Earth Resources
A Continuing Bibliography
with Indexes

National Aeronautics and Space Administration

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ACCESSION NUMBER RANGES

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

STAR (N-10000 Series) N82-22141 - N82-28242
IAA (A-10000 Series) A82-28539 - A82-38102

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EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

Issue 35

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between July 1 and September 30, 1982 in

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

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INTRODUCTION

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

This literature survey lists 587 reports, articles, and other documents announced between July 1 and September 30, 1982 in Scientific and Technical Aerospace Reports (STAR), and International Aerospace Abstracts (IAA).

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

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

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in STAR, or IAA, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

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

IAA entries identified by accession number series A82-10,000 in ascending accession number order;
STAR entries identified by accession number series N82-10,000 in ascending accession number order.

After the abstract section, there are six indexes: subject, personal author, corporate source, contract number, report/accession number, and accession number.
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Instructions are given for using the Winterkill indicator model CCAD data base interface driver. The purpose of the system is to interface the Winterkill Indicator Model with the CCAD operational data base. The interface driver routine decides what meteorological stations should be processed and calls the proper subroutines to process the stations.

TYPICAL CITATION AND ABSTRACT FROM IAA

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MEETING DATE

Results from the July 1981 Workshop on Passive Remote Sensing of the Troposphere. L. S. Keafer, Jr. and H G Reichle, Jr (NASA, Langley Research Center, Hampton, VA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan 11-14, 1982, paper 82-0207. 8 p. 6 refs Potential roles of passive remote sensors in the study of the chemistry and related dynamics of the lower atmosphere were defined by a Tropospheric Passive Remote Sensing Workshop, and technology advances required to implement these roles were identified. A promising role is in making global-scale, multi-layer measurements of the more abundant trace tropospheric gaseous species (e.g., O3, CO, CH4, HNO3) and of aerosol thickness and size distribution. It includes both nadir- and limb-viewing measurements. Technology advances focus on both scanning and fixed-spectra, nadir-viewing techniques with resolutions of 0.1 km/s or better. Balloon- and Shuttle-borne experiments should be performed to study the effects of instrument noise and background fluctuations on data inversion and to determine the utility of simultaneously obtained nadir- and limb-viewing data.

 ix
A REPORT ON THE 'COSMIC RAY PROPAGATION PROBLEM'

Data on abundances of elements are now of such quality, that the major source of discrepancies in cosmic ray propagation results is believed to be due to a difference in the propagation programs being used by different groups. Nine groups were therefore asked to use a standardized source, E equals 2.3 GeV/n with no energy loss, and propagate it through a 5 g/sq cm exponential path length of hydrogen, using their values of the Silverberg and Tsao cross sections at 2.3 GeV/n (1973, 1977, 1979). Results indicate significant discrepancies arising from propagation, demonstrating the differences that can result when different physical conditions are assumed.

THE QUESTION OF SHORT PATHLENGTHS IN INTERSTELLAR PROPAGATION

Interstellar propagation calculations for cosmic rays, He-4 - Ni-54, are compared with currently available abundance ratios for B/C and sub-Fe/Fe. The calculations show that an exponential pathlength distribution (leaky box model) cannot reproduce both secondary to primary ratios in the interval 0.5-1 GeV/n unless some values of the propagation parameters are modified. The calculated ratios are shown to be particularly sensitive to the adopted cross sections, the presence of the sub-Fe elements in the source regions, the shape of the source energy spectrum, and ionization energy loss.

THE COSMIC RAY POSITRON SPECTRUM

A calculation is made of the flux of secondary positrons expected above 100 MeV for various disk-halo diffusion models, which are consistent with the observed grammage and Be-10 abundance. It is found that models which give a high surviving fraction of Be-10 (about 0.3) give a secondary positron spectrum which is consistent with the observations, while a model predicting a low Be-10 abundance (about 0.1 surviving) gives a poorer fit at high energies hinting at the presence of a primary positron component. Implications of these results are discussed.

THE ELECTRON AND POSITRON SPECTRA IN PRIMARY COSMIC RAYS

It is contended that variations in the results of various authors' positron calculations derive mainly from differences between the local interstellar electron spectrum and those derived from radio data. It is found that, among the spectra derived from radio data, that of Rockstroh and Webber (1978) is the most consistent with the description using the usual 'leaky box' model. In addition, it is shown that the electron injection spectrum with a single power law cannot satisfactorily explain the primary electron spectrum. Analysis also shows that the leaky box model is able to account for the mean behavior of interstellar positrons and electrons in a cosmic ray containment volume whose galactic scale height and width around the earth are, respectively, 0.5-1 kpc and 2-3 kpc.

COMPARISON OF THE MEASURED ANTIPROTON FLUX WITH THAT PREDICTED BY THE 'LEAKY BOX' MODEL

STEADY-STATE COSMIC RAY ELECTRON SPECTRUM UNDER DIFFUSION, CONVECTION, ADIABATIC DECELERATION AND SYNCHROTRON LOSSES
A82-22557
MASS PER CHARGE RATIO IN HOT PLASMAS AND COSMIC RAY SOURCE COMPOSITION

Some models of shock acceleration of cosmic rays assume that particles are injected out of the thermal plasma behind the shock and are selected according to their effective charge (Eichler, 1979; Ellison et al., 1981). The pattern of compositions that could emerge from such a selection starting from plasmas in ionization equilibrium at various temperatures greater than or equal to 100,000 K and containing no grains is considered. It is found that, in the case of steady state ionization equilibrium and of time-dependent cooling of a hot plasma, which are possible descriptions of the hot ISM and of the halo gas, it is not possible to reproduce the observed cosmic ray composition with this simple scheme.

(Author)

A82-22559
PHYSICAL STATE OF THE BIRTH PLACE OF COSMIC RAYS AND ITS IMPLICATION TO THE ACCELERATION PROCESSES

To observe the expected chemical composition of galactic cosmic rays at their sources, it is suggested that this composition is the result of an acceleration mechanism, possibly related to the charge states of particles ambient in the source regions. Since it is likely that most of the particles are partially ionized in these regions, the ambient temperature there will be less than 100,000 K before the start of acceleration.

C.R

A82-22560
ON VOLATILITY, FIRST IONIZATION POTENTIAL, AND S- AND R-PROCESSES

The possibility of a correlation between the first ionization potential and volatility (in that elements of low potential tend to be refractory and those of high potential volatile) is considered. It is noted that the apparent correlation between galactic cosmic ray source (GCRS) elemental abundances and the first ionization potential may in fact be based on volatility. Attention is given here to compositional clues which may determine whether volatility or the first ionization potential is the relevant parameter. The correlation between the first ionization potential and volatility is examined, and those elements which do not fit into the correlation are isolated. Attention is also given to possible ambiguities in interpreting the charge spectrum beyond Ni that clerve from coincidences between regions of change in the first ionization (and volatility) and the s- and r-process peaks.

C.R

A82-22561
INTERSTELLAR GRAINS AS SEEDS FOR GALACTIC COSMIC RAYS

The theoretical basis for the supernova envelope shock origin of cosmic rays is reviewed. The theoretical explanation of the SN Type II light curve requires a critical mass fraction. The criterion of the adiabatic deceleration by Alfvén wave trapping neither applies in theory, when beta is greater than 1, or practice, as in the Starfish high-altitude nuclear explosion experiment. Arguments of delayed acceleration due to K-capture are not applicable to SN ejecta because a period of prompt recombination exists before subsequent stripping in propagation.

(Author)
A82-22571 ORIGIN OF COSMIC RAYS IN GALACTIC CENTRE SOURCES

A model is proposed which attributes the origin of cosmic rays to rare explosive events in galactic nuclei. In accordance with the model, the individual explosions are separated by times of the order of 100 million years, and the duration of each explosion is much shorter than the period of separation. Particles produced with a power-law spectrum would propagate by diffusion throughout the Galaxy, and in its simplest form, there would be simple three-dimensional diffusion with a diffusion coefficient independent of position. The proposed model could provide an explanation for the very low electron-proton ratio (about 3 percent at 1 GeV) of cosmic radiation at the earth.

V.L.

A82-22572 ACCELERATION PROCESSES NEAR MASSIVE BLACK HOLES

Ultra-massive accreting black holes in the nuclei of active galaxies have been proposed as the central sources of energy emission, especially of the nonthermal kind. Accretion disks around massive black holes in the centers of active galactic nuclei are shown to be likely sites of particle acceleration. Electrons can be accelerated to relativistic energies by electromagnetic processes as well as purely gravitational processes (e.g., Penrose pair production). Protons are also accelerated to very high energies by processes such as (1) Fermi acceleration, (2) betatron acceleration, (3) shock wave acceleration, and (4) in beams via the electromagnetic dynamo process. The stochastic Fermi process acting over a period of only about a day in the ergosphere suffices for efficient acceleration of protons, even to high energies.

Author

A82-22584* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

INTERPLANETARY PARTICLE OBSERVATIONS ASSOCIATED WITH SOLAR FLARE GAMMA-RAY LINE EMISSION

Observations of particle emissions during three solar flares which were observed to emit 2.22 MeV gamma rays as recorded by the Solar Maximum Mission are discussed. The 2.22 MeV line is produced by neutron capture by hydrogen, and additional attention is given to a 4.4 MeV emission line of June 7, 1980, with estimates made of the particle density 1 AU from the sun assuming a good magnetic connection between the earth and the sun. The measurements were made from the ISEE-3 and HELIOS-1 spacecraft. The connectedness of the earth and the sun in a magnetic field leads to conclusions that few particles actually escaped into interplanetary space.

M.S.K.

A82-22587 COMPUTER SIMULATION OF THE TIME DEPENDENCE OF THE PHOTON ENERGY SPECTRA PRODUCED IN PROTON AND ELECTRON BREMSSTRAHLUNG

An analytic model of the time dependence of the photon generation spectra resulting from proton and electron bremsstrahlung in matter is presented. The lifetimes of the protons and electrons with the same Lorentz factor are shown to differ by a factor of at least three, which implies that the time dependence of photon energy spectra resulting from pulse beam injection of accelerated particles into a generation region depends on the types of particles accelerated. Basic equations are formulated for the evolution of the photon distribution function in matter, with consideration given to path lengths which remain or pass from the matter. The proton energy spectrum is then defined and the generation function for the production of gamma rays in a target block is derived, taking into account the density of the target. Similar calculations for electrons showed that the time the energy spectra becomes harder for electrons.

M.S.K.

A82-22589 POSSIBLE EVIDENCE FOR ATTENUATION OF AN MHD SHOCK BY A MAGNETIC NEUTRAL SHEET IN THE SOLAR CORONA

The possibility that H-alpha filaments in the solar chromosphere are markers beneath regions where coronal shocks experience severe attenuation, and are thus the areas where particles can be ejected from the corona, is examined from data from flares of Aug 4, 1972 and Nov. 9, 1979. Both flares produced gamma rays with 2.2 MeV energy, and data exists for the energetic protons received at earth stations. The efficiency of transport was high for the August event and two magnitudes lower for the November event. H-alpha filtergrams of the two flares show that in the second flare the shock propagation crossed two or three filaments lying in its path. The low efficiency of particle transport is taken to indicate a degraded shock in the region above the filaments, indicating that the particles needed a different route to escape.

M.S.K.

A82-22591* Chicago Univ., Ill

THE RELATION OF TYPE II RADIO BURSTS TO SOLAR ENERGETIC PARTICLES OBSERVED AT EARTH

Observations of particle events associated with type II radio bursts as recorded on the ISEE-3 spacecraft are reported. Data on burst events following flares of Sept 23,1978 and Aug. 16, 1979 yield time histories of the particle fluxes, which exceed 25 MeV energy. The profiles of the Category-1 type II bursts display a continuous release of particles, which was concluded by no decrease in the fluxes until after the passage of the shock. The continuous nature of the recorded events suggests that the secondary acceleration process associated with the type II bursts is maintained as the flare shock propagates through interplanetary space, and may be the source of the energetic particles which propagate with the shock.

M.S.K.
A SURVEY OF SOLAR PROTONS AND ALPHA DIFFERENTIAL SPECTRA BETWEEN 1 AND GREATER THAN 400 MEV/NUCLEON

M.S.K.


The rigidity exponent form shows a good fit over a broad range except during the onset of a proton shower. A parabolic spectral shape is presented which becomes a power law at low rigidity. Best fits were obtained with the exponential in rigidity, an exponential in energy, and a Bessel function of momentum/nucleon. The intensity-time profiles and anisotropies of the solar cosmic-ray ground level events (GLEs) on November 22, 1977 and May 7, 1978 were addressed by means of a Monte Carlo simulation of relativistic solar flare protons propagation in the interplanetary magnetic field. Pitch angle scattering mean free paths of 0.5 AU and more than 3 AU are deduced. The injection of the solar flare protons has an extended time structure, correlated with the X-ray burst profiles in the 1-8 A and 0.5-4.0 A bands, respectively, for the November 1977 and May 1978 GLEs. O.C.

NON-FLARE INJECTION OF PROTONS INTO INTERPLANETARY SPACE


The intensity-time profiles and anisotropies of the solar cosmic-ray ground level events (GLEs) on November 22, 1977 and May 7, 1978 were addressed by means of a Monte Carlo simulation of relativistic solar flare protons propagation in the interplanetary magnetic field. Pitch angle scattering mean free paths of 0.5 AU and more than 3 AU are deduced. The injection of the solar flare protons has an extended time structure, correlated with the X-ray burst profiles in the 1-8 A and 0.5-4.0 A bands, respectively, for the November 1977 and May 1978 GLEs. O.C.

LOW-ENERGY PARTICLES IN INTERPLANETARY MAGNETIC FIELD NEAR THE SECTORIAL BOUNDARY ON SEPTEMBER 26, 1977


Proton-6 data are used to examine effects of the sign reversal in the interplanetary magnetic field of September 26, 1977 on the 70-keV to 40 MeV proton fluxes, and the 10-30 keV and 40-500 keV electron fluxes. The sectoral boundary of interplanetary magnetic field traversed the earth at 2300 UT, and in that period the interplanetary space was filled with the solar cosmic ray particles generated in the flare of September 24, 1977, whose intensity decreased in time. Results indicate that the event of September 26, 1977 was the first observation where effects of the sectoral boundary were traced up to proton energies of 40-50 MeV. O.C.

COULOMBIAN ENERGY LOSSES AND THE NUCLEAR COMPOSITION OF THE SOLAR COSMIC RAYS


Coulombian energy losses suffered by fast ions in a two component plasma are discussed quantitatively. Their dependence on the temperature and density of the ambient plasma is also investigated. It is shown that these losses coupled with the transient nature of the flare can give rise to selectivity effects. The ion charge states are also discussed. (Author)
out to account for the observed excessive variability, which is presumably related to a phase lag effect or hysteresis effect between changes in intensities of particles of different rigidities and the level of solar modulation.

A82-29435
REMOTE SENSING OF THE WEEDINESS OF CROP FIELDS [DISTANTSIONNIE OPREDENLENIE ZASORENNOSTI SELSKOHOZJAISTVENNYKH POLEI]

A82-29526
COLOR AERIAL PHOTOGRAPHY IN THE PLANT SCIENCES AND RELATED FIELDS; PROCEEDINGS OF THE EIGHTH BIENNIAL WORKSHOP, LURAY, VA, APRIL 21-23, 1981

Aerial photography methods, equipment, targets, and the effectiveness of remote sensing of vegetation are discussed. Analysis with color or IR equipment is examined, and color aerial photography of riparian vegetation in northeastern California, wildlife on an island, and the use of color IR photography for vegetative monitoring are described. Specific photography of loblolly pine plantations, Alaskan resource, forest land changes, rangeland cover proportions, Oregon vegetation, and fir trees infested by beetles are considered. Spectral scanning of SO2-affected winter wheat and soybeans is presented, along with IR color photography of damaged citrus crops, the application of a scanning microdensitometer in plant science studies, and the development of an IR exposure meter.

A82-29527
DEVELOPMENT AND APPLICATION OF PANORAMIC AERIAL PHOTOGRAPHY IN FOREST PEST MANAGEMENT

Characteristics of panoramic aerial photography and its use in forest pest management are reviewed. Applications to date include estimating losses caused by the mountain pine beetle and planning salvage operations of insect killed timber in California. Advantages of the optical bar panoramic aerial camera system include the ability to acquire high-resolution photography over large areas of land rapidly. Disadvantages include a relatively high acquisition cost, a limited acquisition capability, unconventional film size, and a changing photo scale.

( Author)
A82-29529
INVENTORY OF WILDLIFE HABITAT FROM COLOR INFRARED AERIAL PHOTOGRAPHY FOR COBB ISLAND, VIRGINIA

A82-29530
CONSIDERATIONS IN USING COLOR INFRARED PHOTOGRAphS FOR VEGETATIVE INTERPRETATION

The literature suggests that the infrared wavelengths are the most significant when color infrared film records the reflectance of vegetation. Some evidence, however, suggests that the relative sensitivity of the infrared sensitive emulsion layer of the film and the apparent intensity of near infrared reflectance from plants combine to saturate that layer when the film is used to photograph agricultural crops at low altitude. In addition, some physiological considerations of plant characteristics also suggest that the red- and green-sensitive emulsion layers would be affected before the infrared-sensitive layer. Observations indicate that tissue damage in agricultural crops is relatively severe before it becomes detectable on color infrared film. It is also then visible to the human eye. This effect suggests that previal detection of crop damage is not likely on color infrared film. Furthermore, the perceptibility of color contrasts by the human eye tends to be a deterrent to visual detection of plant symptoms, both in the field and in the interpretations of color-infrared photographs. (Author)

A82-29531
COLOR AERIAL PHOTOGRAPHY DETECTS NUTRIENT STATUS OF LoblOLLY PINE PLANTATIONS
A. LYONS and E. BUCKNER (Tennessee, University, Knoxville, TN) In: Color aerial photography in the plant sciences and related fields; Proceedings of the Eighth Biennial Workshop, Luray, VA, April 21-23, 1981. Falls Church, VA, American Society of Photogrammetry, 1981, p. 53-58. Research supported by the Champion International Corp. refs

A82-29532
MULTI-RESOURCE INVENTORY IN INTERIOR ALASKA

Data reduction, conversion, and application of NASA small scale color IR photography for Alaskan renewable resource evaluation are described. The photographs are taken at a 1:120,000 scale, and special overlay ink and film allow suitable definitions of forest and woodland, although brush heights and tundra are undiscernable. The study is concentrated along the Susitna River basin, where rapid development is occurring along the road between Anchorage and Fairbanks. Interpretation involves classification of forest, woodland, nonforest, and nonvegetated groups, with forest and woodland further defined into closed or open crown areas, depending on exceeding 50% cover. It is recommended that relating ground sample selection based on photointerpretation to a digitized map be accomplished by completing the map digitization prior to field plot selection, and statistically being photointerpretation sampling schemes to detailed in-place digitized map sampling schemes. M.S.K.

A82-29533
APPLICATION OF 35MM COLOR AERIAL PHOTOGRAPHY TO FOREST LAND CHANGE DETECTION

Attention is called to the high cost ($280 per plot) of examining the sample plots that form the data base in forestry surveys. The use of 35-mm color aerial photography for detecting change in these plots is investigated. With the method envisaged here, only those sample plots found to be significantly changed (logging, fire, blowdown, insect damage, disease) would be examined, the rest would be updated by computer growth projection models. This runs with 35-mm color aerial photography in Minnesota and Michigan yielded good results at a cost estimated at $20 per plot. C.R.

A82-29534
ESTIMATING RANGELAND COVER PROPORTIONS WITH LARGE-SCALE COLOR-INFRARED AERIAL PHOTOGRAPhS

A82-29535
MAPPING RIPARIAN VEGETATION IN SOUTHEASTERN OREGON USING DIGITIZED LARGE SCALE COLOR INFRARED AERIAL PHOTOGRAPHY

A82-29536
REMOTE SENSING OF DOUGLAS-FIR TREES NEWLY INFESTED BY BARK BEETLES

Two study plots containing Douglas-fir (Pseudotsuga menziesii /Mrb/ Franco) newly infested by Douglas-fir beetle (Dendroctonus pseudotsugae Hopk.) were photographed with large-scale (1:1000), color infrared film on July 29, 1979 - approximately three months after possible insect attack. Significant differences were found between the ratios of the optical density values of the images of healthy and attacked trees. It is concluded that trees which have been successfully attacked by beetles can be detected on color infrared air photos approximately three months after initial attack when the trees still support visually green, healthy-appearing foliage. (Author)

A82-29537
SPECTRAL SCANNING OF EXPERIMENTAL PLOTS OF SO2-AFFECTED WINTER WHEAT AND SOYBEANS FOR MISSION PLANNING

A series of TVA experiments is described wherein plots of soybeans and winter wheat plants were grown to the critical
seed-filling stage of development, exposed to controlled doses of SO2, observed systematically for foliar effects, then scanned row by row with a spectroradiometer. The spectral curves were statistically analyzed to determine the changes in spectral reflectance that occur after plants are stressed by SO2 emissions. For soybeans, the affected subplots had higher visible reflectance, lower IR reflectance, and a lower IR/red ratio. Variance analysis showed significant differences in IR and IR/red reflectance between chlorotic soybeans and unaffected ones, and in red reflectance, IR reflectance and IR/red ratio between necrotic and unaffected ones. Since the wheat subplots showed no chlorosis, analysis of reflectance data concentrates on necrosis, which showed a significant difference in red, IR, and IR/red reflectance between classes of differentially injured wheat.

C D

A82-29538* National Aeronautics and Space Administration John F. Kennedy Space Center, Cocoa Beach, Fla.


Detection and disease damage assessment of citrus tree losses in a Florida citrus grove were made by establishing a registration (grove site location) coordinate system, developing a damage assessment system, and testing sequential aerial color infrared (ACIR) photography at the scale of 1 m = 333 ft (2.5 cm = 100 m) during the winter, spring, and summer seasons of 1978 and spring of 1979. Spring photography was the easiest to photo interpret, showed the greatest differences between healthy and diseased trees, and had the least shadow and background interference for photo interpretation. Trees showing slight disease damage were detected in ACIR before they were found in ground surveys. (Author)

A82-29539* Minnesota Univ, St Paul


(Contract NGL-24-005-263)

This paper presents a representative sample of projects aimed at vegetation mapping and assessment via analysis of both digital photographic and Landsat data projects and illustrates the potential for using scanning microdensitometric data extracted from color infrared photographs in the following applications: freshwater wetlands mapping, tree type mapping, and yield vs reflectance modeling in corn fertilization experiments. These case studies are presented to illustrate the general applicability of scanning microdensitometric data in the contexts of image classification and enhancement as well as quantitative modeling of ground parameters. (Author)

A82-29747


Precipitation and vegetation remote sensing techniques developed during Phase I of the UN Food and Agricultural Organization program to monitor rainfall and vegetation conditions known to presage desert locust plagues are described. Landsats 2 and 3 multispectral scanners were used, along with Tros-N and Meteosat and Goes satellite data, to quantify the location, extent, duration, and intensity of rainfall events in the recession area, that region where locusts live as ordinary grasshoppers until conditions which lead to population explosions and subsequent swarming are present. Outbreak areas were sought, along with ecological conditions which induced the outbreaks. Landsat data handling procedures are reviewed, and it is noted that mosaic image construction has resulted in the construction of 10 maps for the north Africa locust recession area of Morocco, Algeria, Tunisia, and Libya. M.S.K.

A82-32701#


(Contract USDA-53-3187-8-25)

A82-32705#


(Contract USDA-53-3187-8-25)

A82-32704#


A82-32703#


A82-32705#


Panoramic aerial photographs were obtained over 40 million acres of forest land in northern California during the period July, 1978, through September, 1979. These were used as an aid in planning timber salvage sales to locate concentrations of bark beetle-caused tree mortality following a severe drought. Several innovative procedures devised to effectively use these unconventional format photographs under field conditions are described. The photos were used in 223 salvage sales, resulting in a harvest of 532.2 million board feet of bark beetle killed timber during the period July, 1978, through May 1979. (Author)
A82-32707
EVALUATION OF SPRUCE-FIR FORESTS USING SMALL-FORMAT PHOTOGRAPHS
J. MCCARTHY (Vermont, University, Burlington, VT), C. E OLSON, JR. and J. A WITTER (Michigan, University, Ann Arbor, MI)
(Contract USDA-23-178)
The effectiveness of large-scale, 14800 small-format color aerial photographs in the evaluation of tree conditions and identification of the balsam fir and white spruce hosts of the spruce budworm is assessed. Contingency tables allowed comparisons of tree condition and species identification from aerial and ground data. It is shown that photointerpretation of small-format photographs provided mean aerial estimates of tree conditions within one-half of a ranking class of the mean from ground truth data, with balsam fir and white spruce separable at a frequency of 80% and host species mortality aerial estimates within 10% of the ground test data.

O.C.

A82-32708*
LANDSAT DETECTION OF HARDWOOD FOREST CLEAR CUTS
(Contract NGL-33-010-171)
In a study of hardwood forests in Pennsylvania, the detection of clearcuts by means of visual analysis of Landsat summer imagery was accomplished best using band 5 images; however, a higher percentage of clearcuts could be detected using bands 5 or 7 of clearcuts by means of visual analysis of Landsat summer imagery of tree condition and species identification from aerial and ground data. It is shown that photointerpretation of small-format photographs provided mean aerial estimates of tree conditions within one-half of a ranking class of the mean from ground truth data, with balsam fir and white spruce separable at a frequency of 80% and host species mortality aerial estimates within 10% of the ground test data.

A82-32897*
REMOTE SENSING OF LEAF WATER CONTENT IN THE NEAR INFRARED
(Previously announced in STAR as N80-20768)

A82-32905*
EFFECTS OF VEGETATION CANOPY STRUCTURE ON REMOTELY SENSED CANOPY TEMPERATURES
(Previously announced in STAR as N79-33530)

A82-32907
THE RESPONSE CHARACTERISTICS OF VEGETATION IN LANDSAT MSS DIGITAL DATA
Empirical evidence is used to propose a model of the response due to a vegetative canopy. The model is a simplification, and hence approximation, of the complex relationship between physical conditions in the canopy and the resultant spectral reflectance. However, the model can be quantified to yield at least two, and possibly more, independent response parameters from the Landsat response data. These independent response parameters can be used to derive estimates of more than one independent physical characteristic of the canopy. Further, the model specifies its limitations, for a given data input, and indicates how further auxiliary data may be used to extract more information from the model.

A82-32909*
FIELD SIZE, LENGTH, AND WIDTH DISTRIBUTIONS BASED ON LACIE GROUND TRUTH DATA
The development of agricultural remote sensing systems requires knowledge of agricultural field size distributions so that the sensors, sampling frames, image interpretation schemes, registration systems, and classification systems can be properly designed. Matila et al. (1976) studied the field size distribution for wheat and all other crops in two Kansas LACIE (Large Area Crop Inventory Experiment) intensive test sites using ground observations of the crops and measurements of their field areas based on current year rectified aerial photomaps. The field area and size distributions reported in the present investigation are derived from a representative subset of a stratified random sample of LACIE sample segments. In contrast to previous work, the obtained results indicate that most field-size distributions are not log-normally distributed. The most common field size observed in this study was 10 acres for most crops studied.

G.R.

A82-32913*
VIEW ANGLE EFFECTS IN THE RADIOMETRIC MEASUREMENT OF PLANT CANOPY TEMPERATURES
D. S. KIMES (NASA, Goddard Space Flight Center, Earth Resources Branch, Greenbelt, MD), S. B. IDSO, P. J. PINTER, JR. and J. A WITTER (Michigan, University, Ann Arbor, MI)
The thermal infrared sensor response from a wheat canopy was extremely non-Lambertian because of spatial variations in energy flow processes; the effective radiant temperature of the sensor varied as much as 13 C with changing view angle. This variation of sensor response was accurately quantified (root-mean-square of deviations between theoretical and measured responses reduced to 1.1 C) as a function of vegetation canopy geometry, vertical temperature distribution of canopy components, and sensor view angle. The results have important implications for optimizing sensor view angles for remote sensing missions.

A82-34179
EVALUATION OF NOAA-AVHRR DATA FOR CROP ASSESSMENT
M. J. DUGGIN, D. PIWINSKI (New York, State University, Syracuse, NY), V. WHITEHEAD, and G. RYLAND (Lockheed Engineering and Management Services Co., Inc., Houston, TX) Applied Optics, vol. 21, June 1, 1982, p. 1873-1875. refs
(Contract NAS-16514)
A study has been carried out in order to determine the angular limits which should be imposed upon NOAA-AVHRR data used in vegetation assessment. The study involved simulations of anticipated sensor output over a wheat crop and empirical investigation of vegetation data over vegetated areas. The conclusion drawn from both approaches is that less than 10% variation in
the simulated vegetative index may be anticipated across the swath of imagery used if only the central 512 pixels are utilized. V.L.

A82-34705
INTERPRETATION OF VEGETATIVE COVER IN WETLANDS USING FOUR-COLOR SAR IMAGERY

As a part of a Canada-West Germany scientific exchange program, SAR imagery obtained over areas in Southern Ontario was investigated. A unique and varied image response was noted at certain wetland sites. A description is provided of the results of an extension of the early observations to other wetland sites, taking into account preliminary correlations between the SAR image response and the wetland cover type. It was found that the effects produced by wetland conditions in Southern Ontario on SAR X- and L-band backscatter make it possible to interpret vegetative cover and moisture conditions from SAR imagery. X-band SAR is sensitive to smaller-scale vegetative content in the wetlands, while L-band SAR is sensitive to larger-scale vegetative content in the wetlands.

A82-34710
PROBLEMS ASSOCIATED WITH REMOTELY DETECTING AND MONITORING SALINE SITES WITHIN IRRIGATED ALBERTA

Of the 400,000 ha of land irrigated in Alberta, from 10% to 30% has been estimated to be adversely affected by high water tables and soil salinity. To facilitate optimum rehabilitation planning, those lands which are affected or are likely to become affected under new irrigation must be identified and monitored. Over the last 25 years several attempts have been made to identify and monitor affected areas using panchromatic air photos. Recently, 1:10,000 color and other photographic sensors and scales have been utilized and preliminary work with Landsat digital data has begun. In an evaluation of these activities, attention is given to mapping details, mapping efficiency, the affected area, visual pattern recognition problems, and ground truth requirements. Plans for future work are also discussed.

A82-34716
A COMPUTERIZED SPATIAL ANALYSIS SYSTEM FOR ASSESSING WILDLIFE HABITAT FROM VEGETATION MAPS

A82-34730* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.

DEFINING THE TEMPORAL WINDOW FOR MONITORING FOREST CANOPY DEFOLIATION USING LANDSAT

An analysis of Landsat imagery of forested areas near Williamsport, Pennsylvania shows that the effects of defoliation by insects can be assessed over a two month period beginning in early June. Within this window heavily defoliated forest can be successfully delineated from moderately defoliated and healthy forest Consequently, the effects of insect damage can be assessed at times other than peak defoliation, doubling the probability that useful satellite data can be acquired in the Williamsport area.

A82-34731
USE OF LANDSAT MULTISPECTRAL SCANNER DATA IN VEGETATION MAPPING OF A FORESTED AREA

Landsat digital data combined with U-2 color infrared photography of the scale 1 120,000 are used for vegetation mapping of a forested area in northern California. The approach involves geometric correction of Landsat digital data, selection of ten training sites, unsupervised classification of training sites, and supervised classification of the entire study area. Best results for unsupervised classification are achieved when each training site is analyzed independently USGS topographic maps of the scale 1:250,000 are useful in the location of control points, delineation of watershed boundary, and geometric correction of Landsat digital data. It is concluded that Landsat repetitive data are a useful means of mapping the area under investigation.

A82-34732
REMOTE SENSING - A POTENTIAL AID IN THE PREPARATION OF AN URBAN TREE INVENTORY

Remote sensing is a reliable tool for the compilation of urban tree inventories. An assessment of the quantity and quality of the Omaha-Bellevue, Nebraska tree population was made the summer of 1979. After digitizing the data several analytical techniques were explored, among them factor analysis. Preliminary results indicated that the use of aerial surveys and computer analysis prove more cost effective and accurate than traditional forest field surveys.

A82-34733
MONITORING DEFORESTATION IN THE EASTERN PART OF THE STATE OF GUERRERO, MEXICO

A research project carried out by the University of Guerrero to investigate deforestation and other land use and land cover changes is described. Landsat imagery, aerial photographs, and cartographic maps are used in determining changes in forest vegetation between 1972 and 1979. The area covered by forest fell from 112,250 hectares to 76,250 hectares. During the period investigated, the population density rose from 36 persons/sq km to 46 persons/sq km. The forest cover comprises tropical and semitropical forests.

C. R.

9

Attention is given to the following techniques of the automated processing of remote-sensing data: the delineation of forest boundaries and homogeneous areas; the delineation of extended land areas and their schematic representation, and the determination of the reserves, completeness, diameter, and other characteristics of plantations. The automatic delineation of such land categories as forest-covered areas, fire-consumed areas, cleared spaces, and swamps is considered. It is shown that the most informative features for the determination of forest-evaluation indices are the combination of the image texture patterns of the delineated area with the landscape characteristics and generalized features of the external appearance of these images.

A82-37194

A C band radar calibration method is presented. The experiment has been conducted in an agricultural area near Paris on three different types of surface: wheat stubble, sugar beet, and corn. It has been found that the sensitivity of the radar backscattering coefficient to surface soil moisture agrees well with the results obtained by Ulaby et al. (1979) when soil moisture values are expressed as percentage of the field capacity.

A82-37503

The potential of the first four proposed TM bands for estimating above-ground biomass and discriminating species groups was evaluated in an area of intertidal salt marsh in Chichester Harbor, Southern England. Ground spectral data were collected using a portable multiband radiometer during August 1979. The correlation and variance-covariance matrices of the data are shown, as are the results of principal components analysis of the ground spectral data and of canonical variate analysis. Individual sites for four types of algae were graphed for principal components and canonical variates. For biomass estimation, the relationship between bidirectional reflectance and dry biomass is shown for the algae C.D.

A82-37589
THE INFLUENCE OF SOIL CHARACTERISTICS ON REGIONAL CONVECTION DIFFERENCES ABOVE NORTHERN GERMANY [DIE AUSWIRKUNG VON BODENEIGENSCHAFTEN AUF DIE REGIONALEN KONVEKTIONSUNTERSCHIEDE UEBER NORDDEUTSCHLAND] D. MUELLER and C KOTTMIEER (Hannover, Technische Universitat, Hanover, West Germany) Meteorologische Rundschau, vol. 35, June 1982, p 84-91. (In German. refs) The present investigation is concerned with the various factors which can affect the intensity of convection. Soil moisture and orography are found to have significant influence on the convection.
A COMPARISON OF STRATIFIED VERSUS REGRESSION ESTIMATORS Final Report

LANDSAT data acquired over an agricultural area along with ground enumeration of the same area are used to obtain crop acreage estimates which are better (as measured in terms of bias and variance) than can be obtained from either data source alone. Two basic approaches considered within the AgrIRSTARS program are a stratified crop acreage estimator and a regression estimator. A statement of the problem was mathematically formulated and some theorems were proved which relate to the variance of the two estimators. For a particular set of data, the regression and stratified estimators are compared in terms of certain easily computed parameters.

A MетеOROLOGIcALLY DRIVEN MAIZE STRESS Indicator MODEL

A maize soil moisture and temperature stress model is described which was developed to serve as a meteorological data filter to alert commodity analysts to potential stress conditions in the major maize-producing areas of the world. The model also identifies optimum climatic conditions and planting/harvest problems associated with poor tractability.

FOREIGN COMMODITY PRODUCTION FORECASTING. THE 1980 US/CANADA WHEAT AND BARLEY EXPLORATORY EXPERIMENT

The crop identification procedures used performed were for spring small grains and are conducive to automation. The performance of the machine processing techniques shows a significant improvement over previously evaluated technology, however, the crop calendars require additional development and refinements prior to integration into automated area estimation technology. The integrated technology is capable of producing accurate and consistent spring small grains proportion estimates. Barley proportion estimation technology was not satisfactorily evaluated because data accuracy sample segment data was not available for high density barley of primary importance in foreign regions and the low density segments examined were not judged to give indicative or unequivocal results. Generally, the spring small grains technology is ready for evaluation in a pilot experiment focusing on sensitivity analysis to a variety of agricultural and meteorological conditions representative of the global environment.
(after tasseling) LANDSAT data. The procedure should be readily adaptable to corn and soybeans labeling required for subsequent exploratory experiments or pilot tests. The machine classification procedures evaluated in this experiment were not effective in improving the proportion estimates. The corn proportions produced by the machine procedures had a large bias when the bias correction was not performed. This bias was caused by the manner in which the machine procedures handled spectrally impure pixels. The simulation test indicated that the weighted aggregation procedure performed quite well. Although further work can be done to improve both the simulation tests and the aggregation procedure, the results of this test show that the procedure should serve as a useful baseline procedure in future exploratory experiments and pilot tests. M.G.

**N82-23580**# Department of Agriculture, Houston, Tex.

EVALUATION OF THE DORAISWAMY-THOMPSON WINTER WHEAT CROP CALENDAR MODEL INCORPORATING A MODIFIED SPRING RESTART SEQUENCE


The Robertson phenology was used to provide growth stage information to a wheat stress indicator model. A stress indicator model demands two accurate predications from a crop calendar date of spring growth initiation; and crop calendar stage at growth initiation. Several approaches for restarting the Robertson phenology model at spring growth initiation were studied. Although best results were obtained with a solar thermal unit method, an alternate approach which indicates soil temperature as the controlling parameter for spring growth initiation was selected and tested. The modified model (Doraiswamy-Thompson) is compared to LACIE-Robertson model predictions E.A.K.

**N82-23581**# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AGRISTARS: SUPPORTING RESEARCH. SPRING SMALL GRAINS PLANTING DATE DISTRIBUTION MODEL


A model was developed using 996 planting dates at 51 LANDSAT segments for spring wheat and spring barley in Minnesota, Montana, North Dakota, and South Dakota in 1979. Daily maximum and minimum temperatures and precipitation were obtained from the cooperative weather stations nearest to each segment. The model uses a growing degree day summation modified for daily temperature range to estimate the beginning of planting and uses a soil surface wetness variable to estimate how a fixed number of planting days are distributed after planting begins. For 1979, the model predicts first, median, and last planting dates set, it may be suitable in areas other than the U.S. Great Plains where spring small grains are planted as soon as soil and air temperatures become warm enough in the spring for plant growth. T.M.

**N82-23582**# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

DESCRIPTION OF HISTORICAL CROP CALENDAR DATA BASES DEVELOPED TO SUPPORT FOREIGN COMMODITY PRODUCTION FORECASTING PROJECT EXPERIMENTS

W. L. WEST, Ill, Principal Investigator Oct 1981 19 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept of the Interior, and Agency for International Development ERTS (Contract NAS9-15800; PROJ. AGRISTARS) (E82-10209; NASA-CR-167488; JSC-17417; NAS 1 26:167488; LEMSCO-16929; FC-L1-04142) Avail: NTIS HC A02/MF A01 CSCL 02C

The content, format, and storage of data bases developed for the Foreign Commodity Production Forecasting project and used to produce normal crop calendars are described. In addition, the data bases may be used for agricultural meteorology, modeling of stage sequences and planting dates, and as indicators of possible drought and famine. M.G.

**N82-23585**# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing

SPECTRAL PROPERTIES OF AGRICULTURAL CROPS AND SOILS MEASURED FROM SPACE, AERIAL, FIELD, AND LABORATORY SENSORS


The state of knowledge of the multispectral reflectance characteristics of crops and soils as measured from laboratory, field, aerial, and satellite sensor systems is reviewed emphasizing current investigations. The relationships of important biological and physical characteristics to their spectral properties of crops and soils are addressed. Future research needs are defined. M.G.

**N82-23588**# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing

DETERMINATION OF THE OPTIMAL LEVEL FOR COMBINING AREA AND YIELD ESTIMATES


Several levels of obtaining both area and yield estimates are considered: county, refined strata, refined/split strata, crop reporting district, and state. Using the CCEA model form and smoothed weather data, regression coefficients at each level were derived to compute yield and its variance. The variance of the yield estimates was largest at the state and smallest at the county level for the two crops studied corn and soybeans. The refined strata had somewhat larger variances than those associated with the refined/split strata and CRD. For production estimates, the difference in standard deviations among levels was not large for corn, but for soybeans the standard deviation at the state level was more than 50% greater than for the other levels. The refined strata had the smallest standard deviations T.M.
A grain sorghum soil moisture and temperature stress model is described. It was developed to serve as a meteorological data filter to alert commodity analysts to potential stress conditions that could influence labeling and classification accuracies were identified in connection with the highest producing states as determined from available Australian crop statistics. The derived evaporation algorithm is combined with precipitation regression model. The model provides reasonably accurate proportion estimations procedure performance evaluations, and sensitivity evaluations are presented. The role of the pilot experiment in foreign technology development is discussed.

N82-23592*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

AGRISTARS. PROJECT MANAGEMENT REPORT: PROGRAM REVIEW PRESENTATION TO LEVEL 1, INTERAGENCY COORDINATION COMMITTEE

3 Nov. 1981 105 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development

ERTS (Contract PROJ AGRISTARS)

(EB2-10219, NASA-TM-84203; JSC-17792; NAS 1 15 84203; SR-J1-04195) Avail NTIS HC A06/MF A01 CSCL 02C

The AGRISTARS supporting research projects in the areas of data systems, scene radiation, and pattern recognition are reviewed. The objectives, activities, and accomplishments of FY-80 and the objectives and status of FY-81 programs are described.

M.G.
Based primarily on these production statistics, Western Australia and New South Wales were selected as the wheat indicator region for Australia. The general characteristics of wheat in the indicator region, with potential problems anticipated for proportion estimation are considered. The varieties of wheat, the diseases and pests common to New South Wales, and the wheat growing regions of both states are examined.

A.R.H.

AGRISTARS: RENEWABLE RESOURCES INVENTORY. LAND INFORMATION SUPPORT SYSTEM IMPLEMENTATION PLAN AND SCHEDULE


The planning and scheduling of the use of remote sensing and computer technology to support the land management planning effort at the national forests level are outlined. The task planning and system capability development were reviewed. A user evaluation is presented along with technological transfer methodology. A land management planning pilot test of the San Juan National Forest is discussed.

T.M.

APPLICATION OF COMPUTER AXIAL TOMOGRAPHY (CAT) TO MEASURING CROP CANOPY GEOMETRY


The feasibility of using the principles of computer axial tomography (CAT) to quantify the structure of crop canopies was investigated because six variables are needed to describe the position-orientation with time of a small piece of canopy foliage. Several cross sections were cut through the foliage of healthy, green corn and soybean canopies in the dent and full pod development stages, respectively. A photograph of each cross section representing the intersection of a plane with the foliage was enlarged and the air-foliation boundaries delineated by the plane were digitized. A computer program was written and used to reconstruct the cross section of the canopy. The approach used in applying optical computer axial tomography to measuring crop canopy geometry shows promise of being able to provide needed geometric information for input data to canopy reflectance models. The difficulty of using the CAT scanner to measure large canopies of crops like corn is discussed and a solution is proposed involving the measurement of plants one at a time.

A.R.H.

AGRICULTURAL RESEARCH SERVICE RESEARCH HIGHLIGHTS IN REMOTE SENSING FOR CALENDAR YEAR 1980 Annual Report


The AR research mission in remote sensing is to develop the basic understanding of the soil plant animal atmosphere continuum in agricultural ecosystems and to determine when remotely sensed data can be used to provide information about these agricultural ecosystems. A brief statement of the significant results of each project is given. A list of 1980 publication and location contacts is also given.

T.M.

APPLICATION OF COMPUTER AXIAL TOMOGRAPHY (CAT) TO MEASURING CROP CANOPY GEOMETRY


The linear polarization and reflection of visible light by wheat as a function of sun-view directions, crop development stage, and wavelength were examined. Two-hundred spectra were taken continuously in wave-lengths from 0.45 to 0.72 Micron in 33 view directions using an Exotech model 20C spectroradiometer six meters above two wheat canopies in the boot and fully headed maturity stages. The analysis results show that the amount of linearly polarized light from the wheat canopies is greatest in the blue spectral region and decreases gradually with increasing wavelength. The results also show that the linearly polarized light from the canopies is generally greatest in the azimuth direction of the Sun and tends toward zero as the view direction tends toward the direction of the hot spot or anti-solar point. It is demonstrated that the single, angle of incidence of sunlight on the leaf, explains almost all of the variation of the amount of polarized light with Sun-view direction.

M.G.
exercise in order to prevent compounding procedural problems with implementation problems. The evaluation proceeded by labeling the sping small grains first. The accuracy of this labeling was, on the average, somewhat better than that in the Transition Year operations. Other departures from the original procedure included a regionalization of the labeling process, the use of trend analysis, and the removal of time constraints from the actual processing. Segment selection, ground truth derivation, and data available for each segment in the analysis are discussed. Labeling accuracy is examined for North Dakota, South Dakota, Minnesota, and Montana as well as for the entire four-state area. Errors are characterized.

N82-23604*# National Aeronautics and Space Administration Lyndon B. Johnson Space Center, Houston, Tex. AGRISTARS. PROJECT MANAGEMENT REPORT: PROGRAM REVIEW PRESENTATION TO LEVEL 1, INTERAGENCY COORDINATION COMMITTEE Semiannual Report Nov. 1981 232 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development (Contract PROJ. AGRISTARS) (E82-10231; NASA-TM-84205; JSC-17438; NAS 1.15:84205; FC-J1-04181) Avail: NTIS HC A10/MF A01 CSCL 02C Accomplishments relating to the development of crop calendars and production estimates for spring small grains, corn, and soybeans and the associated data acquisition and processing systems are reviewed. The areas of interest included the Great Plains Corridor and Argentina.

N82-23605*# Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing. A MODEL OF PLANT CANOPY POLARIZATION V. C. VANDERBILT Jun. 1980 12 p refs Repr from Machine Process. of Remotely Sensed Data, Jun 1980 p 68-108 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS (Contract NAS9-15466, PROJ AGRISTARS) (E82-10233; NASA-CR-167415; SR-P1-04170; NAS 1.26:167415; LEMSCO-16595, RR-LO-00466) Avail: NTIS HC A03/MF A01 CSCL 02C A model for the amount of linearly polarized light reflected by the shiny leaves of grain crops is based on the morphological and phenological characteristics of the plant canopy and upon the Fresnel equations which describe the light reflection process at the smooth boundary separating two dielectrics. The theory used demonstrates that, potentially, measurements of the linearly polarized light from a crop canopy may be used as an additional feature to discriminate between crops such as wheat and barley, two crops which are so spectrally similar that they are misclassified with unacceptable frequency. Examination of the model suggests that, potentially, satellite polarization measurements may be used to monitor crop development stage, leaf water content, leaf area index, hail damage, and certain plant diseases. The information content of these measurements is needed to evaluate the proposed polarization sensor for the satellite-borne multispectral resource sampler.

N82-23606*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. A MODEL OF PLANT CANOPY POLARIZATION AGRICULTURE AND FORESTRY Classification (NSC) system could be used in the heterogeneously forested southeastern United States where it had not previously been used. Results show that the reduced UNESCO international classification and mapping of vegetation system, as incorporated into the NSCS, is general enough at the higher levels and specific enough at the lower levels to adequately accommodate densely forested, heterogeneous areas as well as the larger, more homogeneous regions of the Pacific Northwest. The major problem is of existing vegetation versus natural vegetation.

A.R.H.

N82-23608*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. DESCRIPTION OF THE FORTRAN IMPLEMENTATION OF THE SPRING SMALL GRAINS PLANTING DATE DISTRIBUTION MODEL J A. ARTLEY, Principal Investigator Aug 1981 55 p refs Sponsored by NASA, USDA, Dept of Commerce, Dept of the Interior, and Agency for International Development ERTS (Contract NAS9-15800; PROJ. AGRISTARS) (E82-10235; NASA-CR-167411; JSC-17414, NAS 1.26:167411; LEMSCO-16954, SR-L1-00309) Avail: NTIS HC A04/MF A01 CSCL 02C The Hodges-Artley spring small grains planting date distribution model was coded in FORTRAN. The PLDVR program, which implements the model, is described and a copy of the code is provided. The purpose, calling procedure, local variables, and input/output devices for each subroutine are explained to supplement the user's guide.

A.R.H.

N82-23609*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. AGRISTARS: AGRICULTURE AND RESOURCES INVENTORY SURVEYS THROUGH AEROSPACE REMOTE SENSING Annual Report Jun 1981 66 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS (Contract PROJ. AGRISTARS) (E82-10236; NASA-TM-84202; JSC-17398, NAS 1.15:84202; AP-JO-04111) Avail: NTIS HC A04/MF A01 CSCL 02C The major objectives and FY 1980 accomplishments are described of a long term program designed to determine the usefulness, cost, and extent to which aerospace remote sensing data can be integrated into existing or future USDA systems to improve the objectivity, reliability, timeliness, and adequacy of information. A general overview, the primary and participating agencies, and the principal highlights of each of the following programs are presented: early warning/crop condition assessment; foreign commodity production forecasting; yield model development; supporting research, soil moisture, domestic crops and land cover; renewable resources inventory; and conservation and pollution.

A.R.H.

N82-23610*# Purdue Univ., Lafayette, Ind. Lab for Applications of Remote Sensing. CANOPY REFLECTANCE AS INFLUENCED BY SOLAR ILLUMINATION ANGLE M. E. BAUER, Principal Investigator, J. C. KOLLENKARK, V. C. VANDERBILT, and C. S. T. DAUGHTRY Mar 1981 24 p refs Sponsored by NASA, USDA, Dept of Commerce, Dept. of the Interior, and Agency for International Development ERTS (Contract NAS9-15466; PROJ. AGRISTARS) (E82-10237; NASA-CR-167402; SR-P1-04039; NAS 1.26:167402; LRS-021681) Avail: NTIS HC A02/MF A01 CSCL 20F The interaction of the solar illumination angle and row azimuth angle of the measured reflectance factor (RF) of soybean canopies was investigated. Diurnal changes of nearly 140% were observed in the red wavelength region when canopies covered 64% of the soil. The amount of shadow observed was a function of the plant geometry and row width. As soil cover approached 100%, the diurnal changes diminished. A function that describes the solar illumination angle with respect to the row azimuth explained most of the diurnal variation in the measured RF. Variation in near
Agriculture and Forestry

Infrared response was much less and did not appear to be as strongly related to Sun-row angle interactions. The near infrared reflectance was highly sensitive to Sun-angle-row direction interactions, whereas the greenness function, utilizing all four spectral bands, was not.

J.D.

N82-23611*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A Multi-frequency Radiometric Measurement of Soil Moisture Content Over Bare and Vegetated Fields


A USDA Beltsville Agricultural Research Center site was used for an experiment in which soil moisture remote sensing over bare, grass, and alfalfa fields was conducted over a three-month period using 0.6 GHz, 1.4 GHz, and 10.6 GHz Dicke-type microwave radiometers mounted on mobile towers. Ground truth soil moisture content and ambient air and soil temperatures were obtained concurrently with the radiometric measurements. Biomass of the vegetation cover was sampled about once a week. Soil density for each of the three fields was measured several times during the course of the experiment. Results of the radiometric measurements confirm the frequency dependence of moisture sensitivity and reduction reported earlier. Observations over the bare, wet field show that the measured brightness temperature is lowest at 5.0 GHz and highest at 0.6 GHz frequency, a result contrary to expectation based on the estimated dielectric permittivity of soil water mixtures and current radiative transfer model in that frequency range.

Author

N82-24519*# Environmental Research Inst. of Michigan, Ann Arbor.


Progress and technical issues are reported in the development of corn/soybeans area estimation procedures for use on data from South America, with particular emphasis on Argentina. Aspects related to the supporting research section of the AgRISTARS Project discussed include: (1) multispectral corn/soybean estimation, (2) through the season separability of corn and soybeans within the 10.6 cm bands, (3) Sun-angle-row interactions derived from the baseline corn and soybean procedure; (5) small fields research, and (6) simulating the spectral appearance of wheat as a function of its growth and development. To assist the foreign commodity production forecasting, the performance of the baseline corn/soybean procedure was analyzed and the procedure modified. Fundamental limitations were found in the existing guidelines for discriminating these two crops. The temporal and spectral characteristics of corn and soybeans must be determined because other crops grow with them in Argentina. The state of software technology is assessed and the use of profile techniques for estimation is considered.

A.R.H.
with a 2x2 sliding window and computes gradient values for bands 5 and 7 to match the segment boundaries. The gradient values are held in memory during the shifting (or matching) process. The reconstructed segment array, containing ones (1’s) for boundaries and zeros elsewhere are computer compared to the LANDSAT array and the best match computed. Initial testing of the ASMA indicates that it has good potential for replacing the manual technique.

T.M.

N82-24565*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

ANALYSIS OF THEMATIC MAPPER SIMULATOR DATA ACQUIRED DURING WINTER SEASON OVER PEARL RIVER, MISSISSIPPI, TEST SITE


N82-24572*# Instituto Geografico Nacional, Madrid (Spain)


DELINEATION OF SOIL TEMPERATURE REGIMES FROM HCMM DATA Quarterly Report


The subsetting of HCMM data into ORSER format was completed for four dates using a modified SUBSET program. Large areas (approximately 2500 scan lines, 1680 elements) were selected to increase the occurrence of suitable control points for registration. Average daily temperatures (ADT) were calculated for each date. The MERGE program combined registered daytime temperature (DAY-IR) with nighttime temperature (NIGHT-IR) to form a separate two-channel data set. The SUBTRAN program averaged the DAY-IR and NIGHT-IR creating a third ADT channel. Registration equations for the four ADT data sets were generated. A one dimensional soil heat flow equation was modified to allow for mean annual soil temperature predictions using merged ADT data sets.

A.R.H.


Soil moisture in the 0-cm to 4-cm layer could be estimated with 1-mm soil temperatures throughout the growing season of a rainfed barley crop in eastern South Dakota Empirical equations were developed to reduce the effect of canopy cover when radiometrically estimating the soil temperature. Corrective equations were applied to an aircraft simulation of HCMM data for a diversity of crop types and land cover conditions to estimate the soil moisture. The average difference between observed and measured soil moisture was 1.6% of field capacity. Shallow alluvial aquifers were located with HCMM predawn data. After correcting the data for vegetation differences, equations were developed for predicting water table depths within the aquifer. A finite difference code simulating soil moisture and soil temperature shows that soils with different moisture profiles differed in soil temperatures in a well defined functional manner. A significant surface thermal anomaly was found to be associated with shallow water tables.

Soil moisture in the 0-cm to 4-cm layer could be estimated with 1-mm soil temperatures throughout the growing season of a rainfed barley crop in eastern South Dakota. Empirical equations were developed to reduce the effect of canopy cover when radiometrically estimating the soil temperature. Corrective equations were applied to an aircraft simulation of HCMM data for a diversity of crop types and land cover conditions to estimate the soil moisture. The average difference between observed and measured soil moisture was 1.6% of field capacity. Shallow alluvial aquifers were located with HCMM predawn data. After correcting the data for vegetation differences, equations were developed for predicting water table depths within the aquifer. A finite difference code simulating soil moisture and soil temperature shows that soils with different moisture profiles differed in soil temperatures in a well-defined functional manner. A significant surface thermal anomaly was found to be associated with shallow water tables.

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65 percent of the variation in yields. Models which simulated the daily effects of weather and intercepted solar radiation on growth had the highest correlations to grain yields. This concept of estimating intercepted solar radiation using spectral data represents a viable approach for merging spectral and meteorological data for crop yield models.

N82-26745*#  Morgan State Coll., Baltimore, Md. Dept. of Biology.


Red, photographic infrared, near infrared spectral data of corn, cotton, soybeans, sugar beets, sorghum, sunflowers and tobacco were collected throughout the entire growing season by using a three band handheld radiometer. Different radiance patterns were found among these crops based on their morphology, green biomass duration and leaf size. Results show near infrared radiance is a good indicator of water content in plant tissue under small scale experimental conditions. E.A.K.

N82-26747*#  California Univ., Santa Barbara Geography Remote Sensing Unit


Soil moisture data obtained using scatterometers, modular multispectral scanners and passive microwave radiometers were revised and grouped into four field cover types for statistical analysis. Guymon data are grouped as alfalfa, bare, milo with rows perpendicular to the field view, and milo viewed parallel to the field of view. Dalhart data are grouped as bare combo, stubble, disked stubble, and corn field. Summary graphs combine selected analyses to compare the effects of field cover. The analysis for each of the cover types is presented in tables and graphs. Other tables show elementary statistics, correlation matrices, and single variable regressions. Selected eigenvectors and factor analyses are included and the highest correlating sensor types for each location are summarized. E.A.K.

N82-26749*#  Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab


Image simulation techniques were employed to generate synthetic aperture radar images of a 17.7 km x 19.3 km test site located east of Lawrence, Kansas. The simulations were performed for a space SAR at an orbital altitude of 600 km, with the following sensor parameters: frequency = 4.75 GHz, polarization = HH, and angle of incidence range = 7 deg to 22 deg from nadir. Three sets of images were produced corresponding to three different spatial resolutions; 20 m x 20 m with 12 looks, 100 m x 100 m with 23 looks, and 1 km x 1 km with 1000 looks. Each set consisted of images for four different soil moisture distributions across the test site. Results indicate that, for the agricultural portion of the test site, the soil moisture in about 90% of the pixels can be predicted with an accuracy of = + or - 20% of field capacity. Among the three spatial resolutions, the 1 km x 1 km resolution gave the best results for most cases, however, for very dry soil conditions, the 100 m x 100 m resolution was slightly superior. A. R. H.

N82-26751*#  Environmental Research Inst. of Michigan, Ann Arbor Infrared and Optics Div


Association is made between the development stages of corn as defined by Hanway and the temporal-spectral development pattern of corn in a transformed data space derived from Landsat-MSS band reflectance values, using field-collected reflectance and associated data. Results indicate that the spectral vegetation index used (a reflectance equivalent of Tasseled Cap Greenness) reaches a maximum well before the stage at which corn is expected to achieve its peak leaf area index. Possible physiological and canopy geometry related causes for this and other results are presented. Author

N82-26752*#  Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography

MAPPING OF WILDLIFE HABITAT IN FARMINGTON BAY, UTAH R. A. JAYNES and R. D. WILLIE, Principal Investigators 1982 15 p refs ERTS (Contract NAGW-95) (E82-10354; NASA-CR-168975; NAS 1.26:168975, CRSC-82-1) Avail: NTIS HC A02/MF A01 CSCL 08B

Mapping was accomplished through the interpretation of high-altitude color infrared photography. The feasibility of utilizing LANDSAT digital data to augment the analysis was explored; complex patterns of wildlife habitat and confusion of spectral classes resulted in the decision to make limited use of LANDSAT data in the analysis. The final product is a map which delineates wildlife habitat at a scale of 1:24,000. The map is registered to and printed on a screened U.S.G.S. quadrangle base map. Screened delineation of wildlife habitat areas are shown on the map. Intensive field checking of the map was accomplished for the Farmington Bay Waterfowl Management Area in August 1981; other areas on the map received only spot field checking. Author

N82-26753*#  Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography

DETECTION OF VARIATIONS IN ASPEN FOREST HABITAT FROM LANDSAT DIGITAL DATA: BEAR RIVER RANGE, UTAH J A MEROLA and R. A JAYNES, Principal Investigators 17 Mar. 1982 34 p refs Sponsored in part by US Forest Service ERTS (Contract NAGW-95; NSF SPI-80-03978) (E82-10355; NASA-CR-168976; NAS 1.26:168976; CRSC-82-2) Avail: NTIS HC A03/MF A01 CSCL 02F

The aspen forests of the Bear River Range were analyzed and mapped using data recorded on July 2, 1979 by the LANDSAT III satellite; study efforts yielded sixty-seven light signatures for the study area; of which three groups were identified as aspen and mapped at a scale of 1:24,000. Analysis and verification of the three groups were accomplished by random location of twenty-six field study plots within the LANDSAT-defined aspen areas. All study plots are included within the Cache portion of the
N82-26754* # Utah Univ., Salt Lake City Center for Remote Sensing and Cartography

IRRIGATED ACREAGE IN THE BEAR RIVER BASIN AS OF THE 1975 GROWING SEASON


The irrigated cropland in the Bear River Basin as of the 1975 growing season was inventoried from satellite imagery LANDSAT color infrared images (scale 1 125,000) were examined for early, mid, and late summer dates, and acreage was estimated by use of township/section overlays. The total basin acreage was estimated to be 573,435 acres, with individual state totals as follows: Idaho 234,370 acres, Utah 265,505 acres, and Wyoming 73,560 acres. As anticipated, wetland areas intermingled among cropland appears to have produced an over-estimation of irrigated acreage. According to a 2% random sample of test sites evaluated by personnel from the Soil Conservation Service such basin-wide over-estimation is 7.5%; individual counties deviate significantly from the basin-wide figure, depending on the relative amount of wetland areas intermingled with cropland.

Author


C. HARLAN, J. HEILMAN, D. MOORE, and V. MYERS, Principal Investigators Feb. 1982 48 p refs (Contract NAG5-37) (82-10357; NASA-CR-168978; NAS 1.26:168978; SDSU-RSI-82-02) Avail: NTIS HC A03/MF A01 CSCL 08H

Two visible/near IR hand held radiometers and a hand held thermopile were used along with soil moisture and lysimeter measurements in a study of soil moisture distribution in alfalfa fields on the Navajo Indian Irrigation Project near Farmington, New Mexico. Radiance from irrigated plots were measured and converted to reflectances. Surface soil water contents (0 cm to 4 cm) were determined gravimetrically on samples collected at the same time as the spectral measurements. The relationship between the spectral measurements and the crop coefficient were evaluated to demonstrate potential for using spectral measurement to estimate crop coefficient.

E. A. K.

N82-26759* # Texas A&M Univ., College Station. Remote Sensing Center

MEASUREMENT OF SOIL MOISTURE TRENDS WITH AIRBORNE SCATTEROMETERS Final Report


In an effort to investigate aircraft multisensor responses to soil moisture and vegetation in agricultural fields, an intensive ground sampling program was conducted in Guymon, Oklahoma and Dalhart, Texas in conjunction with aircraft data collected for visible/near infrared and passive and active microwave systems. Field selections, sampling techniques, data processing, and the aircraft schedule are discussed for both sites. Field notes are included along with final (normalized and corrected) data sets.

A. R. H.

N82-26760* # Texas A&M Univ., College Station. Remote Sensing Center

MULTIFREQUENCY REMOTE SENSING OF SOIL MOISTURE Final Report


Multifrequency sensor data collected at Guymon, Oklahoma and Dalhart, Texas using NASA's C-130 aircraft were used to determine which of the all-weather microwave sensors demonstrated the highest correlation to surface soil moisture over optimal bare soil conditions, and to develop and test techniques which use visible/near infrared sensors to compensate for the vegetation effect in this sensor's response to soil moisture. The L-band passive microwave radiometer was found to be the most suitable single sensor system to estimate soil moisture over bare fields. In comparison to other active and passive microwave sensors the L-band radiometer (1) was influenced least by ranges in surface roughness, (2) demonstrated the most sensitivity to soil moisture differences in terms of the range of return from the full range of soil moisture; and (3) was less sensitive to errors in measurement in relation to the range of sensor response. L-band emissivity related more strongly to soil moisture when moisture was expressed as percent of field capacity. The perpendicular vegetation index as determined from the visible/near infrared sensors was useful as a measure of the vegetation effect on the L-band radiometer response to soil moisture.

A. R. H.

N82-26761* # Texas A&M Univ., College Station. Remote Sensing Center

DEVELOPMENT OF VISIBLE/NIR/MICROWAVE AGRICULTURE CLASSIFICATION AND BIOMASS ESTIMATION ALGORITHMS Final Report


Agricultural crop classification models using two or more spectral regions (visible through microwave) are considered in an effort to estimate biomass at Guymon, Oklahoma Dalhart, Texas. Both grounds truth and aerial data were used. Results indicate that inclusion of C, L, and P band active microwave data, from look angles greater than 35 deg from nadir, with visible and infrared data improve crop discrimination and biomass estimates compared to results using only visible and infrared data. The microwave frequencies were sensitive to different biomass levels. The K and C band were sensitive to differences at low biomass levels, while P band was sensitive to differences at high biomass levels. Two indices, one using only active microwave data and the other using data from the middle and near infrared bands, were well correlated to total biomass. It is implied that inclusion of active microwave sensors with visible and infrared sensors on future satellites could aid in crop discrimination and biomass estimation.

E. A. K.

N82-26762# California Univ., Santa Barbara.

THE USE OF SOIL TEXTURE AND FIELD CAPACITY TO NORMALIZE MICROWAVE SOIL MOISTURE MEASUREMENTS: SOME PROBLEMS M.S. Thesis

R. D. LEES May 1982 72 p refs Sponsored by Texas A & M Univ.

Avail: NTIS HC A04/MF A01

Soil moisture normalizing techniques attempt to explain variations in soil-water content between soils in terms of soil texture based on the percent sand, silt and clay in the soil. A critical analysis of these techniques was made to examine their effectiveness in comparing soils of varying texture and soil moisture...
content in relation to their microwave (radar) backscatter. While the particle size distribution is recognized as a significant factor in the soil-water relationship, its influence is regulated by a number of other factors. Results indicate that "normalization" by use of field capacity - derived from the percentages of sand, silt, and clay - actually reduced the sensitivity of backscattering coefficient to soil-water content. The water holding capacity of soils is variably influenced by properties such as soil structure, clay mineral type, organic matter content, aeration, soil layering, and hysteresis and related water addition and extraction processes. B.W.

ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

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

A82-22545

DEPENDENCE OF EARTH SPECTRUM OF POSITRONS AND ANTIPRTONS ON PROPAGATION MODELS


A calculation of the equilibrium spectra of positrons and antiprotons for different models is presented. A total of five propagation models is considered, comprising a simple leak box, a modified leaky box, a nested leaky box, a simple closed galaxy, and a modified closed galaxy. The antiproton spectrum is noted to be dependent only on the propagation model and not on the solar modulation, which supports the use of an antiproton spectrometer in monitoring the degree of solar modulation. Kinetic energy fluxes are determined for the two components as predicted for each model, and observed antiproton fluxes are shown to rule out the modified and nested leaky box models. The modified closed galaxy model is found to accurately predict solar modulation from low energy data, and positron data at high energies is taken to quantify the mean gas density in a region of total confinement to be 0.05 atoms/cu cm. M.S.K.

A82-22557

ON THE STELLAR ORIGIN OF LOW ENERGY COSMIC RAYS


The hypothesis is proposed that energetic ions of He, C, N, O, etc., in the low energy (1 to 50 MeV/amu) anomalous component of cosmic rays, originate from O-type stars which manifest very strong stellar winds with very high mass loss rates of about 3 x 10^{-7} to the -6th solar mass/yr. These have terminal velocities of 1200-4000 km/s which are typically several times their escape velocities. These velocities correspond to ion energies of 10 to 200 keV/amu. These ions of energy of about 100 keV/amu are in partly ionized states and are accelerated in the interstellar shock fronts to about 10 MeV/amu, thus accounting for the observed anomalous component of low-energy cosmic rays (Author)

A82-22559

REMARKS ON COSMIC RAY ORIGIN


Various problems related to current work on the origins of cosmic rays are considered. The acceleration of cosmic ray particles at the spherical front of an interstellar shock wave is analyzed, and a value of 10 to the 12th eV is obtained for the upper limit to accelerated particle energies. Transport in the Galaxy by means of large-scale turbulent motions is shown to produce a cosmic ray diffusion coefficient that is too low, while acceleration due to scattering by isotropic magnetohydrodynamic turbulence is also small. A possible method for the estimation of the contribution of local sources to cosmic ray concentrations observed near the earth is also presented, and possible explanations are suggested for the recent gamma ray observations of lowered cosmic ray electron concentrations at a distance less than 2 kpc from the galactic center. A.L.W.

A82-22570

PULSAR MODELS AND COSMIC-RAY ACCELERATION


It is argued that radio pulsars and X-ray pulsars differ mainly in the fact that the latter are surrounded by an inward moving accretion disk while the former are surrounded by an outward moving fossil collapse disk presumably left over from the formation event. Cosmic rays of more-or-less "solar" composition can be accelerated to energies of 10 to the 20th eV shortly after the formation event. (Author)

A82-22583

SOLAR GAMMA-RAY EXPERIMENT ON ASTRO-A SATELLITE


The instrumentation and performance parameters of the Japanese Astro-A satellite for measuring solar gamma ray lines and continua associated with solar flares are described. A gamma ray spectrometer which is a phoswich scintillator covers the gamma ray range from 0.24-6.48 MeV with a resolution of 10 percent at 662 keV. Techniques to discern gamma ray from particle events are discussed, along with the 128 channel pulse height analyzer.
with three regions for the pulse height spectrum. Low bit rates are recorded during quiet modes, and high speed rates are enacted during a solar flare. The spacecraft was launched in Feb 1981 and is in-flight calibrated by reference to the atmospheric positron annihilation line at 0.51 MeV.

**A82-22588**

**HIGH-ENERGY SOLAR PROTONS**


Evidence is presented for a second particle acceleration phase following the explosive phase of a solar flare. Cerenkov and scintillation counters were employed on the Prognoz satellite to detect the arrival of protons with energies greater than 100 MeV or 500 MeV, respectively. Delays of several minutes to several tens of minutes were observed for the arrival of protons from solar flares in the cm range and X ray bursts during solar flare activity. A similar delay was recorded on the Proton-3 satellite during a burst event of Nov. 22, 1977, using the same measurement techniques. The existence of a second acceleration phase, when protons are accelerated to high energies and electrons up to relativistic energies, is noted to not contradict a model of the explosive phase of the flare as a process of disappearance and break of the current layer in the region of a highly dense plasma.

**A82-22605**

**TIME AND ENERGY DEPENDENCE OF HEAVY ION ABUNDANCES IN SOLAR FLARE ENERGETIC PARTICLE EVENTS**


Data from a survey of solar flare events undertaken by the UMD/mpi ULET telescope on the IMP-8 satellite during the period 1973-1977 yields examples of time and energy dependence of the abundances and spectra of the He, C, O and Fe heavy ions. Time variations are found in the O/He, O/C and Fe/O ratios and is in-flight calibrated by reference to the atmospheric positron annihilation line at 0.51 MeV.

**A82-22606**

**HIGH RESOLUTION MEASUREMENTS OF SOLAR FLARE ISOTOPES**


The 11-year modulation in cosmic ray intensity is examined with a view towards the study of cosmic ray spectra in interstellar space. The steady-state, homogeneous solution of the cosmic ray modulation equation is used to determine a value of 0.5 plus or minus 0.1 for the modulation coefficient and a value between 15 and 20 GV for the rigidity of the unmodulated spectrum. Cosmic ray spectra outside the modulation region are then calculated from the modulation coefficient and differential energy spectra measured near earth at solar activity minimum, taking into account cosmic ray energy changes during passage through interplanetary space. Results are shown to be in agreement with measurements of galactic gamma ray intensities.
A82-30293

AIRCRAFT MONITORING OF SURFACE CARBON DIOXIDE EXCHANGE

R L DEQUARDINS, E. J BRACH (Agriculture Canada, Ottawa, Canada), and National Research Council. refs

Aircraft-mounted sensors were used to measure the exchange of carbon dioxide above a cornfield, a forest, and a lake under midday conditions. Mean absorption values of 3400, 1200, and 100 milligrams of carbon dioxide per square meter per hour, respectively, are consistent with reported ground-based observations of carbon dioxide flux. Such information, gathered by aircraft, could be used to provide a quantitative evaluation of source and sink distributions of carbon dioxide in the biosphere, to establish a correlation between satellite data and near-surface measurements, and to monitor crop performance.

Author

A82-30307

PROBLEMS OF THE INTERPRETATION OF AERIAL AND SATELLITE IMAGES OF INDUSTRIAL SMOKE [PROBLEMY INTERPRETACJI LOTNICZYCH I SATELITARNYCH ZDJEC DYMOW PRZEMYSLOWYCH]


Methods for the interpretation of aerial and satellite photographs of industrial smoke emissions are considered, with particular attention given to the difficulties of the qualitative interpretation of such images. Conditions that should be taken into account in an approximate solution of the radiative-transfer equations are examined. Recommendations on the practical solution of a specific satellite remote-sensing problem are presented.

B J

A82-31295#

DETECTION OF VOLCANIC SMOKE AND ASH-FALL AREA AT VOLCANO ASO, FROM LANDSAT MSS DATA

Y TANAKA (Meteorological Research Institute, Isukuba, Ibaraki, Japan), K. TSUCHIYA, and Y YAMAURA (National Space Development Agency of Japan, Tokyo, Japan) Papers in Meteorology and Geophysica, vol 32, Dec 1981, p 275-290. refs

Landsat imagery is employed to determine the extent of volcanic smoke and ashfall associated with the eruptions of the volcano ASO in 1979 and 1980, and a comparison is made with nearby meteorological data. Pictures from four bands 0.5-0.6, 0.6-0.7, 0.7-0.8, and 0.8-1.1 micron, are analyzed for information on volcanic smoke, polluted sea water, vegetation, clouds, and visibility over urban areas. The imagery comprises natural, false, and Ektachrome colors, taken from multispectral band scanners on Landsats 2 and 3. A qualitative analysis of volcanic smoke is developed, and a comparison of topographic data with the Landsat images showed that the Landsat pictures are useful and sufficiently accurate for detecting terrain changes due to the volcanic activity, including the forms of caldera. Assessment of the volcanic state, smoke, and ashfall were also possible using the Landsat imagery.

M S K

A82-31990* Lincoln Lab., Mass Inst of Tech., Lexington.

DETECTION OF REGIONAL AIR POLLUTION EPISODES UTILIZING SATELLITE DIGITAL DATA IN THE VISUAL RANGE


Digital analyses of satellite visible data for selected high-sulfate cases over the northeastern U.S., on July 21 and 22, 1978, are compared with ground-based measurements. Quantitative information on total aerosol loading derived from the satellite digitized data using an atmospheric radiative transfer model is found to agree with the ground measurements, and it is shown that the extent and transport of the haze pattern may be monitored from the satellite data over the period of maximum intensity for the episode. Attention is drawn to the potential benefits of satellite monitoring of pollution episodes demonstrated by the model.

O C

A82-32342* Liverpool Univ (England)

SYSTEM ALBEDO AS SENSED BY SATELLITES - ITS DEFINITION AND VARIABILITY


System albedo, an important climatological and environmental parameter, is considered. Some of the problems and assumptions involved in evaluating albedo from satellite data are discussed. Clear-sky and cloud albedos over the United Kingdom and parts of northwest Europe are treated. Consideration is given to the spectral, temporal, and spatial variations and the effect of averaging. The implications of these results for those using and archiving albedo values and for future monitoring of system albedo are discussed. Normalization of this parameter is of especial importance since this correction alters many albedo values. The pronounced difference in spectral albedo of the two visible channels reemphasizes the problem of attempting to calculate integrated albedo values from meteorological satellite data. The assumption of isotropic reflection is seen to be invalid, hindering the computation of accurate albedo values.

C R

A82-32348* Alabama Univ, Huntsville

REMOTE SENSING OF TORNADIC STORMS FROM GEOSYNCHRONOUS SATELLITE INFRARED DIGITAL DATA


Two cases of GOES digital infrared data were analyzed during the three-hour period immediately prior to the tornado touchdown times. Clouds associated with tornadoes were compared to those without tornadoes using a combination of satellite infrared and rawinsonde data. On the basis of this limited data sample, it appears as if the altitude to which the overshooting cloud top penetrated above the tropopause is the factor which determines whether or not a tornado is formed. In these cases, the overshooting cloud top collapsed about 15 to 30 min before the tornado touchdown.

Author

A82-32441* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RESOURCE INVENTORY TECHNIQUES USED IN THE CALIFORNIA DESERT CONSERVATION AREA


A variety of conventional and remotely sensed data for the 25 million acre California Desert Conservation Area (CDCA) have been integrated and analyzed to estimate range carrying capacity. Multispectral classification was performed on a digital mosaic of ten Landsat frames. Multispectral classes were correlated with low level aerial photography, quantified and aggregated by grazing allotment, land ownership, and slope.

Author

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02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

A82-32711
SAMPLE DESIGN FOR ESTIMATING CHANGE IN LAND USE AND LAND COVER

The tasks of the field of applied statistics known as sample design are enumerated as: (1) sampling within a specified population, (2) consideration of sampling distribution; (3) determination of sample size; (4) determination of sample selection procedure; and (5) estimation of population means, totals, variances and confidence limits from the sample information. This methodology, which is used in the estimation of land use and land cover change, is sufficiently general to extend to the determination of change in any type of time-variant thematic mapping. An opportunity is presented for the determination of land use and land cover change in the state of Pennsylvania over a 20-year period.

O.C

A82-32899
IMPACTS OF REMOTE SENSING ON U.S. GEOGRAPHY
J. E. ESTES, D. S. SIMONETT (California, University, Santa Barbara, CA), and J. R. JENSEN (Georgia, University, Athens, GA) Remote Sensing of Environment, vol. 10, Aug. 1980, p. 43-80. ref.

Attention is called to the fact that few senior academic geographers are doing research in remote sensing and that few economic geographers have even considered the possibilities opened up by this technique. This dearth of research is even more pronounced among regional geographers with interests in less-developed countries. Programs of study in remote sensing are considered vital because remote sensing can provide the geographer with significant improvements in the quantity, quality, and timeliness of data.

C.R

A82-32901
EFFECT OF ATMOSPHERIC CONDITIONS ON REMOTE SENSING OF VEGETATION PARAMETERS

The effects of atmospheric and observational conditions on the remote sensing of vegetation parameters are studied in simulations of the ratio of radiances in the 0.76-0.90 micron and 0.52-0.60 micron bands (Landsat Thematic Mapper bands 4 and 2, respectively) as a function of leaf water content in blue grama grass. The simulations were performed based on spectral reflectance and canopy data for 35 plots with different leaf water levels and three different models of the cloud-free midlatitude summer atmosphere with moderate and high aerosol contents at solar zenith angles from 0 to 80 deg, heights from the top to the bottom of the atmosphere, nadir angles from 0 to 75 deg and azimuth angles from 0 to 180 deg. Selected results demonstrate that the slope and intercept of the straight line expressing the dependence of radiance ratio on leaf water content can be significantly affected by atmospheric conditions and viewing geometry.

A.L.W.

A82-33652
SOUFRIERE VOLCANO, ST. VINCENT - OBSERVATIONS OF ITS 1979 ERUPTION FROM THE GROUND, AIRCRAFT, AND SATELLITES

The eruption began with a series of discrete vertical explosions, blasting a new vent through the 1971-1972 lava island in the middle of the 1-km-wide crater lake. The second phase was characterized by the quiet extrusion of viscous basaltic andesite lava, resulting in the growth of a dome over the vent. The importance of the geologic, seismic and ground-deformation data gathered prior to the eruption is discussed.

D.L.G

A82-33654
GEOSTATIONARY SATELLITE OBSERVATIONS OF THE APRIL 1979 SOUFRIERE ERUPTIONS

Infrared images from the geostationary satellite SMS-1 were used to study the growth of the eight major eruptions of Soufriere, St. Vincent, during April, 1979. These eruptions differed considerably in growth and intensity, the most intense being that of April 17, which formed an ash cloud of 96,000 square kilometers in 4 hours. The weakest eruption formed a cloud of only 16,000 square kilometers.

A82-33655
METEOROLOGICAL ANALYSIS OF THE ERUPTION OF SOUFRIERE IN APRIL 1979
S. BARR (Los Alamos National Laboratory, Los Alamos, NM) and J. L. HEFFTER (NOAA, Air Resources Laboratory, Silver Spring, MD) Science, vol. 216, June 4, 1982, p. 1109-1111. ref.

Meteorological upper-air data, in conjunction with satellite imagery, lidar light detection and ranging returns, and aircraft sampling, aid in the determination of plume altitude and transport. The estimated trajectories indicate that the ash was transported eastward across the Atlantic to Africa in 3 to 5 days and that there was modest meridional transport as far as 15 deg poleward during the first week of travel.

A82-33656
SKIRT CLOUDS ASSOCIATED WITH THE SOUFRIERE ERUPTION OF 17 APRIL 1979

A fortuitous and dramatic photograph of the Soufriere eruption column of April 17, 1979 displays a series of highly structured skirt clouds. The gentle distortion of thin, quasi-horizontal layers of moist air has been documented in meteorological situations. It is proposed that at St. Vincent subhorizontal layers of moist air were intensely deformed by the rapidly rising eruption column and were carried to higher altitudes, where they condensed to form the skirt clouds.

A82-33657* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va
AIRBORNE LIDAR MEASUREMENTS OF THE SOUFRIERE ERUPTION OF 17 APRIL 1979

At the time of the Soufriere, St. Vincent, volcanic eruption of April 17, 1979, a NASA P-3 aircraft with an uplooking lidar (light detection and ranging) system onboard was airborne 130 kilometers east of the island. Lidar measurements of the fresh volcanic ash were made approximately 2 hours after the eruption, 120 kilometers to the northeast and east. On the evening of April 18, the airborne lidar, on a southerly flight track, detected significant amounts of stratospheric material in layers at 16, 17, 18, and 19.5 kilometers. These data, and measurements to the north on April 19, indicate that the volcanic plume penetrated the stratosphere to an altitude of about 20 kilometers and moved south during the first 48 hours after the eruption.

A82-33659* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va
FINE PARTICLES IN THE SOUFRIERE ERUPTION PLUME

The size distributions of fine particles measured at tropospheric altitudes in the periphery of the eruption plume formed during the April 17, 1979 eruption of Soufriere Volcano and in the low-level effluents on May 15, 1979 were found to be bimodal, having peak concentrations at geometric mean diameters of 1.1 and 0.23 micrometers. Scanning electron microscopy and energy-dispersive
X-ray analysis of the samples revealed an abundance of aluminum and silicon and traces of sodium, magnesium, chloride, potassium, calcium, and iron. The submicrometer-sized particles were covered with liquid containing sulfur, assumed to be in the form of liquid sulfuric acid. (Author)

A82-33865
EPA'S NEW BUBBLE AND BANKING POLICIES

The use of multispectral scanning (MSS), laser technology, and aerial photography in remote sensing programs to monitor potential and existing environmental problems are examined. Airborne MSS applications involve the detection of visible and IR emissions from the earth's surface for electronic cleaning of the imagery and reproduction of the sensed scene. Spectroscopic coding of the images allows identification of pollutants, the health of vegetative cover, and the state of observable water quality. Airborne laser sensing of chlorophyll-a in water bodies has allowed association of dissolved organic nutrients, due mainly to sewage discharges, with increases in the population of the algae. Lidar measurements permit digitized air quality measurements from aircraft. The development of a differential absorption lidar (DIAL) system, using two lasers close in frequency output, is paving the way for specific species labeling.

A82-34218* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, MD
THE USE OF LANDSAT-3 THERMAL DATA TO HELP DIFFERENTIATE LAND COVERS

Landsat-3 Multispectral Scanner Subsystem (MSS) digital data of the Baltimore, Maryland area gathered on May 24, 1976, are examined to show the usefulness of thermal data in providing better discrimination between agricultural and residential areas, certain types of urban/industrial areas and water, cloud shadows and water, and bare-extractive areas and bright urban cover types. High altitude aircraft imagery taken on May 3, 1978, provides ground truth and training site verification. Two classifications are made for each training site: the initial one using bands 4, 5, and 7 and a second in which the thermal data are included with the visible and near infrared data. This permits a direct comparison of areas spectrally similar with and without the inclusion of the thermal data. Commission errors determined from selected subsets of the data show reductions of 95% for the urban/industrial versus water themes, 84% for the residual versus agriculture themes, 64% for the bare-extractive versus bright urban themes, and 24% for the cloud shadow versus water themes when the thermal data are included in the signature.

A82-34711
SITE SELECTION AND ENGINEERING ISSUES FOR A MAJOR INDUSTRIAL COMPLEX - APPLICATION OF IMAGE AND MAP INTERPRETATION

A major port and industrial complex is being developed in Indonesia near Singapore. Little existing data is available facilitating application of remote sensing techniques for site evaluation and planning. Over eight hundred square kilometers of area was analyzed. Landsat images, aerial photographs, and topographic maps where interpreted for geology, geomorphology, soils, hydrology, and vegetation. Significantly improved engineering potential for environmental and development/engineering issues culminating in a phased master plan. The data contributed by remote sensing represented a significant savings in site reconnaissance, design and construction.

A82-34739
A NEW APPROACH TO MULTIRESOURCE INVENTORIES USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS TECHNOLOGIES

The design for a new multiresource inventory system is presented. Two geographic information systems are employed in concert to support a sampling system which can provide estimates for multiple resource parameters. One GIS (the upper level) is cell- and tape- oriented and incorporates various types of Landsat processing. The other (the lower level) is a disk-based polygon system that holds high resolution sample maps. The two systems are connected through a linear regression model. The results of a pilot test of a prototype system in South Carolina are presented. (Author)

A82-34743* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED LAND USE CLASSIFICATION FROM LANDSAT AND SEASAT SATELLITE IMAGERY REGISTERED TO A COMMON MAP BASE

In the case of Landsat Multispectral Scanner System (MSS) data, ambiguities in spectral signature can arise in urban areas. A study was initiated in the belief that Seasat digital SAR could help provide the spectral separability needed for a more accurate urban land use classification. A description is presented of the results of land use classifications performed on Landsat and preprocessed Seasat imagery that were registered to a common map base. The process of registering imagery and training site boundary coordinates to a common map has been reported by Clark (1980). It is found that preprocessed Seasat imagery provides signatures for urban land uses which are spectrally separable from Landsat signatures. This development appears to significantly improve land use classifications in an urban setting for class 12 (Commercial and Services), class 13 (Industrial), and class 14 (Transportation, Communications, and Utilities).

A82-34744* National Aeronautics and Space Administration
LONGWAVE INFRARED OBSERVATION OF URBAN LANDSCAPES

An investigation is conducted regarding the feasibility to develop improved methods for the identification and analysis of urban landscapes on the basis of a utilization of longwave infrared observations. Attention is given to landscape thermal behavior, urban thermal properties, modeled thermal behavior of pavements and buildings, and observed urban landscape thermal emissions. The differential thermal behavior of buildings, pavements, and natural areas within urban landscapes is found to suggest that integrated multispectral solar radiant reflectance and terrestrial infrared data significantly enhance potential for analyzing urban landscapes. In particular, daytime satellite observations of the considered type should permit better identification of urban areas and an analysis of the density of buildings and pavements within urban areas. This capability should

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enhance the utility of satellite remote sensor data in urban applications.

G.R.

A82-35534

OBSERVED MAGNETIC SUBSTORM SIGNATURES AT SYNCHRONOUS ALTITUDE

T. NAGAI


Magnetic field data from the geostationary satellites GOES 2 and GOES 3 are examined to study the development of substorm activity in the near-earth nightside magnetosphere (around a radial distance of 6.6 earth radii). Substorm events are those in which a well-defined single onset is seen at low latitudes on the ground. The field configuration change from more taillike to more dipolelike starts initially in a longitudinally localized region in association with the ground onset, and it develops westward and eastward, even when the simultaneous onset of the low-latitude positive bay is recorded in a wide longitudinal region on the ground. It is also found that the variation caused by the field-aligned current starts at the ground onset and reaches a peak at the time of the field change. The present results are consistent with the view that a substorm is associated with a disruption and subsequent conversion of the cross-tail current to the field-aligned current connected with the polar ionosphere. It is indicated that the cross-tail current near synchronous orbit and its disruption are important in producing the field configuration change at synchronous orbit.

A82-35542*

MARYLAND UNIV., COLLEGE PARK

GENERATION OF THE AURORAL KILOMETRIC RADIATION

C. S. WU, H. K. WONG (Maryland, University, College Park, MD), D. J. GORNEY (Space Sciences Laboratory, El Segundo, CA), and L. C. LEE (University, Fairbanks, AK)


Data collected from the S3-3 spacecraft in the auroral kilometric radiation (AKR) source region are employed to form a stability theory from which numerical results are obtained and discussed. The distribution function was found to be isotropic outside the auroral atmospheric loss-cone region, which was partially filled with upwelling electrons. A parallel electric field was observed to be modifying the loss-cone distribution. A model distribution function is formulated, along with a magnetic field model expressed in terms of the electron cyclotron frequency. Models for the parallel electric field are also introduced, the first with the field distributed over a broad altitude range, while the second assumes a potential drop only above 4000 km. The presence of the field is found to enhance the growth rate of the AKR. At higher altitudes, the cutoff frequency of the X mode is affected by the rising energetic electrons. Finally, the folding distances of spatial amplification are calculated.

A82-35895

OBSERVATION OF THE DIURNAL VARIATION OF ATMOSPHERIC OZONE

J. L. LEAN (Adelaide, University, Adelaide, Australia)


Research supported by the World Meteorological Organization.

Ozone densities in the stratosphere and mesosphere have been derived from broad-band photometer measurements of Hartley band absorption of middle ultraviolet radiation. Seven rockets were launched during October-November 1979 from Wallops Island. Six rockets, each carrying one detector comprising two UV photometers, were launched at different times of the day. A seventh rocket, with three similar detectors each having three UV photometers, was launched at the time of a full moon and provided estimates of the nighttime ozone densities. Results from these rocket flights form a basis for investigating ozone diurnal variations. The number of flights provides greater statistical reliability for the ozone profiles than is generally afforded from in situ measurements with a single rocket. During the night, an enhancement in ozone densities occurred at altitudes above about 50 km. At 70 km, for example, the nighttime ozone was determined to be a factor of 6.4 greater than at sunset. In addition, these experiments suggest that near 40 km the magnitude of the ozone density at noon may be greater by 10-15% than the nighttime concentration.

A82-36053# NATIONAL METEOROLOGICAL CENTER, WASHINGTON, D.C.

TOTAL OZONE VARIATIONS 1970-74 USING BACKSCATTERED ULTRAVIOLET /BUV/ AND GROUND-BASED OBSERVATIONS

A. J. MILLER, R. M. NAGATANI, T. G. ROGERS (NOAA, National Meteorological Center, Washington, DC), A. J. FLEIG, and D. F. HEATH (NASA, Goddard Space Flight Center, Greenbelt, MD)


NASA-supported research.

The most long-lived satellite set of ozone observations, to date, is that derived from the Backscatter Ultraviolet (BUV) ozone sensor on Nimbus 4 and extends from April 1970 through 1976. Unfortunately, this experiment suffered spacecraft power limitations which limited the spatial and temporal coverage and also appears to have suffered from long-term drifts which may be associated with changes in the instrument characteristics or the incident solar flux. Techniques for fitting observed results to model results have been developed to account for these problems, and this paper presents results of the BUV total ozone variations and compares them with those from ground-based observations, specifically the computations of Angell and Korshover (1978). After adjustments for the spatial gaps and comparison with concurrent Dobson ground-based observations, no significant trend was found in the BUV data over the years 1970-74. This finding is in contrast to a general decrease of about 2% during the same period appearing in the data of Angell and Korshover. The difference in these results is discussed in terms of the geographic sampling and the methods of hemispheric integration.

A82-36247#

AIRCRAFT MEASUREMENTS OF NO/X IN THE LOWER TROPOSPHERE ABOVE THE COAST OF JAPAN

Y. KONDO, M. TAKAGI, Y. MORITA, and A. IWATA


Research supported by the Nissak Science Foundation.

Concentrations of NO(x) in altitude regions of 0.5-3.0 km above the coastal area of Japan were measured. The measured mixing ratio range from 20 to 50 ppt depending on the altitude, location, and time of the observations. From the measured mixing ratio, it can be said that relatively large amounts of NO(x) emitted at ground level are often transported at least as far as 3 km vertically and 200 km horizontally.

A82-36268

CHARACTERISTICS OF FIELD-ALIGNED E-REGION IRREGULARITIES OVER IOKA /36 N/ JAPAN

T. TANAKA and S. V. VENKATESWARAN (California, University, Los Angeles, CA)


Measurements with a 25-MHz radar over Ioka, Japan, reveal that field-aligned E-region irregularities occur mostly at night in association with sporadic E (E) layers at an altitude range of about 100-110 km and that they drift predominantly westward with speeds of the order of 60 m/s. It is shown that these observed characteristics of the irregularities are in reasonable agreement with quantitative predictions of the gradient drift instability theory. The predictions are based on appropriate models for neutral air density and temperatures, ionic composition and ionospheric electric field, and available observations of electron density profiles of the E and Es layers. Observations of multifrequency (4-64 MHz) echoes with an oblique incidence ionosonde and of Doppler spectra with a fixed frequency (25 MHz) radar are then presented and discussed. It is shown that the ionosonde observations are capable of being explained in terms of the linear theory of cross-field or
gradient-drift instability, which is presumed to generate the field-aligned irregularities

A82-36292* National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
TROPOSPHERIC CO MEASUREMENT EXPERIMENT FROM THE SECOND SPACE SHUTTLE FLIGHT
The MAPS experiment was designed to remotely measure the mixing ratio of carbon monoxide in the middle and upper troposphere using a gas filter radiometer as the sensing instrument. The asymmetrical worldwide distribution of CO is discussed as background, and the experimental scientific and technical objectives are briefly stated. The gas filter radiometer is described in detail, and the second Shuttle mission is summarized. Auxiliary and correlative data were obtained in order to evaluate the performance of the measurement system, to assess the effect of stratospheric ozone on the radiometer signals, and to determine the effect of the underlying surface. The experiment acquired about 32 hours of data between 38 deg N and 38 deg S, signal-to-noise ratios were as predicted, and the instrument achieved satisfactory stability in spite of large temperature variations. Data reduction is in progress.

A82-36293* National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
AMMONIA AND THE NOX BUDGET OF THE TROPOSPHERE
Liu et al. (1980) suggested that NOx transported from the stratosphere, as opposed to the anthropogenic source of NOX, may be the dominant source that controls the distribution of NOX in the global troposphere. These ideas require a reevaluation, and, in particular, an assessment of the role of the oxidation of ammonia as a source of NOX. Attention is given to the results of an ammonia measurement program, in which the vertical distribution of ammonia in the troposphere and lower stratosphere could be studied with the aid of the Infrared Heterodyne Radiometer (IHR), a solar-viewing remote sensor. A one-dimensional photochemical model of the troposphere reported by Levine et al. (1980) was employed to study the chemical and physical processes that control the loss of ammonia in the troposphere. The results of the considered investigation suggest that the oxidation of ammonia may indeed be a significant source of NOX in the troposphere.

A82-36362* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD
ATMOSPHERIC OZONE DETERMINATION BY SOLAR OCCULTATION USING THE UV SPECTROMETER ON THE SOLAR MAXIMUM MISSION
The UV spectrometer polarimeter instrument on the Solar Maximum Mission spacecraft has been used to measure ozone in the 53-75 km altitude interval by the technique of solar occultation. A 1 x 180 arcsec entrance aperture spectrometer with 0.04-A spectral resolution was employed. Resulting high-quality data are reduced by expressing measured UV attenuation as a Volterra integral equation. Solution of the equation is accomplished by expressing the integral in terms of a series representing the sum of ozone densities contained in concentric shells through tangent points separated by specified altitude increments. Solar occultation vs altitude profiles are presented for the equatorial region. These data show reproducibility to better than 10%. The density at 60 km is 7.3 + or - 0.1 1 x 10 to the 9th/cu cm for 2.5 deg latitude and longitudes between 81 and 105 deg west in September 1980. Density vs altitude profile exhibits changes in slope between 50 and 75 km

A82-36405# SENSITIVITY OF DOBSON TOTAL OZONE ESTIMATIONS TO WAVELENGTH BAND CALIBRATION UNCERTAINTIES
It is pointed out that calibration uncertainties in the center wavelength, bandwidth, and shape of the Dobson instrument's bands propagate uncertainty into extraterrestrial constants, ozone absorption coefficients, standard lamp calibrations, and total ozone estimations. Detailed calculations of these uncertainties have been conducted for a wide range of conditions of calibration and operation. It is emphasized that all of the considered calculations refer to the defined 'well calibrated', 'well operated' instrument. It is found that the percent standard errors in total ozone are very dependent on airmass and ozone amount. The errors are greatest at low airmass and low ozone, especially for the D and CD band combinations. The AD combination generally has the least error of the double wavelength pairs, and for the directly intercompared instruments has a standard error of 1% or less

A82-36406# THE EFFECT OF THE SPECTRAL ATTENUATION OF UV RADIATION BY AEROSOL ON THE TOTAL OZONE MEASUREMENTS
(Contract EPA-5-536-4)
The effect of aerosol in the atmosphere on ozone measurements is considered. Shah (1976) had concluded that changes in aerosol concentration and particle size distribution affect the measurement results only slightly. DeLuisi (1975), on the other hand, had found that substantial differences exist between values for ozone content obtained by taking into account scattering and values calculated without regard to scattering effects. Instrumental errors are analyzed and the statistical relationship between measurements at different wavelengths are investigated. It is found that differences between the results of measurements related to different wavelength pairs are greater than instrumental errors. It is shown that these results are connected with the spectral extinction of the atmospheric aerosol

A82-36414# APPLICATION OF INFRARED TECHNIQUES TO THE STUDY OF ATMOSPHERIC OZONE [APPLICATION DES TECHNIQUES INFRAROUGES A L'ETUDE DE L'OZONE ATMOSPHERIQUE]
The present investigation is concerned with the utilization of the infrared wavelength region for the study of the ozone in the atmosphere, taking into account three atmospheric windows including the wavelength ranges near 10, 5, and 3 micrometers. More than 3200 spectral lines could be assigned to different bands of the ozone spectrum. Laboratory studies formed one part of the investigation. Spectral frequencies, absorption line intensities, and linewidths were determined for ozone. Some of the obtained results were employed in connection with data provided by the radiometric probe LIMS on board the Nimbus-7 satellite. The second part of the investigation involved a study of the atmosphere. The same
spectrum in the laboratory study was utilized, and the sun was employed as radiation source. The obtained results were compared with data provided by a Dobson spectrophotometer. Attention is also given to vertical concentration profiles. It is concluded that infrared absorption spectroscopy represents a suitable technique for studies of atmospheric ozone.

MICROEVE MEASUREMENT OF STRATOSPHERIC AND MESOSPHERIC OZONE


It is pointed out that ozone has a rich rotational spectrum with many lines at millimeter wavelengths. Measurement of these lines can provide a means of remotely sensing stratospheric and mesospheric ozone. Technology has recently advanced to the state where it is reasonable to consider monitoring upper atmospheric O₃ on a global scale by microwave radiometers in earth orbit. An investigation indicates that approximately 1% accuracy and approximately 2 km vertical resolution O₃ mixing ratio measurements are reasonable goals for limb-viewing microwave radiometers in earth orbit. Mesospheric ozone can also be measured by the considered techniques using stronger (but more temperature-sensitive) O₃ lines. A balloon-borne microwave limb sounder has recently been constructed to test the practical limitations on the measurement concepts. Also under study is a microwave limb sounder for operation in earth orbit.

TOTAL OZONE RETRIEVAL FROM SATELLITE METEOR 28 FOURIER SPECTROMETER MEASUREMENTS


The efficiency and accuracy of four different algorithms for deriving total ozone from IR radiance measurements made with Fourier spectrometers are assessed. For a total of more than 1,100 spectrometer-interferometer spectra measured between July and September 1977, 40 corresponding Dobson ozone values are found with a maximum spatial distance between the subsatellite point and the Dobson station of 300 km and an average distance of 175 km; 35 values here are from midlatitudes of the Northern Hemisphere. The Dobson ozone values are used in determining a different number of coefficients for each method applying the least square method. With these coefficients, ozone values are calculated. The original number of spectral channels is then reduced to two intervals. It is found that a radiometer with one or two channels in the 9.6/µm band in the window and in the 15/µm band is sufficient for the total ozone determination. A highly significant positive correlation is found between spectrometer-interferometer ozone and calculated relative topographies of the lower stratosphere. This correlation holds even if the latitudinal dependence and autocorrelation of ozone values and relative topographies are eliminated.

OPTICAL STOP AND FOCUSSING EFFECTS IN THE DOBSON INSTRUMENT


The present investigation shows that the 'directional effect' observed in connection with the photoelectric spectrometer designed by Dobson (1931) is caused by defects in optical stopping and focusing. The considered effect consists of two parts, related to different field-of-view boundaries for the two wavelength bands being measured, and varying relative sensitivity across the field of view for the two bands. The stop problem is readily tested for and corrected, and it may affect only a limited number of instruments. The focussing problem, however, affects all but the earliest instruments, and its solution will require a careful consideration of the involved aspects.

DOBSON SPECTROPHOTOMETER CALIBRATIONS, POSSIBLE ERRORS IN OZONE ABSORPTION COEFFICIENTS, AND ERRORS DUE TO INTERFERING POLLUTANT GASES


In connection with the employment of Dobson spectrophotometers as standard instruments for measurements of total ozone, it is imperative that the accuracy of the total ozone measurements be properly assessed. Research within the Geophysical Monitoring for Climatic Change program into the accuracy of ozone observations is currently focused on possible variations of the Dobson instrument extraterrestrial constants. Attention is given to spectrophotometer calibrations, the systematic ozone measurement error, and interfering trace gas pollutants. It is pointed out that ozone produced photochemically in polluted air near ground level can also be considered an interferer since it renders unreliable background measurements of total ozone.

OBSERVATIONS AND ANALYSES OF THE TOTAL AMOUNT OF ATMOSPHERIC OZONE IN THE BEIJING REGION AND IN THE REGION OF JOLMOLUNGMA MOUNTAIN IN TIBET


OSO-8 LOWER MESOSPHERIC OZONE NUMBER DENSITY PROFILES


Solar occultation data gathered by the French ultraviolet spectrophotometer telescope on the NASA Orbiting Solar Observatory, scanning between about 50 deg N and 50 deg S between June 1975 and June 1976, are presented. The occultation profiles, observed near 2800 A, contain information on the ozone concentration at altitudes between about 52 and 75 km. Results obtained between June 5 and August 4, 1975 are discussed, longitudinal and latitudinal variations are demonstrated, and comparisons with published ozone density profiles are shown.
02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

A82-36477# COMPARISON OF OZONE IN POLLUTED AND CLEAN AIR MASSES OVER LAKE MICHIGAN

A82-36534*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
THE SEASONAL VARIATIONS OF OZONE AND TEMPERATURE IN THE MIDDLE AND UPPER STRATOSPHERE

The seasonal variations in ozone and temperature inferred from the Nimbus-4 BUV (Backscatter Ultraviolet Spectrometer) and the SCR (Selective Chopper Radiometer) experiments are compared with predictions based on a simplified radiative photochemical model. It is shown that the observations, in agreement with the model calculations, show a systematic phase shift from a summer maximum at 10 mb to a winter maximum at 1 mb with equinoxial maxima at intermediate heights. In contrast, the temperature between these pressure levels shows no appreciable phase shift and the summer maximum prevails at all heights. The observed phase differences in ozone and temperature are shown to be a manifestation of the radiative feedback on the photochemistry of the upper stratosphere (Author)

A82-36741 ON THE APPLICATION OF A MODEL OF BOUNDARY-LAYER FLOW OVER LOW HILLS TO REAL TERRAIN

A attempts to apply a computer model (Walmsley et al., 1980) to neutrally-stratified, boundary-layer flow over an isolated hill of moderate slope (Kettles Hill, Alberta) lead to velocity perturbation fields which probably overemphasize the impact of small-scale topographic features. Some numerical smoothing of the digitized terrain input field is found to be helpful in reducing this effect, although such a procedure is somewhat arbitrary. An extension of the original theory results in an improved representation of the effect of small-scale terrain components. These modifications are described and some results of an application of the extended model to Kettles Hill are presented (Author)

A82-37405* Aerospace Corp., El Segundo, Calif
SOFT X-RAYS FROM THE SUNLIT EARTH'S ATMOSPHERE
D L MCKENZIE, H. R. RUGGE (Aerospace Corp., Space Sciences Laboratory, El Segundo, CA), and P. A. CHARLES (California, University, Berkeley, CA) Journal of Atmospheric and Terrestrial Physics, vol 44, June 1982, p 499-508. Research supported by the Aerospace Corp.

Observations of soft X-ray emission from the sunlit earth atmosphere are presented and compared with the predictions of an earth albedo X-ray theory. The exact theory accounts for the flux of Thomson scattered solar X-rays and fluorescently excited K X-rays that arise following the absorption of incident X-rays as a function of observing geometry Observations were made at widely separated geometries with the two low-energy detectors of the A-2 experiment on the HEAO-1 satellite. Fitting of the model to the observed spectra results in values for the solar coronal temperature and emission measure that are in good agreement with expected values for the monitoring such indicating that X-ray observations of the sunlit atmosphere may be a useful monitor of solar activity for satellites unable to view the sun directly. The total measured fluorescent line flux is also in agreement with calculations, although the N/O line ratio is not. X-ray fluorescence measurements from the sunlit atmosphere will thus be useful in monitoring atmospheric composition only to the extent that the total line counting rates depend upon the composition. A.L.W.

A82-37502 SPATIAL RESOLUTION REQUIREMENTS FOR URBAN STUDIES
R. WELCH (Georgia, University, Athens, GA) International Journal of Remote Sensing, vol 3, April-June 1982, p 139-146. refs
Remote sensor data with spatial resolutions corresponding to 0.5-10 m ifov are required to define adequately the high frequency detail which characterizes the urban scene. Effective analyses of the small parcels, compact structures and narrow street patterns typical of Asian environments will necessitate data of much higher resolution than are required for Western countries. Consequently it is unlikely that satellite image data expected for the 1980s will replace aerial photographs as a primary source of information about urban areas. (Author)

N82-23043# Comptroller General of the United States, Washington, D C
STREAMLINING AND ENSURING MINERAL DEVELOPMENT MUST BEGIN AT LOCAL LAND MANAGEMENT LEVELS Report to the Chairman, Committee on Energy and Commerce, House of Representatives
4 Dec 1981 24 p refs

A study of the use of Federal lands, particularly military lands, concluded that success in streamlining and accelerating mineral development on Federal lands depends on the Bureau of Land Management state offices ultimately responsible for the implementation of Department of Interior minerals policies. It was found the eastern States Office of the Bureau of Land Management did not effectively deal with potential Federal mineral trespass in the East, and was unable to issue mineral leases and permits on a timely basis. Moreover, it was unable to effectively deal with new areas of mineral interest because of Department actions. Recommendations to improve the mineral trespass program help relieve lease and permit backlogs, maintain dedicated staff, and improve headquarters communications with State offices were made R J F

N82-23793# California Univ., Berkeley Lawrence Berkeley Lab Engineering and Technical Service Div
ENVIRONMENTAL MONITORING REPORT OF THE LAWRENCE BERKELEY LABORATORY, 1980 Annual Report
G E SCHLIEMER, ed. Apr. 1981 33 p refs

The environmental monitoring program of the Lawrence Berkeley Laboratory is described. Data for 1980 are presented and general trends are discussed. Airborne and waterborne radionuclides are discussed. The radiation dose on the surrounding population is discussed. R J F

N82-23891# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service
COMPARISON OF SATELLITE DERIVED RADIATION BUDGET MEASUREMENTS OVER MONEX DURING 1979 TO 1980
P. K. RAO IN WMO Intern. Conf on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt. 7 p Apr. 1981 Avail. NTIS MF A01; HC WMO

The environmental monitoring program of the Lawrence Berkeley Laboratory is described. Data for 1980 are presented and general trends are discussed. Airborne and waterborne radionuclides are discussed. The radiation dose on the surrounding population is discussed. R J F

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**02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES**

N82-23963*# Intermountain Forest and Range Experiment Station, Ogden, Utah. Aviation and Fire Management Staff.

**REMOTE AUTOMATIC WEATHER STATION FOR RESOURCE AND FIRE MANAGEMENT AGENCIES**

J. R. WARREN and D. L. VANCE Aug. 1981 15 p refs (PB82-107335, FSGTR(INT-116) Avail NTIS HC A02/MF A01 CSCL 045)

A weather station that operates automatically in remote areas, without power or communication lines was developed and is commercially available. Remote automatic weather stations (RAWS) transmit precipitation, windspeed, air temperature, humidity, and barometric pressure data via satellite. Data may be acquired by direct dialing or through a fire forecasting program.

**G.R.A.**


**APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS**


(E82-10288; NASA-CR-168857, NAS 1.26:168857; SAPR-16) Avail: NTIS HC A05/MF A01 CSCL 06B

The objectives, accomplishments, and future plans of several LANDSAT applications projects in Mississippi are discussed. The applications include land use planning in Lowandies County, strip mine inventory and reclamation, white tailed deer habitat evaluation, data analysis support systems, discrimination of forest habitats in potential lignite areas, changes in gravel operations, and determination of freshwater wetlands for inventory and monitoring.

In addition, a conceptual design for a LANDSAT-based information system is discussed.

M. G.

**N82-24567**# Utah Unv., Salt Lake City. Center for Remote Sensing and Cartography

**IDENTIFYING ENVIRONMENTAL FEATURES FOR LAND MANAGEMENT DECISIONS**


Advances in digital processing of LANDSAT imagery and in the interpretation of aerial photography are reported as well as the development of a geographic information system and the acquisition of cartographic equipment. Services to technical specialists and dignitaries are also described. The status of the following studies is discussed: Farmington Bay waterfowl; Sevier River wetland and agriculture; Davis County foothill development; Bear River Range aspen habitat; Wasatch-Cache rnanon habitats; irrigated acreage in the Bear River Basin; the Parker Mountain rangeland inventory; and the development of techniques for inventorying aspen and aspen conifer stands. The cooperative project with NASA-Ames to verify LANDSAT digital maps of the forest and range resources on the LaSal Mountains is also considered.

A. H.

**N82-24598**# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND MAGSAT ALTITUDES**


The MAGSAT data for the period Nov. 2-20, 1979 were studied. From the observed H, the HMD predicted by model was subtracted. The residue delta H = H-HMD shows storm-time variations similar to geomagnetic Dst, at least qualitatively. Delta H sub 0, i.e., equatorial values of delta H were studied separately for dusk and dawn and show some differences.

M. G.

**N82-25661**# National Aeronautics and Space Administration.

**IN SITU OZONE DATA FOR COMPARISON WITH LASER ABSORPTION REMOTE SENSOR: 1980 PEPE/NEROS PROGRAM**


Several sets of in situ ozone (O3) measurements were made by a NASA aircraft in support of the laser absorption spectrometer (LAS) remote sensor. These measurements were designed to provide comparative O3 data for the LAS sensor. The LAS, which was flown on a second aircraft, remotely measured the vertical burden of O3 from the aircraft to the surface. In situ results of the air quality (O3 and B sub scat) and meteorological (temperature and dewpoint) parameters for three successive missions are presented. The aircraft flight plans, in situ concentration profiles and vertical burdens, and measurement errors are summarized.

B. W.

**N82-26757**# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

**COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND MAGSAT ALTITUDES:**


The MAGSAT data for the period Nov. 2-20, 1979 were studied. From the observed H, the HMD predicted by model was subtracted. The residue delta H = H-HMD shows storm-time variations similar to geomagnetic Dst, at least qualitatively. Delta H sub 0, i.e., equatorial values of delta H were studied separately for dusk and dawn and show some differences.

T. M.

**N82-27737**# California Unv., Livermore. Lawrence Livermore Lab

**FEASIBILITY OF LASER-Separation OF 36 S AND ITS USE AS AN ATMOSPHERIC TRACER**


The use of laser-produced sulfur isotopes to analyze the acid rain situation is considered. The proposed use of isotopically labelled SO2, in particular of (36)SO2, as a tracer can help elucidate the chemical and transport facets in a unified experiment.

Separation of a sufficient quantity of the rare (36)S isotopes to perform several of these tracer studies appears to be practical and economical.

T. M.
REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION. VOLUME 1: SUMMARY Final Report
(Contract EPA-ID-IE-8721)
(DE82-900581; TVA/ONR/ARP-81/6-VOL-2; EPA-500/7-81-114)
Avail: NTIS HC A13/MF A01

Airborne multispectral scanner data covering affected soybean fields were analyzed using three computer-assisted procedures: unsupervised, supervised, and pseudosupervised. The last method provided the best results. LANDSAT imagery was also investigated, but the foliar effects of SO2 were too subtle to detect from orbit.

REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION. VOLUME 2: DATA Final Report
(Contract EPA-ID-IE-8721)
(DE82-900581; TVA/ONR/ARP-81/6-VOL-2; EPA-500/7-81-114)
Avail: NTIS HC A13/MF A01

03 GEODESY AND CARTOGRAPHY

Includes mapping and topography

A82-22294* Pittsburg Univ., Pa
A COLOR-RATIO MAP OF MERCURY

Orange and UV frames are used to construct a color-ratio map of the portion of Mercury imaged by Mariner 10, with at least two independent color-ratio images being used for each region in order to prevent spurious, blemish-induced color differences appear to be smaller than those of the moon, and many apparently fresh craters and their ray systems tend to be bluer than their surroundings. Regions of interesting color contrast are noted, and it is concluded that there is little evident correlation of color with either geology or topography.

A82-22595 PREFLARE INCREASES IN SOLAR COSMIC RAYS RELEVANT TO THE MODE OF ENERGY ACCUMULATION IN THE ACTIVE REGIONS ASSOCIATED WITH LARGE FLARES

Evidence of preflare increases in the electron and proton solar cosmic ray components is analyzed to develop a model of the processes involved. Data from the Prognoz-5 and Helios-1 and -2 satellites are cited as proof of a temporal form of particle arrival similar to a flare-produced event. The electron data indicates a set of individual events of acceleration up to 5 MeV and proton data shows the same process up to tens of MeV, implying a quasiconstant generation of particles. The low-energy particle increase has been observed to occur several days in advance of a flare, with the particle acceleration happening in subregions of an imminent flare event. It is suggested that Coulomb interactions in the two-component plasma are responsible for the accelerations, which do not culminate in a flare until the ionization energy loss on the electrons and protons becomes insignificant compared to the acceleration rate. M.S.K.

A82-22596 COMPARISON OF SOLAR PROTON ACTIVITY IN 1967 AND 1969 WITH THAT IN 1978 AND 1979 AS MEASURED ONBOARD VENERA 4, 5, 11, 12 SPACE PROBES

A comparison of the proton activity in 1967 and 1969 with that in 1978-1979 shows that proton activity in 1967 was much below the level of 1978-1979 owing to the high solar activity during the rise phase of the 21st cycle. It is also found that the activity in 1969 was much above the level of 1978-1979, although the smoothed sunspot number was approximately 110. This is seen as indicating that proton activity is weakly correlated with the smoothed sunspot number and is determined largely by the phase of the solar cycle. The greatest proton activity was observed in phases of maximum solar activity and solar activity decay.

A82-22598 SPACECRAFT DETERMINATION OF ENERGETIC PARTICLE PROPAGATION PARAMETERS - THE 1 JANUARY 1978 SOLAR EVENT

Intensity-time profiles in similar energy intervals measured by the longitudinally separated Helios 1/2 and Prognoz 6 spacecraft are used to learn the interplanetary propagation. The scattering mean free path for the interplanetary propagation turns out to be in essence the same for the three locations where the coronal propagation is described by a Reid-Axford type diffusion model, the diffusion coefficient is approximately constant below 200 MeV (about 0.1 AU), and, above this rigidity it exhibits a power law increase.

A82-22614 THE MODEL OF THE COSMIC RAY ENRICHMENT BY HELIUM-3

A model of He(3) enrichment is used to demonstrate that a stratified electron shock front propagating through the upper chromosphere may produce the He(3) enrichment in solar cosmic rays. The model also shows that bursts of hard X-rays, microwaves and UV radiation are produced. An analysis of available data shows that He(3) nch events are accompanied by hard X-rays, whose fluxes are in good agreement with theoretical estimations by Kocharov et al. (1980).

D L.G.
that the feasibility of both ground-speed and map-matching
described Institute activities cover precise levelling, high-precision
covering +50 to -50 deg geographic latitude, and the separation
of Magsat north, east, vertical and total field charts with Canadian
used for hovering operations. The results of field tests indicate
operations are too slow to track the vehicle path. The system is
GROUND-SPEED AND MAP-MATCHING NAVIGATION
gravimetry on land uplift gravity lines, earth tide observations, gravity
THE FINNISH GEODETIC INSTITUTE
WORK RELATED TO THE BLUE ROAD GEOTRAVERSE AT
FINNISH GEODETIC INSTITUTE
J MAKINEN (Geodeettinen Laitos, Helsinki, Finland) Earth
Evolution Sciences, vol 1, Mar. 1981, p 71-76. refs
Finnish Geodetic Institute research work and research
capabilities relevant to Blue Road Geotraverse studies are
described Institute activities cover precise levelling, high-precision
gyrometry on land uplift gravity lines, earth tide observations, gravity
mapping, geod calculations, satellite geodesy, VLBI techniques,
and geometric geodesy.
O.C.
MAGNETIC ANOMALIES AS A REFERENCE FOR
GROUND-SPEED AND MAP-MATCHING NAVIGATION
The use of the earth's magnetic field for ground referenced
motion and position measurements is discussed A magnetic
terrain-navigation concept is set forth, and its sensor configuration,
data processing and data storage unit, and navigation data interface
unit are discussed. The navigational accuracy of the system is
assessed, one particular advantage of terrain navigation systems
is that ground-speed accuracy is independent of vehicle speed
until speeds are reached at which the sensors and/or computer
operations are too slow to track the vehicle path. The system is
therefore excellent at low speeds and can advantageously be
used for hovering operations. The results of field tests indicate
that the feasibility of both ground-speed and map-matching
methods is indeed promising.
C.D.
MAGNETIC CHARTS OF CANADA DERIVED FROM MAGSAT
DATA
L. R. NEWITT, E. DAWSON, R. L. COLES, and A NANDI
(Department of Energy, Mines, and Resources, Div
of Geomagnetism, Ottawa, Canada) Geophysical Research Letters,
vol 9, Apr 1982, p 246-249 refs
The feasibility of regional magnetic chart production by means of
Magsat scalar and vector data is assessed through comparisons
of Magsat north, east, vertical and total field charts with Canadian
aeromagnetic data. After reducing all satellite and aeromagnetic
data to sea-level, gridding at 1-deg intervals of longitude and
latitude, and contouring the charts, it was determined that good
agreement exists between the two data sets, with an overall rms
difference of 150 nT. In all components, the greatest discrepancies
between data sets occur in the northern U.S and along the east
coast of Canada.
O.C.
INITIAL SCALAR MAGNETIC ANOMALY MAP FROM MAGSAT
R. A. LANGEL, C. C SCHNITZLER (NASA, Goddard Space Flight
Center, Greenbelt, MD) Geophysical Research Letters, vol 9, Apr.
1982, p 269-272. refs
Magsat data acquired during the November 1979-January 1980
mission was used to derive a scalar magnetic anomaly map
covering +50 to -50 deg geographic latitude, and the separation
of anomaly fields from core and external fields was accomplished
by techniques developed for POGO satellite data. Except in the
Atlantic and Pacific at latitudes south of -15 deg, comparison of
the Magsat map with its POGO data-derived counterpart shows
basic anomaly patterns to be reproducible, and higher resolution
due to Magsat's lower measurement altitude Color-coded scalar
anomaly maps are presented for both satellites.
O.C.
INITIAL VECTOR MAGNETIC ANOMALY MAP FROM MAGSAT
R. A. LANGEL, C. C SCHNITZLER (NASA, Goddard Space Flight
Center, Greenbelt, MD), J. D. PHILLIPS (U.S. Geological Survey,
Reston, VA), and R. J. HORNER (Computer Sciences Corp., Silver
275-276. refs
Global magnetic component anomaly field maps have been
derived from the Magsat vector magnetometer data obtained from
November 1979 through May 1980. The amplitude of variations of
the components over the maps are between 10 and 15 nT, well
about the noise of the data. Averaged data, in 2-by-2 deg blocks,
exhibit standard errors of the mean of about 1 nT over most of
the X and Z maps, and about 2 nT over most of the Y maps.
Errors rise to about twice these amounts near the auroral belts.
Most of the anomalies in the component data are consistent with
a crustal magnetization model which incorporates dipoles aligned
only in the direction of the main field. However, there appear
to be some regions which require dipoles aligned in some other
direction i.e., remanent magnetization.
(Author)
MAGSAT MAGNETIC ANOMALIES OVER ANTARCTICA AND
THE SURROUNDING OCEANS
M. H. RITZWOLLER and C. R BENTLEY (Wisconsin, University,
Madison, WI) Geophysical Research Letters, vol. 9, Apr. 1982,
p. 285-288 ref
(Contract NASS-25977)
SPATIAL RESOLUTION AND REPEATABILITY OF MAGSAT
CRUSTAL ANOMALY DATA OVER THE INDIAN OCEAN
R. V. SAILOR, A. R. LAZAREWICZ, and R. F. BRAMMER (Analytic
9, Apr. 1982, p. 289-292. refs
(Contract NASS-26424)
PRELIMINARY COMPARISON OF THE MAGSAT DATA AND
INITIAL VECTOR MAGNETIC ANOMALY MAP FROM MAGSAT
R. A. LANGEI, C. C SCHNITZLER (NASA, Goddard Space Flight
Center, Greenbelt, MD), J. D. PHILLIPS (U.S. Geological Survey,
Reston, VA), and R. J. HORNER (Computer Sciences Corp., Silver
293-295. refs
(Contract NASS-25030)
A PRELIMINARY COMPARISON OF THE MAGSAT DATA AND
INITIAL SCALAR MAGNETIC ANOMALY MAP FROM THE CONTINENTAL U.S.
I. J. WON and K. H. SON (North Carolina State University, Raleigh,
296-298. refs
(Contract NASS-26157)
A preliminary regional scale magnetic anomaly map derived from
the Magsat data over the continental U.S. shows reasonably
good correlations when compared with the corresponding
aeromagnetic map. This conclusion is based upon the analysis of
the fine attitude scalar Magsat data of about a two-month duration
starting November 2, 1979 and the analysis of the Project Mag
U.S. aeromagnetic data in the same region.
(Author)
A82-30795* Purdue Univ., Lafayette, Ind.
A SATELLITE MAGNETIC MODEL OF NORTHEASTERN SOUTH AMERICAN AULACOGENS
Magnetic modeling of the Amazon River and Takatu Aulacogens in northeastern South America illustrate the utility of satellite magnetic data in characterizing the properties and structure of the Isthmus. Specifically, reduction of preliminary Magnet scalar magnetic anomaly data to an equivalent condition of vertical polarization shows a general correlation between magnetic anomaly minima and the Amazon River and Takatu Aulacogens. Surface gravity data demonstrate a correlative positive anomaly Spherical earth modeling of the magnetic data indicates a less magnetic crust associated with the aulacogens which is compatible with previous studies over the Mississippi River Aulacogen and Rio Grande Rift in North America. (Author)

A82-30796 PRELIMINARY INTERPRETATION OF MAGNETIC ANOMALIES OVER JAPAN AND ITS SURROUNDING AREA
M. YANAGISAWA, T. YUKUTAKE, N. FUKUSHIMA (Tokyo University, Tokyo, Japan) and M. KONO (Tokyo Institute of Technology, Tokyo, Japan) Geophysical Research Letters, vol. 9, Apr. 1982, p. 322-324 refs

A82-30849 ALbedo and angular characteristics of the reflectance of the underlying surface and clouds [ALBEO I UGLOVYE KHARAKTERISTIKI OTRAZHENIIA PODSTILAIUCHCHEI POVERKHNOsti I OBLAKOV]
K. IA, KONDRAIEV, V. I. BINENKO, L. N. DIACHENKO, V. I. KORZOV, and V V MUKHENBERG Leningrad, Gidrometeoizdat, 1981 232 p In Russian refs
Information on the reflectance in the short-wave region of the spectrum of clouds and of the system comprising the earth's surface and atmosphere is discussed. Data are presented on the total albedo of the underlying surface and on the geographical distribution of albedo. Attention is given to the principles determining the spectral distribution of the albedo. Also considered are the laws governing the angular distribution of the reflectance of various types of natural formations C.R.

A82-31994* Kansas Univ Center for Research, Inc., Lawrence, The recognition of extended Targets - SAR images for level and hilly terrain
Radar image simulation techniques are used to determine the character of SAR images of area-extensive targets, for the cases of flat underlying terrain and of moderate relief, with a view to the severity of elevation change effects on the detection and recognition of boundaries and shapes. The experiment, which demonstrated these effects on shapes and boundaries, was performed in order to establish Seasat-A SAR performance. Attention is given to the geometry/propagation effects in range perspective imaging that must be known for information extraction. O.C.

A82-32077* Ohio State Univ., Columbus, Reference coordinate systems for earth dynamics - A preview
It is anticipated that terrestrial reference systems for geodynamics studies which include adopted plate motion models will be introduced for the analysis of both LAGEOS satellite and very long baseline interferometry ranging data. One of the possible approaches involves adjustment of ground station coordinates in conjunction with solutions for Universal Time 1 (UT1) and polar motion as functions of time. Another method uses principal value decomposition to reduce the number of degrees of freedom being solved for by three in a third alternative, the values of UT1 and polar motion derived from the available data by means of the initial set of coordinates are kept fixed, and an appropriate block of data is reanalyzed using the previously determined values of UT1 and polar motion so that a new set of station coordinates can be derived O.C.

A82-32084 The definition of the terrestrial coordinate frame by long baseline interferometry
W. H. CANNON (York University, Toronto, Canada) and M. G ROCHESTER (Newfoundland, Memorial University, St. John's, Canada) In Reference coordinate systems for earth dynamics, Proceedings of the Fifty-sixth Colloquium, Warsaw, Poland, September 8-12, 1980. Dordrecht, D. Reidel Publishing Co., 1981, p. 111-118. refs
This paper examines the question of the definition of the celestial and terrestrial coordinate frames by the technique of long baseline interferometry. It demonstrates how the celestial coordinate frame may be useful defined in terms of basis l-forms associated with the advancing phase fronts of the radiation fields from compact radio sources using only interferometer observables. The paper then proceeds to show how the terrestrial coordinate frame could be useful defined, incorporating fully the effects of plate tectonics and secular motion of the observatories, by an application of the theory of continuum mechanics to interferometer observables. (Author)

A82-32090 On reference coordinate systems used in polar motion determinations
B. KOLACZEK (Polaska Akademia Nauk, Centrum Badan Kosmicznych, Warsaw, Poland) and G. TLEK~ (Astronomiska Ospervalja, Belgrade, Yugoslavia) In: Reference coordinate systems for earth dynamics, Proceedings of the Fifty-sixth Colloquium, Warsaw, Poland, September 8-12, 1980 Dordrecht, D. Reidel Publishing Co., 1981, p. 185-173. Research supported by the Smithsonian Institution. refs A short review of the reference pole presently used in polar motion determinations by classical astrometric methods is followed by a discussion of the systematic differences between systems of polar coordinates and the influence of the mean latitude of stations on pole position The importance of homogenous processing of astrometric data is stressed. (Author)
ORIGIN AND SCALE OF COORDINATE SYSTEMS IN SATELLITE GEODESY

The center of mass of the earth is commonly taken as origin for the coordinate systems used in satellite geodesy. In this paper the notion of the ‘geocenter’ is discussed from the point of view of mechanics and geophysics. It is shown that processes in and above the crust have practically no impact on the position of the geocenter. It is possible however that motions of the inner core may cause variations of the geocenter of the order of 1 m. Nevertheless the geocenter is the best point for the origin of a coordinate system. Mather’s method of monitoring geocenter motion is discussed, and some other possibilities are mentioned. Concerning the scale problem, the role of the constant GM and time measurements in satellite net determinations are briefly discussed.

(Author)

(A82-32646*) California Univ., Los Angeles.
GEOID HEIGHT-AGE RELATION FROM SEASAT ALTIMETER PROFILES ACROSS THE MENDOCINO FRACTURE ZONE
(Contract NAGS-152)

Twenty-eight Seasat altimeter profiles crossing the Mendocino Fracture Zone are used together with seafloor ages determined from magnetic lineations to estimate the change in oceanic geoid height with age, between ages of 15 and 135 m.y. An unbiased estimate of the overall geoid offset along each profile is determined from a least-squares fit of the along-track derivative of the geoid to the geoid slope predicted from a simple two-layer gravitational edge effect model. Uncertainties based upon the statistical properties of each profile are also determined. A geoid slope-age relation is constructed by normalizing the geoid offsets and uncertainties by the age offsets. The results are in agreement with geoid slope-age relations determined from symmetrically spreading ridges (Sandwell and Schubert, 1980). However, the fracture zone estimates have smaller uncertainties and show less scatter. A comparison of these results with the geoid slope-age prediction of the boundary layer cooling model shows that the thermal structure begins to deviate from this model at an early age (20-40 m.y.). A plate cooling model with a thickness of 125 km is most compatible with the geoid slope-age estimates, although significant deviations occur, these may indicate that the lithospheric thermal structure is not entirely age dependent.

(Author)

(A82-32393) ESTABLISHING GEODETIC-GEODYNAMIC PARAMETERS USING LUNAR LASER RANGE MEASUREMENTS [DIE BESTIMMUNG GEODAETISCH-GEODYNAMISCHER PARAMETER MIT HILFE VON LASERDISTANZMESSUNGEN ZUM MOND]

In German. refs

The state of the art of lunar laser range measurements is reviewed. The transit time of the signals is simulated to determine if the effects of the final signal speed should be taken into account, and modeling of the signal time delay is treated in the frame of earth-moon dynamics. Results concerning coordinates and distances of laser stations in the United States, USSR and Austria, and essential UTO and UT1 analyses are presented. Conditions for establishing the geodetic-geodynamic parameters are determined, and preliminary estimations are made.

(Author)
the solution of the problem in a spatial coordinate system; the determination of coordinates in a spatial polar system; allowance for different times of Doppler measurements in determining the coordinates of a mobile station; and allowance for feedback of satellite determinations.

B.J.


(Previously announced in STAR as N82-19731)


Efforts in support of a geomagnetic survey of the Brazilian area are described Software to convert MAGSAT data tapes to the Burroughs/B-6700 binary format was developed and tested. A preliminary analysis of the first total intensity anomaly map was performed and methodologies for more intensive analysis were defined. The sources for correlative geological, aeromagnetic, and gravimetric data are described M.G.


The results of modeling satellite-elevation magnetic and gravity data using the constraints imposed by near surface data and seismic evidence shows that the magnetic minum can be accounted for by either an intracrustal lithologic variation or by an upwarp of the Curie point isotherm. The long wavelength anomalies of the NOO's-vector magnetic survey of the continental U.S. were contoured and processed by various frequency filters to enhance particular characteristics. A preliminary inversion of the data was completed and the anomaly field calculated at 450 km from the equivalent magnet sources to compare with the POGO satellite data. Considerable progress was made in studying the satellite magnetic data of South America and adjacent marine areas. Preliminary versions of the 1 deg free-air gravity anomaly map (20 m gal contour interval) and the high cut (lambda approximately 8 deg) filtered anomaly maps are included A.R.H.


The time scale and time lapse over which crustal movements are traditionally monitored by geodesy and seismology was studied. Efforts are made to bridge this gap through increasing the frequency of geodetic measurements in the regions of particular interests, establishment of a global network of long and ultralong period seismometers, and development of geophysical and geodetic instrumentation that should be capable of measuring rates of crustal deformation over arbitrary time scales. The following measurements were undertaken: 1) on a global scale; 2) deformation near active plate boundaries; 3) deformation within plate interiors and other neotectonic motion; and 4) instrumentation for measuring tectonic deformation. E.A.K.


Issues of interest and importance to society and science are presented. The problems considered are of national concern; their solutions may contribute to a better understanding of tectonic deformation and earthquake hazards. The need for additional field data, the role of geodetic measurements, the importance of both ground and space techniques, and the need for advanced instrumentation development are discussed. GRA


Programs are being adapted to the UNIVAC 1000 computer and others are being developed for immediate utilization in processing MAGSAT data. The magnetization intensity, susceptibility, Koenningsberger ratio, NMR stability against alternated fields and temperature, and the Curie temperature were determined for some rock formations with mineralogical compositions stable to the intermediate for lower continental crust and to upper mantle conditions. Attempts to resolve crustal anomalies from one selected profile passing through western mediterranean using procedures commonly used at NASA yielded dubious results because of uncertainties in the adoption of coefficients in the expression accounting for the effect of equatorial nng currents and the empirical approach used for other corrections. Instead, filtering techniques are to be applied to each profile once investigator B tapes relative to the whole planet are received. A.R.H.


Progress in the use of MAGSAT data to confirm that the radius of the Earth's core-mantle boundary can be accurately determined magnetically is reported. The MAGSAT data was used in conjunction with a high quality manfield model for epoch 1965. The unsigned flux linking the core and mantle of the Earth is considered to be a legitimate invariant for a span of time. The value from MAGSAT of this constant is 16.056 GWb (ggawbers). J.D.
for an arbitrarily shaped body are derived from interpolation of coordinate limits of the source volume. Variable integration limits of 36 points which approximate the body's surface envelope. The equivalent point sources was determined directly from the poles or magnetic dipoles were calculated. The distribution of gravity anomalies identified on the basis of gravity images. M.G.

R. V. SAILOR and A. R. LAZAREWICZ, Principal Investigators
(Contract NASA ORDER S-40256-B)
(E82-10204; NASA-CR-168631; NAS 1.26:168631) Avail: NTIS HC A02/MF A01 CSCL 05B
The quality of the MAGSAT data was assessed, especially the charactenization of spikes. The spectral passbands of significance to geophysical analysis were analyzed, including computations of spectral coherence between nearby repeating satellite tracks. A spectrum modeling effort was begun which is designed to show the effect of spacecraft attitude on the observability of magnetic anomalies. The data obtained is to be used to compute crustal anomaly maps by modeling the equivalent dipoles in the project area. A.R.H.

TOPOGRAPHIC SLOPE CORRECTION FOR ANALYSIS OF THERMAL INFRARED IMAGES
K. WATSON, Principal Investigator 1982 14 p refs HCMM
(Contract NASA ORDER S-40256-B)
(E82-10214; NASA-CR-168774; NAS 1.26:168774) Avail: NTIS HC A02/MF A01 CSCL 08B
A simple topographic slope correction using a linearized thermal model and assuming slopes less than about 20 degrees is presented. The correction can be used to analyze individual thermal images or composite products such as temperature difference or thermal inertia. Simple curves are provided for latitudes of 30 and 50 degrees. The form is easily adapted for analyses of HCMM images using the DMA digital terrain data.

Purdue Univ., Lafayette, Ind Dept of Geosciences.

(Contract NASA-25036)
(E82-10242; NASA-CR-168822, NAS 1.26:168822) Avail: NTIS HC A02/MF A01 CSCL 05B
The anomalous potential of gravity and magnetic fields and their spatial derivatives on a spherical Earth for an arbitrary body represented by an equivalent point source distribution of gravity poles or magnetic dipoles were calculated. The distribution of equivalent point sources was determined directly from the coordinate limits of the source volume. Variable integration limits for an arbitrarily shaped body are derived from interpolation of points which approximate the body’s surface envelope. The versatility of the method is enhanced by the ability to treat physical property variations within the source volume and to consider variable magnetic fields over the source and observation surface. A number of examples verify and illustrate the capabilities of the technique, including preliminary modeling of potential field signatures for Mississippi embayment crustal structure at satellite elevations. T.M.

(A. R. LAZAREWICZ and R. V. SAILOR, Principal Investigators 15 Apr. 1982 19 p refs ERTS
(Contract NASA-25036)
(E82-10303; NASA-CR-168878; NAS 1.26:168878) Avail. NTIS HC A02/MF A01 CSCL 08G
A higher resolution anomaly map of the Broken Ridge area (2 degree dipole spacing) was produced and reduced to the pole using quiet time data for this area. The map was compared with equally scaled maps of gravity anomaly, geoid undulation, and bathymetry. The ESMAP results were compared with a NASA MAGSAT map derived by averaging data in two-degree bins. A survey simulation was developed to model the accuracy of MAGSAT anomaly maps as a function of satellite altitude, instrument noise level, external noise model, and crustal anomaly field model. A preliminary analysis of the geophysical structure
Broken Ridge is presented and unresolved questions are listed. A.R.H.

**N82-24578**# Analytic Sciences Corp., Reading, Mass.


A. R. LAZAREWICZ and R. V. SAILOR, Principal Investigators 22 Jan. 1982 17 p refs ERTS

(Contract NAS5-26424)

(E82-10304, NASA-CR-168879; NAS 1 26 168879; PR-1325-4) Avail. NTIS HC A02/MF A01 CSCL 08G

MAGSAT investigator-B tapes were preprocessed by (1) removing all data points with obvious erroneous values and location errors; (2) removing smaller spikes (typically 15 nT or more), and deleting data tracks with fewer than 20 points; and (3) removing a linear trend from each track. The remaining data were recorded on tape for use by the equivalent source mapping (ESMAP) program which uses a least squares algorithm to fit the magnetization parameter of the gnd of equivalent source dipoles in the crust to satellite data acquired at different times and locations. ESMAP was implemented on the TASC computing system and modified to read preprocessed MAGSAT tapes and interface with TASC plotting software. Some verification of the software was accomplished. Grided 1-degree mean values of gravity anomaly and sea surface undulation computed from SEASAT radar altimeter were obtained and brought on line. A.R.H.

**N82-24582**# Wisconsin Univ., Madison

INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status Technical Progress Report

C. R. BENTLEY, Principal Investigator 14 Jan. 1982 1 p ERTS

(Contract NAS5-25977)

(E82-10306; NASA-CR-168883; NAS 1 26 168883; QSTPR-8) Avail. NTIS HC A02/MF A01 CSCL 08G

Development of a spectral analysis technique to determine the depth to the Curie isotherm from MAGSAT data over Antarctica is reported. The analysis of the power spectra of a number of MAGSAT passes over Antarctica indicates on the average two power maxima for each flight pass, one with spatial wavelength of approximately 2000 km and the other with a wavelength of approximately 700 km. It was not determined whether these spectral peaks are geological or mathematical in origin. T.M.

**N82-24583**# Wisconsin Univ., Madison

INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status Technical Progress Report

C. R. BENTLEY, Principal Investigator 16 Apr. 1982 1 p ERTS

(Contract NAS5-25977)

(E82-10309; NASA-CR-168884; NAS 1 26 168884; QSTPR-9) Avail. NTIS HC A02/MF A01 CSCL 08G

Plans to create an improved version of the MAGSAT magnetic anomaly map by more carefully scrutinizing the accepted data for field-aligned current effects are discussed. Data are continued to a 39th km surface for the compilation of a final map. Based on this set of data, vector anomaly maps over Antarctica are planned. A high-pass anomaly map with a cut-off wavelength of approximately 1500 km is also envisioned. It is suspected that longer-wavelength features have their origin outside the crust. T.M.

**N82-24584**# Colorado Univ., Boulder Dept. of Astro-Geophysics.


E. R. BENTON, Principal Investigator 1 Apr. 1982 7 p refs ERTS

(Contract NAS5-25957)

(E82-10310, NASA-CR-168885; NAS 1 26 168885, QPR-9) Avail. NTIS HC A02/MF A01 CSCL 08G

It was established that the total absolute magnetic flux crossing the core- mantle boundary has been a constant of the core motion for the last 50 years. This provides a scalar constraint that could be added to the geometric modelling procedure. The GSFC 8/80 model is being evaluated. The absolute magnetic flux linking the CMB to that model was plotted as a function of time during the span covered by the data, and increasing truncation level. The inclusion of the standard error of each Gauss coefficient derived from the statistics of fit in the GSFC 9/80 model is useful. The magnitude and sense (upwelling or downwelling) of vertical fluid motion adjacent to the core-mantle boundary was calculated using the model. Standard errors were found to be sufficiently small at all but one or two of the 40 or more critical points of B sub r. They do not nearly overlap the value gamma u/gamma r = 0. It is concluded that the core is upwelling and downwelling at an observationally detectable level A.R.H.

**N82-24586**# Purdue Univ., Lafayette, Ind Dept of Geosciences


(E82-10312; NASA-CR-168886; NAS 1 26 168886) Avail. NTIS HC A02/MF A01 CSCL 05B

The cleaning and magnetic tape storage of spherical Earth processing programs are reported. These programs include NVERTSM which inverts total or vector magnetic anomaly data on a distribution of point dipoles in spherical coordinates; SMFLD which utilizes output from NVERTSM to compute total or vector magnetic anomaly fields for a distribution of point dipoles in spherical coordinates; NVERTG; and GFLD. Abstracts are presented for papers dealing with the mapping and modeling of magnetic and gravity anomalies, and with the verification of crustal components in satellite data. T.M.

**N82-24587**# Phoenix Corp., McLean, Va.

IMPROVED DEFINITION OF CRUSTAL MAGNETIC ANOMALIES FOR MAGSAT DATA Final Report


(Contract NAS5-25982)

(E82-10314; NASA-CR-168889; NAS 1 26 168889) Avail. NTIS HC A02/MF A01 CSCL 08G

The routine correction of MAGSAT vector magnetometer data for external field effects such as the ring current and the daily variation by filtering long wavelength harmonics from the data is described. Separation of fields due to low altitude sources from those caused by high altitude sources is affected by means of dual harmonic expansions in the solution of Dinchlet's problem. This regression/harmonic filter procedure is applied on an orbit by orbit basis, and initial tests on MAGSAT data from orbit 1176 show reduction in external field residuals by 24.33 nT RMS in the horizontal component, and 10.95 nT RMS in the radial component J.D.
ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA


D. A. HASTINGS, Principal Investigator 30 Sep. 1981 34 p
Sponsored by NASA ERTS
(Contract DI-14-08-0001-16439)

(E82-10316; NASA-CR-166887; NAS 1.26:166887) Avail: NTIS HC A03/MF A01 CSCL 08B

Accomplishments with regard to the mapping and analysis of MAGSAT data for the investigation of correlations between the magnetic field characteristics of South American and African shields are reported. Significant results in the interpretation of the global total-field anomalies and the anomaly patterns of Africa and South America are discussed. The central position of the Brazilian shield tends to form a negative total-field anomaly, consistent with findings for shields in equatorial Africa. Sedimentary sequences in the Amazon basin and in the Rio de Janeiro-Sao Paolo areas exhibit positive anomalies, also consistent with equatorial Africa. Results for the Caribbean Sea and Guyana regions are also described.

M.G.


D. A. HASTINGS, Principal Investigator 31 Dec. 1981 13 p
Sponsored by NASA ERTS
(Contract DE-14-08-0001-16439)

(E82-10317, NASA-CR-166895, NAS 1.26:166895) Avail: NTIS HC A02/MF A01 CSCL 08G

Several possible causes for the east-west striping of the MAGSAT anomaly maps are listed and discussed including: (1) the inadequacy of the field model used for core-crustal separation of geomagnetic anomalies; (2) external field noise remaining in the available maps; (3) east-west trends of crustal uplift and depression; (4) east-west trends to convection patterns in the mantle; (5) bands of crustal materials of similar metamorphic grade; (6) variations in the depth of the Curie isotherm; and (7) the data processing techniques used to overcome the absence of tie lines and orbital path of MAGSAT.

M.G.

AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarter Report, 1 Jan. - 31 Mar. 1982

D. A. HASTINGS, Principal Investigator 31 Mar. 1982 14 p
Sponsored by NASA ERTS
(Contract DI-14-08-0001-21249)

(E82-10318, NASA-CR-166896; NAS 1.26:166896) Avail: NTIS HC A02/MF A01 CSCL 08B

The problems associated with the use of an interactive magnetic modeling program are reported and a publication summarizing the MAGSAT anomaly results for Africa and the possible tectonic associations of these anomalies is provided. An overview of the MAGSAT scalar anomaly map for Africa suggested a correlation of MAGSAT anomalies with major crustal blocks of uplift or depression and different degrees of regional metamorphism. The strongest MAGSAT anomalies in Africa are closely correlated spatially with major tectonic features. Results indicate that the Bangui anomalies may be caused by a central old Precambrian shield, flanked to the north and south by two relatively young sedimentary basins.

M.G.

L. W. BRAILLE, J. A. PONZI, and R. R. B. VONFRESE, Principal Investigators
31 Mar. 1982 8 p Sponsored by NASA ERTS (E82-10393, NASA-CR-168958; NAS 1.26:168958) Avail. NTIS HC A02/MF A01 CSCL 05B

Efforts to process 2 deg-averaged MAGSAT data for a radially polarized map of Africa and western Europe and investigator B data tapes were initiated M.G.


E. R. BENTON, Principal Investigator
1 Jan. 1982 3 p ERTS (Contract NASS-25957)

(E82-10342; NASA-CR-168959; NAS 1.26:168959; OSTRP-8) Avail: NTIS HC A02/MF A01 CSCL 08G

Accomplishments to date were summarized in three parts submitted for publication. Goddard models and MAGSAT data were used heavily in the investigation which addressed: (1) the sensitivity of selected geomagnetic properties to truncation level of spherical harmonic expansions; (2) the pole strength of the Earth from MAGSAT, and magnetic determination of the core radius, and (3) frozen flux upper limits to the MAGSAT geomagnetic coefficients and relative multipole indices for Earth.

A.R.H.

COMPUTER-PROCESSED GEOPHYSICAL ATLAS OF DIGITAL DATA FOR THE EAST COAST MARGIN OF THE UNITED STATES FROM SURFACE AND SPACECRAFT DATA


(Contract N00014-82-C-0019) (AD-A111366; WHCI-81-104) Avail: NTIS HC A03/MF A01 CSCL 08J

This atlas comprises maps for the East Coast margin of the United States of free-air gravity anomaly, geoid anomaly, regional geoid anomaly, residual geoid anomaly, magnetic crustal anomaly, and bathymetry. Data from surface measurements, GEOS-III and MAGSAT Satellites, GEM-9 spherical harmonic coefficients, and SYNBAPS bathymetry profiling systems were utilized. Estimated error maps for the geod data are not included because for the marine areas, these data are uniformly of very low error. The data are presented in three sets of maps of northern, central, and southern portions of the margin. Author (GRA)

DEFENSE MAPPING AGENCY HYDROGRAPHIC AND TOPOGRAPHIC CENTER, WASHINGTON, D.C.

A COMPARISON OF POLE POSITIONS DERIVED FROM GPS SATELLITE AND NAVY NAVIGATION SATELLITE OBSERVATIONS


The observation of the motion of the Earth's spin axis with respect to the crust has been done continuously since the latter part of 1899 by the International Service. With the advent of new technologies, new determinations of polar motion have been possible. Doppler tracking of the Navy Navigation Satellites has provided estimates of the polar motion on a regular basis since 1969. Currently, these estimates are done at the Defense Mapping Agency and are distributed to several agencies including the Bureau International de l'Heure (BIH), which has the responsibility of centralizing polar motion data. The NAVSTAR Global Positioning System (GPS) is a new navigation satellite system which will eventually replace the existing Navy Navigation Satellite System. As a byproduct of the orbit estimation process for the GPS satellites, values for the position of the pole are determined. In this paper the two different methods for computing the pole's position from satellite observations are described. The most recent results from each method are compared to each other and to the standard BIH values. Author (GRA)


D. D. JACKSON (UCLA) 1 May 1981 50 p refs

(Contract W-7405-ENG-48) (DE82-001558; UCRL-15382) Avail: NTIS HC A03/MF A01 CSCL 08J

Patterns of gravitational and thermal anomalies, strike slip faulting, volcanism in the Imperial Valley were investigated. These patterns suggest that the continental crust may still be spreading. In recent years, the United States Geological Survey and Caltech have added new seismic stations into a dense network in the Imperial Valley to study in detail the relationship between geothermal areas and earthquakes, and to understand the tectonic processes taking place there. The following areas were examined: (1) crustal structure data on P wave arrival times of local earthquakes; (2) leveling data for evidence of tectonic subsidence or uplift, and (3) correlations between seismicity, seismic velocity, geodetic motion, geothermal activity, and local geology. Author (DOE)

FIELD MEASUREMENTS IN SUPPORT OF DISPERSION MODELING IN COMPLEX TERRAIN (1980) Annual Report

W. EBERHARD Jul. 1981 26 p refs

(PB82-148644; NOAA-81-102005) Avail: NTIS HC A03/MF A01 CSCL 13G

The EPA is engaged in a concerted effort to develop models for prediction of air quality in complex terrain. Remote sensors and an instrumented aircraft from the Wave Propagation Laboratory and other elements of NOAA's Environmental Research Laboratory are participating with EPA in a series of field experiments that are necessary for development and validation of such models. A calibrated particulate mapping lidar with multwavelength capability is the principal remote sensor. NOAA's accomplishments during
the first year (February 1980 - January 1981) under the EPA-NOAA Intergancy Agreement for Energy and Environment are participation by lidar and other sensors in EPA's Small Hill Impaction Study No. 1 studying plume impingement or elevated terrain; preliminary experiment by instrumented aircraft on power plant plumes near Farmington, New Mexico, lidar participation in DOE's 1988-ADOT experiment investigating nocturnal drainage flows W mountainous terrain; and improvements to the lidar for plume mapping applications

N82-27900# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

THE EARTH'S GRAVITY FIELD TO DEGREE AND ORDER 180 USING SEASAT ALTIMETER DATA, TERRRESTIAL GRAVITY DATA AND OTHER DATA


(OAD-A113089, DGS-322; SCIENTIFIC-12; AFGl-TR-82-0019)

Aval: NTIS HCA04/MF A01 CSCL 08N

The spherical harmonic expansion of the Earth's gravitational field has been obtained to degree 180 by combining several sources of data. The first data set was an a priori set of potential coefficients to degree 36 based on number of recent solutions including a substantial of resonance terms. A second data set was a 1 x 1 deg anomaly field derived from the SEASAT data set, while the third data set was an updated 1 x 1 deg terrestrial field. The last two fields were combined into one set containing 56761 1 x 1 deg values. The remaining values were computed from the a priori potential coefficients. A rigorous combination solution was not carried out. Instead all anomalies were weighted in such a way that the normal equations were diagonal. The results of the adjustment were 64800 1 x 1 deg anomalies that were expanded into spherical harmonics using the optimum quadrature procedure developed by Colombo. Accuracy estimates for each coefficient were obtained considering noise propagation and sampling error caused by the finite block size in which the anomalies are given. The percentage error of the solution reaches 100% near degree 120. The coefficients and their accuracy to degree 50 are listed in an appendix.

03 GEODESY AND CARTOGRAPHY

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

N82-252574

EXTRAGALACTIC COSMIC RAYS, THEIR SOURCES AND SPECTRUM


have shown that cosmic rays at energies above 10 to the 19th eV are likely to be extragalactic in origin. The energy density above 10 to the 19th eV is 3 x 10 to the -8th eV/cu cm, and the exponent of the integral energy spectrum is -1.4 plus or minus 0.1. For estimating the energy density of relativistic protons (E greater than GeV) in metagalactic space an energy input rate W sub p into protons similar to that for relativistic electrons (W sub e) in active galactic nuclei is assumed. For cosmic rays in the supercluster, W sub p is found to be 10 to the -4th (plus or minus 1) eV/cu cm. This estimate for W sub p is supported by the following internal consistency argument: this spectrum at 10 to the 9th eV, when extended with an exponent -1.4, smoothly joins the extragalactic spectrum at 10 to the 19th eV, having a

similar spectral slope (The exponent -1.4 also is that of galactic cosmic rays when corrected for rigidity-dependent leakage from the Galaxy.)

A82-22604

THE APPROXIMATE 1 GEV SOLAR COSMIC RAYS IN THE FORBUSH-EFFECT OF FEBRUARY 15, 1978


Differences in the behavior of the cosmic microwave intensity are studied using the data from the Alert and Deep River neutron monitors from February 14 to 17, 1978. The behavior of the intensity at Alert and Deep River is normalized to the initial stage of February 14, before the Forbush effect, and the additional differential flux reaches 15 percent. The observed anomalous differences are explained by an additional particle flood of about 1 GeV of solar origin in the Forbush effect.

A82-22607*

Maryland Univ., College Park

OBSERVATIONS OF THE IONIZATION STATES OF ENERGETIC PARTICLES ACCELERATED IN SOLAR FLARES


The ionization states and spectra of 0.3 to 2.4 MeV/nuc He, C, O and Fe are measured in a survey of ten solar flare particle events. HeEplus is found to be present in all events, which indicates the common presence of energetic HeEplus in the source material from which solar particles are accelerated. The distribution functions of HeEplus, HeEplus and heavier elements are represented by simple exponentials of the particle speed times its rigidity to a power n, where n is between 0 and 1, and equal e-folding values. Results are consistent with a model where ions are accelerated in the corona by multi-dimensional shocks out of a population taken from both hot and cold coronal regions.

A82-22609

A TENTATIVE ORDERING OF ALL AVAILABLE SOLAR ENERGETIC PARTICLES ABUNDANCE OBSERVATIONS. I - THE MASS UNBIASED BASELINE. II - DISCUSSION AND COMPARISON WITH CORONAL ABUNDANCES


A82-22613*

Maryland Univ., College Park.

ON THE ANTICORRELATION BETWEEN THE HE/3//HE/4 RATIO AND PROTON INTENSITY IN HE/3//RICH FLARES


(Author)

A model is presented to explain the observed anticorrelation between the size of the He(3)/He(4) abundance ratio at not less than 0.3.
than about 10 MeV/nuc and the peak intensity of about 10 MeV protons in the He(3) rich events. The anticorrelation is shown to be a natural consequence of producing abundance enhancement by a two step acceleration process, where He(3) is preaccelerated with respect to He(4) prior to the main ion acceleration phase, which has an effective injection cutoff varying from flare to flare. D.L.G.

A82-30304
REGIONAL GEOLOGICAL, TECTONIC AND GEOPHYSICAL FEATURES OF NORDLAND, NORWAY

Foliation and lineament patterns from Landsat imagery, gravity and magnetic data mapping of Nordland, Norway shows a high degree of correlation with known tectonostratigraphic units and suggests other, previously unidentified tectonic units. Attention is given to regionally important lineament systems, one striking approximately ENE-WSW, and a younger one N-S. It is indicated by the kilo-scale residual gravity lows along the Norway-Sweden border, which are associated with basement domes, and by magnetic data and lineament patterns, that the eastern basement windows represent large-scale culminations. By contrast, the western domes represent smaller, perhaps granitic cores of recumbent fold nappes. A positive correlation is found between the seismotectonic coastal zones of Nordland and the area's Bouguer gravity anomaly maximum gradient. O.C.

A82-30305
SATELLITE IMAGE INTERPRETATION OF THE EASTERN CALEDONIAN PART OF THE BLUE ROAD GEOTRaverse AND ITS GEOLOGICAL IMPLICATIONS /NORDLAND, VASTERBOTTEN, SCANDINAVIA/

An 80% coincidence of known geological features with the lineaments interpreted in the satellite image presented by Ehrenborg (1977) is found through the quantitative study of Landsat interpretations for the case of a Precambrian area in southeastern Sweden. Because of its probable connection with the quaternary glacial erosion, the distribution of joints and faults may be interpreted as (1) EW-striking lineaments locally correlated with faults affecting Caledonian low-angle thrusts and fissions, (2) NW-SE lineaments locally correlated with leucocratic dikes, and (3) NNW-SSW lineaments generally parallel to the present coast which, by contrast to the region farther west, is of minor importance. O.C.

A82-30786* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.
MAGSAT SCALAR ANOMALY DISTRIBUTION - THE GLOBAL PERSPECTIVE

It is established that geographic coincidences exist between high-latitude MagSat scalar anomalies and major geologic and tectonic structures, with oceanic abyssal plains overlain by negative anomalies agreeing well in spatial extent and position and submarine platforms lying beneath positive scalar anomalies. In addition, geographic coincidence is found in the continents between many high-latitude positive anomalies and shields and cratons in North America, Eurasia and Australia. While these correlations are qualitative, they serve to identify regions for detailed study. The global distribution of anomalies provides a basis for comparative study which will be enhanced when reduced-to-pole versions of the MagSat data become available. O.C.

A82-32442* Jet Propulsion Lab., California Inst. of Tech, Pasadena
SPECTROSCOPIC REMOTE SENSING FOR GEOLOGICAL APPLICATIONS

Remote sensing is being used with increasing frequency in the development of geologic maps and in the exploration process. Spectral data from airborne and spaceborne multispectral scanners provide information on rock type and vegetation stress, important in geologic applications. Emphasis is now being placed on direct identification of materials rather than discrimination among geologic units. To do this, higher spectral resolution systems with wider spectral coverage than currently available are required. Imaging spectroscopy in the 0.4 - 14 microns region appears to be the answer. (Author)

A82-32898
POSSIBLE FAULT DETECTION IN COTTONBALL BASIN, CALIFORNIA AN APPLICATION OF RADAR REMOTE SENSING

An analysis of a 3-cm wavelength radar image of Cottonball Basin in Death Valley National Monument has revealed the existence of two suspect fault traces in evaporite deposits that are less than 2000-yr old. The traces are well defined on the image because the radar system was able to differentiate surface roughness variations at the centimeter scale. The features are not recognizable on data sets recorded in the visible and near-infrared spectral bands. Results indicate the potential of radar images as a tool to help locate recent breaks along a fault when the disturbed zone is represented by a somewhat rougher surface than is found in immediately adjacent areas. (Author)

A82-33402
AEROGEOPHYSICAL METHODS OF FINDING URANIUM DEPOSITS [AEROGEOFIZICHESKIE METODY PROGNOSZIROVANIIA MESTOROZHDENII URANAI

Geophysical prospecting for uranium with the aid of a large-scale, comprehensive gamma-spectrometric, aeromagnetic, and aerolectric survey is considered. The development in the USSR and in other countries of aerogeophysical prospecting for uranium is surveyed. Features of geophysical fields that are characteristic of regions containing endogenous and exogenous deposits of uranium are analyzed. Direct and indirect radiogeochemical, magnetogeophysical, and electrog eo physical indicators of uranium-bearing structures are described. The methods described here rely on a comprehensive interpretation of aerogeophysical, geological, and other types of data. C.R
A82-34721* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**LANDSAT IN THE SEARCH FOR APPALACHIAN HYDROCARBONS**


A study has been conducted to determine the applicability of enhanced Landsat imagery for oil and gas exploration in Appalachia. Attention was given to the feasibility to employ lineaments identified on Landsat imagery as a tool in petroleum exploration. Lineaments, as defined in this connection, are linear or sublinear traces seen on Landsat imagery. They frequently reflect subsurface geological structures. The investigation was conducted in two stages. The first was designed to identify the specific Landsat imagery enhancement best suited for displaying lineaments. The second stage consisted of plotting lineaments and conducting an analysis of the lineament trends with regard to both local geological structure and regional tectonics. A close relationship was observed between lineaments identified on Landsat imagery and known oil and gas reservoirs. This result suggests that lineaments can be related to the structural control of oil and gas reservoirs throughout Appalachia.

G R


**INFLUENCE OF CO2 ON MELTING OF MODEL GRANULITE FACES ASSEMBLAGES - A MODEL FOR THE GENESIS OF CHARNOKITES**


A model is described for the melting of a simple granulite assemblage, in the presence of CO2-rich fluid phases, which can occur between 750 and 1000°C at crustal pressures and is therefore within the range estimated for such regional metamorphism as that of the Adirondacks. For melting which occurs at about 750°C in the presence of both H2O and CO2 pressures corresponding to the deep crust are required to generate a melt enriched in pyroxene and feldspar components, while melting the presence of pure CO2 at about 1000°C generates analogous melt compositions at lower pressures. These experimental reactions are in keeping with observations constraining charnockite occurrences (1) pressure- and temperature constraints; (2) mineralogical constraints; and (3) constraints on the compositions of volatiles associated with peak conditions of charnockite formation.

O C

A82-37198* Significance of Tectonics in Linear Feature Detection and Interpretation on Satellite Images


There are two main concepts of linear feature evaluation based on satellite images. One puts emphasis on finding equivalence between the image and the field data, in the other, the basic aim is to correlate them after they are more or less separate interpretation. A comparative study of the two methods has been carried out on a test field in Southwest Hungary using several kinds of geological and geophysical data as reference. Combining the statistical and deterministic approach a block-faulting mechanism can be recognized and described with ENE-WSW main axes. Correlation of satellite and reference data obtained, the difference of the northern and southern parts of the test field. This led to the conclusion that one can derive textural information on tectonics from a Landsat image concerning especially short lines. This implies that not only the present surface expression of faults and tectonics is detectable but the determination of the latest tectonically active surface is also possible.

Author

A82-22624*# Bureau de Recherches Geologiques et Minieres, Minieres, Paris (France).

**SPATIAL THERMAL RADIOMETRY CONTRIBUTION TO THE MASSIF ARMORICAIN AND THE MASSIF CENTRAL FRANCE LITHO-STRUCTURAL STUDY Final Report**

J Y. SCANVINC, Principal Investigator Nov 1980 85 p refs Sponsored by NASA. Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md 20771. Domestic users send orders to 'Attn: National Space Science Data Center', nondomestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'.

CHARNOCKITE

(E82-10190; NASA-CN-168618, NAS 1.26:168618; REPT-80-SGN-848-REPT-3) Avail. NTIS HC A05/MF A01 CSCL 08G

Thermal zones delimited on HCM images, by visual interpretation only, were correlated with geological units and carbonated rocks, granitic, and volcanic rocks were individualized. Rock signature is evolution parameter and some distinctions were made by addition of day, night and seasonal thermal image interpretation. This analysis also demonstrated that forest cover does not mask the underlying rocks thermal signature. Thermal lines are associated with known tectonics but the observed thermal variations from day to night and from one to another represent a promising concept to be studied in function of neotectonics and hydrogeology. The thermal anomalies discovered represent a potential interest for which is to be evaluated. Significant results were obtained in the Mont Dorm area and additional geological targets were defined in the Paris Basin and the Montmartrau granite.

Author

A82-22569* Natural Environment Research Council, London (England)

**OVERSEAS GEOLOGY AND MINERAL RESOURCES NUMBER 56: A GEOLOGICAL INTERPRETATION OF LANDSAT IMAGERY AND AIR PHOTOGRAPHY OF BOTSWANA**

D. I. J MALLICK, F HABGOOD, and A. C SKINNER 1981 41 p refs Original contains color maps Original contains color illustrations

OVERSEAS GEOLOGY AND MINERAL RESOURCES NUMBER 56: A GEOLOGICAL INTERPRETATION OF LANDSAT IMAGERY AND AIR PHOTOGRAPHY OF BOTSWANA

I A 1.1 million geological map compiled from LANDSAT and air photography of Botswana and border areas is presented. The distribution of 22 geological units of Karoo and Precambrian age is shown together with the post-Karoo deposits, differentiated into 7 units, based on geomorphological criteria. The data help distinguish volcanics of the Kaapvaal Group from those of the Ventersdorp Group, and the Transvaal Supergroup from those of the Waterberg Group at localities far from their better exposed outcrop areas in the southeast of the country. Eolian, lacustrine and alluvial components of Kalahari desert superficial deposits are differentiated. The fracture and lineament pattern is only partly evident from the photographs.

Author (ESA)

A82-23569* Texas Univ. at El Paso


A 1.1 million geological map compiled from LANDSAT and air photography of Botswana and border areas is presented. The distribution of 22 geological units of Karoo and Precambrian age is shown together with the post-Karoo deposits, differentiated into 7 units, based on geomorphological criteria. The data help distinguish volcanics of the Kaapvaal Group from those of the Ventersdorp Group, and the Transvaal Supergroup from those of the Waterberg Group at localities far from their better exposed outcrop areas in the southeast of the country. Eolian, lacustrine and alluvial components of Kalahari desert superficial deposits are differentiated. The fracture and lineament pattern is only partly evident from the photographs.

Author (ESA)
and in map form as anomaly maps, flight path maps, and computer printer maps on microfiche; in graphic form as profiles and histograms: obtained over the Kenora map area of Minnesota are discussed.

The final data are presented in four different forms—on magnetic tape; on microfiche, printer maps. DOE

During the months of June through October, 1980, Aero Service Division Western Geophysical Company of America conducted an airborne high sensitivity gamma-ray spectrometer and magnetometer survey over eleven 30 by 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven (7) 20 by 10 NTMS quadrangles in North and South Dakota. The results obtained over the Kenora map area of Minnesota are discussed. The final data are presented in four different forms: on magnetic tape; on microfiche, in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. UTUUKI RIVER QUADRANGLE, ALASKA, VOLUME 2 Final Report
Mar. 1981 208 p
(Contract DE-AC13-76GJ-01664)
(DE82-000316; GJ8X-302-81-VOL-2) Avail: NTIS HC A10/MF A01

The flight path map, multiparameter profiles, histograms, and anomaly maps for uranium, thorium, potassium, uranium/thorium, uranium/thorium, and thorium/potassium are presented. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. SAGAYANIRKTOK QUADRANGLE, ALASKA, VOLUME 2 Final Report
Mar. 1981 114 p
(Contract DE-AC13-76GJ-01664)
(DE82-000311; GJ8X-306-81-VOL-2) Avail: NTIS HC A06/MF A01

Magnetic and gamma ray spectral data are given including the flight path map, multiparameter profiles, histograms, and anomaly maps for uranium, thorium, potassium, uranium/thorium, uranium/thorium, and thorium/potassium are included. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. DULUTH QUADRANGLE, MINNESOTA, VOLUME 2 Final Report
Apr. 1981 56 p
(Contract DE-AC13-76GJ-01664)
(DE82-001027; GJ8X-330-81-VOL-2) Avail: NTIS HC A04/MF A01

The flight path map, multiparameter profiles, histograms, and anomaly maps for uranium, thorium, potassium, uranium/potassium, uranium/thorium, and thorium/potassium are included. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. ROSEAU QUADRANGLE, MINNESOTA, VOLUME 2 Final Report
Apr. 1981 50 p 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-001025; GJ8X-329-81-VOL-2) Avail: NTIS HC A03/MF A01

Multiparameter profiles, histograms, and flight path and anomaly maps are provided for uranium, thorium and potassium deposits. N.W.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. DEVIL'S LAKE QUADRANGLE, NORTH DAKOTA, VOLUME 1 Final Report
May 1981 98 p refs 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-004161; GJ8X-354-81-VOL-1) Avail: NTIS HC A05/MF A01

During the months of June through October, 1980, an airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over eleven 20 X 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 NTMS quadrangles in North and South Dakota. The results obtained over the Devil's Lake map area of North Dakota are discussed. The final data are presented in four different forms: on magnetic tape; on microfiche, in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. DEVIL'S LAKE QUADRANGLE, NORTH DAKOTA, VOLUME 2 Final Report
Apr. 1981 98 p 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-004168; GJ8X-354-81-VOL-2) Avail: NTIS HC A05/MF A01

Volume 2 on airborne gamma ray spectrometer and magnetometer surveys contains the flight path map, radiometric multiple parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for uranium, potassium, thorium, uranium/potassium, uranium/thorium, and thorium/potassium. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. BEMIDJI QUADRANGLE, MINNESOTA, VOLUME 1 Final Report
May 1981 102 p refs 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-001032; GJ8X-331-81-VOL-1) Avail: NTIS HC A06/MF A01

The results obtained over the Bemidji map area of Minnesota by airborne high sensitivity gamma ray spectrometer and magnetometer surveys are discussed. The final data are presented in four different forms: on magnetic tape; on microfiche, in graphic form as profiles and histograms, and in map form as anomaly maps, flight path maps, and computer printer maps. Complete data listings of both the reduced single record and the reduced averaged record data are also reported. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. BEMIDJI QUADRANGLE, MINNESOTA, VOLUME 2 Final Report
Mar. 1981 50 p 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-001026; GJ8X-331-81-VOL-2) Avail: NTIS HC A03/MF A01

Aerial surveys of the Bemidji quadrangle, Minnesota are reported. In volume 2 the flight path map, multiparameter profiles, histograms and anomaly maps for uranium, thorium, potassium, uranium/potassium, uranium/thorium and thorium/potassium are presented. DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. HIBBING QUADRANGLE, MINNESOTA, VOLUME 1 Final Report
Apr. 1981 111 p refs 2 Vol
(Contract DE-AC13-76GJ-01664)
(DE82-004159, GJ8X-355-81-VOL-1) Avail: NTIS HC A06/MF A01

An airborne high sensitivity gamma-ray spectrometer and magnetometer survey over eleven 20 X 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 NTMS quadrangles in North and South Dakota was conducted. The results obtained over the Hibbing, Minnesota map area are presented in four different forms: on magnetic tape; on microfiche; in graphic form as profiles and histograms, and in map form as anomaly maps, flight path maps, and computer printer maps. DOE
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. HIBBING QUADRANGLE, MINNESOTA, VOLUME 2 Final Report

(Contract DE-AC13-76GJ-01664)
(DE82-004166; GJBX-356-81-VOL-2) Avail: NTIS HC A06/MF A01

The flight path map, radiometric multiple-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, and histograms are presented. Anomaly maps for uranium, thorium, potassium, uranium/thorium, and thorium/potassium are included.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. ABERDEEN QUADRANGLE, SOUTH DAKOTA, VOLUME 1 Final Report

(Contract DE-AC13-76GJ-01664)
(DE82-004152; GJBX-357-81-VOL-1) Avail: NTIS HC A05/MF A01

An airborne high sensitivity gamma-ray spectrometer and magnetometer survey over eleven 20 x 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 NTMS quadrangles in North and South Dakota were conducted. The results obtained over the Aberdeen, South Dakota map area are discussed. The final data are presented in four different forms: on magnetic tape, on microfiche; in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. ABERDEEN QUADRANGLE, SOUTH DAKOTA, VOLUME 2 Final Report

(Contract DE-AC13-76GJ-01664)
(DE82-004164; GJBX-357-81-VOL-2) Avail: NTIS HC A06/MF A01

The flight path map, radiometric and multiple-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, and histograms are presented. Anomaly maps for uranium, thorium, potassium, uranium/thorium, and thorium/potassium are included.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. INTERNATIONAL FALLS QUADRANGLE, MINNESOTA, VOLUME 1 Final Report

(Contract DE-AC13-76GJ-01664)
(DE82-004151; GJBX-356-81-VOL-1) Avail: NTIS HC A06/MF A01

Results obtained using an airborne high sensitivity gamma-ray spectrometer and magnetometer to survey the International Falls map area of Minnesota are presented on magnetic tape, on microfiche; in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. INTERNATIONAL FALLS QUADRANGLE, MINNESOTA, VOLUME 2 Final Report

(Contract DE-AC13-76GJ-01664)
(DE82-004166; GJBX-356-81-VOL-2) Avail: NTIS HC A06/MF A01

The flight path map is presented as well as radiometric multiple-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for uranium, potassium, thorium, uranium/potassium, thorium/potassium, and uranium/thorium.

APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Sep. - Nov. 1981


A more accurate algorithm was developed to compute thermal inertia from temperature difference and albedo information. The error of this algorithm is about 1/3 of the measurement error in HCMM as opposed to the current algorithm which can have an error 5 times larger. A northeast trending lineament was discovered in southwestern Arizona on enhanced thermal inertia images. 

APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Mar. - May 1981


The effects of topographic elevation and slope on thermal images were examined using representative field obstructions of the solar and sky radiation and a simple linearized thermal model. The forms are easily adapted for analysis of HCMM images using the DMA digital terrain data. From a representative set of field observations, it was found that flux variations with elevation can cause changes in the mean diurnal temperature gradient from -4 deg to -14 deg per km evaluated at 2000 m. Changes in the temperature difference gradient of 1 to 2 C per km are also produced which is equivalent to an effective thermal inertia gradient of 100 W s to the 1/2 power/sq m K/1 per km. Exposed bedrock on topographic ridges will appear to have a lower thermal inertia due to the additional effect.


Problems with the Curie balance, which severely hindered the acquisition of data, were rectified. Chemical analytical activities are proceeding satisfactorily. The magnetization characteristics of metamorphic suites were analyzed and susceptibility data for a wide range of metamorphic and igneous rocks. These rock magnetic signatures are discussed as well as the relationships between geology, gravity and MAGSAT anomalies of West Africa. 


A. R. H. 04 GEOLOGY AND MINERAL RESOURCES

N82-23640# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.

N82-23641# Western Geophysical Co. of America, Houston, Tex. Aero Service Dept

N82-23642# Western Geophysical Co. of America, Houston, Tex. Aero Service Div

N82-23643# Western Geophysical Co. of America, Houston, Tex. Aero Service Div

N82-23644# Western Geophysical Co. of America, Houston, Tex. Aero Service Div
USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 31 Mar. 1982
R S. CARMICHAEL, Principal Investigator al 24 Mar 1982 2 p ERTS
(Contract NASS-26425)
(E82-10321, NASA-CR-168900; NAS 1.26:168900; QR-5) Avail: NTIS HC A02/MF A01 CSCL 08G

Personnel matters related to the processing and interpretation of MAGSAT data are reported. Efforts are being initiated to determine the crustal geology, structure, and potential economic consequences to be deduced from the satellite magnetic anomalies in conjunction with remote-sensed data.

A R H.

R S. CARMICHAEL, Principal Investigator 31 Dec. 1981 31 p refs ERTS
(Contract NASS-26425)
(E82-10323; NASA-CR-168902; NAS 1.26:168902; QR-4) Avail: NTIS HC A03/MF A01 CSCL 08G

The analysis and preliminary interpretation of investigator-B MAGSAT data are addressed. The data processing included: (1) removal of spurious data points; (2) statistical smoothing along individual data tracks, to reduce the effect of geomagnetic transient disturbances; (3) comparison of data profiles spatially coincident in track location but acquired at different times, (4) reduction of data by weighted averaging to a grid with 1 deg x 1 deg latitude/longitude spacing, and with elevations interpolated and weighted to a common datum of 400 km; (5) wavelength filtering; and (6) reduction of the anomaly map to the magnetic pole.

The analysis was found to be a magnitude data anomaly map and a reduce-to-the-pole map supporting the general assumption that, on a large scale (long wavelength), it is induced crustal magnetization which is responsible for major anomalies. Abnormal features are identified and explanations are suggested with regard to crustal structure, petrologic characteristics, and Curie temperature isotherms.

M G.

THE INFLUENCE OF AUTOCORRELATION IN SIGNATURE EXTRACTION: AN EXAMPLE FROM A GEOBOTANICAL INVESTIGATION OF COTTER BASIN, MONTANA
M. L. LABOVITZ and E. J. MASUOKA, Principal Investigators Dec 1981 28 p refs Submitted for publication ERTS
(E82-10341; NASA-TM-83871; NAS 1.15:83871) Avail: NTIS HC A03/MF A01 CSCL 05B

The presence of positive serial correlation (autocorrelation) in remotely sensed data results in an underestimate of the variance-covariance matrix when calculated using contiguous pixels. This underestimate produces an inflation in F statistics. For a set of Thematic Mapper Simulator data (TMS), used to test the ability to discriminate a known geobotanical anomaly from its background, the inflation in F statistics related to serial correlation is between 7 and 70 times. This means that significance tests of mean differences of spectral bands initially appear to suggest that the anomalous site is more different in spectral reflectance and emissivity from its background sites. However, this difference often disappears and is always dramatically reduced when compared to frequency distributions of test statistics produced by the comparison of simulated training sets possessing equal means, but which are composed of autocorrelated observations.

A R H.

MIDCONTINENT Quarterly Report, period ending 31 Mar. 1982
R S. CARMICHAEL, Principal Investigator 31 Dec. 1981 31 p refs ERTS
(Contract NASS-26425)
(E82-10321, NASA-CR-168900; NAS 1.26:168900; QR-5) Avail: NTIS HC A02/MF A01 CSCL 08G

The analysis and preliminary interpretation of investigator-B MAGSAT data are addressed. The data processing included: (1) removal of spurious data points; (2) statistical smoothing along individual data tracks, to reduce the effect of geomagnetic transient disturbances; (3) comparison of data profiles spatially coincident in track location but acquired at different times, (4) reduction of data by weighted averaging to a grid with 1 deg x 1 deg latitude/longitude spacing, and with elevations interpolated and weighted to a common datum of 400 km; (5) wavelength filtering; and (6) reduction of the anomaly map to the magnetic pole.

The analysis was found to be a magnitude data anomaly map and a reduce-to-the-pole map supporting the general assumption that, on a large scale (long wavelength), it is induced crustal magnetization which is responsible for major anomalies. Abnormal features are identified and explanations are suggested with regard to crustal structure, petrologic characteristics, and Curie temperature isotherms.

M G.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. LOOKOUT RIDGE QUADRANGLE, ALASKA, VOLUME 2 Final Report

The flight path map, multiparameter profiles, histograms, and anomaly maps are included. Uranium, thorium, potassium, uranium/potassium, uranium/thorium, and thorium/potassium are investigated.

DOE

J W HEAD, III, Principal Investigator 28 Feb. 1982 1 p HCM/M (Contract NAS5-26728) (E82-10352; NASA-CR-168996, NAS 1.26:168996) Avail: NTIS HC A02/MF A01 CSCL 08G

The nature of the HCM/M data set and the general geophysical application of thermal inertia imaging using HCM/M data were studied. Fragment/block size distributions in various terrain types were characterized with emphasis on volcanic terrain. The SEASAT L-band radar images of volcanic landforms at Newberry, Oregon, were analyzed and compared to imagery from LANDSAT band 7.

E.A.K.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: NORTH/SOUTH TIELINE, VOLUME 1 Final Report

Computer printer maps of the magnetic total intensity and the six radiometric parameters were prepared in addition to the radiometric anomaly maps for this area. The magnetic total intensity map displays a rather subdued response pattern of broad low amplitude anomalies over much of the area with an average magnetic intensity of approximately 58,900 gammas. The radiometric response over much of the area is relatively low. Equivalent concentrations of uranium, thorium and potassium only rarely exceed 3.2 ppm, 7.5 ppm and 1.4% respectively. A number of these zones of increased concentrations show corresponding anomalous responses on the uranium/potassium and/or uranium/thorium pseudo-contour maps. Based on this set of computer printer maps alone however, it is, at times, difficult to discern the contribution of coinciding local decreases in the potassium and thorium parameters to these ratio anomalies. Based on the criteria stated in the general section on interpretation, a total of seven uranium and seven thorium anomalies were outlined on the interpretation map.

DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SIOUX FALLS QUADRANGLE, SOUTH DAKOTA, VOLUME 1 Final Report

The flight path, radiometric multiparameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Sioux Falls Quadrangle in South Dakota are presented. These data are used to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium.

DOE

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: NORTH/SOUTH TIELINE, VOLUME 2 Final Report

The six Trans-Pecos Texas quadrangles (Van Horn, Pecos, Marfa, Fort Stockton, Presidido, and Emory Peak Quadrangles, Texas) were surveyed. The aeromagnetic gravity and geochemical data, their processing, and their analysis are discussed. The geologic history and setting of the Trans-Pecos are discussed along with the uranium potential of the region. Uranium anomalies and occurrences are present in the study area, and information is presented on 33 drill holes into the geophysical maps have been prepared to be overlays for the geophysical maps. Residual aeromagnetic anomaly, complete Bouger gravity anomaly, flight line index, gravity station index, and anomaly interpretative maps were prepared for each quadrangle. A large suite of digitally processed maps of gravity and aeromagnetic are included.

DOE
04 GEOLOGY AND MINERAL RESOURCES

INTERPRETATION AND COMBINED GEOPHYSICAL INTERPRETATIONS AND COMBINED GEOPHYSICAL INTERPRETATIONS OF NURE AND RELATED GEOSCIENCE DATA IN THE VAN HORN, PECOS, MARFA, FORT STOCKTON, PRESIDIO, AND EMORY PEAK QUADRANGLES, TEXAS Final Report

An atlas containing the geophysical data publicly available in the Van Horn, Pecos, Marfa, Fort Stockton, Presidio, and Emory Peak quadrangles and a major file of basic data which are the object of much industrial interest is presented. Narrative discussion of the maps and contour maps of the aeromagnetic and gravity data, as well as maps of flight path recovery and gravity station locations are included. Geologic maps, key radiometric data, and ground truth sample location and data are also displayed. A scale of 1:500,000 is employed so that the maps can be overlain for qualitative comparisons. The maps refer to the qualitative analysis, particularly the interpretative anomaly index maps

N82-27810#  Carson Helicopters, Inc., Perkasie, Pa.
NURE AERIAL GAMMA-RAY AND MAGNETIC RECONNAISSANCE SURVEY OF PORTIONS OF NEW MEXICO, ARIZONA AND TEXAS. VOLUME 2: NEW MEXICO-CARLSBAD QUADRANGLE Final Report

A rotary wing high sensitivity radiometric and magnetic survey was flown covering the Carlsbad Quadrangle of the State of New Mexico. The survey was flown with a Sikorsky S-61 helicopter equipped with a high sensitivity gamma ray spectrometer and the dynamic test range at Lake Mead, Arizona Instrumentation and data reduction methods are presented in Volume I of this report. The reduced data is presented in the form of stacked profiles, standard deviation anomaly plots, histogram plots and microfiche listings. The results of the geologic interpretation of the radiometric data together with the profiles, anomaly maps and histograms are presented in this Volume II final report.

N82-27811#  Bendix Field Engineering Corp., Grand Junction, Colo.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SUSANVILLE QUADRANGLE, CALIFORNIA, VOLUME 1 Final Report

An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over ten areas within the Northern California and southwestern Oregon. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 10 x 30 areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. The lines were flown north-south approximately eighteen (18) miles apart. A total of 16,880 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1517 line miles are in this quadrangle. Geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States were computed. The magnitude and distribution of uranium resources with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States were computed.

N82-27812#  Bendix Field Engineering Corp., Grand Junction, Colo.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: ROSEBURG QUADRANGLE, OREGON, VOLUME 2 Final Report

- Data from an airborne high sensitivity gamma ray spectrometer and magnetometer survey of the Roseburg quadrangle, Oregon are presented. The magnitude and distribution of uranium resources and favorable areas for occurrence of uranium in the US are discussed.

N82-27813#  Western Geophysical Co. of America, Houston, Tex. Aerop Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: UKIAH QUADRANGLE, CALIFORNIA, VOLUME 1 Final Report

Transverse lines were flown in an east to west direction at a line spacing of six miles. Tie lines were flown north to south approximately eighteen miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled and interpreted during the survey, of which 1517 line miles are in this quadrangle. Geologic and other information was compiled with which to assess the magnitude and distribution of uranium in the United States.

N82-27814#  Western Geophysical Co. of America, Houston, Tex. Aerop Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: HURON QUADRANGLE, SOUTH DAKOTA Final Report

Geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States were acquired. An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over eleven 20 x 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 NTMS quadrangles in North and South Dakota. The quadrangles located within the North and South Dakota survey area include Devil's Lake, New Rockford, Jamestown, Aberdeen, Huron, Mitchell, and Sioux Falls. The results obtained over the Huron map area are discussed. Traverse lines were flown in an east-west direction at a line spacing of six miles. The lines were flown north-south approximately 24 miles apart.

N82-27815#  Western Geophysical Co. of America, Houston, Tex. Aerop Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: CHICO QUADRANGLE, CALIFORNIA Final Report

The magnitude and distribution of uranium resources with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States was investigated. An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted.
over 10 areas over northern California and southwestern Oregon. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukiah, and Chico along with the 10 x 20 areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. The results obtained over the Chico, California, map area are discussed.

DOE

OCEANOGRAPHY AND MARINE RESOURCES

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

A82-22306* California Inst. of Tech., Pasadena. 
LAbORATORY STUDIES OF ACTINIDE-METAL-SILICATE FRACTIONATION

A82-22619 FEATURES OF COSMIC RAY VARIATIONS DUE TO VARIATIONS IN THE TOTAL MAGNETIC FIELD OF THE SUN

A82-28907* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. 
REMOTE SENSING OF PRECIPITABLE WATER OVER THE OCEANS FROM Nimbus 7 MICROWAVE MEASUREMENTS
C. PRASHAKARA, A. T. C. CHANG (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, MD), and H. D. CHANG (NASA, Goddard Space Flight Center, Laboratory for Atmospheric Sciences, Greenbelt, Computer Sciences Corp., Silver Spring, MD) Journal of Applied Meteorology, vol. 21, Jan 1982, p. 59-58. refs

05 OCEANOGRAPHY AND MARINE RESOURCES

A82-29601* Jet Propulsion Lab., California Inst. of Tech., Pasadena. 
SEASAT MEASUREMENT SYSTEM EVALUATION - ACHIEVEMENTS AND LIMITATIONS

The Seasat project, which demonstrated the feasibility of microwave oceanographic remote sensing, was sponsored by the National Aeronautics and Space Administration and managed by the Jet Propulsion Laboratory. The evaluation of the measurement system (elements of the satellite, the sensors, the data handling, and data processing subsystems) was a key activity of the Seasat project. This paper summarizes the primary achievements and highlights the generic limitations of the evaluation process. Other papers in this issue present details of the geophysical evaluation process carried out under the auspices of the Seasat project. (Author)

A82-29602* Texas Univ., Austin. 
THE SEASAT ALTIMETER DATA AND ITS ACCURACY ASSESSMENT
B. D. TAPLEY (Texas, University, Austin, TX), G. H. BORN, and M. E. PARKE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA). Journal of Geophysical Research, vol. 87, Apr. 30, 1982, p. 3179-3186. NASA-supported research, refs

A description is given of the Seasat satellite radar altimeter, which was designed to measure (1) the altitude of the satellite above the ocean surface, (2) surface wave height, and (3) the ocean-surface backscatter coefficient from which wind speed may be inferred. The atmospheric and geophysical effects influencing radar altimeter measurement accuracies and the attendant correction models adopted for the altimeter geophysical data record are summarized, along with Seasat Altimeter/Precision Orbit Determination Experiment Team activities directed towards the validation and improvement of these models and investigations assessing the accuracy of both the altimeter measurements and the computed satellite altitude ephemeris. (O.C.)

A82-29603* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. 
SEASAT ALTIMETER HEIGHT CALIBRATION

Previously announced in STAR as N81-19526

A82-29604# TIDAL AND GEODETIC OBSERVATIONS FOR THE SEASAT ALTIMETER CALIBRATION EXPERIMENT

As part of the Seasat calibration activities of September and October 1978, a tide gage was installed by the National Ocean Survey at an open coastal location on Bermuda to provide instantaneous sea surface height determinations during Seasat overflights of the island. Because the tide gage was geodetically tied to the laser tracking station on Bermuda, the satellite's position relative to the sea surface could be determined independently for comparison with altimeter measurements. A root sum square error of 4.0 cm in the laser's vertical position determination, relative to the sea surface, has been estimated apart from possible errors arising from the present lack of precise information on the elevation of the Bermuda geoid. (O.C.)
AN EMPIRICAL DETERMINATION OF THE EFFECTS OF SEA STATE BIAS ON SEASAT ALTIMETRY
G. H. BORN, M. A. RICHARDS (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA), and G. W. ROSBOROUGH (Texas, University, Austin, TX) Journal of Geophysical Research, vol. 87, Apr. 30, 1982, p. 3227-3231. refs

A linear empirical model has been developed for the correction of sea state bias effects, in Seasat altimetry data altitude measurements, that are due to (1) electromagnetic bias caused by the fact that ocean wave troughs reflect the altimeter signal more strongly than the crests, shifting the apparent mean sea level toward the wave troughs, and (2) an independent instrument-related bias resulting from the inability of height corrections applied in the ground processor to compensate for simplifying assumptions made for the processor aboard Seasat. After applying appropriate corrections to the altimetry data, an empirical model for the sea state bias is obtained by differencing significant wave height and height measurements from coincident ground tracks. Height differences are minimized by solving for the coefficient of a linear relationship between height differences and wave height differences that minimize the height differences. In more than 50% of the 36 cases examined, 7% of the value of significant wave height should be subtracted for sea state bias correction.

A EMPIRICAL DETERMINATION OF THE EFFECTS OF SEA STATE BIAS ON SEASAT ALTIMETRY

SEA-STATE-RELATED ALTITUDE ERRORS IN THE SEASAT RADAR ALTIMETER

A significant wave height-dependent bias is identified in Seasat-measured surface heights which cannot be neglected when using Seasat data at accuracies within 10 cm. Ten-second averages of the data from 63 waveform sampling rates in the Seasat radar altimeter were least squares fitted with a six-parameter model, the time-origin parameter of which provides a measure of the position of the actual mean radar waveform relative to the sampling rate and therefore provides attitude measurement corrections. Attention is given to actual altimeter point target response function, waveform sampler noise baseline, waveform sampler gain calibration, attitude angle and sea surface skewness, as effects not accounted for in Seasat altimeter measurements and standard data processing.

SEA-STATE-RELATED ALTITUDE ERRORS IN THE SEASAT RADAR ALTIMETER

SEASAT ALTIMETER DETERMINATION OF OCEAN CURRENT VARIABILITY
R. L. BERNSTEIN, R. H. WHRITNER (California, University, La Jolla, CA), and G. H. BORN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Journal of Geophysical Research, vol. 87, Apr. 30, 1982, p. 3261-3268. refs

An experiment conducted in the Kuroshio Current, east of Japan, has confirmed the ability of radar altimeters of precision on the order of 10 cm, such as that of the Seasat satellite, to measure the small oceanic height variations associated with geostrophic ocean currents. Changes in surface dynamic height were inferred from data gathered by air-expendable bar乔nographs, which had been dropped to coincide with the Seasat subtrack, for the periods between the flights of September 25 and October 5 and 13, 1978. The changes registered generally agreed to within + or - 10 cm of the height changes observed in the altimeter data.
THE SEASAT ALTIMETER MEAN SEA SURFACE MODEL


Gndding techniques are used to combine an 18-day set of Seasat altimeter data and two precisely-computed Seasat ephemeredes, in order to arrive at global contour maps of the mean sea surface topography. The altimeter data have an rms agreement of 0.11 m with the SS3 mean sea surface computed by means of the PGS-SS3 ephemeredes, and of 0.70 m with the SS4 mean sea surface derived from the PGS-S4 ephemeredes. While comparisons with the GEM 10B 1 x 1 deg gravimetric geoid have yielded rms differences of 2.8 m, those with a global mean sea surface derived from GEOS 5 altimeter data show rms differences of 1.3 m and 1.1 m for the cases of the SS3 and SS4 surfaces, respectively. An SS4 mean sea surface topograph is featured among the study findings presented. Further improvements in the representation of mean sea surface topography are expected with the development of more accurate gravity models for orbit computation.

THE SEASAT-A SATELLITE SCATTEROMETER - THE GEOPHYSICAL EVALUATION OF REMOTELY SENSED WIND VECTORS OVER THE OCEAN


A description is given of the algorithm used to convert Seasat-A satellite microwave scatterometer measurements of ocean normalized radar cross section to the neutral stability vector wind at 19.5 m height, as well as to compare these winds with high-quality surface observations. The wind vector algorithm used an empirical normalized radar cross section model function to describe the ocean normalized radar cross section's dependence on the 19.5-m neutral stability wind vector. In addition, two model functions were evaluated by means of an independent set of in situ surface wind observations from the Joint Air Sea Interaction experiment (JASIN). Better results were produced by these comparisons than the stipulated Seasat wind speed and direction accuracy specifications of + or - 2 m/sec and + or - 20 deg, respectively, over the 0.16 m/sec range of winds observed during JASIN.

THE RELATIONSHIP BETWEEN WIND VECTOR AND NORMALIZED RADAR CROSS SECTION USED TO DERIVE SEASAT-A SATELLITE SCATTEROMETER WINDS


The Seasat-A Satellite Scatterometer (SASS) ocean normalized radar cross section (NRCS) dependence on the 19.5-m neutral stability wind vector may be specified as a function of radar incidence angle, the angle between wind direction and radar azimuth, and the neutral stability wind speed expressed in m/sec at a height of 19.5 m. An account is given of the development of models both expressing this relationship and providing the basis of inversion of NRCS to SASS winds, from initially aircraft scatterometer measurement-based forms to three Seasat field-validation experiments which furnish model NRCS versus surface winds speed data for comparison with SASS data.

SURFACE WIND ANALYSES FOR SEASAT

R. A. BROWN (Washington, University, Seattle, WA), V J CARDONE (Oceanweather Inc., White Plains, NY), T. GUYMER (Institute of Oceanographic Sciences, Wormley, Surrey, England), J. HAWKINS (NOAA, National Hurricane and Environmental Meteorology Laboratory, Bay Saint Louis, MS), J. E. OVERLAND (NOAA, Pacific Marine Environment Laboratory, Seattle, WA), W. J. PIERSON (City College, New York, NY), S. PETERHEYCH (Department of the Environment, Atmospheric Environment Service, Downsview, Ontario, Canada), J. C WILKERSON (NOAA, Camp Springs, MD), P M. WOICESHYN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA), and M WURTELE (California, University, Los Angeles, CA) Journal of Geophysical Research, vol. 87, Apr. 30, 1982, p. 3355-3364. refs

During the 99 days of Seasat operation, two large-scale experiments were conducted which established the satellite sensors' wind measuring capabilities: (1) the Gulf of Alaska Experiment (GOASEX), and (2) the Joint Air Sea Interaction Experiment (JASIN), which unlike GOASEX was independent of the Seasat program and undertook comprehensive air and sea investigations which furnished excellent comparison data for Seasat. Qualitative comparison windfields were also provided by several storms. The point measurements in GOASEX and JASIN were averaged in conjunction with Seasat scatterometer regions and, on the basis of comparisons between several anemometers on buoys and meteorological ships and the calculation of varous averaging times, a 20-mm average yields a scatterometer scale windfield accuracy of up to + or - 1 m/sec and + or - 10 deg in well-behaved windfields.
05 OCEANOGRAPHY AND MARINE RESOURCES

INTERCOMPARISON OF WIND SPEEDS INFERRED BY THE SASS, ALTIMETER, AND SMRR
(Contract NAS1-16032; NASA-100)

The operational theory, control algorithms, and comparisons with surface-determined wind speeds for the scatterometer (SASS), altimeter (ALT), and passive microwave radiometer (SMRR) on board the Seasat satellite are presented. Radiative scattering combining specular reflections and Bragg resonance scattering are noted to occur at biting waves and sea foam, two conditions highly correlated with wind speed. SASS scans swaths of 70, 200, and 700 km from nadir, the SMRR covers a 150 km ship. Normalized radar sections are derived from the SASS and ALT telemetry, and brightness temperature from the SMRR ALT winds were found to be biased about 3 m/sec low, while intercomparison between the SASS and SMRR data showed a mean difference of 0.3 m/sec with a standard deviation from measured winds of 1.7 m/sec or less. The effects of land thermal emissions, rain, and sun glint are discussed, and good viewing conditions are concluded to result in 2 m/sec accuracy. M.S.K.

A82-29622* Jet Propulsion Lab., California Inst. of Tech., Pasadena
DESCRIPTION OF SEASAT RADIMETER STATUS AND RESULTS
(Contract NAS7-100)

Improved geophysical algorithms are shown to be able to determine sea surface temperature (SST) to an accuracy of 1 C (1 sigma) under favorable surface and atmospheric conditions over an SST range of 10-30 C. Under similar conditions, the radiometer wind retracves track the scatterometer winds within a scatter of 2 m/sec (1 sigma) over a wind speed range of 0-25 m/sec. These conditions require that contamination from land, rain, sun glint, and radio frequency interference be avoided. What is more, water vapor determinations in the midlatitudes and in the tropical Pacific are found to agree with estimates of precipitable water from radiosondes to within 10%.

C.R.

A82-29623* Stanford Univ., Calif.
THE OBSERVATION OF OCEAN SURFACE PHENOMENA USING IMAGERY FROM THE SEASAT SYNTHETIC APERTURE RADAR - AN ASSESSMENT
J. F VESECKY (Stanford University, Stanford, CA) and R. H STEWART (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, California, University, La Jolla, CA) Journal of Geophysical Research, vol 87, Apr. 30, 1982, p. 3397-3430. refs
(Contract N00014-75-C-0356; NOAA-MAO-01-78-00-4318)

The principles governing synthetic aperture radar (SAR) and its use on the Seasat spacecraft are reviewed. The way in which wind stress, surface currents, long gravity waves, and surface films modulate the scattering properties of resonant (approximately 30-cm-wavelength) waves is discussed, with particular emphasis placed on the mechanisms that could produce images of long gravity waves. Doppler effects by ocean motion are also described. Measurements of long (wavelength more than about 100 m) gravity waves made using Seasat SAR imagery are compared with surface measurements during several experiments. Combining these results, it is found that dominant wavelength and direction are measured by Seasat SAR within + or - 12% and + or - 15 deg, respectively. It is noted, however, that ocular waves are not always visible in SAR images, and detection criteria are discussed in terms of wave height, length, and direction. C.R.

A82-29624* National Oceanic and Atmospheric Administration, Seattle, Wash
SEASAT WIND AND WAVE OBSERVATIONS OF NORTHEAST PACIFIC HURRICANE IVA, AUGUST 13, 1978

The paper examines Seasat wind and wave observations collected in the eye of hurricane Iva on August 13, 1978, in the northeast Pacific. A maximum wind speed of 25-30 m/s is observed, along with a banana-shape high-wind-speed distribution. Two-dimensional Fourier transforms of selected SAR scenes show a dominant wavefield characterized by wavelengths of 165-211 m, with a fanlike distribution of propagation directions. A simple geometric model is proposed to explain the dominant wave field in terms of low storm intensity and location, which is combined with the Ross parametric hurricane wave model and Seasat wind and wave data to estimate a value of 43 km for the effective radial distance from the storm center to the region of maximum winds.

D.L.G.

A82-30666#
A STUDY OF THE EARTH'S RADIATION BUDGET USING A GENERAL CIRCULATION MODEL
A model clarifying the roles played by clouds and the surface in determining the seasonal variations in the radiation budget is described. The model employs an interactive radiation scheme with seasonally varying climatological sea surface temperatures, incoming solar radiation, and zonal mean climatological cloud amounts. Since its simulation of the various components of the earth's radiation compares favorably with results from satellites, its results are used in explaining certain aspects of the observed budget. The model results are also used to estimate the earth's annual mean total energy budget and, in particular, the poleward flux of heat by the oceans. The oceanic heat flux implied by the model compares favorably with estimates based on observations, the main differences being at the equator and near the North Pole.

C.R.

A82-30810
A SEARCH FOR SEAMOUNTS IN THE SOUTHERN COOK AND AUSTRAL REGION

A82-31294#
EMISSIVITY AND REFLECTANCE OF THE MODEL SEA SURFACE FOR THE USE OF AVHRR DATA OF NOAA SATELITES

The emissivity and reflectance of the sea surface modeled from AVHRR advanced radiometer sensing from the NOAA-6 satellites, are derived as a function of the incident and emergent directions of radiation. The sea surface is modeled numerically with slope components varying according to a gaussian distribution, including isotropy if independent of the wind direction, and anisotropy if dependent on the wind direction. The geometry of the slope with changing incident and reflecting angles is formulated in terms of spherical trigonometry. Treatment of the surface as a specular reflector is found to be acceptable except for visible light, where the reflecton depends on the surface characteristics and a bivariate gaussian analysis is necessary. Additional influences
due to oil slicks are considered, particularly for reflectance reduction.

M.S.K.

A82-31995* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.

RETRIEVAL OF OCEAN SURFACE AND ATMOSPHERIC PARAMETERS FROM MULTICHANNEL MICROWAVE RADIOMETRIC MEASUREMENTS

Methods for the retrieval of ocean surface temperature, surface wind speed, rain rate, cloud height, and the amounts of water vapor and nonprecipitated liquid water over the ocean from Scanning Multichannel Microwave Radiometer (SMMR) data are presented. The sensitivity of retrieval algorithms for wind speed and sea surface temperature, in the absence of rain, to the undetected presence of rain, is discussed along with the accuracy of a more general method for the retrieval of rain rate in conjunction with other meteorological parameters. It is concluded that the inability to retrieve the average rain rate accurately at small rain angles is due to the inability of SMMR to distinguish between small raindrops and nonprecipitating droplets.

A82-32559#

LASER-INDUCED BIOLUMINESCENCE

A project has been initiated to determine the feasibility of developing a complete airborne remote sensing system for rapidly mapping high concentration patches of bioluminescent organisms in the world's oceans. Conceptually, this system would be composed of a laser illuminator to induce bioluminescence and a low light level image intensifier for detection of light. Initial laboratory measurements consisted of using a 2-J flash lamp pulsed optical dye laser to excite bioluminescence in the marine dinoflagellate Pyrocystis lunula at ambient temperature using Rhodamine 6G as the lasing dye (585 nm) and a laser pulse width of 1 microsec. After a latency period of 15-20 msec, the bioluminescence maximum occurred in the blue (480 nm is the wavelength maximum for most dinoflagellate bioluminescence) with the peaking occurring approximately 65 msec after the laser pulse. Planned experiments will investigate the effect of different excitation wavelengths and energies at various temperatures and salinities of the cultures.

A82-32651

A SHIP AND SATELLITE VIEW OF HYDROGRAPHIC FEATURES IN THE WESTERN GULF OF MEXICO
D. A. BROOKS (Texas A & M University, College Station, TX) and R. V. LEGECKIS (Texas A & M University, College Station, TX; NOAA National Earth Satellite Service, Washington, DC) Journal of Geophysical Research, vol 87, May 20, 1982, p. 4195-4206. refs

(Contract NSF OCE-79-24606; NSF OCE-78-22481)

In April 1980, nearly synoptic hydrographic observations were obtained in the western Gulf of Mexico by satellite and ship. A meandering surface thermal front which turned northeastward from the Mexican coast near 23 deg N was prominent in the satellite infrared observations. The front separated a southern anticyclone and a northern cyclone, both of which had horizontal scales of several 100 km and were prominent in the subsurface hydrographic observations. The eastward geostrophic volume transport in the confluent leg of the two features was roughly equal to that of the Florida Current. A shallow layer of fresh, cool water from the Texas shelf region extended about 300 km seaward into the cyclone along the northern side of the front. Remnant Subtropical Underwater in the core of the April anticyclone indicates its origin in the eastern Gulf Loop Current.

A82-32881

ON THE SYNTHETIC APERTURE RADAR IMAGING OF OCEAN SURFACE WAVES

A process of synthetic aperture radar imaging of ocean surface waves is considered on the basis of the two-scale model of microwave scattering by a disturbed sea surface. Analytical expressions are obtained to relate characteristics of a large-scale wave image, averaged over an ensemble of realizations of the small-scale ripple, with the wave, radar, and viewing scheme parameters. It is shown that the wave image would be defocused as an image of a target moving in the along-track direction with a speed equal to a half of the wave phase speed projection on the line of flight. The defocusing magnitude was measured experimentally for the ocean swells images, obtained with an airborne S-band radar, and the results are found to be in satisfactory agreement with the model predictions.

A82-32882*

Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OCEAN WAVE HEIGHT MEASUREMENT WITH SEASAT SAR USING SPECKLE DIVERSITY

Measurement of ocean wave heights with the synthetic aperture radar can be accomplished with high spatial resolution by determining the variation of speckle intensity with the frequency and angle of illumination. A comparison of data obtained by the SEASAT SAR with surface truth measurements obtained during the GOASEX and the JASIN experiments demonstrates this concept.

A82-32902

INFRARED SENSING OF SEA SURFACE TEMPERATURE FROM SPACE

The retrieval of sea surface temperature information from the infrared signals received by remote sensing satellites is examined. Factors influencing the received signal are evaluated, including surface emissivity, spectral radiance, atmospheric transmittance, and sources of error in lengthy computer retrievals based on the integration of the radiative transfer equation related to imperfections in atmospheric transmittance models, uncertainties in the vertical profiles of atmospheric pressure, temperature and humidity profiles, temperature discontinuities at the air-sea interface, differences between surface and bulk water temperatures and the neglect of surface emissivity and reflectance are pointed out. The simple retrieval scheme of Prabhakara et al. (1974), which makes use of three spectral bands to achieve an rms error of + or - 1.1 K, is then reviewed, and a simplified version of this scheme based on only two bands is presented which reduces the rms error to + or - 1.0 K.

A82-32903

NEARSHORE CURRENT PATTERN OFF SOUTH TEXAS - AN INTERPRETATION FROM AERIAL PHOTOGRAPHS

Turbidity patterns seen on aerial photographs of nearshore waters are analyzed to derive the current patterns in a 4-km wide zone along the south Texas coast. Scales of color aerial photographs were taken vertically from an altitude of 3700 m on December 23, 1968, following the passage of a cold front.
accompanied by strong northwesterly to northeasterly winds. Examination of photographs taken from 6 to 80 m apart indicate the presence of southward currents nearly parallel to the shore, with velocities increasing from about 17 cm/sec off shore to about 40 cm/sec at the breakers. Rip-current plumes were observed to drift with the longshore current and be deformed by the horizontal shear. The turbidity by which these currents were traced originated in Aransas pass, a tidal inlet connecting several estuarine bays to the Gulf of Mexico, and a preceding ebb-tidal plume from the same inlet. A linear pattern of turbid and less turbid bands also suggests the development of Langmuir circulation with cell axes parallel to the shelf current.

**A82-32917**
MEASURING SEA SURFACE TEMPERATURE FROM SATELLITES - A GROUND TRUTH APPROACH
D. C. MCCONNAGHY (NOAA, Southwest Fisheries Center, La Jolla, CA)

Determining the correction for atmospheric attenuation is a major problem in processing thermal infrared digital data from very high resolution radiometers aboard NOAA Polar Orbiting Satellites. An empirical equation for estimating this correction is developed. The coefficients of the equation are determined by using regression techniques and comparing satellite observations to sea surface temperature measurements. Although there is not sufficient data to fully evaluate this procedure, initial satellite measurements are within 0.5°C of independent sea surface temperature measurements.

**A82-33322** National Aeronautics and Space Administration
Langley Research Center, Hampton, Va
DEPRESSION OF BRIGHTNESS TEMPERATURE OF SEA SURFACES COVERED WITH MONOMOLECULAR OIL FILMS RELATIVE TO CLEAN WATER SURFACES AT 1.43 GHZ
H. J. C. BLUME (NASA, Langley Research Center, Hampton, VA)
Institute of Electrical and Electronics Engineers, International Geoscience and Remote Sensing Symposium, Munich, West Germany, June 1-4, 1982, Paper 6 p. refs

**A82-33438** National Aeronautics and Space Administration
Langley Research Center, Hampton, Va
CHARACTERISTICS OF 13.9 GHZ RADAR SCATTERING FROM OIL FILMS ON THE SEA SURFACE
J. W. JOHNSON and W. F. CROSWELL (NASA, Langley Research Center, Hampton, VA)

Air-borne microwave scatterometer measurements were presented, which were made in 1979 as part of a project to study the response of a number of active and passive microwave and optical remote sensors to an oil-covered sea surface conducted by NASA Langley Research Center. A 13.9-GHz Doppler scatterometer with a fan beam antenna and coherent detection was used to measure radar backscatter as a function of incidence angle. The radar scattering signature of the clear surface and signatures of the surface covered with various crude oil films are compared. Reductions in Ku band microwave backscatter up to 14 dB are observed for both treated and untreated LaRosa and Murban crude oil films deposited on the sea surface. Maximum Ku band sensitivity to the effects of the oil in terms of differential scatter is observed in the 25-35 deg incidence angle region.

**A82-33717**
SATELLITE OBSERVATIONS OF SEA SURFACE TEMPERATURE AROUND THE BRITISH ISLES
Research supported by the European Space Agency, Natural Environment Research Council, and Science and Engineering Research Council.

TIROS-N Advanced Very High Resolution Radiometer (AVHRR) imagery has been used to study the temperature structure of the sea surface around the British Isles. The satellite imagery from both TIROS-N, METEOSAT and conventional synoptic data are combined to obtain a calibration for both 11-micron infrared channels, which gave sea surface temperatures accurate to ±0.5 K. The changes in the sea surface temperature around the British Isles for July 12, 1979 are shown well by the satellite data. In particular, a study is made of an anomalously warm patch in the North Sea that appeared at local noon over an area where the surface winds were weak, inhibiting surface mixing.

**A82-34219**
COASTAL ENVIRONMENT CHANGE ANALYSIS BY LANDSAT MSS DATA
J. K. HONG (Tokyo University of Agriculture and Technology, Tokyo, Japan) and J. ISSAKA (IBM Japan, Ltd., Tokyo, Japan)

A case study of coastal environmental change is conducted using computer-assisted analysis of Landsat scenes for three different years. The Kanto area in Japan is divided into three study areas on the basis of social and geographical factors. Land use changes along the bay from November 26, 1972, to November 11, 1980, are studied and the results are interpreted by referring to the ground truth data. The results show a continuous decrease in the area of shallow water along the bay and changes in land use in the coastal areas. The changes are recognized as being closely related to the bay area changes; they are found to correspond well to differences in social developments in the study areas. Landsat data are thus shown to provide sufficient information on the environmental changes taking place.

**A82-36005**
ESTIMATION OF THE TEMPERATURE OF THE UPPER BOUNDARY OF CLOUD COVER OVER THE WORLD OCEAN [OTSENKA TEMPERATURY VERKHENEI GRANITY OBLACHNOSTI NAD MIROVYM OKEANOM]
O. AVASTE, O. KIARNER, and S. KEEVALLIK (Akademia Nauk Estonskoi SSR, Institut Astrofiziki i Fiziki Atmosfery, Tartu, Estonian SSR)
Meteorologiya i Gidrologiya, June 1982, p. 54-59. In Russian

The temperature of the upper boundary of cloud cover over the world ocean is estimated on the basis of cloud-amount estimates made by Avaste et al. (1981). Climatological means of sea surface temperature, and mean monthly values of outgoing radiation fluxes are presented. Mean monthly upper-cloud-boundary temperatures over the world ocean are estimated for the 30°N to 30°S latitude belt. Data from the Nimbus-3 and NOAA meteorological satellites were used in the estimation.

**A82-36341**
INTERANNUAL VARIATIONS OF OUTGOING IR ASSOCIATED WITH TROPICAL CIRCULATION CHANGES DURING 1974-1978
B. LIEBMANN and D. L. HARTMANN (Washington, University, Seattle, WA)
(Contract NSF 78-07368; NSF 81-06099)

Interannual variability of outgoing IR in the tropical Pacific Ocean is studied using measurements derived from the NOAA scanning radiometer. In addition to the usual mean maps, seasonal anomaly maps are constructed from June, July, August 1974-December 1977, and January, February 1978. Time series representing the equatorial eastern Pacific sea-surface temperature (SST) anomalies and monthly anomalies at various locations are also plotted. During this period a warming event occurs, in which SSTs in the eastern Pacific rapidly become anomalously warm. Dramatic changes in outgoing IR occur simultaneously with this SST increase. The region of convergence over Indonesia shifts eastward and connects to a well-developed intertropical convergence zone (ITCZ). The South Pacific convergence zone (SPCZ) is also connected to the Indonesian convergence zone, but develops more slowly and does not reach its maximum strength until more than a year after the SST increases occur. By this time the ITCZ has returned to its

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AQUANTITATIVE MULTISPECTRAL ANALYSIS SYSTEM FOR AERIAL PHOTOGRAPHS APPLIED TO COASTAL PLANNING


A system that may be used to study the dispersion of effluents in the sea either by means of their color or by using a fluorescent tracer, rhodamine B, is described, and its use is illustrated with the study of the dispersion over one day of a release of rhodamine in seawater. The underlying principle is the adjustment of the data acquisition device to the optical properties of the phenomenon being studied, so that the signal-to-noise ratio is optimized. A very accurate digitizing microdensitometer is used, and the data processing system is adapted to allow for correction of radiometric, spatial, and temporal variations. A simple mathematical representation of the interaction of sunlight with the environments encountered before reaching the negative is employed. An experimental procedure that eliminates the need for sampling from boats is used to follow the evolution of the plume, giving maps showing quantity of rhodamine to an accuracy of about five percent.

C. D
the BALSAMINE experiment. A set of successive pictures is presented in loops. Each picture can be moved relative to the others. Pictures are aligned using landmarks and cloud motions are measured by moving the pictures so that the observed cloud appears motionless during the loop. The relative displacement of the pictures and the location of the cloud elements are recorded and the results are processed on a computer that plots them on a map. It takes 4 hr to obtain a field. Results compare well with other methods and indicate that low cloud tracers follow the wind like constant level balloons. Over the Indian Ocean low cloud representatives are of the 900-850 mb layer. Cloud winds are advocated as a tool for investigating monsoon overturnings. Regions which are predominantly convective tropics and into the subtropics than for times of less active tropical monsoon than over the eastern Arabian Sea. In the central Arabian Sea, deepening is greatest at the northern end. In the eastern Arabian Sea the layer deepening is higher at the southern location. The observed deepening shows good agreement with the computed layer depth, considering convective turnover caused by surface cooling. However, wind induced mixing contributes to the observed layer depth more in Phase-1U than Phase-2U. Vertical flow at the base of the mixed layer is upward, causing entrainment of colder waters from the upper thermocline and leading to mixed layer deepening and cooling.

Author (ESA)

N82-23909# Naval Physical and Oceanographic Lab., Cochin (India).

ON THE SPACE-TIME VARIABILITY OF OCEAN SURFACE MIXED LAYER CHARACTERISTICS OF CENTRAL AND EASTERN ARABIAN SEA DURING MONSOON-77

R. R. RAO, P. G. K. MURTY, M. G. JOSEPH, and K. V. S. RAMAN in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt. 8 p Apr 1981

Avail. NTIS MF A01; HC WMO

Surface mixed layer deepening and cooling of the Arabian Sea, which occurs in a nonhomogeneous manner during the monsoon season, is described. Ship polygons collected data on mixed layer (MLD) characteristics Average MLD and vertical temperature gradient below MLD were recorded spatially and temporally. Deepening and cooling rates are higher over the central Arabian Sea than over the eastern Arabian Sea. In the central Arabian sea, deepening is greatest at the northern end. In the eastern Arabian Sea the layer deepening is higher at the southern location. The observed deepening shows good agreement with the computed layer depth, considering convective turnover caused by surface cooling. However, wind induced mixing contributes to the observed layer depth more in Phase-1U than Phase-2U. Vertical flow at the base of the mixed layer is upward, causing entrainment of colder waters from the upper thermocline and leading to mixed layer deepening and cooling.

Author (ESA)

N82-23910# Wisconsin Univ., Madison

ESTIMATES OF SEA SURFACE STRESS FOR SUMMER MONEX FROM CLOUD MOTIONS

B. B. HINTON and D. P. WYLIE in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt. 5 p Apr. 1981

Avail. NTIS MF A01; HC WMO

Numerical modeling of surface wind stress is described. Satellite winds, cloud motions and monthly ship data are analyzed. Cloud moisture content is plotted as a function of the speed measured by a collocated ship. A regression line extrapolates speed from cloud to ship level. Regression relations are exploited for direction changes, e.g. veering. Cloud and ship data are merged in order to produce daily stress maps. Results agree with observed published data. The method is accurate over a wide area, at a 2 deg or more resolution, for several days. Cross correlations indicate that gndded cloud motion measurements error characteristics are compatible with ship wind measurements.

Author (ESA)

N82-23912# Australian Numerical Meteorology Research Center, Melbourne.

THE ONSET OF THE AUSTRALIAN NORTHWEST MONSOON DURING WINTER MONEX: BROADSCALE FLOW REVEALED BY AN OBJECTIVE ANALYSIS SCHEME

B. J. MCAVANEY, N. E. DAVIDSON, and J. L. MCBRIDE in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt. 5 p Apr. 1981

Avail. NTIS MF A01; HC WMO

The structure on the surface of the seasonal movement of the equatorial trough was studied using an univariate, three-dimensional optimum interpolation objective analysis scheme. Wind field and surface pressure are analyzed. Analyses are cycled so that the analysis from 12 hr previous is used as the first guess field. Ships, aircraft, land stations, ocean platforms, satellite and archive data are analyzed. The monsoon onset is a large scale event (10 deg latitude by 30 deg longitude). It is not preceded by a similar change in the Northern Hemisphere. Forcing comes

Author (ESA)

N82-23908# Miami Univ., Fla.

MONEX OCEANOGRAPHIC OBSERVATIONS ALONG THE EAST AFRICAN COAST

O. B. BROWN AND F. SCHOTT in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt. 16 p Apr. 1981

Avail. NTIS MF A01; HC WMO

Ship, buoy, and satellite current, temperature and air pressure data were used in order to study the Somali current. Wind field development, near surface circulation and upwelling were noted.
from changes in the Southern Hemisphere subtropical circulation. These changes are well simulated by numerical prediction models on the 3 to 4 day time scale.

Author (ESA)

N82-23929# Brookhaven National Lab, Upton, N. Y. Atmospheric Sciences Div.

MARINE BOUNDARY LAYER WIND STRUCTURE OVER THE BAY OF BENGAL DURING MONEX-79

S. SETHRAMAN in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt 7 p Apr 1981 refs Sponsored by NSF

Avail: NTIS MF A01; HC WMO

The role of the atmospheric boundary layer in monsoon formation was investigated through a micrometeorological tower which observed turbulent fluxes of heat and momentum over the ocean, a weather station that continuously recorded mean parameters, and pilot balloon observations to a height of 1 km. Wind profiles and surface/layer fluxes of momentum and heat indicate a change in the direction of the heat flux (in a vertical plane). Surface heat flux is upward with small values for cases with large downward heat fluxes in the upper layers. This occurs when the monsoon trough is far northward causing a break in the monsoon. When the trough moves to its normal position, there is a strong convective boundary layer over the Bay of Bengal.

Author (ESA)

N82-23939# MAIN Geophysical Observatory, Leningrad (USSR). ESTIMATES OF THE STATISTICAL STRUCTURE OF THE ATMOSPHERIC PRESSURE FIELD IN SUMMER MONEX-79 AREA

I. A. DUBYKIN, E. A. SOSNINA, and N. A. SHKABURA in WMO Intern. Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt 4 p Apr 1981 refs

Avail: NTIS MF A01; HC WMO

Atmospheric pressure measurements (P) obtained from ships and three stationary polygons are presented. Diurnal course values, the temporal correlation structural functions, and their 95% confidence intervals were calculated using data with the diurnal course included and excluded. These show that in the northwest Indian Ocean the mean background of pressure oscillates within the limits 1011, 9 + or - 0, 7 gPa and the scatter of singular measurements is within 1011, 9 + or - 2, 8 gPa in the premonsoon period. During transition to monsoon circulation it is within 1008, 7 + or - 1, 2 gPa and 1008, 7 + or - 3, 7 gPa. During the monsoon onset it is 1007, 4 + or - 0, 7 gPa and 1007, 4 + or - 3, 2 gPa. The mean pressure field variability sigma P shows no significant differences for the polygons. It is within 1, 4 sigma P in 1, 7 gPa.

Author (ESA)

N82-23945# All-Union Scientific Research Inst. of Hydrometeorological Information, Moscow (USSR). WORLD DATA CENTRE.

ANALYSIS OF OCEAN AND ATMOSPHERE THERMODYNAMICAL CHARACTERISTICS DURING THE ONSET OF SOUTHWEST MONSOON OVER THE ARABIAN SEA

P. V. NUZHIDIN in WMO Intern Conf. on Early Results of FGGE and Large-Scale Aspects of its Monsoon Expt 2 p Apr 1981

Avail: NTIS MF A01; HC WMO

Ship surface and oceanographic data are used to analyze the onset of the Arabian Sea monsoon. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling. A positive enthalpy anomaly is formed in this area from the moment of monsoon onset. Areas of marked heat storage, such as the central Arabian Sea are treated as centers of air sea coupling.

Author (ESA)

N82-24597# Defence Science and Technology Organisation, Edgewof (Australia).


Feb 1982 88 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn. National Space Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM (E82-10324; NASA-CR-168903; NAS 1.26 168903; PANRL-1/82, AR-38466) Avail: NTIS HC A05/MF A01 CSCL 08F

Of the Nearly 1000 standard infrared photographic images received, 273 images were on computer compatible tape. It proved necessary to digitally enhance the scene contrast to cover only a select few degrees K over the photographic grey scale appropriate to the scene-specific range of sea surface temperature (SST). Some 178 images were so enhanced. Comparison with sea truth show that SST, as seen by satellite, provides a good guide to the ocean currents and eddies off East Australia, both in summer and winter. This is in contrast, particularly in summer, to SST mapped by surface survey, which usually lacks the necessary spatial resolution.

Author

N82-25609# Jet Propulsion Lab., California Inst. of Tech., Pasadena

SEA-ICE MISSION REQUIREMENTS FOR THE US FIREX AND CANADA RADARSAT PROGRAMS


Avail: NTIS HC A05/MF A01 CSCL 08F

A bilateral synthetic aperture radar (SAR) satellite program is defined. The studies include addressing the requirements supporting a SAR mission posed by a number of disciplines including science and operations in sea ice covered waters. Sea ice research problems such as ice information and total mission requirements, the mission components, the radar engineering parameters, and an approach to the transition of spacecraft SAR from a research to an operational tool were investigated.

S. L.

N82-26525# Remote Sensing Systems, Sausalito, Calif.

THE EFFECT OF SEA-SURFACE SUN GLITTER ON MICROWAVE RADIOMETER MEASUREMENTS

F. J. WENTZ 4 Nov. 1981 58 p refs (Contract JPL-954958)

(NASA-CR-168984; NAS 1.26 168984) Avail: NTIS HC A05/MF A01 CSCL 08F

A relatively simple model for the microwave brightness temperature of sea surface Sun glitter is presented. The model is an accurate closeform approximation for the fourfold Sun glitter intensity. The model computations indicate that Sun glitter contamination on orbit radiometer measurements is appreciable over a large swath area. For winds near 20 m/s, Sun glitter affects the retrieval of environmental parameters for Sun angles as large as 20 to 25 deg. The model predicted biases in retrieved wind speed and sea surface temperature due to neglecting Sun glitter are consistent with those experimentally observed in SEASAT SMMR retrievals. A least squares retrieval algorithm that uses a combined sea and Sun model function shows the potential of retrieving accurate environmental parameters in the presence of...
A STUDY OF ATMOSPHERIC DIFFUSION FROM THE LANDSAT IMAGERY

N. DEJESUSPARRADA, Principal Investigator, Y. VISHWADHAM, and J. A. TORSANI Dec. 1981 58 p refs Submitted for publication Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (E82-10380; NASA-CH-168981; NAS 1.26:168981; INPE-2284-PRE/060) Avail: NTIS HC A04/MF A01 CSCL 04A

LANDSAT multispectral scanner data of the smoke plumes which originated in eastern Cabo Frio, Brazil and crossed over into the Atlantic Ocean, are analyzed to illustrate how high resolution LANDSAT imagery can aid meteorologists in evaluating specific air pollution events. The eleven LANDSAT images selected are for different months and years. The results show that diffusion is governed primarily by water and air temperature differences. With colder water, low level air is very stable and the vertical diffusion is minimal; but water warmer than the air induces vigorous diffusion. The applicability of three empirical methods for determining the horizontal eddy diffusivity coefficient in the Gaussian plume formula was evaluated with the estimated standard deviation of the crosswind distribution of material in the plume from the LANDSAT imagery. The vertical diffusion coefficient in stable conditions is estimated using Weinstock's formulation. These results form a data base for use in the development and validation of meso scale atmospheric diffusion models.

ICE DISTRIBUTION AND WINTER SURFACE CIRCULATION PATTERNS, KACHEMAK BAY, ALASKA

L. W. GATTO Dec 1981 52 p refs (AD-A110806; CRREL-81-22) Avail: NTIS HC A04/MF A01 CSCL 08C

Development of the hydropower potential of Bradley Lake, Alaska, would nearly double winter freshwater discharge from the Bradley River into upper Kachemak Bay, and the Corps of Engineers is concerned about possible subsequent increased ice formation and related ice-induced problems. The objectives of this investigation were to describe winter surface circulation in the bay and document ice distribution patterns for predicting where additional ice might be transported if it forms. Fifty-one LANDSAT MSS band 5 and 7 and RBV images with 70% cloud cover or less, taken between 1 November and 30 April each year, were analyzed for the eight winters from 1972 to 1980 with standard photointerpretation techniques. Results of this analysis showed that glacial sediment discharged into Kachemak Bay acts as a natural tracer in the water. Inner Kachemak Bay circulation in the winter is predominantly counterclockwise, with northeastward nearshore currents along the south shore and southwestward nearshore currents along the north shore. Most of the ice in the inner bay forms at its northeast end and is discharged by the Fox, Sheep and Bradley Rivers. Some ice becomes shorefast on the tidal flats at the head of the bay, while some moves southwestward along the north shore pushed by winds and currents. When this ice reaches Coal Bay, it accumulates between Homer Spit and the north shore. This buildup extended out to Coal Point at the tip of Homer Spit in February 1976 and 1978; ice was not observed in the nearshore zone along the south shore of the inner bay.

Rapid oceanographic data gathering: some problems in using remote sensing to determine the horizontal and vertical thermal distributions in the Northeast Pacific Ocean. M.S. Thesis

G. W. LUNDELL Sep 1985 189 p refs (AD-A111005; NUFB-85-1-006) Avail: NTIS HC A09/MF A01 CSCL 08J

NOAA-6 satellite AVHRR data and AXBT data were collected in the Northeast Pacific Ocean in late 1980 as part of the Naval Postgraduate School-sponsored Acoustic Storm Transfer and Response Experiment which was in turn part of the U.S.-Canadian Storm Transfer and Response Experiment (STREX). Some of the problems in transferring AXBT geographical positions to satellite images were solved by designing a computer program with accuracies of less than 2 pixels. Thermal comparisons were made between AXBT, NOAA-6, and GSSTCOMP data with the result that NOAA-6 data was on the average of 2.9 C colder than AXBT data and 3 C colder than GSSTCOMP data. Linear regression methods reduced to 0.3 C the difference between NOAA-6 and AXBT data. Use of this method over a period of 15 days produced
a mean error of 0.5 C. Although NOAA-6 cannot sense directly the subsurface thermal structure, it is excellent for observing surface manifestations of horizontal thermal features. Further investigation into using satellite data as the basis of an empirical relationship between the surface temperature and the subsurface vertical thermal structure is warranted. 

Author (GRA)
A SIMULATION OF SOIL MOISTURE ESTIMATION BY A SPACE SAR

An evaluation of the accuracy of soil moisture estimates available from satellite radar remote sensing is made, along with an assessment of the effects of spatial resolution on the estimation accuracy. Synthetic aperture radar (SAR) images of a 17.7 x 19.3 km test site were generated by image simulation techniques for a synthetic aperture radar (SAR) orbiting at 600 km and operating at 4.75 GHz, an HH polarization, and an angle of incidence range between 7-22 deg from nadir. Data bases were constructed of U-2 color IR photographs, 20 m x 20 m pixel soil elements from the USDA totalling 800,000 pixels classified for target class, soil texture, and surface elevation. Three sets of images were generated for four varying soil moisture distributions across the site. Soil moisture in 90% of the 20 m x 20 m pixels were found to be predictable in terms of moisture capacity to within 20% of a 100 m x 100 m resolution was best for very dry soil conditions.

A SPACE SAR INTERPRETATION OF SURFACE-WATER CIRCULATION, ARANAS PASS, TEXAS, USING LANDSAT IMAGERY

The development of plumes of turbid surface water in the vicinity of Aranas Pass, Texas has been analyzed using Landsat imagery. The shape and extent of plumes present in the Gulf of Mexico is dependent on the wind regime and astronomical tide prior to and at the time of satellite overpass. The best developed plumes are evident when brisk northerly winds suspend bay-bottom muds and flow through Aranas Pass is increased by wind stress. Seaward diversion of nearshore waters by the inlet jetties was also observed. A knowledge of surface-water circulation through Aranas Pass under various wind conditions is potentially valuable for monitoring suspended and surface pollutants.

A COMPARATIVE STUDY OF MICROWAVE RADIOMETER OBSERVATIONS OVER SNOWFIELDS WITH RADIATIVE TRANSFER MODEL CALCULATIONS

(Author)

Use of AERIAL PHOTOGRAPHY IN DETERMINING LAND USE AND STREAMFLOW RELATIONSHIPS ON SMALL DEVELOPING WATERSHEDS

Research supported by the University of Minnesota.

AERIAL PHOTOGRAPHY FOR COVER TYPE EFFECTS ON SNOWFIELD OBSERVATIONS

AERIAL PHOTOGRAPHY FOR COVER TYPE EFFECTS ON SNOWFIELD OBSERVATIONS
AERIAL PHOTOGRAPHY VS. LANDSAT FOR DIGITAL LAND-COVER MAPPING IN AN URBAN WATERSHED

A comparison was made between digital analyses of color infrared film and Landsat to provide land-cover information in an urban watershed. The results were compared to a manual photo interpretation of a black and white infrared photograph. Both the color infrared and Landsat produced similar land-cover acreages and both were similar to the black and white interpretation. However, the color infrared was found to be a better representation. (Author)

STUDY OF THE HYDROLOGICAL CYCLE BY AEROSPACE METHODS [IZUCHENIE GIDROLOGICHESKOGO TSIKLA PO AEROKOSMICHESKIM METODAMI]
K. IA. KONDRATEV, (ED.) and IU V KURILOVA Moscow, Izdatel'stvo Radio i Sviaz', 1982. 100 p. In Russian

Topics discussed include principles and methods of the study of the hydrological cycle on the basis of remote-sensing methods, water-balance differentiation of natural complexes on the basis of satellite photographs, the use of remote sensing to study the hydrology of elementary watersheds, and methods for the analysis of the melting of firm complexes on the basis of satellite photographs. The mapping of snow lines in the central part of the European USSR, the forecasting of pluvials floods in Mongolia on the basis of remote-sensing data, the measurement of water-surface temperature by means of airborne infrared radiometers, the use of multispectral photography to study littoral zones, and the use of remote sensing to study the space-time variability of water quality are also considered. B J.

PRINCIPLES AND METHODS OF THE STUDY OF THE HYDROLOGICAL CYCLE ON THE BASIS OF AEROSPACE DATA [PRIINTSIPI I METODY IZUCHENIIA GIDROLOGICHESKOGO TSIKLA PO AEROKOSMICHESKOMU INFORMATSII]

The paper examines the possibilities and advantages of using satellite data to study various aspects of the hydrological cycle. Methods for evaluating the separate components of the cycle are generalized. In addition, indirect methods for determining slowly and rapidly varying parameters of the cycle on the basis of global TV and IR data acquired by satellites are proposed. Attention is also given to the principles of dynamic regionalization according to types of processes and landscape features on the basis of multispectral data. B J.

WATER-BALANCE DIFFERENTIATION OF NATURAL COMPLEXES ON THE BASIS OF SATELLITE PHOTOGRAPHS [VODNOBALANSOVAIA DIFFERENTSIIATSIIA PRIRODNYKH KOMPLEKSOV NA OSNOVE ISPOL'ZOVANIITYA KOSMICHESKIIH SNIMKOV]

The paper examines methods for assessing the role of natural complexes, particularly forest complexes, in hydrology. These methods are then used to evaluate techniques of the differentiation and mapping of hydrological parameters on the basis of the structural elements of natural-territorial complexes. As an example, attention is given to the thermal and water-balance characteristics of the natural complexes of the middle and southern tage of the Ob-Yenisei interfluve as determined from satellite photographs. B J.

THE POSSIBILITY OF USING REMOTE-SENSING METHODS TO STUDY THE HYDROLOGY OF ELEMENTARY WATERSHEDS [VOZMOZHNOSTI PRIMENENIIA DISTANTSIIONNYKH METODOV V OBLASTI GIDROLOGII ELEMENTARNYKH VODOSBOROV]

Theoretical and experimental determinations of the microwave radiation characteristics of wet soils are compared. A survey is then presented of methods for monitoring the hydrological regimes of soils in the visible, infrared, and microwave ranges. Particular emphasis is placed on the use of active-radar techniques at wavelengths of 0.3-30 cm and even 100 cm, which make it possible to analyze the hydrological regimes of soils at great depths. B J.

THE SEASONAL SNOW-LINE WITHIN THE FERGANA BASIN AND THE POSSIBILITY OF USING IT FOR HYDROLOGICAL FORECASTING [SEIZONNAIA SNOGOVAIA GRANITA V PREDELAHK FERGANSKOII KOTLOVINY I VOZMOZNOSSII EE ISPOL'ZOVANIIA I GIDROPROGNOZAKH]

TV data acquired by meteorological satellites during 1969-1978 are used to study snow cover within the mountain region of the Fergana basin. The dynamics of the seasonal snow-line during spring thaw is investigated, and the positions of the seasonal snow-line for individual days in 1969 are given. The data are used to evaluate the possibility of making hydrological forecasts on the basis of relationships between the monthly average water discharge and the height of the snow line at the end of the preceding month. B J.

THE USE OF SATELLITE PHOTOGRAPHS TO STUDY SNOW-COVER DYNAMICS AND TO DETERMINE THE AVERAGE WATER DISCHARGE OF THE AMUDARYA DURING A VEGETATION PERIOD [ISPOL'ZOVANI SPUTNIKOVYKH SNIMKOV DLIA IZUCHENIIA DINAMIKI SNEZHNOGO POKROVA OTSENNI SREDNEGO RASHHODA VODY AMUDARYA I DENI V GIDROPROGRAMZH]

METHOD FOR THE ANALYSIS OF THE MELTING OF A FIRN COMPLEX ON THE BASIS OF AEROSPACE PHOTOGRAPHS [METODIKA RASCHETA TAIANIIA KOMPLEKS II SNEZHNIKOV PO AEROKOSMICHESKIM SNIMKAM]

The characteristics of firn melting are investigated on the basis of studies performed in the polar Urala, Crimean, and Kamchatka, as well as on the basis of satellite data. It is shown that the intensity of melting is determined by the dimensions and shape of the firn basin. A dimensionless parameter for the shape of a firn basin is proposed which makes it possible to calculate the melting rate of individual firn basins as well as their complexes. Methods of automated processing of satellite photographs are examined, which may be used to determine this parameter in hydrometeorological calculation and forecasting. B J.
A82-35134

The paper examines techniques for the compilation of snow-cover melting maps from satellite photographs as well as methods for the interpretation of snow-cover features for various territories. Attention is given to the possibility of determining the following features from satellite photographs: the position of snow lines and the velocity of their motion, and the extent of snow in river drainage systems. The accuracy with which snow lines can be depicted on maps is examined. B.J.

A82-35135

Two sets of experiments are described whose objective was to evaluate the accuracy of the MIR-3 small-scale infrared radiometer, installed on the Il-14 aircraft, for measuring the surface temperature of natural water bodies. The first set involved measurements of the surface temperature of Lake Issyk-Kul, carried out in July 1977. The second set involved five series of measurements of the surface temperature of the Aral Sea and five series of measurements of the surface temperature of Lake Issyk-Kul. The effect of atmospheric attenuation on the performance of the radiometers was evaluated. B.J.

A82-35138

Remote-sensing techniques for obtaining the quantitative characteristics of the space-time variability of water quality and reservoir pollution are assessed with particular attention given to the possibility of developing an operational system for the monitoring of water quality. Optimal spectral ranges of measurements, photointerpretation keys, and zones of relatively constant concentration values are determined on the basis of ground-based and airborne measurements. Algorithms for the processing of remote-sensing images obtained by different techniques are examined, and a hybrid system based on the synthesis of TV and digital data is proposed. B.J.

A82-35140

The application of HCMM thermal infrared data to snow hydrology and the prediction of snowmelt runoff was evaluated. For the Salt Verde watershed in central Arizona and the southern Sierra Nevada in California, HCMM data were compared to LANDSAT and NOAA satellite data, U-2 thermal data, and other correlative data. It was determined that HCMM thermal imagery provides data as accurate for snow mapping as does satellite data, but the accuracy is rather poor. B.J.

A82-37501

Multispectral scanning data from Landsat are used to study the sandbanks and tidal flats in the Tay Estuary, and the specialized digital image-processing system used in the study is briefly described. Several examples of Landsat-2 images of the Tay Estuary and its environs are presented as false-color composites and monochromatic pictures, and a qualitative interpretation and several quantitative ones are presented. The low-water mark for sandbanks in the upper and lower estuary is determined and the results are compared with existing charts and maps, showing that changes in the positions of sandbanks of the size found in the estuary can be monitored satisfactorily using satellite imagery. The position of an estuarine front is mapped and also observed in situ in the position indicated by this image. An attempt at quantitative bathymetry, using a high tide Landsat image, indicated that depths up to three or four meters can be determined from the satellite data, but the accuracy is rather poor. C.D.

N82-22625*# Environmental Research and Technology, Inc., Concord, Mass.


The application of HCMM thermal infrared data to snow hydrology and the prediction of snowmelt runoff was evaluated. For the Salt Verde watershed in central Arizona and the southern Sierra Nevada in California, HCMM data were compared to LANDSAT and NOAA satellite data, U-2 thermal data, and other correlative data. It was determined that HCMM thermal imagery provides data as accurate for snow mapping as does visible imagery, and that in comparison with the resolution of other satellite imagery, it may be the most useful. Data from the HCMM thermal channel, with careful calibration, provides useful snow surface temperature data for hydrological purposes. An approach to an automated method of analysis is presented. J.D.
DATA PROCESSING AND DISTRIBUTION SYSTEMS

N82-22644# National Oceanic and Atmospheric Administration, Rockville, Md. Ocean Technology and Engineering Services Office.

BIAS CORRECTION PROCESSES FOR AIRBORNE LASER HYDROGRAPHY

Depending on the entry nadir angle of the beam and the optical properties of the water, one of two opposing effects, multiple scattering and geometric "undercutting", will dominate and result in either a deep or shallow depth measurement bias, respectively. The magnitude of this bias can greatly exceed international hydrographic accuracy standards, and hence bias correctors must be calculated and applied to the raw depths in postflight data processing to attain the required accuracy for the overall system. The magnitudes of the bias correctors depend not only on the water and flight parameters, but also on the basic design of the receiver electronics. Several typical systems and procedures required to calculate a set of bias correctors for any given system are described and a cookbook approach for the necessary postflight data processing algorithms are included. GRA

N82-22854# National Oceanic and Atmospheric Administration, Rockville, Md. Earth Satellite Lab

A STATISTICAL APPROACH TO RAINFALL ESTIMATION USING SATELLITE AND CONVENTIONAL DATA
L. F WHITNEY, JR. Apr 1982 55 p refs (NOAA-TR-NESS-89) Avail NTIS HC A04/MF A01

A statistical approach is employed in an attempt to estimate convective rainfall using both satellite and conventional data. A variety of variables derived from both satellite and conventional meteorological sources are presented. From among these variables, a screening regression method selects those which best explain area-averaged rainfall. Among the cases studied, the relationship of each variable to rainfall is weak to poor, particularly as cases are combined. Although multivariate selections improve the relationships, inconsistency of selection develops from one case to another and from one time to another, even in the same meteorological situation. Regression equations are found to estimate the amount inadequately, even when using dependent data. At best, rainfall is not likely to be measured quantitively by such an approach and, at worst, concern is raised about the validity of using the variables investigated to estimate rainfall.

B.W

N82-24569# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DYNAMIC STUDY OF THE UPPER SAO FRANCISCO RIVER AND TRES MARIAS RESERVOIR USING MSS/LANDSAT IMAGES M.S. Thesis

The relationship between the dispersion and concentration of sediment in the superficial layers of the Tres Marias reservoir and the dynamics of the drainage basins of its tributaries was verified using LANDSAT MSS imagery. The drainage network, dissection patterns, and land use of each watershed were considered in an analysis of multispectral images, corresponding to bands 4, 5, and 7, of dry and rainy seasons in 1973, 1975, 1977, and 1978. The superficial layer water layers of the reservoir were also divided according to the grey level pattern of each image. Two field trips were made to collect Secchi depths and in situ water reflectance. It is concluded that it is possible to determine the main factors that act in the dynamics of the drainage basins of a reservoir by simultaneous control of the physical variables and the antropic action of each basin.

A.R.H.

N82-24601# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.

HCMM HYDROLOGICAL ANALYSIS IN UTAH Quarterly Progress Report

Temperature calibration and groundwater depth location studies were finalized. Distinctions among algae species and among suspended materials (turbidity) using HCMM data were investigated. Field evaluations of algae's effect on evaporation pan readings were completed and related to the lake and HCMM data. Additional correlations among infrared and reflectivity data were made using the color graphics capabilities developed during this project.

E.A.K

07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

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

A82-22538# New Hampshire Univ., Durham

FRAGMENTATION OF FE NUCLEI ON CARBON, HYDROGEN AND CH2 TARGETS. I - INDIVIDUAL CHARGE CHANGING AND TOTAL CROSS SECTIONS. II - ISOTOPIC CROSS SECTIONS

The fragmentation of Fe nuclei in carbon and CH2 targets at energies of 650, 800, and 950 MeV/nuc has been studied. Direct measurements of the interaction between Fe nuclei and the carbon and CH2 targets were carried out. The Fe to H charge changing cross sections derived for selected nuclei showed a clear energy dependence, consistent with the results of Westfall et al. (1979) Values for the total inelastic cross section Fe to H charge changing were determined by two methods: the first method involved subtracting the total CH2 and C cross sections (values of 703 plus or minus 9 mb and 65 plus or minus 10 mb at 950 MeV/nuc and 650 MeV/nuc, respectively were obtained). The same cross sections were obtained by adding the individual charge changing cross sections A cross section for Fe to fragment into lower mass Fe isotopes of 65 plus or minus 5 mb was also observed, giving total inelastic mass changing cross sections of 768 plus or minus 11 mb and 716 plus or minus 12 mb, respectively. In addition, the individual isotopic cross sections for Z equals 16-25 are reported.

J.F.


The interstellar spectra of several cosmic ray nuclei and ions (H, He, C, O) are calculated in the energy range from 10 MeV/n, where the charge-exchange processes become significant. The ionization energy loss and the processes of electron loss and capture are taken into account. The cosmic ray intensity calculation is discussed in detail, and spectra results are presented and interpreted.

J.F.
A82-22555* New Hampshire Univ., Durham
THE CHARGE AND ISOTOPIC COMPOSITION OF Z EQUALS 7-16 COSMIC RAY NUCLEI AT THEIR SOURCE
Using the cosmic ray data from our 1976 and 1977 balloon flights, the charge and isotopic composition of Z equals 7-16 cosmic ray nuclei have been determined. A low abundance of both N and Ne in the cosmic ray source relative to solar cosmic rays is observed. However, the cosmic ray source ratio, Ne-22/Ne is 2.75 plus or minus 0.42 times the solar ratio. A possible enhancement of the Mg-26/Mg ratio, which is 1.29 plus or minus 0.14 times the solar ratio is also observed. (Author)

A82-22558 COSMIC RAY COMPOSITION FROM ACCELERATION OF THERMAL MATTER
The source composition of cosmic rays is thought to be controlled by Coulombian interactions during the acceleration of thermal matter. A given element is representative of the source or depletion depending on whether the predominant ionic state at the temperature of the source is lower than a threshold imposed by Coulombian losses. Coupling this restriction to the theory of ionization equilibrium, the source abundances are calculated. The results corroborate sources of relatively low temperature. C.R.

A82-22559 ACCELERATION OF COSMIC RAYS IN ACCRETION SHOCKS
Spherically symmetric accretion around condensed astronomical objects like white dwarfs, neutron stars and black holes very often go through a quasi-stationary shock close to the object. The transport of radiation, energetic particles and neutrinos in such flows is studied, and it is found that these are accelerated to high energies very efficiently. The generated spectra are seen to have power-law behavior when the diffusion coefficient is independent of particle momentum. The possibility that the bulk of the galactic cosmic rays are accelerated by approximately 10,000 neutron stars which are surrounded by dense interstellar clouds is briefly discussed. (Author)

A82-22573 THE GALACTIC ORIGIN OF COSMIC RAYS, II
The cosmic ray pressure limit to cosmic ray acceleration in the interstellar medium (ISM) is considered. It is found that the beta equals 1 Alvén speed streaming limit imposes a new and strong constraint on supernova-ISM shock models of cosmic-ray acceleration. A more detailed analysis is, therefore, required. Ultrahigh energy cosmic rays are also discussed, giving attention to sources of cosmic rays inside and outside the Galaxy. In connection with complexities and constraints, one source for all energies within all galaxies is finally considered, taking into account a flattening of the source in slope and the characteristics of spectrum and flux produced by the shock ejection of the envelope of a type I supernova. G.R.

A82-22575 ASTROPHYSICAL SCENARIOS FOR CRITICALLY EVALUATING A ZERO-POINT FIELD ACCELERATION MECHANISM
If the electromagnetic zero-point field of ordinary quantum theory is considered as a real field that may act on particles in the usual way that random fields act in classical electrodynamics, it is possible to show that electromagnetically interacting particles perform a random walk in velocity space to ever-increasing translational kinetic energies. As the zero-point field has a Lorentz invariant energy density spectrum, it can be shown that in a very high vacuum an unconfined gas of infinitely many of those particle displays an energy spectrum of the form E to the (-eta) (eta is a parameter) when in equilibrium with the zero-point field. Scenarios are presented in order to critically discuss and evaluate the possible astrophysical relevance of the model as applied to the acceleration of particles in intergalactic space. (Author)

A82-22576 CALCULATION OF PRODUCTION RATES OF COSMOGENIC NUCLIDES BY MONTE CARLO METHOD
A method is presented for the calculation of production rates of cosmogenic nuclides based on Monte Carlo simulations of hadronic cascade processes in matter. Calculations are carried out for the case of a semi-infinite iron slab with a thickness of 2.5 m, and the hadronic cascade is assumed to consist only of nucleons and pions. The nucleide production is found to exhibit only a weak energy dependence, especially at higher energies. D L G.

A82-22577 MEASUREMENT OF COSMOGENIC NUCLIDES USING A MULTI-CRYSTAL GAMMA-RAY COINCIDENCE SPECTROMETER
The activities of Na-22 and Al-26 in a recently fallen meteorite, Mayo Belwa, have been measured using an improved gamma-ray spectrometer. This uses six sodium iodide detectors, arranged symmetrically, so that extended samples can be measured. By recording total rates, 2-fold and 3-fold coincidences simultaneously, it is possible to correct for source absorption and other instrumental effects. The absolute intensity of Al-26 was found to be comparable to that found in other meteorites, but that of Na-22 is anomalously high. (Author)

A82-22578 NUCLEOSYNTHESIS OF LIGHT AND BY-PASSED ISOTOPES IN THE SOLAR SYSTEM MATTER
A model of nucleosynthesis of light and by-passed isotopes is proposed, which is based on the idea that a supernova event led simultaneously to nuclear explosion burning, to collective...
acceleration of particles up to relativistic energies by shock waves, and to spallation reactions. It is shown that solar system matter was formed in two main events of intense nucleosynthesis. The first event led to the formation of about 99 percent of K-40, V-50, and the by-passed isotopes with A not less than 113. The second event led to the formation of observed abundances of isotopes and about 1 percent of other products of spallation reactions. Proton fluxes, the alpha/p value, the gamma value, irradiation duration, and the sequence of nucleosynthesis processes are obtained.

D.L.G.

A82-22579

MAGNETIC MONOPOLE PAIR AND ITS OBSERVATION IN COSMIC RAYS


The bound system of a magnetic monopole and an antimonopole is analyzed. It is pointed out that the angular momentum of the ground state may be 48 or 194. Some unexplained events in cosmic rays may be identified as the monopole pairs with high spin.

(Author)

A82-22580


The sun and heliosphere are examined from satellite data of solar cosmic ray events recorded by satellite and theories of the interplanetary propagation of particles and particle acceleration within the heliosphere. Attention is given to X-ray, radio, energetic electron, gamma ray, and nuclear reactions of energetic protons observations of solar activity. Ground-, balloon-, and satellite-based detection of particle events are discussed, along with data relevant to the propagation of particles, especially for He-3 enriched events. Modulation of galactic cosmic rays by the solar cycle is explored, and theories of the interplanetary propagation of particles and of the heliospheric medium are presented. Theoretical models of the acceleration of particles within the heliosphere are investigated, including the effect of planetary magnetospheres on the solar-accelerated particles.

M.S.K.

A82-22581

MODEL FOR SOLAR HARD X-RAY BURSTS


Balloon-borne observations of the hard X-ray burst event of Sept 19, 1979 are presented as a basis for a description of the temporal behavior of a number of electrons. One NaI(Tl) monitor and four NaI(Tl) counters provided measurements in the energy ranges 30-50, 50-80, 80-120, and 120-200 keV with a counting rate of 1 sec. The energy spectra of the hard X-rays were correlated with solar flares and sunspots, and were fitted to power law forms evaluated at the sampling time. A trap-plus-precipitation model describes accelerated electrons as being magnetically trapped and precipitated onto a denser region, leading to hard X-ray emission, yielding a electron/X-ray ratio calculated to be 1,700,000, in accord with other observations. A thermal model approximated the energy spectrum of hard X-rays by the thermal radiation spectrum from hot plasma, with variations in temperature and emission.

M.S.K.

A82-22582

THE DETERMINATION OF DIFFERENTIAL X-RAY SPECTRUM OF THE SOLAR FLARE USING IONOSPHERIC DATA


The ionization velocity of X-rays from a solar flare entering the lower ionosphere is determined by first assuming that the X-ray spectrum outside the atmosphere is described by a third degree polynomial. The absorption of monochromatic radiation is modeled as a function of atmospheric density, of the absorption cross-section, and of the path length. The ionosphere is divided into three levels, from which coefficients are calculated from data on ionization from the X-ray flux. Substitution of the coefficients into the third degree polynomial equation yields the differential X-ray spectrum.

M.S.K.

A82-22585

UNUSUAL PROPERTIES OF PARTICLE EVENTS ASSOCIATED WITH SOLAR FLARE GAMMA RAY EVENTS


An attempt to establish a link between gamma rays observed at the earth with solar flare areas highly enriched with electrons is presented. Two hour averages of the counting rates of 5-100 MeV electrons and 25-145 MeV protons performed on the ISEE-3 spacecraft were correlated with solar flares with a maximum intensity of 6-11 MeV electrons and 25-44 MeV protons recorded by other observers. The coverage was part of the Solar Maximum Mission, which attained a 50 percent coverage. Gamma-ray associated events showed high ratios of electrons to protons, about 0.2, and electrons with energies greater than 80 MeV were observed, which are values high enough to produce the highest gamma rays observed, 40 MeV. The available data for electron, proton, and rare isotope fluxes and the time histories of the fluxes are noted to provide a data base for further information on solar flares and particle acceleration mechanisms.

M.S.K.

A82-22586


Results from ISEE-3 experiments on interplanetary energetic charged particles from gamma-ray line solar flares are presented. Observations of interplanetary energetic charged particles on June 7, June 21, and July 1, 1980 dealing with gamma ray producing solar flares are reported. The data were gathered by the Ultra Low Energy Wide Angle Telescope, which comprises a thin window, flow through proportional counter/solid-state detector composition telescope. Evidence of a specified time delay from an observed flare and the recording of 0.44-1.3 MeV electrons on ISEE-3 combined with quiescent periods of at least two hours before the commencement and recording provides a link between the events. The data indicates interplanetary energetic particle enhancement, and a second, similar set of occurrences was also observed. Protons were accelerated up to 10-20 MeV. No enrichment of either He-3 or Fe was found.

M.S.K.
07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

A82-22590
AZIMUTHAL PROPAGATION OF FLARE PARTICLES IN THE HELIOSPHERE
Empirically determined properties of solar coronal particle transport are used to quantitatively describe coronal propagation. A velocity dependence of the transport is formulated based on the diffusive nature of the transport and the observation that a drift motion acts on the particles. Both characteristics are assumed to be applicable outside of the fast propagation region, where convective processes dominate. An evolution of particle density is defined, and time profiles of the distribution are calculated for the two regions just before propagation into outer space. A prediction of prompt particles is made, and is caused by contact between the expanding magnetic bottle and field lines of opposite polarity, which leads to a tearing mode instability and a transfer of energy excess to thermal particles. A calculation of the growth time of the instability shows that particles will be observed before the flare particles appear.
M. S. K.

A82-22597
THE SOLAR PROTON FLUXES IN APRIL, 1979
Increases in the solar low-energy proton intensity near the earth detected in April 1979 by the Venera-11 space probe are discussed. During that period the probe was located at approximately 55 deg west of the sun-earth line. A comparison between the proton intensity profiles measured on Venera-11 and on earth shows that the proton propagation conditions during the period of high solar activity were essentially inhomogeneous in the azimuthal direction.
C. R.

A82-28905
SURFACE TEMPERATURE DETERMINATION FROM AN AMALGAMATION OF GOES AND TIROS-N RADIANCE MEASUREMENTS
A technique for exploiting the TIROS-N capability of measuring the earth skin surface temperature and the GOES ability to monitor surface changes with line temporal and horizontal resolution is described. Atmospheric absorption due to water vapor is assumed to vary slowly in space and time relative to the same scales of the GOES observations, thus allowing a horizontally varying correction field derived from 2-hr TIROS-N data to be used to obtain quasi-continuous surface temperature features from the GOES data. Additionally, a field of temperature differences between the corrected TIROS-N window channel brightness temperatures and uncorrected GOES brightness temperatures are specified. The GOES temperatures are then correctable to within six hours. Two examples are provided of regional temperature assessments with comparison with surface-measured data and accuracy with the satellite data is within 1 K.
M. S. K.

A82-29326
DEVELOPMENT OF THREE-DIMENSIONAL SPATIAL DISPLAYS USING A GEOGRAPHICALLY BASED INFORMATION SYSTEM
Procedures necessary for the development of a generalized three-dimensional perspective software capability in support of graphic, topographic, and color mapping of Landsat data are reviewed. The NASA Earth Resources Laboratory developed the procedures in order to facilitate the processing and analysis of disparate, geographically oriented base maps from aircraft and satellite sensors. Perspective displays are obtained through a translation of the space-viewed object to a vantage point coordinate system, followed by a rotation through two angles for alignment along the vantage line of sight, and finally a perspective transformation to yield two-dimensional displays with no hidden lines. Matrix equations for the transformations are reviewed, including scaling, and block diagrams are provided of the data and perspective software systems. The classification data plane may be mapped onto a topographic elevation data plane.
M. S. K.

A82-29328
THE USE OF RESIDUAL IMAGES IN LANDSAT IMAGE ANALYSIS
Methods of classification of Landsat data for interactive image display and analysis are reviewed, and the use of the residual image to improve the postclassification analysis is examined. The mean image is formed from an accumulation of the mean radiance values from four channels, while the residual image is generated in the form of pixels in terms of the difference between the class mean and the actual measured radiances. The residual image facilitates detection of departures from hierarchical classes and patterns. A reference model is developed to standardize residual images, and gains in texture analysis during visual analysis are noted with inclusion of the residual images. Examples are provided of land cover mapping an area in southeast Australia, and spectral class mapping on the northeast coast, where differences between inland and coastal vegetation are made visible using residual imagery.
M. S. K.

A82-29409
DESCRIPTION OF GRAY LEVEL PICTURE USING A COLLECTION OF DENSITY CONTOUR LINES
T. AGUI, M. NAKAJIMA, and K. MATSUBARA (Tokyo Institute of Technology, Yokohama, Japan) Institute of Electronics and Communication Engineers of Japan, Transactions, Section E (English), vol E 65, Jan 1982, p. 36-43. refs
An extraction method of density contour lines of gray level pictures is described. Two kinds of quads composed of four image pixels and non-image pixels are defined for making the density contour lines simple closed paths. From the resultant density contour lines of simple closed paths, a tree graph is made for executing the recognition of a house included in a monochromatic aerial photograph of an urban area.
(Author)

A82-29762
RELATING LANDSAT DIGITAL COUNT VALUES TO GROUND REFLECTANCE FOR OPTICALLY THIN ATMOSPHERIC CONDITIONS
The relation of Landsat digital count (DDC) values to ground-measured bidirectional reflectance (R), is obtained from four previous investigations that are summarized and examined as a unified data set, is shown to be useful in the estimation of R by...
means of a simplified linear formulation for conditions approximating optically thin atmospheres. All digital count values and formulas were corrected to appear as though obtained at a sun zenith angle of 39 deg, with a Landsat-2 calibration for the January 22-July 15, 1975 period. The relations for R4-7 are: -5.9 + 0.476DC4c, -1.94 + 0.373DC5c, -1.40 + 0.412DC6c, and -0.49 + 1.220DC7c, respectively. O.C.

A82-32039
EXTRACTION OF LINE SHAPED OBJECTS FROM AERIAL IMAGES USING A SPECIAL OPERATOR TO ANALYZE THE PROFILES OF FUNCTIONS

Line-shaped objects are extracted sequentially by object-guided and object-specific methods with the facility for interactive support. The line following starts at locations which reliably are part of line-shaped objects. Two different object-guided methods may be initialized at these starting points. The methods follow the object by applying special operators to extract line segments. The operator is described that analyzes the function profiles, the detection of starting points, the two methods for line following and the combination of all methods in a system for the extraction of line-shaped objects from discrete gray level pictures. Results of a test are shown.

C. D.

A82-32344
PRELIMINARY EVIDENCE FOR THE INFLUENCE OF PHYSIOGRAPHY AND SCALE UPON THE AUTOCORRELATION FUNCTION OF REMOTELY SENSED DATA

This paper deals with the approximation of probability density functions with dependent feature trees. The optimal dependent feature trees are proposed to be constructed using criteria of mutual information and distance measures. Expressions are derived for the criteria when the distributions of the features are Gaussian. Expressions are developed for the covariances between the features connected by a path in a dependent feature tree. The case when the nodes in a dependent feature tree represent a set of features is also considered. Furthermore, experimental results from the classification of remotely sensed multispectral scanner imagery data are presented.

A82-32345
DEPENDENT FEATURE TREES FOR DENSITY APPROXIMATION. I - OPTIMAL CONSTRUCTION AND CLASSIFICATION RESULTS

A simple method has been developed for estimating wave height from synthetic aperture radar (SAR) imagery obtained by the Seasat satellite. The method is based on measuring the contrast of the image and the wavelength of the dominant wave. A calculation has been made for two orbits made by the satellite over the North Atlantic in 1978, using digitally processed data supplied by DFVLR in West Germany. Comparison with sea truth measurements shows agreement to within about 20 per cent.

A82-32350
DIGITALLY ENHANCED VISUAL DISPLAYS FACILITATE THE ANALYSIS OF LANDSAT IMAGERY

There have been efforts during most of the past decade to increase the interpretability of Landsat multispectral scanner (MSS) imagery through the performance of various kinds of image enhancement. Attention is given to research recently conducted for the U.S. Forest Service (USFS) with the objective to develop improved "multiresource inventory methods" entailing the direct visual analysis of Landsat MSS imagery. The establishment of the resource categories to be identified is discussed along with approaches for producing the digitally enhanced visual displays, the preparation of the image analysis keys, the selection of personnel to evaluate the imagery, and the administration of the image interpretability tests. Preliminary results clearly showed that the studied procedure of enhanced visual display (color composite image in opaque print form) was significantly more interpretable than the conventional Landsat color composite imagery.

G. R.
A82-32581* Lowell Observatory, Flagstaff, Ariz.

SUBTLETTIES IN THE FLAT-FIELDING OF CHARGE-COUPLED DEVICE (CCD) IMAGES


(Astronomical photometry with CCDs will often involve relatively low signal levels (less than 1000 charge carriers per pixel), at which nonlinear effects sometimes become significant. These effects will probably play a role in the processing of Space Telescope data. The problem apparently arises because signal charges are not read out equally completely from all columns and all pixels. It is shown that, although a first-order correction can be made by subtracting a low-level flat field from all frames before conventional processing, higher accuracy can be achieved by modeling the response with a nonlinear function.)

A82-32709 COMPUTATION WITH PHYSICAL VALUES FROM LANDSAT DIGITAL DATA


(Although the analysis of Landsat digital images by using the digital numbers for each pixel recorded on a computer-compatible magnetic tape may be adequate when only a single, internally-consistent image is used, incorrect results will be given by the procedure if more than one image is used for analysis, as in mosaics or temporal overlays. The digital numbers for each pixel should in such cases be converted to their dimensionless equivalents, such as (1) radiance, as measured at the satellite, in mW/sq cm per steradian (sr), or (2) reflectance, both of which vary depending on the calibration of satellite MSS, sun angle, atmospheric state, terrain slope and aspect, and surface cover. Equations are given for reflectance and radiance calculations for the cases of five radiometric conditions, neglecting atmospheric correction.)

A82-32900 GEOGRAPHIC LOCATION OF INDIVIDUAL PIXELS


(A major problem in processing thermal infrared digital data from very high resolution radiometers aboard NOAA Polar Orbiting Satellites is the geographic placement of digital data fields. Geographic placement is especially difficult over oceanic areas because of the lack of landmarks. Using a series of geometric constructions, an analytic approach may be developed for geographic location of individual data pixels. The errors associated with this method are generally less than 0.1 deg latitude and longitude.)

A82-32904* California Univ., Santa Barbara.

THE USE OF PRIOR PROBABILITIES IN MAXIMUM LIKELIHOOD CLASSIFICATION OF REMOTELY SENSED DATA


(refs)

(A new classification procedure that removes sharp-edge features from digital imagery and that more clearly reveals any patterns more diffuse in nature that may be present is proposed. The procedure relies on the hypothesis that the sharp edges separate areas of uniform but differing optical density. These differences are frequently sufficiently large to obscure other patterns that are more diffuse ("fuzzy") in nature. The technique is illustrated by application to a Landsat scene where a suspected mosaic arising from soil variability is overlain by agricultural fields.)

A82-32906 MONITORING LAND-COVER CHANGE BY PRINCIPAL COMPONENT ANALYSIS OF MULTITEMPORAL LANDSAT DATA


(Two four-channel Landsat scenes of the same area, which were recorded on different dates, were superimposed and treated as a single eight-dimensional (channel) data array. Principal component analysis (PCA) of this array resulted in the gross differences associated with overall radiation and atmospheric changes appearing in the major component images and statistically minor changes associated with local changes in land cover appearing in the minor component images.)

A82-32911 TERRAIN ANALYSIS FROM LANDSAT USING A COLOR TV ENHANCEMENT SYSTEM


(Visual interpretation of Landsat false-color composite imagery was employed to map terrain types on the Navajo Indian Reservation in northeastern Arizona and northwestern New Mexico. Three main difficulties were encountered in the visual analysis: (1) determination of the exact boundary positions, (2) repeatability of the boundary decisions over an area; and (3) discrimination of subtle tone differences associated with certain terrain type groupings. A simple image enhancement technique, based on a color television system was developed to make the visual analysis more accurate. A color TV camera was used to view the image and a color monitor used for the display. Image enhancement was achieved by use of the chroma, hue, contrast, and brightness controls on the monitor. The use of a zoom lens on the camera allowed rapid scale change and facilitated study of small areas of the image. By working directly from a color image, the technique obviated the need for separation positives with their attendant registration problems.)

A82-32916 APPEARANCE OF IRREGULAR TREE CANOPIES IN NIGHTTIME HIGH-RESOLUTION THERMAL INFRARED IMAGERY


(refs)

A82-34225 SEPARATION OF DIFFUSE FROM SHARP-EDGED FEATURES IN DIGITAL IMAGERY


(A new classification procedure that removes sharp-edge features from digital imagery and that more clearly reveals any patterns more diffuse in nature that may be present is proposed. The procedure relies on the hypothesis that the sharp edges separate areas of uniform but differing optical density. These differences are frequently sufficiently large to obscure other patterns that are more diffuse ("fuzzy") in nature. The technique is illustrated by application to a Landsat scene where a suspected mosaic arising from soil variability is overlain by agricultural fields.)

C.R.
A82-34469
EVALUATION OF THE EFFECTIVENESS OF SYSTEMATIC IMAGE DISTORTION COMPENSATION [OTSINKA EFEKTIVNOSTI KOMPENSACTSII SISTEMATICHESKIH ISKAZHENII (IZOBRAZHENII)]
The improvements in image accuracy afforded by two methods for the compensation of systematic distortions in aerial photographs are studied The techniques of field calibration, which involves the correction of image coordinates by interpolation from the coordinates of selected calibration points, and polynomial correction using additional reference points, in which the distortion field is approximated by second- and third-degree polynomials, were applied to aerial photographs subject to four different types of distortions Examination of the errors in the determination of the coordinates of control points and the maximum errors of their mutual positioning indicates field calibration to be more effective for sign-changing point displacements, while polynomial approximation is more effective for regular displacements.

A L W.

A82-34702
A PRACTICAL STUDY OF GROSS-ERROR DETECTION IN BUNDLE ADJUSTMENT
A special bundle adjustment program has been developed with built-in automatic gross-error detector by the data snooping approach. The program computes, in an efficient way, the exact values of the redundancy numbers for each image point. Using actual data, many of the factors affecting the reliability of bundle adjustment and the ability of the technique to detect gross errors are studied. The effects of different block parameters, point type and location, and the use of additional constraints are presented. (Author)

A82-34717
AN INFORMATION-THEORIC SPATIAL TRANSFORM
Significant improvements in the sensitivity of existing computer algorithms for digital remote-sensor image classification may be effected without involving any software modification of these systems. An information-theoric spatial transform may be applied to the raw multispectral data set, and synthetic channels thus created may be utilized in the classification process. The transform is analogous in operation to the transform which occurs in the retina of higher organisms, a processing stage which has been omitted in most existing classification schemes. The transform algorithm is described and preliminary results of the application of the algorithm to the study of forest ecosystems from Landsat MSS image data are discussed (Author)

A82-34720*
Jet Propulsion Lab., California Inst. of Tech., Pasadena.

BATHYMETRIC IMAGING
Digital topography has, for some years, been formatted and processed into shaded relief images for specific studies involving land use and thermal properties Application to bathymetry is a new and seemingly fruitful extension of these techniques Digital terrain models of the earth - combining subaerial topography with an extensive collection of bathymetric soundings - have been processed to yield shaded relief images. These images provide new and exciting insights into submarine geomorphology and portray many aspects of plate tectonic physiography in a manner not previously possible (Author)

A82-34722
A QUANTITATIVE METHOD TO TEST FOR SIMILARITY BETWEEN PHOTO INTERPRETERS
Photo interpretation is the art and science of identifying objects and deducing its significance on aerial photos. The judgment involved is generally qualitative in nature, and, therefore, difficult to evaluate or compare with interpretations made by others. The present investigation is concerned with an approach which makes it possible to quantify photo interpretation results, taking into account a statistical method for comparing these results. The proposed procedure can be employed in tests regarding the degree of similarity between interpreters or the consistency of the same interpreter over time. The procedure is based on the employment of a similarity matrix and the conduct of a discrete multivariate analysis to test the degree of similarity between the error matrices.

A82-34723
TERRAIN CLASSIFICATION BY FOURIER ANALYSIS - ACCURACY AND ECONOMY
The Fourier transformation is applied to terrain profiles for classification purposes. Areas with different geology are considered, and the power spectra are estimated. The spectrum is used to predict the accuracy of a digital terrain model and to calculate some economic consequences of the relation between type of terrain, accuracy of measurements, point density, and surveying expenses. (Author)

A82-34726
RAMS-1, A RESOURCE ANALYSIS AND MAPPING SYSTEM
RAMS-1 is a Resource Analysis and Mapping System developed by Systemhouse. RAMS-1 will produce colour shaded thematic overlays as well as planimetric base maps This paper describes the hardware configuration and software facilities of the SHL RAMS-1 system (Author)

A82-34940
PRESENT STATUS OF ON-LINE ANALYTICAL TRIANGULATION
Basic principles of solutions suitable for analytical aerial triangulation are outlined and analyzed in the context of existing on-line photogrammetric systems Two basic categories of procedures are considered: those which primarily aim for a quality controlled data acquisition followed by an off-line adjustment, and those which make the adjustment a part of the on-line procedure proper. The discussion covers geometrical as well as numerical considerations and emphasizes practical and methodological aspects which may bring about a higher efficiency of work and a reduction of preparatory operations. (Author)
07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

A82-35141
ALLOWANCE FOR THE EFFECT OF THE ATMOSPHERE IN THE PROCESSING OF SATELLITE REMOTE-SENSING IMAGES [UCHET VLIJANII ATMOFSERY PRI OBRABOTKE KOSMICHESKOI VIDEOINFORMATSI]


A method for the radiative correction of multispectral imagery is presented which relies on the physicomathematical modeling of the formation of the outgoing-radiation field on the basis of experimental data concerning the distribution of atmospheric aerosol and average statistical data on the distribution of the gaseous constituents of the atmosphere. As an example, attention is given to the radiative correction of Meteor-satellite data, realized by a special-purpose image-processing system.

B. J.

A82-35650*
National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md

INFLUENCE OF SKY RADIANCE DISTRIBUTION ON THE RATIO TECHNIQUE FOR ESTIMATING BIDIRECTIONAL REFLECTANCE


(Contract DACW39-77-C-0073, DARSG09-79-C-0199)

The technique of ratioing scene radiance to the radiance obtained from standard Lambertian reference panels in order to estimate bidirectional reflectance factors may depend on the angular distribution of the diffuse irradiance field as well as the direct solar irradiance. A simulation study was performed to estimate the magnitude of this effect for differing clear sky irradiance distributions for a variety of vegetated surfaces. For the seven surfaces and wavelengths analyzed, the error induced in the estimation of bidirectional reflectance factors using the standard ratio technique was less than 5 percent for zenith view and sun angles less than 55 degrees.

(Author)

A82-35824*
Business and Technological Systems, Inc., Seabrook, Md

APPLICATION OF SATELLITE MAGNETIC ANOMALY DATA TO CURIE ISOTHERM MAPPING


(Contract NASS-25720)

A82-36043#

THE METEOROLOGICAL PRODUCT - 'CLOUD-TOP HEIGHT'


The rationale for choices made in the method of presenting Meteosat IR and visual imagery to commercial users for visual analyses are examined. IR, at 11 microns, and water vapor (WV), at 6 microns, channels are noted to produce pictures in 2500 x 2500 pixel grids, while the 0.4-11 micron visible channel yields 5000 x 2500 pixel images. It was found necessary to digitally compress every picture by four in both directions for direct transmission to users. A resolution of 20 km was then available at the subsatellite point. Eight grey levels showed clouds above 12,000 m height in 1500 m steps to the 300 m level. A correction for the semitransparency of clouds is numerically determined, particularly for overlying cirrus formations. User-activated corrections to images from remote terminals is described. A time lag of a little over two hours existed between Meteosat-1 acquisition and dissemination.

M. S. K.

A82-36935

SATELLITE RADIATION MEASUREMENTS FOR THE RETRIEVAL OF THE VERTICAL TEMPERATURE PROFILES [PRZETWARZANIE SATELITARNYCH POMIAROW PROMIENIOWANIA NA PIONOWE PROFILE TEMPERATUR]


The physical basis underlying satellite IR determination of vertical temperature profiles in the atmosphere is detailed. The earth is treated as a black-body emitting radiation at temperatures dependent only on the concentration, temperature, and absorption coefficient of the absorbers present in the atmosphere. Consideration is given to the ratioing method, the inverse matrix method, and direct retrieval techniques, noting that regression is preferred as the first choice in all cases and is the only method when transmission properties are not known. The level of agreement between derived profiles and measured values is shown to depend on the number of spectral frequency measurements. Good correlations are found, with the in situ data being slightly higher than the satellite figures. Examples are cited from TIROS N and NOAA spacecraft data.

M. S. K.

A82-37048

DESIGN GUIDELINES FOR SATELLITE IMAGE DATA DISTRIBUTION SYSTEMS


A modular, systems level design for satellite systems which produce images is presented. This is a three-stage, ten-step iterative design technique which applies to the data flow from the sensing instruments through the processing system to the image product users. Procedures for converting operational requirements into functional architecture are described. The resulting architectures are translated into a subsystem level design by using an array of building blocks. An important feature of this structured approach is the parametric characterization of the interfaces between building blocks.

B. J.

A82-37200
LANDSAT D TO YIELD MORE PRECISE DATA


The Landsat D spacecraft to be launched in mid 1982 will offer new multispectral and thermal imaging capabilities. The satellite is designed to improve the monitoring of renewable resources and to provide rock discrimination data for mineral and petroleum geologists. The expanded features of the new satellite include a seven-band thematic mapper with spectral ranges from 0.45-0.52 microns to 2.08-2.35 microns and a multispectral scanner capable of higher resolution and spectral fidelity than used in previous Landsats. The development of the Landsat D has been complicated by project changes both in the Space Shuttle and the Tracking and Data Relay Satellite Program, which resulted in an increase in weight (now 4400 lb.). An additional dehydrating tank and narrow band tape recorders. Other details on the spacecraft include total array output power of 2200 W, operational altitude of 705 km and launching on a Delta 3920.

N. B.
(E82-10188; NASA-CR-168616; NAS 1.26:168616, PR-3) Avail: NTIS HC A02/ MF A01 CSCL 04A
The magnetic disturbance fields caused by global external current systems are considered with particular emphasis on the improvements in the MAGSAT data, which were routinely plotted in the Universal Time (UT) format as well as in a polar plot format. The HYD/U coordinate system was adopted as the standard for representing the MAGSAT residual magnetic field vectors. A data file was generated and the T/POOL computer code was developed to determine the time, latitude, and MLT of the minimum latitude of each transpolar segment of orbit. The precision of the vector data set from MAGSAT prompted an extended exploratory phase for data analysis procedures, modeling techniques and phenomenology.
A.R.H.

MAGSAT AND AEROMAGNETIC DATA IN THE NORTH AMERICAN CONTINENT Progress Report, 8 Jun. 1981 2 p ERTS
(Contract NAS5-26157)
(E82-10193; NASA-CR-168620; NAS 1.26:168620) Avail: NTIS HC A02/ MF A01 CSCL 05B
Problems were encountered in deriving a proper reference field to be subtracted from the aeromagnetic data obtained from the Geomagnetic Field model. Field models used thus far do not seem to eliminate properly the ambient field. The MAGSAT data in the North American continent for the period November 1 to December 22, 1979 are being compiled and compared with MAGNET data. Efforts are being made to eliminate the orbital bias errors. A computer program was developed and successfully tested which computes a topographic profile of the Curie depth isotherm which fits best to the observed vector or scalar field magnetic data.
A.R.H.

D. M. KLUMPAR, Principal Investigator 8 Jul. 1981 12 p ERTS
(Contract NAS5-26309)
(E82-10195; NASA-CR-168622; NAS 1.26:168622, UTD-E0533-01; OSTRP-5) Avail: NTIS HC A02/ MF A01 CSCL 05B
Refinements to the modeling procedure developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere are described. The modeling technique utilizes a linear current element representation of the large scale space current system. A model polar current system is presented and magnetic field perturbations resulting from this system are computed along two hypothetical satellite orbits.
M.G.
INVESTIGATION OF MAGSAT AND TRIAD MAGNETOMETER DATA TO PROVIDE CORRECTIVE INFORMATION ON HIGH-LATITUDE EXTERNAL FIELDS Progress Report, 1 Jul. - 30 Sep. 1981

T A. POTEMRA, Principal Investigator 4 Nov 1981 10 p

Sponsored by NASA ERTS

The compilation of a catalog of the MAGSAT-observed high altitude disturbances is discussed and an example of contents and format is given. The graphs allow the investigation of Birkeland current signatures which are superimposed upon the main geomagnetic field. An example of a display of the MAGSAT orbital tracks in a polar geomagnetic coordinate system with the locations, flow directions, and intensities of field aligned currents shown in color is also given. The display was generated using an interactive color graphics terminal. M.G


Sponsored by NASA ERTS

Progress in the preparation of software for converting data tapes produced on an IBM system to data readable on a DEC-10 system, in the creation of awareness of the utility of MAGSAT data among users in India, and in making computer programs supplied by NASA operational on the DEC-10 system is reported. Papers presented to Indian users, at the IAGA fourth scientific assembly, at a symposium on interdisciplinary approaches to geomagnetism, and a paper published in Science Today are included.

GROUND SUPPORT DATA FROM JULY 10 TO JULY 29, 1978, FOR HCMC THERMAL SATELLITE DATA OF THE POWDER RIVER BASIN, WYOMING

S. HUMMER-MILLER, K. WATSON, and R. KIFFINGER, Principal Investigators 1980 48 p

Sponsored by NASA HCMM

The compilation of a catalog of the MAGSAT-observed high latitude disturbances is discussed and an example of contents and format is given. The graphs allow the investigation of Birkeland current signatures which are superimposed upon the main geomagnetic field. An example of a display of the MAGSAT orbital tracks in a polar geomagnetic coordinate system with the locations, flow directions, and intensities of field aligned currents shown in color is also given. The display was generated using an interactive color graphics terminal. M.G

REGISTRATION OF HEAT CAPACITY MAPPING MISSION DAY AND NIGHT IMAGES

K. WATSON, S. HUMMER-MILLER, and D. L SAWATZKY, Principal Investigators 1982 17 p

Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA, Goddard Space Flight Center, code 601, Greenbelt, Md. 20771. Domestic users send orders to ‘Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn World Data Center A for Rockets and Satellites'. HCMC

The registration of heat capacity images for both day and night may be performed rapidly on a minicomputer. A.R H.

Spherical Harmonic Representation of the Main Geomagnetic Field for World Charting and Investigations of Some Fundamental Problems of Physics and Geophysics Progress Report


Sponsored by NASA ERTS

An algorithm is proposed which predicts the optimal features at every node in a binary tree procedure. The algorithm estimates the probability of error by approximating the area under the likelihood ratio function for two classes and taking into account the number of training samples used in estimating each of these two classes. Some results on feature selection techniques, particularly in the presence of a very limited set of training samples, are presented. Results predicted by the proposed algorithm as a function of dimensionality as compared to experimental observations are shown for aircraft and LANDSAT data. Results are obtained for both real and simulated data. Finally, two binary tree examples which use the algorithm are presented to illustrate the usefulness of the procedure. A.R H.
07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

N82-23595*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex

EVALUATION OF VICAR SOFTWARE CAPABILITY FOR LAND INFORMATION SUPPORT SYSTEM NEEDS

(A82-10223; NASA-CR-167442; JSC-17431; NAS 1.26:167442; LEMSCO-17269, RR-L1-17269) Avail: NTIS HC A02/MF A01 CSCL 09B

A preliminary evaluation of the processing capability of the VICAR software for land information support system needs is presented. The geometric and radiometric properties of four sets of LANDSAT data taken over the Elk River, Idaho quadrangle were compared. Storage of data sets, the means of location, pixel resolution, and radiometric and geometric characteristics are described. Recommended modifications of VICAR programs are presented.

N82-23599*# Texas Univ. at Dallas. Center for Space Sciences.

D. M. KLUMPAR, Principal Investigator 9 Jan. 1982 10 p ERTS (Contract NAS8-28309)

(E82-10226; NASA-CR-168800; NAS 1.26:168800, QSTPR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

Efforts in support of the development of a model of the magnetic fields due to ionospheric and magnetospheric electrical currents are discussed. Specifically, progress made in reading MAGSAT tapes and plotting the deviation of the measured magnetic field components with respect to a spherical harmonic model of the main geomagnetic field is reported. Initial tests of the modeling procedure developed to compute the ionosphere/magnetosphere-induced fields at satellite orbit are also described. The modeling technique utilizes a linear current element representation of the large scale current system.

N82-23605*# Texas Univ. at Dallas. Center for Space Sciences.

D. M. KLUMPAR, Principal Investigator 12 Oct. 1981 9 p ERTS (Contract NAS8-28309)

(E82-10232; NASA-CR-168801, NAS 1.26:168801, QSTPR-4) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress is reported in reading MAGSAT tapes in modeling procedure developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere. The modeling technique utilizes a linear current element representation of the large scale space-current system.

N82-23612*# Tokyo Univ. (Japan).

N. FUKUSHIMA, Principal Investigator 20 Jul. 1981 10 p Sponsored by NASA ERTS (E82-10229; NASA-CR-168755; NAS 1.26:168755, PR-3) Avail: NTIS HC A02/MF A01 CSCL 05B

The acquisition of tapes which contain vector and scalar data decimated at an interval of 0.5 sec, together with time and position data, is reported. Progress in the study of magnetic anomalies in the vicinity of Japan and in electric currents in the ionosphere and magnetosphere is also reported. MAGSAT data was used in obtaining a map of total force anomaly for the area of latitude 10-70 deg N and longitude 110-170 deg E. One of the outstanding features in the map of the magnetic anomaly is a negative magnetic anomaly in the Okhotsk Sea, which is of geophysical interest because of its possible connection with high heat flow values in that area.

N82-23613*# Miami Univ., Fla School of Marine and Atmospheric Science

G. A. HARRISON, Principal Investigator Nov. 1981 2 p Sponsored by NASA ERTS (E82-10240; NASA-CR-168756; NAS 1.26:168756) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in study of the details of spherical harmonic representations of the Earth's magnetic field is reported. The first of the investigator's quiet time tapes were received and determined to be error free.


NONLINEAR THEORY FOR ELASTIC BEAMS AND RODS AND ITS FINITE ELEMENT REPRESENTATION (Contract NAS9-23605; NASA-CR-168741; NAS 1.26:168741) Avail: NTIS HC A02/MF A01

J. P. BESSELING Oct. 1981 25 p refs (WTHD-143) Expressions for large curvatures of elastic beams and rods are given in terms of displacement components and angular coordinates. The application of these expressions to bifurcation and stability problems, based on the principle of virtual work is discussed. This approach is compared with another finite element representation, and an error in this representation is corrected. The condition of zero extension of the axis in the case of the Euler column is shown to require division into a large number of finite elements in order to ensure an accurate result for the stability coefficient. The conditions of zero extension of the axis and zero curvature about one principal axis of the cross section in the case of the lateral buckling of the end loaded cantilever have similar consequences.

Author (ESA)

N82-24570*# Survey of India, Dehra Dun. Geodetic and Research Branch.


Magsat data for quiet days for the period 4.11.79, 17.11.79 to 24.11.79, which pertains to 44 passes, was screened to exclude the period of maximum diurnal variation. The results of this screening process is a data set that has the effect, at least the major part of the effect, of the external field removed from it. Such a data set is the basis for further analysis which is in hand. The data set is now being reduced to horizontal plane. The mathematical techniques uses a finite harmonic series representation of the three dimensional data, combined with least squares approach for the solution of coefficients. A computer program was developed to reduce satellite data to a common elevation.

A.R.H.

N82-24572*# Indian Inst. of Geomagnetism, Bombay.

R. G. RASTOGI, B. P. SINGH, D. R. K HAO, G. K. RANGARAJAN, R. RAJARAM, M. ROY, and B. R. ARORA, Principal Investigators 1 Apr 1982 5 p ERTS (E82-10206; NASA-CR-168865; NAS 1.26:168865; M-38; PR-2) Avail: NTIS HC A02/MF A01 CSCL 08G

The major activities of the period are summarized. Data tapes generated on an IBM system were read on DEC-10 system new tapes compatible with DEC-10 system were prepared for data.
sections of interest. Core and external current contributions were removed from selected passes over the Indian region and the residuals analyzed. Possible equatorial electrojet contributions to the MAGSAT data were studied.

J.D.

N82-24580*# Texas Univ. at Dallas, Richardson. Center for Space Sciences

D M. KLUMPAR, Principal Investigator 27 Apr. 1982 11 p ERTS
(Contract NAS5-26309)
(E82-10306, NASA-CR-168881; NAS 1.26:168881; STRP-6)
Avail: NTIS HC A02/MF A01 CSCL 05B

Progress made in reducing MAGSAT data and displaying magnetic field perturbations caused primarily by external currents is reported. A periodic and repeatable perturbation pattern is described that arises from external current effects but appears as unique signatures associated with upper mid-latitude sections of the Earth's surface. Initial testing of the modeling procedure that was developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere is also discussed. The modeling technique utilizes a linear current element representation of the large scale space current system. 

M.G.

N82-24581*# North Carolina Stato Univ., Raleigh Dept. of Marine, Earth and Atmospheric Sciences.

MAGSAT SCALAR AND VECTOR ANOMALY DATA ANALYSIS Progress Report, period ending 31 Jan. 1982
1 Feb. 1982 1 p ERTS
(Contract NAS5-26157)
(E82-10307; NASA-CR-168882; NAS 1.26:168882)
Avail: NTIS HC A02/MF A01 CSCL 08B

Efforts on the analysis of MAGSAT scalar anomaly data, the application of the scalar analysis results to three component vector data, and the comparison of MAGSAT data with corresponding MAGNET aeromagnetic and free air gravity anomaly data are briefly described.

M.G.

N82-24588*# Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

MULTIDISCIPLINARY INVESTIGATIONS ON HCMM DATA OVER MIDDLE EUROPE AND MAROCCO Final Report, 1979 - 1981
R. WOLF, Principal Investigator, G. DALKE, J. HENKEL, and H. KAUFMANN 10 Mar. 1982 86 p Sponsored by NASA, Deutsche Forschungsgemeinschaft and Bundesministerium fuer Forschung und Technologie Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20070. Domestic users send orders to 'Attn: National Space Science Data Center', nondomestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM (E82-10315; NASA-CR-168910, NAS 1.26:168910) Avail: NTIS HC A05/MF A01 CSCL 05B

The development approaches in presenting HCMM data in combination with LANDSAT for improved interpretability is presented. The techniques are based on the IHS (intensity hue and saturation) concept which permits the calculation of LANDSAT/HCMM merges exhibiting the high spatial resolution of LANDSAT along with the HCMM thermal recordings coded into perceivable and interpretable colors. A further approach is based on the calculation of synthetic LANDSAT stereo images showing HCMM thermal recording as a quasiphotography. The feasibility of these approaches are discussed on the basis of LANDSAT and HCMM images representing the test sites. On the basis of a scene covering an area of the Anti Atlas, the relationship between geological phenomena and their interpretability via LANDSAT/HCMM merged products.

E.A.K.

N82-24595*# Tokyo Univ. (Japan). Geophysics Research Lab.


Progress in the data processing and data acquisition of computer compatible MAGSAT tapes is reported. Investigations focused on the crustal structure near Japan and its Antarctic station, and electric currents and hydrodynamic waves in the ionosphere and the magnetosphere. The magnetization of the crust in the northwestern Pacific region is discussed.

T.M

N82-24600*# Pans VI Univ (France).

MODELS AND MAPS OF THE MAIN FIELD Progress Report
J L LEMOUEL, Principal Investigator, C. GIREF, and J. DUCRUU 1 Apr. 1982 13 p refs Sponsored by NASA ERTS (E82-10327; NASA-CR-168906; NAS 1.26:168906) Avail: NTIS HC A02/MF A01 CSCL 08B

The difference between the models comes from the difference in the procedures of data selection and depends on the aim the model is intended for: regional studies necessitates locally higher density of data and for downward continuation the reduction of external variations must be as careful as possible. Refinements of preliminary models MAGP1 and MAGP2 are presented. Models MAGP1 and MAGP2 are found to have drawbacks coming from insufficient reduction of the external variations and from the inhomogeneity in the distribution of the measurement points. New analysis was performed to overcome these shortcomings. The quality of the new models is characterized by the average rms of the differences measurement model.

T.M.
from digital multi-spectral sensor data. A dramatic impact has been
made in the ability to analyze these digital data bases by applying
state-of-the-art digital image technology processing and displaying
concepts. These include a variety of color and/or black and white
displays of not only intensity/color coded matrix data, but also image
processed data using specialized convolution filters, texture
discrimination, and special color representation techniques. In
addition, computer generated imagery from these data bases serves
as a final analysis tool.

**N82-25613**  
Measurement Concept Corp, Rome, N. Y.  
**SOURCE ASSESSMENT SYSTEM Final Technical Report**  
R. H. SENN, M L. TAYLOR, R BURNS, and M SMITH  
Griffiss AFB, N.Y.  
RADC Nov 1981 153 p rePs  
(Contract F30602-81-C-0040, AF PROJ. 4303)  
(AD-A111223; RADC-TR-81-303)  
Avai. NTIS HC A08/MF A01  
CSCL 09B

This report contains an analysis of the Source Assessment Procedures at both Defense Mapping Agency (DMA) production facilities (Aerospace Center DMAAC in St. Louis MO and Hydrographic Topographic Center DMAHTC in Washington DC). Following the analysis, the report documents a design trade off of various approaches to a Source Assessment System. Finally, a Design Plan for the selected approach analog-digital video system is presented.

Author (GRA)

**N82-25614**  
Army Engineer Topographic Labs., Fort Belvoir, Va.  
**COORDINATION OF STEREO IMAGE REGISTRATION AND PIXEL CLASSIFICATION Computer Sciences Lab.**  
M A. CROMBIE 20 Mar. 1982 10 p rePs  
Presented at the ACSM-ASP Ann. Conv., Denver, 1982  
(AD-A111307; ETL-R034)  
Avai. NTIS HC A02/MF A01  
CSCL 14E

An inadequate concept of how corresponding points relate to one another on dissimilar images has a greater effect than exposure geometry or data collection on registration problems in stereo photogrammetry Conventional correlation, or one of its relatives, is the measure of similarity used in all automated stereo correlation systems. Correlation, a measure of the linear dependence between two sets of data, is an inadequate measure when there is less than, or more than, a moderate amount of image structure at and around points selected for image matching. The existence of structure should be recognized and utilized in an appropriate manner for image matching. Similarly, the absence of structure should be recognized, and the surrounding imagery should be used to complete matches where it is possible. The concurrent determination of what a pixel is, as well as where it is, can alleviate much of the registration problem. A variety of features including point-density data, texture, and edges, as well as existing cartographic knowledge, can be combined and organized through rules in order to more completely describe a point. The overall thoroughput of the compilation process will be improved in both time and accuracy if those functions which tend to support one another are concurrently, rather than sequentially, performed. If the compilation process takes place in image space, then the image matching process as well as the other feature extraction operations can be ordered by the data processing manager to best suit the function of the process.

Author (GRA)

**N82-26027**  
Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).  
**SMS/GOES DATA COLLECTION PLATFORM SYSTEM [PLATAFORMA DE COLETA DE DADOS SISTEMA SMS/GOES]**  
In PORTUGUESE  
Aval NTIS HC A12/MF A01

The SMS/GOES synchronous meteorological satellite system, consisting of the satellite, ground stations, and data collection platforms, is described. The objectives of the system and the services it performs are listed. Applications of the data collection platforms are surveyed and the platforms described. The parameters of the data collected are listed.

Author by J.D.

**N82-26037**  
European Space Agency, Toulouse (France),  
**THE METEOSAT DATA COLLECTION SYSTEM AND ITS APPLICATION**  
Avai. NTIS HC A12/MF A01

The METEOSAT data collection system and its applications are described. Use of the system for collection of meteorological data at remote land sites in Greenland, for meteorological and sea state monitoring at offshore sites in the North and Baltic Seas, for hydrological monitoring in Great Britain, and for meteorological data collection from aircraft is discussed.

J.D.

**N82-26756**  
Survey of India, Dehra Dun.  
**ANALYSIS OF MAGSAT DATA OF THE INDIAN REGION**  
K L. KHOSLA, Principal Investigators, M G ARUR, S R. M. GUPTA, S. P. S BAINS, S. J. LAL, J. G NEGI (NGRRI), P. K. AGARWAL (NGBI), B. N. P. AGARWAL (Indian School of Mines), and B. SAHAI (Space Application Centre, Ahmedabad, India) 31 Mar. 1982 3 p rePs  
Sponsored by NASA ERTS (EB2-10358; NASA-CR-168975; NAS 1.26:168979; REPT-2; REPT-3)  
Avai. NTIS HC A02/MF A01  
CSCL 05B

Progress in the development of software for reading MAGSAT data tapes and for the reduction of anomaly data, and in the preparation of data for magnetic anomaly maps is reported.

Author

**N82-26753**  
Environmental Systems Research Inst., Redlands, Calif.  
**EXPLORATION INTO TECHNICAL PROCEDURES FOR VERTICAL INTEGRATION**  
Final Contractor Report  
R. J. MICHEL and K D. MAW Sep. 1979 29 p rePs  
(Contract NASA ORDER A-65111-B)  
(NASA-CR-166352; NAS 1.26:166352)  
Avai. NTIS HC A03/MF A01  
CSCL 08G

Issues in the design and use of a digital geographic information system incorporating landuse, zoning, hazard, LANDSAT, and other data are discussed. An eleven layer database was generated. Issues in spatial resolution, registration, grid versus polygonal structures, and comparison of photointerpreted landuse to LANDSAT land cover are examined.

Author

**N82-26756**  
Earth Satellite Corp., Washington, D.C.  
**EXPERIMENTAL ASSESSMENT OF IMPROVED SPATIAL RESOLUTION LANDSAT DATA**  
Final Report  
C. SHEFFIELD, M PLACE, D GAROFALO, J. DYKSTRA, and L. HALL  
Ft Belvoir, Va.  
ETL 30 Sep. 1981 82 p rePs  
(Contract DAAK70-80-C-0016)  
(AD-A110538, E/S-1234; ETL-0268)  
Avai. NTIS HC A05/MF A01  
CSCL 14E

This report describes the possible uses of higher resolution (25 meter) space-derived images for delineating and measuring surface features of interest in the Corps of Engineers’ Civil Works Program. Following a discussion of imagery sensors and computer processing methods, test evaluations are described in which LANDSAT multispectral scanner data and SEASAT SAR data were interpreted for surface features. The comparative advantages of the two data sources are discussed, and the complementary nature of LANDSAT MSS and SEASAT SAR images is displayed in the image analyses. Image examples are included for both background discussion and test site evaluation.

Author (GRA)
The results of regression analysis suggest that the infrared meter from a hand-held instrument fall into three groups: instrument films developed to aid the aerial photographer in adjusting camera settings for optimum exposure of a variety of scenes. Also given of a spotmeter sensitive in the wavelength band of infrared film has less latitude to variations in scene brightness than most normal color films, camera exposure adjustment is crucial in the processing of the interferogram data for spectral retrieval; and (3) analysis of the obtained atmospheric emission data.

08 INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.


The surficial solar wind from the feldspar grain-size separates of lunar soils is removed by selective chemical etching to determine whether the long term average solar flare Ne composition is planetary or solar. Mineral residues mostly containing solar flare implanted noble gas components are analyzed by step wise gas release mass spectrometric methods. Results do not show any major differences in the Ne ratios of solar flares and solar wind, and the long term average composition of low energy solar flares implanted Ne is similar to solar wind neon instead of planetary or solar. Mineral residues mostly containing solar flare implanted noble gas components are analyzed by step wise gas release mass spectrometric methods. Results do not show any major differences in the Ne ratios of solar flares and solar wind, and the long term average composition of low energy solar flares implanted Ne is similar to solar wind neon instead of planetary or solar. Neutral and ion densities are determined from the Doppler shift of the solar wind neon IIIA 125.8 line.


It is noted that, since the commonly used color infrared aerial film has less latitude to variations in scene brightness than most normal color films, camera exposure adjustment is crucial in the infrared aerial photography of natural resources. A description is given of a spotmeter sensitive in the wavelength band of infrared films developed to aid the aerial photographer in adjusting camera settings for optimum exposure of a variety of scenes. Also discussed are airborne tests undertaken to evaluate the meter for agricultural, forest, and range cover. The problems encountered in using photographic photometry to evaluate lumiance readings from a hand-held instrument fall into three groups: instrument pointing problems, film sensitivity, and camera calibration. The optimum exposure for quantitative density analysis is thought to be about three-fourths of a stop lower than for visual interpretation. The results of regression analysis suggest that the infrared meter marks an improvement over conventional spotmeters in predicting the infrared response of the film.

A82-29922 THERMOGRAPHY - A REMOTE SENSING METHOD WITH MANY PERSPECTIVES [THERMOGRAFIE - EINE PERSPEKTIVREICHE FERNERKUNDUNGSMETHODE]


Thermography as considered in this report, is concerned with the utilization of the electromagnetic radiation of the far-infrared region for the formation of images. Possibilities for such a utilization improved greatly with the development of cooled semiconductor sensing devices during the last twenty years. Thermographs were designed as far-infrared image-forming devices which provide a thermal photograph by scanning a far-infrared image of an object or a scene. A description is provided of investigations in which such devices, carried on board of a helicopter or a fixed-wing aircraft, were used to obtain thermal images of an area on the ground. Thermography is found to be a valuable approach for the study of energetic aspects, geologic structures, groundwater budget questions, the vitality of forests and agricultural areas, and water pollution.


A description is presented of the first observation of large scale undulations in the equatorward boundary of the diffuse aurora by pictures of global auroral displays in the afternoon-evening sector. These observations are made by a broad band scanning radiometer on the Defense Meteorological Satellite Program (DMSP) satellites. Attention is given to four periods during which the equatorward boundary of the diffuse aurora is undulated. Three of these are taken in the southern polar region and one in the northern polar region. The duration of the undulations is considered along with geomagnetic and interplanetary conditions. All undulations are found to occur during the period of a geomagnetic storm near the peak development of the storm-time ring current. All are accompanied by substorm patterns of discrete auroras.

A82-31020 EXTREMELY HIGH LATITUDE AURORAS M. S. GUSSENHOVEN (Boston College, Chestnut Hill, MA) Journal of Geophysical Research, vol. 87, Apr 1, 1982, p 2401-2412. refs

A description is presented of the first observation of large scale undulations in the equatorward boundary of the diffuse aurora by pictures of global auroral displays in the afternoon-evening sector. These observations are made by a broad band scanning radiometer on the Defense Meteorological Satellite Program (DMSP) satellites. Attention is given to four periods during which the equatorward boundary of the diffuse aurora is undulated. Three of these are taken in the southern polar region and one in the northern polar region. The duration of the undulations is considered along with geomagnetic and interplanetary conditions. All undulations are found to occur during the period of a geomagnetic storm near the peak development of the storm-time ring current. All are accompanied by substorm patterns of discrete auroras.
A82-31991
A SYSTEM DESIGN FOR A MULTISPECTRAL SENSOR USING TWO-DIMENSIONAL SOLID-STATE IMAGING ARRAYS
R. M. HODGSON (Canterbury, University, Christchurch, New Zealand), F. M. CODY (Montana State University, Bozeman, MT), and D. PEARMAN (Department of Geomatics and Industrial Research, Physics and Engineering Laboratories, Lower Hutt, New Zealand) IEEE Transactions on Geoscience and Remote Sensing, vol. GE-20, Apr 1982, p. 177-179 Research supported by the University of Canterbury and University Grants Committee.

A system developed for remote sensing from light aircraft in the 400-1100 nm wavelength range possesses an architecture which permits the simultaneous capture of up to four images from a solid-state, two-dimensional image sensor. In operation, the array sensor captures a series of relatively rapid, approximately 10 msec exposures at intervals as long as 10 sec. This mode of operation has the advantage of nearly the same degree of distortion due to aircraft roll in all image elements. The software generation of sensor drive signals is incorporated in the system. O.C.

A82-32440
IMAGING SPECTROSCOPY; PROCEEDINGS OF THE SEMINAR, LOS ANGELES, CA, FEBRUARY 10, 11, 1981
The seminar concentrated on the science applications of spectral imaging, multispectral imaging sensors, and spectral filtering. Papers are presented on spectroscopic remote sensing for geological applications, spectral mapping of Jupiter, system design of an interferometer imaging sounder and a common module imaging spectral radiometer. Other topics discussed include the performance and application of an intensified linear self-scanned array instrument, tunable optical filtering using an interferometer for selective modulation, design studies for a spatially agile staring sensor system, and acousto-optic tunable filters for high-resolution spectral analysis.

A82-32443* Columbia Univ., New York
HIGH SPECTRAL RESOLUTION AIRBORNE SPECTROMETRY
An airborne spectroradiometer system developed at Columbia University has been providing new spectral data for use in remote sensing for natural resources. The system has been improved by addition of a solid state silicon detector array, and has been extended into the infrared by addition of a 64 element lead sulfide detector array. The infrared data in the 2000 to 2500 nm region especially holds large potential for mineral and oil exploration.

A82-32447* Santa Barbara Research Center, Goleta, Calif.
THEMATIC MAPER - AN OVERVIEW OF SPECTRAL BAND REGISTRATION
The Thematic Mapper (TM) is a high-resolution radiometer designed for earth resources classification and mapping. The TM employs multispectral scanning in a near polar orbit to sweep a 185-km swath. Data are obtained through a combination of spacecraft motion and the sweeping action of the scan mirror. These data are transmitted either directly to ground stations around the world or through a relay to the central data processing facility at White Sands, NM. Seven spectral passbands are employed, and applications include coastal water mapping, soil vegetation differentiation, biomass surveys, water body delineation, vegetation moisture measurement, plant heat stress management, and hydrothermal mapping. Attention is given to the scan mirror assembly, scan nonlinearities, the characterization and compensation of scan profiles, experimental performance, and a procedure for midscan correction.

A82-32448* Jet Propulsion Lab., California Inst of Tech., Pasadena
MULTISPECTRAL MAPPER - IMAGING SPECTROSCOPY AS APPLIED TO THE MAPPING OF EARTH RESOURCES
A multispectral mapper is a sensor system, and acousto-optic tunable filters for high-resolution spectral analysis.

A82-32658* Massachusetts Inst. of Tech., Cambridge
INVERSION OF DATA FROM DIFFRACTION-LIMITED MULTIWAVELENGTH REMOTE SENSORS. II - NONLINEAR DEPENDENCE OF OBSERVABLES ON THE GEOPHYSICAL PARAMETERS
Linear shift-invariant spatial filtering is applied to inversion of radiometric measurements of the earth in both polarizations at the following frequencies: 6.6, 10.7, 18, 21, and 37 GHz. For purposes of radiative transfer calculations at these frequencies, the state of the ocean-atmosphere system is described by a seven-parameter model. The parameters are near-surface wind speed, sea surface temperature, integrated water vapor mass, scale height of water vapor in an exponential distribution, integrated liquid water mass, height of the liquid water, and characteristic drop radius in a Best (1950) drop size distribution. Also described is a spatial filtering algorithm by means of which geophysical parameters are retrieved from measurements made over the ocean by the scanning multichannel microwave radiometer on the Nimbus 7 satellite. The parameters here are near-surface wind speed, sea surface temperature, rain rate, integrated atmospheric water vapor content, and integrated liquid water content (including rain).

A82-32702*
PHOTOMGRAMMETRIC METHODS FOR MAPPING RESOURCE DATA FROM HIGH ALTITUDE PANORAMIC PHOTOGRAPHY
Characteristics of the Itok KA-80A optical bar panoramic camera are discussed. Two computer based mapping systems designed to correct for variations in photo scale are described. Panoramic Grid (PANGRID) is a computer program that creates a panoramic grid.
08 INSTRUMENTATION AND SENSORS

image overlay of an equal area grid assumed to lie on flat ground. The Photographic Mapping System (PMS) provides for the generation of both map registered grid overlays and mapping of digitized point, line, and polygon data. Both programs make use of single frame resection techniques and digital terrain data. (Author)

A82-32766
SIMPLIFIED TECHNIQUES TO STUDY COMPONENTS OF SOLAR RADIATION UNDER HAZE AND CLOUDS

A82-32824#
AN OPTICAL OBJECTIVE LENS FOR EARTH OBSERVATIONS BY SATELLITES [UN OBJECTIF OPTIQUE POUR L'OBSERVATION DE LA TERRE A PARTIR DE SATELLITES]

The features and performance of objective lenses intended for transmission of optical images of the earth to deposition on the detectors of CCDs onboard the ESA land application satellite system/optical imaging instrument are described. Trials to determine satisfactory durability for space-based uses are reviewed. The lenses were required to have an angular field of 16 deg, a 105 mm aperture, cover the spectral bands 0.6, 0.69, 0.8, and 0.9 micron, the panchromatic band from 0.52-0.9 micron, have a focal distance to within 3 mm of 567 mm, cause less than 1 percent distortion in the image size, and less than 1.5 micron error in the spectral domain. Other requirements were for a 0.75 transmittance, polarization less than 1 percent, and a modulation transfer function close to theoretical limits, which was realized at less than 1 mm. The objective produced will have a resolution of around 15 mm at the earth's surface from an orbit of 881 km and a total field of view of 167 km. M.S.K.

A82-32912
QUANTITATIVE RELATIONSHIPS OF NEAR-SURFACE SPECTRA TO LANDSAT RADIOMETRIC DATA

It is shown that for typical homogeneous and moderately heterogeneous terrains, the number of samples required for estimating the mean reflectance of a pixel is small. No more than 9-20 samples are required to be within 2% reflectance at the 95% probability level. Coincident field measurements and satellite observations are used to test the equivalency and correlation of the reflectance data. It is noted that, before the Landsat data could be compared with the surface measurements, the satellite brightness values had to be converted to absolute radiometric units and corrected for atmospheric attenuation and scattering. A conversion method using a standard/target comparison, which indirectly compensates for atmospheric attenuation and scattering, produces a Landsat equivalent reflectance exhibiting a root-mean-square error of + or - 4% reflectance (compared with the surface measured value at 12 test sites). C.R.

A82-32915*
National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md. SNOWPACK MONITORING IN NORTH AMERICA AND EURASIA USING PASSIVE MICROWAVE SATELLITE DATA

Areas of the Canadian high plains, the Montana and North Dakota high plains, and the steppes of central Russia have been studied in an effort to determine the utility of spaceborne microwave radiometers for monitoring snow depths in different geographic areas. Significant regression relationships between snow depth and microwave brightness temperatures were developed for each of these homogeneous areas. In each of the study areas investigated in this paper, Nimbus-5 (0.81 cm) ESMR data produced higher correlations than Nimbus-5 (1.55 cm) ESMR data in relating microwave brightness temperature to snow depth. It is difficult to extrapolate relationships between microwave brightness temperature and snow depth from one area to another because different geographic areas are likely to have different snowpack conditions. (Author)

A82-33296
INVESTIGATIONS OF POINT TRANSFER [UNTERSUCHUNGEN VON PUNKTUEBERTRAGUNG]
M. SIGLE (Stuttgart, Universitaet, Stuttgart, West Germany) Bildmessung und Luftbildwesen, vol 50, May 1, 1982, p. 91-100. In German refs

The effectiveness of various new instruments developed for point transfer in practical photogrammetry is discussed with emphasis on their accuracy and economy by controlled aeronotangulation. A comparison is made between signalled and artificially labeled connection points using controlled aeronotangulation selected according to the bundle method. Point transmission methods, picture coordinate measurements and block adjustments are discussed. Investigations are conducted using the equipment of the firms Zeiss and Kern, and no significant difference is found for the transcribers Zeiss PM1 and Kern PMG2 (CPM1). D.L.G.

A82-33297
IMAGE QUALITY AND HEIGHT MEASUREMENT ACCURACY OF SERIAL SURVEY CAMERA IMAGERY FROM HIGH ALTITUDES [BEITRAEGE ZUR BILDQUALITAET UND HOEHENMESSGENAUIGKEIT VON REIHENMESSKAMMERAUFNAHMEN AUS GROESSEREN FLUGHOEHEN]
J. SIEVERS and K. SCHUERER (Institut fuer angewandte Geoasess, Frankfurt am Main, West Germany) Bildmessung und Luftbildwesen, vol. 50, May 1, 1982, p. 101-118. In German. refs

The image quality for imagery obtained in photomissions flying from heights of 6 to 14 km is determined using four cameras of different focal lengths and the aerial film material Agfa Aviphot Pan 200. Resolving power is determined using a tri-bar test target, and a method is developed to estimate height accuracy with the aid of statistics. The influence of image quality on the model is taken into consideration, and a highlands area with differences in elevation up to 200 m is used as a terrestrial basis for comparison. D.L.G.

A82-33442#
INFERENCE OF REFRACTIVITY PROFILES BY SATELLITE-TO-GROUND RF MEASUREMENTS

A technique is described to infer an estimate of the tropospheric refractivity index distribution from earth-based observations of a satellite-born beacon. This technique, known as the direct inference technique (DIT), predicts the refractivity profile by comparing the observed interference pattern, created as the satellite moves through low elevation angles, to patterns generated
from a family of assumed refractivity profiles. It is shown that DID correctly predicts the ducting environment for 12 of 22 satellite-to-ground RF measurements made during July and August 1978. Although the inferred profile geometry can differ significantly from the refractivity profile measured by an upper air sounding, the technique is moderately successful in predicting whether the true profile contains a ground-based or elevated duct. However, the overall reliability of predicting the dominant features of the duct (e.g., refractive gradient through the trapping layer, top height of the duct) is not adequate for operational usage. (Author)

A82-34222 National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md

**IRRADIANCE MEASUREMENT ERRORS DUE TO THE ASSUMPTION OF A LAMBERTIAN REFERENCE PANEL**


A technique is presented for determining the error in diurnal irradiance measurements that results from the non-Lambertian behavior of a reference panel under various irradiance conditions. Spectral biconical reflectance factors of a spray-painted barium sulfate panel, along with simulated sky radiance data for clear and hazy skies at six solar zenith angles, were used to calculate the estimated panel irradiances and true irradiances for a nadir-looking sensor in two wavelength bands. The inherent errors in total spectral irradiance (0.68 microns) for a clear sky were 0.60, 6.0, 13.0, and 27.0% for solar zenith angles of 0, 45, 60, and 75 deg, respectively. The technique can be used to characterize the error of a specific panel used in field measurements, and thus eliminate any ambiguity of the effects of the type, preparation, and aging of the paint. (Author)

A82-34470

**TECHNICAL AND ECONOMICAL CHARACTERISTICS OF THE AFA-TES-10M AERIAL CAMERA [TEKHNIKO-EKONOMICHESKIE POKAZATELI AEROFOTOAPPARATA AFA-TES-10M]**


The technical characteristics and economics of the AFA-TES-10M aerial camera are compared with those of the AFA-TES-100M camera which it replaces. Although a focal length of 100 mm makes both suitable for large-scale cartography, the newer camera, which makes use of a Russar-71 objective, exhibits reduced objective distortion and increased resolution in comparison with the AFA-TES-100M. A shorter operating cycle and an extended exposure range also allow a wider applicability and greater effectiveness in large-scale cartography. Analysis of the costs involved in producing topographic maps of 10.000 scales by the AFA-TES-10M indicates an overall savings as a result of reductions in labor costs, the amount of field validation and camera photogrammetric processes required and specific capital investment, as well as an increase in the productivity of survey work. Development costs of the new system would be recovered typically in two years. (Author)

A82-34471

**ANALYTICAL PROCESSING OF PHOTOGRAPHS TAKEN BY PAIRED CAMERAS [ANALITICHESKAIA OBRABOTKA FOTOSNIMKOV, POLUCHENNYKH SPARENNYMI FOTOKAMERAMI]**


The use of direct analytical methods for the processing of photographs taken simultaneously by pairs of cameras with parallel optical axes mounted on a moving airborne or ground vehicle is examined. A method is presented whereby the angular and linear components of the external orientation of a stereo model may be computed from the positions of three reference points visible on each of the photographs, and thus used to derive the geodesic coordinates. A computer algorithm based on the method has been used to derive a topographic layout of the geometrical elements and transverse and longitudinal profiles of a road based on strip photography taken by a camera pair mounted on a moving automobile. (Author)

A82-34701

**AMERICAN SOCIETY OF PHOTOGRAMMETRY, ANNUAL MEETING, 47TH, WASHINGTON, DC, FEBRUARY 22-27, 1981, ASP TECHNICAL PAPERS**

Falls Church, VA, American Society of Photogrammetry, 1981, Vol. 662 p $125.00

Simple plotters for close-range photogrammetry are considered along with remote sensing of thermal subsurface terrain properties, the effect of mixtures of primary forest scence components on spectral variability, Landsat in the search for Appalachian hydrocarbons, and the exterior orientation of side looking sensors. Attention is given to image processing with microcomputers in remote sensing, sensitometry in Canadian aerial survey, aerial camera vibration, raster scanning and its application in automated cartography, improved land use classifications from Landsat and Seasat satellite imagery registered to a common map base, and a quantitative method to test for similarity between photo interpreters. Other topics explored are related to remote sensing of ice, morphological factors affecting the visibility of certain objects in remotely sensed materials, the use of Skylab S190-B photography for small scale mapping, an optical data link for an airborne scanning system, and new instrumentation for direct photogrammetric mapping. (Author)

A82-34708

**IMAGE PROCESSING WITH MICROCOMPUTERS IN REMOTE SENSING**


A description is given of a digital image processing system which has proved to be useful in a number of application areas. In connection with the employment of a relatively low resolution sensor, it was possible to use relatively inexpensive computing components, memory, and bulk storage devices. The speed of operation for a wide range of application programs was high enough to allow the system to be useful for interactive image processing. The convenience gained by the use of the considered computer indicates that similar results can be obtained with higher resolution arrays by utilizing higher performance, new generation microprocessors. The discussed system is based on the use of an eight-bit microprocessor with an addressing space of 65,536 locations.

A82-34724

**SENSITOMETRY IN CANADIAN AERIAL SURVEY**


Since 1943, sensitometric control of the processing of aerial negatives has been used by the Royal Canadian Air Force (RCAF) in connection with the performance of its task to provide aerial photography for Canada. The sensitometers used by the RCAF suffered from a variety of problems which, however, could be overcome by making use of repair and recalibration facilities. The transfer of aerial photography assignments from the RCAF to a number of private companies in the 1950's made it appear desirable to employ sensitometers which could perform reliably without easy access to specialized repair facilities. Attention is given to a sensitometer which was designed to satisfy these requirements. The design features of the new instrument are discussed, taking into account the light source, the spectral quality of illumination, the shutter, and the electrical supply. Aspects of sensitometer...
calibration and verification are considered along with the uses of sensitometric control of aerial photography in Canada G.R.

A82-34777
REMOTE SENSING OF THERMAL SUBSURFACE TERRAIN PROPERTIES

It is noted that although the sensed radiation is generated and limited by heat flow through the material underlying the emitting surface, little attention appears to have been paid to the effect of variation in properties of the conducting materials on the information carried by the emitted radiation. As a consequence, variations in thermal radiation may be attributed solely to variation of the temperature and emissivity of the radiating surface However, it is shown that variation in radiant emittance can equally well be dominated by variation in the thermal conductivity of the underlying material. Criteria are derived under which either thermal conductivity variations or emissivity variations dominate radiant emittance data. A definition is given of threshold temperature; below the threshold, emissivity variations dominate, above it thermal conductivity variations dominate. Expressions are presented for the threshold temperature for various kinds of surface cooling C.R.

A82-34737
AN OPTICAL DATA LINK FOR AIRBORNE SCANNING SYSTEM

In connection with a study of oceanic thermal fronts, the Navy is interested in a thermal scanning system which could be used with their P-3 patrol aircraft. A suitable scanning system would be the RS-18A scanning thermal IR radiometer. However, an obstacle regarding the envisaged use of the instrument is related to the necessity to employ the aircraft without an introduction of any modifications. The obstacle has been overcome by making use of an optical data link which replaces the hardwire connections between the scanner and the power supply. The optical link is housed in a ten inch diameter tube which is clamped in position directly behind the scanner head G.R.

A82-34742
THE USE OF SKYLAB S-190B PHOTOGRAPHY FOR SMALL SCALE MAPPING

The use of the Skylab Earth Terrain Camera (S-190B) with 1:946,000 scale photography in small-scale mapping is investigated. The procedure used in making the measurements on the Skylab imagery is described An analytical absolute orientation is performed, and the results show that the photography could be used for mapping at scales of 1:100,000 and smaller. The photography used in the test comprises a strip of three photographs exposed on the SO-242 high-resolution color film. Second generation film transparencies made from the original film are used in the actual test. C.R.

A82-34746
COMPARISONS OF LAND COVER CLASSIFICATIONS FROM SELECTED REMOTE SENSING SYSTEMS

The present investigation is concerned with differences in accuracy of land cover maps generated by manual interpretation of several forms of remote sensing imagery. An area near Harmsburg, PA was imaged by K-band SLAR, the Landsat-1 MSS, the Landsat-3 RBV, and two Seasat SAR passes These images were manually interpreted to yield land cover parcels corresponding to the Level I categories considered by Anderson et al. (1976). The resulting interpretations were compared with the more detailed USGS land cover map of the same region to determine classification errors It is pointed out, however, that the results of this comparison cannot be interpreted as definitive assessments of the merits of each sensor system Continued research is necessary According to the current study, airborne radar imagery produced the best overall accuracy. With respect to the four space-borne sensor systems the MSS and RBV images are preferable to the digitally processed Seasat SAR image with the optically processed Seasat SAR image being the least accurate system product. G.R.

A82-36018
THE USE OF MICROWAVE RADIOMETRY FOR THE DETERMINATION OF SNOW COVER HEIGHT [SPOLOZOVANIE SVCH RADIOMETRII DLIA OPREDELENIJA VYSOTY SNEZHNOGO POKROVA]

A method is proposed for determining the height of snow cover from remote measurements of the brightness temperatures in the wavelength range 1.5-0.34 cm. The method is validated by means of a model experiment and by comparing the results with direct measurements. The remote and direct measurements are found to correlate to within 5 cm. V.L.

A82-37809#
MICROWAVE SENSING FROM SPACE

The design, functions, and performance of satellite microwave sensor systems for earth imaging are described. It is noted that microwave operations can be carried out in all weather and in day or night conditions, and that current satellite systems operate in the interval of 1-20 GHz. Applications for soil characterization, moisture, and wind vector measurements over the sea are described in terms of frequency selection, power, and antenna requirements. Synchronous orbits offer the advantage of low power storage capabilities due to avoidance of eclipse conditions. Areas of development necessary to implement an SAR for GEO positioning are reviewed, and features of a microwave remote sensing experiment involving SAR operating at 9.6 GHz during the first Spacelab flight on the Shuttle are presented. Finally, details of the ERS-1 satellite, which will carry a radar altimeter, wind scatterometer, and SAR are outlined M.S.K.
and in situ data at the selected surface sites. The list contains sufficiently small to allow efficient and accurate extraction of SASS to the ascending node, which is estimated to be within +6 seconds. The methods by which the inflight sensor performance will be determined or evaluated are discussed and the supporting operational modes which would allow for cross track and stereoscopic viewing as well as a multiaxialitude operational capability. A description is presented of a summary of some of the salient features of four different MLA design concepts, as developed by four American companies. The systems ranged from the use of three different reflective telescopes utilizing three groups of focal plane detectors electronic correlation processing, for achieving spatial registration, and incorporating palladium silicide (PdS) SWIR detectors, to a four-mirror all-reflective telecentric system utilizing a beam splitter for spatial registration. G.R.

**USE OF NOAA/AVHRR VISIBLE AND NEAR-INFRARED DATA FOR LAND REMOTE SENSING**


The data were analyzed for their usefulness in monitoring lake ice, snowcover, water quality, crop condition and terrain classification on the H.P. 1000 computer interactive system. Terrain phenomena that were studied using LANDSAT MSS data could also be monitored with the NOAA-6 channels, but at a lesser resolution. T.M.

**SEASAT: A SATELLITE SCATTEROMETER IMAGING TIMES OF SELECTED IN SITU SITES**


A list of times that the SEASAT A Satellite Scatterometer (SASS) illuminated from directly above or directly abeam, selected surface sites where in situ winds were measured is provided. The list is ordered by the Greenwich Mean Time (GMT) of the midpoint of the illumination period (hit time) for a given surface site. The site identification, the orbit number and the direction from the subtrack in which the truth lies are provided. The accuracy of these times depends in part upon the ascending node times, which are estimated to be within +1 sec, and on the illumination time relative to the ascending node, which is estimated to be within +6 seconds. The uncertainties in the times provided were judged to be sufficiently small to allow efficient and accurate extraction of SASS and in situ data at the selected surface sites. The list contains approximately six thousand hit times from 61 geographically dispersed sites. Author

**SEASAT-A 37812#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**N82-22643#** National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.

**N82-22685#** National Aeronautics and Space Administration Langley Research Center, Hampton, Va.


Research performed with satellites of the 'Intercosmos' series is discussed. Scientists have investigated short wave emissions of the Sun and the Earth's ionosphere and magnetosphere, cosmic rays and meteorite flows. Various technical systems were tested in these satellites. A transmitter of the 'beacon' type operated successfully in the first 'Intercosmos' satellites, while a special telemetric system later functioned in space and was recommended for further use. The unified telemetric system transmitted information directly to ground stations without the use of spacecraft instruments. S.L.

**N82-24489#** Research Inst. of National Defence, Linkoping (Sweden).

**STUDY VISIT TO UNITED STATES LASER TECHNOLOGY CENTERS, 1981 [RAPPORT FRAAN USA-RESA INOM LASEROMRAADET, 1981]**

O. STEINVALL Jan. 1982 29 p Partly in SWEDISH and ENGLISH (FOA-C-30257-E1) Avail NTIS HC A03/MF A01

Coherent infrared radar and coherent CO2 laser radar were studied. Information from visits to research laboratories and radar manufacturers is outlined, focusing on TEA lasers, heterodyne radiometers, laser absorption spectrometers, and transportable measurement radar. Airborne oceanographic lidar, laser cloud mappers, and oceanographic detection were examined. Infrared imaging systems, and hydrographic laser sounders were investigated. Author (ESA)

**N82-25602#** General Software Corp., Landover, Md.

**LANDSAT-D CONICAL SCANNER EVALUATION PLAN**


The planned activities involved in the inflight sensor calibration and performance evaluation are discussed and the supporting software requirements are specified. The possible sensor error sources and their effects on sensor measurements are summarized. The methods by which the inflight sensor performance will be analyzed and the sensor modeling parameters will be calibrated are presented. In addition, a brief discussion on the data requirement for the study is provided. T.M.

**N82-25610#** National Aeronautics and Space Administration.

**RADIOMETER MISSION REQUIREMENTS FOR LARGE SPACE ANTENNA SYSTEMS**

L. S. KEAFER, JR., P. SWANSON, and J. ECKERMAN May 1982 64 p refs Avail NTIS HC A04/MF A01 CSCL 20N

Requirements are defined for Earth observational microwave radiometry using large space antenna systems with apertures in the 50 to 200 meter range. General Earth observational needs, specific measurement requirements, orbital mission guidelines and constraints, and general radiometric requirements are defined. Specific measurements include soil moisture, water surface temperature, water roughness, ice boundaries, salinity, and water pollutants. Measurements with 10 to 1 km spatial resolution and 3 to 1 day temporal resolution are required. Author
N82-2642#  Barringer Research Ltd., Rexdale (Ontario)
BREADBOARD GAS FILTER CORRELATION SPECTROMETER
FOR ATMOSPHERIC MEASUREMENT OF HYDRAZINES AND
R. DICK Oct 1981 31 p refs
(Contract F33615-77-C-0604, AF PROJ. 7930)
(AD-A110868; TR-79-281, SAM-TR-81-11) Avail. NTIS HC
A03/MF A01 CSCL 14B
This report describes the efforts to build a broadband Gas Filter Correlation Spectrometer (GFSC) for the atmospheric measurement of hydrazines and nitrogen dioxide. The instrument was configured for use as an ambient monitor, for the atmosphere. Results of model flight proven multispectral scanner; and a new instrument expected to evaluate the aeroheating effects on ESAM during launch and to improve the Earth Sensor Experiment (ESEAM) for the NASA Shuttle Transportation System (STS) orbiter bay. Results of model analyses. The flight proven multispectral scanner is a new instrument expected to provide improved spatial resolution for the Earth Sensor Experiment (ESEAM) for the NASA Shuttle Transportation System (STS) orbiter bay. Results of model analyses.

N82-26741* National Aeronautics and Space Administration, Washington, D. C.
LANDSAT D TO TEST THEMATIC MAPPER, INAUGURATE
OPERATIONAL SYSTEM
21 Jun. 1982 43 p
(NASA-NEWS-RELEASE-82-100, P82-10:03) Avail. NASA Scientific Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A
LANDSAT D will launch the LandSat D spacecraft on July 9, 1982 aboard a new, up-rated Delta 3920 expendable launch vehicle. LANDSAT D will incorporate two highly sophisticated sensors: the flight proven multispectral scanner, and a new instrument expected to provide improved spatial resolution. The flight proven multispectral scanner is a new instrument expected to provide improved spatial resolution. These models were used to develop and verify the thermal design of the ESAM and DTM, to evaluate the aerothermal effects on ESAM during launch and to evaluate the thermal response of the LANDSAT-D assuming the hard-line heaters failed on with the spacecraft in the Space Transportation System (STS) orbiter bay. Results of model analyses. The flight proven multispectral scanner is a new instrument expected to provide improved spatial resolution.

N82-26743* Pennsylvania State Univ., University Park, Dept. of Meteorology
INTERACTIVE INITIALIZATION OF HEAT FLUX PARAMETERS
FOR NUMERICAL MODELS USING SATELLITE TEMPERATURE
T. N. CARLSON, Principal Investigator 1 Jun. 1982 4 p
HCMM
(Contract NAS5-26548)
(E82-10319; NASA-CR-168998; NAS 1.26:168998, Q-4) Avail. NTIS HC A02/MF A01 CSCL 05B
Progress made in HCMM research, including testing the interactive minicomputer system and preparation of a paper on the analysis of regional scale soil moisture patterns, is summarized. An exhibit on remote sensing including a videotape display of HCMM images, most of them of the State College area, was prepared.

N82-26744* OAO Corp., Beltsville, Md.
LANDSAT-D THERMAL ANALYSIS AND DESIGN SUPPORT
1982 134 p ERTS
(Contract NAS5-25737)
(E82-10948; NASA-CR-166788; NAS 1.26:166788, Q4/TM/0036) Avail. NTIS HC A07/MF A01 CSCL 05B
Detailed thermal models of the LANDSAT-D Earth Sensor Assembly Module (ESAM), the Dummy Thematic Mapper (DTM), and a small thermal model of the LANDSAT-D spacecraft for a heater analysis were developed. These models were used to develop and verify the thermal design of the ESAM and DTM, to evaluate the aerothermal effects on ESAM during launch and to evaluate the thermal response of the LANDSAT-D spacecraft for a heater analysis. Results of model analyses.

A82-22546 ANTI PROTONS FROM GALACTIC SOURCES OF COSMIC RAYS AND GAMMA RAYS
R. COWSIK (Franklin Institute, Bartol Research Foundation, Newark, DE; Tata Institute of Fundamental Research, Bombay, India) and T. K. GAISSE (Franklin Institute, Bartol Research Foundation, Newark, DE) in International Cosmic Ray Conference, 17th, Paris, France, July 13-25, 1981, Conference Papers. Volume 2 Gif-sur-Yvette, Essonne, France, Commissariat a l'Energie Atomique, 1981, p. 218-221. Research supported by the U S Department of Energy. refs
Recent observations of discrete galactic sources of gamma rays were examined in the light of a modified version of the nested leaky box model of Cowsk and Wilson (1973, 1975). It is shown that the modified model can account for the observed high fluxes of antiprotons. The essential idea is that bright gamma-ray sources are surrounded by significantly more matter than most other sources of cosmic rays, they are thus strong sources of both secondary gamma rays and antiprotons, and at the same time, efficient absorbers of heavy nuclei.

A82-22547* George Mason Univ., Fairfax, Va.
CONFINEMENT AND ACCELERATION OF COSMIC RAYS IN GALACTIC SUPERBUBBLES
The role of the newly discovered galactic superbubbles on the confinement and acceleration of cosmic rays is examined. It is shown that these structures naturally account for the lifetime and the local origin of the cosmic rays, as well as for the location of galactic gamma-ray sources not associated with pulsars.

A82-22548 INTERACTIONS OF COSMIC RAYS WITH MOLECULAR CLOUDS
The optical thickness of HI, tau, obtained from the dip of 21 cm line for cold clouds is found to depend on the linear size as tau varies as d^2 to the 0.44 power. Cosmic rays responsible for the production of HI from H2 are appreciably absorbed in the inner part of the clouds. The tau-d relation indicates a nearly flat energy spectrum of cosmic rays at low energies.

A82-22549 DERIVATION OF THE DISTRIBUTION OF SYNCHROTRON EMISSIVITY IN THE GALAXY FROM THE 408 MHz ALL-SKY SURVEY
Includes economic analysis.
**A82-22550**

**Angular Variations of Nonthermal Radio Emission from the Galaxy Relevant to the Structure of Interstellar Magnetic Field**


The relation between the correlation function of the intensity of galactic radio-emission at different directions and the correlation function of interstellar magnetic field at different points is found. This relation is shown to be used for the determination of random and regular components of magnetic field. Measurements at different frequencies clarify the character of cosmic ray propagation in the Galaxy, and in particular, distinguish between the diffusive and convective transfer of cosmic rays. (Author)

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**A82-22551**

**Convection Outflow of Cosmic Rays from the Galaxy and Background Radio Emission**


An X-ray survey of flat spectrum radio sources is carried out. All sources are detected, among them two highly compact BL Lac type objects which show aligned triple X-ray sources. Interpreting these features as very large X-rays by inverse Compton scattering of microwave background photons leads to strong constraints on the process of acceleration and the energetics of the sources. C.R.

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**A82-22552**

**Consequences of an Inverse Compton Emission Model for Extragalactic X-Ray Sources**


An X-ray survey of flat spectrum radio sources is carried out. All sources are detected, among them two highly compact BL Lac type objects which show aligned triple X-ray sources. Interpreting these features as very large X-rays by inverse Compton scattering of microwave background photons leads to strong constraints on the process of acceleration and the energetics of the sources. C.R.

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**A82-22554**

**Calculated Isotopic Source Composition and Tests for Origin and Propagation of Cosmic Rays with Mass Numbers Less Than or Equal to 62**


Recent measurements of the nucleonic composition of cosmic-ray Ne and Mg are used to calculate their isotopic source compositions. In addition, the effects of these neutron-rich species on abundances of various secondary nucleides are presented. Implications of anomalies in the source composition for nucleosynthesis and/or evolution of the galactic composition are discussed. Finally, the arriving isotopic abundances C-59, C-57 and Ti-44, Ti-46 are calculated for time intervals much less than 50 years, much greater than 50 years, much less than 100,000 years, and much greater than 100,000 years between nucleosynthesis and acceleration to cosmic-ray energies. (Author)

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**A82-22556**

**Comparative Abundances in Solar Energetic Particles and in Galactic Cosmic Ray Sources, and the Ne-22 Anomaly**


An analysis is made of the time dependence of solar cosmic ray intensity and anisotropy. Results show that the coronal time is the time of the escape of the bulk of the particles into the interplanetary space, and it is found that the generation of solar cosmic rays is almost simultaneous in the fast propagation region, which could be in the case of solar cosmic ray acceleration by the quasi-spherical shock wave. This result is in agreement with values found by Bazilevskaya and Vashenyuk (1979) for the transit time of the first particles in the corona for high energy solar cosmic rays. D.L.G.
of the ARGOS satellite, which has been in operation since 1974. The data to be collected by SPOT will be pertinent to research in agricultural land use, agricultural meteorology, hydrology, forest management, agriculture, mineralogical resources. Attention is given to the coordination of such research and the dissemination of its data by French government agencies. O C.

A82-33555
REMOTE SENSING OF THE EARTH’S RESOURCES - THE SOVIET EXPERIENCE

The tools, techniques, and targets of Soviet remote sensing systems are explored. Satellite viewing results are rechecked by both aerial surveys and surface sampling for purposes of calibration and confirmation. A total of 1,260 Kosmos spacecraft were launched by 1979, and carried vidicons and microwave sensors for data acquisition. The Salyut space stations were also equipped with a multispectral scanner which featured 10 m resolution, could discern between wet and dry ground, and covered the range 0.46-0.89 microns. Additional instrumentation comprised a radio telescope, stereoscopic camera, and SAR. World grain crops are observed with a multispectral scanner which featured 10 m resolution, could discern between wet and dry ground, and covered the range 0.46-0.89 microns. Additional instrumentation comprised a radio telescope, stereoscopic camera, and SAR. World grain crops are monitored to anticipate the world wheat market, regions of intense storm activity such as the Bermuda Triangle are studied, and weather conditions and evolution, particularly in Arctic shipping areas, are tracked. Telemetry stations are located in five countries outside the Soviet Union. Instances of successful cosmonaut remote sensing for mineral prospecting, glacier mapping, and sea ice tracking to protect ocean-going vessels are cited. M.S.K.

A82-34116#
EARTH OBSERVATIONS FROM SPACE - TRENDS AND PROSPECTS

The instrumentation and missions of various earth observation satellites are outlined. Earth observation satellites are grouped into experimental types for testing instruments or observing techniques, operational meteorological satellites with on-line users, the Landsat series of satellites for performing whole-earth scanning using different EM wavelengths, and ocean and ice scanning satellites. The Tiros-N series of satellites included advanced very high resolution radiometers for sea-surface temperature measurements, a solar backscatter ultraviolet sensor for global ozone monitoring, and an advanced microwave sounding unit. The GOES-D spacecraft carries an improved imaging radiometer for atmospheric vertical sounding, while the European Meteosat features a water vapor channel at 6-7 microns for upper atmosphere water vapor content assays. Landsat data has been useful in areas such as agriculture, forestry, urban planning, mapping, cartography, water resources studies, and geology. M.S.K.

A82-34367#
ERS-1 EUROPEAN REMOTE SENSING SATELLITE

The mission objectives and the components developed for the ERS-1 remote sensing satellite are discussed. The spacecraft is intended for use in weather forecasting, sea state forecasting, off-shore activities support, ship routing, ice monitoring, ocean pollution monitoring, scientific investigations of complex ocean interactions, and microwave sensing of land surfaces and coastal zones. A supply module provides power for the instruments and earth pointing. The data will be transmitted and possibly stored on board. Launched by the Ariane into a 675 km sunsynchronous orbit, ERS-1 will carry a sidescan radar with SAR for high resolution land and ocean imaging and wave spectra plotting, and a water vapor content meter for measurements from 4-24 m/sec over the oceans. A microwave radar serves for wave height, earth surface height, wind speed, and ice- or open-ocean determination. Launch is scheduled for 1987. M.S.K.

A82-36617*
SPACE SCIENCE FOR APPLICATIONS - THE HISTORY OF LANDSAT
The history of the Landsat project is discussed in terms of three historical phases, each characterized by a dominant problem. From 1964 to 1967, the challenge was to develop interagency cooperation and to achieve consensus on basic plans for the satellite. Between 1968 and 1971, the cooperating agencies had to persuade the Bureau of the Budget to provide funding for the project. Since 1972, the challenge to NASA has been to encourage applications of the Landsat data and plan the shift from an experimental program to an operational one. The tension between experimental and operational goals has run through all these phases, and the conflicts between agencies is detailed, as well as the interaction between technological and political systems.
C.D.

N82-22640#
Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

TEN-ECOSYSTEM STUDY Final Report
A. V. MAZADE, Principal Investigator Aug. 1981 96 p refs
Sponsored in part by USDA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (Contract NAS9-15860; PROJ. AGRISTARS)

EROS-10186; NASA-CR-167457; NAS 1.26:167457; LEMSCO-13491) Aval NTIS HC A05/MF A01 CSCL 13B Remote sensing methodology developed for the Nationwide Forestry Applications Program utilize computer data processing procedures for performing inventories from satellite imagery. The Ten-Ecosystem Study (TES) was developed to test the procedures for performing inventories from satellite imagery. The results of TES indicate that LANDSAT multispectral imagery and associated automatic data processing techniques can be used to distinguish softwood, hardwood, grassland, and water and make inventory of these classes with an accuracy of 70 percent or better. The technical problems encountered during the TES and the solutions and insights to these problems are discussed. The TES experience is useful in planning subsequent inventories utilizing remote sensing technology.
T.M.

N82-22630#
Committee on Science and Technology (U. S. House)

CIVIL LAND REMOTE SENSING SYSTEM

Current remote sensing research and development activities, current planning for an operational system, and international remote sensing activities are summarized. Significant issues considered include: the role of government vis-a-vis the private sector, the way in which it can best serve both the public and the private sector, its role in future research and development, and regulations and terms it must mandate for a civil land remote sensing system. Legislation needed for government/industry joint ventures is also examined.
A.R.H.

N82-23258*# National Aeronautics and Space Administration, Washington, D.C.

OSTA-1 POST MISSION OPERATION REPORT
1982 17 p (NASA-TR-84191, NAS 1.15:84191; S-420-81-01) Aval. NTIS HC A02/MF A01 CSCL 26A
The first science and applications payload for the space shuttle was carried on mission STS-2. The space shuttle’s performance and systems were tested. The Shuttle’s capability of providing a platform

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for scientific and applications research was demonstrated. The OST-A payload was selected and developed to demonstrate this secondary objective. The experiments selected for the OST-A payload were concerned with remote sensing of Earth resources, environmental quality, ocean conditions, meteorological phenomena and life sciences. These experiments demonstrated the Shuttle's capability for space research and the potential application of techniques for future remote sensing.

N82-23568* Environmental Research Inst of Michigan, Ann Arbor.


Major first year accomplishments are summarized and plans are provided for the next 12-month period for a program established by NASA with the Environmental Research Institute of Michigan to investigate methods of making LANDSAT technology readily available to a broader set of private sector firms through local community colleges. The program applies a network where the major participants are NASA, university or research institutes, community colleges, and obtain hands-on training in LANDSAT data analysis techniques, using a desk-top, interactive remote analysis station which communicates with a central computing facility via telephone line, and provides for generation of land cover maps and data products via remote command.

N82-24216# Centre National d'Etudes Spatiales, Toulouse (France)

HISTORY OF THE FRENCH SATELLITE SPACE PROGRAM [HISTORIQUE DU PROGRAMME SPATIALE SCIENTIFIQUE FRANCAIS]
J C. HUSSON in its The Technol of Spaceborne Sci Expt p 3-10 1981 In FRENCH
Avail: NTIS HC A99/MF A01

The amplitude of the French space program and the variety of research that supports it are discussed. Three objectives stand out: (1) develop space research and technology; (2) develop spacecraft and related technology; and (3) participate on a global scale in research into the terrestrial environment, space observation, and exploration of the solar system. Given this perspective, results concerning astronomy, planetology, geophysics, geodesy, meteorology, and biology are reviewed. Future projects in space manufacturing are also mentioned.

Author (ESA)


COST-EFFECTIVENESS OF GEOGRAPHIC SURVEYING FROM SPACE
Avail: NTIS HC A07/MF A01

An economic evaluation of space based observation systems is presented. The cost effectiveness of these satellite systems is discussed.

S.L.


A LEGISLATOR'S GUIDE TO LANDSAT
1982 33 p Sponsored by NASA. Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (E82-10290; NASA-CR-168859, NAS 1.26.168859) Avail: NTIS HC A03/MF A01 CSCL 05B

The LANDSAT satellite is an effective tool in meeting the natural resources data requirements of state and federal legislation. The availability of data from the satellite is beginning to have an impact on state legislature activities. An overview of the history, operation, and data analysis techniques, is presented as well as a discussion of the advantages and limitations of this method of remote sensing. Applications are discussed in the areas of (1) land resource planning and management; (2) coastal zone management; (3) agriculture; (4) forestry; (5) routing and siting; (6) environmental monitoring; and (7) geological exploration. National and state sources from which information about LANDSAT technology is available are listed.

N82-26746* Purdue Univ., Lafayette, Ind. Lab. of Applications of Remote Sensing.

KEY ISSUES IN THE ANALYSIS OF REMOTE SENSING DATA: A REPORT ON THE WORKSHOP

The procedures of a workshop assessing the state of the art of machine analysis of remotely sensed data are summarized. Areas discussed were data bases, image registration, image preprocessing operations, map oriented considerations, advanced digital systems, artificial intelligence methods, image classification, and improved classifier training. Recommendations of areas for further research are presented.

J. D.
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- California Univ., Berkeley. Lawrence Berkeley Laboratory. Environmental monitoring report of the Lawrence Berkeley Laboratory, 1980
- California Univ., Cal. Jolla. Seasat altimeter determination of ocean current variability
- California Univ., Livermore Lawrence Livermore Lab. Seismic and geodetic studies of the Imperial Valley, California
- California Inst. of Tech., Pasadena. Laboratory studies of actinide metals-combine fractionation
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- Centre National d'Etudes Spatiales, Toulouse (France). History of the French satellite space program
- Centre National de la Recherche Scientifique, Paris (France). Representativeness of cloud motion winds deduced from GOES Indian Ocean satellite imagery for the description of the Indian summer monsoon
- Chicago Univ., III. The question of short pathlengths in interstellar propagation
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