ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)       N85-29910 – N85-36162

IAA (A-10000 Series)         A85-39961 – A85-50132

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EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

Issue 48

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between October 1 and December 31, 1985 in

- Scientific and Technical Aerospace Reports (STAR)
- International Aerospace Abstracts (IAA).
This supplement is available as NTISUB/038/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $14.50 domestic; $29.00 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
INTRODUCTION

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

This literature survey lists 326 reports, articles, and other documents announced between October 1 and December 31, 1985 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 include the original accession numbers from the respective announcement journals.

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

IAA entries identified by accession number series A85-10.000 in ascending accession number order;
STAR entries identified by accession number series N85-10.000 in ascending accession number order.

After the abstract section, there are seven indexes:

subject, personal author, corporate source, foreign technology, contract number, report/accession number, and accession number.
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EARTH RESOURCES

A Continuing Bibliography (Issue 48)

JANUARY 1986

AGRICULTURE AND FORESTRY

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

A85-41350

L Guyot and J-P. Poupard (Institut Geographique National, Departement de Teledetection, Saint-Mande, France) Societe Francaise de Photogrammetrie et de Teledetection (ISSN 0244-6014), no. 97, 1985, p. 19-40 In French. refs

A thematic simulation was made of projected soil mapping scans with the SPOT instruments under development. The study was targeted at testing the usefulness of SPOT imagery for classifying land usage, e.g., agriculture, forests, prairies, etc. The study was extended to multitemporal images. Sample images were collected using airborne instrumentation to radiometrically scan a 9 km long scene from 6 km altitude with a scan path 35 deg on either side of the vertical. Attention was given to the effects of the view angle, the level of scene illumination, and directional reflectivity. Various previously identified agricultural crops were scanned in different growth stages. Successful classifications were achieved only with multiple images, at specific times of the year, and by trained personnel who were familiar with the airborne imagery.

M.S.K.

A85-42865*
SPÉCULAIRE, DIFFUSE, AND POLARISÉE LIGHT SCATTERED BY TWO WHEAT CANOPIES V. C. VANDERBILT, L. GRANT, L. L BIEHL, and B F ROBINSON (Purdue University, West Lafayette, IN). Applied Optics (ISSN 0003-6935), vol. 24, Aug. 1, 1985, p. 2408-2418. refs

Using polarization measurements, the reflectance factor of two wheat canopies is divided into components due to specularly and diffusely reflected light. The data show that two key angles may be predicted, the angle of the polarizer for minimum flux and the angle of incidence of sunlight specularly reflected by a leaf to a sensor. The results show that specular reflection is a key aspect to radiation transfer by two canopies. Results suggest that the advent of heading in wheat may be remotely sensed from polarization measurements of the canopy reflectance.

Author

A85-43114*

Directional reflectance factors that spanned the entire extant hemisphere were collected on the ground throughout the morning period for common cover types in Tunisia, Africa. NOAA 7/8 AVHRR bands (0.58-0.68 microm) and 2 (0.7301 microm) were used in data collection. The cover types reported were a plowed field, annual grassland, steppe grassland, hard wheat, salt plain, and irrigated wheat. Several of these cover types had geometrical structures that are extreme as compared to those reported in the literature. Comparisons were made between the dynamics of the observed reflectance distributions and those reported in the literature. It was found that the dynamics of the measured data could be explained by a combination of soil and vegetation scattering components. The data and analysis further validated physical principles that cause the reflectance distribution dynamics as proposed by field and simulation studies in the literature. Finally, the normalized difference transformation (Band 2 - Band 1) /(Band 1)
A85-43120

VIEW AZIMUTH AND ZENITH, AND SOLAR ANGLE EFFECTS ON WHEAT CANOPY REFLECTANCE

M. SHIBAYAMA and C. L. WIEGAND (USDA, Remote Sensing Research Unit, Weslaco, TX) Remote Sensing of Environment (ISSN 0034-4257), vol. 18, Aug. 1985, p. 91-103. refs

The present study was conducted with the objective to develop a simple model to describe bidirectional characteristics of canopy reflectance. The model is needed to estimate the reflectance factor at nadir view position from off-nadir measurements. This capability would be especially helpful to handheld radiometer users when it is difficult to enter plots or fields for nadir view measurements. Spectral measurements were made at a research farm in 1984 over two canopies of hard red spring wheat. Results were obtained for the near infrared (NIR) in the range from 0.76 to 0.90 micron, and the visible region in the range from 0.63 to 0.69 micron. It was found that within experiments, at least, the simple model considered may provide an effective tool for adjusting off-nadir looking reflectance data for crop canopies.

G.R.

A85-45690* California Univ., Berkeley.

EVALUATION OF THEMATIC MAPPER DATA FOR MAPPING FOREST, AGRICULTURAL AND SOIL RESOURCES

S. DEGLORIA, A. BENSON, K. DUMMER (California, University, Berkeley), and E. FAKHOURY (California, University, Davis) (COSPAR, Plenary Meeting, 25th Workshop II on the Earth's Surface Studied from Space, Graz, Austria, June 25-July 7, 1984) Advances in Space Research (ISSN 0273-1177), vol. 5, no. 5, 1985, p. 31-39. refs

(Contract NASS-27377, NCC2-205)

Color composite TM film products which include TM5, TM4, and TM3, and one band (TM1, TM2, or TM3) are superior to composites which exclude TM4 for discriminating most forest and agricultural cover types and estimating area proportions for inventory and sampling purposes. Clustering a subset of TM data results in a spectral class map which groups diverse forest cover types into spectrally and ecologically similar areas suitable for use as a stratification base in traditional forest inventory practices. Analysis of simulated Thematic Mapper data indicate that the location and number of TM spectral bands are suitable for detecting differences in major soil properties and characterizing soil spectral curve form and magnitude.

Author

A85-45691* Maryland Univ., College Park.

SHORTWAVE INFRARED DETECTION OF VEGETATION

S. N. GOWARD (Maryland, University, College Park). (COSPAR, Plenary Meeting, 25th: Workshop II on the Earth's Surface Studied from Space, Graz, Austria, June 25-July 7, 1984) Advances in Space Research (ISSN 0273-1177), vol. 5, no. 5, 1985, p. 41-50. refs

(Contract NCCS-20; NCCS-26)

Shortwave infrared sensors were included on the Thematic Mapper (TM) to observe vegetation reflected radiance patterns related to water leaf content. Analysis of field measurements for corn and soybeans throughout the growing season showed that shortwave infrared measurements enhance discrimination between the species, particularly in midseason. A numerical model of the canopy reflectance showed that differential leaf absorbance can provide a better statistical measure than analysis of coincident studies of leaf optical properties were conducted to generalize the results to other types of vegetation.

I.H.

A85-45872

EVALUATION OF SIMULATED SPOT IMAGERY FOR THE INTERPRETATION OF AGRICULTURAL RESOURCES IN CALIFORNIA

S. D. DEGLORIA (California, University, Berkeley) Photogrammetric Engineering and Remote Sensing (ISSN 0034-4257), vol. 51, Aug. 1985, p. 1103-1108 Research supported by the University of California. refs

Simulated SPOT data were acquired over a diverse agricultural site in the Central Valley of California for assessing the potential utility of these data for discriminating multiple crop types and agronomic conditions. Ground data and low altitude oblique photography were acquired coincidently with the SPOT data acquisition. Ground data included crop type, percent crop canopy and crop residue cover, canopy and crop residue height, irrigation and cultivation practices, and dominant land use for selected individual fields and tracts. The range in field size is from less than 1.0 hectare to greater than 80 hectares. Analysis of the P site data set in image format has yielded the following significant results: (1) the panchromatic data sampled to 10 m IFOV pixels permit the definition of inter- and intra-field boundaries, road networks, and water distribution systems; and (2) the multispectral data sampled to 20 m IFOV pixels permit (a) the discrimination of selected crop canopies having less than 20 percent ground cover, and (b) the discrimination of within-field variability due to irrigation and fertilization practices, soil type, and type and degree of harvesting practices.

Author

A85-47806* California Univ., Berkeley.

INTERPRETATION OF LANDSAT-4 THEMATIC MAPPER AND MULTISPECTRAL SCANNER DATA FOR FOREST SURVEYS

A. S. BENSON and S. D. DEGLORIA (California, University, Berkeley) Photogrammetric Engineering and Remote Sensing (ISSN 0034-4257), vol. 51, Sept. 1985, p. 1281-1289. refs

(Contract NAS5-27377)

Landsat-4 Thematic Mapper (TM) and Multispectral Scanner (MSS) data were evaluated by interpreting film and digital products and statistical data for selected forest cover types in California. Significant results were: (1) TM color image products should contain a spectral band in the visible (bands 1, 2, or 3), near infrared (band 4), and middle infrared (band 5) regions for maximizing the interpretability of vegetation types; (2) TM color compositions should contain band 4 in all cases even at the expense of excluding band 5; and (3) MSS color composites were more interpretable than TM color composites for certain cover types and for all cover types when band 4 was excluded from the TM composite.

Author

A85-49104* State Univ of New York, Binghamton

TWO-DIMENSIONAL LEAF ORIENTATION DISTRIBUTIONS

D. E. STREBEL (Science Applications Research, Greenbelt, MD), N. S. GOEL (New York, State University, Binghamton), and K. J. RANSON (Purdue University, West Lafayette, IN) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-23, Sept. 1985, p. 640-647. refs

(Contract NAS9-16528)

Combined inclination/azimuth leaf angle distributions are important for accurate models of vegetation canopy reflectance. It is shown that appropriate mathematical representations can be constructed from beta distributions under most circumstances. This is illustrated by analyzing observational data on soybean leaves and balsam fir needles. There are some problems when the data is imprecise and when correlations between inclination and azimuth
angle are induced by heliotropism. Otherwise, the two-dimensional beta-type distribution appears to be a versatile tool for describing the wavelength of incident flux. The model treats incoherent multiple scattering from Lambertian facets distributed on a periodic boundary. Validation of the model was carried out using measured directional reflectance data for two canopies exhibiting typical anisotropic scattering properties of the soil; (2) the geometric effect of the vegetation probability gap function on the soil anisotropy and solar irradiance; and (3) the anisotropic scattering of vegetation leaves. The application of the theoretical results to the development of earth-observing sensor systems is discussed.

A85-49108* State Univ of New York, Binghamton.
EVALUATION OF A CANOPY REFLECTANCE MODEL FOR LAI ESTIMATION THROUGH ITS INVERSION
A technique for estimating leaf area indices (LAI's) based on bidirectional canopy reflectance (CR) data is applied to three plant canopies: a naturally growing healthy soybean canopy, and a clumped and tufted orchardgrass canopy, respectively. The CR data were collected using a PARABOLA instrument which is capable of acquiring complete sky-and-ground looking hemispheres in 11 seconds. The model fit and LAI estimates were good for the soybean and clumped orchardgrass canopies, but poor for the tufted orchardgrass canopy when the maximum zenith angle was less than 50 percent. It is shown that the biophysical parameter estimation based on CR measurements applied well to homogeneous herbaceous vegetation types, while better CR models are needed to adequately represent discontinuous plant canopies.

A85-49109* George Washington Univ., Washington, D.C.
MICROWAVE INVERSION OF LEAF AREA AND INCLINATION ANGLE DISTRIBUTIONS FROM BACKSCATTERED DATA
(Contract NAG5-265)
The backscattering coefficient from a slab of thin randomly oriented dielectric disks over a flat lossy ground is used to reconstruct the inclination angle and area distributions of the disks. The disks are employed to model a leafy agricultural crop, such as soybeans, in the L-band microwave region of the spectrum. The distorted Born approximation, along with a thin disk approximation, is used to obtain a relationship between the horizontal-like polarized backscattering coefficient and the joint probability density of disk inclination angle and disk radius. Assuming large skin depth reduces the relationship to a linear Fredholm integral equation of the first kind. Due to the ill-posed nature of this equation, a Phillips-Twomey regularization method with a second difference smoothing condition is used to find the inversion. Results are obtained in the presence of 1 and 10 percent noise for both leaf inclination angle and radius densities.

A85-49110* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELING THE RADIANT TRANSFERS OF SPARSE VEGETATION CANOPIES
The scattering dynamics of sparse vegetation canopies were studied within the framework of the three-dimensional radiative transfer model of Kimes (1984). The model was upgraded by including an algorithm for the anisotropic scattering of a soil boundary. Validation of the model was carried out using measured directional reflectance data for two canopies exhibiting typical scattering behavior with low and intermediate vegetation density. The canopies were: an orchard grass canopy; and a hard wheat canopy. A number of factors were found contributing to the final reflectance distribution of the canopies, including: (1) the strong anisotropic scattering properties of the soil; (2) the geometric effect of the vegetation probability gap function on the soil anisotropy and solar irradiance; and (3) the anisotropic canopy angle and disk radius, which is controlled by the phase function and the layering of leaves. The application of the theoretical results to the development of earth-observing sensor systems is discussed.

A85-49105 REMOTE SENSING OF ANGULAR CHARACTERISTICS OF CANOPY REFLECTANCES
The effect of the atmosphere on the remotely sensed angular distribution of canopy reflectance is studied by radiative transfer calculations with a coupled atmosphere canopy model and a pure atmosphere model. The canopy in the pure atmosphere model was replaced by an equivalent bidirectional reflectance distribution function (BRDF). In the decoupled model the canopy model was used to compute canopy equivalent BRDFs. The atmospheric perturbation of the angular reflectance pattern is computed for a Lambertian BRDF, a mixed Lambertian/specular BRDF, and the measured BRDFs of savannah and coniferous canopies using one aerosol-free and two polluted atmospheres with surface visual ranges of V(0) = 23 km and V(0) = 5 km. It is shown that the local extremes in the angular distribution of the surface reflectance were still detectable above the atmosphere and were nearly invariant to atmospheric perturbations for surface albedos greater than 10 percent. It is suggested on the basis of the numerical results that off-nadir satellite observations may contribute additional information for crop identification.

A85-49106* Nebraska Univ., Lincoln.
CONTRASTS AMONG BIDIRECTIONAL REFLECTANCE OF LEAVES, CANOPIES, AND SOILS
J. M. NORMAN, E. A. WALTER (Nebraska, University, Lincoln), and J. M. WELLES (Li-Cor, Inc., Lincoln, NE) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-23, Sept. 1985, p. 659-667. Research supported by the University of Nebraska. refs
(Contract NAG5-2777; NCT-28-004-801, NASA ORDER S-19563-D)
Simple models are presented for predicting the bidirectional reflectance distribution functions (BRDFs) for soils and plant canopies viewed from various directions. BRDFs are predicted for bare soil, individual leaves, and plant canopies, and the results are compared with measurements and a three coefficient empirical equation. BRDF measurements for corn and soybean leaves are presented to contrast with canopy and soil distributions. Estimates of the soil, canopy, and leaf BRDFs are combined into a model called Cupid to predict BRDFs for complex natural surfaces.

A85-49107* Colorado State Univ., Fort Collins.
A MONTE CARLO REFLECTANCE MODEL FOR SOIL SURFACES WITH THREE-DIMENSIONAL STRUCTURE
(Contract NAG5-270)
A Monte Carlo soil reflectance model has been developed to study the effect of macroscopic surface irregularities larger than the wavelength of incident flux. The model treats incoherent multiple scattering from Lambertian facets distributed on a periodic surface. Resulting bidirectional reflectance distribution functions are non-Lambertian and compare well with experimental trends reported in the literature. Examples showing the coupling of the Monte Carlo soil model to an adding bidirectional canopy of reflectance model are also given.
A geometric-optical model of a conifer forest canopy was constructed to describe the variance of a remotely-sensed image of a forest stand. The model is driven by interpixel variance generated from three sources: (1) the number of crowns in the pixel; (2) the size of the individual crowns; and (3) the overlapping shadowing of a tree and its shadow is described as a cone using parallel-ray geometry. The model can also be inverted to provide estimates of the size, shape and spacing of the trees using remotely-sensed imagery and a minimum of ground measurements. The results of field tests using 10-meter and 80-meter multispectral imagery of two test conifer stands in northeastern California are presented. It is shown that the model produces reasonable estimates for the geometric parameters of the stand and appears to be sufficiently robust for application to other geometric shapes corresponding to different types of vegetation.

 Autor

PLANT CANOPY SPECULAR REFLECTANCE MODEL

A model is derived for the amount of light specularly reflected and polarized by a plant canopy. The model is based on the morphological and phenological characteristics of the canopy and upon the Fresnel equations of optics. The theory demonstrates that the specular reflectance of the plant canopy is a function of the angle of incidence and potentially contains information to help discriminate between species. The theory relates the specular reflectance to botanical condition of the canopy - to factors such as development stage, plant vigor and leaf area index (LAI).

 Autor

INCLUSION OF SPECULAR REFLECTANCE IN VEGETATIVE CANOPY MODELS

A detailed comparison of the observed soybeans and corn canopy reflectance with that calculated from three vegetative canopy reflectance models have shown systematic angular deviations. A likely cause of these effects is noninclusion of leaf specular reflectance. In this paper a formulation is presented to calculate the component of leaf specular reflectance as a function of incident solar and view zenith angles, leaf area index, leaf angle distribution, and leaf specular reflectance has been developed. The SAIL model has been modified to include this component and the results are compared with an extensive observational data set on soybeans. It is shown that the systematic differences between the SAIL model and observations dependent on scattering azimuth are removed. An analysis of variance shows model improvement of 30 percent over the uncorrected SAIL model.

 Autor

A COMPARISON BETWEEN ACTIVE AND PASSIVE SENSING OF SOIL MOISTURE FROM VEGETATED TERRAINS
A K FUNG (Texas A&M University, College Station, TX) and H J EOM (Illinois Institute of Technology, Chicago) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol GE-23, Sept. 1985, p. 765-775. Previously announced in STAR as N85-13364

A comparison between active and passive sensing of soil moisture over vegetated areas is studied via scattering models. In active sensing three contributing terms to radar backscatter can be identified: (1) the ground surface scatter term; (2) the volume scatter term representing scattering from the vegetation layer; and (3) the surface volume scatter term accounting for scattering from both surface and volume. In emission three sources of contribution can also be identified: (1) surface emission; (2) upward volume emission from the vegetation layer; and (3) downward volume emission scattered upward by the ground.
surface. As ground moisture increases, terms (1) and (3) increase due to increase in permittivity in the active case. However, in passive sensing, term (1) decreases but term (3) increases for the same reason. This self-compensating effect produces a loss in sensitivity to change in ground moisture. Furthermore, emission from vegetation may be larger than that from the ground. Hence, the presence of vegetation layer causes a much greater loss of sensitivity to passive than active sensing of soil moisture. M. G.


Avail NTIS HC A04/MF A01 CSCL 22B

Forest fires in the taiga can be detected and forecasted by meteorological satellites. A new method of predicting natural disasters was developed. The radiofrequency heat radiation of sectors of soil with different moisture contents differs sharply from each other. The water-content limit below which mosses, peat mosses and grasses become subject to combustion are well-known. A microwave radiometer was developed and proved suitable for determination of the moisture content of soil. This instrument is at present only installed on airplanes. Meteorological satellites will be equipped with the instrument.

E A K

N85-31604# National Aeronautics and Space Administration, Washington, D. C. INFLUENCE OF SPATIAL VARIABILITY OF HYDRAULIC CHARACTERISTICS OF SOILS ON SURFACE PARAMETERS OBTAINED FROM REMOTE SENSING DATA IN INFRARED AND MICROWAVES


NASA-TM-77902, NASA 1.1577902, Avail. NTIS HC A02/MF A01 CSCL 08M

The correct interpretation of thermal and hydraulic soil parameters inferred from remotely sensed data (thermal infrared, microwave) implies a good understanding of the causes of their temporal and spatial variability. Given this necessity, the sensitivity of the surface variables (temperature, moisture) to the spatial variability of hydraulic soil properties is tested with a numerical model of heat and mass transfer between bare soil and atmosphere. The spatial variability of hydraulic soil properties is taken into account in terms of the scaling factor. For a given soil, the knowledge of its frequency distribution allows a stochastic use of the model. The results are treated statistically, and the part of the variability of soil surface parameters due to that of soil hydraulic properties is evaluated quantitatively.

Author


Avail. NTIS HC A08

The data from multiband video images made from space is distorted by the atmosphere, the optical parameters of which fluctuate around average values and are generally unknown. The mean statistical error in determining the brightness ratio of a target object at two different wavelengths is determined from measurements at 0.63 and 0.57 micrometers for the cities Krasnoyarsk, Markovo, Riga, Omsk, Pechora and Gu'yev, with the average values of the optical thickness at these wavelengths and their dispersions being taken from astrometric station data. An analytical expression is derived for calculating the dispersion of this ratio. The maximum relative error reaches 10%, an amount which can be significant in research and practical applications.

Author


Avail. NTIS HC A08

Aerial photographs were taken from an AN-30 laboratory aircraft on July 27th, 1984 from about 2,500 m (scale of 1:20,000) with an MKF-6M camera during the Telefeto-80 experiment conducted within the framework of the Intercosmos program. The photos were interpreted to the following crops: corn, potatoes, beets, wheat, flax, meadow and pasture land, barley, oats, and rye and rape the area around the Polish villages of Kulm and Tsesazhovitse. The results of interpreting color photos of 119 fields near the former and 132 fields near the latter locations show (1) the natural colors of crops determined visually yield the same results for rye and wheat, corn and potatoes as well as meadow and pasture lands. The incorporation of an infrared analysis channel makes it possible to discriminate between corn and potatoes, and between rye and wheat. The average identification accuracy for individual agricultural crops ranged from 86 to 100% (with the exception of oats, which was only correctly identified 35% of the time, since it was incorrectly identified as flax because of the small number of fields).

Author


Avail. NTIS HC A08

Data from ground, aircraft and helicopter measurements of the spectral brightness coefficients of the Earth's surface which were obtained during 1976 to 1982 by the Institute of Astrophysics and Atmospheric Physics of the Estonian SSR Academy of Sciences, are used to compile a catalog of these brightness factors for the northwest portion of the European area of the USSR for all seasons of the year. Three wavelengths were used: 0.550, 0.675 and 0.795 micrometers. A classification system is developed for the mapping of the surface which is comparable to the land use and land cover scheme of Anderson, et al., and corresponds to the second level of this classification in terms of the degree of detail. Some 32 different classification categories were selected. The average values of the spectral brightness are summarized for these categories in tabular form for five periods of the year: winter, spring, summer, late summer and fall. The reliability of the catalog requires that the spectral brightness coefficients be supplemented with variation coefficients, however, there is still not sufficiently reliable data for this.

Author


Avail. NTIS HC A08

Data from aircraft measurements using the MKF-6 multiband camera and ground measurements of the phytometric parameters of winter wheat, e.g., the height, thickness, leaf surface area, phytomass dry and moist weight by volume, vegetative soil shading and other parameters for wheat in the Kherson test area in 1981,

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were subjected to regression analysis in order to determine the relationship between the remote measurements and ground measurements for the vegetation soil system. The regression analysis consisted in calculating the coefficients of the linear step by step regression, the correlation matrices and residual dispersion of the significant parameters. The findings are: (1) the inadequate precision in relating the aircraft and ground measurements to each other for the April phenophase resulted in considerable errors in the predictive model; (2) results were much better for the June phenophase when the ground data were better tied to the aircraft measurements; (3) very low correlation coefficients are noted between the denseness and the other parameters, and the results and brightnesses. The lack of sufficient statistical data does not now allow for an explanation; (4) a comparison of calculations based on single factor models, when the vegetation index and straight line distance was taken as the factor, showed that the results obtained for the straight line distance are substantially better.

Author

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.

A85-42579

ESTIMATION OF RURAL POPULATION IN KORDOFAN, SUDAN

Landsat RBV images are presented of the Sudan region, with attention focusing on stable sand dunes and clay plains. The images were gathered as part of a census of settlements. The black/white images are discussed with reference to ground-truth data for, e.g., typical reflectances of human habitants, wells, land surfaces, etc. Population densities were estimated from the size of a village area within the image relative to a preset density. A 0.9 correlation was established between estimates using the Landsat data and verified census tallies.

M.S.K.

A85-43375*

THE ORIGIN OF TEMPORAL VARIANCE IN LONG-LIVED TRACE CONSTITUENTS IN THE SUMMER STRATOSPHERE
P. G. HESS and J. R. HOLTON (Washington, University, Seattle) Journal of the Atmospheric Sciences (ISSN 0022-4928), vol. 42, July 1, 1985, p. 1455-1469, refs

(Task ATM-83-14111; NAGW-662)

Temporal variances in the concentrations of N2O, CF2Cl2, CFC13 and CH4 in the summer stratosphere at a midlatitude location have been measured by Ehhalt and others. A simple dynamical model is used to argue that these variances are created by irreversible mixing associated with the springtime final stratospheric warming. Tracer perturbations generated during the warming are advected passively in the zonal mean easterlies so that the tracer variance is effectively frozen into the summertime stratosphere. Temperature perturbations, on the other hand, are subject to radiative dissipation; the temperature variance created during the final warming relaxes quickly to an ambient value.

Author

A85-48571

SPOT SIMULATION IMAGERY FOR URBAN MONITORING - A COMPARISON WITH LANDSAT TM AND MSS IMAGERY AND WITH HIGH ALTITUDE COLOR INFRARED PHOTOGRAPHY

One advantage of a synoptic view displaying landform assemblages provided by imagery is that one can often identify geomorphic processes which have shaped the region and which may affect the habitability of the area over a human life time. Considering the continued growth of the world population and the resultant pressure and the exploitation of land, usually without any consideration given to geomorphic processes, it is imperative that we attempt to educate as large a segment of the population as we can about geomorphic processes and how they influence land use. Space platform imagery which exhibits regional landscapes can be used: (1) to show students the impact of geomorphic processes over relatively short periods of time (e.g., the Mount St. Helens lateral blast); (2) to display the effects of poor planning because of a lack of knowledge of the local geomorphic processes (e.g., the 1973 image of the Mississippi River flood around St. Louis, MO); and (3) to show the association of certain types of landforms with building materials and other resources (e.g., drumlins and gravel deposits).

G.L.C.

N85-34563/#

Canada Land Data Systems, Ottawa (Ontario) Lands Directorate.

APPLIED COMPUTER GRAPHICS IN A GEOGRAPHIC INFORMATION SYSTEM: PROBLEMS AND SUCCESSES

Aval: NTIS HC A19/MF A01

A geographic information system (GIS) reports and displays data which are referenced to geographic locations. As opposed to automated cartography, geographic information systems often have developed graphic output as an afterthought or secondary product. The Canada geographic information system, (CGIS) was designed with no graphic output capability, but now provides a variety of interactors and hard copy output, on a day-to-day basis. These graphics are applied to problems in land evaluation, land use monitoring, natural resource planning, wildlife habitat conservation, and so on. Three categories of graphic outputs in map form are required, interactive displays, working diagrams and publication quality diagrams. These are achieved by using remote interactive color and monochrome terminal, pen-and-ink jet plotters, vector-based plotting on a high quality drum plotter and the direct

A85-46249

AERIAL AND SPACE-BASED REMOTE SENSING IN ECOLOGICAL PROGNOSIS [AEROKOSMICHESKIE METODY V EKOLOGICHESKOM PROGNOZE]
B. V. VINOGRAODOV (AN SSSR, Institut Evoliutsionnoi Morfologii i Ekologi Zhivotnykh, Moscow, USSR) Phiroda (ISSN 0032-874X), July 1, 1985, p. 13-23 In Russian, refs

Ecological prognoses for large ecoregions can be made through the retrospective analysis of ecological tendencies in terms of coefficients of change with time and through extrapolation of the change into the future. The method depends on a comparison of periodically made photographs, obtained by aerial and space-based remote sensing equipment which permits the simultaneous monitoring of large regions. The details of the method are discussed including the optimal times between the photographing, the scale of imaging needed, and photointerpretation methods. The method is illustrated by particular examples of mathematical relationship, ranging widely in complexity. Equations are also given for finding the number of possible combinations of several ecosystems coexisting within large regions, and for the dynamics of such heterogeneous systems. The analysis described makes it possible to predict ecological catastrophes usually eight to sixteen years ahead, and thus to prepare anticipatory measures.

I.S.
production of publication quality color separates on a large format optical scanner with laser plotter capabilities. Author


FEDERAL MINERAL LAND INFORMATION SYSTEM Abstract Only 


Avail: NTIS HC A05/MF A01 

The U.S. Geological Survey is developing the Federal Mineral Land Information System (FMLIS), which will allow land managers, policy makers, and others to rapidly retrieve, display, and analyze mineral information on Federal lands at regional, State, and National levels. This capability is being developed in order to input, manipulate, analyze, and output digital data through a geographic information system (GIS). A GIS is a tool for integrating and analyzing spatial data functions with a GIS allow for changes in map scale and projection, data editing, registration and overlay, selection, retrieval, and display of data tabulation of acreages; and measurement of distances. In an interactive environment, the user can rapidly analyze data, examine alternatives, and test hypotheses. Author

N85-35542#  Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphare.

PROCEEDINGS OF METEOROLOGICAL MOTOR GLIDER (MEMO) WORKSHOP '84 

Jan. 1985 213 p refs Partly in ENGLISH and GERMAN Proc. held at Oberpfaffenhofen, West Ger., 1-5 Oct. 1985 Report will also be announced as translation (ESA-TT-945) (DFVLR-MITT-85-04; ISSN-0176-7739) Avail. NTIS HC A10/MF A01 

Motor glider meteorology and the history of motor gliders used for meteorological flight are reviewed. Vertical wind velocity determination using aircraft motion is discussed. Meteorological data from the Falcon aircraft and the ASK 16 motor glider are compared. Atmospheric boundary layer turbulence is investigated. Environmental meteorological data in urban areas are examined. The concept of Lagrangian partitioning was applied to turbulent energy transport. Horizontal and vertical structure of the boundary layer, and the energy budgets above rural and urban areas are treated. Lee circulation in a Foehn wind is studied. Meteorological measuring campaigns with instrumented motor gliders in Poland are reviewed. A data acquisition system for meteorological measurements onboard light aircraft is developed. Accuracy and error analysis of meteorological measuring data is considered. The principles of wind velocity measurements onboard research aircraft are presented.

N85-35549#  Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)

ENVIRONMENTAL-PHYSICAL MEASUREMENTS AND DETERMINATION OF ATMOSPHERIC TURBULENCE WITH THE ASK-16 MOTOR GLIDER [UMWELT-PHYSikalische MESSUNGEN UND ERFASSUNG ATMOPHÄISCHER TURBULENZ MIT DEM MOTORSEGLER ASK-16] 


Avail: NTIS HC A10/MF A01 

Meteorological motor glider flights are performed to determine environmental and atmospheric turbulence parameters. Temperature and humidity probes used in the project CLIMOD (climate modification) studying the effect of increasing urbanization and planned nuclear power plants with their cooling systems on the climate, and the results of the measurements and model calculations are discussed. Ozone in the lower troposphere due to the existence of smog reactions in the neighborhood of Zurich is investigated in ground stations and with two captive balloons; the regional ozone distribution was measured by motor gliders, the measurements strongly point at the Zurich agglomeration as the origin of the ozone-depleted air. The motions of motor gliders due to air flows are used to determine atmospheric turbulence in the wavelength domain between 10 and 100 m; the measurements confirm previous results: agreement between the measurements and a mathematical turbulence parameterization model is found. Author (ESA)

A85-40003* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GEODETIC AND GEOPHYSICAL RESULTS FROM Lageos 


Seven years of laser tracking of the Lageos spacecraft have been used to derive geodetic quantities describing the earth and its rotational motion. The dynamical motions of the solid-earth on its axis have been derived continuously since launch and changes in the length-of-day show very high correlation with variations in the atmospheric zonal winds between 1000 and 50 mbars. A significant improvement in the determination of the product of the earth's mass and the gravitational constant has been made. The high accuracy of the orbit determination of Lageos over the 7 years since launch has permitted the identification of a small deceleration in the nodal precession of the orbit. This deceleration is being caused by a small reduction in the flattening of the earth arising from the rebound of the earth after the last ice age. Measurements of the distances between the tracking stations over several years are showing changes consistent with tectonic plate motion and with general ideas of vertical movements. Author

A85-41199# FURTHER IMPROVEMENTS OF THE ORBITAL PROGRAM SYSTEM POTSDAM-5 AND THEIR UTILIZATION IN GEODETIC-GEODYNOMIC INVESTIGATIONS

G. GENDT (Deutsche Akademie der Wissenschaften, Zentralinstitut fuer Physik der Erde, Potsdam, East Germany) Nabludenia Iksusstvennykh Sputnikov Zemli, no. 23, 1984, p. 421-427. refs 

The program system POTSDAM-5 had been developed in the last years on the basis of POTSDAM-4. It is implemented on the computer EC 1040 and shall provide a model accuracy of some cm. This high precision can only be achieved by improvements of the reference system, force model and parameter estimation. 

03 GEODESY AND CARTOGRAPHY

Includes mapping and topography.
Results are presented using laser data for the determination of station coordinates, baselines and polar motion.

A85-41195#
CALIBRATION OF DOPPLER RECEIVERS

A summary of different methods used for the calibration of Doppler receivers is given. Using the observations of the second Doppler calibration campaign at the Satellite Geodetic Observatory in Penc, Hungary, a new concept is presented. Consideration is given to the investigation of receiver weight, receiver delay, the phase center, and to statistics of the single-point solutions. A standard procedure for the calibration of receivers for the optimal network determination with a multipoint solution and broadcast ephemera is proposed.

M.D.

A85-41199#
PRELIMINARY RESULTS OF FINNISH-HUNGARIAN DOPPLER OBSERVATION CAMPAIGN /FDODC/
A. CZBOR, J. ADAM, SZ. MIHALY, T. VASS (Satellite Geodetic Observatory, Penc, Hungary), T. PARM (Geodetic Institute, Helsinki, Finland) et al Nabludienia Iskusstvennykh Sputnikov Zemli, no 23, 1984, p 529-548. refs

The Finnish-Hungarian Doppler Observation Campaign, carried out in Finland during 13 days in August 1983, is discussed. It is shown that three Hungarian JMR-1A receivers and one Finnish JMR-4 receiver occupied 9 stations together with the first order Observatory, Penc, Hungary), T. PARM (Geodetic Institute, Helsinki, Finland) et al. The processing of the data, performed in SGO, Penc, using two different program systems, GEOOOP III and SADOSA, is described. The observation strategy and the results obtained by the two programs, as well as the S-transformations, are given. The data are presented in tables and graphs.

M.D.

A85-41203#
INTERFEROMETRIC ANALYSIS OF DOPPLER MEASUREMENTS FOR DIFFERENTIAL RECEIVER CALIBRATION
R. DIETRICH and K. LEHMANN (Deutsche Akademie der Wissenschaften, Zentralinstitut fuer Physik der Erde, Potsdam, East Germany) Nabludienia Iskusstvennykh Sputnikov Zemli, no 23, 1984, p 587-592. refs

The interferometric approach to the calibration problem which uses observation differences of two receivers instead of single observations, is examined. Doppler satellite observations from standpoints close to each other are performed for this calibration purpose. Electronic delay differences, frequency differences, and coordinate differences (baseline components in a horizontal system) in the adjustment procedure are determined by introducing the satellite positions and one receiver position as known. The numerical results are presented in tables and proposed calibration strategies for parameter determination (delay differences, antenna phase center differences) are discussed.

M.D.

A85-41024#
THE RESEARCH WORK AT THE CENTRAL INSTITUTE FOR PHYSICS OF THE EARTH, POTSDAM, GDR, IN THE FIELD OF DOPPLER SATELLITE GEODESY
R. DIETRICH (Deutsche Akademie der Wissenschaften, Zentralinstitut fuer Physik der Erde, Potsdam, East Germany) Nabludienia Iskusstvennykh Sputnikov Zemli, no 23, 1984, p 593-604. refs

Since 1981 a JMR-4A Doppler receiver is used mostly for stationary observations at the Potsdam observatory. The research activities have three main directions: (1) methodical investigations of satellite interferometry using Doppler receivers and receiver calibration, (2) computation of regional netorks using the orbital program POTSDAM-5, 3. Computation of long global arcs for determination of polar motion and station coordinates.

Author

A85-42451# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.
SATELLITE GEODYNAMICS

The application of space technology to the study of solid-earth geophysics is reviewed. Attention is given to the major experiments in the field of space-based geodynamics research including early satellite laser ranging (SLR) measurements, the GEOS-3 satellite observations, and the installation of corner cube reflectors on the moon. The contribution of VLBI techniques to terrestrial positioning measurements is also discussed. Prospects for future advances with the development of the Global Positioning System (GPS) and observations from on board the Space Station are also assessed.

I. H.

A85-42452# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.
SPACE-AGE GEODESY - THE NASA CRUSTAL DYNAMICS PROJECT

The NASA Crustal Dynamics Project (CDP) has deployed satellite laser ranging (SLR) systems and VLBI techniques for measurements of global and regional crustal motions and earth rotation parameters. The measurement programs for the years 1984 and 1983 are described, and some preliminary results are presented. A complete list of the fixed receiving stations in the CDP network is given.

I. H.

A85-42464# Jet Propulsion Lab., California Inst. of Tech., Pasadena
A WATER-VAPOR RADIOMETER ERROR MODEL

The water-vapor radiometer (WVR) is used to calibrate unpredictable delays in the wet component of the troposphere in geodetic microwave techniques such as very-long-baseline interferometry (VLBI) and Global Positioning System (GPS) tracking. Based on experience with Jet Propulsion Laboratory (JPL) instruments, the current level of accuracy in wet-troposphere calibration limits the accuracy of local vertical measurements to 5-10 cm. The goal for the near future is 1-3 cm. Although the WVR is currently the best calibration method, many instruments are prone to systematic error. In this paper, a treatment of WVR data is proposed and evaluated. This treatment reduces the effect of WVR systematic errors by estimating parameters that specify an assumed functional form for the error. The assumed form of the treatment is evaluated by comparing the results of two similar WVR's operating near each other. Finally, the observability of the error parameters is estimated by covariance analysis.

Author

A85-42469
GEOPOTENTIAL RESEARCH MISSION - STATUS REPORT
S. M. YIONOULIS and V. L. PISACANE (Johns Hopkins University, Laurel, MD) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol. GE-23, July 1985, p 511-516. refs

The Geopotential Research Mission (GRM) is a NASA mission planned to produce more exact measurements of the gravitational and geomagnetic fields of the earth. A status report on the progress of the mission is presented, with emphasis given to the engineering requirements of the gravitational field measurements. The guidance and measurements instruments of the GRM spacecraft are described, including the proof-mass measurement system; the disturbance compensation system (DISCOS); and an optical interferometric system for proof-mass measurements. A schematic diagram of the GRM spacecraft is presented.

I. H.
The magnetic field of the Earth—performance considerations for space-based observing systems


Basic problems inherent in carrying out observations of the Earth's magnetic field from space are reviewed. It is shown that while useful observations of the core and crustal fields are possible at the peak of the solar cycle, the greatest amount of useful data is obtained during solar minimum. During the last three solar cycles, the proportion of data with a planetary disturbance index of less than 2 at solar maximum was in the range 0.4-0.8 in comparison with solar minimum. It is found that current state of the art orbit determination techniques should eliminate orbit error as a problem in gravitational field measurements from space. The spatial resolution obtained for crustal field anomalies during major satellite observation programs of the last 30 years are compared in a table. The relationship between observing altitude and the spatial resolution of magnetic field structures is discussed. Reference is made to data obtained using the Magsat, the Polar Orbiting Geophysical Observatory (POGO), and instruments on board the Space Shuttle.

A85-43958

Intrinsic geodesy


Phenomenological problems in geodesy are analyzed, applying Weyl's invariance of the Riemann-Cartan connection, in a collection of published papers from the period 1950-1981. Topics examined include the fundamentals of intrinsic geodesy, the structure of the gravity field and Laplace's equation, the application of intrinsic geodesy principles to the normal reference field, mapping the actual gravity field onto the normal reference field, mapping between surfaces, propagation of light in continuous isotropic refracting media, and the motion of a free particle and a spherical pendulum in the microgravitational field of a gravitationally stabilized satellite in a circular orbit in a central field.

A85-44102

Establishment of three-dimensional geodetic control by interferometry with the Global Positioning System


The classical methods of establishing local and regional geodetic control are essentially not three-dimensional, and the horizontal and the vertical problems are regarded as separate. Geodetic practices for the establishment of local and regional control have not yet been altered by the advent of the so-called extraterrestrial methods of geodesy. The reasons for this situation have been related to insufficient accuracy, cumbersome procedure, and cost factors. However, revolution has been beginning to occur in connection with the signals provided by the Global Positioning System (GPS) satellites. An analysis of the 35-station Eifel network is discussed. It is found that radio interferometric observations of the present, incomplete constellation of GPS satellites can yield reliable determinations of the relative position vectors between stations 10 km apart with uncertainties of 1 ppm in both horizontal coordinates.

A85-45594

Application potential of SPOT imagery for topographic mapping


NERC-supported research. The suitability of SPOT imagery for compiling 1 100,000 scale topographical maps has been evaluated by calculating ground coordinates and pixel positions for level 1b photographic images. The use of digital image processors in the mapping procedure is described, with emphasis given to an analytical stereo plotter instrument which reconstructs the geometry of a panoramic photograph on the basis of a mathematical model. The results of a mapping simulation based on SPOT imagery are presented. It is found that the geometry of SPOT imagery should be suitable for mapping most terrains on a scale of 1:100,000.

A85-45870

Cartographic potential of SPOT image data

R. Welch (Georgia, University, Athens) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 51, Aug. 1985, p. 1085-1091.

In late 1985, the SPOT (Systeme Probatoire d'Observation de la Terre) satellite is to be launched by the Anane rocket from French Guiana. This satellite will have two high resolution VIS/IR line array sensor systems capable of producing monoscopic and stereoscopic coverage of the Earth. Cartographic applications are related to the recording of stereo image data and the acquisition of 20-m data in a multispectral mode. One of the objectives of this study involves a comparison of the suitability of SPOT and TM image data for mapping urban land use/cover. Another objective is concerned with a preliminary assessment of the potential of SPOT image data for mapping remote areas with conventional map sheets converted to raster formats.

A85-46076

Propagation and diffraction of radio waves in the millimeter and submillimeter ranges

R. Welch (Georgia, University, Athens) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 51, Aug. 1985, p. 1085-1091.

The papers presented in this volume provide an overview of theoretical and experimental studies of the propagation and diffraction of radio waves in the ionosphere, atmospheric boundary layer, and near an inclined Earth's surface (e.g., rough surfaces of land cover and rough sea surface). The discussion also covers various remote sensing applications of millimeter waves in studies of the atmosphere, ocean and land parameters, vegetation, and snow and ice covers.

A85-46078

Backscattering of centimeter and millimeter radio waves by the Earth's surface at low grazing angles (Review)


The characteristics of the backscattering of centimeter and millimeter radio waves from the Earth's surface at low grazing angles are examined in terms of theoretical models and experimental data. An empirical expression is proposed which relates the specific effective scattering surface to the grazing angle and the wavelength for vegetation-covered terrain. The expression is shown to provide a satisfactory approximation of experimental results in the 10-100 GHz range for grazing angles less than 30 degrees.

A85-46079

Backscattering of centimeter and millimeter radio waves by the Earth's surface at low grazing angles


The characteristics of the backscattering of centimeter and millimeter radio waves by the Earth's surface at low grazing angles are examined in terms of theoretical models and experimental data. An empirical expression is proposed which relates the specific effective scattering surface to the grazing angle and the wavelength for vegetation-covered terrain. The expression is shown to provide a satisfactory approximation of experimental results in the 10-100 GHz range for grazing angles less than 30 degrees.
DISTRIBUTION OF THE EFFECTIVE SCATTERING AREA OF THE EARTH SURFACE AT LOW GRAZING ANGLES


The statistical distributions of the specific effective scattering area of the earth surface at low grazing angles are examined for the centimeter and millimeter wavelengths. A model with a variable number of scatterers in a resolution cell is proposed to explain the higher (in comparison with the Rayleigh distribution) number of "tails" It is shown that experimental distributions of the specific effective scattering surface allowing for the spatial-temporal structure of the reflections are adequately approximated by a lognormal function.


The existing theoretical models for randomly inhomogeneous reflecting surfaces are briefly reviewed, and their applicability to natural terrains is examined. In particular, attention is given to model selection and identification for natural terrains in the millimeter wave band with allowance for field measurements at nearly vertical angles.


In the interpretation of satellite imagery, the assessment of the condition of the observed areas proceeds on the basis of the reflection characteristics, i.e., the luminance factors of these areas. However, the presence of an atmospheric layer between the earth and the radiation detectors produces a change in the spectral characteristics of the reflected radiation. Questions arise regarding the effect of this change on the results of the interpretation process. The present study is concerned with an investigative method which is based on a consideration of the spatial-frequency characteristics of an insulated atmosphere. This method makes it possible to explore a number of significant aspects, taking into account questions concerning effects related to the distance from the interface, effects of the characteristics of the radiation above a studied homogeneous area, and the dimensions of a uniform area for which disturbing effects on the luminance can be disregarded.


A successful solution of problems involving the remote sensing of an underlying surface depends to a large extent on the possibility to consider atmospheric effects under the given conditions.
TERRA revealed systematic errors in the terrestrial solution. DOE

N85-31585*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.

IMPROVING THE GEOLOGICAL INTERPRETATION OF MAGNETIC AND GRAVITY SATELLITE ANOMALIES Final Report

W. J. HINZE, L. W. BRAILE, Principal Investigators, and R. R. B. VONFRESE (Ohio State Univ., Columbus) 1985 67 p refs ERTS

Current limitations in the qualitative interpretation of satellite-elevation geopotential field data and magnetic anomaly data were investigated along with techniques to overcome them. A major result was the preparation of an improved scalar magnetic anomaly map of South America and adjacent marine areas directly from original MAGSAT data. In addition, comparisons of South American and Euro-African data show a strong correlation of anomalies along the Atlantic rifted margins of the continents.

N85-31586*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.

MAGSAT SCALAR ANOMALY MAP OF SOUTH AMERICA Abstract Only

J. R RIGGWAY, W. J. HINZE, and L. W. BRAILE In its Improving the Geol. Interpretation of Magnetic and Gravity Satellite Anomalies 1 p 1985 ERTS

A scalar magnetic anomaly map was prepared for South America and adjacent marine areas directly from original MAGSAT orbits. The preparation of the map poses special problems, notably in the separation of external field and crustal anomalies, and in the reduction of data to a common altitude. External fields are manifested in a long-wavelength ring current effect, a medium-wavelength equatorial electrojet, and short-wavelength noise. The noise is reduced by selecting profiles from quiet periods, and since the electrojet is confined primarily to dusk profiles, its effect is minimized by drawing the data set from dusk profiles only. The ring current is corrected through the use of the standard ring current equation, augmented by further filtering with a Butterworth band-pass filter. Under the assumption that the time-variant ring current is best removed when a replication of redundant profiles is achieved, a test set of 25 groups of 3 nearly coincident orbits per group is set up for filtering with a range of long-wavelength cutoffs to determine which cutoff best replicates the residual profiles. Altitude differences are then normalized by an inversion of the profile data onto a grid of equal magnitude dipoles, and recalculated at an altitude of 350 km. The resulting map, when compared to the 2 deg averaged map, shows more coherent anomalies, with notable differences in the region affected by the electrojet.

M.G.

N85-31587*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.

A COMPARATIVE STUDY OF SPHERICAL AND FLAT-EARTH GEOPOTENTIAL MODELING AT SATELLITE ELEVATIONS Abstract Only

M. H. PARROTT, W. J. HINZE, L. W. BRAILE, and R. R. B. VONFRESE (Ohio State Univ., Columbus) In its Improving the Geol. Interpretation of Magnetic and Gravity Satellite Anomalies 1 p 1985 ERTS

Flat-Earth modeling is a desirable alternative to the complex spherical-Earth modeling process. These methods were compared using 2 1/2 dimensional flat-earth and spherical modeling to compute gravity and scalar magnetic anomalies along profiles perpendicular to the strike of variably dimensioned rectangular prisms at altitudes of 150, 300, and 450 km. Comparison was achieved with percent error computations (spherical-flat/spherical) at critical anomaly points. At the peak gravity anomaly value, errors are less than + or - 5% for all prisms. At 1/2 and 1/10 of the peak, errors are generally less than 10% and 40% respectively, increasing to these values with longer and wider prisms at higher altitudes. For magnetics, the errors at critical anomaly points are less than -10% for all prisms, attaining these magnitudes with longer and wider prisms at higher altitudes. In general, in both gravity and magnetic modeling, errors increase greatly for prisms wider than 500 km, although gravity modeling is more sensitive than magnetic modeling to spherical-Earth effects. Preliminary modeling of both satellite gravity and magnetic anomalies using flat-Earth assumptions is justified considering the errors caused by uncertainties in isolating anomalies.

M.G.
Gravity and scalar magnetic anomalies perpendicular to the strike of variably dimensioned rectangular prisms at altitudes of 150, 300, and 450 km. Results indicate that the error caused by the flat-Earth approximation is less than 10% in most geometric conditions. Generally, error increase with larger and wider anomaly sources at higher altitudes. For most crustal source modeling applications at conventional satellite altitudes, flat-Earth modeling can be justified and is numerically efficient.

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Flatt-Earth and spherocal-Earth geopotential modeling of crustal anomaly sources at satellite elevations are compared by computing gravity and scalar magnetic anomalies perpendicular to the strike of rectangular prisms at altitudes of 150, 300, and 450 km. Results indicate that the error caused by the flat-Earth approximation is less than 10% in most geometric conditions. Generally, error increase with larger and wider anomaly sources at higher altitudes. For most crustal source modeling applications at conventional satellite altitudes, flat-Earth modeling can be justified and is numerically efficient.

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The 883-km-long San Andreas Fault Experiment (SAFE) baseline between Quincy in northern California and Monument Peak in southern California spans the San Andreas Fault in a way designed to measure motion between the North American and the Pacific Plates. This baseline and a closely related baseline have been measured with the satellite laser ranging techniques (SLR) for over 10 years. The baseline was measured with the very-long-baseline interferometry (VLBI) technique to confirm or reject the results already obtained from SLR.
EUROPE WITH PARTICULAR CONSIDERATION TO THE LIEGE
N85-31694# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
SATELLITE-DETERMINED STRESSES IN THE CRUST OF EUROPE WITH PARTICULAR CONSIDERATION TO THE LIEGE
EARTHQUAKE OF NOVEMBER 8, 1983
H. S. LUI In its Geodyn Branch Res Program 8 p Aug.
1985 refs
Avail NTIS HC A09/MF A01 CSCL 08K

The calculated stress field in Europe as inferred from satellite
gravity data predicts two important features (1) orientation of the
principle stresses in the Brussels-Liege region, and (2) possible
horizontal crustal block movements in central Europe. Based on
these features, a seismotectonic theory was developed to derive
geosynamical principles which govern the present state of stresses
in the European lithosphere and predict specific seismic risk regions
in central Europe. According to this theory, the lithosphere of
Europe is under Northwest-Southeast compressional stress with the
compression centroid located under the Brussels-Liege region in
Belgium. Therefore, the Liege area in Belgium has great potential
for earthquakes. Although central Europe has been seismologically
stable for centuries, an earthquake did occur in the Liege area in
November of 1983. G L C

N85-31707# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
SPACEBORNE GRADIOMETER ERROR ANALYSIS
1985 refs
Avail NTIS HC A09/MF A01 CSCL 08B

The low frequency terms of the geopotential are observable
from satellites perturbations as viewed by a high orbiting satellite
or satellites. To measure and map the fine structure of the Earth's
gravity field could be accomplished by a Spaceborne Gradiometer
Mission. Since a gradiometer measures second derivatives of the
geopotential field, the gradiometer will be sensitive to the density variations of the earth's outer crust which is
the source of the high frequency components of the Earth's
gravity field. A gravity gradiometer mission would provide in situ
measurements on a global scale of the Earth's gravity field fine
structure. Covariance error analyses were performed which indicate
that a spaceborne gravity gradiometer having a precision of .001
E to .0001 E in a circular/orbital orbit and flown at altitudes 160
km to 200 km can determine the gravity field and geoid to
accuracies of 1 to 3 mGal and 3 to 5 cm respectively, with a
horizontal resolution of 50 km. The potential scientific information
which could be derived from a Shuttle borne gradiometer is
considered. Author

N85-31708# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
GEODYN SYSTEMS DEVELOPMENT
B H PUTNEY In its Geodyn Branch Res. Program 7 p Aug.
1985
Avail. NTIS HC A09/MF A01 CSCL 08A

The purpose of the GEODYN Orbit Determination and
Parameter Estimation, the SOLVE and ERODYN computer software
is to recover geodetic and geophysical parameters from satellite
and other data in a state-of-the-art manner and in the most
operationally efficient manner. The philosophy of the development
of the software system has been maintenance of computer-efficient,
well-structured software, with appropriate orbit, Earth and numerical
models, using precise satellite measurement modeling and efficient
numerical methods, and performing careful benchmark procedures.
Recent developments accomplished through the use of the three
programs are noted. B.W.
03 GEODESY AND CARTOGRAPHY

PHYSICO-GEOGRAPHICAL REGIONALIZATION OF CASPIAN LOWLAND BASED ON SPACE SURVEY MATERIALS Abstract Only
Avail. NTIS HC A08

Imagery from Salyut-4 and Meteor and other satellites was used to establish regionalization through analysis of functional internal structures of the natural geosystems consisting of conjunctions of spatial and genetic landscape complexes. Each characteristic physico-geographical area has dominant landscapes shown in the imagery by patterns which can be analyzed according to geometry, optical density, boundaries and other features. The original level in the Caspian lowland, has in parts, been affected by exogenous processes such as erosion, eolianism and undermining producing Baer formations and dendritic, striated, spotted, circular-concentric and other identifiable shapes. The regional pattern is built up from textures of landscapes and their morphostructural and zonation lineaments as well as paleogeographical features are often visible. Regionalization is more precise and detailed and shows complex interrelations better than previous versions and can be applied for agricultural, reclamation, conservation and other purposes. Author

MAPPING OF DYNAMICS OF DELTAS BY SPACE PHOTOGRAPHY Abstract Only
Avail. NTIS HC A08

River delta dynamics based upon hydromorphological development processes, delta movements seawards and river flow were studied by means of space imagery deltas from Meteor-Pmoda and Landsate satellite scanners with medium (240 m) and high (80 m) resolution and from Salyut orbital station photos with 30 m resolution. Delta development was shown by map series using survey mapping of present conditions as the reference. Scanner photos from earth resources and meteorological satellites were used to map seasonal variations. Photos retaken with the same technology several years later allowed representation and comparison of changes and analysis of dynamics due to hydrodynamic systems and agricultural and reclamation activities, and the identifications of delta movements, appearance of spits and bars and channel variations. Delta histories were studied over longer periods by means of topographic survey maps from the 1940 to 1950's or even 19th century military maps. Geomorphological and landscape characteristics were studied by means of space imagery mapping showing relief features; ground studies identified development stages. The practical value of space imagery for mapping was demonstrated. Author

COMPREHENSIVE MAPPING OF ARID TERRITORIES OF ARIZONA USING SPACE PHOTOGRAPHY Abstract Only
Avail. NTIS HC A08

Cartographic work to compile maps of the and part of Arizona from space photographs is described. Work was done from a picture obtained from the LANDSAT 1 satellite using a multispectral scanning system. The picture was taken at a height of 915 km. at a scale of 1:3,360,000 with a spatial resolution of 70 meters and covers an area of 34 square kilometers Decoding was done from synthesized color images in the spectral ranges 0.5 to 0.6 micrometers (green), 0.6 to 0.7 micrometers (red), and 0.8 to 1.1 micrometers (near infrared) using a working scale of 1:1,000,000. The initial map, clearly showing the higher belt of the piedmont and the southwest edge of the Colorado Plateau, was used to compile geomorphological, soil, geobotanical and land usage maps of the same area. Features of the thematic maps are described. It is suggested that the large scale use of space photography could be useful in compiling photographic maps of the USSR at a scale of 1:1,000,000. It is asserted that the use of space methods facilitates improvements in geographical cartography, which can then also be used to compile thematic maps Photomapping is acquiring increasing importance in monitoring the natural environment. Author

N85-33552# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL DYNAMICS PROJECT: CATALOGUE OF SITE INFORMATION
Avail. NTIS HC A18/AF A01  CSCI 96

This document represents a catalogue of site information for the Crustal Dynamics Project. It contains information and descriptions of those sites used by the Project as observing stations for making the precise geodetic measurements useful for studies of the Earth's crustal movements and deformation. Author

04 GEOLOGY AND MINERAL RESOURCES

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

A85-40612
FINE STRUCTURE OF THE PRELIMINARY IMPULSE OF A SUDDEN STORM COMMENCEMENT [TOKONKI STRUKTURE PREDVARIETEL'NOGO IMPUL'SA VNEZAPNOGO NACHALA MAGNITNYKH BUR']

The fine structure of preliminary reverse impulses is analyzed on the basis of 200 SSC events recorded during 1965-1979 at the Irkutsk station and special experiments at the meridional chain of stations; a joint analysis of ground and satellite observations of the SSC of July 29, 1977 is also performed. It is shown that the PRI fine structure has the form of a strain of damped oscillations in the Pc2-3 range with a duration not greater than approximately 2 min. The excitation of these oscillations is connected with the propagation of a fast magnetosonic wave, generated in the interaction between the interplanetary shock wave and the magnetosphere. B.J.

A85-41661
THE SIGNIFICANCE OF LINEAMENTS MAPPED FROM REMOTELY SENSED IMAGES OF THE 1:250,000 LAU SHEET IN BENU TROUGH OF NIGERIA
S. A. ISIORHO (Case Western Reserve University, Cleveland, OH) International Journal of Remote Sensing (ISSN 0143-1161), vol. 6, June 1985, p. 911-918. refs

A85-42171
THE ANTARCTIC ICE

The data base on the physical characteristics of the Antarctic ice sheet has been increased significantly since the inception of
04 GEOLOGY AND MINERAL RESOURCES

Granites were not easily defined by the images, which best served for identifying folded and lineament structures. M.S.K.

A85-42583
ERUPTION OF MOUNT ONTAKE IN 1979 - DETECTION OF VOLCANIC ASH FALL AREA FROM LANDSAT MSS CCT DATA

A85-45688
PRELIMINARY EVALUATION OF THE LANDSAT-4 THEMATIC MAPPER DATA FOR MINERAL EXPLORATION

A85-45873
EVALUATION OF SPOT SIMULATOR DATA FOR THE DETECTION OF ALTERATION IN GOLDFIELD/CUPRITE, NEVADA

A85-47898#
SECULAR VARIATION, CRUSTAL CONTRIBUTIONS, AND TECTONIC ACTIVITY IN CALIFORNIA, 1976-1984

Five to ten years of data from 34 total field magnetometers were used to define temporal and spatial characteristics of secular variations (SV) of the earth's geomagnetic field throughout central and southern California, and to compare these measurements with predictions from global SV models based on global and local observatory data. Least squares analysis of the magnetometer data indicates a generally linear SV decrease in southeasterly direction. However, deviations by as much as 1 nT/a occur for many neighboring locations, indicating that contributions from local induction sources and magnetization effects in the crust can contaminate SV estimates. A method is suggested for identifying and reducing these effects in data used for SV modeling. These techniques are applied to the Californian array data, and the residuals are discussed in terms of possible tectonomagnetic sources along the San Andreas fault. I.S.

A85-42476*
Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PRELIMINARY SPECTRAL AND GEOLOGIC ANALYSIS OF LANDSAT-4 THEMATIC MAPPER DATA, WIND RIVER BASIN AREA, WYOMING

NASA-supported research. refs

A Landsat-4 Thematic Mapper (TM) image of the Wind River Basin area in Wyoming is currently under analysis for stratigraphic and structural mapping and for assessment of spectral and spatial characteristics using visible, near infrared, and short wavelength infrared bands. To estimate the equivalent Lambertian surface reflectance, TM radiance data were calibrated to remove atmospheric and instrumental effects. Reflectance measurements for homogeneous natural and cultural targets were acquired about one year after data acquisition. Calibration data obtained during the analysis were used to calculate new gains and offsets to improve scanner response for earth science applications. It is shown that the principal component images calculated from the TM data were the result of linear transformations of ground reflectance images prepared from this transform, the separation of spectral classes was independent of systematic atmospheric and instrumental factors. Several examples of the processed images are provided. I.H.

A85-42580
GEOL OGY AND STRUCTURES STUDY OF THE NUBA MOUNTAINS, SUDAN, USING LANDSAT IMAGES

Digitally enhanced Landsat black/white imagery was used to generate a 1:250,000 scale map of the Nuba Mountains in the Sudan for the purposes of geological classifications. Analyses of the image resulted in mapping schists and gneisses, nanna series, intrusive granites and syenites, ring intrusions, shallow surfaces and pediments, and sandy and clay-rich plains and valley alluvium. The classifications obtained will replace the existing geological maps of the area which has shown evidence of commercially exploitable oil reserves. M.S.K.

A85-42582
A SURVEY OF THE REHAMNA HERCYNIAN RANGE IN WESTERN MOROCCO USING LANDSAT COLOR COMPOSITE IMAGERY

Landsat MSS bands 3, 5, and 7 were employed to generate 1:500,000 scale images of the Moroccan Hercynian Range in May 1979. The three bands chosen were known to provide the highest possible contrast for the identification of geological formations. Three features were most apparent: a folded Paleozoic formation, an unconformable Mesozoic-Cenozoic formation lying over the Paleozoic formation, and agricultural plots on quaternary deposits.
04 GEOLoGY AND MINERAL RESOURCES

A85-48387
REFLECTIONS OF POSSIBLE OIL- AND GAS-BEARING STRUCTURES OF THE PRE-JURASSIC COMPLEX IN THE PRESENT-DAY TERRAIN OF WESTERN SIBERIA [OTRASZHENIIA NEFTEGAZOPERSPEKTIVNYKH STRUKTUR DOIURSKOGO KOMPLEKSA V SOVREMENNOI POVERKHNOSTI ZAPADNOI SIBIRI]
N. P. ZAPIVALOV and V. A. BELYAEVA (Prozvodstvennoe Geologicheskoe Ob'edinenie Novosibirskgeoloniya, USSR)

The paper is concerned with the relationship between the present-day surface structure and the tectonic elements of deeply settled crust horizons. With reference to satellite data obtained for Western Siberia, it is shown that the present-day surface structure is reflected in the most mobile components of the terrain formed as a result of exogenous geological processes associated with the activation of tectonic motions in the Holocene. It is further shown that by combining geochemical methods with satellite data it is possible to identify oil- and gas-bearing structures by analyzing natural topographic features.

A85-48873
POLAR MOTION MEASUREMENTS - SUBDECIMETER ACCURACY VERIFIED BY INTERCOMPARISON

An important bound on the accuracy of modern techniques for monitoring polar motion is established by intercomparison of measurement series from two different observing techniques, very long baseline interferometry and satellite laser ranging. The root-mean-square differences between the estimates of the pole position from both techniques are shown to be only 2 milliseons of arc (about 6 centimeters at one earth radius). In the absence of common systematic errors, these differences bound the total errors in both sets of estimates An initial investigation did not reveal any clear signature in the pole position that seems to be associated with major earthquakes. Continued measurements at this level of accuracy hold promise for resolving long-standing arguments over such questions as the nature of the excitation mechanisms required to maintain the motion of the pole.

A85-49227
HIGH-LATITUDE MESOPAUSE NEUTRAL WINDS AND GEOMAGNETIC ACTIVITY - A CROSS-CORRELATION ANALYSIS

A cross-correlation analysis of horizontal winds at 87 km obtained by the Poker Flat mesosphere-stratosphere-troposphere (MST) radar and College magnetometer horizontal component fluctuations has been performed on three years of summertime data. As a result, a peak in the average four-day estimates of cross-correlation results appeared from year to year. Individual estimates similarly do not show evidence of a peak in cross correlation at a variable time lag during geomagnetically active intervals. In addition, the one-day 24and 12-hour wave amplitudes and phases and average zonal and meridional winds do not vary significantly and consistently with the daily averaged magnetometer horizontal component fluctuations or with the standard deviation thereof. The interval following the July 13, 1982, polar cap absorption event and geomagnetic storm, however, shows a different cross-correlation estimate behavior and is characterized by significantly more westward zonal winds and enhanced 24-hour zonal wind amplitude.

DISCOVERY IN EARTHQUAKE FORECASTING AND SEISMIC ZONING RECORDED ABSTRACT ONLY

Seismic zoning maps were compiled for a long time, however, they have not fully reflected the geological processes which determine the occurrence of earthquakes. It was established that the size of an earthquake center, is determined by the dimensions of the blocks of the Earth's crust which shift along faults. The discovens opened the way for compiling seismic zoning maps. The zoning maps indicate zones of centers of origin of future earthquakes, and list their characteristics: the force of possible subterranean tremors, the frequency of their repetition, the size and depth of centers which affect the force of tremors at the Earth's surface. In many regions of Central Asia and India for which such maps were compiled 23 strong earthquakes occurred during the past 40 years. All earthquakes occurred in places indicated on the maps, and their characteristics are confirmed.

SPACE METHODS FOR GEOLoGY RESEARCH ABSTRACT ONLY

Methods for use remote data for geological mapping, new geological data obtained by use of aerospace methods, methods for processing space information and new methods and immediate prospects for the development of remote sensing are discussed. The principal directions in the development of remote geological sensing methods are outlined. A systematic approach to use of materials from remote surveys in different stages of the geological prospecting process. Production of new types of geological maps, based on surveys from space, such as space tectonic and space photogeologic maps. Study of the nature of geological formations on the bases of their spectral characteristics, giving broad possibilities for lithological mapping by remote methods. Specialized processing of remote, geological, geophysical and geochemical data, using computers and displays. Study of the nature, geological structure and mineragenetic importance of annular structures. Use of remote survey data in the search for and prediction of mineral deposits. Interpretation of space photographs for solving major problems in regional and global geology and tectonics. Development of international scientific cooperation in application of geological remote sensing methods. These methods will advance research in the fields of geological mapping, tectonic, geodynamic and mineragenetic studies.

CONDITIONS FOR FORMATION OF PARAGENESSES CONTAINING KYANITE-ORTHoclase IN REGION OF MOUNT PROVENDER AND PRATT PEAK (SHACKLETON RANGE, ANTARCTICA) ABSTRACT ONLY

Metamorphic formations arising under conditions of a kyanite garnet biotite-orthoclase schists of the almandine amphibolte high pressure facies are rare throughout the world. This article describes the first finds of such metamorphic rocks in Antarctica. The geosites and crystalline schists containing kyanite and orthoclase are regarded as interest because they are formed under conditions of extremal pressures and temperatures and with a rather unusual composition of the fluid solutions, characterized by a high content of hydrocarbons relative to the remaining components. Three independent methods were used in ascertaining
the conditions for formation of these rocks exposed in the Shackleton Range. Three types of inclusions (melt, gas fluid and gas) in the minerals of these rocks are discussed. An analysis of the ratio of the rock minerals and their chemical composition made it possible to trace the evolution of mineralization in these parageneses and determine the nature of development of the geothermal regime of metamorphism.

Author


The existence of several circumarctic subconcentric tectonic zones inscribed in one another is a highly important feature of the regional tectonics of the Arctic sector. Three such zones can be discriminated outer (Precambrian), middle (Paleozoic) and inner (Cenozoic). The circum-Pacific Ocean tectonic belt in turn consists of two zones outer (Mesozoic) and inner (Cenozoic). A figure accompanying the text is a map showing these zones and such features as rift valleys, graben rifts and basement blocks. The following are the most important features characteristic of the Arctic segment with respect to the regional tectonic plan: zonal subconcentric positioning of regions of different age; presence of Baykal blocks of different age in the structure of the younger zones; and spatial overlapping of circum-Pacific Ocean zones on the circumarctic tectonic zones. The arctic sector is characterized by extensive development of fault tectonics and therefore a great fracturing of the Earth's crust. The graben-ribs are grouped into system oriented in submedional and sublatitudinal directions.

Author


The purpose of the report is to characterize the geotechnical parameters of the American Bottom area in the vicinity of East St. Louis, Illinois, and Missouri. The area encompassed is equivalent to 15 min of longitude and latitude, and is covered by portions of the Granite City, Monks Mound, Cahokia, and French Village 7.5-min US Geological Survey quadrangles. Geotechnical parameters of the study area were determined from existing data, including engineering and water well borings, aerial photography, soil, geologic and topographic maps, and published and unpublished reports and field notes. Geotechnical parameters selected for mapping and analysis include physiography, surface geology, subsoil geology, surficial soils, land surface slope, surface drainage, and sources of construction materials. Each parameter, or factor, is portrayed as a transparency for overlay on the map of the surface geology, enabling the simultaneous visual analysis of several geotechnical parameters. Of particular importance to engineering projects are the engineering properties of the various surficial soils, mapped by geologic environments and shown on the surface geology map. Relevant engineering properties of soils which occur in abandoned channels, point bars, chutes and bars, backswamps, alluvial fans, tributary valleys, and loessial uplands are given. The occurrence of ground water in the area and its influence on engineering projects is discussed.

GRA

N85-31588# Ohio State Univ., Columbus. Dept. of Geology and Mineralogy GEOLOGIC ANALYSIS OF AVERAGED MAGNETIC SATELLITE AND GRAVITY ANOMALIES IN THE SOUTH-CENTRAL UNITED STATES Abstract Only H. K. GOYAL, R. R. B. VONFRESE, and W. J. HINZE (Purdue Univ., Lafayette, Ind.) In Purdue Univ. Improving the Geol Interpretation of Magnetic and Gravity Satellite Anomalies 1 p 1985 ERTS

To investigate relative advantages and limitations for quantitative geologic analyses of magnetic satellite scalar anomalies derived from arithmetic averaging of orbital profiles within equal-angle or equal-area parallelograms, the anomaly averaging process was simulated by orbital profiles computed from spherical-earth crustal magnetic anomaly modeling experiments using Gauss-Legendre quadrature integration. The results indicate that averaging can provide reasonable values at satellite elevations, where contributing error factors within a given parallelogram include the elevation distribution of the data, and orbital noise and geomagnetic field attributes. Various inversion schemes including the use of equalvalent point dipoles are also investigated as an alternative to arithmetic averaging. Although inversion can provide improved spherical grid anomaly estimates, these procedures are problematic in practice where computer scaling difficulties frequently arise due to a combination of factors including large source-to-observation distances (400 km), high geographic latitudes, and low geomagnetic field inclinations.

Author

N85-31595# Ohio State Univ., Columbus. Dept of Geology and Mineralogy STATISTICAL MAGNETIC ANOMALIES FROM SATELLITE MEASUREMENTS FOR GEOLOGIC ANALYSIS Abstract Only H. K. GOYAL, R. R. B. VONFRESE, and W. J. HINZE (Purdue Univ., Lafayette, Ind.) In Purdue Univ. Improving the Geol Interpretation of Magnetic and Gravity Satellite Anomalies 1 p 1985 ERTS

The errors of numerically averaging satellite magnetic anomaly data for geologic analysis are investigated using orbital anomaly simulations of crustal magnetic sources by Gauss-Legendre quadrature integration. These simulations suggest that numerical averaging errors constitute small and relatively minor contributions to the total error budget of higher orbital estimates (approx. 400 km), whereas for lower orbital estimates the error of averaging may increase substantially. Least-squares collocation is also investigated as an alternative to numerical averaging and found to produce substantially more accurate anomaly estimates as the elevation of prediction is decreased towards the crustal sources.

Author

N85-31591# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences. THE SOUTH-CENTRAL UNITED STATES MAGNETIC ANOMALY Abstract Only P. J. STARICH, W. J. HINZE, and L. W. BRAILE. In its Improving the Geol Interpretation of Magnetic and Gravity Satellite Anomalies 1 p 1985 ERTS

A positive magnetic anomaly, which dominates the MAGSAT scalar field over the south-central United States, results from the superposition of magnetic effects from several geologic sources and tectonic structures in the crust. The highly magnetic basement rocks of this region show good correlation with increased crustal thickness, above average crustal velocity and predominantly negative free-air gravity anomalies, all of which are useful constraints for modeling the magnetic sources. The positive anomaly is composed of two primary elements. The western-most segment is related to middle Proterozoic granite intrusions, rhyolite flows, and interporous metamorphic basement rocks in the Texas panhandle and eastern New Mexico. The anomaly and the magnetic crust are bound to the west by the north-south striking Rio Grande Rift. The anomaly extends eastward over the Grenville age basement rocks of central Texas, and is terminated to the
south and east by the buried extension of the Ouachita System. The northern segment of the anomaly extends eastward across Oklahoma and Arkansas to the Mississippian Embayment. It corresponds to a general positive magnetic region associated with the Wichita Mountains igneous complex in south-central Oklahoma and 1.2 to 1.5 Ga. felsic terrane to the north. 

Author

N85-31592**# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.

THE SOUTH-CENTRAL UNITED STATES MAGNETIC ANOMALY Abstract Only

P. J. STARICH In its Improving the Geol. Interpretation of Magnetic and Gravity Satellite Anomalies 1 p. 1985 ERTS

The South-Central United States Magnetic Anomaly is the most prominent positive feature in the MAGSAT scalar magnetic field over North America. The anomaly correlates with increased crustal thickness, above average crustal velocity, negative free-air gravity anomalies and an extensive zone of Middle Proterozoic anorogenic felsic basement rocks. Spherical dipole source inversion of the MAGSAT scalar data and subsequent calculation of reduced-to-pole and derivative maps provide additional constraints for a crustal magnetic model which corresponds geographically to the extensive Middle Proterozoic felsic rocks trending northeastward across the United States. These felsic rocks contain insufficient magnetization or volume to produce the anomaly, but are rather indicative of a crustal zone which was disturbed during a Middle Proterozoic thermal and event which en echched magnetic material deep in the crust.

Author

N85-31595**# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.

REDUCED TO POLE LONG-WAVELENGTH MAGNETIC ANOMALIES OF AFRICA AND EUROPE Final Report

R. OLIVIER (Lausanne Univ., Switzerland), W. J. HINZE, and R. R. VONFRESE (Ohio State Univ., Columbus) In its Improving the Geol. Interpretation of Magnetic and Gravity Satellite Anomalies 1 p. 1985 Previously announced as N84-25132 ERTS

To facilitate analysis of the tectonic framework for Africa, Europe and adjacent marine areas, MAGSAT scalar anomaly data are differentially reduced to the pole and compared to regional geologic information and geophysical data including surface free-air gravity anomaly data upward continued to satellite elevation (350 km) on a spherical Earth. Comparative analysis shows magnetic anomalies correspond with both ancient as well as more recent Cenozoic structural features. Anomalies associated with ancient structures are primarily caused by intra-crustal lithologic variations such as the crustal disturbance associated with the Bangui anomaly in west-central Africa. Anomalies corresponding with Cenozoic tectonic elements appear to be related to Cune isotherm perturbations. A possible example of the latter is the well-defined trend of magnetic minima that characterize the Alphine orogenic belt from the Atlas mountains to Eurasia. In contrast, a well-defined magnetic satellite minimum extends across the stable craton from Finland to the Urals mountains. Prominent magnetic maxima characterize the Arabian plate, Iceland, the Kursk region of the central Russian uplift, and generally the Precambrian shields of Africa. DOE

The Precambrian shields of Africa and Europe exhibit varied magnetic signatures. All shields are not magnetic highs and, in fact, the Baltic shield is a marked minimum. The reduced-to-pole magnetic map shows a marked tendency for northeasterly striking anomalies in the eastern Atlantic and adjacent Africa, which is coincident to the track of several hot spots for the past 100 million years. However, there is little consistency in the sign of the magnetic anomalies and the track of the hot spots. Comparison of the radially polarized anomalies of Africa and Europe with other reduced-to-pole magnetic satellite anomaly maps of the Western Hemisphere support the reconstruction of the continents prior to the origin of the present-day Atlantic Ocean in the Mesozoic Era. A.R.H.
CONTEMPORARY PLATE MOTIONS FROM LAGEOS


Laser data taken on the surface of the Earth with the satellite's orbital ephemeris assessed through simultaneous solutions of station coordinates and Earth orientation parameters on an annual basis. These annual solutions have been intercompared and have yielded preliminary observations of tectonic motions.

GEOPHYSICAL INTERPRETATION OF SATELLITE LASER RANGING MEASUREMENTS


Since 1972 satellite laser ranging (SLR) measurements were made in California at two sites whose 900 km intersite baseline spans the San Andreas Fault. The research reported compares the SLR measurements with ground-based geodetic surveys and information derived from seismological and geological studies. The objective is to determine whether the various data are consistent with one another and to determine the distribution of crustal deformation over the extent of the SLR baseline.

The objective of Dynamic Satellite Geodesy is to relate points on the observed ranges and times. Laser data taken on Lagoos continue to be analyzed in this dynamical mode to yield precise positions of the Earth-based systems in a geocentric reference system. Definition of the laser network has been assessed through simultaneous solutions of station coordinates and Earth orientation parameters on an annual basis. These annual solutions have been intercompared and have yielded preliminary observations of tectonic motions.

ACCOMPLISHMENTS DURING 1982

K. M. REED, ed. and S. BARTSCH-WINKLER, ed. 1984 165 p refs

Remote sensing technology, particularly the development of satellite imagery, has given geology a valuable tool for the study of large area, regional landscapes. The small scale large area format of LANDSAT and other satellite imagery reduces the amount of detailed information provided for a given region. This can be an advantage for regional study as much of the local information that is filtered out tends to be detail which, while significant in small area studies, could mask regional patterns.

GEOMORPHOLOGICAL SIMILARITY AND UNIQUENESS

R. S. HAYDEN In NASA, Goddard Space Flight Center Global Mega-Geomorphology p 21-22 Jul. 1985 Avail: NTIS HC A07/MF A01 CSCL 08G

Remote sensing technology, particularly the development of satellite imagery, has given geology a valuable tool for the study of large area, regional landscapes. The small scale large area format of LANDSAT and other satellite imagery reduces the amount of detailed information provided for a given region. This can be an advantage for regional study as much of the local information that is filtered out tends to be detail which, while significant in small area studies, could mask regional patterns.

REGIONAL LANDFORM THRESHOLDS

D. P. RITZKER In NASA, Goddard Space Flight Center Global Mega-Geomorphology p 23-26 Jul. 1985 Avail: NTIS HC A07/MF A01 CSCL 08B

Remote sensing technology allows us to recognize manifestations of regional thresholds, especially in the spatial characteristics of process agents. For example, a change in river channel pattern over a short distance reflects a threshold alteration in the physical controls of discharge and/or sediment. It is, therefore, a valuable indicator of conditions as they exist. However, we probably will have difficulty determining whether the systemic parameters are now close to threshold conditions at which a different change will occur. This, of course, is a temporal and magnitude problem which is difficult to solve from the spatial characteristics.

GEOMORPHOLOGY, TECTONICS, AND EXPLORATION

F. F. SABINS, JR. In NASA, Goddard Space Flight Center Global Mega-Geomorphology, p 41 Jul. 1985 Avail: NTIS HC A07/MF A01 CSCL 08G

Remote sensing data help us recognize features that are significant and others that are not. Geologic and energy deposits The tectonic features of interest range in scale from regional (sedimentary basins, fold belts) to local (faults, fractures) and are generally expressed as geomorphic features in remote sensing images. Explorationists typically employ classic concepts of geomorphology and landform analysis for their interpretations, which leads to the question - Are there new and evolving concepts in geomorphology that may be applicable to tectonic analyses of images?—G L C
GEOLGY AND MINERAL RESOURCES

N85-32366*# New Mexico Inst. of Mining and Technology, Socorro.
MEGA-GEOMORPHOLOGY AND NEOTECTONICS
Avail: NTIS HC A07/MF A01 CSCL 08G

For several decades, subtle neotectonic effects involving several square kilometers have been studied in detail using remote sensing, primarily various types of stereo-aerial photographs at scales of 1:10,000 to 1:80,000. These subtle effects, especially local uplifts associated with growing structures of differential compaction, have been detected by the effect on drainage patterns, changes in hydraulic geometry of individuals channels or groups of channels, talus halos (soil) and fracture patterns. The studies were extended with the advent of thermal IR imagery particularly in tectonic analyses, and SLAR primarily in fracture pattern studies. Lately, quantitative efforts have begun attempting to link measured uplift over known structures with measured changes in hydraulic geometry and alluvial deposition. Thus, efforts are now underway attempting to quantify the relationship between neo- (micro-) tectonic changes and geomorphic parameters of drainage systems.

G.L.C.

ANDREAN EXAMPLES OF MEGA-GEOMORPHOLOGY THEMES
A. L. BLOOM In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 44-45 Jul. 1985
Avail: NTIS HC A07/MF A01 CSCL 08G

Geomorphic (or physiographic) provinces have been a well known and useful method of regional landform classification for a century. Every earth scientist will recognize a phrase such as Appalachian Plateau or Southern Rocky Mountains as defining a discrete region of consistent geologic structure that has experienced a similar interval of erosion by a similar process or set of processes. The geomorphic provinces formalized in the United States by Fenneman in the 1920's continue to be highly satisfactory even though some boundaries were only vaguely drawn. Mosaics of LANDSAT images illustrate better than any earlier maps the validity and coherence of Fenneman's provinces. The concept of geomorphic provinces has been used subconsciously or intuitively, to describe the relief of the ocean floor and the topography of the Moon and other planets.

G.L.C.

N85-32368*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.
SPACE IMAGERY AND SOME GEOMORPHOLOGICAL PROBLEMS OF THE GUIANA SHIELD, SOUTH AMERICA
W. N. MELHORN In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 46-53 Jul. 1985 refs
Avail: NTIS HC A07/MF A01 CSCL 08B

Some ongoing involvement in regional geomorphologic research in South America is described. Because of association with LARS at Purdue University, there has been engagement, vicarious or advisory, in projects which led to LANDSAT 1-2 mapping of the natural resources of Bolivia (1,00,00,000 scale), and preparation of a geographic information system which mapped the general geography, geology, soils, and vegetation of Ecuador (1,00,00,000 scale). Currently we are involved more specifically in geological-geomorphological mapping of the Venezuelan portion of the Guiana shield, and because of manuscript limitations only questions pertinent to this region are posed in the ensuing discussion.

G.L.C.

USE OF THE SYNOPTIC VIEW: EXAMPLES FROM EARTH AND OTHER PLANETS
B. K. LUCCHITTA In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 59-61 Jul 1985 refs
Avail: NTIS HC A07/MF A01 CSCL 08B

Space technology has added the synoptic view to other techniques used in geomorphology. Synoptic views are provided by spacecraft images or by application of space technology to time-honored information systems. Examples of spacecraft images of Earth are LANDSAT, SEASAT, and the SIR (Shuttle Imaging Radar) series Examples of applied space technologies include the digital conversion of topographic maps to shaded relief maps and digital correlation methods. From the study of other planets we have learned that synoptic views enable the deciphering of a planet's history: large features are identified and mapped before small ones studied and the specific. On Earth, we generally recognize smaller features and study specific processes first, then extrapolate toward larger features and a general synthesis. With the advent of space images of Earth, perhaps the time is ripe to employ the methods used for other planets to the study of terrestrial geology and geomorphology. The following examples illustrate the use of regional-scale studies on Earth: the application of synoptic-view images in Antarctica, the use of digital methods and correlations of multiple data sets in regional studies, and some benefits to our understanding of terrestrial geology that have been obtained from analyses of other planets.

G.L.C.

GEOMORPHIC CLASSIFICATION OF ICELANDIC AND MARTIAN VOLCANOES: LIMITATIONS OF COMPARATIVE PLANETOLOGY RESEARCH FROM LANDSAT AND VIKING ORBITER IMAGES
R. S. WILLIAMS, JR. In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 52-63 Jul. 1985
Avail: NTIS HC A07/MF A01 CSCL 08K

Some limitations in using orbital images of planetary surfaces for comparative landform analyses are discussed. The principal orbital images used were LANDSAT MSS images of Earth and nominal Viking Orbiter images of Mars. Both are roughly comparable in having a pixel size which corresponds to about 100 m on the planetary surface. A volcanic landform on either planet must have a horizontal dimension of at least 200 m to be discernible on orbital images. A twofold bias is directly introduced into any comparative analysis of volcanic landforms on Mars versus those in Iceland because of this scale limitation. First, the 200-m cutoff of landforms may delete more types of volcanic landforms on Earth than on Mars or vice versa. Second, volcanic landforms in Iceland, too small to be resolved or orbital images, may be represented by larger counterparts on Mars or vice versa.

R.J.F.

N85-32374*# State Univ. of New York, Binghamton Dept. of Geological Sciences.
GEOMORPHIC ANALYSES FROM SPACE IMAGERY
M. MORISAWA In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 68-75 Jul. 1985 refs
Avail: NTIS HC A07/MF A01 CSCL 08B

One of the most obvious applications of space imagery to geomorphological analyses is in the study of drainage patterns and channel networks. LANDSAT, high altitude photography and other types of remote sensing imagery are excellent for depicting stream networks on a regional scale because of their broad coverage in a single image. They offer a valuable tool for comparing and analyzing drainage patterns and channel networks all over the world. Three aspects considered in this geomorphological study are: (1) the origin, evolution and rates of development of drainage systems; (2) the topological studies of network and channel arrangements; and (3) the adjustment of streams to tectonic events and geologic structure (i.e., the mode and rate of adjustment).

R.J.F.

USE OF SPACEBORNE IMAGING RADAR IN REGIONAL GEOMORPHIC STUDIES
J. P. FORD In NASA. Goddard Space Flight Center Global Mega-Geomorphology p 81-83 Jul. 1985 refs
Avail: NTIS HC A07/MF A01 CSCL 171

In the past two decades, the use of both photographic and non-photographic remote sensing from satellite platforms has...
provided a unique capability for the observation and study of Earth and planetary surfaces. A wide range of imaging sensors that operate in different portions of the electromagnetic spectrum have yielded images of large areas that formerly were unknown or that had not previously been observed at a simultaneous instant in time. In addition, remote sensors equipped with multispectral or multiband capabilities are capable of taking data at different wavelengths simultaneously. Notable examples include the LANDSAT series of multispectral scanners, thematic mappers, and return beam vidicons. Synthetic aperture radar and LANDSAT imagery are discussed.

R.J.F

N85-32378*# London Unv. (England). Faculty of Science (Geography).

TECHNIQUES, PROBLEMS AND USES OF MEGA-GEOMORPHOLOGICAL MAPPING

C. EMBLETON In NASA Goddard Space Flight Center Global Mega-Geomorphology p 84-88 Jul. 1985 ref

Available NTIS HC A07/MF A01 CSCL 08B

A plea for a program of global geomorphological mapping based on remote sensing data is presented. It is argued that the program is a necessary step in bringing together the rapidly evolving concepts of plate tectonics with the science of geomorphology. Geomorphologists are urged to bring temporal scales into their subject and to abandon their recent isolation from tectonics and geological history. It is suggested that a start be made with a new geomorphological map of Europe, utilizing the latest space technology.

R.J.F.


QUANTITATIVE ANALYSIS OF GEOMORPHIC PROCESSES USING SATELLITE IMAGE DATA AT DIFFERENT SCALES


Available NTIS HC A07/MF A01 CSCL 08B

When aerial and satellite photographs and images are used in the quantitative analysis of geomorphic processes, either through direct observation of active processes or by analysis of landforms resulting from inferred active or dormant processes, a number of limitations in the use of such data must be considered. Active geomorphic processes work at different scales and rates. Therefore, the capability of imaging an active or dormant process depends primarily on the scale of the process and the spatial-resolution characteristic of the imaging system. Scale is an important factor in recording continuous and discontinuous active geomorphic processes, because what is not recorded will not be considered or even suspected in the analysis of orbital images. If the geomorphic process of landform change caused by the process is less than 200 m in x to y dimension, then it will not be recorded. Although the scale factor is critical, in the recording of discontinuous active geomorphic processes, the repeat interval of orbital-image acquisition of a planetary surface also is a consideration in order to capture a recurring short-lived geomorphic process or to record changes caused by either a continuous or a discontinuous geomorphic process.

R.J.F.


QUANTITATIVE GEOMORPHOLOGIC STUDIES FROM SPACEBORNE PLATFORMS


Available NTIS HC A07/MF A01 CSCL 08B

Although LANDSAT images of our planet represent a quantum improvement in the availability of a global image-data set for independent or comparative regional geomorphic studies of landforms, such images have several limitations which restrict their suitability for quantitative geomorphic investigations. The three most serious deficiencies are: (1) photogrammetric inaccuracies, (2) two-dimensional nature of the data, and (3) spatial resolution. These deficiencies are discussed, as well as the use of stereoscopic images and laser altimeter data.

R.J.F.

N85-32382*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GLOBAL GEOMORPHOLOGY: REPORT OF WORKING GROUP NUMBER 1

I DOUGLAS (Manchester Univ., England) In its Global Mega-Geomorphology p 101-104 Jul. 1985

Available NTIS HC A07/MF A01 CSCL 08B

Remote sensing was considered invaluable for seeing landforms in their regional context and in relationship to each other. Sequential images, such as those available from LANDSAT orbits provide a means of detecting landform change and the operation of large scale processes, such as major floods in semiarid regions. The use of remote sensing falls into two broad stages: (1) the characterization or accurate description of the features of the Earth's surface; and (2) the study of landform evolution. Recommendations for future research are made.

R.J.F.

N85-32383*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LANDSCAPE INHERITANCE: REPORT OF WORKING GROUP NUMBER 2

C. R. TWIDALE (Adelaide Univ., Australia) In its Global Mega-Geomorphology p 105 Jul. 1985

Available NTIS HC A07/MF A01 CSCL 08B

The conventional wisdom is, or until recently has been, that the earth's scenery is essentially youthful, much of it being of Pleistocene age. The validity of this assertion was questioned, surfaces and forms of much greater antiquity being cited from several cratonic regions, and also from the older orogens. Exhumed forms, some of them of great age (one inselberg landscape of Archaean age was noted), are more common and extensive than has previously been supposed. Epigene forms of Mesozoic age are increasingly being demonstrated from the world's cratons and orogens. Each feature also is more widely developed than has been realized. It was recommended that studies of denudation chronology be undertaken, possible in relation to contrasted cratonic regions. The nature and age range of surfaces that make up the shields ought to be analysed, the processes responsible for shaping the surfaces, and, in the case of the ancient epigene forms, the reasons for their survival.

R.J.F.

N85-32384*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.

PROCESS THRESHOLDS: REPORT OF WORKING GROUP NUMBER 3


Available NTIS HC A07/MF A01 CSCL 08B

The Process Thresholds Working Group concerned itself with whether a geomorphic process to be monitored on satellite imagery must be global, regional, or local in its effect on the landscape. It was pointed out that major changes in types and magnitudes of processes operating in an area are needed to be detectable on a global scale. It was concluded from a review of geomorphic studies which used satellite images that they do record change in landscape over time (on a time-lapse basis) as a result of one or more processes. In fact, this may be one of the most important attributes of space imagery, in that one can document land form changes in the form of a permanent historical record. The group also discussed the important subject of the acquisition of basic data for different scales by different satellite imaging systems. Geomorphologists already have available one near-global basis data set resulting from the early LANDSAT program, especially images acquired by LANDSATs 1 and 2. Such historic basic data sets can serve as a benchmark for comparison with landscape changes that take place in the future. They can also serve as a benchmark for comparison with landscape changes that have occurred in the past (as recorded by images, photography and maps).

R.J.F.
04 GEOLOGY AND MINERAL RESOURCES

N85-32385# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md
PLANE TARY PERSPECTIVE. REPORT OF WORKING GROUP
NUMBER 4
L. A. ROSSBACHER (California State Polytechnic Univ., Pomona)
In its Global Mega-Geomorphology p 106-110 Jul. 1985
Avail: NTIS HC A07/MF A01 CSCL 03B

The study of global meggeomorphology from a planetary
perspective requires that, philosophically, we view the Earth as
a planet like any other; one among a number of bodies of varied
size and composition which, together with the Sun, form the Solar
System. A first step in the study of the Earth from the planetary
perspective is the development of global distribution maps of
surface factors as landforms, tectonics, and of key processes
operating on Earth. Data of other types, such as gravity and
magnetism, should also be included and, so far as possible, multiple
data sets should be developed. The compilation of maps would
serve as a catalyst for research and a basis for interpretation.
They could be used scientifically to document changes such as
glacial variations and their relationships to climate, volcanic
eruptions and their effects, and coastal alterations. Slow and rapid
changes should be studied together with the relationships between
scale and the rapidity of change. A study of the relationship of
geomorphology (i.e., surficial processes) to lithology and structure
is needed. The planetary perspective can also help in the
identification and investigation of exotic features such as suspect
terrains. R.J.F.

SPACECRAFT-AIDED RESEARCH DISCUSSED AT GEOLOGY
CONGRESS Abstract Only
N. KONSTANTINOV and Y. SHCHEVYAKOV in its USSR Rept.: Space
(JPRS-USP-84-006) p 118 14 Nov. 1984 Transl into ENGLISH
from Turkmensskaya Iskra (Ashkhabad, USSR), 10 Aug.
1984 p 3
Avail: NTIS HC A08

A presentation of the Space Geological Map of the USSR
turned out to be one of the highlights of the 27th International
Geological Congress. A discussion of problems of satellite aided
geology and comparative planetology was included in the program
B. N. Mozhayev, general director of the Aerogeology association,
discussed achievements in this field. He said that structures whose
existence could only be suspected by geologists in the past become
visible on the Earth's surface from the altitude of an orbital flight.
The pertain primarily to large, complex structures, several thousand
kilometers in diameter, and to linear transcontinental faults of the
Earth's crust which are thousands of kilometers long. More than
4,000 structures have been detected from space on the territory
of the USSR and entered on maps. Soviet orbiting stations, Soyuz
spaceships and satellites of the Meteor and Kosmos series are
equipped with photographic and scanning instruments. MKF-6
cameras, for example, are capable not only of distinguishing details
only 15 kilometers in size in a locality; they also can determine
the chemical composition of rocks on the basis of remote
spectrograms.

LANDSCAPE INTERPRETATION CAPABILITIES USING SPACE
PHOTOGRAPHS OF REGIONS OF A MULTISTAGE PLATFORM
MANTLE STRUCTURE Abstract Only
O. S. OBRYADCHIKOV and S. Y. PETROV in its USSR Rept.: Space
(JPRS-USP-84-006) p 121-122 14 Nov. 1984 Transl.
into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2.
Mar. - Apr. 1984 p 35-43
Avail: NTIS HC A08

Space photographs of such regions as the sub-Urals plateau
(a semi arid plain practically devoid of vegetation) exhibit a uniform,
washed out shading with little contrast. This paper analyzes the
information content of such local regional space photos for the
eastern part of the Caspian basin, an area with a complex structure
of the upper strata of the platform mantle (down to the lower
Permian inclusively) and extensively developed salt dome tectonic
systems. Using the deviation of the plan view position of the
lineaments from the projection onto the ground surface of the
fracture faults corresponding to the lineaments revealed by deep
seismic prospecting, one can determine the inclination angles of
the planes of their displacements. For the Emba and Timir river
faults, these angles average 45 deg and 55 deg, respectively.
While local space photos can be of practical importance in terrain
interpretation when studying the deep structure and developmental
history of the most complexly structured ancient platforms with a
multistage mantle, careful combined analysis of space and
geophysical data is still required. When geophysical data are
inadequate, unambiguous interpretation of space photographs is
impossible, but they will be of definite value in assisting with the
planning of further ground studies. Author

USE OF SPACE PHOTOGRAPHS FOR ANALYSIS OF ARTICULAR
AND DYNAMIC CONDITIONS OF FORMATION OF ANCIENT
PHILOGOPITE AND APATITE DEPOSITS Abstract Only
K. G. ZINATOV and R. F. VAFIN in its USSR Rept.: Space
(JPRS-USP-84-006) p 123 14 Nov. 1984 Transl. into ENGLISH
from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr.
1984 p 48-54

Onginal language document previously announced in
IAA as A84-34781
Avail NTIS HC A08

From a tectonophysical analysis of satellite photos, the
mechanism by which systems of diagonal fractures were formed
in the central part of the Aldan shield is established. Reasons are
also suggested to explain why the pattern has been preserved
and why Precambrian fractures survived into the Phanerozoic.
Attention is given to the role played by stress fields in forming
structures which in the Precambrian were able to accumulate
phlogopite and apatite in the Phanerozoic ensured that these
deposits were preserved. The method is shown to be applicable
in regional analyses for other minerals. C.R.

USING REMOTE PHOTOGRAPHS IN PROSPECTING FOR
HYDROCARBONS ON THE KERCH PENINSULA Abstract Only
V. I. KHNYKIN and N. V. KOLODY in its USSR Rept.: Space
(JPRS-USP-84-006) p 124 14 Nov. 1984 Transl. into ENGLISH
from Issled. Zemli iz Kosmosa (Moscow), no 2, Mar. - Apr.
1984 p 55-59

Onginal language document previously announced in
IAA as A84-34782
Avail NTIS HC A08

Satellite TV images, photographs from manned spacecraft and
aerial photographs were interpreted to ascertain the configuration
of lineaments in the Indolo-Kuban trough on the Kerch Peninsula.
The lineaments are grouped into two systems: the first, which is
the most extensive and pronounced in photographs with the
largest tectonic structures and emphasizes individual structural
elements in some cases; the second group is a system of
lineaments running parallel to the trend of the local folds, and can
usually be traced intermittently over long distances.

The latter can serve as tectonic shields for pools of hydrocarbons.
Prospecting for such pools in the Nizmeyshkopsky deposits is
underway on the Kerch Peninsula at the present time. It has been
shown that there are no reservoirs in the crests of the structures
in the southwestern part. Considering the presence of transverse
fractures here, local folds in this area can be treated as consisting
of individual blocks of pools. The prospecting is to be started
in these blocks from the peripheral portions of the folds, concerning
them to be independent prospecting targets from the central
portions of the structures. Author

22
Geologic studies carried out in Alaska during 1983 are reported. Various geologic aspects of the onshore and offshore areas of Alaska are investigated. Topics cover a wide range in scientific and economic interest.

Geologic mapping, petrologic analysis, isotopic dating, and geophysical studies have identified several areas in the western Tushar Mountains, Utah, that may be underlain by mineralized intrusive systems containing molybdenum, uranium, and other valuable metals. One of these areas is near Indian Creek, 18 km north of Beaver, Utah, where there may be a multiple intruded mineralized stock. Several lines of evidence were pulled together to make this interpretation, providing a good example of synergism in geological research.

The geophysical component of these studies is focused upon. Evidence from geophysical data sets were assembled from the Department of Defense files and were draped with the airborne survey and are in digital form. Gravity data were examined in profile form. Regional trends were removed where possible. AEROMAGNETIC AND GRAVITY MODELS OF THE PLUTON BELOW THE LAKE CITY CALDERA, COLORADO

Author: R.J.F.

Geologic mapping, petrologic analysis, isotopic dating, and geophysical studies have identified several areas in the western Tushar Mountains, Utah, that may be underlain by mineralized intrusive systems containing molybdenum, uranium, and other valuable metals. One of these areas is near Indian Creek, 18 km north of Beaver, Utah, where there may be a multiple intruded mineralized stock. Several lines of evidence were pulled together to make this interpretation, providing a good example of synergism in geological research. The geophysical component of these studies is focused upon.

Geologic studies carried out in Alaska during 1983 are reported. Various geologic aspects of the onshore and offshore areas of Alaska are investigated. Topics cover a wide range in scientific and economic interest.

AEROMAGNETIC AND RADIOMETRIC SIGNATURES OF A POSSIBLE PORPHYRY SYSTEM IN THE WESTERN TUSHAR MOUNTAINS, UTAH

Author: R.J.F.

AEROMAGNETIC AND RADIOMETRIC SIGNATURES OF A POSSIBLE PORPHYRY SYSTEM IN THE WESTERN TUSHAR MOUNTAINS, UTAH

Author: R.J.F.
THE DEVELOPMENT OF ASSESSMENT TECHNIQUES (DAT) Program

The Development of Assessment Techniques (DAT) Program is a program of basic and applied research on the origin and the geological, geochemical, and geophysical expression of mineral deposit systems. The objectives are to develop concepts and techniques to improve the capability of identifying and evaluating mineral resources. To achieve these objectives, the program supports multidisciplinary field and laboratory studies directed toward understanding the processes by which mineral deposits form and developing new techniques for identifying and evaluating mineral resources and analyzing resource data more efficiently and more precisely.

THE ALASKA MINERAL RESOURCES ASSESSMENT PROGRAM

Abstract Only
G. R. WINKLER In its USGS Res. on Mineral Resources, 1985 p 66-68 1985
Avail: NTIS HC A05/MF A01
AMRAP (Alaska Mineral Resources Assessment Program), the prototype U.S. Geological Survey regional resource assessment program, enters its second decade with the continuing goal to provide comprehensive information on the mineral and energy resource endowment of Alaska to the public, the private sector, the academic community and those who are concerned with national mineral policy. The program is designed: (1) to provide information to land management agencies for decisions regarding the classification and allocation of Alaska's Federal lands; (2) to produce systematic, state of the art geoscience information to the mineral and energy industries, Alaska natives, and other public and private interests; and (3) to expand the general knowledge of Alaska's complex geological setting, much of which is known presently only in reconnaissance.

N85-35470# Dennett, Mueßing, Ryan and Associates Ltd., Iowa City, Iowa.
EVALUATION: CLOSE-RANGE PHOTOGRAMMETRY FOR SLOPE INVENTORY AND MONITORING Final Report
H. MUEßIG Sep. 1984 43 p refs Sponsored by Pennsylvania Dept. of Transportation (PB85-192755; FHWA/PA-84-012) Avail: NTIS HC A03/MF A01 CSCL 13B
The use of close-range photogrammetry as a rock slope inventory procedure for the inspection, identification, and classification of slope stabilities was studied. A geotechnical description and evaluation form is supplemented by photogrammetric measurements and a contour map and profiles of the slope are illustrated which were prepared from a single stereopair using an analytical stereoplotter. Slope stability monitoring, using close-range photogrammetry, is discussed and compared with other measurement procedures and several metric camera systems and analytical stereoplotters are compared. Implementation of a close-range photogrammetric inventory and monitoring program is recommended.

OCEANOGRAPHY AND MARINE RESOURCES

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

A85-40237
THE IMPACT OF HIGHER-ORDER BRAGG TERMS ON RADAR SEA RETURN
The possibility that radar sea return observed using a Ku band fan beam Doppler airborne scatterometer flown over crude oil artificial spills might have been back-scattered via the second-order Bragg interaction is surmised. An attempt is made to justify the absence of the first-order Bragg term.
A85-40644
INVESTIGATION OF ICE COVER FROM PLATFORMS IN THE AIR AND IN SPACE USING RADAR EQUIPMENT
[ISSLEDOVANIE LEDOVYKH POKROVOV RADIOFIZICHESKIMI SREDSTVAMI S AEROKOSMICHESKIMI NOSITELLI]

The possibility of using space platforms to study sea-ice cover is discussed. Data obtained using both side-looking radar and microwave radiometer instruments mounted on the Cosmos-1500 satellite and various airborne platforms are evaluated in terms of their information content concerning ice thickness and general morphological features. A Legendre polynomial expansion for Cosmos-1500 data is proposed, which is applicable to the identification of sea-ice types. A series of Cosmos-1500 images of sea-ice formations in the Karas Sea is provided.

A85-41662
THERMAL SATELLITE IMAGERY APPLIED TO A LITTORAL MACROBENTHOS INVESTIGATION IN THE GULF OF MAINE

(Credit NOAA-NA-80FAC0008)

The application of satellite imagery to oceanographic problems has grown in recent years. Its use in biological oceanography, however, has been largely limited to studies of primary productivity. The ability of thermal satellite imagery to identify coastal oceanic fronts suggests that there may be an application to macrobenthos investigations. This communication describes how thermal satellite imagery was applied to the study of sand-beach community distribution in the Gulf of Maine.

A85-41752
RADAR SENSING OF THE OCEAN

A discussion is conducted concerning the principles of radar scattering from the sea that form the bases for such diverse techniques as spaceborne radar altimetry and scatterometry, and of synthetic aperture radars (SARs). Attention is given to the principle of wind vector scatterometry and to unresolved questions that have emerged in the course of its development. It is noted that the theory of SAR wave imaging (for ocean surfaces) is the focus of controversy; nevertheless, SAR imaging is expected to furnish important future advancements in the detection of the presence of internal waves eddies, and currents, and in the acquisition of information about bottom topography in shallow waters. SAR of this type will require a theory for bathymetric imaging.

O.C.

A85-41753
METHODS OF OBTAINING OFFSHORE WIND DIRECTION AND SEA-STATE DATA FROM X-BAND AIRCRAFT SAR IMAGERY OF COASTAL WATERS

X-band synthetic aperture radar (SAR) imagery of the Goto Islands of Japan was digitally analyzed to extract air-sea interaction parameters and to assess the potential of texture measures in analysis of SAR ocean imagery. Wind direction is extracted from wind rows, wind streaks, and random turbulence patterns observed in the SAR imagery. Sea-state parameters are either extracted directly from the imagery or estimated using the extracted information in previously established empirical formulas. A convenient method of digitally presenting imagery, local power spectra, and the extracted/estimated parameters is presented. Texture analysis based on gray-level co-occurrence (GLC) matrices is applied to SAR ocean imagery. The inertia measure is shown to extract similar information to the power spectrum. The cluster-shade measure is shown to be sensitive to image phase.

A85-41961
WAVE-INDUCED PRECIPITATION AS A LOSS PROCESS FOR RADIATION BELT PARTICLES

Precipitation of radiation belt electrons by VLF waves injected from ground-based transmitters was achieved during the Stimulated Emission of Energetic Particles (SEEP) experiments (Imhof et al., 1983), the first direct satellite based observation of modulated precipitation of electrons in the bounce loss cone. This paper considers the temporal and spectral shape as well as the absolute flux level of the observed precipitation pulses. In order to model these results, both the pitch angle dependence of the particle distribution near the edge of the loss cone and atmospheric backscatter which leads to multiple interactions of the particles with the wave are considered. Based on a comparison of theory with observations, the leverage of the precipitation process is estimated. Crude estimates of the percentage depletion of the radiation belt population due to the observed transmitter induced precipitation are also made.

A85-41993#
SATELLITE MEASUREMENT OF SEA SURFACE TEMPERATURE IN THE PRESENCE OF VOLCANIC AEROSOLS

A procedure is described for including aerosol effects in atmospheric transmittance models. It is then shown that two-window correction algorithms produce errors up to 3 C in the presence of a realistic aerosol concentration. An alternative triple-window algorithm is developed which provides accurate corrections for atmospheric absorption and is essentially impervious to the aerosols simulated in this study. The results are verified by using actual satellite measurements made after the eruption of El Chonc in April 1982 which are compared with buoy measurements near Mauna Loa, Hawaii and in the Gulf of Mexico.

V.L.

A85-41994
TRANSMISSION MODEL AND GROUND-TRUE INVESTIGATION OF SATELLITE-DERIVED SEA SURFACE TEMPERATURES

Multichannel sea surface temperature algorithms from ground-truth regression analyses are compared with theoretical algorithms obtained by using a band model of atmospheric transmission. Good agreement in calculated sea surface temperatures is found between the theoretical and regression algorithms. Ground-truth data are used to investigate further the performance of these algorithms, and it is found that the effect of atmospheric absorption as calculated by the model is too small. The model is also used to derive algorithms for the AVHRR and VAS radiometers that are used on the operational NOAA and GOES satellites, respectively. Results indicate that in some cases different algorithms should be used for different view angles.

V.L.
A85-42050
SATellite PROPAGATION IN THE SOUTH PACIFIC REGION
E. BACHMANN (Overseas Telecommunications Commission of
Australia, Sydney, Australia) ATR/Australian Telecommunication
Research (ISSN 0001-2777), vol. 19, no. 1, 1985, p. 3-11. refs

Attention is given to the propagation impairments associated
with those frequency bands that are useful in a South Pacific
satellite system, with emphasis on the satellite signal attenuation
effects of rainfall. On the basis of the climatological regional
commonality of eastern (tropical) Australia, Papua New Guinea,
and the South Pacific islands, reliable long term rain intensity
measurements have been obtained and converted to rain
attenuation values by means of an empirical formula. System
margins are proposed for trunk and concentrated subscriber
telephone circuits, and transmission margins are calculated for 25
representative earth stations in the South Pacific region for 11
and 14 GHz operation. O.C.

A85-42134
OPTICAL-PHYSICAL METHODS FOR THE STUDY OF THE
OCEAN [OPTIKO-FIZICHESKIE SREDSTVA ISSLEDOVANIIA
OKEANA]
V. N. GULKOV, V. A. ZAITSEV, M. A. KROPOTKIN, E. G.
PASHCHENKO, and V. V. TIKHONOV Lenigrad, Izdatel'stvo
Sudostroenie, 1984, 264 p. In Russian. refs

Current trends in the investigation of the ocean by
physical-optical methods are reviewed. Theoretical principles are
given, and recent experimental studies of the oil pollution of the
world ocean, the radiation balance of the ocean surface and water
mass, the electromagnetic fields of the ocean, and sea roughness.
Various devices are described, and test results are presented.
Particular attention is given to the design of thermoelectric radiation
detectors; instruments for measuring the underwater field of solar
radiation; the determination of the statistical characteristics of the
three-dimensional wave roughness field on the ocean, roughness
studies using self-orienting buoys; and instruments for measuring
the characteristics of underwater electromagnetic fields. B.J.

A85-42177#
GEOPOTENTIAL HEIGHTS AND THICKNESSES AS
PREDICTORS OF ATLANTIC TROPICAL CYCLONE MOTION
AND INTENSITY
A. C. PIKE (NOAA, National Hurricane Center, Coral Gables, FL)
Monthly Weather Review (ISSN 0027-0644), vol. 113, June 1985,
p. 931-939. refs

In response to the increasing availability of satellite and aircraft
temperature observations on the periphery of tropical cyclones,
archived thickness and geopotential height data from National
Meteorological Center analyses are compared as Atlantic cyclone
predictors. For maximum use in motion prediction, thicknesses
must be converted into deep-layer-mean or midtropospheric heights
using an accurate reference-level height analysis. The 1000-700
mb thickness in the vicinity of cyclones in the poleward and
eastward quadrant is a significant predictor of 24 h intensity change,
even when combined with climatology and persistence. Author

A85-42222
SATELLITE OCEANOGRAPHY
I. S. ROBINSON (Southampton, University, England) Chichester,
England/New York, Ellis Horwood, Ltd./Halsted Press, 1985, 455
p. refs

The acquisition of terrestrial remote-sensing data from satellites
and the applications of these data in oceanography are examined in
an introductory text intended for graduate or senior
undergraduate students. Individual chapters are devoted to space
hardware, data handling and data transmission, the oceanographic possibilities of satellite sensors, the principles of remote sensing of the sea, image processing, visible-wavelength ocean-color sensors, sea-surface temperatures from IR scanning radiometers, passive microwave radiometers, satellite altimetry of sea-surface topography, active microwave sensing of surface roughness, the altimeter as a roughness sensor, SAD, microwave scatterometers, and advanced sensors currently being developed. Graphs,
diagrams, maps, tables of numerical data, and sample images are
provided. T.K.

A85-42254
WAVE REFRACTION BY WARM CORE RINGS
G. R. MAPP, C. S. WELCH, and J. C. MUNDAY (College of William
and Mary, Gloucester Point, VA) Journal of Geophysical Research
(ISSN 0148-0227), vol. 90, July 20, 1985, p. 7153-7162. refs

A numerical model for refraction of ocean swell by currents
associated with a warm core ring was developed and tested with
Seasat synthetic aperture radar (SAR) data. The wave field of
SAR orbit 1232 was measured using optical Fourier transforms.
The wave refraction model produced rays by simultaneous,
numerical integration of the Hamiltonian ray equations applied to
a moving medium. Wave orthogonal were constructed from wave
number vectors calculated at each incremental time step. The
flow field used by the model to simulate a warm ring was a steady,
circular jet, with the radial profile of tangential velocity composed
of a power function joined to a Gaussian. Initial wave conditions
for simulation of refraction by the SAR-imaged ring were determined
from measurements outside the ring. No data were available from
which to determine the current field of the SAR-imaged ring, so
the current field input to the model was adjusted until the output
wave field most nearly resembled the SAR observations. The
relative locations of convergence and divergence of rays were as
observed on the SAR image, and the relative energy density in
crossed seas was correctly predicted. However, predicted patterns
of wavelength variation (presuming that incident waves were
uniform in wavelength) were not observed. Author

A85-42255
SOME FEATURES OF THE ALGERIAN CURRENT
C MILLOT (Laboratoire d'Oceanographie Physique,
La-Seyne-sur-Mer, France) Journal of Geophysical Research
(ISSN 0148-0227), vol. 90, July 20, 1985, p. 7169-7176. refs

The dynamics of the Algerian Current and flow of the Atlantic
Water in the Algerian Basin are investigated on the basis of thermal
satellite images. An analysis of hydrological and infrared data
indicates that the Algerian Basin is characterized by a large
esoscale variability mainly due to the instability of the Algerian
Current. The Basin looks like a reservoir in which the Atlantic
Water is amassed, it forms a buffer zone which partially disconnects
the flux coming in at Gibraltar from the fluxes going out toward
the Ligunan Sea and through the Strait of Sardinia. V L.

A85-42257
DISPERSION OF SEA ICE IN THE BERING SEA
S MARTIN (Washington, University, Seattle) and A S THORNDIKE
(University of Puget Sound, Tacoma, WA) Journal of Geophysical
Research (ISSN 0148-0227), vol. 90, July 20, 1985, p. 7223-7226. refs

The dispersion of sea ice in the Bering Sea is analyzed in
terms of the changes in separation between pairs of ice floes.
The statistics of these changes depend on the separation itself
and on the time interval over which the changes are measured.
Rather than being constant, as in the case of molecular or Fickian
diffusion, the diffusivity increases according to the 1.5 power of the
separation. For short times the diffusivity is proportional to
time. For times greater than three days the diffusivity appears to
approach a constant value for any particular separation.
Comparison with other data shows that the ice floe diffusivity is
about an order of magnitude smaller than the diffusivity at the
surface of the temperate ocean and about an order greater than
the diffusivity of sea ice in the Beaufort Sea. Author
05 OCEANOGRAPHY AND MARINE RESOURCES

A85-42259
ALBEDO OF A WATER SURFACE, SPECTRAL VARIATION, EFFECTS OF ATMOSPHERIC TRANSMITTANCE, SUN ANGLE AND WIND SPEED

The albedo's dependence on transmittance (cloudiness) and solar altitude is examined using observations obtained from aircraft and a ship in the Joint Air-Sea Interaction experiment, from a ship in the GARP Atlantic Tropical Experiment, and from an instrumented mast located in Lake Washington (Seattle, WA). For short solar wavelengths (0.28-0.53 micron), surface albedo shows little dependence on transmittance, while for longer solar wavelengths (0.53-2.8 microns), albedo increases with decreasing transmittance. The results obtained are in general agreement with those of Payne (1972), but some deviations are indicated at high solar altitudes with low transmittance and for solar altitudes below 20 deg. Author

A85-42512#
VISIBLE FLUORESCENCE FROM ULTRAVIOLET EXCITED CRUDE OIL

Radiant fluorescent intensity, from a UV irradiated sample of crude oil in the visible spectral region, was measured as a function of exposure time of the crude oil to the atmosphere. The intensity of the laboratory source of UV irradiation (300-400 nm) was calibrated and compared with the intensity of the sun at sea level through 1 atm. The maximum intensity of the sun excited fluorescence was estimated to be 5 times less than that required to be detected by presently available satellite mounted visible spectrum detectors and 500 times less than that required to differentiate one crude oil type from another. Author

A85-43117
SATELLITE OBSERVATIONS OF THE CIRCULATION EAST OF THE MISSISSIPPI DELTA - COLD-AIR OUTBREAK CONDITIONS
W. W. Schroeder (Alabama, University, Dauphin Island), O. K. HuH, L. J. RouSe, JR., and W. J. Wiseman, JR (Louisiana, State University, Baton Rouge) Remote Sensing of Environment (ISSN 0034-4257), vol. 18, Aug 1985, p. 49-58. Research supported by the University of Alabama, Dauphin Island Sea Laboratory, and NOAA, refs

Examination of 12 years of Landsat multispectral scanner images shows a recurrent pattern of westward flow immediately south of the Mississippi-Alabama barrier islands under northerly winds. Such flow patterns are also seen under similar conditions in imagery from the Advanced Very High Resolution Radiometer (AVHRR) of the NOAA-satellite satellites. The flow enters Chantecler Sound between Ship Island and the northern end of the Chantecler Islands. It appears to be driven by northerly winds, which force water south through the Chantecler-Breton Sound, drawing water in from the shelf region south of the Mississippi-Alabama barrier islands. These observations on circulation can be simply explained assuming linear dynamics. These two operational satellite systems are accumulating valuable records of coastal circulation patterns under clear-sky conditions. Author

A85-44925
THERMAL ISOSTASY IN THE SOUTH ATLANTIC OCEAN FROM GEOID ANOMALIES

Transfer functions (admittances) were computed for the main tectonic units of the South Atlantic Ocean using the detailed Seasat geoid. Ensemble averaging in the two-dimensional wavenumber domain was applied. The topography of the Walvis Ridge and Rio Grande Rise visually correlates with the local geoid; i.e., the difference between the total Seasat geoid and first ten harmonics of the GRIM 3 model. The mid-Atlantic geoid visually correlates with the total geoid. Sea-gravimetry was used to evaluate the contribution of mechanical isostasy to the geoid. Admittances computed from the geoid and from gravimetry data agree well in the short waveband (wavelengths shorter than 300 km). A deviation at longer wavelengths is found between the observed admittance and the one due to mechanical isostasy for the southwestern Walvis Ridge. It is explained with a density perturbation at about 20 km deep. The admittance for the Mid-Atlantic Ridge is interpreted in terms of a boundary layer model and an average thickness of 30 km for the thermal lithosphere is obtained. Author

A85-45875
A COMPARISON OF SPOT SIMULATOR DATA WITH LANDSAT MSS IMAGERY FOR DELINEATING WATER MASSES IN DELAWARE BAY, BROADKILL RIVER, AND ADJACENT WETLANDS
S. G. Ackleson, V. Klemas (Delaware, University, Newark), H. L. McKim, and C. J. Merry (US Army, Cold Regions Research and Engineering Laboratory, Hanover, NH) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 51, Aug. 1985, p. 1123-1129. refs
05 OCEANOGRAPHY AND MARINE RESOURCES

A85-46251
PROGRAM OF EXPERIMENTS ON THE COSMOS-1500 SATELLITE [PROGRAMMA EKSPERIMENTOV NA ISZ 'KOSMOS-1500']
IU. A. AFANASEV, B. A. NELEPO, A. S. SELIVANOV, B. E. KHMYROY, G. M. TAMKOVICH (GNI Tsentr Izucheniia Prirodnikh Resursosv, AN SSSR, IR i E and IKI, Moscow, USSR), AN USSR, MGU, Sevastopol; AN USSR, IR i E, Kharkov; Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, Ukrainian SSR) et al. Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 3-8 In Russian refs

The main objectives and results of experiments involving the remote sensing of the ocean from the Cosmos-1500 satellite are summarized. The features of the scientific instrumentation are described along with details of subsystem measurements. In addition, programs for the support and control of the measurements are discussed, and the planning of satellite operations and the distribution of data to users are considered. As an example, attention is given to the application of ice-radar-survey data to the analysis of the ice situation in the Eastern Arctic during the winter of 1983.

A85-46252
INTERPRETATION OF SEA ICE ON SATELLITE RADAR IMAGES [DESHIFRIROVANIE LED'OV NA RADIOLOKATSIONNYKH SPUTNIKOVYKH SNIMKAX]
A. V. BUSHUEV, V. D. GRISHCENKO, and A. D. MASANOV (Avtarkhochrome i Antarctshcheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 9-15 In Russian

The information content of radar images of Arctic sea ice obtained during the winter of 1983 is analyzed on the basis of subsatellite reference data. Features characterizing the interpretation of sea ice on these images are examined. It is concluded that such interpretation can provide information of navigational use, including data on channels in massive old ice, the location and configuration of giant ice fields, and the drift velocity and direction of ice over the entire Arctic Ocean.

A85-46253
L. M. MITNIK (AN SSSR, Tikhoookansko Okeanologicheski Institut, Vladivostok, USSR), G. I. DESIATOVA (Dal'nevostochny Regional'ny Tsentr Priema i Obrazovaniia Sputnikovykh Dannyk, Khabarovsk, USSR), and V. V. KOVBASIUK (Kamchatskoe Regional'noe Upravlenie po Gidrometeorologii i Kontroliu Prirodnikh Sredy, Petropavlovsk-Kamchatski, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 16-22. In Russian refs

Cosmos-1500 radar images of the Sea of Okhotsk during the winter of 1983-1984 are analyzed. A comparison of these images with ice maps obtained through aerial reconnaissance made it possible to determine the features of the formation and development of new, nilas, and young ice which have not been obtained through satellite measurements in various spectral bands.

A85-46254
THE USE OF RADAR IMAGES OBTAINED WITH THE COSMOS-1500 SATELLITE TO STUDY THE DISTRIBUTION AND DYNAMICS OF SEA ICE [ISPOL'ZOVANIE RADIOLOKATSIIONNYKH SNIMKOV ISZ 'KOSMOS-1500' DLIA ISSLEDONIYAS RASPREDENLLENNII I DINAMIKH MORSKIIH LED'OV]
A. V. BUSHUEV and IU. D. BYCHENKO (Arkticheskii i Antarctshcheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 23-27 In Russian

A85-46255
QUANTITATIVE INTERPRETATION OF SATELLITE RADAR IMAGES OF SEA ICE USING A PRIORI DATA [KOLICHESTVENNAIA INTERPRETATSIIA SPUTNIKOVYKH RADIOLOKATSIIONNYKH OIBRAZHENII MORSKIIH LED'OV S ISPOL'ZOVANIIM A PRIORNYKH DANNYKH]
V A ALEKSANDROV and V. S. LOSHCHILOV (Avtarkhochrome i Antarctshcheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 28-31. In Russian

A85-46256
IDENTIFICATION OF EDDY FORMATIONS IN A RADAR IMAGE OF THE OCEAN SURFACE [OB IDENTIFIKATSIII VIKHREVKH OBRAZOVANII V RADIOLOKATSIIONNOM IZOBRAZHENII POVERKHNOSTI OKEANA]
A. D. DULOV, G. K. KOROTAIEV, V. I. KUDRIAVTSEV, V. S. SUETIN, and IU. V. TEREKHIN (AN USSR, Morskoii Gidrofizicheskii Institut, Sevastopol, Ukrainian SSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 32-40. In Russian. refs

A model for the formation of the radar image of a synoptic eddy is proposed with reference to Cosmos-1500 radar data on the ocean surface near Newfoundland. The model is based on the dependence of the radar backscattering on the breaking intensity of wind-generated waves. This dependence results from the covering of the ocean surface by foam (which absorbs the radio waves) and the smoothing of the scattering ripples in focus of small-scale near-surface turbulence generated by wave breaking. The breaking intensity is defined by the parameters of the wind-generated waves.

A85-46257
ORDERED MESOSCALE STRUCTURES ON THE OCEAN SURFACE IDENTIFIED FROM SATELLITE RADAR DATA [OB UPORIADOCHENNYKH MEZOMASSHTABNYKH STRUKTURAKH NA POVERKHNOSTI OKEANA, VYIYAVLENNYKH PO DANNYM RADOLOKATSIIONNOGON IZOBRAZHENII S'EOMOK IZ KOSMOSA]
A. I. KALMYKOV, M. NIZIROV, P. A. NIKITIN, A. P. PICHUGIN, and IU. G. PISHTOBOV (AN USSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR; Gosudarstvennyi Nauchno-Issledovatel'skii Tsentr Izucheniia Prirodnikh Resursosv, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 41-47. In Russian. refs

Synchronous radar and optical surveys of the ocean from the Cosmos-1500 satellite revealed the existence of a mesoscale cellular and linearly periodic quasi-homogeneous spatial organization of near-surface hydrophysical fields (wind-generated waves and related temperature fields, currents, and dissolved and suspended substances) connected with convective and wave processes in the atmospheric surface layer. The mechanism for this phenomenon consists in the fact that these structures are adapted to the spatial distribution of elements of convective and wave perturbations in the atmospheric surface layer as the result of nonuniform molecular, turbulent, and convective energy transfer between ocean and atmosphere. Empirical rules are established for determining the direction of general air transfer over the ocean in accordance with a physical interpretation of ordered structures observed on radar images.
THE NORTHWEST PACIFIC ON DECEMBER 6, 1983

COMBINED ANALYSIS OF RADAR AND OPTICAL IMAGES OF THE NORTHWEST PACIFIC ON DECEMBER 6, 1983

TIKHOGO OKEANA ZA 6 DEKABRIA 1983 G.

OPTICHESKOGO IZOBRAZHENII SEVERO-ZAPADNOI CHASTI

COMBINED ANALYSIS OF RADAR AND OPTICAL IMAGES OF A85-46258

Tsentr Pnema i Obrabotki Sputnikovykh Dannykh, Khabarovsk, USSR, TOI, Vladivostok, USSR; Dal'nevostochnyi Regional'nyi Tsentr Prema i Obrabotku Sputnikovykh Dannikh, Khabarovsk, USSR; Kamchatskoe Territorial'noe Upravlenie po Gidrometeorologi i KPS, Petropavlovsk-Kamchatski, USSR) issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 48-53. In Russian. refs

RADAR MAPS OF THE ARCTIC AND ANTARCTIC COMPILED ON THE BASIS OF COSMOS-1500 SATELLITE DATA, AND PRELIMINARY RESULTS OF THEIR ANALYSIS

[RADIOLOKATSIONNYE KARTY ARKTIKI I ANTARKTIDY PO DANNYM ISZ 'KOSMOS-1500' I PREDVARITEL'NYE REZULTATY IH ANALIZA]

A. BURTSEV, V. A. KROVOTYNTSEV, M. NAZIROV, P. A. NKITIN, and IU. G. SPIRIDONOV (Gosudarstvennyi Nauchno-Issledovatelskii Tsentr Izuchenia Pnrodnykh Resursov, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 54-63. In Russian. refs

Theoretical aspects of the formation of radar signals reflected from the sea and sea ice are examined. Radar maps of the Arctic and Antarctic basins obtained with the Cosmos-1500 sideldooking radar are presented. Ice-cover features of the maps are analyzed.

THE DATA ACQUISITION SYSTEM ON THE COSMOS-1500 SATELLITE [BORGOVOI INFORMATSIONNYI KOMPLEKS SPUTNIKA 'KOSMOS-1500']

S S KAVELIN, E. I. BUSHUEV, V. I. DRANOVSKII, V. V. PUSTOVOITENKO, IU D. SALTIKOV (Dnepropetrovskii Gosudarstvennyi Universitet, Dnepropetrovsk, AN USSR, Morskii Gidrofizicheski Institut, Sevastopol', Ukrainan SSR) et al. Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 64-69. In Russian. refs

The data acquisition system (DAS) of the Cosmos-1500 oceanographic satellite includes a sideldooking radar, an 0.8-cm-wavelength scanning microwave radiometer, a three-frequency microwave spectrometer, a radio-TV system, and a system for the acquisition of data from buoy stations. The design features of this DAS are described. Attention is given to differences between this DAS and those of other Russian satellites.

INVESTIGATION OF THE OCEAN WITH LOW-RESOLUTION MULTISPECTRAL SCANNERS [ISSLEDOVANIE OKEANA S POMOSCH'U MULTISPECTRAL'NYKH SKANIRUJUSCHIKH USTROISTV MALOGO RAZRESHENIIA]

A. S. SELIVANOV, IU. M. GEKTIN, M. K. NARAEVA, A. S. PANFILOV, and V. P. CHEMODANOV Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 70-75 In Russian. refs

L. Trends in the remote sensing of the ocean by optomechanical multispectral scanners are reviewed. The design features and specifications of this DAS are described. Attention is given to differences between this DAS and those of the Cosmos-1076, Cosmos-1151, and Meteor-Pnroda oceanographic satellites.

THE SIDELOOKING RADAR ON THE COSMOS-1500 SATELLITE [RADIOLOKATOR BOKOVOGO OBZORA ISZ 'KOSMOS-1500']

A. I. KALMYKOV, A. S. KUREKIN, V. B. EFIMOY, A. B. FETISOV, V. V. IGOILKIN (AN USSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainan SSR) et al. Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 76-82. In Russian. refs

The choice of the main specifications of the sideldooking radar (SLR) of the Cosmos-1500 oceanographic satellite is justified. These specifications include the wavelength of the sounding signal, the surface irradiation angles, the polarization of the radiation, and the mean power of the transmitter. The main components of the SLR are described, and the overall system design is examined. It is concluded that results of full-scale experiments confirm the correctness of the theoretical principles and design solutions underlying the development of the SLR.

INFORMATIONAL POTENTIAL OF THE SIDELOOKING RADAR OF THE COSMOS-1500 SATELLITE [INFORMATSIONNYE VOZMOZHNOSTI RADIOLOKATSIONNOI SYSTEMY BOKOVOGO OBZORA ISZ 'KOSMOS-1500']


An assessment of the informational potential of the Cosmos-1500 sideldooking radar (SLR) shows that this system can efficiently solve various problems of oceanographic research and ice survey. The system is characterized by a wide survey band (450-500 km), a sufficiently high resolution (1-2 km), efficient onboard data processing, and data transmission on standard transmission lines. The SLR is particularly suitable for the study of the wind velocity field near the ocean surface and the rough ocean surface.

AUTOMATED PROCESSING OF REMOTE-SENSING DATA OBTAINED WITH THE MICROWAVE RADIOMETER OF THE COSMOS-1500 SATELLITE [AVTOMATIZIROVANNAYA OBRABOTKA DANNYKH DISTANTSIONNYKH IZMERENII SVCH-RADIOMETROM ISZ 'KOSMOS-1500']

V. S. SUETIN, V. D. MASLOV, V. V. MAKOVKIN, A. N. NEDOVESOV, V. V. MIROSHNICHENKO (AN USSR, Morskii Gidrofizicheski Institut, Sevastopol', Ukrainan SSR; AN SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR; AN SSSR) et al. Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 103-106. In Russian. refs

A block diagram of the system for the processing of remote-sensing data obtained with the multichannel microwave radiometer of the Cosmos-1500 oceanographic satellite is presented. The processing is carried out using the Es computer and a special software package. The various steps of processing are described in some detail.

DIGITAL PROCESSING OF RADAR IMAGES OBTAINED WITH THE COSMOS-1500 SATELLITE [TSIFROVAIA OBRABOTKA RADIOLOKATSII IZOBRAZHENII, POLUCHENNYKH SO SPUTNIKA 'KOSMOS-1500']

V V ASMUS, P. A. NIKITIN, A. E. POPOV, V I. POPOV, and IU G. SPIRIDONOV (Gosudarstvennyi Nauchno-Issledovatelskii Tsentr Izuchenia Pnrodnykh Resursov, Moscow, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p. 107-114. In Russian. refs

The method for the digital processing of radar images obtained with the sideldooking radar of the Cosmos-1500 oceanographic satellite is described, and a block diagram of the processing is presented. The functional groups of the software modules are described, and preliminary processing results are presented. It is concluded that the processing method described here can be used to determine wind velocity over the ocean and other...
characteristics of the state of the ocean and atmosphere, as well as to classify types of ice cover.

A85-46267

THE EXPERIMENTAL OCEANOGRAPHIC SATELLITE COSMOS-1500 [EKSPERIMENTAL'NYI OKEANOGRAFICHESKI SPUTNIK 'KOSMOS-1500']

S. S. KAVELIN, D. G. BELOV, V. F. ZUBENKO, I. D. IGODALOVA (Dnepropetrovsk Gosudarstvennyi Universitet, Dnepropetrovsk, Ukrainian SSR) et al. Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), May-June 1985, p 115-122 In Russian.

After a discussion of requirements on the design and operation of oceanographic remote-sensing satellites, the paper describes the design of the Cosmos-1500 satellites. The basic structural-design features are considered, and the principles of satellite control are described.

A85-47921†# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. LIDAR OBSERVATIONS OF VERTICALLY ORGANIZED CONVECTION IN THE PLANETARY BOUNDARY LAYER OVER THE OCEAN


Observations of a convective planetary boundary layer (PBL) were made with an airborne, downward-looking lidar system over the Atlantic Ocean during a cold air outbreak. The lidar data revealed well-organized, regularly spaced cellular convection with dominant spatial scales between two and four times the height of the boundary layer. It is demonstrated that the lidar can accurately measure the structure of the PBL with high vertical and horizontal resolution. Parameters important for PBL modeling such as entrainment zone thickness, entrainment rate, PBL height and relative heat flux can be inferred from the lidar data. It is suggested that wind shear at the PBL top may influence both entrainment and convective cell size.

A85-48670* University of South Florida, St. Petersburg. SOLID-STATE SPECTRAL TRANSMISSOMETER AND RADIOMETER

K L. CARDER, R. G. STEWARD (South Florida, University, St. Petersburg), and P. R. PAYNE (Aztec Computer Engineering, Pinellas Park, FL) Optical Engineering (ISSN 0091-3286), vol. 24, Sept.-Oct. 1985, p. 863-868. refs (Contract NAGW-465)

An in situ instrument designed to measure the spectral attenuation coefficient of seawater and the ocean remote-sensing reflectance from 400 to 750 nm is in the test and development stage. It employs a 256-channel, charge-coupled type of linear array measuring the spectral intensities diffracted by a grating. Examples of the types of data delivered by this instrument have been simulated using a broadband laboratory instrument and an above-water, solid-state radiometer. Algorithms developed using data from these instruments provide measures of chlorophyll a plus phaeopigments concentrations from less than 0.1 to 77.0 mg/cu m, gelbstoff spectral absorption coefficients, and detrital spectral backscattering coefficients for waters of the west Florida shelf.

A85-48970 INVERSE METHODS FOR OCEAN WAVE IMAGING BY SAR


A Synthetic Aperture Radar (SAR) can form high resolution images of the sea surface. The direct problem for such an imaging system is now reasonably well understood and is summarized here for both the SAR image and its power spectrum. The inverse problem has only recently been explored and some simple approaches based on linear demodulation and speckle removal are described. These are applied to a number of SeaSat images.

A85-49477 MODELING OF RADIO-WAVE SCATTERING BY ICE COVER [MODELIROVANIE PROTSESSOV RASSEIVANIIA RADIOVOLN LELOVMI POKROVAMI]

A. I. TIMCHENKO, IU. A. SINITSYN, and V. B. EFIMOVA (AN USSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR) Radiofizka (ISSN 0021-3462), vol. 28, no 7, 1985, p. 816-822 In Russian refs

The use of numerical modeling to study scattering characteristics in the radar sounding of ice cover, with the aim of determining ice age and thickness, is examined. Radiation-transfer theory is used to investigate radio-wave reflection from a dielectric layer with rough boundaries for different values of the bulk absorption coefficient Results of numerical calculations are compared with experimental data, and analytical solutions of the transfer equations are discussed. Particular attention is given to the formation of the scattering indicatrix.

A85-49855*- Washington Univ., Seattle. SMALL-SCALE CYCLES ON THE PERIPHERY OF A GULF STREAM WARM-CORE RING

M. A. KENNELLY (Washington, University, Seattle), R. H. EVANS (Miami, University, FL), and T. M. JOYCE (Woods Hole Oceanographic Institution, MA) Journal of Geophysical Research (ISSN 0148-0227), vol. 90, Sept. 29, 1985, p. 8845-8857. refs (Contract NSF OCE-80-16983; NSF OCE-80-16991; NAGW-272; NAGW-273)

Small-scale cyclones found around Gulf Stream warm-core ring 82B are investigated using infrared satellite images and current information obtained with an acoustic-Doppler velocimeter. Currents in these cyclones reveal speeds ranging from 20 to 80 cm/s. One small cyclone or 'ringlet' found in June 1982 was studied extensively by removing the basic rotational velocities of 82B. The azimuthal velocity field for this ringlet was used with the gradient current equation to calculate the absolute dynamic topography at 100 dbar. It was found that the ringlet was 13 dyn-cm lower than its surroundings. In addition, neglect of the centrifugal term would have changed the dynamic topography of the ringlet by 30 percent. From a comparison with CTD data the absolute reference level was determined, and a vertical profile of horizontal currents was calculated for the ringlet. Other cyclones were found throughout the slope water region around warm-core ring 82B with observable lifetimes of 1 to 2 weeks. The northeast quadrant of 82B was a favored generation site for ringlets. Two cyclones were observed to form in this region and were advected anticyclonically around 82B. Typically, at any one time, six cyclones with diameters of approximately 40 to 50 km can be detected north of the Gulf Stream by using satellite images.

A85-49863 A WIND-INDUCED MESOSCALE EDDY OVER THE VANCOUVER ISLAND CONTINENTAL SLOPE


Nimbus 7 satellite coastal zone color scanner imagery and direct oceanic measurements are used to investigate the mesoscale circulation pattern formed off the coast of Vancouver Island, British Columbia, in July, 1979. Attention is given to a well defined cyclonic eddy that formed in 1900 m of water over the central portion of the continental slope. The eddy and its attendant mesoscale circulation pattern are suggested to have evolved through mixed barotropic-baroclinic instability of a poleward-flowing coastal jet that had been generated during a one-week period of strong southwesterly winds.

O.C.
THE EFFECT OF EL CHICHON ON WIND VARIABILITY IN THE TROPOSPHERE, STRATOSPHERE, AND MESOSPHERE OVER ALASKA

SHEMDIN

A85-49872

COMMENT ON "MEASUREMENT OF HIGH-FREQUENCY WAVES USING A WAVE FOLLOWER" BY S. TANG AND O. H. SHEMDIN

F. DOBSON (Bedford Institute of Oceanography, Dartmouth, Canada) Geophysical Research (ISSN 0148-0227), vol. 90, Sept. 20, 1985, p. 9203, 9204; Reply, p. 9205.

A85-49933

THE EFFECT OF EL CHICHON ON WIND VARIABILITY IN THE TROPOSPHERE, STRATOSPHERE, AND MESOSPHERE OVER ALASKA

B. B. BALSLEY and R. CARELLO (NOAA, Aeronomy Laboratory, Boulder, CO) Geophysical Research Letters (ISSN 0094-8276), vol. 12, Sept. 1985, p. 581-584 NSF-supported research. refs. Data from the Poker Flat, Alaska MST radar combined with standard NWS balloon observations at Fairbanks, Alaska show that low-frequency (3-11 day) wind fluctuations within the troposphere and lower stratosphere for the period January-March 1983 were noticeably weaker than those for other similar periods between 1973-1984. Similar effects can be detected in the higher-frequency (1-6 hr and 8-48 hr) wind fluctuations obtained from the radar data alone. In contrast to these decreases in the troposphere and lower stratosphere wind variations, the magnitude of the tidal period (8-48 hr) atmospheric wind fluctuations observed by radar in the mesosphere during June-July were significantly increased in 1983 relative to surrounding years. All of these variations appear to be reasonably well associated with the presence of enhanced aerosol concentrations in the lower stratosphere following the explosion of El Chichon volcano in April 1982.

Author

N85-30411# Joint Publications Research Service, Arlington, Va

MODEL COMPUTATIONS OF LIGHT REFLECTION FROM SEA SURFACE Abstract Only


Avail: NTIS HC A04/MF A01 CSCL 20F

The method of stochastically distributed surfaces is used extensively in marine optics in computing the reflection of light from the wave covered sea surface; surface brightness is determined through the Fresnel reflection coefficient for which there is a mirror observation direction relative to the direction of incidence. This method cannot be used for other angles because then shadow effects and multiple reflection of light from roughness elements which are not taken into account in the stochastically distributed surfaces method become important. This problem has been solved in the example of a very simple model which makes it possible to obtain important estimates. In this model it is possible to trace the fate of each ray incident on the surface separately; both the shadow effect and multiple reflection are taken into account. Refracted beams are neglected in order to study the characteristics of the phenomenon related only to reflection from the surface.

Author

N85-30451# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MIZEK, 1984, NASA CV-990 FLIGHT REPORT


During June/July 1984, the NASA CV-990 Airborne Laboratory was utilized in a mission to overly the Fram Strait/East Greenland Sea marginal ice zone (MIZ) during the main summer marginal ice zone experiment (MIZEK '84). The eight data flights were coordinated where possible with overpasses of the Nimbus-7 satellite, and with measurement of sea ice, open ocean, and atmospheric properties at the surface. The surface research teams were based on seven research vessels, some with helicopters: (1) M/V Kvibjorn, (2) M/V Polarequeen, (3) M/S Haakon Mosby,
SATELLITE MEASUREMENTS OF ATMOSPHERIC AEROSOLS
M. GRIGGS 28 p (Contract N00014-77-C-0489)
(AD-A153807; SAIC-85/1606) Avail: NTIS HC A03/MF A01
CSCL 04B
An error analysis of the two-channel techniques has shown that the AVHRR
noise will result in root-mean-square errors of about 0.40 in the size distribution
parameter, and about 0.08N in aerosol content. These errors are increased due to the effects
of undetected clouds in the field of view and variations in the ocean surface reflectance. Based on an analysis of the Barbados and USNS Hayes data, these environmental errors could be of the same magnitude for, and larger for N. However, because of uncertainties in the data set there is uncertainty in these estimates of the environmental errors. GRA

CONTINENTAL AND OCEANIC MAGNETIC ANOMALIES:
ENHANCEMENT THROUGH GRM Abstract Only
R. R. B. VONFRESE and W. J. HINZE (Purdue Univ., Lafayette, Ind.) In Purdue Univ. Improving the Geol. Interpretation of Magnetic and Gravity Satellite Anomalies 4 p 1985 ERTS
Avail: NTIS HC A04/ MF A01 CSCL 08N
In contrast to the POGO and MAGSAT satellites, the Geopotential Research Mission (GRM) satellite system will orbit at a minimum elevation to provide significantly better resolved lithospheric magnetic anomalies for more detailed and improved geologic analysis. In addition, GRM will measure corresponding gravity anomalies to enhance our understanding of the gravity field for vast regions of the Earth which are largely inaccessible to more conventional surface mapping. Crustal studies will greatly benefit from the dual data set as modeling has shown that lithospheric sources of long-wavelength magnetic anomalies frequently involve density variations which may produce detectable gravity anomalies at satellite elevations. Furthermore, GRM will provide an important replication of lithospheric magnetic anomalies as an aid to identifying and extracting these anomalies from satellite magnetic measurements. The potential benefits to the study of the origin and characterization of the continents and oceans, that may result from the increased GRM resolution are examined. M.G.

E. CHAPUIS, C. SCHGOUIN, and N. LANNELONGUE 20 Feb. 1984 76 p refs In FRENCH; ENGLISH summary Sponsored by CNES and CNRS (CNES-84/142/TT/CT/DRT/TIT/RL) Avail: NTIS HC A05/ MF A01
A frequency modulated scatterometer mounted on an icebreaker was used to study microwave interactions with sea-ice and water. The frequency, polarization and incidence of radar signals were studied to identify ice types and ice-snow surface characteristics. The most significant results are obtained with a polarized signal that at 13.66 Hz allows the identification of 4 types of surfaces. Author (ESA)

globally mean sea surface based upon a combination of the total set of GEOS-3 and SEASAT altimeter data was computed. In order to minimize the effects of radial orbit errors, a combination of accurate SEASAT reference orbits and crossing-arc techniques was used in the computation process. The mean sea surface provides a reference surface for the detection of mesoscale ocean circulation features, global ocean circulation patterns and detailed information over the oceans on the internal structure of the Earth. B.W.

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**Oceanography and Marine Resources**

N85-32310# Emory Univ., Atlanta, Ga Dept. of Chemistry. **A MICROPROCESSOR-CONTROLLED, MULTICHANNEL FLUORIMETER FOR ANALYSIS OF SEA WATER** P. B. OLDHAM, G. PATONAY, and I. M. WARNER 30 Apr 1985 29 p (Contract N00014-83-K-0026) (AD-A154986; EMORY/DC/TR/6) Avail: NTIS HC A03/MF A01 CSCL 06J

The multichannel fluorometer described provides good sensitivity and rapid data acquisition. The advantages of multichannel fluorescence detection are discussed with special reference to the continuous monitoring of in vivo chlorophyll fluorescence in sea waters. Experiments on chlorophyll a determinations indicate a detection limit of 5 times 10 to the minus 12th power M with a linear range over at least three orders of magnitude of concentration.


Historically, marine geologists have always worked with mega-scale morphology. This is a consequence both of the scale of the ocean basins and of the low resolution of the observational remote sensing tools available until very recently. In fact, studies of deep sea morphology have suffered from a serious gap in observational scale. Traditional wide-beam echo sounding gave images on a scale of miles, while deep sea photography has been limited to scales of a few tens of meters. Recent development of modern narrow-beam echo sounding coupled with computer-controlled swath mapping systems, and development of high-resolution deep-towed side-scan sonar, are rapidly filling in the scale gap. These technologies also can resolve morphologic detail on a scale of a few meters or less. As has also been true in planetary imaging projects, the ability to observe phenomena over a range of scales has proved very effective in both defining processes and in placing them in proper context. G.L.C

N85-32388# Army Engineer Waterways Experiment Station, Vicksburg, Miss. **ENVIRONMENTAL LABORATORY HANDBOOK FOR OBTAINING AND USING AERIAL PHOTOGRAPHY TO MAP AQUATIC PLANT DISTRIBUTION** Final Report J. M. LEONARD Nov. 1984 42 p (AD-A154584, WES-IR-A-84-2) Avail. NTIS HC A03/MF A01 CSCL 08C

Stepwise procedures are given for the tasks required in using low-altitude aerial photography to map aquatic plants. The tasks include problem identification, photommission design, acquisition of ground truth data, and photointerpretation and data presentation. The sources of existing aerial photographs and the general and technical requirements for aerial photography are given in Appendices A and B, respectively. Author (GRA)


This thesis summarizes the Marginal Ice Zone Experiment (MIZEX-83) conducted in the Arctic during the summer of 1983 and describes the mesoscale features and atmospheric refraction conditions. The three case studies examined are: warm air advection over dense pack ice causing strong elevated ducting and subrefraction; cold air advection over relatively open water causing shallower convection and normal refraction conditions, and large scale subsidence in the western quadrants of an anticyclone leading to super-refraction and weak ducting. Developing synoptic...
scale cyclones adjacent to the MIZEX-83 area often determined the airflow over the region. The observed large horizontal sea surface temperature gradients were the dominant forcing mechanisms on surface layer stability. Trapping layers associated with subsidence inversions can be located on satellite imagery by the airflow over the region. The observed large horizontal sea during MIZEX-83 due to strong mesoscale variability. Factors on surface layer stability. Trapping layers associated with subsidence inversions include subsidence and entrainment mixing. Bulk Richardson number value for locations over the open water and pack ice show significant variability in stability conditions across the MIZ. GRA

N85-32622# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science

PROPERTIES OF AEROSOL PARTICLES DETECTED BY SATELLITES IN COASTAL REGIONS
Avail: NTIS HC A09/MF A01

The particles detected in the marine boundary layer were primarily sphenoidal, 1 to 6 microns in diameter and of oceanic origin. Optical depths 0.04 to 0.10 were resolved. The particles detected above the boundary layer were primarily submicron, partially hygroscopic and a mixture of rural, oceanic and possibly urban particles. These particles could mask radiation scattered by boundary layer particles. Near-simultaneous satellite radiometric measurements and airborne aerosol measurements have shown particles of oceanic origin are responsible for a majority of the scattered energy in cloud-free regions except when significant upper-level haze layers are present

R.J.F.

N85-32660# Institute of Experimental Meteorology (USSR)

THE VARIABILITY OF AEROSOL MICROSTRUCTURE IN CONTINENTAL AND OCEANIC SURFACE LAYERS OF THE ATMOSPHERE IN ANTICYCLONES
N. V. GONCHAROV, O. A. LIPSKAYA, V. V. SMIRNOV, and A. D. UVAROV In International Commission for Cloud Physics 11th Intern. Conf. on Atmospheric Aerosols, Condensation and Ice Nuclei, Vol 1 p 154-158 1984 refs
Avail: NTIS HC A14/MF A01

Data on the atmospheric D = 0.01-20 micron aerosol dispersive composition and variability, generalized for summer and winter anticyclones typical of the center of the European territory of the USSR and the Southern Hemisphere oceans are presented

Author

N85-32707# Naval Postgraduate School, Monterey, Calif.

COASTAL EROSION ALONG MONTEREY BAY M.S. Thesis

Permanent beach erosion in Southern Monterey Bay, CA, is episodic, occurring infrequently when high tides coincide with stormy weather which allows wave action to erode the toe of the cliffs. This thesis uses precise aerial photogrammetric techniques to measure cliff recession from 1946 through 1984. Maximum erosion occurs in the vicinity of Fort Ord (7.3 ft yr) and decreases to the south. A model is developed to predict cliff erosion based on the hypothesis that erosion occurs only when the water level due to combined tides, wave set-up and run-up exceeds the cliff elevation. The model combines predicted tidal elevations and wave heights. Shallow water wave heights at various locations are calculated by transforming deep-water directional wave spectra provided by the Fleet Numerical Oceanography Center. Refraction of the wave energy is responsible for the variability of erosion rates along the shore. The bathymetry of Monterey Bay is such that the refracted wave energy is greater in the Fort Ord area than to the south. The erosion model was calibrated using the spectral wave climatology and aerial photographs covering an 18-year period. The model qualitatively replicates the temporal variability of the measured recession rates and gives a reasonable prediction of the spatial variation of the mean recession rates.

GRA


BASIC PROPERTIES AND INTERPRETATION OF SYNTHESIZED RADAR IMAGES OF SEA WAVES WITH LONG SYNTHETIZATION TIME Abstract Only
Avail: NTIS HC A05/MF A01

The synthetic-aperture-radar (SAR) imaging of sea waves is considered as a process of measuring the correlation between values of backscattered radiation of the SAR for different azimuthal positions of the SAR platform A relatively simple description is proposed for the focusing effect peculiar to the SAR imaging of sea waves, and it is shown that the wave image contrast does not degrade with increasing synthesis time. The same results are obtained by the direct analysis of the transformation of the radar input signal (calculated in accordance with the two-scale model of scattering) into an image for the case of a sinusoidal wave without limits on the synthesis time.

B.J.

N85-33651# SeaSpace, San Diego, Calif.

LARGE-SCALE SEA SURFACE TEMPERATURE VARIABILITY FROM SATELLITE AND SHIPBOARD MEASUREMENTS

A series of satellite sea surface temperature intercomparison workshops were conducted under NASA sponsorship at the Jet Propulsion Laboratory. Three different satellite data sets were compared with each other, with routinely collected ship data, and with climatology, for the months of November 1979, December 1981, March 1982, and July 1982. The satellite and ship data were differenced against an accepted climatology to produce anomalies, which in turn were spatially and temporally averaged into two-degree latitude-longitude, one-month bins. Monthly statistics on the satellite and ship bin average temperatures yielded rms differences ranging from 0.58 to 1.37 °C, and mean differences ranging from -0.48 to 0.72 °C, varying substantially from month to month, and sensor to sensor.

Author

N85-33653# Department of Energy, Morgantown, W. Va. Energy Technology Center


The DOE Arctic and Offshore Research (AOR) effort is designed to meet the needs for a centralized, high quality, Arctic energy related data base and for long term, high risk research. The ultimate purpose of the DOE effort is to promote extensive private use of the evolving AOR data and technology base in order to accelerate development of Arctic oil and gas resources. Current activities include determining the Arctic bibliography data base and initiating most pieces of the research described above (except multiyear ice properties and pipeline research). Some of the FY 1984 major accomplishments are: four to five ice islands 1 to 2 miles in length drifting off the Ellesmere ice shelves north of Ellesmere Island were remotely surveyed. A report was completed on the location of the ice shelf edge, breakup, and regrowth of the Ellesmere ice shelves over the past two decades. Ice adzing shear zone studies have shown that the 6 to 10 feet high shoals usually under the shear zone are not totally destroyed from ice gouging from one year to the next, but that the ice gouging may be instrumental in initiating and maintaining the shoals, which may protect Arctic offshore structures. Airborne radar sensing techniques were used
to determine the electromagnetic properties of sea ice and physical properties.

DOE

N85-34327* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR DELTA KAPPA SYNTHETIC APERTURE RADAR MEASUREMENT OF OCEAN CURRENT Patent

A. JAIN, inventor (to NASA) (JPL, Pasadena, Calif.) 2 Apr. 1985

Supersedes N82-28502 (20 - 19, p 2673)

US Patent and Trademark Office CSCL 171

A synthetic aperture radar (SAR) employed for delta k measurement of ocean current from a spacecraft without the need for a narrow beam and long observation times. The SAR signal is compressed to provide image data for different sections of the chirp band width, equivalent to frequencies and a common area for the separate image fields is selected. The image for the selected area at each frequency is deconvolved to obtain the image signals for the different frequencies and the same area. A product of pairs of signals is formed, Fourier transformed and squared. The spectrum thus obtained from different areas for the same pair of frequencies are added to provide an improved signal to noise ratio. The shift of the peak from the center of the spectrum is measured and compared to the expected shift due to the phase velocity of the Bragg scattering wave. Any difference is a measure of current velocity v sub o (delta k).

Official Gazette of the U.S. Patent and Trademark Office


MICROWAVE PROPERTIES OF A QUIET SEA

J. STACEY 15 May 1985 74 p refs

(Contract NAS7-918)

(NASA-CR-176199, JPL-PUB-85-33) Avail: NTIS HC A05/MF A01

The microwave flux responses of a quiet sea are observed at five microwave frequencies and with both horizontal and vertical polarizations at each frequency--a simultaneous 10 channel receiving system. The measurements are taken from Earth orbit with an articulating antenna. The 10 channel responses are taken simultaneously since they share a common articulating collector with a multifrequency feed. The plotted flux responses show: (1) the effects of the relative, on-axis-gain of the collecting aperture for each frequency; (2) the effects of polarization rotation in the output responses of the receiver when the collecting aperture mechanically rotates about a feed that is fixed; (3) the difference between the flux magnitudes for the horizontal and vertical channels, at each of the five frequencies, and for each pointing position, over a 44 degree scan angle; and (4) the RMS value of the clutter--as reckoned over the interval of a full swath for each of the 10 channels. The clutter is derived from the standard error of estimate of the plotted swath response for each channel. The expected value of the background temperature is computed for each of the three quiet seas. The background temperature includes contributions from the cosmic background, the downwelling path, the sea surface, and the upwelling path.

Author


MARINE PHOSPHORITE DEPOSITS MODEL FOR EXPLORATION, WITH EMPHASIS ON DEPOSITS IN THE US ATLANTIC COASTAL PLAIN Abstract Only

J. B. CATHCART In its USGS Res on Mineral Resources, 1985 p 7 1985

Avail: NTIS HC A05/MF A01

Phosphorus is an essential element for growth in plants and animals; its principal source is deposits of phosphate rock. Offshore deposits of phosphorite, a marine sedimentary rock, constitute about 80 percent of the world's phosphate resources and are the source for about 80 percent of world production. Identified resources (reserve base) of phosphorite in the world are estimated to be about 69 billion metric tons containing at least 25 percent P2O5, and resources in deposits that may become economic are thought to be about double the identified resources. Deposits on the sea floor form an additional, probably enormous, resource.

R. J. F.


USGS COASTAL RESEARCH, STUDIES AND MAPS: A SOURCE OF INFORMATION FOR COASTAL DECISION MAKING

J. T. SUN, ed. 1985 84 p

(USGS-CIRC-883) Avail: NTIS HC A05/MF A01

The tasks of the U.S. Geological Survey (USGS) coastal research, an information resource for coastal decision making, are outlined. The different projects include: coastal zone management, national mapping, geologic and water resources investigation and research, and activities applicable to coastal states.

E A K.

06 HYDROLOGY AND WATER MANAGEMENT

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

A85-40098*

PROFILE STATISTICS OF RAIN IN SLANT PATH AS MEASURED WITH A RADAR


Rain rate profile statistics along a slant path have been derived with the use of an S band meteorological radar, calibrated with the satellite SIRIO beacon. The results may be used as physical inputs to models for the prediction of rain attenuation in satellite-earth radiolinks operating at frequencies above 10 GHz. Information is given about absolute and conditional rain rate, space autocorrelation functions and correlation distances. Also distributions of point rain rate versus slant distance are given: these latter present two regions of apparent stationarity, discussed in the paper. Joint and marginal distributions among the above variables have been computed showing high correlation between the parameters related to rain rate, while no significant correlation exists between rain rate and path length. Also average and standard deviation curves of profiles normalized to their maximum values versus slant distance are given.

Author

A85-41320*

HYDROLOGIC AND LAND SCIENCES APPLICATIONS OF NOAA POLAR-ORBITING SATELLITE DATA


(Contract NOAA-NA-83SAC00650)

The National Environmental Satellite, Data, and Information Service (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA) operates the civil polar-orbiting satellite system for the collection of environmental data. This program began in 1960 with the launch of Tiros-1. Successive satellites in the Improved Tiros Operational Satellite (ITOS) program include concurrent multiple-channel sensing on a daily basis. The data obtained with the sensors of the NOAA satellites are used for hydrology and land sciences. In a discussion of hydrologic applications, attention is given to the continental snow cover, a regional snow cover assessment, river basin snow mapping, river flood monitoring, and soil moisture analysis. A description is provided of studies related to renewable resources, taking into account monitoring vegetation progress, seasonal vegetation changes, fire fuels monitoring, fire detection, and fire monitoring.
Urban effects are also considered along with dust and sandstorm monitoring, volcanoes, and a geologic assessment. G.R.

A85-45693
EVALUATION OF SPOT HRV SIMULATION DATA FOR CORPS OF ENGINEERS APPLICATION

Land cover classifications and water quality assessments were carried out for three different aquatic regions of the U.S., based on simulated data of the High Resolution Visible (HRV) radiometer instrument onboard SPOT. The three sites were: Chesapeake Bay, MD; Berlin Lake, OH, and Lac Qui Parle, MN. Multispectral imagery data of 20-meter resolution were obtained for each of the sites in three spectral bands: 0.50-0.59 microns; 0.61-0.68 microns; and 0.79-0.89 microns. The data were analyzed for use in dredging; recreational resource management; and wildlife habitat monitoring in situ water quality measurements in the Lac Qui Parle site were compared with the simulated SPOT data, and the results are discussed. I.H.

A85-47923* Wisconsin Univ., Madison
MEASURING THE GLOBAL DISTRIBUTION OF INTENSE CONVECTION OVER LAND WITH PASSIVE MICROWAVE RADIOMETRY
(Contract NAG5-391)

The global distribution of intense convective activity over land is shown to be measurable with satellite passive-microwave methods through a comparison of an empirical rain rate algorithm with a climatology of thunderstorm days for the months of June-August with the 18 and 37 GHz channels of the Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR), the strong volume scattering effects of precipitation can be measured. Even though a single frequency (37 GHz) is responsive to the scattering signature, two frequencies are needed to remove most of the effect. It is evident that variations in thermometric temperatures and soil moisture have on the brightness temperatures. Because snow cover is also a volume scatterer of microwave energy at these microwave wavelengths, a discrimination procedure involving four of the SMMR channels is employed to separate the rain and snow classes, based upon their differences in average thermometric temperature. Author

STRONG FLUCTUATION THEORY FOR SCATTERING, ATTENUATION, AND TRANSMISSION OF MICROWAVES THROUGH SMOOTH LAYERS
(Contract NAG5-295)

The strong fluctuation theory is applied to the study of the atmospheric snowfall which is modeled as a layer of random discrete-scatterers medium. As functions of size distribution, fractional volume, and radius of scatterers, the relationship is illustrated between the reflectivity factor and precipitation rate, the attenuation of the centimeter and millimeter waves, and the line-of-sight transmission of coherent and incoherent wave components. The theoretical results are shown to match favorably with experimental data. Author

MICROWAVE HYDROLOGY: A TRILOGY
J. M. STACEY, E. J. JOHNSTON, M. A. GIRARD, and H. A. REGUSTERS 1 Apr. 1985 48 p
(Contract NAS7-918)

(NASA-CR-176042; JPL-PUB-85-21; NAS 1.26:176042) Avail: NTIS HC A03/MF A01 CSCL 08H

Microwave hydrology, as the term is construed in this trilogy, deals with the investigation of important hydrological features on the Earth's surface as they are remotely, and passively, sensed by orbiting microwave receivers. Microwave wavelengths penetrate clouds, foliage, ground cover, and soil, in varying degrees, and reveal the occurrence of standing liquid water on and beneath the surface. The manifestation of liquid water appearing on or near the surface is reported by a microwave receiver as a signal with a low flux level, or, equivalently, a cold temperature. Actually, the surface of the liquid water reflects the low flux level from the cosmic background into the input terminals of the receiver. This trilogy describes and shows by microwave flux images: the hydrological features that sustain Lake Baykal as an extraordinary freshwater resource; manifestations of subsurface water in Iran; and the major water features of the Congo Basin, a rain forest. Author

N85-32570* South Dakota School of Mines and Technology, Rapid City.

(NASA-CR-176050; NAS 1.26:176050) Avail: NTIS HC A02/MF A01 CSCL 04B

The feasibility of rain volume estimation over fixed and floating areas was investigated using rapid scan satellite data following a technique recently developed with radar data, called the Area Time Integral (ATI) technique. The radar and rapid scan GOES satellite data were collected during the Cooperative Convective Precipitation Experiment (CCOPE) and North Dakota Cloud Modification Project (NDCMP). Six multicell clusters and cells were analyzed to the present time. A two-cycle oscillation emphasizing the multicell character of the clusters is demonstrated. Three clusters were selected on each day, 12 June and 2 July. The 12 June clusters occurred during the daytime, while the 2 July clusters during the nighttime. A total of 86 time steps of radar and 79 time steps of satellite images were analyzed. There were approximately 12-min time intervals between radar scans on the average. B.W.

N85-35466 Texas Univ., Austin.
Avail. Univ. Microfilms Order No. DA8508274

The lower member of the Glen Rose Formation contains one of the most productive and laterally extensive aquifers in the region. The lower member is divided into an upper and lower unit on the basis of lithologic and hydrologic differences. Ground water in the Lower Glen Rose aquifer is under confined and unconfined conditions. Two types of systems of groundwater flow are present, a regional system dominated by syndepositional permeability and porosity, and many local systems produced by later solutional activity. Isotopic dating of samples of ground water from the Lower Glen Rose aquifer by C yields modern apparent ages for ground water of the local systems and older apparent ages (8,490 to 28,980 years) for ground water of the regional system. Velocity of ground water movement in the regional system as determined by C analyses ranges from 4.2 to 4.9 m/year. Velocities obtained from hydrologic parameters compare favorably with these values. A similar range of velocity of ground water movement was determined for the Floridan aquifer of Florida and the Pahapola Limestone of South Dakota and Wyoming. Dissert. Abstr.
DATA PROCESSING AND DISTRIBUTION SYSTEMS

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

A85-41396
A FAST FOURIER TRANSFORM METHOD FOR COMPUTING TERRAINCORRECTIONS
M. G. SIDERIS (Calgary, University, Canada) Manuscripta Geodaetica (ISSN 0340-6825), vol. 10, no. 1, 1985, p. 66-73. NSERC-supported research. refs

The paper presents a method of evaluating the terrain correction integral using the Fast Fourier Transform. The method requires height data on a regular grid and produces terrain corrections on all grid points. For a 1 km grid spacing, the accuracy is generally better than 1.5 mgal for typically rough areas and is rather insensitive to errors in the data. The required CPU time is proportional to NlogN, where N is the number of grid points. This paper also discusses the covariance function computation by Fourier techniques. The method is most suitable for application in the solution of geodetic boundary value problems, but it can also be used for other types of geodetic or geophysical problems involving terrain corrections.

A85-41659
THE GENERATION AND INTERPRETATION OF FALSE-COLOUR COMPOSITE PRINCIPAL COMPONENT IMAGES

Following the observation that the presentation of multichannel image information as a false color composite is achievable with minimum sacrifice of data if the three leading image components are used, rather than the three conventional 'raw' channels, a hard-wired electronic system has been developed which implements principal components analysis on a 256 x 256 four-channel array of pixels in a few seconds. The system is controlled by a microcomputer, and can generate color hard copy outputs in the form of composites of the principal component images. The system's use is illustrated by a Landsat MSS subframe of southern Spain. The necessity of contrast stretching the minor principal component images, in order to generate a visually effective color composite, is demonstrated. O.C.

A85-41660
STANDARDIZED PRINCIPAL COMPONENTS
A. SINGH (Reading, University, England) and A. HARRISON (NERC, Thematic Information Services, Swindon, England) International Journal of Remote Sensing (ISSN 0143-1161), vol. 6, June 1985, p. 883-896. Research supported by the Forest Department of Manipur. refs

In remote sensing, principal components analysis is usually performed using unstandardized variables. However, the use of standardized variables yields significantly different results. In this paper principal components of two Landsat MSS subscenes were separately calculated using both methods. The results indicate substantial improvement in signal-to-noise ratio and image enhancement by using standardized variables in the principal components analysis.

A85-41664
IMPROVING THEMATIC MAPPER LAND COVER CLASSIFICATION USING FILTERED DATA

In an attempt to alleviate the classification problems introduced by the higher spatial resolution of the Thematic Mapper in comparison to the Multispectral Scanner, classifications were performed on two to six band combinations, first using Thematic Mapper bands only, and subsequently replacing band 5 by its mean-filtered and median-filtered counterpart. The combination of filtered data with non-filtered data smooths out scene noise while retaining some of the boundary detail.

A85-42511
MEASUREMENT AND ANALYSIS OF 2-D INFRARED NATURAL BACKGROUND

Natural background was recorded in the 8-12-micron band using an airborne IR camera. The results were analyzed and the statistical and spatial features of the radiance in this band were found. The statistical distribution approaches the normal distribution inside the two standard deviation regions but deviates slightly outside. The spatial autocorrelation function fits to a high degree a 2-D exponent.
A85-42584
MODELING MANUAL EXTRACTION OF TEXTURAL ELEMENTS BY MATHEMATICAL MORPHOLOGY
G. FLOUZAT and Y. MERGHOUB (Centre d'Etude Spatiale des Rayonnements, Toulouse, France) Photo Interpretation (ISSN 0031-8523), vol. 22, Nov.-Dec. 1983, p. 6 In English, French, and Spanish.

The results of attempts to mathematically perform photointerpretation tasks of remotely sensed imagery are illustrated in terms of the analysis of a Landsat image. Textural features are preserved by one- or multi-dimensional classifications in the first thematic interpretation of pixels, then construction and extraction of textural elements by the laws of mathematical morphology (MM). The MM technique joins neighboring pixels of similar signatures and generates the features numerically. Erosion and expansion operators combined to form opening and closing operations permit the classification of sets of pixels representing agricultural, village, forest and water areas and surface minerals Although some errors are observed, the resulting binary filter is concluded useful for an overall analysis requiring discriminations among villages and other structures.

M.S.K.

A85-42853* New York State Univ., Syracuse.

COMMENTS ON THE INTERCALIBRATION OF MULTISENSOR, MULTITEMPORAL, MULTICHANNEL DIGITAL RADIANCE DATA

When comparing the recorded radiance data obtained on a given date by means of different sensors or on different dates using the same sensor, the values in question must be referred to some common datum. It is presently noted that more data are required for remote sensing instruments, and that these should consist of gain, offset, spectral response and point spread function for each bandpass. Such information will be the bases for studies of sensor intercalibration procedure.

O.C.

A85-43118
ON THE ANALYSIS OF THERMAL INFRARED IMAGERY - THE LIMITED UTILITY OF APPARENT THERMAL INERTIA

A spectral window in the thermal infrared permits observations of surface temperature by satellite radiometry. The Heat Capacity Mapping Mission (HCMM) acquired 10-12 micron data at times of day favorable for estimation of surface thermal properties and the surface energy budget. Two variables, surface wetness, which controls evaporation and hence mean surface temperature, and thermal inertia, which relates the diurnal excursion of surface temperature to ground heat flux, are responsible for most observed temperature variability. These variables may be estimated from the midnight (2:30 a.m.) and early afternoon (1:30 p.m.) data from the HCMM or from the afternoon NOAA satellites. However, the HCMM data product, 'apparent thermal inertia,' is potentially misleading in agricultural areas because surface evaporation reduces the amplitude of the soil heat flux compared to the amplitude in dry areas. Thus apparent thermal inertia should not be used in regions having variability in surface moisture. Author

A85-44864
CARTOGRAPHIC-PHOTOGRAHMETRIC ANALYSIS AND ANALYTICAL CORRECTION OF SPACE SCANNER IMAGES [KARTOGRAFO-FOTOGRAHMETRICHESKIY ANALIZ I ANALITICHESKOE ISPRAVLINIE SKANERNYKH KOSMICHESKII ] [IZOBRAZHENII]

It is demonstrated on the example of multispectral scanner images obtained with the Meteor-satellite Fragment system that the analytical correction of space scanner images makes possible a significant improvement in the accuracy with which coordinates on the earth surface can be determined from such images. This leads to an improvement in the accuracy and efficiency with which cartographic information can be obtained.

B.J.

A85-45687* Santa Barbara Research Center, Goleta, Calif.

LANDSAT IMAGE DATA QUALITY STUDIES
C. F. SCHUELER (Santa Barbara Research Center, Goleta, CA) and V. V. SALOMONSON (NASA, Goddard Space Flight Center, Greenbelt, MD) (COSPAR, Plenary Meeting, 25th: Workshop II on the Earth's Surface Studied from Space, Graz, Austria, June 25-July 7, 1984) Advances in Space Research (ISSN 0273-1177), vol. 5, no. 5, 1985, p. 1-11.

Preliminary results of the Landsat-4 Image Data Quality Analysis (LDQA) program to characterize the data obtained using the Thematic Mapper (TM) instrument on board the Landsat-4 and Landsat-5 satellites are reported. TM design specifications were compared to the obtained data with respect to four criteria, including spatial resolution; geometric fidelity; information content; and image relativity to Multispectral Scanner (MSS) data. The overall performance of the TM was rated excellent despite minor inconsistencies and radiometric anomalies in the data. Performance of the TM exceeded design specifications in terms of both image sharpness and geometric accuracy, and the image utility of the TM data was at least twice as high as MSS data. The separability of alfalfa and sugar beet fields in a TM image is demonstrated.

I.H.

A85-45892
SPOT IMAGE QUALITY AND POST-LAUNCH ASSESSMENT

The image quality specifications of the SPOT are presented, and the methods used to evaluate SPOT performance are described. Consideration is given to two separate categories of evaluation techniques: pre-launch ground testing, and post-launch assessment during the first two months in orbit. Specifications are described with respect to image location accuracy; length distortion; multi-data and multispectral recording; and local coherence. Radiometric specifications are presented with respect to: SNR; detector equalization, distortion due to high radiances (blooming); and the modulation transfer function (MTF). Plans for post-launch assessment following the launching of the SPOT in August 1985 are described.

I.H.

A85-45995
MULTIPLE SENSOR GEOCODED DATA
F. E. GUERTIN, R. SIMARD, R. J. BROWN, P. M. TILLET (Canada Centre for Remote Sensing, Ottawa), and D. FRIEDMANN (MacDonald Dettwiler and Associates Ltd., Richmond, Canada) (COSPAR, Plenary Meeting, 25th Workshop II on the Earth's Surface Studied from Space, Graz, Austria, June 25-July 7, 1984) Advances in Space Research (ISSN 0273-1177), vol. 5, no. 5, 1985, p. 81-96.

A general description is given of the design of the Multi-Observational Satellite Image Correction (MOSAICS) system for integrating remotely sensed images from satellites into a reference projection. The MOSAICS system is currently being developed for use with the Canadian National Topographic System for resource management applications. The main processing functions of MOSAICS include: data transcription; data correction; manual and digital control point marking, and geocoding to a national standard map base. The geocoded data are formatted to film and CCT products. MOSAICS will offer bulk scene and geocoded subscene projections of Landsat MSS and TM data, together with data from the HRV and PLA sensors of SPOT. The hardware and software requirements of MOSAICS are considered, with emphasis given to its high functionality and throughput rate. The digital stereo processing procedure of MOSAICS was used.
to derive a Digital Evaluation Model (DEM) from Landsat-4 TM data. Contour plots of the DEM are presented in a table.

**A85-47807**

INVESTIGATION OF LANDSAT-4 THEMATIC MAPPER LINE-TO-LINE AND BAND-TO-BAND REGISTRATION AND RELATIVE DETECTOR CALIBRATION


It has been found that image quality parameters can have an important influence on the results of users' investigations. An evaluation of the scanners delivering the images is, therefore, of the first importance. The defaults linked to the scanner itself can be partially corrected by a ground preprocessing. A study of the raw image quality is needed to optimize the ground segment algorithms. The present study is concerned with the Thematic Mapper (TM). Aspects of line-to-line and band-to-band registration are discussed, taking into account the use of a method based on automatic correlation techniques, intraband misregistrations, and misregistrations between different bands. Attention is also given to the general problem of detector calibration and the related bright target saturation.

G.R.

**A85-47808**

Environmental Research Inst. of Michigan, Ann Arbor.

CHARACTERIZATION AND COMPARISON OF LANDSAT-4 AND LANDSAT-5 THEMATIC MAPPER DATA

M. D. METZLER and W. A. MALILA (Michigan, Environmental Research Institute, Ann Arbor) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol. 51, Sept. 1985, p. 1315-1330

Engineering analyses of Thematic Mapper (TM) image data have been conducted, giving particular attention to the radiometric characterization of the sensor. While the data in general were found to be excellent, anomalies do exist in the data from both Landsat-4 and Landsat-5 TM. A summary is provided of the Landsat-4 TM image data. The present paper concentrates, however, on recent analyses of Landsat-5 TM data and comparisons of the radiometry of the two sensors. One of the specific topics covered is within-line droop, a phenomenon whereby the signal levels of the sensor change systematically during the active scan. Attention is also given to scan-correlated level shifts, an effect which raises or lowers the signal level of all pixels in a scan line or set of scan lines. A comparison of Landsat-4 and Landsat-5 radiometric corrections is also discussed.

G.R.

**A85-47810**

INTRABAND RADIOMETRIC PERFORMANCE OF THE LANDSAT THEMATIC MAPPERS


The present report is concerned with several intrinsic radiometric characteristics of the Landsat-4 and Landsat-5 Thematic Mappers (TMs). The approach employed is based on an examination of internal consistency within natural scenes rather than depending on calibration data. It is pointed out that the overall behavior of the TMs is excellent; imperfect behavior is barely discernible in a typical image. The reported study is part of the Landsat Image Data Quality Analysis Program conducted by NASA. Attention is given to the Landsat scenes used in this report, the width of the digital levels, aspects of level shift, droop, overshoot, delay in bright-target recovery, noise, and a comparison of Landsat-4 and Landsat-5 responses.

G.R.

**A85-47812**

ASSESSMENT OF RADIOMETRIC ACCURACY OF LANDSAT-4 AND LANDSAT-5 THEMATIC MAPPER DATA PRODUCTS FROM CANADIAN PRODUCTION SYSTEMS


**A85-47813**

General Electric Co., Lanham, Md.

METHODS FOR DESTRIPING LANDSAT THEMATIC MAPPER IMAGES - A FEASIBILITY STUDY FOR AN ONLINE DESTRIPING PROCESS IN THE THEMATIC MAPPER IMAGE PROCESSING SYSTEM (TIPS)


**A85-47817**

Arizona Unv., Tucson.

LANDSAT THEMATIC MAPPER IMAGE- Derived MTF


**A85-47818**

LANDSAT-4 AND LANDSAT-5 THEMATIC MAPPER DATA QUALITY ANALYSIS


The analysis of Landsat-5 Thematic Mapper (TM-5) data described in this paper was undertaken to evaluate geometric and radiometric quality. Anuta et al. (1984) had analyzed Landsat-4 Thematic Mapper (TM-4) and Multispectral Scanner (MSS) data for the geometric and radiometric quality and information content. The results of the studies related to Landsat-4 are compared with the results of the Landsat-4 study. Attention is given to aspects of band-to-band misregistration, striping effects, a coherent noise analysis, the resolution estimation in TM data, the calibration of Landsat-5 TM thermal IR data, and the response curves for the Landsat-4 and Landsat-5 thermal IR band detectors.

G.R.
A85-47820* State Univ. of New York, Syracuse
SYSTEMATIC AND RANDOM VARIATIONS IN THEMATIC MAPPER DIGITAL RADIANCE DATA
M. J. DUGGIN, H. SAKHAVAT (New York, State University, Syracuse), and J. LINDSAY (Systems and Applied Sciences Corp., Vienna, VA) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol 51, Sept. 1985, p. 1427-1434. refs (Contract NAS5-27565)
Studies are reported of the systematic and random variations in digital radiance data obtained by the Landsat-4 and Landsat-5 Thematic Mappers over an agricultural crop area which was apparently uniform and cloud-free. Systematic variations appeared to be time-dependent and bandpass-dependent. The predominant effect seemed to be random variations, which appeared to be in keeping with those expected from prior investigations. It is suggested that uncorrected variations will provide a limitation on the nonphotointerpretative analysis of images. Author

A85-47821* Jet Propulsion Lab., California Inst of Tech., Pasadena
AN ANALYSIS OF LANDSAT THEMATIC MAPPER P-PRODUCT INTERNAL GEOMETRY AND CONFORMITY TO EARTH SURFACE GEOMETRY
Performance requirements regarding geometric accuracy have been defined in terms of end product goals, but until recently no precise details have been given concerning the conditions under which that accuracy is to be achieved. In order to achieve higher spatial and spectral resolutions, the Thematic Mapper (TM) sensor was designed to image in both forward and reverse mirror sweeps which that accuracy is to be achieved. In order to achieve higher spatial and spectral resolutions, the Thematic Mapper (TM) sensor was designed to image in both forward and reverse mirror sweeps. Both hardware and software have been augmented and changed during the course of the Landsat TM developments to achieve improved geometric accuracy. An investigation has been conducted to determine if the TM meets the National Map Accuracy Standards for geometric accuracy at larger scales. It was found that TM imagery, in terms of geometry, has come close to, and in some cases exceeded, its stringent specifications. G.R

A85-47822* Environmental Research Inst. of Michigan, Ann Arbor
COMPARISON OF THE INFORMATION CONTENTS OF LANDSAT TM AND MSS DATA
W. A. MALILA (Michigan, Environmental Research Institute, Ann Arbor) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol 51, Sept. 1985, p. 1449-1457. refs (Contract NASS-27346)
A communications-theory approach is taken to analyze the dispersion and concentration of signal values in various data spaces, irrespective of specific class membership. Entropy is used to quantify information, and mutual information is used to measure the information represented by subsets of spectral variables. Several different comparisons of information content are made. These include comparisons of system design capacities, of data volumes occupied by agricultural data in the spaces defined by original bands and by transformed spectral (Tasseled Cap) variables, of the information contents of original bands and Tasseled Cap variables, and of the information contents of TM and MSS for the given agricultural data sets. Also, the effects of sample size, scene content, and quantization level are examined. Author

A85-47823* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
PERFORMANCE COMPARISONS BETWEEN INFORMATION EXTRACTION TECHNIQUES USING VARIABLE SPATIAL RESOLUTION DATA
The decreased instantaneous field of view (IFOV) is one of the principal advances noted for the Thematic Mapper (TM) sensor. The 42.5 microradian IFOV of TM and the 710 km nominal orbit altitude result in a 30 m nominal spatial resolution at the earth surface. This is a considerable decrease in the projected pixel area when compared to the 79 m nominal spatial resolution of the Landsat Multispectral Scanner (MSS). An experiment was conducted which allowed a rigorous test of the influence of classifier design, with data spatial resolution of TM (30 m) and approximately that of the Landsat MSS (80 m); on classification performance for a particular TM scene. The experiment involved evaluation of the results for the per-point Gaussian maximum likelihood (GML) classifier and the supervised ECHO (Extraction and Classification of Homogeneous Objects) classifier. G.R

A85-47824* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 THEMATIC MAPPER SCENE CHARACTERISTICS OF A SUBURBAN RURAL AREA
The Thematic Mapper (TM) sensor, which is carried by the Landsat-4 and Landsat-5 satellites, represents the latest generation of an earth resource scanner system. TM applications range from determining the amount and type of land cover contributing agricultural yields. The TM has improvements over the Multispectral Scanner (MSS) with respect to spatial resolution, spectral regions, and radiometry. The present paper is concerned with two major objectives related to the analysis of the Landsat TM. One of these objectives is related to an evaluation of the utility of TM in the discrimination of surface cover. In connection with the second objective, an evaluation was conducted of the utility of selected image processing procedures to enhance the capability of Landsat TM to map land cover. It was found that TM data may be used for discriminating smaller targets, such as agricultural fields and city blocks, than previously obtainable with MSS data. G.R

A85-47825 EFFECT OF SPATIAL FILTERING ON SCENE NOISE AND BOUNDARY DETAIL IN THEMATIC MAPPER IMAGERY
J L CUSHNIE and P. ATKINSON (Reading University, England) Photogrammetric Engineering and Remote Sensing (ISSN 0099-1112), vol 51, Sept. 1985, p. 1483-1493. refs (Contract NERC-F60/G6/03)
The improvement in spatial resolution provided by the Thematic Mapper (TM) of the Landsat-4 and Landsat-5 satellites has resulted in visually more interpretable images. However, computer interpretations using the standard per-point classifiers have in some cases been less than satisfactory. In an investigation of the effects of increasingly fine spatial resolution on per-point classification, it was found that the internal variation (or scene noise) within cover classes is increased. Thus, the presence of trees, roads, and lawns as residential areas may lead to classification difficulties. On the other hand, a reduction in the proportion of mixed or boundary pixels leads to a corresponding reduction in the number of misclassified or rejected pixels. The present study is concerned with reducing the scene noise effects within land cover categories where this is necessary, without significantly increasing the proportion of boundary pixels between the categories. G.R
SPECTRAL REFLECTANCES OF NATURAL TARGETS FOR USE IN REMOTE SENSING STUDIES
Jun 1985 185 p Refs Prepared in cooperation with Computer Sciences Corp.
(NASA-SP-113S, L-15920; NAS 1.61:1139) Avail. NTIS HC A05/MF A01 CSCL 05B

A collection of spectral reflectances of 156 natural targets is presented in a uniform format. For each target both a graphical plot and a digital tabulation of reflectance is given. The data were taken from the literature and include laboratory, field, and aircraft measurements. A discussion of the different measurements of reflectance is given, along with the changes in apparent reflectance when targets are viewed through the atmosphere. The salient features of the reflectance curves of common target types are presented and discussed.

Author: Zemli iz Kosmosa (Moscow), no. 2, Mar.-Apr. 1984 p 87-97

INTERACTIVE PROCEDURES FOR DISCRIMINATING AND RESTORING CONTOUR LINE NETWORKS Abstract Only
R. L. ELLEFSON IN CANADIAN INFORMATION PROCESSING SOCIETY Graphics Interface 1985 p 171-177 1985 refs

In computer aided topical mapping using data derived from aerial and space photographs the contour lines comprising the structural outlines of a map can be fed into the computer in various ways (encoder, TV or optomechanical input unit). A series of interactive procedures are analyzed which allow an operator controlling a display to discriminate the sketched outline on a photograph and reproduce it on the screen of the display within the precision allowed by computer digitization errors. It is assumed that the contour outlines are sketched on the photos by the person interpreting them with white gouache paint. The discrimination of the contour lines is accomplished by either an indistinct mask or a logic mask. Following the discrimination procedures, the contour outlines in the marker display memory are in binary form. The recovery procedures are based on the use of a domain with dimensions of 3x3 store locations. The techniques and decision making rules for the reproduction of the contours are discussed in depth and illustrated with sample maps, showing the intermediate stages.

Author: Zemli iz Kosmosa (Moscow), no. 2, Mar.-Apr. 1984 p 87-97

REPETITION OF DENSE CLOUD COVER ABOVE INDIAN OCEAN FROM GENERALIZED SATELLITE DATA Abstract Only
Avail: NTIS HC A08

Using as a data base information contained in the USSR Hydrometeorological Center maps compiled during the period 1967 to 1971 (produced from pictures obtained by Soviet and U.S. satellites for the purpose of petroleum analysis) an attempt was made to determine patterns of repetition in dense cloud cover above the Indian Ocean (latitude 30 deg south to 30 deg north, longitude 150 deg east to 150 deg west) and the association (if any) between cloud type and cloud cover. It was found that the cloud cover repetition patterns during the survey period (1967 to 1971) was most marked in the region of the equator, reaching 25 to 26% between 92 deg east and 96 deg east. In the median field cloud cover repetition reached approximately 10.6%. Patterns over the Indian Ocean are compared with similar patterns over the Atlantic and Pacific oceans, and the significance of cloud cover patterns for global thermal flows is discussed. Cloud types were analyzed. It was found that the dominant type overall above the Indian Ocean is cumuliform, which does not usually form dense cloud covers. Dense covers of cumulus dominate in the east equatorial and Arabian Sea zones. Stratiform and cirrus frequently accompany cumulus. It is concluded that most of the dense cloud cover in the Southern Hemisphere occurs in the equatorial region and that the Southern Hemisphere is still the major recipient of solar heat.

Author: Zemli iz Kosmosa (Moscow), no. 2, Mar.-Apr. 1984 p 87-97

THE SCIENTIFIC AND TECHNICAL ISSUES IN INTEGRATING REMOTELY SENSED IMAGERY WITH GEOCODED DATA BASES Abstract Only
W. M. STROME and B. GRUSH IN CANADIAN INFORMATION PROCESSING SOCIETY Graphics Interface 1985 p 171-177 1985 refs

Digital analysis techniques of remote sensed data are discussed. The decreasing cost of computer equipment, especially both on-line and off-line memory, has led to an explosion in the use of digital mapping techniques. It is recognized that the full potential benefits of satellite remote sensing can not be realized until digital analysis of satellite image data and automated cartography/geocoded information systems are more compatible and integrated. The difficulties associated with this integration are explored.

E.A. K.

SELECTION OF SEGMENT SIMILARITY MEASURES FOR HIERARCHICAL PICTURE SEGMENTATION Abstract Only
J. M. BEAULIER and M. GOLDBERG (Ottawa Univ.) IN CANADIAN INFORMATION PROCESSING SOCIETY Graphics Interface 1985 p 171-177 1985 refs

The problem of defining appropriate segments similarity measures for picture segmentation was examined. In agglomerative hierarchical segmentation, two segments are compared and merged if found similar. The approximation error resulting from merging two segments. Similarity measures derived from constant approximations and planar approximations are applied to a LANDSAT picture, and the results are presented. The advantages of combining similarily measures are stressed. Different picture areas require different measures which must be combined to obtain good overall results. In hierarchical segmentation, simple measures are used for the first merging steps, while, at a higher level of the segment hierarchy, more complex measures are employed.

F. A. K.

N85-35463# Purdue Univ., West Lafayette, Ind. Lab. for Application of Remote Sensing.

A LANDSAT Thematic Mapper (TM) quality evaluation study was conducted to identify geometric and radiometric sensor errors in the post-launch environment. The study began with the launch of LANDSAT-4. Several error conditions were found, including band-to-band misregistration and detector-to-detector radiometric calibration errors. Similar analysis was made for the LANDSAT-5 Thematic Mapper and compared with results for LANDSAT-4. Remaining band-to-band misregistration was found to be within tolerances and detector-to-detector calibration errors were not severe. More coherent noise signals were observed in TM-5 than in TM-4, although the amplitude was generally less. The scan direction differences observed in TM-4 were still evident in TM-5. The largest effect was in Band 4 where nearly a digital count difference was observed. Resolution estimation was carried out using roads in TM-5 for the primary focal plane bands rather than field edges as in TM-4. Estimates using roads gave better resolution. Thermal IR band calibration studies were conducted and new nonlinear calibration procedures were defined for TM-5.
DATA PROCESSING AND DISTRIBUTION SYSTEMS

The overall conclusion is that there are no first order errors in TM-5 and any remaining problems are second or third order.

Author

STUDY OF SPECTRAL/RADIOMETRIC CHARACTERISTICS OF THE THEMATIC MAPPER FOR LAND USE APPLICATIONS


W. A. MALILIA and M. D. METZLER, Principal Investigators

Washington, D. C. National Environmental Satellite, Data and Information Service.

SURFACE CYCLONEGENESIS AS INDICATED BY SATELLITE IMAGERY

F. J. SMIGIELSKI and G. P. ELLROD
Mar. 1985

SATELLITE IMAGERY

DISCUSSIONS

80

INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

Author


THEORY OF MICROWAVE REMOTE SENSING

L TSANG (Washington, University, Seattle), J. A KONG, and R. T. SHIN (MIT, Cambridge, MA)


An IR spectrometer on board the satellite Ohtzona for taking atmospheric limb absorption spectra is described, together with observational results. The instrument analyzes sunlight passing through the limb and permits identification of various atmospheric species. Spectra are recorded in the 1.6-2.4, 2.8-4.8 and 8.6-10.2 microns intervals by 32- and 64-element self-scanning pyroelectric arrays. Sample data from April 1984 observations are discussed, noting distinctions between water vapor and aerosol signatures. A variation of aerosol scattering extinction was noted to be a function of altitude.

M.S.K.

A85-41570#

PROBABILITIES, PROBABILITIES, AND PERSPECTIVES OF MICROWAVE LONG-RANGE RECONNAISSANCE [MOGLICHKEITEN, PROBLEME UND PERSPEKTIVEN DER MIKROWELLENFERNERKUNDUNG]


The present state of the art in the use of radar and microwave remote sensing of land and sea is discussed in terms of technology and areas of application. The problems and potential of long-range reconnaissance are highlighted, in particular those pertaining to the use of microwave sensors in aircraft and satellites. Different methods of remote sensing are compared in terms of their

applications to remote sensing problems. Analytical wave theory using the Dyson and Bethe-Salpeter equations is employed to treat scattering by random media. The backscattering enhancement effects, strong permittivity fluctuation theory, and modified radiative transfer equations are addressed. The electromagnetic wave scattering from a dense distribution of discrete scatterers is studied. The effective propagation constants and backscattering coefficients are calculated and illustrated for dense media.

C.D.

A85-41089*

RESTORATION OF MULTICHANNEL MICROWAVE RADIOMETRIC IMAGES

R. T. CHIN, C.-L. YEH (Wisconsin, University, Madison), and W. S. OLSON (Eastman Kodak Research Laboratones, Rochester, NY)

IEEE Transactions on Pattern Analysis and Machine Intelligence (ISSN 0162-8828), vol. PAMI-7, July 1985, p. 475-484. Research supported by the University of Wisconsin refs (Contract NAGW-380)

A constrained iterative image restoration method is applied to multichannel diffraction-limited imagery. This method is based on the Gerchberg-Papoulis algorithm utilizing incomplete information and partial constraints. The procedure is described using the orthogonal projection operators which project onto two prescribed subspaces iteratively. Its properties and limitations are presented. The effect of noise was investigated and a better understanding of the performance of the algorithm with noisy data has been achieved. The restoration scheme with the selection of appropriate constraints was applied to a practical problem. The 6.6, 10.7, 18, and 21 GHz satellite images obtained by the scanning multichannel microwave radiometer (SMMR), each having different spatial resolution, were restored to a common, high resolution (that of the 37 GHz channels) to demonstrate the effectiveness of the method. Both simulated data and real data were used in this study. The restored multichannel images may be utilized to retrieve rainfall distributions.

Author

A85-41362#

ON OBSERVATION OF MIDDLE ATMOSPHERE WITH LAS (LIMB-ATMOSPHERIC INFRARED SPECTROMETER) ON BOARD OF SATELLITE 'OHZORA' (EXOS-C)

A. MATSUZAKI, T. ITOH, and Y. NAKAMURA (Tokyo, University, Japan)


An IR spectrometer on board the satellite Ohtzona for taking atmospheric limb absorption spectra is described, together with observational results. The instrument analyzes sunlight passing through the limb and permits identification of various atmospheric species. Spectra are recorded in the 1.8-2.4, 2.8-4.8 and 8.6-10.2 microns intervals by 32- and 64-element self-scanning pyroelectric arrays. Sample data from April 1984 observations are discussed, noting distinctions between water vapor and aerosol signatures. A variation of aerosol scattering extinction was noted to be a function of altitude.
parameters, such as radial and tangential velocity, distance, bandwidth, integration time, and all-weather capability. C.D.


A passive, modular 90-140 GHz microwave imaging system is described, and the multiplicity of signatures from objects in the environment is demonstrated using selected characteristic measurement results. The physical background of the system is examined, including the Rayleigh-Jeans law, the radiation temperature, and the contributions of eigenemission and background emission to the radiation temperature of a natural object. The structure of the imaging system is described, as is the preparation and presentation of the data images and derived histograms and temperature profiles are presented for flights over water- and vegetation-covered surfaces, over a built-up island, and over a parking place. C.D.


Temperature profiles are derived from ground- and satellite-based microwave radiometric observations. Data taken by the NOAA Profiler during December 1981 to December 1982, at Stapleton International Airport, Denver, CO, are combined with NOAA 6/7 Microwave Sounding Unit (MSU) observations over Denver. The results of 460 retrievals by the Profiler, the MSU, and the Profiler + MSU are compared with soundings by National Weather Service radiosondes (RAOBs). From the surface to 300 mb, maximum rms differences between the combined retrievals and RAOBs are less than about 2 K. For 17 cases in March 1981, radiometric data from the Profiler and MSU were combined with tropopause height measurements obtained from a VHF radar. The combined retrievals using the tropopause height information were improved in the vicinity of the tropopause by about 2 K relative to the pure passive ones. Author


This article proposes the use of superconducting magnetic gradiometers, magnetometer sensors based on SQUID technology as sensors for space-borne magnetic investigations. The existing state of the art of such sensors is described. Estimates of their performance as space sensors is made; in particular, it is shown that they will provide magnetic data of improved sensitivity and accuracy over conventional magnetic sensors. It is also found that gradiometers of the sensitivity proposed here will aid in the analytic continuation of field data, will allow separation of magnetic field temporal variations from field changes due to flight past fixed magnetic sources, will provide the ability to make meaningful measurements of fixed anomalies on magnetospherically active days, and will allow increased spatial resolution of magnetic sources. The requirements for a high-performance space gradiometer are described as well as current progress aimed at achieving such a sensor. Satellite system requirements are also addressed. Particular attention is given to magnetic noise sources in the sensor environment and to the problems associated with reducing this noise to the desired sensor noise levels. Author


A technique based on statistically determined maximum-information criteria is developed to facilitate the selection of multispectral remote-sensing channels. The information value of each possible combination of channels is estimated by calculating the determinants of a correlation matrix constructed using data on the spectral properties of the objects of interest. Since for large numbers of channels this procedure is complex and time-consuming, a quasi-optimum selection procedure is considered. Numerical results for a typical remote-sensing problem involving channels in the 450-1650-nm range are presented in tables and graphs and compared with experimental data T.K.

A85-42576# LASERS IN SPACE E. D. HINKLEY, J. R. LESLIE, and R. T. MENZIES (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Laser Focus (ISSN 0023-8589), Feb. 1985, 6 p. NASA-supported research. refs

Hinkley and Herring (1984) have considered the differences between active (laser) and passive remote sensing from space. The conclusion was reached that spaceborne lasers will eventually complement passive sensors in providing information on the distributions of key atmospheric species and meteorological parameters. Precise information can also be obtained of ice sheet and crustal dynamics for geological and mapping applications. NASA initiated recently an airborne measurement program directed toward some of these objectives. The program employs optical and near-infrared radar (laser radar) systems onboard the NASA advanced ER-2 high-flying aircraft. The results of the experiments are to provide important information with respect to the potential utility of spaceborne laser remote sensing. A study indicated that a spaceborne pulsed carbon dioxide laser could measure tropospheric winds. Attention is also given to measurements of atmospheric gases by spaceborne lasers, solid-state lasers for spaceborne remote sensing, and laser communication in space. G.R.


Problems in the design of multichannel data acquisition and processing systems for the remote sensing of earth resources are examined. The functional diagram, description, and specifications of a system of this type based on the K589-series microprocessor set are presented B J
THE ATMOSPHERIC EFFECT ON THE SEPARABILITY OF FIELD CLASSES MEASURED FROM SATELLITES

Y. J. KAUFMAN (NASA, Goddard Space Flight Center, Greenbelt; Maryland, University, Baltimore) (ISSN 0034-4257), vol. 18, Aug. 1985, p 21-94. refs

The atmospheric effect on the upward radiance emerging from the atmosphere above a nonuniform surface results in a reduction of the separability between the surface classes by broadening the radiance probability distribution of each class, while narrowing the total radiance range. The atmospheric modulation transfer function (MTF) is used in Fourier transform analyses to simulate the atmospheric effect on the imagery of a nonuniform surface and to demonstrate the atmospheric effect on separability of field classes.

A85-43116* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SENSOR-INDUCED TEMPORAL VARIABILITY OF LANDSAT MSS DATA


Landsat-1 and Landsat-2 multispectral scanner (MSS) data were studied to determine the consistency of the calculated reflectance values over time. Data from six spectrally stable targets were collected over a 3-year period (1975-1977). Reflectance values calculated from the digital numbers were regressed against time to note any long term changes. Results indicate that, over a 1000-day period beginning 1 January 1975, MSS 2 reflectances were stable. MSS 1 reflectances over that same period decreased approximately 25-32 percent. The observed decreases are most likely due to a deterioration of the transmissive qualities of the Landsat-1 scanner's internal optical path. Although MSS temporal variation may be unique to MSS 1, time (days in orbit) should be considered as an independent variable when intersatellite calibration equations are computed. A case is made for a stable, monitored calibration system which would permit the calculation of true top-of-the-atmosphere reflectance measures.

A85-43691 TO FLY ON THE WINGS OF THE SUN - A STUDY OF SOLAR-POWERED AIRCRAFT


Solar High Altitude Powered Platform (Solar HAP) aircraft are unmanned remote sensing vehicles designed for cruises lasting up to one year at 20-km altitude, while carrying up to 250 pounds of cameras and electrooptic sensors in an underslung payload pod. It is anticipated that real time IR and UV images of earth features may be more inexpensive and accurately obtained by this means than by the conventional geosynchronous earth resources satellites. Solar HAPPs, with wing spans of over 300 ft and weights of only 2000 lb, require ultralight composite structures with external wire bracing. Solar cells will cover both sides of the vertical wing stabilizers and wing tips, which hinge up in daytime to capture the maximum amount of sunlight. A 15-HP electric propulsion unit drives a low-rpm, large diameter propeller; power will be derived from the solar cells durnally, and from hydrogen-oxygen fuel cells nocturnally. The fuel gases will be generated in a water electrolyzer during the day by excess solar cell output.

O.C.

A85-43944 TECHNIQUES OF RADAR REFLECTIVITY MEASUREMENT

N. C. CURRIE, ED. (Georgia Institute of Technology, Atlanta) Dedham, MA, Aerotech House, Inc., 1984, 539 p. No individual items are abstracted in this volume.

The experimental determination of radar reflectivities (RRs) is examined in an introductory and reference text comprising review chapters contributed by leading experts. Chapters are devoted to the fundamentals of RR measurement, the radar cross section (RCS), basic RCS measurement concepts and systems, RR calibration procedures, data-acquisition and recording systems, data-analysis procedures, bistatic RCS measurements, far-field RCS measurement ranges, organization of test programs, ground-truth measurements, statistical properties of RR data, radar angle measurements, and radiometric measurements. Graphs, diagrams, and photographs are provided.

A85-44015 METHODS FOR THE PREDICTION OF THE ATTENUATION STATISTICS OF RADIO WAVES IN THE 10-100 GHZ RANGE IN RAIN - INCLINED PATHS [O METODAK PROGNOSA STATISTIKI OSLABLENIA V DOZHDIAK RADIOVOLN DIPA AZONA 10-100 GCTS - HAKLONNE TRASSY]

V. B ERMAKOV, M. A KOLOSOV, and V. N POZHIDAEV Radotelechnika i Elektronika (ISSN 0033-8494), vol. 30, June 1985, p. 1071-1079. In Russian refs

Available data on methods and computational models for the prediction of the mean statistical probability of radio-wave attenuation at 10-100 GHz in rain on inclined space-ground paths are examined. Existing prediction methods are compared, and the method of Misme and Waldteufel (1980) is found to yield the best agreement between calculations and experimental results. A computational algorithm is developed with the aim of extending the applicability of the Misme-Waldteufel method to higher frequencies.

B.J.

A85-45235* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GLOBAL CLIMATOLOGY OF TOTAL OZONE FROM THE NIMBUS 7 TOTAL OZONE MAPPING SPECTROMETER


A global climatology of total column ozone has been computed from 4 days of daily observations by the total ozone mapping spectrometer aboard the Nimbus 7 polar-orbiting satellite. Observations were made at local noon, no observations are available in polar regions during the polar night. The orbital data have been area averaged onto a regular 5 deg by 5 deg latitude-longitude grid. The global coverage is more than 90 percent complete during the last 3 observing years (October 1979 to September 1982) and approximately 70 percent complete during the first year (October 1978 to September 1979). Global maps of the temporal mean and rms variance and the amplitude and phase of the annual and semianual harmonics are presented. Similar analyses of the zonal mean values are given along with a time-latitude section of the zonal-mean total ozone. This climatology should be useful both for validating numerical models and for inspiring theoretical analyses.

Author

A85-45696 VERIFICATION STUDIES OF MOS-1 SENSORS


Verification experiments with a breadboard model of the Microwave Scanning Radiometer (MSR) instrument to be installed on the Manne Observation Satellite (MOS-1) are described. The accuracy of MSR measurements was determined with respect to: observed brightness temperature (Tb); Tb corrected for contributions other than the target; Tb content of the vertical polarization component of the 23.8 GHz channel; and the observed Tb of the horizontal polarization component of the 23.8 GHz channel of the MSR. Correlation coefficients are obtained between the vertical Tb component at 23.8 GHz and the horizontal component at 23.8 GHz, and Tb values are obtained for observations over fresh water targets and ocean targets in various sea-surface meteorological conditions. On the basis of the obtained MSR measurements, it is concluded that the MSR will be an effective tool for observing the correlations between the physical properties of snow and atmospheric water content in different regions of the
A85-45697
UTILITY OF PROPOSED SENSORS FOR COASTAL ENGINEERING STUDIES

The utility of satellite-based sensors for coastal engineering applications is discussed. The spatial resolution of several instruments is evaluated with respect to 20-meter resolution requirements of studies of fisheries potential; erosion of shore contours; and littoral drift. Among the current instruments considered are: the NOAA AVHRR radiometer, and the Landsat Multispectral Scanner (MSS). The utility of sensors proposed for future satellite missions is discussed, with emphasis given to the Thematic Mapper (TM) instrument of Landsat-4 and Landsat-5; the High-Resolution Visible (HRV) radiometer of the SPOT satellite; and the Multispectral Electronic Self-Scanning Radiometer (MESSR) of the Marine Observation Satellite (MOS-1). A map showing the movement in the position of a shoreline from 1980 to 1981 is constructed in order to demonstrate the utility of MSS data.

A85-456297
SCATTERING IN PRECIPITATION DURING MICROWAVE-BEAM POWER TRANSMISSION (O RASSEIANNI V OSADKAKH PRI PEREDACHE ENERGII PUCHKOM SVCH-RADIOVOLN)

Consideration is given to the effect of precipitation on microwave energy beamed down toward earth from a satellite solar power station in geostationary orbit. The level of microwave radiation scattered by rain at distances up to 200 km from the center of the receiving antenna is calculated. The results indicate that the scattered-signal level in intense rain is sufficiently high to overload the input circuits of the radio receiver, thus making necessary special means of protection.

VARIATION IN THE STRATOSPHERIC AEROSOL ASSOCIATED WITH THE NORTH CYCLONIC POLAR VORTEX AS MEASURED BY THE SAM II SATELLITE SENSOR

Contract NAS1-17032, NAS1-17165

Optical depth data gathered by the stratospheric aerosol measurement (SAM II) satellite during the 1979-80 winter season are analyzed to study mean atmospheric motions. The spacecraft photometer yielded extinction rates over the Northern Hemisphere in the 8-30 km altitude interval. Filtering was performed to remove the effects of high clouds and polar stratospheric clouds. Free horizontal mixing was prevalent below 14 km, as was a systematic difference across the polar jet stream above that altitude. The aerosol declined in altitude as the winter progressed. The polar vortex is concluded to have a base at 14 km altitude and an outer boundary which coincides with the jet stream axis. The model accords with atmospheric tracer measurements made during the open-air nuclear testing programs in the 1950s.

A85-45849
THE ERS-1 SYNTHETIC APERTURE RADAR AND SCATTEROMETER

The synthetic aperture radar (SAR) and scatterometer instruments on board the European Remote Sensing satellite (ERS-1) are described. SAR performance requirements are presented with respect to: impulse response function measures; radiometric resolution, and antenna geometry. The radar frequency and polarization requirements of the scatterometer instrument are given in a table. In addition to the SAR and scatterometer instruments, consideration is given to the Active Microwave Instrument (AMI) on board ERS-1. The On-Board Data Handling System (OBDHS) for receiving instrument commands and transmitting instrument status data to a ground station is also described.

A85-47244#
APPLICATION OF PATTERN-RECOGNITION AND EXTRAPOLATION TECHNIQUES TO FORECASTING

The indirect inference of fields of user-important phenomena from remote-sensed data and synoptic analyses is discussed as a problem of pattern recognition. The general procedures are illustrated by a review of the skills of objective procedures for forecasting rainfall, severe weather and aircraft-icing conditions from radar, satellite, and synoptic data. Work done in the last 20 years on nowcasting these phenomena by extrapolation and advection is described. Author

A85-47245#
CONCEPTUAL MODELS OF PRECIPITATION SYSTEMS

Nowcasting of precipitation systems using radar and satellite imagery is discussed, noting imagery interpretation in terms of synoptic and mesoscale phenomena. Explanations of a number of systems associated with midlatitude cyclones and mesoscale convection systems in the tropics and midlatitudes are presented. The examples described are (1) conveyor belt models for midlatitude frontal systems, (2) classification of mesoscale rainbands, (3) squall lines in midlatitudes and tropics, (4) nonsquall convective systems in midlatitudes and tropics, (5) submesoscale scale comma clouds associated with cold air vortices, and (6) polar-trough conveyor belts and instant occlusions.

A85-47805*
LANDSAT-4 AND LANDSAT-5 MSS COHERENT NOISE - CHARACTERIZATION AND REMOVAL

The Multispectral Scanner (MSS) remote sensing instrument carried by Landsat-4 and Landsat-5 is similar to MSS instruments carried by Landsat-1, Landsat-2, and Landsat-3. However, the addition of the Thematic Mapper (TM) instrument to Landsat-4 and Landsat-5 required several design changes in the MSS instruments carried on these satellites because of the lower orbit and new satellite platform. Data from the MSS onboard the Landsat-4 and Landsat-5 satellites were found to be generally...
comparable to the data obtained in the case of the earlier Landsat MSSs. However, a coherent noise pattern was observed in the Landsat-4 MSS data. In the present paper, the conduction of a noise analysis is discussed along with the noise characterization results, and a technique through which the Landsat-4 MSS coherent noise can be removed. G.R.

A85-47808
THEMATIC MAPPER - OPERATIONAL ACTIVITIES AND SENSOR PERFORMANCE AT ESA/EARHTNET
L. FUSCO, U. FREI, and A. HSU (ESA, European Space Research Institute, Frascati, Italy) Photogrammetrie Engineering and Remote Sensing (ISSN 0099-1112), vol. 51, Sept. 1985, p 1299-1314. refs
The ESA-Earthnet Thematic Mapper image characterization performed in the framework of the LIDO Program includes operational activities support, understanding of the instrument relationship, characterization and performance in time, and comparison of TM products generated by different processing systems. The paper overviews the different topics within the Earthnet Program investigations. Author

A85-47819*
National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EVALUATION OF THEMATIC MAPPER INTERBAND REGISTRATION AND NOISE CHARACTERISTICS
It is pointed out that the Thematic Mapper (TM) instruments aboard the Landsat-4 and Landsat-5 spacecraft have provided the first digital imagery of the earth's surface with a resolution sufficient to distinguish cultural features easily. The present paper provides a description of the results of studies designed to investigate the band-to-band registration, geodetic registration to a map base, and periodic noise in the eight TM scenes analyzed, the band-to-band registration accuracy was high enough before correction, and the correction for the shift between focal planes brought all bands into registration according to tight specifications. G.R.

A85-47916
A NEW TECHNIQUE FOR INFERRING SURFACE ALBEDO FROM SATELLITE OBSERVATIONS
B. PINTY (Clermont-Ferrand II, Universite, Aubiere, France) and G. SZEJWACH (Ecole Polytechnique, Palaiseau, France) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol 24, Aug. 1985, p 741-750. refs
A technique for inferring the spatial and seasonal albedo changes over a whole climatic region from satellite data is developed. This technique uses the diurnal variation of radiances which is measured by geostationary satellites and requires the knowledge of a surface albedo value over at least one reference site. The proposed method is tested over western Africa, using Meteosat data; and surface albedo maps representative of the wet and dry seasons are derived. With regard to the considered scales and to the achievable accuracies, the technique is shown to be relevant for climatological studies. Author

A85-47917
RELATIONSHIPS BETWEEN MEASURED AND SATELLITE-ESTIMATED SOLAR IRRADIANCE IN TEXAS

A85-48994#
MESSAGE COLLISION OF DATA COLLECTION SYSTEM AND ITS COMPUTER SIMULATION
Data collection system (DCS) is a telemetry instrument using a satellite as a relay station for transmitting earth environment data. The DCS of near-earth satellites such as that of Landsat and Tiros-N, are all designed by means of the random access principle. For the design of the systems, the law of message collision which is concerned with the capacity of the systems is an important problem. In this paper, the theoretical representations which agree with the simulation results are given. Computations of the probability of the message collision for various schemes are presented. Author

A85-50022* Centre National de la Recherche Scientifique, Verneres-Le Busson (France).
COMPARISON OF MESOSPHERIC OZONE MEASUREMENTS USING THE LRIR AND UVMCS SATELLITE INSTRUMENTS
F. MILLIER (CNRS, Laboratoire de Physique Stellulaire et Planetaire, Verneres-Le-Busson, France), G. P. ANDERSON (USAF, Geophysics Laboratory, Bedford, MA), A. C. AIKIN (NASA, Goddard Space Flight Center, Greenbelt, MD), and J. C. GILLE (National Center for Atmospheric Research, Boulder, CO) Annales Geophysicae (ISSN 0755-0685), vol. 3, July-Aug. 1985, p. 439-443. Research supported by the National Center for Atmospheric Research, CNES, and NASA. refs
A comparison between mesospheric ozone profiles determined by two radically different satellite-borne instruments is presented for the period of July to November, 1975. The Limb Radiance Inversion Radiometer measured 9.6-micron C3 emission, while two ultraviolet Multiple Channel Spectrometers measured the atmospheric attenuation of solar ultraviolet radiation during passage of the OSO-8 satellite across the terminator. Only nine near coincident measurements were found. The individual instruments have estimated precision errors of + or - 10 to 15 percent. Agreement between ozone values as measured by the two techniques for specific cases varies between 10 and 20 percent. The statistical correlation is positive and significant at all altitudes where both instruments had reasonable signal-to-noise ratio. A maximum correlation of 0.76 occurred at 0.3 mb (about 59 km). Author

N85-31225#
European Space Agency, Paris (France).
PRELIMINARY INVESTIGATIONS CONCERNING A 90 GHZ RADIOMETER SATELLITE EXPERIMENT
F. HEEL and H KIETZMANN Dec 1984 68 p refs Transl. into ENGLISH of "Voruntersuch zur Durchfuehrung eines Satellitenexp. mit einem 90-GHz-Radiometer" Oberpfaffenhofen, West Ger. Rept. DFVLR-FB-84-02, 1984 Original language doc. previously announced as N84-24693 (ESA-IT-850; DFVLR-FB-84-02) Avail. NTIS HC A04/MF A01, original German version available from DFVLR, Cologne DM 20.50
The feasibility of satellite experiments with a 90 GHz radiometer was assessed using a computer model of the radiation temperatures of sand, vegetation, concrete, and water for different atmospheric conditions. Measurements with an uncooled airborne 90 GHz radiometer tested model results. Results are better for low reflectivity objects and for cloudy conditions. A null-balancing radiometer is proposed. In the case of null-balancing failure this system also can be operated as total power radiometer. Author (ESA)
changes in stratospheric mass loading produced by the eruptions, and to study the dispersion of the newly injected material


... accelerometer data. Sources of model uncertainties and problems in reducing them are described. Long-term programs involving coordinated measurements, analyses of available data and theoretical studies are required along with development of more accurate indicators of solar and geomagnetic activity before models can show significant improvement. GRA

N85-33130# Joint Publications Research Service, Arlington, Va COSMONAUTS PARTICIPATE IN MULTILEVEL REMOTE SENSING EXPERIMENT Abstract Only

... An international experiment was conducted for the study of natural resources by remote methods. Photography and spectrometry of the republic's territory from orbit and the spectral characteristics of natural objects in the Sheki and Zakataly rayons and at the Mingechaur Reservoir were recorded. The aerospace experiment was conducted at several levels, ranging from equipment in orbit and instruments on board airplanes and helicopters, to a ground-based automated information-and-measurement complex. The purpose of the project is to develop scientific-methodological and physical-technical bases of environmental studies from space. The information will provide farmers with recommendations, maps and charts for the rational use of agricultural lands, pastures and reservoirs based on study of mountain-meadow, forest and valley geosystems. The materials obtained from the manned complex, correlated with data from aerial photography and ground-based observations. E.A.K.


... An analysis of an improved satellite measurement technique for H (upper cloud cover boundary) is presented which resolves the following problems: (1) the determination of the scope and complement of the apnoor global information; (2) the generation of the requisite catalog and procedure for its timely use; (3) the automation of the identification of IR data on cloud conditions; (4) the procedure for the use of IR measurements in mapping the cloud top altitude and taking into account the effect of the atmospheric layer over the clouds on the IR measurements. The altitude determination procedure was checked by comparing synchronous radio sensing and satellite data for two regions where cloud shape and altitude differ substantially: the White Sea (1978) and the tropical latitudes of the Indian Ocean (1977). The following are summarized in extensive tables the satellite and radio sensing data on H; the transmittance function of the atmospheric layer over the clouds as a function of latitude in both the Northern and Southern Hemispheres in July and January; the value of H based on radio sounding data and calculated from the measured radiation temperature and climatic data as well as estimates of the impact of the atmospheric layer above the clouds on the determination of H. Author


... Expressions for the solar altitude and azimuth are derived and analyzed for terrain points at the moment they are photographed as a function of the orbital parameters of an earth resources satellite, the photograph dates, the geographic latitude of these points and their distance from the satellite track. It is assumed that the scanner photos are taken from satellites in a circular solar synchronous orbit at an altitude of 600 to 900 km, that the photos are taken during the descending orbital trajectories, i.e., when the satellite is moving southwest in the morning or noontime hours, the Earth's surface is represented by a sphere and the orbit is strictly circular and the optical spectrum is used, employing an optical mechanical scanner with linear horizontal line scanning or using a solid state MSU-E or the HRV scanner of the SPOT system. All line elements of the photos are assumed to be recorded simultaneously. It is shown that the lighting conditions are practically independent of the satellite altitude and are completely governed by the mean local time of passage of the descending orbit. Quantitative expressions are also found for the change in illumination within any scanning photo and considerations are discussed which allow recommending an optimal value for the local mean time of descending trajectory passage. Author
OPTIMIZING LIGHTING CONDITIONS

Abstract

Only

FOR SCANNING PHOTOGRAPHS FROM SPACE AND CALCULATING SOLAR HIGHLIGHT AND SHADELESS AREAS

and the second to the direction of the mirror reflection of these coincident with the azimuth of the Sun. The first maximum is based on the geometry of the Sun-satellite-Earth surface system space scanner photography from earth resources satellites and high-light regions

The analysis is based on the geometry of the Sun-satellite-Earth surface system and also treats the question of the duration of the space photography season and its dependence on lighting conditions. Equations are solved for the isolines and centers of the shadeless and high-light regions

Author

N85-33556# Bureau of Reclamation, Denver, Colo.

PROJECT SKYWATER, 1983-84 SCPP (SIERRA COOPERATIVE PILOT PROJECT) DATA INVENTORY


An inventory of all data collected from October 15, 1983, through April 1984, in association with the SCPP (Sierra Cooperative Pilot Project), a weather modification research project in winter orographic cloud seeding. It is subdivided into an introduction plus 12 sections and appendices A, B, C and D Forecasting, Radar, Satellite, Aircraft, Rawinsondes, Surface Meteorological Observations, Precipitation Gage Network, Ground Based Microphysical Observations, Radiometer, Cooperative and Operational Seeding Activities, Snow Chemistry Measurements, National Weather Service, Federal Aviation Administration, and National Climatic Center Products, and Sierra PROBE Data Availability, SCPP Operations for 1983-84, University of Wyoming King Air Flight Summary Notes.

Author

N85-33534# Hughes Aircraft Co, El Segundo, Calif.

SIX MECHANISMS USED ON THE SSM/1 RADIOMETER


Avail NTIS HC A17/MF A01 CSCL 13M

Future USAF Block 5D Defense Meteorological Satellites will carry a scanning microwave radiometer sensor (SSM/1). SSM/1 senses the emission of microwave energy and returns to earth data used to determine weather conditions, such as rainfall rates, soil moisture, and oceanic wind speed. The overall design of the SSM/1 radiometer was largely influenced by the mechanisms. The radiometer was designed to be stowed in a cavity on the existing spacecraft. The deployment of the sensor is complex due to the constraint of this cavity and the need for precision in the deployment. The radiometer will continuously rotate, instead of oscillate, creating the need for a bearing and power transfer assembly and a momentum compensation device. The six mechanisms developed for this program are described

Author

N85-35217# Naval Postgraduate School, Monterey, Calif.

TARGET OBSERVABILITY FOR SATELLITE-BASED SENSORS M.S. Thesis


The purpose of this thesis is to discuss the observability of targets moving on or near the Earth’s surface when viewed from space by an orbiting satellite. A simplified derivation of the satellite’s orbital mechanics is undertaken, when taken in conjunction with a description of the target’s motion allows for the derivation of a system of relative coordinates. An observability analysis is then performed on the resulting series of nonlinear equations, which in turn forms the basis for the design of a deterministic nonlinear observer and an Extended Kalman Filter to track the target.

Author

N85-35218# National Environmental Satellite Service, Washington, D. C.

SPACE STATION POLAR PLATFORM: INTEGRATING RESEARCH AND OPERATIONAL MISSIONS


This report describes how an operational payload proposed by NOAA for the Space Station Polar Platform may be merged together with the research sensors scheduled to be carried on the Platform as part of NASA’s Earth Observing System (EOS). This is the third in a series of NOAA/NESSDIS Technical Reports on the space station project. Issues addressed include studies of solar terrestrial interactions, as well as monitoring of the Earth’s atmosphere, oceans and land masses using both operational and R&D sensors.

Author

N85-40793 PRINCIPLES OF REMOTE SENSING


This book is produced for undergraduate and graduate courses in remote sensing. A review of remote sensing today is presented, taking into account recent developments in remote sensing, social and legal implications of remote sensing, the status of remote sensing, and recommended reading. Other topics explored are related to electromagnetic radiation at the earth’s surface, aerial photography, aerial sensor imagery, satellite sensor imagery, and image processing. Attention is given to the components of a remote sensing system, remote sensing terminology and units, sources and types of electromagnetic energy used in remote sensing, earth surface interactions with electromagnetic radiation, atmospheric interactions with electromagnetic radiation, the multispectral scanner, thermal infrared linescaner, sideways-looking airborne radar, earth resources satellites, manned earth resources satellites, meteorological satellites, military and USSR satellites, and geographic information systems.

G.R.

A85-41657 COMMERCIALIZATION OF REMOTE-SENSING TECHNOLOGY

S. A. MORAIN (New Mexico, University, Albuquerque) International Journal of Remote Sensing (ISSN 0143-1161), vol. 6, June 1985, p. 837-846. refs

The Technology Application Center (TAC) of the University of New Mexico has accumulated a decade of experience in the transition of remote sensing technology to commercialization efforts. The present management and cost information for 48 completed projects sheds light on small businesses’ expectations regarding the frequency and duration of such projects, their requisite level of effort, and before-profit revenues. The presently ascertained gross average salary per full time employee equivalent, which has averaged only $10,500 since 1975, suggests that market forces have not yet generated sufficient demand to support the level of skills entailed by this technology.

O.C.
THE EVOLVING CONTINENTS /2ND REVISED AND ENLARGED EDITION/
B. F. WINDLEY (Leicester, University, England) Chichester, England, and New York, John Wiley and Sons, 1984, 416 p. refs. The earth's history is traced through the tectonic evolution of the continental crust from the very beginning of the geological record, rather than by studying the stratigraphy of a particular area. The topics addressed include: Archean granite-gneiss belts; Archean greenstone belts; crustal evolution in the Archean; early to mid-Proterozoic anorogenic magmatism and abortive rifting; mid-late Proterozoic basins, dykes, glaciations, and life forms; late Proterozoic mobile belts; and crustal evolution in the Proterozoic. Also considered are: paleomagnetism and continental drift; paleoclimatology and the fossil record, Caledonian-Appalachian fold belt; the Hercynian fold belt; Pangaea and its breakup; plate tectonics and sea-floor spreading; island arcs; continental margin orogenic belts; the Western Americas, the Alpine fold belt; the Himalayas; and the evolving continents. C.D.

A85-42223
THE SPACE STATION: AN IDEA WHOSIE TIME HAS COME
T. R. SIMPSON, ED. New York, IEEE Press, 1985, 314 p. No individual items are abstracted in this volume. A general overview of the goals and technologies to be used in the assembly of the Space Station in the 1990s is presented. Among the topics addressed are: the historical background of American and Russian manned Space Station concepts, the views of key decision-makers in the Federal Government with respect to the Space Station; the capabilities and structure of various Space Station design concepts; and the long term potential of space systems to support manned spaceflight within the solar system in the 21st century. Excerpts from the major Presidential documents concerned with manned space flight over the past 24 years are provided in an appendix. I.H.

A85-45666* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York. THE EARTH'S SURFACE STUDIED FROM SPACE; PROCEEDINGS OF WORKSHOP II OF THE COSPAR 25TH PLENARY MEETING, GRAZ, AUSTRIA, JUNE 25-JULY 7, 1984 S. G. UNGAR, ED. (NASA, Goddard Institute for Space Studies, NY) Advances in Space Research (ISSN 0273-1177), vol. 5, no. 5, 1985, 120 p For individual items see A85-45687 to A85-45697. Consideration is given to: Landsat image data quality studies; a preliminary evaluation of Landsat-4 Thematic Mapper (TM) data for mineral exploration, and the early evaluation of TM data for mapping forest, agricultural and soil resources. Among other topics discussed are: shortwave infrared detection of vegetation, SPOT image quality and post-launch assessment, an evaluation of SPOT HRV simulation data for Corps of Engineers applications, and the application potential of SPOT imagery for topographic mapping. Consideration is also given to: verification studies of MOS-1 sensors; multiple sensor geocoded data; and the utility of proposed sensors for coastal engineering studies. I.H.

A85-48524
THE USSR AS VIEWED FROM SPACE [SSSR IZ KOSMOSA]
IU. P. KIENKO, ED., V. F. MARKOV, ED., E. A. VOSTOKOVA, ED., IU. G. KELNER, ED., and I. M. KOMISSAROVA, ED. Moscow, Glavnoe Upravlenie Geodezii i Kartografii, 1983, 65 p. In Russian. No individual items are abstracted in this volume. A series of photographs of the entire territory of the Soviet Union obtained through satellite remote sensing is presented along with various maps compiled on the base of these photographs. Emphasis is placed on images obtained with the KATE-140, FMS, and MKF-6 cameras, as well as Meteor-satellite TV images. Examples of the following types of items are included: physical and geographic photointerpretation; geological-structural, geomorphological, and glaciological maps; and forest surveys. B.J.
Typical Subject Index Listing

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(Effective October 1, 1985)

### Schedule A
STANDARD PRICE DOCUMENTS AND MICROFICHE

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<tr>
<td>TITLE</td>
<td>K. P. PRICE, M. K. RIDD, and J. A. MEROLA 1984</td>
<td>8 p 8 pages</td>
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Range inventorying methods using LANDSAT MSS data, coupled with ancillary data were examined. The study area encompassed nearly 20,000 acres in Rush Valley, Utah. The vegetation is predominately desert shrub and annual grasses, with some annual forbs. Three LANDSAT scenes were evaluated using a Kauth-Thomas brightness/greenness data transformation (May, June, and August dates). The data was classified using a four-band maximum-likelihood classifier. A print map was taken into the field to determine the relationship between print symbols and vegetation. It was determined that classification confusion could be greatly reduced by incorporating geomorphic units and soil texture (coarse vs fine) into the classification. Spectral data, geomorphic units, and soil texture were combined in a GIS format to produce a final vegetation map identifying 12 vegetation types.

### TYPICAL CITATION AND ABSTRACT FROM AIAA

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<td>EVALUATION OF PROCEDURES TO CORRECT FOR VARIABLE VIEWING AND ILLUMINATION GEOMETRY WHEN OBSERVING A NON-LAMBERTIAN SURFACE THROUGH THE ATMOSPHERE</td>
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<td>AUTHORS</td>
<td>V. S. WHITEHEAD (NASA, Johnson Space Center, Houston, TX), W. R. JOHNSON, M. L. MATHEWS, and N. C. HORBATH (Lockheed Engineering and Management Services Co., Inc., Houston, TX)</td>
<td>Author's Affiliation</td>
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Data from the Advanced Very High Resolution Radiometer aboard the NOAA polar orbiting satellite are being operationally applied to provide estimates of vegetation cover and/or condition over a large part of the earth by the USDA. The wide scan angle (+ or - 54 deg) of this system permits daily views of the earth when used to its limits. Five-day repetitive coverage is acquired, assuming cloud-free conditions, in current operations which limit the use of the scan to the center + or - 14 deg of swath. While use of the full scan width would provide clear acquisitions frequent enough to monitor crop development and condition even with normal cloudiness, these off-nadir data are made difficult to interpret due to the non-Lambertian nature of the surface, enhanced effect of the atmosphere, inclusion of subpixel and thin invisible clouds in the scene, and differences in illumination across the scene; all of which contribute to variations in observed reflected radiation. Some approaches to provide corrections for these effects are discussed here.

Author
This bibliography lists 326 reports, articles and other documents introduced into the NASA Scientific and Technical Information System between October 1 and December 31, 1985. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.
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