

Russian and Japanese Aerospace Literature

Throughout 1993 the *AIAA Journal* will carry selected abstracts on leading research topics from Russian aerospace literature and, as space permits, from similar Japanese literature. The topics will be chosen and the abstracts reviewed for pertinency by *AIAA Journal* editors. This month features Remote Sensing from Russia and Japan.

Support for assembling and publishing the selected abstracts has been provided by the Innovative Science and Technology Directorate of the Strategic Defense Initiative Organization (SDIO), with the sponsorship and technical management of the abstract service by the Office of Naval Research (ONR) under ONR Grant N0014-87-6-0137.

Abstracts in this listing have been taken from the semimonthly abstract journal International Aerospace Abstracts (IAA), published by the American Institute of Aeronautics and Astronautics (AIAA) in cooperation with the National Aeronautics and Space Administration (NASA) under Contract No. NASW-4373. Additional material can be obtained through searching the Aerospace Database—available online via DIALOG or NASA RECON.

Paper copies and microfiche of the original documents cited are available from AIAA Library, Technical Information Division, American Institute of Aeronautics and Astronautics, Inc., 555 W. 57th St., New York, NY 10019 (212) 247-6500, ext. 231. Use the "A" number to identify material you want. Please be advised that most of the original documents are in the original language. Direct questions concerning this abstract section of the *AIAA Journal* to Norma Brennan, Director, Journals.

Russian Aerospace Literature This month: *Remote Sensing*

A92-57456 Consideration of atmospheric parameters in remote laser gas analysis (Uchet parametrov atmosfery v lazernom distant-sionnom gazoanalize). V. N. AREF'EV, G. I. BUGRIM, K. N. VISH-ER-ATIN, N. I. SIZOV, *Rossiiskaya Akademiya Nauk, Izvestiya, Fizika Atmosfery i Okeana* (ISSN 0002-3515), Vol. 28, No. 4, April 1992, pp. 391-397.

A differential method for the remote measurement of atmospheric trace gases is presented. The effects of ambient air temperature and pressure as well as of the absorption by various air components on errors of remote laser measurement of gases are analyzed. Results of atmospheric water vapor concentration measurements using a CO₂ laser are presented. A modified method for improving agreement between remote and in situ measurements is proposed. Recommendations for remote sensing of water vapor, ethylene, and ammonia are given.

A92-53948 A method for the digital processing of aerial and space remote-sensing data for the interpretation of soil cover (Metodika tsifrovoi obrabotki aerokosmicheskoi informatsii dlia deshifirovaniya pochvennogo pokrova). E. V. SHCHERBENKO, V. V. ASMUS, *Methods and tools for the processing of remote sensing data on the parameters of the environment* (A92-53943 23-43). Leningrad, Gidrometeoizdat, 1991, pp. 78-100.

A method of soil-cover interpretation based on the digital processing of remote-sensing imagery is described, and its application to a region near the Volga River is considered as an example. The method consists of the following stages: (1) creation of a data base of remotely sensed and ground information; (2) digital processing of the remotely sensed images; (3) interactive and visual analysis of digital-processing results and the original images; and (4) determination of the soil structure characteristics.

A92-53943 Methods and tools for the processing of remote sensing data on the parameters of the environment (Metody i sredstva obrabotki aerokosmicheskikh dannykh o parametrah prirodnoi sredy). V. V. ASMUS, ED. Leningrad, Gidrometeoizdat (*Nauchno-Proizvodstvennoe Ob'edinenie Planeta, Trudy*, No. 39), (ISSN 0201-9949), 1991, 200 pp. For individual items see A92-53944 to A92-53949.

Problems of thematic information retrieval from multispectral remote-sensing imagery are examined in a series of papers. Consideration is given to simulation techniques related to a geographic information system (GIS); software to handle satellite data user requirements; a number of new and modified thematic processing algorithms; the extraction and assessment of geometrical parameters of targets; and spatial data archiving and handling within GISs. Test results on the techniques considered are shown with reference to the following tasks in the study of earth resources: identification of soil composition, land surface water quality assessment, soil-type recognition, and seismological mapping.

A92-53946 A method of expansion in multiplicity of reflections from the underlying surface in problems of solar-radiation transfer above the irregular earth surface (Metod razlozheniya po kratnosti otrazhenii ot podstilayushchei poverkhnosti v zadachakh perenosu solnechnogo izlucheniya nad neodnorodnoi poverkhnost'yu zemli). I. U. G. SPIRIDONOV, *Methods and tools for the processing of remote sensing data on the parameters of the environment* (A92-53943 23-43). Leningrad, Gidrometeoizdat, 1991, pp. 36-51.

The method of expansion of solar-radiation intensity in multiplicity of reflections from the underlying surface yields a rigorous solution to the 3D transfer equation with irregular boundary conditions at the lower atmospheric boundary which is expressed through the solution of the 1D transfer equation and the Green surface function. An analysis is carried out which makes it possible to assess the applicability of the approximation of single reflection from the underlying surface, which determines the linear relation between outgoing radiation at the upper atmospheric boundary and the surface albedo. The analysis thus makes it possible to substantiate the use of the albedo-linear approximation in connection with the radiative correction of multispectral satellite imagery. The linear approximation provides efficient solutions to both the direct and the inverse problems of radiative transfer above an irregular underlying surface.

A92-53944 System for controlling the reception and processing center of priority satellite information (Sistema upravleniya tsentrom priema i obrabotki sputnikovoi informatsii pervoi ocheredi). V. I. KHIZHNICHENKO, A. V. KUKHARSKII, *Methods and tools for the processing of remote sensing data on the parameters of the environment* (A92-53943 23-43). Leningrad, Gidrometeoizdat, 1991, pp. 21-29.

The paper examines the hardware and software structure of a system for controlling the reception and processing center of satellite remote-sensing information. Descriptions are given of the main software modules realizing support of the special-purpose data base, remote intermachine information exchange, prediction of the center-of-mass motion of the satellite, and spacecraft-survey planning taking user requirements into account.

A92-53896 An algorithm for reducing radar image redundancy (Algoritm sokrashcheniya izbytochnosti radiolokatsionnogo izobrazheniya). V. V. MANSUROV, B. M. MIRONOV, *Radiotekhnika* (ISSN 0021-3470), Vol. 35, No. 4, April 1992, pp. 54-58.

An algorithm for reducing the redundancy of SAR images is developed which is based on nonlinear image processing. The efficiency of the algorithm proposed here is demonstrated using results of a quantitative evaluation. It is shown that the algorithm makes it possible to reduce the amount of required imaging data by a factor of 2-10 or greater.

A92-53933 Choice of instrumentation for spaceborne monitoring of the ozonosphere (O vybore apparatury dlia kosmicheskogo monitoringa ozonosfery). N. V. TEREB, *Atmospheric optics* (A92-53926 23-46). Moscow, Gidrometeoizdat, 1991, pp. 70-77.

The paper examines the advantages and drawbacks of UV instrumentation designed for monitoring the ozonosphere from space platforms in which interference filters are used to isolate the required spectral regions. It is shown that the interference filters do not allow the mapping of the ozone concentration field. They also do not provide the required measurement accuracy owing to their low contrast and instability.

A92-53895 Analysis of the capabilities of multipurpose radar systems for earth imaging from space (Analiz vozmozhnostei mnogotselevykh radiolokatsionnykh sistem distantsionnogo zondirovaniia zemli iz kosmosa). A. I. KALMYKOV, O. V. SYTNIK, V. N. TSYMBAL, *Radioelektronika* (ISSN 0021-3470), Vol. 35, No. 4, April 1992, pp. 18-25.

The paper deals with the problem of optimizing spaceborne imaging radar systems in order to maximize the information value of the observations and to expand the system's functional capabilities. The existing and future radar systems for earth imaging from space are examined. A generalized optimality criterion is proposed which makes it possible to optimize a system for maximum information content for given constraints on the technical parameters of the system.

A92-53857 An inverse problem of the photometry of solar radiation reflected by an optically thick planetary atmosphere. III - Remote sensing of minor gaseous components and atmospheric aerosol (Obratnaia zadacha fotometrii solnechnogo izlucheniia, otrazhennogo opticheski tolstoi planetnoi atmosferoi. III - Distantsionnoe zondirovanie mal'kikh gazovykh sostavliashchikh i atmosfernogo aerologii). E. A. USTINOV, *Kosmicheskie issledovaniia* (ISSN 0023-4206), Vol. 30, No. 2, Mar.-Apr. 1992, pp. 212-225.

Attention is given to the application of the inverse problem formulated by Ustinov (1991) to the remote sensing of minor gaseous components and aerosol in the planetary atmosphere on the basis of observational data on reflected solar radiation. The radiative transfer equation is considered in a two-component medium consisting of the background molecular atmosphere and the atmospheric component being sounded. General expressions that describe variations of the intensity of the outgoing radiation due to variations of the extinction coefficient and scattering phase function of the component sounded are obtained. These expressions are used to formulate the inverse problems of the retrieval of the minor gaseous component mixing ratio, volume extinction coefficient of scattering aerosol, and microphysical parameters of aerosol particles. Expressions for weighting functions of the appropriate linearized inverse problems are obtained.

A92-46639 Remote monitoring of air pollution and emissions (Distantsionnyi monitoring zagriazneniia atmosfery i vybrosov). A. N. NIKOLAEV, SH. D. FRIDMAN, EDS. Moscow, Gidrometeoizdat (Institut Prikladnoi Geofiziki, Trudy, No. 78), (ISSN 0201-9965), 1991, 140 pp. In Russian.

No individual items are abstracted in this volume. The book describes spectral-optical methods of gas and aerosol analysis used in remote sensing of atmospheric pollutants and for observing the behavior and the distribution of pollutants from their sources. Attention is given to experimental investigations of CO₂ in the urban atmosphere, the determination of the vertical CO₂ profile in Berlin, a universal laser gas analyzer, and the application of a laser gas analyzer for monitoring the sources of ammonia in agriculture and industry. Particular consideration is given to the metrological characteristics of a nondispersive correlation radiometer with gas filters; an application of high-frequency laser radiation in gas analysis; mixed modulation of laser radiation in gas analysis; and measurements of aerosol pollutants in Moscow using a single-frequency lidar.

A92-44014 The Earth Observing System (EOS): Ecological priorities and observation planning. I - Priorities (Sistema nabludenii zemli /EOS/: Ekologicheskie priority i planirovanie nabludenii. I - Priority). K. IA. KONDRAT'EV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 96-107.

Scientific priorities used as the basis for developing the Earth Observing System (EOS) are described. The key role in EOS planning is given to studies of the energy and water cycles and the biogeochemical cycles of carbon dioxide, nitrogen, and sulfur, as well as to a systematic approach to the observation planning. High priority is given to the global monitoring of the ocean and land bioproductivities (e.g., the phytoplankton and forest dynamics). Of particular interest are polar-region studies in the context of the effect of cryosphere dynamics on global climate. The respective observational requirements are discussed.

A92-44010 Assessing the possibilities of interpretation of poppy fields using a photometric method (Otsenka vozmozhnostei deshifirovaniia polei maka fotometricheskimi metodami). L. M. MATIASEVICH, D. V. KOCHERGIN, IU. L. SUBBOTIN, V. N. MAMATULIN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 67-75.

The paper discusses methodological problems associated with the recognition and interpretation of poppy fields on remote-sensing images of various scales. Results are presented of experimental studies on poppy-field classification based on zonal brightness characteristics.

A92-44013 Estimating parameters of the soil-vegetation cover from multispectral satellite data (Otsenka parametrov pochvenno-rastitel'nogo pokrova po mnogospektral'nym sputnikovym dannym). K. IA. KONDRAT'EV, N. V. VANDYSHEVA, V. V. KOZODEROV, V. S. KOSOLAPOV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 88-95.

The use of atmospheric correction in the thematic interpretation of remotely sensed data for estimating the parameters of the soil-vegetation cover is discussed. Estimates of the accuracy of the vegetation-biomass content retrieval from multispectral satellite images are made. Results of the processing of high-resolution data obtained by the Cosmos-1939 satellite for April and August 1989 are presented, illustrating new possibilities for biosphere studies from space.

A92-44012 Studies of fronts of the Yellow Sea and the East China Sea, using satellite data (Issledovanie frontov Zheltogo i Vostochno-Kitaiskogo morei po sputnikovym dannym). A. S. KAZ'MIN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 81-87.

Results are presented of a study of front characteristics of the Yellow Sea and the East China Sea, based on the analysis of IR and visible spectra obtained by spaceborne measurements. The hydrophysical conditions necessary for front formation are analyzed in terms of parameters applicable to the problem of interpreting spaceborne data, and a scheme of frontal zone distribution is constructed. The characteristics of the frontal zones of the two seas are described.

A92-44007 Automation of the forecasting of the spring-ice dynamics in Lake Ladoga using remotely sensed data and simulation modeling (Avtomatizatsiia prognozirovaniia dinamiki l'da Ladozhskogo ozera v vesennii period po aerokosmicheskoi informatsii metodami imitatsionnogo modelirovaniia). N. IU. BURDA, A. V. ANTROPOV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 42-49.

Model simulations were used together with remote images to calculate spring-ice dislocations in Lake Ladoga, in order to be able to make forecasts for days when weather conditions prevent aerial and/or space observations. A close correlation was found between the values of the calculated coincidence criteria and those obtained from airborne measurements, as well as between calculated results and the image interpretation data for two types of remotely sensed information.

A92-44006 Analysis of sea-surface-temperature retrieval algorithms based on observations from the NOAA and ERS-1 operational satellites (Analiz algoritmov vosstanovleniia temperatury poverkhnosti okeana na osnove nabludenii s operativnykh sputnikov NOAA i ERS-1). N. A. TIMOFEEV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 35-41.

Several commonly used methods for retrieving sea-surface temperature from remotely sensed data are examined. It is shown that, if measurement errors are reduced to 0.1°C, the data processing algorithm developed in the Ukraine Institute of Marine Hydrophysics (Timofeev et al., 1991) will better satisfy the accuracy requirements of the international research programs than will the commonly used algorithms, such as those of McClain et al., (1985) and Barton et al. (1989).

A92-44005 Methods of satellite data assimilation for the analysis and forecasting of atmospheric ozone fields (O metodakh usvoeniia sputnikovoi informatsii dlia tselei analiza i prognoza polei atmosfernogo ozona). K. IA. KONDRAT'EV, A. A. BUZNIKOV, O. M. POKROVSKII, IU. B. IANUSHANETS, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 26-34.

Various methods used for the temporal-spatial analysis of remotely sensed ozonometric data are discussed, and spectral and grid algorithms are developed for an objective spatial analysis of ozone fields. Using a 2D dynamic-photochemical stratosphere-lower mesosphere model as the basis for the temporal assimilation of analytical results, the error structure of the analysis is investigated for a variety of spatial data distributions and for different periodicities in data assimilation.

A92-44004 Analysis of the correlation between spectral and phytometric parameters of young crops from field data (Analiz vzaimosviazi spektral'nykh i fitometricheskikh parametrov posevov po dannym polevogo opyta). R. M. KOROBOKOV, V. IA. RAILIAN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 16-25.

The sensitivities of spectral and phytometric parameters of a triticale crop canopy to the differences in the crop varieties and the sowing rates were investigated using results of a field experiment in which six genotypes and three sowing rates were recorded in three replicates on a total of 54 fields at various phases of crop growth. The response variables were the first canonical variable of the brightness coefficient of the crop canopy in its most informative regions of the visible and NIR spectral ranges, and the corresponding statistics of the phytometric characteristics of the crop: the above-ground dry weight, the plant height, the canopy density, and the leaf area index. It is shown that the first canonical correlation, at the stages starting from the seed booting to the milk ripeness, exceeded 0.7, while the proportion in the total variance ranged from 52.6 to 82.2 percent. It was found that the canopy reflection spectrum was no less sensitive to various growth factors than are traditional phytometric parameters.

A92-44008 Some aspects of processing radar data for studies of boreal forests (Nekotorye voprosy obrabotki radarnykh dannykh dlia izucheniia boreal'nykh lesov). G. I. BEL'CHANSKII, M. N. ORDVINTSEV, G. K. OVCHINNIKOV, V. G. PETROSIAN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 3, May-June 1992, pp. 50-61.

Results are presented of the development of software for processing data of a low-resolution side-looking radar of the Okean series, for studies of boreal forests. The observation data were obtained from data bases of several forest geographic information systems. Results obtained on the classification of vegetation using several criteria are compared. It was found that the classification scheme based on the values of backscattering coefficient was more accurate than that based on data for pixel intensities.

A92-41925 Keeping an eye on earth - Remote sensing in Russia. ARNOLD S. SELIVANOV, *Planetary Report* (ISSN 0736-3680), Vol. 12, No. 3, May-June 1992, pp. 11-15.

The Soviet space-based terrestrial remote-sensing program is briefly reviewed, from its beginnings in the late 1960s until the present. Consideration is given to the Resource-F photographic satellites, the Resource-O multispectral satellites (combining a survey camera with high-resolution pointable cameras), the Ocean-O satellites (especially designed for polar ice imaging), and ecological surveillance programs. Sample images are provided.

A92-40669 Incoherent radiophysical methods of the sea surface remote sensing (Radiofizicheskie nekogerentnye metody distantsionnogo zondirovaniia morskoi poverkhnosti). G. G. BAKHSHIAN, G. I. MARINOSIAN, K. S. MOSOIAN, *Radiofizika* (ISSN 0021-3462), Vol. 34, No. 6, June 1992, pp. 630-638. In Russian.

Expressions for calculating the mean specific effective scattering surface (SESS) and brightness temperature have been obtained using a 2D scattering and radiation model for radiowaves of microwave frequencies from excited sea surface. The dependence of the mean SESS and the brightness temperature on the observation angle for vertical and horizontal polarization of transmitting and receiving antennas is described. Optimal observation conditions are determined for sea irregularities of different origin.

A92-40645 Aerial/space video-reporting survey (Telereportazhnaia aerokosmicheskaia s'emka). B. N. RODIONOV, *Geodeziia i Kartografiia* (ISSN 0016-7126), No. 2, Feb. 1992, pp. 21-25. In Russian.

The principal features, applications, and advantages of aerial/space video reporting as a new method for the remote sensing of agricultural resources are examined. The method consists in the use of portable video recording equipment to film agricultural resources from aircraft or spacecraft, with simultaneous recording of the operator's comments on the video tape. The film can then be viewed on any commercial TV set. The method combines the accuracy of instrumental observations with the immediate availability of a video report and is accessible to a wide range of users. A discussion of the geometrical and brightness characteristics of video images is included.

A92-36414 Determination of the economic effectiveness of using space information in agriculture (Opredelenie ekonomicheskoi effektivnosti ispol'zovaniia kosmicheskoi informatsii v sel'skokhoziaistvennom proizvodstve). A. F. DEMIDOV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 98-108.

Specifics of assessing the effectiveness of applying space information (SI) in agriculture are considered. A technique for determining the annual cost effectiveness of SI for final agricultural consumption is proposed. Estimates are given for the potential annual cost effectiveness and profit for consumers, in the space system and in the branch system of the thematic processing of SI. The paper shows the possibility of employing the method for analyzing variants of remote sensing and thematic processing, for estimating their returns, and for measuring the actual effect from the introduction of novel farming techniques.

A92-36407 An experiment on the IR thermal sensing of gas deposits on the Black Sea shelf (Eksperiment po IK-teplovomu zondirovaniu raiona gazovykh mestorozhdenii na shel'fe Chernogo moria). L. T. SHEVYREV, M. D. GORLOV, A. A. FEOKTISTOV, E. L. ZLOBIN, V. A. ZELENNIN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 48-50.

Results of an experiment on the IR thermal sensing of offshore gas deposits in the Black Sea performed with the aid of a multichannel scanner system are presented. The capabilities of the IR thermal remote sensing method for monitoring the ecological state of a water body are discussed. (P.D.)

A92-36411 Processing of space monitoring data for studying large mammals in the Arctic environment (Obrabotka dannykh kosmicheskogo monitoringa dlia izucheniia krupnykh mlkopitaiushchikh v arkticheskoi srede). G. I. BEL'CHANSKII, G. K. OVCHINNIKOV, V. G. PETROSIAN, L. F. PANK, D. C. DOUGLAS, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 75-81.

Attention is given to the development of software for the integrated processing of data obtained by remote sensing, simultaneous satellite observations, and space biotelemetry for studying large Arctic mammals. Emphasis is placed on radar-data processing and interpretation and on the architecture of the software complex.

A92-36409 Calibration of remote measurements of 2D spatial wave spectra from optical images (Kalibrovka distantsionnykh izmerenii dvumernykh prostranstvennykh spektrov volneniia po opticheskim izobrazheniiam). V. D. BARANOVSKII, V. G. BONDUR, V. V. KULAKOV, V. A. MALINNIKOV, A. B. MURYININ, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 59-67.

Attention is given to a technique for testing the accuracy of remote measurements of seawave spectra in the gravity range and gravity-capillary range by comparing them with point measurements in situ and with stereophotogrammetric data. The technique is used to analyze integrated remote-contact experimental data to check the efficiency of nonlinear methods for the reconstruction of 2D wave spectra from optical images.

A92-36408 Spectral investigations using an 8-14 micron field spectrometer (Spektral'nye issledovaniia s pomoshch'iu polevogo spektrometra diapazona 8-14 mkm). V. G. SURIN, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 51-58.

A method for making measurements using an 8-14 micron spectrometer is described. Diorite rock in central Kazakhstan is used to illustrate the technique. The method makes it possible to obtain quantitative data on the radiation characteristics of natural objects, and obviates the need for special temperature measurements. Spectral investigations of other rocks were also performed on the basis of this method.

A92-36405 Ecological monitoring of the territory of Moscow using data of airborne-scanner IR-thermal channels (Ekologicheskii monitoring territorii Moskvy s ispol'zovaniem dannykh IK-teplovyykh kanalov samoletnogo skanera). A. A. FEOKTISTOV, E. L. ZLOBIN, A. F. MOLCHANOVA, V. A. ZELENNIN, V. S. ARTEMKOV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 38-40.

Results of ecological monitoring of the territory of Moscow are discussed. Data of airborne-scanner IR-thermal channels were used to detect sources of water pollution. The results show that photographs of an area of large industrial agglomerations can find practical application in the evaluation of the territory's ecological condition.

A92-36402 Problems of studying the biosphere from space (Problemy izucheniia biosfery iz kosmosa). K. IA. KONDRAT'EV, V. V. KOZODEROV, V. S. KOSOLAPOV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 2, Mar.-Apr. 1992, pp. 15-23.

An evaluation of biospheric parameters from satellite data is discussed in the context of the existing global environmental problems. The objectives of the First Field Experiment within the framework of the International Satellite Land Surface Climatology Project, conducted to reconstruct the vegetation biomass from multispectral satellite images, are analyzed. Methods used in the investigation are described.

A92-35318 Remote sensing of natural films on the sea surface. S. A. ERMAKOV, A. R. PANCHENKO, S. G. SALASHIN, *IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium*, Espoo, Finland, June 3-6, 1991. Vol. 4 (A92-34851 14-43). New York, Institute of Electrical and Electronics Engineers, Inc., 1991, pp. 2343-2345.

Remote measurements of damping in the wavenumber wind-ripple wavelengths were carried out by optical spectrum analyzers for artificial and natural film slicks. Dependencies of wave damping on the film elasticity and wind velocity are analyzed theoretically. The theoretical and the experimental data for artificial films with measured elasticity are shown to be in good agreement. The possibility of the reconstruction of the film elasticity values for natural slicks is demonstrated.

A92-35277 Multi-channel microwave radiometer system. A. K. ARAKELIAN, A. G. GULIAN, K. V. GRIGORIAN, R. N. JAMGARIAN, R. M. MARTIROSIAN, V. V. MUSSATOV, *IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium*, Espoo, Finland, June 3-6, 1991. Vol. 4 (A92-34851 14-43). New York, Institute of Electrical and Electronics Engineers, Inc., 1991, pp. 2127-2130.

A multichannel microwave radiometric system that provides simultaneous reception of vertical and horizontal polarized components of radio-thermal radiation of the earth is described. The structural and circuit solutions are discussed, and the main technical characteristics of the radiometric systems are presented. The spectral, angular, polarizational, temperature, and wind characteristics of brightness temperature of the water surface are considered. The radiometric methods of water-temperature and wind-speed determination, as well as methods and devices for detection of various types of anomalous formations, are described.

A92-32038 Identifying the physiological condition of plants from spectra of laser-induced fluorescence (Raspoznavanie fiziologicheskogo sostoiianiia rastenii po spektram lazerno-indutsirovannoi fluo-restsentsii). D. M. MIRKAMILOV, A. A. MUKHAMEDOV, M. M. MANSUROV, SH. N. ERNAZAROV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), Jan.-Feb. 1992, pp. 92-95.

It is shown that the use of a multidimensional discriminant analysis (classifier) of LIF spectra of plant leaves can significantly increase the accuracy of the assessment of the plants' physiological condition, as compared to the conventional one-dimensional estimation from the ratio of intensities in two spectral regions. Data are presented demonstrating the reliability of recognition with the use of classifiers trained on representative samples of LIF spectra.

A92-35176 Brightness temperature of freshwater ice cover on the region with bottom's gas liberation. G. S. BORDONSKII, S. D. KRYLOV, S. V. POLIAKOV, *IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium, Espoo, Finland, June 3-6, 1991. Vol. 3 (A92-34851 14-43).* New York, Institute of Electrical and Electronics Engineers, Inc., 1991, pp. 1577-1579.

The microwave emissivity of freshwater ice cover containing gas inclusions was investigated. Three types of structures were considered: a) homogeneous distribution of gas bubbles, whose dimensions are considerably less than the radiation wavelength; b) large inclusions, whose dimensions are comparable with the wavelength; and c) a layer of gas-water mixture on the lower ice cover boundary. Calculations and measurements were carried out for 18 cm, 2.3 cm, and 0.8 cm wavelengths. It is found that the microwave spectral characteristics may vary considerably for different cases. The structures with higher brightness temperatures were determined in natural conditions. Increments of ice-cover microwave brightness temperature of the Trans-Baikal lakes reached 10 K at 2-cm band.

A92-35024 Nonlinear theory of synthetic aperture radar sea wave imaging. M. B. KANEVSKII, V. I. KARAEV, L. V. NOVIKOV, *IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium, Espoo, Finland, June 3-6, 1991. Vol. 2 (A92-34851 14-43).* New York, Institute of Electrical and Electronics Engineers, Inc., 1991, pp. 847-850.

It is shown that the synthetic aperture radar (SAR) sea wave imaging mechanism is nonlinear for any sea wave travel direction except for the nearly range one. The SAR image spectrum for azimuthally traveling waves is found with the speckle noise taken into account.

A92-34934 The distance determination of fire hazard in forests. V. I. TROITSKII, V. N. AMBARNIKOV, A. N. ELAGIN, N. F. PODKOVKO, I. K. SHESTOPALOV, *IGARSS '91; Proceedings of the 11th Annual International Geoscience and Remote Sensing Symposium, Espoo, Finland, June 3-6, 1991. Vol. 2 (A92-34851 14-43).* New York, Institute of Electrical and Electronics Engineers, Inc., 1991, pp. 381-383.

The prognosis of fire danger in the forests is needed for effective application of fire-fighting measures. For resolving this problem the statistical treatment of radiothermal emission measurements from the airboard is supposed. The appropriate statistical number of data is formed from the measured values of brightness temperatures. By using a special procedure of statistical calculations, the brightness temperatures corresponding to trees and forest soil are separated. The statistical characteristics of the latter are functionally related to the degree of fire hazard in the forest.

A92-32039 The accuracy of sea-surface temperature estimates and its variations using spectral methods of satellite microwave radiometry (Tochnost' opredeleniia temperatury poverkhnosti okeana i ee variatsii spektral'nymi metodami sputnikovoi SVCh-radiometrii). A. G. GRANKOV, A. M. SHUTKO, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Jan.-Feb. 1992, pp. 107-121.*

Current methods used for sea-surface temperature (SST) determinations from cm-wavelength radiometric measurements are classified and examined for accuracy. Accuracy estimates for SST determinations from orbital-satellite measurements are given, and conditions necessary for obtaining desirable accuracy for this type of radiometry are considered. Results are presented from calculations of the accuracy of estimates of short-time, synoptic, and seasonal SST variations calculated from satellite measurements at cm wavelengths.

A92-32037 Use of spectral information for estimating the level of mineral nutrition in farm crops (Ispol'zovanie spektral'noi informatsii v zadachakh otsenki urovnia mineral'nogo pitaniia sel'skokhoziaistvennykh posevov). A. I. ZHUMAR', E. A. IANOVSKAIA, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Jan.-Feb. 1992, pp. 85-91.*

The effects of various mineral nutrients in a fertilizer on the reflectance spectra of potato leaves and potato crops were investigated using results from laboratory and field experiments as well as mathematical modeling of the crop-reflected radiation field. Spectral indexes were derived for remote determinations of the nutrition adequacy in potato crops fertilized by nitrogen-containing fertilizers.

A92-32036 Results of studies on the use of space photography to investigate water and land resources of Afghanistan (Rezultaty issledovaniia po ispol'zovaniu kosmicheskoi fotos'emki pri izuchenii vodno-zemel'nykh resursov respublikii Afganistan). G. F. KRASNOZHON, M. N. ZURMATI, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Jan.-Feb. 1992, pp. 79-84.*

The first results are presented from studies of water and land resources in Afghanistan based on space images obtained during the August-September 1988 Soviet-Afghan orbital mission. Using the Logar-River region as an example, it is shown that medium-scale space photographs can be used for obtaining maps of river basins, irrigation canals, swamplands, and irrigated and unirrigated farmlands in mountainous regions.

A92-32035 Spaceborne quick-look global monitoring of atmospheric ozone (O global'nom operativnom monitoringe atmosfernogo ozona iz kosmosa). A. I. KOT, A. M. LIUDCHIK, A. N. KRASOVSKII, A. F. CHERNIAVSKII, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Jan.-Feb. 1992, pp. 72-78.*

The paper proposes to use the atmospheric-brightness distribution pattern, obtained by satellite measurements in UV spectrum, for quick-look monitoring of the ozoneosphere condition. Model calculations are presented demonstrating the efficiency of the technique.

A92-30346 Joint interpretation of spaceborne lidar and photometric data on cloud fields (Sovmestnaia interpretatsiia lidarnykh i fotometricheskikh dannykh pri issledovanii oblachnykh polei iz kosmosa). I. U. S. BALIN, S. I. KAVKIANOV, S. V. STREPETOVA, *Optika Atmosfery (ISSN 0235-277X), Vol. 4, Oct. 1991, pp. 1077-1083.* In Russian.

The possibility of performing complex optical experiments using a spaceborne lidar and radiometer is discussed. The lidar and photometric measurements were correlated on the basis of model representations of the vertical stratification of stratiform clouds. An isolated numerical experiment simulating a random cloud field against the background of an underlying surface with different albedo is conducted. The results illustrate the information capacities of joint measurements.

A92-30327 Complex geoeological investigations of zones of ecological disaster on the basis of space photographs (Kompleksnye geokologicheskie issledovaniia zon ekologicheskogo bedstviia po kosmicheskim snimkam). N. N. ALEKSEVA, E. V. GLUSHKO, T. I. KONDRAT'eva, A. V. PTICHNIKOV, *Geodeziia i Aerofotos'emka (ISSN 0536-101X), No. 1, 1991, pp. 40-48.* In Russian.

A system of geoeological monitoring from space is being developed with the aim of monitoring changes of the environment in arid regions. The most important element in the spaceborne monitoring is complex geoeological mapping on scales of 1:2,400,000, 1:1,000,000 and greater. The region that has been chosen as the object of the geoeological investigations is the Aral region and the desert of Kyzylkum, including large areas of ecological disaster. The condition of the environment in this region was evaluated using photographs from the Salyut station and the Resurs-F satellite.

A92-25357 The velocity of geostrophic surface current - A comparison of satellite and ship measurements (Skorost' geostroficheskogo techeniia na poverkhnosti - Sopostavlenie sputnikovykh i sudovykh izmerenii). A. I. ALEKSANIN, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Nov.-Dec. 1991, pp. 55-61.*

A comparison is presented of Kuroshio surface current velocities calculated on the basis of dynamical topography (ship hydrological measurements) and by means of the determination of displacements of small thermal inhomogeneities from a series of satellite images. The results of a preliminary analysis of ship and satellite data are used to solve the problem of the mismatch of space and time measurements.

A92-25333 Determination of the concentration of phytoplankton chlorophyll in the ocean from measurements from the Mir orbital station in the Caribe-88 experiment (Opredelenie kontsentratsii khlorofilla fitoplanktona v okeane po izmereniam s orbital'noi stantsii 'Mir' v eksperimente 'Karibe-88'). V. V. BADAIEV, L. N. VASIL'EV, V. N. PELEVIN, V. L. SOLOMAKHA, G. TSIMMERMAN, *Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), Sept.-Oct. 1991, pp. 47-55.*

Phytoplankton chlorophyll and admixture concentration in sea water are determined. Results were obtained via research-vessel-based biological and optical measurements, as well as spaceborne measurements of brightness, with consideration for atmospheric correction of surface images, obtained during the Caribe-88 experiment using MKS-M instrumentation and methods. The applicability of these methods to remote study of the ocean and coastal waters is shown.

A92-24211 Electromagnetic ELF radiation from earthquake regions as observed by low-altitude satellites. O. N. SEREBRIAKOVA, S. V. BILICHENKO, V. M. CHMYREV, M. PARROT, J. L. RAUCH, F. LEFEUVRE, O. A. POKHOTILOV, *Geophysical Research Letters (ISSN 0094-8276), Vol. 19, Jan. 24, 1992, pp. 91-94.*

Seismoelectromagnetic waves observed by low-altitude satellites passing over seismic regions were studied. The data of the Cosmos-1809 satellite were analyzed over an earthquake region. Intense EM radiation at frequencies below 450 Hz was observed at the L-shells of the earthquake, during 12 orbits out of the 13 that passed within 6 deg in longitude from the epicenter, and during 1 out of 6 in the range of 6-8 deg longitude away from this region. The other orbits, which passed 10-12 deg from the epicenter, showed no effect. The emissions observed by another low-altitude satellite are used to complete the study. It is shown that during the event the seismic region is permanently radiating; the intensity and the envelope shape of the wave depend on its time relatively to the time of the earthquake. Their frequency spectra are compared to the average spectrum recorded in the same geomagnetic regions. Similar wave intensities and spectral distributions were observed on the two satellites during the seismic periods.