

Russian and Japanese Aerospace Literature

During 1997 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 Remote Sensing from Japan.

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Russian Aerospace Literature This month: Remote Sensing

A96-36787 Ill-posed problems in radio astronomy and remote sensing (Nekorrektnye zadachi v radioastronomii i distantsionnom zondirovanii; 1995). A. S. PAVLOV (Moskovskij Gosudarstvennyj Tekhnicheskij Univ., Moscow, Russia), *Moskovskij Gosudarstvennyj Tekhnicheskij Universitet, Vestnik, Seriya Priborostroenie* (ISSN 0236-3933), No. 4, 1995, pp. 96–105. In Russian. 6 Refs. Documents available from Aeroplus Dispatch.

The problem of increasing the resolution of radio telescopes through the processing of observation results is examined. Some reconstruction methods are reviewed, including regularization in the frequency domain, minimization of the smoothing functional, and the maximum entropy method. The methods considered are compared in terms of reconstruction efficiency and computational effort. The use of the maximum entropy method for the reconstruction of real sun images obtained with a radio telescope is illustrated by experimental results.

A96-35498 Multiplicative coding and code detection of composite phase-shift keyed signals (Mul'tiplikativnoe kodirovanie i kodovoe detektirovanie sostavnykh fazomanipulirovannykh signalov; 1996). L. F. BORODIN, I. V. KUTSEVICH, and A. A. CHERNIKOV, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 41, No. 4, 1996, pp. 450–455. In Russian. 4 Refs. Documents available from Aeroplus Dispatch.

The principles of new approaches to the reception of composite signals synthesized from the opposite phase-shift keyed components using the rules of multiplicative binary group codes are presented. The methods of code detection combine the demodulation and decoding processes, use the fundamental properties of correction codes, and combine the advantages of phase-shift keying and analog decoding procedures.

A96-32848 Remote acoustic diagnostics of the wake behind a heated cylinder (Distatsionnaya akusticheskaya diagnostika sleda za nagretyim tsilindrom; 1995). A. B. EZERSKIY, A. B. ZOBININ, and P. L. SOUSTOV (RAN, Inst. Prikladnoy Fiziki, Nizhni Novgorod, Russia), *Radiofizika* (ISSN 0021-3462), Vol. 38, No. 8, 1995, pp. 832–840. In Russian. 7 Refs. Documents available from Aeroplus Dispatch.

The possibility of the remote acoustic diagnostics of flow is investigated experimentally and theoretically using a Karman vortex street behind a heated cylinder as a flow model. The vortex temperature is higher than the ambient temperature. A laboratory experiment carried out in a weakly turbulent wind tunnel at a Reynolds number of about 100 demonstrates that the characteristics of sound scattered by the flow can be used to determine the vorticity, stall rate, spatial period, and temperature of the vortices.

A96-32197 Research and application of remote sensing, measurement and control technique in modern navigation; 1996. L. YAN, H. XU (Beijing Univ., China), Y. FAN, and H. ZHANG (Beijing Univ. of Aeronautics and Astronautics, China), *3rd Saint Petersburg International Conference on Integrated Navigation Systems*, St. Petersburg, Russia, May 1996, Proceedings. Pt. 1 (A96-32176 08-35), St. Petersburg, Russia, State Research Center of Russia Elektropribor, 1996, pp. 138–142. 11 Refs. Documents available from Aeroplus Dispatch.

The paper addresses the concept of 3R (remote sensing, remote measurement, and remote control) in modern navigation. The 3R forms a closed-loop system. The remote sensing signals are first compared with remote measurement and reference data; the compared results are then transferred to a ground receiver station and processed on line; and finally, remote control commands are produced at the station to adjust the direction or attitude of

the navigated carrier. The precision of 3R navigation depends on the precision of remote sensing and remote measurement and the efficiency of signal transmission during the 3R feedback process. Further, it also depends on the fusion and fault tolerance characteristics of the 3R system when dealing with multi-source information.

A96-29714 Temperature dependence of the permittivity of frozen sand (O temperaturnoy zavisimosti dielektricheskoy pronitsaemosti merzlogo peska; 1995). V. A. IL'IN, V. Y. RAJZER, A. V. ROSSIJSKIY, and Y. M. SOSNOVSKIY, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 40, No. 12, 1995, pp. 1882–1886. In Russian. 12 Refs. Documents available from Aeroplus Dispatch.

A study is made of the temperature dependence of the dielectric permittivity of frozen sand containing no free moisture. An electrodynamic model in the form of a three-phase matrix structure with spherical inclusions is proposed. The model is used to explain the experimentally observed anomalous increase of the dielectric permittivity of frozen sand at a frequency of 20 GHz as the temperature decreases from 0 to -20°C .

A96-29711 Methodology for the radiometric sounding of trace gas components and ozone in the lower layers of the atmosphere (Metodologiya radiometricheskogo zondirovaniya mal'kh gazovykh sostavlyayushchikh i ozona v nizhnikh sloyakh atmosfery; 1995). N. N. MARKINA, A. P. NAUMOV, and A. V. TROITSKIY, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 40, No. 12, 1995, pp. 1843–1849. In Russian. 10 Refs. Documents available from Aeroplus Dispatch.

The methodological aspects of the ground-based millimeter-band remote sensing of ecologically important trace gas components of the lower atmosphere are examined. A procedure for the radiometric determination of pollutants is described, with the remote sensing of sulfuric anhydride used as an example. The results of the study can be useful in the development of radiometric equipment for the remote sensing of small amounts of pollutants in the atmosphere and also in the physical interpretation of radiometric data.

A96-23473 Microwave dielectric losses of freshwater ice (Dielektricheskie poteri presnogo l'da na SVCh; 1995). G. S. BORDONSKIY, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 40, No. 11, 1995, pp. 1620–1622. In Russian. 4 Refs. Documents available from Aeroplus Dispatch.

Temperature and frequency dependence of the imaginary part of the relative dielectric permittivity of pure freshwater ice is obtained using the available experimental data. The formula proposed here is valid in the frequency range 1–100 GHz and in the temperature range from 0 to -40°C . For ice with salt inclusions, a formula is presented for the coefficient in the linear salinity dependence of the imaginary part. It is noted, that a hysteresis of dielectric losses may occur in the case of large variations of ambient temperature. As a result of the losses, the temperature for weakly saline ice varies.

A96-20589 Polarization studies of the sea surface microwave emission fluctuations (Polarizatsionnye issledovaniya fluktuatsii SVCh-izlucheniya morskoy poverkhnosti; 1995). I. T. BUBUKIN, K. S. STANKEVICH, V. P. IVANOV, and M. I. AGAFONOV, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 40, No. 9, 1995, pp. 1368–1379. In Russian. 11 Refs. Documents available from Aeroplus Dispatch.

Based on results of theoretical and experimental studies of sea surface microwave emission fluctuations for different polarizations, it is shown that the

spectrum of brightness temperature fluctuations of rough seas is determined by the gradient spectrum in the sight plane in the case of vertical polarization and by the gradient spectrum in the plane normal to the sight plane for a polarization angle of 45 deg. A theory is developed which describes fluctuations of the brightness temperature of the sea surface for arbitrary polarization with allowance for large-scale (relative to the emission wavelength) waves.

A95-38881 Remote detection of spatial anomalies of an agitated sea surface (O distantsionnom obnaruzhenii prostranstvennykh anomalii vzvolnovannoy morskoy poverkhnosti; 1995). B. D. BORISOV and V. A. KRUTIKOV (RAN, Inst. Optiki Atmosfery, Tomsk, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 8, No. 5, 1995, pp. 714-723. In Russian. 11 Refs. Documents available from Aeroplus Dispatch.

Preliminary experimental results of remote diagnostics of the state of an agitated sea surface at dark using airborne instrumentation are discussed. The results are obtained by means of frame-by-frame statistical processing of TV images taken during the illumination of the sea surface by direct optical pulse. The estimates of space amplitude, frequency, and autocorrelation functions of the images' structure are considered and compared for the case of background wind disturbance and in the area of the wake of a moving vessel.

A95-38878 Errors in retrieving the vertical profile of aerosol scattering coefficients from remote sensing data for the Earth's twilight atmosphere (Pogreshnosti vosstanovleniya vertikal'nogo profilya koefitsienta rasseyaniya aërozolya po dannym zondirovaniya sumerechnoy atmosfery zemli; 1995). S. V. LOGINOV (RAN, Konstruktorско-Tekhnologicheskij Inst. Optika, Tomsk, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 8, No. 5, 1995, pp. 697-700. In Russian. 7 Refs. Documents available from Aeroplus Dispatch.

A numerical simulation is used to compare the Tikhonov and Volz-Goody methods as applied to retrieval of the aerosol scattering coefficient from data of satellite remote sensing of the twilight atmosphere of the Earth. The Tikhonov method is shown to provide lesser divergence between initial and retrieved profiles. The retrieved profiles are also shown to be more stable to random errors artificially entered into the initial data.

A95-34664 A study of the possibility of background water fluorescence signal suppression in problems of the remote detection of oil films (Issledovanie vozmozhnosti podavleniya signalov fonovoy fluorestsentsii vody v zadachakh distantsionnogo obnaruzheniya neftyanykh plenok; 1995). V. M. KLIMKIN and V. N. FEDORISHCHEV (RAN, Inst. Optiki Atmosfery, Tomsk, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 8, No. 4, 1995, pp. 632-639. In Russian. 3 Refs. Documents available from Aeroplus Dispatch.

The possibility of suppressing the underlying water layer signals in problems of the remote analysis of films of oil products from laser-induced fluorescence spectra is investigated by numerical simulation. It is shown that increasing the time resolution of the equipment to 1 ns does not produce a significant gain in the signal-to-noise ratio. A noticeable positive effect, however, is achieved by employing bistatic sounding. A simple method for calculating the optical scheme of a fluorimeter is proposed.

A95-33420 Radio wave scattering by a layer with rough boundaries (Rasseyaniye radiovoln ot sloya s sherokhovatyimi granitsami; 1995). N. A. ARMAND, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 40, No. 3, 1995, pp. 357-367. In Russian. 5 Refs. Documents available from Aeroplus Dispatch.

The problem of radio wave scattering by a layer characterized by large-scale surface roughness at its boundaries is investigated analytically. An integral equation for the local reflection coefficient is obtained and solved by using the low-angle approximation for a layer of moderate thickness. Formulas are derived for the coherent and noncoherent components of the backscatter field.

A95-25171 Spectral fluorescence characteristics of petroleum products in films and in water (Spektral'nye osobennosti fluorestsentsii nefteproduktov v plenkakh i v ob'eme vody; 1994). T. ABD DEJDAN, S. V. PATSAEVA, V. V. FADEEV, and V. I. YUZHAPOV (Moskovskij Gosudarstvennyj Univ., Moscow, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 7, No. 4, 1994, pp. 455-463. In Russian. 17 Refs. Documents available from AIAA Dispatch.

Knowledge of the spectral fluorescence characteristics of oil films and oil products in water and of the differences between these characteristics and those of dissolved organic products of natural origin is essential for the development of fluorescence methods for the identification and quantitative analysis of oil and oil products in water basins. Results of an experimental study of the fluorescence characteristics of petroleum products in films varying in thickness from 1 to 100 μ and in water are reported.

A95-24685 Ground-based and airborne laser sounding of power plant stack plumes (Nazemno-samoletnoe lazernoe zondirovanie dymov ehlektrostantsii; 1994). I. E. PENNER and V. S. SHAMAEV (RAN, Inst. Optiki Atmosfery, Tomsk, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 7, No. 3, 1994, pp. 338-345. In Russian. 6 Refs. Documents available from Aeroplus Dispatch.

Results of lidar sounding of a stack plume from the Gusinozersk power plant are presented. First, sounding was performed with an airborne lidar, and then the same lidar was dismounted from the aircraft and used for ground-based sounding of the stack plume. It is shown that under stable weather

conditions the plume is at least 10 km long. The intensity of the lidar return signals from dry smoke aerosol in the region just above the stack mouth, as well as fluctuation and polarization characteristics of these signals, is strongly affected by the quality of heat production process in the power plant boilers. It is concluded that measurements of these characteristics can be used for operative ecological monitoring of atmospheric emissions from power plants.

A95-22425 Coordinate systems in space photogrammetry (Sistemy koordinat v kosmicheskoy fotogrammetrii; 1994). Y. S. TYUFLIN *Geodeziya i Kartografiya* (ISSN 0016-7126), No. 10, 1994, pp. 26-31. In Russian. Documents available from Aeroplus Dispatch.

The principal coordinate systems employed in the processing of the space imagery of the Earth surface are examined, and relationships between the different coordinate systems are discussed. In particular, attention is given to the camera coordinate system Sxyz; the spacecraft coordinate system Sx(c)y(c)z(c); geocentric geoequatorial coordinates systems, object-centric geoequatorial systems; object-centric orbital systems; and geocentric orbital systems.

A95-22114 Numerical estimation of wind-induced seas in problems of simulating the radiation characteristics of the ocean-atmosphere system (Chislennaya otsenka kharakteristik vetrovogo volneniya v zadachakh imitatsionnogo modelirovaniya radiatsionnykh kharakteristik sistemy 'okean-atmosfera'; 1994). V. S. KOPMAROV, E. V. KONSTANTINOVA, and E. Y. KLYUKOV (RAN, Inst. Optiki Atmosfery, Tomsk, Russia), *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 7, No. 11-12, 1994, pp. 1549-1553. In Russian. 12 Refs. Documents available from Aeroplus Dispatch.

A simplified method for calculating the characteristics of wind-induced seas is proposed, and its applicability is evaluated. Results of calculations of wave elements for various regions of the Black Sea are presented.

A95-19920 Nonstatic models of the effective dielectric permittivity of natural media allowing for scattering by medium particles (Nestatsicheskije modeli ehfektivnoj giehlektricheskoy pronitsaemosti prirodnykh sred, uchityvayushchie rasseyaniye na chastitsakh sredy; 1994). D. A. BOYARSKIY, N. I. KLORIN, V. G. MIROVSKIY, and V. V. TIKHONOV (Moskovskij Pedagogicheskij Gosudarstvennyj Univ., Moscow, Russia), *Radiotekhnika i Elektronika* (ISSN 0021-3462), Vol. 35, No. 11-12, 1994, pp. 929-937. In Russian. 21 Refs. Documents available from Aeroplus Dispatch.

The possibility of considering the effect of scattering when describing the dielectric permittivity of natural media by using the dynamic polarizability of the spherical particles comprising the medium is examined. This approach is shown to be also applicable to multicomponent mixtures. A model of the dielectric properties of wet snow is considered as an example. Good agreement is obtained between the experimental and theoretical values of the dielectric permittivity of wet snow when the effects of scattering and moisture distribution in the snow are taken into account.

A95-16829 A frequency-dependent model of the effective dielectric permittivity of wet snow (Chastotno-zavisimaya model' ehfektivnoj diehlektricheskoy pronitsatel'nosti vlazhnogo snega; 1994). D. A. BOYARSKIY, V. G. MIROVSKIY, and V. V. TIKHONOV, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 39, No. 10, 1994, pp. 1479-1485. In Russian. 16 Refs. Documents available from Aeroplus Dispatch.

The possibility of describing the dielectric permittivity of natural media over a wide frequency range in the microwave region is examined, with a model of the effective dielectric permittivity of wet snow used as an example. Good agreement between the theoretical and experimental dependences of the dielectric permittivity of wet snow in the microwave region is obtained when the scattering effects and the structural characteristics of the medium are taken into account.

A95-16633 Optical retroreflectors as remote sensors (Retrootrazhateli opticheskogo izlucheniya kak distantsionnye datchiki; 1994). V. E. KARASIK and V. B. PYASETSKIY (Moskovskij Gosudarstvennyj Tekhnicheskij Univ., Moscow, Russia), *Moskovskij Gosudarstvennyj Tekhnicheskij Universitet, Vestnik, Seriya Priborostroenie* (ISSN 0236-3933), No. 3, 1994, pp. 24-30. In Russian. 2 Refs. Documents available from Aeroplus Dispatch.

Remote sensors of a new kind, which are suitable for the monitoring of any physical quantities, are described. The operation of the sensors is based on the amplitude and/or spectral modulation of retroreflected optical radiation as a function of the monitored quantity in an optical link with a monitoring and control system. The principal computational formulas and accuracy estimates are presented.

A95-16500 Determining the area of objects from digital space imagery (Opredelenie ploshchadi ob'ektov po tsifrovym kosmicheskim snimkam; 1994). L. N. AKSYUTOV and T. G. KOSTITSINA (NII Kompleksnykh Ispytanij Optiko-Ehlektronnykh Priborov i Sistem, Russia), *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 6, 1994, pp. 108-112. In Russian. 6 Refs. Documents available from Aeroplus Dispatch.

A method and an algorithm for estimating the area of objects in images following preliminary digital processing are presented. The accuracy of the method is evaluated for various information levels. The accuracy of the method is found to be consistent with the theoretical estimate and independent of the geometrical parameters of the image for information levels above 2. (Author)

Japanese Aerospace Literature This month: *Remote Sensing*

A96-33943 Monitoring of grassland annual change using multi-temporal satellite data. N. MINO, G. SAITO, and A. HIRANO (National Inst. of Agro-Environmental Sciences, Tsukuba, Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba Univ., 1995, pp. 292-297. 5 Refs. Documents available from Aeroplus Dispatch.

In Hokkaido, Japan, there are many dairy farming regions; their grassland is managed intensively for mowing or grazing. Since grassland covers a wide area, field surveys involve much labor and time to collect spatial information on annual grassland change. Satellite observations can collect a wide range of spatially distributed information. If satellite data can be used for grassland monitoring, this will be an effective tool for various types of management. The objective of this study is to elucidate characteristics of grassland annual change in reflectance. (Author)

A96-33938 Monitoring deforestation in Luzon, the Philippines, using remote sensing data. A. HIRANO, G. SAITO, and N. MINO (National Inst. of Agro-Environmental Sciences, Tsukuba, Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba University, 1995, pp. 259-266. 3 Refs. Documents available from Aeroplus Dispatch.

A comparison was made between a land use map derived from remote sensing data and an existing land use map. A GIS (Geographic Information System) was implemented to evaluate the land use change of the Camiling district, Luzon, the Philippines. Deforestation in the study area was monitored. The soil/vegetation matrix method was used to create a land use map from MOS-1/MESSR data. Satellite data taken during the dry season and the rainy season, respectively, in the study area were used to make the classification more accurate. The following procedures were taken for both satellite images taken during the dry season and during the rainy season in 1990. Pixels of the image were classified according to their vegetation coverage ratio and soil dryness index using a matrix. Classified images derived from two different seasons were then logically related to each other to generate the satellite-derived land use map. Land use information was extracted from an existing topographic map published in 1977. The information was then input to a GIS. Land use maps of two different times were logically overlaid onto each other to evaluate the land use change that occurred during the period. A clear decrease in forest area, namely deforestation, was monitored. The forest area in the Camiling district was about 457 sq km in 1977, whereas it was about 246 sq km in 1990. It had shrunk by about 48%. Spatial analysis of this area showed that 45% of the formerly forest area had turned into paddy field. (Author)

A96-33926 Ground truth database for vegetation remote sensing. K. KAJIWARA (Chiba Univ., Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba Univ., 1995, pp. 182-185. Documents available from Aeroplus Dispatch.

The features that should characterize a ground truth database for vegetation remote sensing are described. Particular attention is given to the kind of information that should be contained in the ground truth database and to the required specifications of the spectral measurement system.

A96-33921 A study on construction of enhanced vegetation cover map considering vegetation cover ratio in a pixel by remote sensing data. D. YUN and A. HOYANO (Tokyo Inst. of Technology, Yokohama, Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba Univ., 1995, pp. 146-153. 5 Refs. Documents available from Aeroplus Dispatch.

The vegetation cover ratio in a pixel was examined using remote sensing data simulated by airborne MSS data with high resolution. In this examination a correct vegetation coverage is needed to establish the algorithm of vegetation cover ratio in a pixel. This map was constructed using airborne MSS data of high resolution and airborne photography, which is verified by field investigation. Remote sensing data of low resolution was simulated by high resolution airborne data. The vegetation cover ratio in a pixel is defined as the ratio of correct vegetation in one pixel of simulated data. From the pixel point of view, the relationship between the vegetation cover ratio in a pixel and the mean NVI (normalized vegetation index) was investigated. This investigation showed that the relationship between the vegetation cover ratio in a pixel and the mean NVI was linear. (Author)

A96-33918 Atmospheric effect and its correction of the remotely sensed VNIR data for the vegetation monitoring. M. MORIYAMA (Nagasaki Univ., Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba Univ., 1995, pp. 123-130. 10 Refs. Documents available from Aeroplus Dispatch.

For correcting remotely sensed VNIR data, an atmospheric correction method which uses only optical thickness is proposed. In this method, the satellite detected radiance is separated into three terms: path radiance, directly reflected radiance, and diffusely reflected radiance. All of the three terms are approximated by the geometry and optical thickness based function. The coefficients in the functions are defined from the multiple regression

analysis between the optical thickness and the computed values from the radiative transfer code LOWTRAN 7. A comparison between the model surface albedo and the albedo estimated from the proposed method shows the potential of the proposed method. (Author)

A96-33916 Monitoring of radiant temperature distribution of urban vegetation using high resolution multi-temporal remote sensing data. A. IINO and A. HOYANO (Tokyo Inst. of Technology, Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, Aug. 29-31, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba University, 1995, pp. 107-114. 11 Refs. Documents available from Aeroplus Dispatch.

In most studies on the basic analysis of the spectral reflectance of vegetation surfaces, only visible, near infrared, and middle infrared images from satellite views, i.e., LANDSAT, SPOT, etc., are analyzed. Thermal infrared images, though, should also be used to indicate the characteristics of the radiant temperature distribution of urban vegetation, from the point of the deterioration of the urban thermal environment. This paper describes the results of an analysis using high resolution images of multi-temporal airborne multi-spectral scanner (MSS) data. The relationship between the radiant temperature distribution of urban vegetation and the area of each group of vegetation is investigated, considering weather parameters, i.e., incident solar radiation and air temperature. Furthermore, the relationship between the normalized vegetation index (NVI) and the temperature of urban vegetation is indicated. (Author)

A96-33911 Spruce stand parameter estimation using airborne sensor imagery. Y. AWAYA (Forestry and Forest Products Research Inst., Ibaraki, Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, Aug. 29-31, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba University, 1995, pp. 64-71. 10 Refs. Documents available from Aeroplus Dispatch.

The suitability of a visible infrared radiometer for stand parameter estimation was evaluated. The diameter at breast height, tree height, timber volume, etc. were selected as the stand parameters. High correlation coefficients between these stand parameters and remote sensing data were observed in some channels. Though channels with stronger absorption by chlorophyll in the visible channels showed lower correlation, other channels such as at the green peak and the red edge showed higher correlation with the stand parameters. The tendency was observed for imagery obtained in early August and early September. Though a high correlation between leaf biomass and the normalized difference vegetation index (NDVI) was reported, no clear relationship was observed between the NDVI and stand parameters. However, high correlation coefficients exceeding 0.8 were observed between stand parameters and a normalized ratio between the 730 nm and the 2200 nm channels (ND730&2200); little observation angle effect was identified on the ND730&2200. Thus, the index is probably useful for biomass estimation of evergreen coniferous forests using wide-view angle sensor imagery. (Author)

A96-33904 Land cover database of Asia. R. TATEISHI and W. C. GANG (Chiba Univ., Japan), *International Symposium on Vegetation Monitoring*, Chiba, Japan, 1995, Proceedings (A96-33901 08-43), Chiba, Japan, Chiba Univ., 1995, pp. 13-19. 6 Refs. Documents available from Aeroplus Dispatch.

The Working Group on the 1-km Land Cover Database of Asia (LCWG) of the Asian Association on Remote Sensing (AARS) was established in October 1993. The WG consists of 49 members from 28 Asian and Oceanian countries. The present activity of the WG is to develop a 8-km land cover dataset using the NOAA/NASA Pathfinder AVHRR Land Data Set. This paper describes the requirements of the land cover data, the land cover classification system, and the classification methodology in the LCWG activity. Emphasis is placed on the development of the land cover classification system. (Author)

A96-32593 Monitoring artificial grassland using satellite data. N. MINO, G. SAITO, A. HIRANO, and M. YOKOHARI (National Inst. of Agro-Environmental Sciences, Tsukuba, Japan), *Strengthening cooperation in the 21st century: Proceedings of the 6th International Space Conference of Pacific Basin Societies*, Marina Del Rey, CA, 1995 (A96-32532 08-12), San Diego, CA, American Astronautical Society (Advances in Astronautical Sciences, Vol. 91), 1996, pp. 747-754. 2 Refs. Documents available from Aeroplus Dispatch.

Satellite monitoring of annual changes of grasslands is discussed. By applying a new method which utilizes the Grass-age Standard Map (GASM) to a study area in Konsen Plain, Hokkaido, Japan, increases of reflectance according to the aging of grasslands were identified from the data observed in May. The increases were estimated as a result of the accumulation of dead leaves on the ground surface of the grasslands. In June data, sudden decreases of reflectance in NIR and mid-IR bands were identified within a 4-yr period after grass renovation. The decreases were estimated as a result of changes in grass species composition. The results of the application prove the significance of the new method for grassland monitoring. (Author)

A96-32592 Analysis of Japanese agriculture using Landsat data—Sugar beet analysis in Hokkaido for agricultural infrastructure. S. OGAWA (National Inst. of Agro-Environmental Sciences, Tsukuba, Japan) and K. MIYAMA (National Agriculture Research Center, Tsukuba, Japan),

Strengthening cooperation in the 21st century; Proceedings of the 6th International Space Conference of Pacific Basin Societies, Marina Del Rey, CA, 1995 (A96-32532 08-12), San Diego, CA, American Astronautical Society (Advances in Astronautical Sciences. Vol. 91), 1996, pp. 737-745. 7 Refs. Documents available from Aeroplus Dispatch.

We used Landsat data to analyze the agricultural environment in the Shamoh area in Japan. It is located in a region that has the lowest precipitation during the planting period in Japan. In this paper, digital analysis showed that the Shamoh area was classified using the supervised classification method with Landsat MSS and TM data in order to pick up the sugar beet fields. Next, we analyzed, on the basis of Landsat TM data, the distribution of sugar beet yields in 1984 when the drought occurred using Landsat MSS data and in 1988 when no drought occurred. The multiple correlation coefficients between sugar beet yields and Landsat data were 0.852 in 1984 and 0.762 in 1988. We analyzed soil moisture and soil humus using sampled soil and Landsat TM data. We calculated the correlation coefficient between Landsat TM data and soil moisture. The correlation coefficient of the soil at 5-15 cm was higher than that between Landsat TM data and soil moisture of the ground surface soil. (Author)

A96-32591 Interpretation of SAR images on agriculture using JERS-1 and ERS-1 data. G. SAITO, N. MINO, and A. HIRANO (National Inst. of Agro-Environmental Sciences, Tsukuba, Japan), *Strengthening cooperation in the 21st century; Proceedings of the 6th International Space Conference of Pacific Basin Societies*, Marina Del Rey, CA, 1995 (A96-32532 08-12), San Diego, CA, American Astronautical Society (Advances in Astronautical Sciences. Vol. 91), 1996, pp. 727-735. 2 Refs. Documents available from Aeroplus Dispatch.

ERS-1 and JERS-1 were launched in 1991 and 1992 respectively, and both satellites mounted SAR instruments. Interpretation of SAR images for agriculture has been performed using L-band SAR (JERS-1) and C-band SAR (ERS-1) data on grasslands, farmlands, and paddies in Japan and the Philippines. Microwaves of L-band SAR pass through plants and then scatter at the ground surface, but microwaves of C-band SAR scatter in plant organs. Although we cannot obtain direct information about agricultural plants using JERS-1 backscattering data, we can obtain useful information about the agricultural environment from the data. The ERS-1 SAR can directly measure agricultural crops, but the data include other information such as soil surface conditions and topographical features. (Author)

A96-32590 Global environmental monitoring with remote sensing data. A. HIRANO and M. ANIYA (Tsukuba, Univ., Japan), *Strengthening cooperation in the 21st century; Proceedings of the 6th International Space Conference of Pacific Basin Societies*, Marina Del Rey, CA, 1995 (A96-32532 08-12), San Diego, CA, American Astronautical Society (Advances in Astronautical Sciences. Vol. 91), 1996, pp. 713-725. 7 Refs. Documents available from Aeroplus Dispatch.

Using satellite remote sensing data, recent glacier variations in the Northern Patagonia Icefield were monitored and examined. The Geographic Information System was used to measure glacier variations. Glaciers in this area showed clear recession at the terminus, which corresponds well with the recent apparent global warming trend. The retreating rate of individual glaciers varied greatly, implying that their recessions are caused not only by ambient climatic conditions such as precipitation and air temperature, but also by local topoclimatic effects and glacier dynamics.

A96-32575 A plan for a Global Disaster Observation Satellite System (GDOS). T. KURODA, S. KOIZUMI, and T. ORII (NEC Corp., Yokohama, Japan), *Strengthening cooperation in the 21st century; Proceedings of the 6th International Space Conference of Pacific Basin Societies*, Marina Del Rey, CA, 1995 (A96-32532 08-12), San Diego, CA, American Astronautical Society (Advances in Astronautical Sciences. Vol. 91), 1996, pp. 485-502. 9 Refs. Documents available from Aeroplus Dispatch.

Since 1987 the authors have been studying the implementation of a World Environment and Disaster Observation Satellite System (WEDOS), and have proposed the system on every available occasion to the relevant world organizations and assemblies. WEDOS has been proposed in order to establish a satellite system whereby any point on the Earth's surface could be observed at least one time per day in order to provide accurate information with regard to the occurrence of disasters and changes in the environment, and to ensure greater safety for all the peoples of the world. Recent studies by the authors have shown that when any disaster occurs it is very important and necessary for disaster observation systems to be able to provide information as promptly as possible, during both daytime and nighttime. This paper describes GDOS, with specific focus on disaster observation, as an alternative version of WEDOS. (Author)

A96-27215 Ground surface features of the Taklimakan Desert. T. ISHIYAMA (Chiba Univ., Inage, Japan), K. TSUCHIYA (Teikyo Univ., Utsunomiya, Japan), and S. SUGIHARA (Shimonoseki Univ. of Fisheries, Japan), *Advances in Space Research* (ISSN 0273-1177), Vol. 17, No. 8, 1996, pp. 41-48. 13 Refs. Documents available from Aeroplus Dispatch.

In an attempt to utilize satellite data to obtain land surface features of Taklimakan Desert in China, in situ measurements of spectral reflectance of the land surface were made with a portable spectroradiometer in the spectral range of 400-2500 nm. The analyses of the data show the following features. The difference in spectral reflectance of different soils is comparatively small. There is a tendency that spectral reflectance of soils increases with increases

of wavelength; for example, the average reflectance of the sands in the periphery areas of the Taklimakan Desert is 21 and 38% in the visible and NIR spectra, respectively. It is found that reflectance of the soils decreases with increase of moisture content. A large decrease is recognized in the 1450 and 1950 nm spectra water absorption bands. This fact suggests that the monitoring of soil moisture is possible by measuring the radiance at these spectra; thus Landsat TM Bands 5 and 7 will be effective for monitoring soil moisture content. (Author)

A96-26513 International joint project for observation of the Earth's environment at Alaska. H. MORI, T. ITABE, H. MASUKO, and K. IGARASHI (Communications Research Lab., Tokyo, Japan), *Communications Research Laboratory, Journal* (ISSN 0914-9260), Vol. 42, No. 3, 1995, pp. 255-263. Documents available from Aeroplus Dispatch.

We are now applying advanced radio and optical sensing technology to the development of instruments for measuring the middle atmosphere, our knowledge in this area having been limited by the difficulties of measurement. After development, these instruments will be taken to Alaska to measure the polar middle-atmosphere in cooperation with the Geophysical Institute of the University of Alaska, Fairbanks. The present situation of the cooperative Japan-U.S. research range in Alaska and the organization of cooperation are also introduced. (Author)

A96-23423 Development of a bread-board model for Tropical Rainfall Measuring Mission (TRMM) and test measurements. H. KUMAGAI, M. SATAKE, H. HANADO, T. IHARA, T. KOZU, and K. OKAMOTO, *Communications Research Laboratory, Journal* (ISSN 0914-9260), Vol. 42, No. 2, 1995, pp. 131-138. 3 Refs. Documents available from Aeroplus Dispatch.

Since the Communication Research Laboratory (CRL) first proposed a spaceborne rain radar for the Tropical Rainfall Measuring Mission (TRMM), we have conducted design studies, development of critical components, and assembly of a breadboard model of the rain radar PR (Precipitation Radar). A description of the breadboard model of the TRMM-PR and experiments conducted to validate its performance are presented. (Author)

A96-23197 A binary division algorithm using a linear discriminant function for the cluster analysis of remotely sensed multispectral images. H. HANAIZUMI, S. CHINO (Hosei Univ., Tokyo, Japan), and S. FUJIMURA (Tokyo Univ., Japan), *Image and signal processing for remote sensing II; Proceedings of the Conference*, Paris, France, 1995 (A96-23181 05-43), Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Vol. 2579), 1995, pp. 182-187. 2 Refs. Documents available from Aeroplus Dispatch.

A new method is proposed for clustering remotely sensed multispectral images. This method has a binary division process in which division boundaries are determined by an algorithm of linear discriminant function. To realize high speed processing, image data are compressed and projected onto a two-dimensional subspace. Then, the image data are repeatedly divided into groups until stopping conditions are satisfied. In this method, the optimal number of clusters are automatically determined accordingly to the statistical property of the image data. The method has higher speed than ISODATA does, and is successfully applied to actual multispectral images. (Author)

A96-22420 Three-dimensional precipitation structure of mid-latitude mesoscale convective system—A combined remote sensing study using ground-based Doppler radar and satellite-borne radiometers. T. KOZU, and T. IGUCHI (Communications Research Lab., Tokyo, Japan), *27th Conference on Radar Meteorology*, Vail, CO, Oct. 9-13, 1995, Preprints (A96-22185 05-47), Boston, MA, American Meteorological Society, 1995, pp. 797-799. 2 Refs. Documents available from Aeroplus Dispatch.

The horizontal and vertical structures of two mesoscale convective systems (MCS) in the midwestern United States are examined using a variety of remote sensing observations, such as ground-based Doppler radar measurements, SSM/I microwave observations, and geostationary satellite observations. In particular, WSR-88D Doppler radar data along with SSM/I passive microwave and GOES infrared observations in two active MCSs are used to verify results of previous studies and to extend the knowledge of the three-dimensional structure of the MCSs. By exploiting the increased sensitivity and temporal resolution of the WSR-88D radar, the study provides improved radar assessment of the vertical microphysical structure of MCSs.

N96-12072 Meteorological Satellite Center Technical Note, No. 30, 1995. Meteorological Satellite Center, Tokyo, Japan. Documents available from Aeroplus Dispatch.

This document contains articles concerned with meteorology from the Meteorological Satellite Center in Tokyo, Japan. Areas of interest are: subtropical cyclones intensity estimates in the northwestern Pacific; outline of an Emergency Information System using a Geostationary Meteorological Satellite (GMS) data function relay; requirements for the imaging function of the Multi-functional Transport Satellite (MTSAT); investigation and characterization of using personal computers with the National Oceanic and Atmospheric Administration data acquisition and processing system; and current status and future plans of the National Ocean and Atmospheric Administration National Environmental Satellite Data and Information Service (NOAA/NESDIS) concerning the development of future NOAA satellites and the processing and utilization of the Defense Meteorological Satellite Program (DMSP) microwave data. For individual titles, see N96-12073-N96-12077. (CASI)