously at three frequencies (multispectral signature) to reduce ambiguity in identification. (Author)

A75-33872 # Measurement of stratified terrain media using active microwave systems. J. R. Lundien (U.S. Army, Mobility and Environmental Systems Laboratory, Vicksburg, Miss.). In: Specialist Meeting on Microwave Scattering and Emission from the Earth, Berne, Switzerland, September 23-26, 1974, Proceedings. Berne, Universität Bern, 1974, p. 197-203.

The ability of a swept-frequency radar system operating under field conditions to detect the presence and measure the thickness of layered substrata and to determine the electrical properties of the materials in these substrata was studied. Reflectivity of layered soils and sections of asphaltic concrete pavements overlying various subsurface layer thicknesses was measured by a specially designed microwave system operating over the frequency range of 0.25 to 8.0 GHz at perpendicular incidence. Test results indicated that swept-frequency radar measurements can be used to estimate power reflectance from the surface material of layered materials and to determine the amplitude of the subsurface contribution. Also, interference patterns, produced in the power reflectance curves, can be used to calculate the thickness of each layer of the structure. (Author)

A75-35457 # Practical considerations to the use of microwave sensing from space platforms. R. P. Eisenberg (GE Valley Forge Space Center, Philadelphia, Pa.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S3-29 to S3-57. 21 refs.

There exists a wide range of microwave sensing techniques (active, passive, imaging) with a varied set of characteristics (frequency, polarization, spatial resolution, etc.) that can be used in obtaining remotely sensed earth resources data from space. The recent Skylab Earth Resources Program provided a valuable opportunity to examine several of these techniques as applied to ocean phenomena and to assess their utility for future applications. The advent of the Seasat Program, as well as many Space Shuttle flight opportunities, promises the maturing of microwave remote sensing into a practical operational method of monitoring our earth and ocean environment on a global scale. This paper describes briefly some of the principles upon which microwave sensing is based, reviews the Skylab S-193 experiment and some of the results obtained, defines a possible sensor complement for Seasat, and illustrates the problems and limitations of microwave remote sensing techniques from space platforms. (Author)

A75-35462 # Remote sensing of small terrestrial temperature differences. N. J. Clinton and C. E. Campbell (Lockheed Electronics Co., Inc., Houston, Tex.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-17 to A-25. 17 refs.

The present work describes how an infrared scanner can be designed for high thermal resolution rather than high spatial resolution, thus enabling it to detect small differences in temperature of the earth's surface, which can then be analyzed for possible information on the subsurface structure. In general, increasing the area of the detector would increase thermal resolution at the cost of spatial resolution. Optimal flight conditions for using a high thermal sensitivity system for geological purposes are discussed. P.T.H.

A75-36831 * Accuracy, resolution, and cost comparisons between small format and mapping cameras for environmental mapping. R. H. Clegg and J. P. Scherz (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 663-691. 10 refs. Grant No. NGL-50-002-127.

Successful aerial photography depends on aerial cameras providing acceptable photographs within cost restrictions of the job. For topographic mapping where ultimate accuracy is required only large format mapping cameras will suffice. For mapping environmental patterns of vegetation, soils, or water pollution, 9-inch cameras often exceed accuracy and cost requirements, and small formats may be better. In choosing the best camera for environmental mapping, relative capabilities and costs must be understood. This study compares resolution, photo interpretation potential, metric accuracy, and cost of 9-inch, 70mm, and 35mm cameras for obtaining simultaneous color and color infrared photography for environmental mapping purposes. (Author)

A75-36835 A new technique for observing mid-latitude ocean currents from space. G. A. Maul and S. R. Baig (NOAA, Miami, Fla.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 713-716.

Infrared observations from the Synchronous Meteorological Satellite are used to locate the cyclonic edge of the Gulf Stream in the offing of the Middle Atlantic Bight. Film loops are made from the high resolution infrared scanner using observations every 30 minutes. For periods of one to three days, the stream's meanders can be considered quasi-stationary. The high velocity of clouds makes identification of the current possible because of the relative motion difference and is analogus to land identification. The technique requires only one channel of carefully gridded data and is free of

atmospheric radiative transfer corrections necessary in other multichannel compositing schemes. (Author)

A75-36837 Quantitative photo-interpretation for wetland mapping. F. L. Scarpace, R. W. Kiefer, S. L. Wynn, B. K. Quirk, and G. A. Friederichs (Wisconsin, University, Madison, Wis.). In: *American Society of Photogrammetry, Annual Meeting,* 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 750-771. 14 refs.

The use of scanned film imagery in mapping the boundaries and quality of a wetland is investigated. The analytical dye density values are transformed through sensitometric calibrations into equivalent exposure values which are related to the scene reflectance. The ranges of equivalent exposure for each film layer for each resource type are then determined using an interactive computer program. Once the user interpreter has determined these values for each vegetation type, the vegetative types are automatically mapped for the entire test site. A comparison between computer-drawn and hand-drawn vegetation maps suggest that digital processing of film imagery is a cost-effective method of mapping large wetlands. S.D.

A75-36839 Simulating true color images of earth from ERTS data. E. M. Eliason, L. A. Soderblom, and P. S. Chavez, Jr. (U.S. Geological Survey, Center of Astrogeology, Flagstaff, Ariz.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 785-788.

A computerized image processing technique has been developed which simulates natural color images of earth using Earth Resources Technology Satellite data. First order atmospheric scattering effects are eliminated from the image, and noise patterns due to the multi-spectral scanner system are suppressed. The final product provides for the user the most normal rendition of terrestrial landscape. (Author)

A75-37340 Specifications for photographic and electro-optical remote sensing systems. P. N. Slater (Arizona, University, Tucson, Ariz.). In: Effective systems integration and optical design; Proceedings of the Seminar, San Diego, Calif., August 21-23, 1974. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 95-102; Discussion, p. 102, 103. 10 refs. U.S. Geological Survey Contract No. 14-08-0001-G-86; Contract No. F04695-67-C-0197.

General performance specifications are described for photographic and electro-optical multispectral cameras to be used in remote sensing applications. The effect of natural limitations on the specification for smallest detectable reflectance difference is discussed. It is shown that reflectance differences of 0.01 can be detected from orbit by a nearly diffraction-limited f/3.5 system of 1-m focal length in a spectral interval from 600 to 700 nm and with an effective instantaneous field of view of 30 m, using a solid-state array of detectors having a noise equivalent signal of 1 microJ/sq m. (Author)

A75-37345 The impact of optical design constraints imposed by space-borne TV cameras. M. H. Mesner (RCA, Astro Electronics Div., Princeton, N.J.). In: Effective systems integration and optical design; Proceedings of the Seminar, San Diego, Calif., August 21-23, 1974. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 131-137.

Important constraints on TV camera lenses and telescopes, unique to space missions include operation and testing in a high vacuum, unusual temperature variations, high levels of shock and vibration, need for light weight construction, damaging radiation environments and specific optical requirements reflecting the type of mission. Specific examples of problems and solutions for the Ranger and ERTS satellites and Apollo optical systems are discussed. Technical and management problems in procuring high quality optical components which will meet the increased standards of space missions, face exacting schedules, and fall within a cost level dictated by government fiscal restraining are pointed out. M.G.

A75-37373 Raman and fluorescence measurements of combustion emissions. D. A. Leonard (Avco Everett Research Laboratory, Inc., Everett, Mass.). In: Impact of lasers in spectroscopy; Proceedings of the Seminar, San Diego, Calif., August 19, 20, 1974. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 110-119. 10 refs. Contract No. F33615-71-C-1875.

The present work reports on some experimental laser-induced Raman and fluorescence measurements of combustion exhausts. Raman data were obtained which could be used to measure the mole fractions of the major species in the exhaust flow from an aircraft combustor, i.e., N2, O2, CO2, and H2O over the entire range of engine operating conditions. These data were compared with the expected values of the species concentrations. Accurate measurements were obtained for the concentrations of O2 and CO2 which were in excellent agreement with conventional probe measurements and calculated values. P.T.H.

A75-37998 Problems and possibilities of remote sensing with microwave radiometers. I (Probleme und Möglichkeiten der Fernerkundung mit Mikrowellenradiometern. I). K. Grüner (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Oberpfaffenhofen, West Germany). *Bildmessung und Luftbildwesen,* vol. 43, July 1, 1975, p. 158-161. In German.

The basic characteristics of microwave radiometry are examined. Studies conducted during the day and during the night provide almost the same results. The characteristic radiation of the atmosphere has a predominant influence. Attenuation effects produced by the atmosphere for different weather conditions are discussed along with problems concerning the identification of the object. Attention is given to the information contained in the data regarding an area below the object surface. G.R.

A75-38497 # Spectral characteristics of remote sensors (Prostranstvenno-spektral'nye kharakteristiki distantsionnykh datchikov). S. V. Dotsenko, A. N. Nedovesov, M. G. Poplavskaia, and V. A. Ryzhenko. *Akademiia Nauk Ukrainskoi SSR, Morskie Gidrofizicheskie Issledovaniia,* no. 2, 1974, p. 162-173. 5 refs. In Russian.

The analytical expression of spectral characteristics of remote sensors designed for measurements of physical fields of the ocean surface from aircrafts and artificial earth satellites is obtained. These characteristics are received for the uniformly averaged sensor and also for the sensors of radiometers installed in artificial satellites 'Kosmos 149' and 'Tiros II'. Their comparative analysis is given. (Author)

N75-21304*# Martin Marietta Corp., Baltimore, Md.
EARTH RESOURCES EXPERIMENT PACKAGE SENSOR PERFORMANCE EVALUATION. VOLUME 2: S191 Final Report
Gerald P. Kenney 2 Jan. 1975 102 p refs
(Contract NAS8-24000)
(NASA-CR-141735; MSC-05546-Vol-2) Avail: NTIS HC $5.25 CSCL 22A

An S191 performance summary based on ground testing and orbital operations in terms of pertinent parameters is provided. Additional tasks covering S191 short-wavelength radiometric calibration, data-acquisition camera, and viewfinder tracking system design criteria, radiometric comparison of S190A, S191, and S192, and wavelength calibration data are included as supplemental analyses. Descriptions of techniques employed in the performance analyses are also discussed. Final results of the evaluations in terms of significant performance degradation, sensor and system anomalies, and achieved performance are presented. Conclusions were based on S191 performance and

interaction of S191 with the EREP system. Recommendations for additional analyses and improvements in design and operation are presented. Author

N75-21589*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM: EARTH RESOURCES EXPERIMENT PACKAGE. SENSOR PERFORMANCE EVALUATION. VOLUME 6: (S194) L-BAND RADIOMETER Final Report
Gerald P. Kenney 7 Apr. 1975 57 p refs
(Contract NAS8-24000)
(NASA-CR-141752; MSC-05546-Vol-6) Avail: NTIS HC $4.25 CSCL 17G

Analysis of the Skylab S194 L-band radiometer experiment data provided significant results pertaining to the actual realized performance during flight. Analysis of preflight test data provided a baseline from which to compare the experiment flight performance, although many radiometric data performance capabilities could only be demonstrated in the flight environment. The final results establish the overall hardware performance of the S194 system from which prospective users of the flight data can refer for various scientific applications. Instrument performance is presented in the areas of housekeeping and internal calibration parameters, antenna system integrity, dynamic range, linearity, precision, resolution, and absolute accuracy. Supplementary evaluations were included for an error analysis of system calibration stability. Results of the evaluation show that the instrument performance was generally as expected. Conclusions are drawn from the final evaluation results, and recommendations for improving the effectiveness of a future program are offered. Author

N75-21769*# National Ocean Survey, Rockville, Md.
SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 15 Jan. - 15 Apr. 1975
Morton Keller, Principal Investigator 15 Apr. 1975 2 p EREP
(NASA Order T-4110-B)
(E75-10247; NASA-CR-142540) Avail: NTIS HC $3.25 CSCL 08B

N75-21773*# Alaska Univ., Fairbanks.
APPLICATION OF REMOTE SENSING DATA TO SURVEYS OF THE ALASKAN ENVIRONMENT Annual Report, 1 Jul. 1973 - 30 Jun. 1974
A. E. Belon and J. M. Miller 30 Jun. 1974 141 p refs
(Grant NGL-02-001-092)
(NASA-CR-142519) Avail: NTIS HC $5.75 CSCL 08F

Coupling of satellite data to resource management problems in Alaska is implemented through feasibility studies of applicability of Landsat data to specific environmental surveys in ecology, agriculture, hydrology, wildlife management, oceanography, geology, etc.; and using the results of these studies to extend the benefits of satellite data applications to the operational needs of mission-oriented agencies of Federal, state, and regional governments, as well as private industry. Activities designed to encourage the participation of users in the Landsat program at levels most appropriate to the users' interests are described and include: observation, coordination, and information exchange; training courses and workshops; data exchange; consulting services; data processing services; user participation in University research projects; and university participation in the operational projects of user agencies. Progress in these areas is reported. The effectiveness of this broad-based approach in overcoming the initial apprehensiveness of users is demonstrated. J.M.S.

N75-21774*# State Univ. of New York Research Foundation, Albany.
REMOTE SENSING: AN INVENTORY OF EARTH'S RESOURCES
Nicholas Gramenopoulos [1974] 37 p
(Contract NASw-2508)
(NASA-CR-142614) Avail: NTIS HC $3.75 CSCL 08G

The remote sensing capabilities of Landsat are reviewed along with the broad areas of application of the Landsat imagery. The importance of Landsat imagery in urban planning and resources management is stressed. J.M.S.

N75-21783# Kansas Univ. Center for Research, Inc., Lawrence. Lawrence Remote Sensing Lab.
PROJECT THEMIS: A CENTER FOR REMOTE SENSING Final Report, 16 Sep. 1967 - 15 Sep. 1973
F. T. Ulaby and R. K. Moore Jun. 1974 173 p refs
(Contract DAAK02-68-C-0089; DA Proj. 4A0-61102-B-81E)
(AD-A003266; CRES-TR-133-29) Avail: NTIS CSCL 08/6

This report summarizes the technical work accomplished under Project THEMIS, A Center for Remote Sensing at the University of Kansas during the period 16 September 1967 through 15 September 1973. The highlights of the four major areas forming the remote sensing system are presented. A detailed description of the latest radar spectrometer results is presented. GRA

N75-22889*# Water Survey of Canada, Ottawa (Ontario).
SENSOR DATA RETRANSMISSION BY SATELLITE
R. A. Halliday, Principal Investigator 1975 11 p refs Presented at the Can. Remote Sensing Soc. Workshop on remote Sensing of Snow Cover, Ottawa, 13-15 Jan. 1975 Sponsored by NASA ERTS
(E75-10278; NASA-CR-142687) Avail: NTIS HC $3.25 CSCL 05B

N75-22890*# Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
RETRANSMISSION OF HYDROMETRIC DATA IN CANADA Progress Report, Oct. 1974 - Mar. 1975
R. A. Halliday, Principal Investigator and I. A. Reid Apr. 1975 8 p Sponsored by NASA ERTS
(E75-10279; NASA-CR-142688) Avail: NTIS HC $3.25 CSCL 08H

N75-22939*# Old Dominion Univ. Research Foundation, Norfolk, Va.
A THEORETICAL/EXPERIMENTAL PROGRAM TO DEVELOP ACTIVE OPTICAL POLLUTION SENSORS, PART 2 Final Report
Sherman K. Poultney May 1975 17 p refs
(Grant NGR-47-003-087)
(NASA-CR-142727) Avail: NTIS HC $3.25 CSCL 13B

Progress is reported on experimental investigations of Lidar and the application of Lidar to environmental and atmospheric science. Specifically the following programs are considered: calibration and application of the LaRC 48-inch Lidar; efficient and certain detection of SO2 and other gases in the calibration tank using the Raman Stack Monitor Lidar; the potential of Lidar remote sensing from the space shuttle; and the planning and mounting of efforts to realize the promise of backscatter differential absorption Lidar. J.M.S.

N75-24055*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Apr. - 30 Apr. 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 14 May 1975 4 p EREP
(Contract NAS9-13276)
(E75-10282; NASA-CR-142719; PR-22) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. The collocation technique to filter the remaining EREP passes no. 4, no. 6, and no. 9 was completed. The correlation studies of altimetry geoid profiles with the gravity data and ocean bottom topography were also completed.

N75-24063* California Univ., Berkeley. Forestry Remote Sensing Lab.
A SURVEY OF EARTH RESOURCES ON APOLLO 9 PHOTOGRAPHY

Robert N. Colwell 25 Apr. 1969 83 p Original contains color illustrations
(Contract NAS9-9348)
(NASA-CR-142900) Avail: NTIS HC $4.75 CSCL 08B

The types of photography obtained on the Apollo 9 mission and on concurrent flights made by supporting aircraft are described. The need for earth resource surveys and the value of aircraft and spacecraft as the platforms from which to make such surveys are considered along with the rational for using multiband photography and the means by which such photography can be enhanced. Aerial and space photographs are presented and analyzed. The feasibility of conducting earth resource surveys by means of space photography is discussed and results are summarized. Author

N75-24073# North Carolina State Dept. of Administration, Raleigh. Office of State Planning.
A MAN-MACHINE PROCEDURE FOR EXTRACTING INFORMATION FROM DATA COLLECTED BY THE EARTH RESOURCES TECHNOLOGY SATELLITE Final Report
David R. Holloman Jun. 1974 125 p refs
(Grant HUD-CPA-NC-1034)
(PB-238431/1) Avail: NTIS HC $5.25 CSCL 08F

A man-machine process is reported for obtaining land use and other earth resource information from the ERTS and other multispectral scanner remote sensors and aggregating this information to 40-acre grid cells for automatic inclusion into the PLUM information system. The basis for this system was developed at the Office for Remote Sensing of Earth Resources at Pennsylvania State University. The report also discusses classification accuracy, problem areas, and costs. GRA

N75-24078# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATION OF MULTISPECTRAL TECHNIQUES FOR REMOTELY IDENTIFYING TERRAIN FEATURES AND NATURAL MATERIALS Final Report, Apr. 1969 - May 1974
P. G. Hasell, Jr., T. W. Wagner, F. J. Thomson, and R. D. Dillman May 1974 50 p refs
(Contract DOT-FH-11-7136)
(PB-238675/3; ERIM-196200-12-F; FHWA-RD-74-28) Avail: NTIS HC $3.75 CSCL 08G

Multispectral techniques for remotely identifying terrain features and natural materials are reported. During a five-year period, multispectral data were collected at sites in four states (Pennsylvania, Kansas, Virginia, and California) and various techniques were used to machine process the data. Techniques ranged from simple amplitude gating of a single spectral band to maximum likelihood classification using ten spectral bands. All techniques provided some assistance to an interpreter, some extended specific ground observations to larger areas with acceptable accuracy, and several showed promise of remote identification of materials as an operational technique in highway site planning. GRA

N75-24088# Geological Survey, Reston, Va. Office of International Geology.
SECOND EROS/AID INTERNATIONAL COURSE ON REMOTE SENSING
Donald G. Orr Nov. 1974 17 p
(Contract PASA-TA(IC)-02-72)
(PB-239479/9; IR-NC-42) Avail: NTIS HC $3.25 CSCL 05I

The course was designed to train participants in practical application of Earth Resources Technology Satellite (ERTS) data and aerial remote sensor systems data to resources and land use analysis and management. ERTS-1 data and aerial data from systems that might be really available to participants were emphasized. The course was attended by 34 scientists whose fields included geology, hydrology, agriculture, forestry, cartography, geography, and aerospace technology. Twenty one nations of Africa, Asia, Europe and South America were represented. This report identifies attendees and training staff, describes the activities of the course, reviews critiques of the participants, and presents a critique by the staff that deals with their own preparations and presentations. GRA

N75-24260# National Environmental Satellite Center, Washington, D.C.
SATELLITE INFRARED SOUNDINGS FROM NOAA SPACECRAFT
L. M. McMillin, D. Q. Wark, J. M. Siomkajlo, P. G. Abel, and A. Werbowetzki Sep. 1973 120 p Previously announced as COM-73-50936
(COM-75-10256/6; NOAA-TR-NESS-65; NOAA-73102413) Avail: NTIS HC $5.25 CSCL 04B

Data are currently being received from a vertical temperature profile radiometer (VTPR) aboard the NOAA 2 spacecraft to produce operational atmospheric soundings of temperature and humidity on a global scale. This report describes the VTPR instrument, its calibration, the procedure to obtain clear radiances from cloud-contaminated radiance measurements, retrieval techniques used to obtain temperature and humidity profiles from clear radiances, the quality checks performed on these profiles, and the various forms in which data are available to potential users. GRA

N75-25240*# Atmospheric Environment Service, Downsview (Ontario). Atmospheric Instruments Branch.
METEOROLOGICAL DATA COLLECTION VIA ERTS-A DATA RETRANSMISSION FACILITIES Final Report
R. E. Vockeroth, Principal Investigator and C. E. Robinson 30 Oct. 1974 26 p Sponsored by NASA ERTS
(E75-10293; NASA-CR-142837) Avail: NTIS HC $3.75 CSCL 04B

The author has identified the following significant results. Two meteorological data acquisition systems were built to support hydrometeorological programs related to flow forecasting. Data errors were detected in the stream level formation; these errors were caused by sensor difficulties.

N75-25255*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN Progress Report, Mar. - May 1975
Robert H. Rogers, Principal Investigator Jun. 1975 41 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10308; NASA-CR-142852; BSR-4183) Avail: NTIS HC $3.75 CSCL 08H

The author has identified the following significant results. Preliminary results in Saginaw Bay show that processed LANDSAT data provides a synoptic view of turbidity and circulation patterns that no degree of ground monitoring can provide. Processed imagery was produced to show nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. Analysis of lakes near Madison, Wisconsin show that inland lake water can be categorized by LANDSAT as clear, tannin, algal, and red clay. LANDSAT's capability to inventory watershed land use was throughly demonstrated in the Ohio-Kentucky-Indiana regional planning area. Computer tabulations providing area covered by each of 16 land use categories were rapidly and economically produced for each of the 225 watersheds and nine counties.

N75-26475*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
METHODS OF EXTENDING SIGNATURES AND TRAINING WITHOUT GROUND INFORMATION Final and Technical Report, 15 May 1974 - 14 Mar. 1975
R. G. Henderson, G. S. Thomas, and R. F. Nalepka May 1975 91 p refs
(Contract NAS9-14123)
(NASA-CR-141864; ERIM-109600-16-F) Avail: NTIS HC $4.75 CSCL 05B

Methods of performing signature extension, using LANDSAT-1 data, are explored. The emphasis is on improving the performance and cost-effectiveness of large area wheat surveys. Two methods were developed: ASC, and MASC. Two methods, Ratio, and RADIFF, previously used with aircraft data were adapted to and tested on LANDSAT-1 data. An investigation into the sources and nature of between scene data variations was included. Initial investigations into the selection of training fields without in situ ground truth were undertaken. Author

N75-26476*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

YIELD PREDICTION BY ANALYSIS OF MULTISPECTRAL SCANNER DATA Final Report, 15 May 1974 - 14 Mar. 1975

John E. Colwell and Gwynn H. Suits May 1975 82 p refs (Contract NAS9-14123)

(NASA-CR-141865; ERIM-109600-17-F) Avail: NTIS HC $4.75 CSCL 02C

A preliminary model describing the growth and grain yield of wheat was developed. The modeled growth characteristics of the wheat crop were used to compute wheat canopy reflectance using a model of vegetation canopy reflectance. The modeled reflectance characteristics were compared with the corresponding growth characteristics and grain yield in order to infer their relationships. It appears that periodic wheat canopy reflectance characteristics potentially derivable from earth satellites will be useful in forecasting wheat grain yield. Author

N75-26477*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

AN INTRODUCTION TO QUANTITATIVE REMOTE SENSING

John Lindenlaub and James Russell 1974 63 p (Contract NAS9-14016)

(NASA-CR-141860; LARS-Note-110474) Avail: NTIS HC $4.25 CSCL 20A

The quantitative approach to remote sensing is discussed along with the analysis of remote sensing data. Emphasis is placed on the application of pattern recognition in numerically oriented remote sensing systems. A common background and orientation for users of the LARS computer software system is provided. Author

09
GENERAL

Includes economic analysis.

A75-30545 # More precise determination of satellite orbits without using the coordinates of terrestrial points (Ob utochnenii orbit ISZ bez ispol'zovaniia koordinat nazemnykh punktov). A. E. Gusev. *Geodeziia i Kartografiia,* Mar. 1975, p. 11-14. In Russian.

The use of the coordinates of terrestrial points for precise evaluation of the orbital parameters of a satellite leads to misrepresentation of the results due to errors in determining the exact locations of these points. Formulas are proposed to assess satellite orbits more precisely without recourse to the coordinates of terrestrial points. The experimental verification of the formulas applied to a model is discussed. S.D.

A75-30830 Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Conference sponsored by the Remote Sensing Society. Edited by W. G. Collins and J. L. Van Genderen. Birmingham, University of Aston, 1974. 152 p.

The fundamentals of remote sensing of the earth are considered along with the principles of optical planning systems and nonimaging remote sensing systems. Passive microwave radiometry and its potential application to earth resources survey are discussed and a description is given of radar terrain properties. Attention is also given to the camera's role in remote sensing from space.

Individual items are announced in this issue. G.R.

A75-30831 # Fundamentals of remote sensing of the earth. S. L. Entres (Department of Trade and Industry, Space Div., London, England). In: Fundamentals of remote sensing; Proceedings of the First Technical Session, London, England, February 13, 1974. Birmingham, University of Aston, 1974, p. 1-45. 7 refs.

The technology of remote sensing and issues affecting its use are discussed. After a brief explanation of the nature of remote sensing, the radiative manifestations of the earth scene and the degrading effects of the atmosphere on electromagnetic radiation passing through it are dealt with. The constituent elements of an integrated remote sensing system for earth survey are indicated for the case of image data acquisition from a space platform. A survey of the major types of imaging and non-imaging sensors follows, covering the photographic camera, the television camera, the optical scanner, the absorption spectrometer, the microwave radiometer and microwave radar. Furthermore, the modulation transfer function is introduced as an objective indicator of image quality. After a brief look at the various types of platform from which remote sensing of the earth may be performed, the earth view open to observers at different heights is investigated and reference is made to the manner in which the type of satellite orbit influences the observation. (Author)

A75-31008 # Space methods and means for studying the natural resources of the earth (Kosmicheskie metody i sredstva dlia issledovaniia prirodnykh resursov zemli). A. V. Gankevich. In: Utilization of space technology for applied goals (Ispol'zovanie kosmicheskoi tekhniki v prikladnykh tseliakh). Moscow, Izdatel'stvo VINITI (Raketostroenie. Volume 4), 1974, p. 87-218. 231 refs. In Russian.

Equipment and methods are reviewed, which are used in researching the earth's natural resources and in environmental control with the aid of spacecraft and aircraft. The advantages of remote sensing of the earth from space are argued. The general features of the American program for earth resource studies are described, with discussion of the ERTS automatic satellites and the Skylab piloted orbital station and instruments employed in them. P.T.H.

A75-31576 Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings (I satellite per la meteorologia e le risorse terrestri - Tecnologie speciali - Collaborazione Internazionale; Convegno Internazionale sullo Spazio, 14th, Rome, Italy, March 18-20, 1974, Atti). Symposium sponsored by the Ministero degli Affari Esteri and Associazione Industrie Aerospaziali. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974. 449 p. In Italian, English, and French.

An aerial survey of the Italian territory related to earth resources and pollution control studies is considered along with the TERRA project. Other topics examined are related to the technological aspects of aerospace vehicles and to space applications to meteorology. Space applications to earth resources are discussed, taking into account the digital evaluation of ERTS-1 data over the Italian peninsula, additive viewing as an interpretative technique, and the development of remote sensing. Attention is also given to studies related to the utilization of solar energy. G.R.

A75-35365 * # Weather support for the Earth Resources Technology Satellite. W. P. Moore (NOAA, National Weather Service, Camp Springs, Md.), K. M. Nagler (NOAA, National Weather Service, Silver Spring, Md.), and P. L. Smith (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 70-73.

The operational plans for ERTS include cloud-cover forecasting as a means of preventing the limited lifetime of the spacecraft's tape recorder to be used up on useless imagery. Each day, a forecast of the cloud cover is prepared for all land areas beneath the satellite's track and some adjacent ocean areas for each of the next day's 14 passes. The forecasts are transmitted by facsimile to the ERTS Operations Control Center at 4:00 p.m. each day, where they are used to plan the next day's operations. The forecasting techniques employed are described. V.P.

A75-35394 # Comparison of three iterative methods for inverting the radiative transfer equation. G. D. Alexander (U.S. Army, Atmospheric Sciences Laboratory, White Sands Missile Range, N. Mex.). In: Conference on Aerospace and Aeronautical Meteorology, 6th, El Paso, Tex., November 12-15, 1974, Preprints. Boston, Mass., American Meteorological Society, 1974, p. 231-238.

The characteristics of the minimum information method, Smith's direct method, and Duncan's modification of the direct method are examined which are used to retrieve the vertical temperature profile from the radiant intensity measurements. The frequency response, information on the sensitivity to the initial guess profile, and rates of convergence are obtained for each method. It is shown that Duncan's modification of Smith's direct method reduces substantially the number of iterations required for convergence and that all of the methods tend to eliminate fourth and higher order harmonic components in the true profile. S.D.

A75-36822 Flight planning for stereo radar mapping. L. C. Graham (Goodyear Aerospace Corp., Litchfield Park, Ariz.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 513-527.

Pairs of terrain imaging radar images may be viewed and measured stereoscopically to obtain elevation data for topographic mapping. An analysis of the technical and economic considerations in selecting flight parameters for mapping projects is presented here. Both parallel and right-angle flightpaths are considered. The results indicate that systems as presently constituted have the potential to

produce data adequate for orginal medium scale mapping, and that the right-angle mode is superior to the parallel flightpath mode under the assumptions made if psychophysical difficulties in image fusion are not encountered. (Author)

A75-36832 Some aspects of photographic flight planning for the orthophoto technique. H. Schoeler (Jenoptik Jena GmbH, Jena, East Germany). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 692-696.

Reasons for unsharp zones in orthophotos are discussed in order to find an effective way of eliminating them. It is shown that with an adequate orientation of the flight line as a function of the earth's surface, the given estimates make it possible to determine the necessary forward and side overlaps according to the quality parameters of orthophoto maps. S.D.

A75-36840 Diplomatic and legal aspects of remote sensing. R. F. Stowe (U.S. Department of State, Office of the Legal Advisor, Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 791-796.

Initiation of experiments in remote sensing of the earth's natural environment from outer space has intensified interest in the international community in developing additional organizational and legal guidelines for such activity. Several proposals to require the prior consent of states before data about their natural resources can be disseminated have been put forward. On the other hand, the United States in particular has urged that a system of open dissemination is far more likely to promote the common good, and that the proposed restrictions could seriously impair the entire remote sensing program. States favoring restrictions on dissemination argue principally that their control over their own natural resources may be undermined by publication of information about those resources, and that their national security may be threatened by the revelation of military and economic data. Negotiations are continuing in the United Nations where attempts to resolve these differing concerns are the focus of debate in the Outer Space Committee and its subdivisions. (Author)

A75-37341 * System trades for the SEOS telescope. M. Ritter (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Effective systems integration and optical design; Proceedings of the Seminar, San Diego, Calif., August 21-23, 1974.
Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 104-108.

The Synchronous Earth Observation Satellite (SEOS) is a geostationary system which provides unique possibilities for earth surveillance. Questions of SEOS applications are considered, taking into account the employment of the Large Earth Survey Telescope. Aspects of performance and costs are examined. The generation of a value function in connection with a quantitative ranking of the applications is discussed along with an analysis performed to determine those parameter values which will maximize mission performance capability at given levels of system cost. G.R.

A75-38548 Landsats - Spacecraft exploring earth. R. Edgar. *Spaceflight*, vol. 17, Aug.-Sept. 1975, p. 312-322.

Landsat 1 and 2 (formerly Earth Resources Technology Satellites) were launched by two-stage thrust-augmented Delta 900 DSV-3N-1 rockets to evaluate technology involved in the remote sensing of earth resources. The spacecraft structure, attitude control subsystem, solar array paddles, truss structure, sensory ring, and payload (including the Return Beam Vidicon /RBV/ camera subsystem) are described in detail. The Landsat Multispectral Scanner Subsystem (MSS) is a 4-band scanner imaging the earth in the four spectral bands simultaneously. Landsat information is coordinated with that from the Skylab EREP, aircraft imagery and other sources in the USGS Earth Resources Observation Systems program. The vast amount of knowledge that has come out of Landsat has direct applications to the studies of: agriculture, land use, forestry, geology, mineral and land resources, marine resources, meteorology, environment and cartography. M.G.

N75-22192*# Environmental Research Inst. of Michigan, Ann Arbor.
SOME ECONOMIC BENEFITS OF A SYNCHRONOUS EARTH OBSERVATORY SATELLITE Final Report, 30 Jun. - 30 Sep. 1974
R. K. Battacharyya (ECON, Inc.), J. S. Greenberg (ECON, Inc.), D. S. Lowe, and I. J. Sattinger Sep. 1974 145 p refs Prepared jointly with ECON, Inc.
(Contract NAS5-20021)
(NASA-CR-143636; ERIM-107400-3-F) Avail: NTIS HC $5.75 CSCL 22B

An analysis was made of the economic benefits which might be derived from reduced forecasting errors made possible by data obtained from a synchronous satellite system which can collect earth observation and meteorological data continuously and on demand. User costs directly associated with achieving benefits are included. In the analysis, benefits were evaluated which might be obtained as a result of improved thunderstorm forecasting, frost warning, and grain harvest forecasting capabilities. The anticipated system capabilities were used to arrive at realistic estimates of system performance on which to base the benefit analysis. Emphasis was placed on the benefits which result from system forecasting accuracies. Benefits from improved thunderstorm forecasts are indicated for the construction, air transportation, and agricultural industries. The effects of improved frost warning capability on the citrus crop are determined. The benefits from improved grain forecasting capability are evaluated in terms of both U.S. benefits resulting from domestic grain distribution and U.S. benefits from international grain distribution. Author

N75-22845 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF A CLOSED SYSTEM OF ENERGY AND MASS EXCHANGE EQUATIONS FOR CALCULATING THE BIOMASS OF FARM CROPS
O. D. Sirotenko and A. P. Boyko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 94-106 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 78-87

A closed system of ordinary and parabolic differential equations was investigated which, when integrated for the known values of standard meteorological variables, can calculate the biomass of crop fields as a function of time during vegetative development period. The model was designed for solving the theoretical and applied problems connected with estimating the agrometeorological conditions of harvest growth. The sorption isotherm was used as the boundary condition at the soil surface for the water transport equations, and an analytical expression for the function describing the intensity of water absorption by plant roots was obtained. Author

N75-22881*# Cornell Univ., Ithaca, N.Y. Div. of Atmospheric Sciences.
PHENOLOGY SATELLITE EXPERIMENT Final Report
Bernard E. Dethier, Principal Investigator Oct. 1974 781 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21781)
(E75-10270; NASA-CR-142679) Avail: NTIS HC $17.25 CSCL 08F

N75-22895# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCISE HANDBOOK ON SURVEYS FOR GRID CONSTRUCTION (SELECTED CHAPTERS)
N. N. Severyanov 24 Jan. 1975 143 p refs Transl. into ENGLISH from the monograph "Kratkii Spravochnik po Izyskan-

iiam. dlya Lineinogo Stroitelstva" Leningrad, 1972 p 25-34, 45-76, 86-107, 166-187
(AD-A007173; FTD-HC-23-1542-74) Avail: NTIS CSCL 08/2

Problems of field surveying are discussed, along with aerial methods of survey and geological engineering surveys. GRA

N75-24075# Canada Centre for Remote Sensing, Ottawa (Ontario).
TOWARDS A CANADIAN POLICY ON REMOTE SENSING FROM SPACE, A SPECIAL REPORT TO THE CANADIAN ADVISORY COMMITTEE ON REMOTE SENSING
31 May 1974 18 p
(PB-238846/0) Avail: NTIS HC $3.25 CSCL 08G

Discussed are the development of a remote sensing program; Canadian government, industry and university;capability; and basic program alternatives. GRA

N75-24076# Canadian Advisory Committee on Remote Sensing, Ottawa (Ontario).
THE CANADIAN ADVISORY COMMITTEE ON REMOTE SENSING, 1973 REPORT
1973 185 p refs
(PB-238848/6) Avail: NTIS HC $7.00 CSCL 08G

The Canadian Advisory Committee on Remote Sensing (CACRS) was established in January 1972 to effect the development of a national program of remote sensing. Covered are reports of working groups and recommendations of CACRS. GRA

N75-25270*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NINETEEN HUNDRED SEVENTY THREE SIGNIFICANT ACCOMPLISHMENTS
Nov. 1974 91 p refs
(NASA-TM-X-66863; JSC-09244) Avail: NTIS HC $4.75 CSCL 08B

Data collected by the Skylab remote sensing satellites was used to develop applications techniques and to combine automatic data classification with statistical clustering methods. Continuing research was concentrated in the correlation and registration of data products and in the definition of the atmospheric effects on remote sensing. The causes of errors encountered in the automated classification of agricultural data are identified. Other applications in forestry, geography, environmental geology, and land use are discussed. Author

N75-26481*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AVIATION'S ROLE IN EARTH RESOURCES SURVEYS
C. A. Syvertson and Donald R. Mulholland Aug. 1972 33 p refs
(NASA-TM-X-62436; A-6081) Avail: NTIS HC $3.75 CSCL 08G

The role of satellites designed to make a wide variety of earth observations is discussed along with the renewed interest in the use of aircraft as platforms for similar and complementary earth resources surveys. Surveys covering the areas of forestry, agriculture, hydrology, oceanography, geology, and geography are inculude. Aerials surveys equipped for nonphotographic remote sensing and aircraft flights synchronized with satellite observations to provide correlated data are discussed. Photographs are shown to illustrate preliminary results from several of the test sites. Author

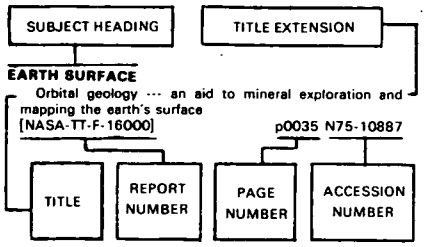
N75-27535*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: NON-US STANDARD CATALOG NO. N-33
31 May 1975 140 p
(NASA-TM-X-72439) Avail: NTIS HC $5.75 CSCL 05B

A catalog used for dissemination of information regarding the availability of LANDSAT imagery is presented. The Image Processing Facility of the Goddard Space Flight Center, publishes a U.S. and a Non-U.S. Standard Catalog on a monthly schedule, and the catalogs identify imagery which has been processed and input to the data files during the referenced month. The U.S. Standard Catalog includes imagery covering the continental United States, Alaska and Hawaii; the Non-U.S. Catalog identifies all the remaining coverage. Imagery adjacent to the continental U.S. and Alaska borders is included in the U.S. Standard Catalog. Author

N75-27545# Massachusetts Univ., Amherst. Water Resources Research Center.
USE OF ECONOMIC-ENVIRONMENTAL INPUT-OUTPUT ANALYSIS FOR COASTAL PLANNING WITH ILLUSTRATION FOR THE CAPE COD REGION
Dennis M. King and David A. Storey 1974 82 p refs
(Contract DI-14-31-0001-3821)
(PB-240918/3; PUB-40; W75-06299; OWRT-A-046-MASS(1)) Avail: NTIS HC $4.75 CSCL 05C

The basic problem in coastal zone management is to determine how the limited set of coastal land and water resources should be allocated among a number of competing human uses or activities. The application of input-output analysis to the coastal zone resources planning process was investigated. The input-output model provides a potential method of displaying within a single framework the economic and environmental impacts of a change in the mix of coastal activities and of displaying tradeoffs between economic and environmental objectives. The economic portions of the model are given empirical content for shoreline activities within a specific planning region, the Cape Cod area of Massachusetts. GRA

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section (of this supplement). If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

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[ONERA, TP NO. 1975-49] p0159 A75-30010

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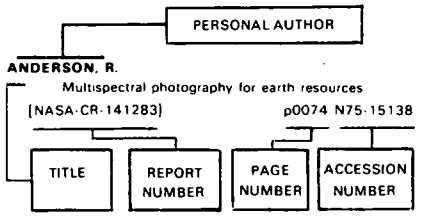

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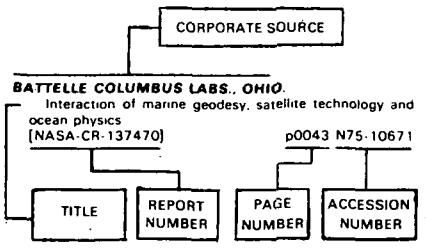

The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

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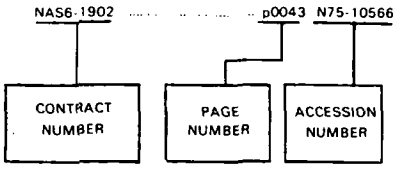

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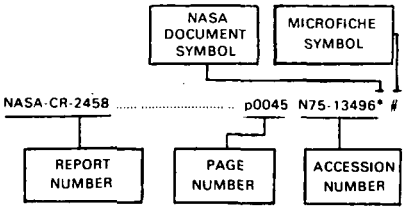

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