

# Russian and Japanese Aerospace Literature

During 1995 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, respectively.

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## Russian Aerospace Literature This month: *Remote Sensing*

**N94-23397** **Rover in the Mars 96 mission** A. EREMENKO, B. MARTINOV, K. PITCHKHADZE, V. POROTOV, and V. NAGRONYK. Babakin Engineering and Research Center, Moscow (Russia). Documents available from Aeroplus Dispatch.

The main data of the Mars-96 mission and performance of the Mars Rover (MR) which is the mission integral element are reported. The tasks of the Mars-96 mission are as follows: remote sensing from the Mars orbit of the various Mars regions in the different spectral bands; in situ investigations of the Martian atmosphere and surface parameters with the Balloon/Probe (BP) floating in the atmosphere; in situ contact investigations of the Mars surface and atmosphere, Martian soil on different depths, interaction of the atmosphere and soil along the MR route. With regard to the MR, the following are discussed: landing, destination, composition, systems functions, control, communication and program of operation, design, main performance. (ESA)

**A94-25164** **Airborne lidar remote sensing of vertical distribution of sea water scattering coefficient.** P. Vasil'kov, Aleksandr, Yuriy A. Goldin, and Boris A. Gureev, (Russian Academy of Sciences, Inst. of Oceanology, Moscow, Russia). Documents available from Aeroplus Dispatch.

Results are presented of experiments designed to verify the polarization technique for determining the scattering profile in sea water by an airborne polarization lidar, proposed by Vasil'kov (1990) on the basis of theoretical considerations. In these experiments, good qualitative agreement was obtained when airborne measurements of the lidar signals were compared to field measurements (made aboard a sea vessel) of the vertical distribution of the sea water attenuation coefficient  $c(z)$ .

**A94-24449** **Pattern recognition and data processing in laser remote sensing of the earth surface and geosystems (Raspoznavanie obrazov i obrabotka dannykh lazernogo distantsionnogo zondirovaniya zemnoj poverkhnosti i geosistem).** T. A. Trifonova, A. A. Nazaryan, L. T. Sushkova, S. M. Arakelyan, (Vladimirskij Politekhnikeskij Inst., Vladimir, Russia). Documents available from Aeroplus Dispatch.

Photoluminescence spectra obtained by a laser spectrometer mounted on board a helicopter are shown to allow the qualitative and quantitative classification of natural objects, including vegetation, soils, water basins, and minerals. By combining these data with space photography, it is possible to identify characteristic optical patterns for certain terrains. As a result, a new model for the formation of different types of terrain has been formulated which is based on universal physical processes associated with the break-down of solids.

**A94-24447** **Remote measurement of the thickness of an oil film on the surface of water using an excimer laser (Distantsionnoe izmerenie tolshchiny plenki nefteproduktov na poverkhnosti vody s ispol'zovaniem ehksimernogo lazera).** A. P. Zhelvakov, D. O. Leshchenko, S. A. Pakkonen, and V.M. Sidorenko, (Gosudarstvennyy Opticheskij Inst., Moscow, Russia). Documents available from Aeroplus Dispatch.

A method for the remote measurement of the thickness of a film of oil products on the surface of water is proposed which employs a fluorometric lidar. Results of an experimental study of the method in the laboratory using an excimer laser as a fluorescence source are reported.

**A94-24439** **Airborne multispectral mm-wave imaging technique.** I. V. Chernyj, G. Ya. Gus'kov, V. P. Shevtsov, O. P. Ivanov, V. P. Nakonechnyj, and S.

Yu Pantsov. (Russian Academy of Sciences, Center for Program Studies and Space Research Inst., Moscow, Russia). Documents available from Aeroplus Dispatch.

An airborne multifrequency microwave imaging technique for remote sensing of ocean and atmosphere is presented. Field tests of the technique show that the resulting observations can be used effectively in studying oceanic processes. Experimental results on microwave diagnostics of the Kuroshio ring are discussed as an example.

**A94-23631** **Possibilities of the remote sensing of auroral and aeronomic characteristics from a spacecraft using a new type of spectrophotometric imaging system (Vozmozhnosti distantsionnoj diagnostiki avroral'nykh i aeronomiceskikh kharakteristik s kosmicheskogo apparata s pomoshch'yu spektrofotometricheskoy izobrazhayushchej sistemy novogo tipa).** A. K. Kuz'min and K. N. Chikov, Documents available from Aeroplus Dispatch.

The possibilities afforded by an on-board spectrophotometric imaging system using a new 'monochromatic eye' lens for the remote sensing of aurorae and electrodynamic characteristics of the polar ionosphere are examined. In particular, attention is given to a possible design version of a system of quasi-monochromatic imaging cameras for the low-apogee Meteor-3 M satellite and to the advantages of such a system in the study of processes in the polar ionosphere and aeronomic characteristics of the upper atmosphere. Further improvements to the imaging system and its possible applications to spaceborne studies of planetary atmospheres and ionospheres are discussed.

**A94-19425** **Atmospheric ozone—The current state of the problem (Atmosfornyj ozon—Sovremennoe sostoyanie problemy).** Igor' L. Karol' (Glavnaya Geofizicheskaya Observatoriya, St. Petersburg, Russia). Documents available from Aeroplus Dispatch.

The current status of the ozone problem is briefly reviewed, with particular reference to measurements obtained by the Total Ozone Mapping Spectrometer on the Nimbus-7 satellite as well as Meteor-3 data. An analysis of the observations provides some evidence of the ozone hole phenomenon in the Northern Hemisphere, with a trend toward an increase in the intensity and duration of ozone holes in the Antarctic stratosphere. The discussion also covers the damage of the ozone layer by aircraft and rockets and the main consequences of the weakening of the ozone shield of the earth.

**94-18432** **Spectral characteristics of earth surface images (Spektral'nye kharakteristiki izobrazhenij zemnoj poverkhnosti)** A. A. Potanov and A. I. Kolesnikov. Documents available from Aeroplus Dispatch.

A method is presented for the recognition of earth surface images using spectral analysis. A method for obtaining three-dimensional Fourier images is implemented by using a two-dimensional coherent optical spectrum analyzer. Results of studies of the energy spectrum of images, formed in the optical and millimeter wavelength regions, are reported.

**A94-17580** **Observation of electron precipitations from the earth's radiation belt on the Mir orbital station in April–May 1990 (Nablyudenie ehlektronnykh vysypanij iz radiatsionnogo poyasa zemli na OS 'Mir' v aprele-mae 1990 g.)** V. I. Lyagushin, O. Yu. Nechaev, M. A. Saraeva, and P. I. Shavrin.

In Southern Hemisphere on drift shells with  $L = 2-3.6$ . The precipitation fluxes and spectra shapes for some of the bursts are estimated.

**A94-13663 Comparison of the spectral and angular IR methods for the remote sensing of the ocean surface temperature (Sravnenie spektral'nogo i uglovogo IK-metodov distantsionnogo opredeleniya temperatury poverkhnosti okeana).** A. M. Ignatov and V. S. Suetin (ANU, Morskoj Gidrofizicheskij Inst., Sevastopol, Ukraine). pp. 431-439. In Russian. Documents available from Aeroplus Dispatch.

The problem of eliminating atmospheric noise during the remote measurement of the ocean surface temperature is investigated with allowance for the regional variability of the vertical profiles of air temperature and humidity. An approach is proposed which makes it possible to analyze the physical mechanisms affecting the accuracy of ocean surface temperature measurements and to obtain reliable estimates of the measurement errors.

**A94-13655 Metal vapor lasers for the remote sensing of atmospheric aerosol (Lazery na parakh metallov dlya distantsionnogo zondirovaniya atmosfernogo aerolya).** V. D. Burlakov, V. V. Zuev, G. S. Evtushenko, A. V. El'nikov, V. N. Marichev, and V. L. Pravdin (RAN, Inst. Optiki Atmosfery, Tomsk, Russia) pp. 326-331. In Russian. Documents available from Aeroplus Dispatch.

The possibility of using metal vapor lasers in lidar systems for the remote sensing of atmospheric aerosol is discussed. In particular, it is shown that data on the aerosol particle spectrum obtained with a multifrequency lidar based on metal vapor lasers make it possible to perform the aerosol correction of the simultaneously measured ozone concentration profiles. A stationary lidar based on a copper vapor laser for measuring the spatial distribution of aerosols over an industrial center is described.

**N94-15889 Almaz V. VITER (Nauchno-Proizvodstvennoe Obединenie).** Radio, Moscow (USSR). pp. 53-58 (SEE N94-15886 03-32). Documents available from Aeroplus Dispatch.

The basic data of the automatic space station ALMAZ-1B is overviewed, including the orbit parameters and maximum power. The principal technical characteristics of its remote sensing equipment is listed for the synthetic aperture and side-looking radar, optoelectronic equipment for stereophotography, high-resolution electronic scanner, middle-resolution optomechanical scanner, spectroradiometer for ocean satellite monitoring, and information transmission and reception. The main objectives and uses of the ALMAZ-1B information are cartography, land monitoring, geology, ecological monitoring, oceanology, pilotage, fishery, and information supply during an emergency such as controlling situation in natural disasters. (CASI)

**A94-12814 Determination of the height profile of the electron concentration of the earth's ionosphere from two-frequency measurements of satellite radio signals (Opredelenie vysotnogo profilya ehlektronnoj kontsentratsii ionosfery zemli po dvukhchastotnym izmereniyam radiosignalov iskusstvennykh sputnikov zemli).** V. A. Andrianov and V. M. Smirnov. 1993, pp. 1326-1335. In Russian. Documents available from Aeroplus Dispatch.

Based on the numerical modeling of radio wave propagation along the ground station-satellite path, the possibility of determining the height distribution profile of the ionospheric electron concentration from measurements of the difference of distances to the satellite measured at two frequencies is demonstrated. The method proposed here makes it possible to determine the electron concentration of the earth's ionosphere with an rms error of not more than 10 percent of its maximum value.

**A94-12813 Correlation characteristics of earth surface images (Korrelatsionnyye kharakteristiki izobrazhenij zemnoj poverkhnosti).** A. A. Potapov and A. I. Kolesnikov. 1993, pp. 1270-1279. In Russian. Documents available from Aeroplus Dispatch.

A method for recognizing complex images of the earth surface using correlation analysis is considered. A method for obtaining two-dimensional correlation functions is implemented by using a noncoherent optical-electronic system with spatial light flux integration. Results of experiments involving correlation analysis of the characteristic types of earth cover using their imagery in the optical and millimeter wavelength bands are presented.

**A94-11130 Remote sensing data analysis using combined orthogonal transforms.** Mikhail A. Rakov and Oleg A. Vakul'skij (Ukrainian Academy of Sciences, Physico-Mechanical Inst., Lvov, Ukraine). Documents available from Aeroplus Dispatch.

Current methods and algorithms for processing remote sensing data are discussed, and further improvements to the algorithms are introduced. Several effective methods and algorithms for digital processing of remote sensing data are proposed, showing that these methods reduce calculation volumes in the spectral and correlation analysis.

**A94-11129 The investigations of ecological state of town agglomerations and ecological diagram-map construction with the use of space and surface information.** I. V. Novikov (Space Ecology Research Centre, Moscow, Russia). Documents available from Aeroplus Dispatch.

An ecological-medical system based on space information systems was developed. Ecological-medical diagram maps of several Russian cities were used in this development. Emphasis is on data acquired for the Tula area. The materials are presented in the form of diagram maps which characterize the spatial distribution of zones of influence of different industries, areas of aerosol pollution, and vegetative cover.

**A94-11032 Using inertial navigation systems for the mapping of anomalies (Ispol'zovanie inertial'nykh navigatsionnykh sistem dlya**

**kartografirovaniya anomalij).** M. A. Uryupin. no. 3, June 1993, pp. 80-88. In Russian. Documents available from Aeroplus Dispatch.

An algorithm of the Kalman filter type is proposed for estimating geoid elevations by comparing data from an on-board inertial navigation system and external data on the position of the vehicle. No constraints are imposed on the vehicle trajectory and a priori distribution of the anomalies. The data are used to determine the deflections of the vertical lines and second derivatives of the anomalous geopotential.

**A94-10990 Use of spaceborne scanner images to identify large burning areas and damage from forest fires (Ispol'zovanie kosmicheskikh skanernykh snimkov dlya vyyavleniya krupnykh garej i ushcherba ot lesnykh pozharov).** V. V. Furyaev (RAN, Inst. Lesa i Drevesiny, Krasnoyarsk, Russia). Documents available from Aeroplus Dispatch.

The possibility of identifying large burning areas in forestlands of the northern taiga that are sparsely populated and unprotected against fires is explored. Examples of the calculation of fire damage based on spaceborne scanner images are given.

**A94-10989 Remote determination of groundwater levels using regional data bases (Distantsionnoe opredelenie urovnej gruntovykh vod s ispol'zovaniem regional'nykh baz dannykh).** S. A. Komarov, V. L. Mironov, and A. N. Romanov (Altajskij Gosudarstvennyj Univ., Barnaul, Russia). Documents available from Aeroplus Dispatch.

The study presents calibration correlations between soil emission coefficients, surface layer moisture, and groundwater levels (GWLs), which are based on the use of regional data bases containing information on the radiation and hydrological and physical characteristics of soils. Experimental results based on in situ and remote GWL measurements in the area of the Kulundinsk Channel are reported. Applicability conditions and GWL measurement accuracy using VHF radiometry are determined.

**A94-10988 Use of satellite IR information for studying the thermal state of Lake Ladoga (Ispol'zovanie IK-sputnikovoj informatsii dlya izucheniya termicheskogo sostoyaniya Ladozhskogo ozero).** M. A. Dyaumenko and S. G. Karetnikov (RAN, Inst. Ozerovedeniya, St. Petersburg, Russia). Documents available from Aeroplus Dispatch.

Results of IR photography of Lake Ladoga using the NOAA AVHRR, which was performed synchronously with ship-borne observations, are analyzed. The possibility of temperature calibration of satellite data performed without ground information is explored. The temperature of highest density (4 C) water associated with the spring frontal thermal zone identified from the extremum on the radio brightness histogram is used as a reference point.

**A94-10984 Digital formation of earth-surface radar images in the synthetic-aperture radar of the Almaz-1 space vehicle (Tsifrovoye formirovaniye radiolokatsionnykh izobrazhenij zemnoj poverkhnosti v radiolokatore s sintezirovannoj aperturoj kosmicheskogo apparata 'Almaz-1').** L. B. Neronskij, V. G. Kobernichenko, and S. M. Zraenko (Moskovskij Nil Priborostroeniya, Moscow, Ural'skij Politehnicheskij Inst., Yekaterinburg, Russia). Documents available from Aeroplus Dispatch.

The principles and features of SAR ECOR-A data processing during the formation of radar images are considered. An algorithm for the digital synthesis of the aperture based on a modification of the piecewise-linear approximation phase reference function is described. The stages of the digital processing of signals at a ground-based receiving station are described.

**A93-56167 Dike swarms and fracture pattern analyses of the Kadabora granite pluton, Eastern Desert, Egypt.** MAHMOUD H. ASHMAWY (Tanta Univ., Egypt). Documents available from Aeroplus Dispatch.

The Kadabora granite pluton is dissected by scores of parallel dike swarms. Field measurements and aerial photo analysis confirmed that the dikes are significantly oriented NNE and less significantly NNW and N. The drainage network of the pluton is radial, reflecting its dome-like structure. Multi-scale analysis was adopted for the detection of the major structural features (faults and joints) affecting the pluton. The majority of the field-measured joints are vertical to steep, and strike significantly NNE and NNW and less significantly WNW and E. Faults (normal and strike-slip) commonly strike N, NW, NE and ENE. The significant preferred orientations of the fracture pattern as determined by the Poisson frequency distribution at the 99 or 95 percent probability levels are NNE, N, WNW-W, NNW, ENE and NE. The NNE trend dominates the overall fracture pattern. The relationship between the dike swarms and the fractures of the pluton is unequivocal; the former were forcefully injected along tension fractures. Magmatic fluid pressure seems likely to be responsible for the development of such fractures.

**A93-56021 Observations of the fractal properties of the Japan Sea surface temperature patterns.** L. A. BUNIMOVICH (RAN, Inst. Okeanografii, Moscow, Russia, Georgia Inst. of Technology, Atlanta), OSTROVSKIY, A. G. (RAN, Inst. Okeanografii, Moscow, Russia, Tokyo Univ., Japan), UMATANI, S. (Kyushu Univ., Kasuga, Japan). Documents available from AIAA Technical Library.

This article considers the self-similarity of sea surface temperature (SST) patterns. The study is based upon the analysis of the NOAA AVHRR IR images of the northern Japan Sea from April 1990. Calculations of isotherms lengths provide experimental evidence of the fractal properties of the SST patterns as tracers of the sea mesoscale turbulence. The isotherms fractal dimension is found to be  $1.27 \pm 0.07$  for space scales from at least 4 km to about 120 km. This value is in complete agreement with that of drifting buoys trajectories in the Kuroshio extension. Estimation of sequences of the mass

exponents shows that the SST patterns exhibit monofractal rather than multifractal behavior. A consideration of the series of the NOAA AVHRR infrared images reveals self-similar turbulent structures, the chains of vortices consisting of vortex pairs and anticyclonic eddies. Such hierarchies of vortices, whose horizontal size grows from several kilometers to about 100 km, exist for at least 20 days. Their evolution and possible mechanism of formation are discussed. (Author (revised))

**A93-55035 Interval estimation of the measurement model parameters in remote sensing problems (Interval'noe otsenivanie parametrov modeli izmerenij v zadachakh distantsionnogo zondirovaniya).** YU. P. PYTEV, V. A. GAZARYAN, SUKHORUKOVA, and T. V. MATVEEVA (Moskovskij Gosudarstvennyj Univ., Moscow, Russia). Documents available from Aeroplus Dispatch.

The interval estimation method is presented as an efficient approach to the estimation of atmosphere parameters from measurements of solar radiation intensity. The dimensions of the confidence set provide a quantitative measure of the information value of a specific experiment with respect to the parameters of the object of interest. Estimates of the total ozone and aerosol contents, optical aerosol parameter, and vertical ozone distribution are presented as an example.

**A93-53546 Stochastic synthesis of thermal microwave images of earth surface covers on the basis of optical images (Stokhasticheskij sintez radioteplovyykh izobrazhenij zemnykh pokrovov po opticheskim).** G. A. ANDREEV, L. V. ZAENTSEV, and D. K. TKHABISIMOV. Documents available from Aeroplus Dispatch.

The synthesis of thermal microwave images of the earth's surface on the basis of aerial photographs and radiometric flight data at 37.5 GHz is described. Images with a format of  $512 \times 512$  resolution elements were synthesized on the basis of linear integral transformations.

**A93-51541 Possibilities of thermal sounding of the atmosphere under non-LTE conditions.** V. S. KOSTSOV and YU. M. TIMOFEEV. (St. Petersburg State Univ., Russia), GRASSL, H., HOLLWEG, H.-D. (Max-Planck-Inst. fuer Meteorologie, Hamburg, Germany) Documents available from Aeroplus Dispatch.

Remote sensing methods (space-borne, air-borne, and ground-based) are presently widely used for obtaining information on atmospheric composition and thermal regime. Modern IR remote sensing methods are based on the validity of LTE, which is not true in the upper atmosphere (height of breaking of LTE depends on gas, absorption band and time under consideration). The non-LTE limb radiance has been calculated in the 15-micron  $\text{CO}_2$  band for tangent heights 50–110 km. The inverse problem has been formulated including the retrieval of vibrational temperature profiles for the lower vibrational states of the  $\text{CO}_2$  molecule. The method is based on measurements of high-resolution limb radiance spectra. The retrieval accuracy has been investigated depending on measurement error, spectral resolution, and spectral region used. (Author (revised))

**A93-47168 Principles of creating a system of global heliogeophysical monitoring based on unmanned space vehicles (Printsipy sozdaniya sistemy global'nogo geliogeofizicheskogo monitoringa na baze avtomaticheskikh kosmicheskikh apparatov).** V. M. KOVTUNENKO, S. I. AVDYUSHIN, and A. V. ZAJTSEV (NPO Lavochkin, Inst. Prikladnoj Geofiziki, Moscow, Russia), pp. 96–109. Documents available from Aeroplus Dispatch.

The basic principles of the development of the Ground/Space System for Global Heliogeophysical Monitoring (SGHM) are outlined. The SGHM is intended for operational monitoring and forecasting of solar activity, the state of the magnetosphere, ionosphere, and the upper atmosphere, as well as of some processes that occur on the surface or inside the earth and are reflected in circumterrestrial space. Attention is given to the composition and specifications of the SGHM's main space components, some parameters of proposed space vehicles, and a possible list of controlled parameters and measuring instrumentation for all echelons of the system.

**A93-47155 Radio wave reflection by the ocean surface in bistatic radar remote sensing using two satellites (Otrazhenie radiovoln poverkhnost'yu okeana pri bistaticheskoy lokatsii s ispol'zovaniem dvukh sputnikov).** S. G. RUBASHKIN, A. G. PAVELEV, O. I. YAKOVLEV, A. I. KUCHERYAVENKOV, A. I. SIDORENKO, and A. I. ZAKHAROV. Documents available from Aeroplus Dispatch.

Results of the bistatic radar remote sensing of the ocean surface in the decimeter wavelength region using two satellites are reported. The integral reflection coefficient for the ocean surface is determined as a function of the wave grazing angle. The energy spectra of the signals are examined, and some parameters of a rough sea surface are discussed.

**A93-46965 Remote sensing of the environment and natural resources in India (Distantsionnoe zondirovanie okruzhayushchej sredy i prirodnykh resursov v Indii).** AL. A. GRIGOR'EV and K. YA. KONDRAT'EV. Documents available from Aeroplus Dispatch.

An overview is presented of satellite investigations of the natural resources and ecology of India. Particular attention is given to the progress made in the fields of agriculture, urban dynamics, water resources, and monitoring natural disasters, such as floods and desertification.

**A93-46964 The feasibility of implicit regularization of solutions to ill-posed problems in remote sensing of the atmosphere (O vozmozhnosti neyavnoj regulyarsizatsii reshenij nekorrektnykh zadach distantsionnogo zondirovaniya atmosfery).** V. A. SMERKALOV and L. K.

USHAKOVA (Inst. Prikladnoj Geofiziki, Moscow, Russia). Documents available from Aeroplus Dispatch.

An implicit regularization method is presented which makes it possible to solve ill-posed inverse problems in aerosol optics, without the use of special regularizing functionals. Numerical examples are presented which show that the use of this method makes it possible to retrieve reliably the concentration and the size spectrum of aerosol particles from data of remote measurements of aerosol light scattering indicatrices with errors up to 50 percent.

**A93-46962 Analysis of the hydrological and biological conditions in the Onega Lake from the results of joint spaceborne radar, airborne, and in situ measurements (Analiz gidrobiologicheskikh uslovij v Onezhskom ozero po dannym sovместnykh kosmicheskikh radiolokatsionnykh, samoletnykh i kontaktnykh izmerenij).** M. A. NAUMENKO (RAN, Inst. Ozerovedeniya, St. Petersburg, Russia), V. S. EHTKIN, K. TS. LITOVCHENKO, and A. V. SMIRNOV (RAN, Inst. Kosmicheskikh Issledovaniy, Moscow, Russia), BELETSKIY, D. V. (RAN, Inst. Ozerovedeniya, St. Petersburg, RAN, Inst. Kosmicheskikh Issledovaniy, Moscow, Russia), RUMYANTSEV, V. B. (RAN, Inst. Ozerovedeniya, St. Petersburg, Russia). Documents available from Aeroplus Dispatch.

The paper presents the results of the first complex limnological experiment in the Onega Lake in the summer of 1989. It is shown that combining satellite (Kosmos-1870 SAR data), airborne (visual observations and IR radiometry), and ship (visual observations and measurements of the temperature and optical characteristics of water) measurements made it possible to identify extensive areas of phytoplankton in the lake.

**A93-46955 Taking into account slopes and surface reflection anisotropy in computations of the illumination of elements of aerial and spaceborne images (Uchet uklonov i anizotropii otrazheniya zemnoj poverkhnosti v raschetakh osveshchennosti ehlementov aehrokosmicheskogo izobrazheniya).** I. G. ZHURKIN and I. V. MISHIN (Moskovskij Inst. Inzhenerov Geodezii, Aehrofotos'emki i Kartografi, Moscow, Russia). Documents available from Aeroplus Dispatch.

A mathematical formula for calculating the illumination of the elements of an uneven non-Lambertian surface image is developed, which can be used for the digital processing of remote data. The natural radiation budget, defined by the sun, the atmosphere, and the surface structure, is calculated in the framework of boundary value problems of the transfer theory.

**A93-46953 The radiation and temperature regime of the Mediterranean Sea/atmosphere system and the heliogeomagnetic activity (Radiatsionno-temperaturnyj rezhim sistemy Sredizemnoe more - atmosfery i geliomagnitnaya aktivnost').** G. A. GRISHIN, E. I. KALININ, and T. M. BAYANKINA (ANU, Morskoy Gidrofizicheskij Inst., Sevastopol, Ukraine). Documents available from Aeroplus Dispatch.

Digitized NOAA satellite data obtained during sea-atmosphere monitoring in the summer of 1991 are used to investigate the radiation-energy state of the Mediterranean Sea/atmosphere system and its dependence on the solar activity, with allowance for the 27-day rotation period of the sun. It is found that the significant increase of solar activity in 1991 led to quasi-synchronous variations of a number of heliogeomagnetic parameters. These, in turn, changed the characteristics of cloudiness, outgoing long-wave radiation, and accessible potential energy.

**A93-46952 Variations of the ocean surface emission in the 8 cm and 18 cm range (Variatsii sobstvennogo izlucheniya okeana v diapazone 8 i 18 sm).** G. A. BOLOTNIKOVA, V. G. IRISOV, V. YU. RAIZER, A. I. SMIRNOV, and V. S. EHTKIN (RAN, Inst. Kosmicheskikh Issledovaniy, Moscow, Russia). Documents available from Aeroplus Dispatch.

Variations of the microwave emission by the ocean surface were studied using measurements by aircraft radiometers at the 8 cm and 18 cm wavelengths. Two-band regression curves of the brightness contrasts are constructed, and the relationship between the regression coefficient and the sea-surface conditions is obtained. The experimental data are theoretically analyzed using two different approaches: a method based on the diffraction theory and a phenomenological (quasi-static) approach. A numerical simulation of the regressions under conditions of developing waves is carried out.

**A93-45648 A quasi-optic heterodyne receiver for the 2-mm band (Kvaziopticheskij geterodinnij priemnik 2-mm diapazona).** I. I. ERU (ANU, Radioastronomicheskij Inst., Kharkov, Ukraine). Documents available from Aeroplus Dispatch.

A quasi-optic heterodyne receiver is described which is designed for conducting radio astronomical observations in the 2-mm wavelength transparency window of the atmosphere. The receiver can also be used for the remote sensing of atmospheric ozone at the frequency of one of its most intense absorption lines, 142 GHz. The discussion covers the general design and the main components of the receiver and its performance characteristics.

**A93-45646 Methods of integrating image transducers of different physical types (Review) (Metody integratsii datchikov izobrazhenij razlichnoj fizicheskoy prirody/Obzor).** YU. V. BOJKO, V. M. BOJTSOV, and M. V. ORDA (Kievskoe Vysshее Voennoe Aviatsionnoe Inzhenernoe Uchilishche, Kiev, Ukraine). Documents available from Aeroplus Dispatch.

Published work concerning the integration of various types of image transducers (e.g., radar, TV, infrared, and lidar) is reviewed. Attention is given to problems related to representing and combining information from image transducers. General requirements are formulated for image transducer integration systems, and advantages of such systems are discussed.