Russian and Japanese Aerospace Literature

During 1994 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 Atmospheric Optics from Russia and Gravitational Physiology from Japan.

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Russian Aerospace Literature
This month: *Atmospheric Optics*

A93-43123   **Reconstruction of images distorted by amplitude blur** (Vosstanovlenie izobrazhenij, iskazhennykh amplitudnym smazom). A. A. PAKHOMOV and A. D. RYAKHIN, *Radiotekhnika i Ehlektronika* (ISSN 0033-8494), Vol. 38, No. 1, Jan. 1993, pp. 183–186.

The problem of enhancing the quality of images observed through the atmosphere is examined. The problem of image quality enhancement is reduced to one of reconstructing the image according to the phase and the ratios of the moduli of its Fourier spectrum. A general reconstruction algorithm scheme is presented, along with computer-simulation results. (AIAA)

A93-36771   **Determination of the spectral dependences of the optical parameters of stratus cloudiness from airborne radiation measurements** (Opredelenie spektral'nykh zavisimostei opticheskikh parametrov sloistoi oblachnosti na osnove radiatsionnykh samoletnykh izmerenii). I. N. MEL'NIKOVA and V. V. MIKHAILOV, *Rossiiskaia Akademiia Nauk, Doklady* (ISSN 0869-5652), Vol. 328, No. 3, Jan. 1993, pp. 319–321.

A method for determining the volume scattering and absorption coefficients for cloud layers is proposed which employs analytical expressions relating the coefficients to the measured characteristics of solar radiation in the atmosphere and airborne spectral measurements of solar radiation fluxes. Based on an interpretation of airborne measurements obtained in four experiments, spectral dependences of the volume scattering and absorption coefficients are obtained for stratus clouds. The method is valid only for those cloud layers for which asymptotic formulas are applicable. (AIAA)

A93-33372   **The acoustic detector Zvuk-1 (A new approach to its development)** (Akusticheskii lokator 'Zvuk-1' /Novyi podkhod k razrabotke/). V. A. GLADKIKH, V. I. KARPOV, N. P. KRASNENKO, B. N. MOLCHANOV, and M. G. FURSOV, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 7, July 1992, pp. 751–756.

The general user requirements demands concerning the design of a new acoustic detector are formulated based on the experience with using acoustic meteorological sensors, and a commercial version of an acoustic sounder, called Zvuk, developed at the Institute of Atmospheric Optics, Siberian Branch of the Russian Academy of Sciences is described along with the Zvuk software and its capabilities to process sodar data. Zvuk allows measurements of the temperature stratification at the atmospheric boundary layer up to 500 m and the structure constant of the temperature field. (AIAA)

A93-32199   **Probability density of intensity difference fluctuations of light beams in the turbulent atmosphere** (Plotnost' veroiatnostei fluktuatsii raznosti intensivnostei opticheskikh puchkov v turbulentnoi atmosfere). G. IA. PATRUSHEV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 3, March 1992, pp. 247–249.

Assuming a 2D log-normal distribution of optical-wave intensities in the turbulent atmosphere, the probability density of intensity difference fluctuations is analyzed. The results obtained using this model are shown to be in good agreement with experimental data for conditions of weak intensity fluctuations. (AIAA)

A93-33368   **On a possibility of detecting anomalous inhomogeneities of the atmosphere (A method for the nonlinear filtering of backscattering signals)** (Ob odnoi vozmozhnosti vyiavleniia anomal'nykh neodnorodnostei atmosfery /Metod nelineinoi fil'tratsii signala obratnogo rasseianiia/). IU. A. POLKANOV, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 7, July 1992, pp. 720–725.

A technique for nonlinear filtering of signals is described, which makes it possible to smoothen regular inhomogeneities of the signal and to amplify the signal drops due to anomalous inhomogeneities of the medium. The efficiency of this technique is demonstrated in numerical experiments comparing the results of filtering using this technique with those obtained with linear and median filtering. The technique was also verified in a field experiment conducted in a turbid medium in the presence of turbulent inhomogeneity. (AIAA)

A93-33367   **The probability density of saturated intensity fluctuations of an optical wave in the turbulent atmosphere** (O plotnosti veroiatnostei nasyshchennykh fluktuatsii intensivnosti opticheskoi volny v turbulentnoi atmosfere). G. IA. PATRUSHEV and O. A. RUBTSOVA, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 7, July 1992, pp. 716–719.

A comparison is made between model probability densities and experimental data on saturated intensity fluctuations. Experimental data for a plane wave in the range of saturated intensity fluctuations indicate deviation from the lognormal distribution and a tendency to the K-distribution, which is considered as an asymptotic approximation of the probability density of saturated intensity fluctuations. (AIAA)

A93-33364   **Field studies of the water vapor absorption continuum in the 10.6-micron wavelength region** (Issledovanie kontinual'nogo pogloshcheniia vodianogo para v naturnykh usloviiakh v oblasti 10,6 mkm). N. N. SHCHELKANOV, IU. A. PKHALAGOV, and V. N. UZHEGOV, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 7, July 1992, pp. 681–687.

The water-vapor absorption continuum in the 10.6-micron wavelength region was isolated from the total attenuation in this region due to atmospheric gases, using data obtained during the April-October period of 1986 in an arid region of Kasakhstan. The values of the fitting parameters of the approximation equation for the calculation of the coefficients of the absorption continuum in the 10.6-micron region were obtained, as well as the general negative temperature dependence of the continuum. (AIAA)

A93-26860   **Estimation of the background interference intensity and signal-to-background ratio during lidar measurements** (Otsenka intensivnosti fonovoi pomekhi i otnosheniia signal/fon pri lidarnykh izmereniiakh). R. R. AGISHEV, *Priborostroenie* (ISSN 0021-3454), Vol. 34, No. 10, 1991, pp. 98–104.

The intensity of background interference and the signal-to-background ratio in lidar measurements are calculated theoretically. A general approach to the estimation of the level of background illumination in an inhomogeneous atmosphere with an arbitrary transparency profile is proposed. The results of the study can be useful in calculating the energy potential and the design parameters of lidars.

A93-32203   Application of Stieltjes integrals in inverse problems of aerosol light scattering (O primenenii integralov Stilt'esa v obratnykh zadachakh aerozol'nogo svetorasseianiia). V. V. VERETENNIKOV and E. P. IAUSHEVA, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 3, March 1992, pp. 276–284.

A numerical scheme is proposed for retrieving the microstructure and refractive index of aerosols from angular measurements of the scattering phase matrix. The proposed method is based on the representation of the scattering characteristics of a polydisperse aerosol in the form of Stieltjes integrals and minimization of the discrepancy on a set of monotonic bounded functions. Numerical simulation results on the inverse problem are presented, along with an example of experimental-data interpretation. (AIAA)

A93-32200   Backscattering of optical radiation in a turbulent medium with discrete particle disseminations (Obratnoe rasseianie opticheskogo izlucheniia v turbulentnoi srede s diskretnymi vkrapleniiami). A. P. SHELEKHOV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 3, March 1992, pp. 250–256.

The problem of light scattering in a turbulent medium with discrete particle disseminations is considered for the case when only a finite number of terms in the expansion of the scattering operator over multiple scattering processes in a two-component medium composed of inhomogeneities and ensembles of particles are taken into account. Expressions for the scattered-wave field are obtained which can be used in theoretical investigations of lidar techniques for sensing the characteristics of the turbulent atmosphere. (AIAA)

A93-32196   Influence of the orientation of aspherical scattering particles on the transmission coefficient of the atmosphere (Vliianie orientatsii nesfericheskikh rasseivaiushchikh chastits na koeffitsient propuskaniia atmosfery). IU. A. LEBEDINSKII and K. G. PREDKO, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 3, March 1992, pp. 227–231.

The transmission coefficient of a plane layer with aspherical spatially oriented scattering particles is calculated in the case of oblique light incidence in the framework of a method for the approximate solution of the radiation-transfer equation. A qualitative analysis of the transmission as a function of the light incidence angle and the parameters of the medium is performed. (AIAA)

A93-25607   Remote-sensing studies of the statistical characteristics of atmospheric parameters (Distantsionnye issledovaniia statisticheskikh kharakteristik parametrov atmosfey). SH. A. AKHMEDOV, S. A. VEISOVA, and N. A. AGAEV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 6, Nov.-Dec. 1992, pp. 62–69.

The relationship betwees n the statistical characteristics of aerosol optical thickness and meteorological conditions is evaluated for several portions of the visible spectral region. Data for western Georgia (USSR) and the northwest Pacific were used in the study. The correlation between the statistical properties of the spectral structure of the optical radiation and meteorological parameters made it possible to elucidate physical causes for different states of atmospheric turbidity.

A93-25586   A combined estimate of the effect of the transfer function of the atmosphere and of the optical system on the detection characteristics of extended objects (Sovmestnaia otsenka vliianiia opticheskoi peredatochnoi funktsii atmosfery i opticheskoi sistemy na kharakteristiki obnaruzheniia protiazhennykh ob'ektov). E. M. AFANAS'EVA and V. A. PON'KIN, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 8, Aug. 1992, pp. 883–887.

The combined effect of the optical transfer function of the atmosphere and of the optical system on the detection characteristics of extended objects is evaluated quantitatively in the context of the theory of extended object detection using the formalism of optical transfer functions. In determining the detection characteristics of small (100-200 m) objects in a horizontal homogeneous scattering atmosphere, it is sufficient to consider the optical transfer function of the optical system only while the spatial-frequency characteristics of the atmosphere can be neglected. For objects with linear dimensions of the order of 500 m, the contribution of scattered radiation may change the detection characteristics by 20 percent or more, whereas the effect of the optical transfer function of the optical system can be neglected.

A93-18262   Investigation of the atmospheric extinction at Shorbulak during 1984-1989 and prospects for improving the accuracy of photoelectric reduction (Issledovanie atmosfernoi ekstinktsii na Shorbulake v 1984-1989 gg. i perspektivy povysheniia tochnosti fotometricheskoi reduktsii). E. V. BERDNIK, D. M. GORSHANOV, K. L. MASLENNIKOV, and V. V. SOMSIKOV, *Pulkovo, Glavnaia Astronomicheskaia Observatoriia, Izvestiia* (ISSN 0367-7966), No. 207, 1991, pp. 97–105.

The atmospheric extinction at Shorbulak (Eastern Pamir) are determined for the 1984-1989 period. A method for determining the main extinction coefficients and also those of the second order is described. Measurements of these coefficients are reported, and the error is estimated. The resulting photometric error is calculated and possible ways of decreasing it are proposed. It is shown that the astronomical transparency at Shorbulak is very good (the mean extinction in the V band is 0.12 m) and stable (the mean nightly variation is 0.015 m).

A93-25602   Correlation between space-experiment models and measurements using fractals (O soglasovanii ispol'zuemykh modelei kosmicheskogo eksperimenta s izmereniiami pri pomoshchi fraktalei). V. V. BADAEV, *Issledovanie Zemli iz Kosmosa* (ISSN 0205-9614), No. 6, Nov.-Dec. 1992, pp. 16–24.

An algorithm is presented for solving problems of the remote sensing of the optical properties of the atmosphere and earth surface in the visible and IR spectral regions, with correlation of the experiment models used with the measurements. The implementation potential of the algorithm is demonstrated in connection with the processing of spectrometry data obtained with the Salyut-7 station.

A93-25576   Visibility range of underwater objects (through water-air interfaces) (Dal'nost' videniia podvodnykh ob'ektov). E. P. ZEGE, I. L. KATSEV, and A. S. PRIKHACH, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 8, Aug. 1992, pp. 789–811.

A new approach to the determination of the visibility range of objects in scattering media is proposed which is based on concepts of optimal image processing. A practical implementation of the approach in programs for calculating the maximum ranges of detection and recognition of underwater objects by passive TV and active laser-TV observation systems is described. Specific examples of maximum visibility range calculations are presented, including observations through the air-water interface. The modular architecture of the programs makes them adaptable to a wider range of conditions.

A93-18106   Latitudinal variations of the limb darkening coefficient on Saturn's disk according to photographic observations (Shirotnye variatsii koeffitsienta potemneniia k kraiu na diske Saturna po fotograficheskim nabliudeniiam). V. G. TEIFEL', N. V. SINIAEVA, and G. A. KHARITONOVA, *Astronomicheskii Vestnik* (ISSN 0320-930X), Vol. 26, No. 4, July-Aug. 1992, pp. 51–61.

Limb darkening coefficients on the disk of Saturn are determined from photographs obtained in 1991 in red, orange, blue, and violet rays for latitudinal belts of 5 deg between planetographic latitudes from -15 to 75 deg. The greatest limb darkening coefficients are in the equatorial belt, and the smallest are at a latitude of about +40 deg. The limb darkening coefficients decrease towards shorter wavelengths, this decrease being stronger for temperate latitudes. Relative values of normal albedo are also estimated. Light cloud formations were observed in the equatorial belt of Saturn at a longitude of about 270 deg.

A93-12963   An antenna complex for laser sounding of the upper atmospheric layers (Antennyi kompleks dlia lazernogo zondirovaniia verkhnikh sloev atmosfery). B. V. KAUL', *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 431–438.

Parameters of the antenna complex of a station for high-altitude laser sounding of the atmosphere situated in Tomsk are described. The main element of the antenna complex is a parabolic mirror with a diameter of 2205 mm. In addition to the goals of increasing the sounding range and the rate of successive soundings, this complex is designed for multifunctionality, i.e., the possibility of performing measurements of elastic scattering at several wavelengths simultaneously, as well as the possibility of making Raman-lidar measurements of some atmospheric parameters. It will be capable of operating under conditions of enhanced sky background noise during short summer nights as well as those of the background created by light sources in the city. It will also be capable of operating under the severe conditions of Siberian winters. The prerequisites and the measures taken to reach these goals are discussed.

A93-12961   Spatial structure of irradiance in the image plane of a lidar sounding a surface with a complex reflectance through the atmosphere (O strukture osveshchennosti v ploskosti izobrazheniia pri lidarnom zondirovanii v atmosfere poverkhnosti s kombinirovannoi indikatrisoi rasseianiia). M. L. BELOV and V. M. ORLOV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 424–427.

The spatial distribution of irradiance in the image plane of a lidar detector is considered for the case of laser sounding of a surface with complex reflectance through the atmosphere. An expression for the irradiance in the image plane is obtained for the sounding, through an optically dense aerosol atmosphere, of the surface with the complex reflectance comprising diffuse and quasi-specular components. It is shown that the spatial distribution of irradiance in the image plane can significantly depend on the relationship between the diffuse and quasi-specular components.

A93-12959   Dynamic correction of nonstationary wind refraction based on the simplex method (Dinamicheskaia korrektsiia nestatsionarnoi vetrovoi refraktsii na osnove simpleks-metoda). I. V. MALAFEEVA, I. E. TEL'PUKHOVSKII, and S. S. CHESNOKOV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 413–417.

The applicability of the simplex method to the compensation of the thermal blooming of a long light pulse in a regular medium is investigated via the simplex method. An algorithm making it possible to improve the efficiency of beam phase control under nonstationary conditions is proposed. The size of the simplex is optimized as a function of the nonlinearity parameter, the beam control duration, and the speed of response of the adaptive system.

A93-25579   Visibility through clouds (O vidimosti cherez oblaka). V. M. GREISUKH, L. S. DOLIN, and I. M. LEVIN, *Optika Atmosfery i Okeana* (ISSN 0869-5695), Vol. 5, No. 8, Aug. 1992, pp. 829–834.

The contrast achieved in observations through clouds is calculated using values of the transmission and albedo of a plane cloud layer determined by the Monte Carlo method. It is shown that large (several kilometers) high-contrast objects can be visible through a continuous cloud layer with an optical thickness of 10 or less while small objects (less than 100 m) can be visible only through thin upper-tier clouds. The possibility of observations through clouds using an active pulsed vision system is estimated. By using a 5-MW radiator, large objects can be observed from a height of 100 km through clouds of an optical thickness of about 30.

A93-12957   Minimization of the angular divergence of a partially coherent light beam on a vertical atmospheric path (Minimizatsiia uglovoi raskhodimosti chastichno kogerentnogo puchka na vertikal'noi atmosfernoi trasse). V. V. KOLOSOV, M. F. KUZNETSOV, and S. I. SYSOEV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 404–407.

The possibility of optimizing laser-beam energy transfer along a vertical path through the atmosphere and into the far diffraction zone is addressed. On the basis of numerical solutions of the small-angle radiation transfer equation for a wide range of energy parameters of the beam, including focusing in two perpendicular directions, the regions of these parameters that provide optimal transfer of the laser beam energy are determined. This approach and the results obtained make it possible to evaluate the feasibility of specific laser systems which transport energy through the atmosphere.

A93-12956   Ray method for solving the equation for the coherence function (Luchevoi metod resheniia uravneniia dlia funktsii kogerentnosti). V. V. KOLOSOV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 397–403.

A beam method for solving the equation for the second-order coherence function is developed. The self-defocusings of coherent and partially coherent beams with the same Fresnel number are compared on the basis of solutions obtained with this technique. The relationship between this technique and ray methods of solving the small-angle radiation transfer equation is discussed.

A93-12954   Intensity distribution in the image plane of a point reflector with an arbitrary angular position in the turbulent atmosphere on a sounding path (Raspredelenie intensivnosti v ploskosti izobrazheniia tochechnogo otrazhatelia s proizvol'nym uglovym polozheniem na lokatsionnoi turbulentnoi trasse). P. A. BAKUT and S. V. SHUL'TS, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 388–390.

It is shown that the correlation between the incident and reflected waves propagating through the same inhomogeneities of a turbulent atmosphere causes a bias in the estimate of the reflector's angular position. An approximate analytical expression for this bias is obtained. It is shown that intensification of backscattering results in an increase of the estimate bias.

A93-12952   Optical measurements of the outer scale of atmospheric turbulence (Opticheskie izmereniia vneshnego masshtaba atmosfernoi turbulentnosti). V. P. LUKIN, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 354–377.

The LF region of the atmospheric turbulence spectrum directly adjacent to the inertial interval is investigated on the basis of a large body of measurement data. The turbulence spectra are compared to those obtained with isotropic models. In the atmospheric boundary layer the outer scale of atmospheric turbulence is found to be dependent not only on the height above the underlying surface but also on the type of atmospheric stratification.

A93-12912   Asymptotics of the light scattering characteristics of spherical particles (Asimptotiki kharakteristik svetorasseianiia sfericheskikh chastits). N. N. BELOV and S. O. SUSLOV, *Rossiiskaia Akademiia Nauk, Doklady* (ISSN 0002-3264), Vol. 323, No. 3, 1992, pp. 456–459.

Asymptotics for the scattered field coefficients in Mie's and for the coefficients of a scattered field of radially inhomogeneous particles are examined. It is shown that the expressions for the coefficients of a scattered field of radially inhomogeneous particles are more general and more accurate than the asymptotics in Mie's theory. However, the use of the former in the case of homogeneous particles is not efficient due to a much greater computational effort.

A92-54530   Efficiency of lidar measurements of wind velocity using a correlation lidar (Effektivnost' lidarnykh izmerenii skorosti vetra korreliatsionnym lidarom). V. G. ASTAFUROV, E. IU. IGNATOVA, and G. G. MATVIENKO, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 5, May 1992, pp. 497–503.

Suboptimal estimates of wind velocity were obtained using spectral processing of lidar signals. An error was found in these estimates, and the dependence of estimates on the atmospheric conditions and on the lidar parameters is assessed for experimentally validated models of correlation functions for lidar signals. Recommendations are offered regarding the choice of parameters for a two-path sounding scheme, taking into account the evolution time of aerosol-related discontinuities.

A93-12958   Resonance self-focusing under in the case of laser-induced nonequilibrium of velocity distributions of gas molecules (Rezonansnaia samofokusirovka pri lazerno-indutsirovannoi neravnovesnosti raspredelenii molekul gaza po skorostiam). A. E. BAZELIAN, S. V. IVANOV, M. N. KOGAN, and V. IA. PANCHENKO, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 4, April 1992, pp. 408–412.

Anomalous dispersion curves of a small amount of absorbing molecules in a buffer gas are calculated under conditions when laser-induced distortions of Maxwellian velocity distributions on levels resonant to the radiation are observed. It is shown that these distortions can increase the absolute values of the refractive index variation by a factor of 2 to 3, depending on the ratio of the T-T and R-T relaxation rates. In the limiting case of slow elastic relaxation a simple formula for the refractive index is obtained and analyzed. The parameter of CO_2-laser self-focusing in the atmosphere is estimated, with the amount of laser-induced distortions of the Maxwellian distributions taken into account.

A93-12872   Limiting brightness characteristics of the emission of a CW CO_2 amplifier with transverse pumping of the active medium (Predel'nye iarkostnye kharakteristiki izlucheniia nepreryvnogo CO2 usilitelia s poperechnoi prokachkoi aktivnoi sredy). I. K. BABAEV, V. N. KOTEROV, A. G. KRASNOVSKII, and N. V. CHEBURKIN, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 62, No. 1, Jan. 1992, pp. 124–136.

Self-induced thermal drifts in CO_2 amplifiers are shown to determine the limits of the mean brightness characteristics of emission. These limits cannot be exceeded by increasing the amplification length without the use of active amplitude-phase correction systems. The dependences of these quantities on the amplifier parameters and input signal characteristics are investigated for a typical CO_2 amplifier mixture. The possibility of improving brightness characteristics through the use of passive emission filtering systems inserted between two amplifier cascades is examined.

A93-10249   Doppler CO_2 lidar for wind velocity measurements (Doplerovskii CO2-lidar dlia izmereniia skorosti vetra). V. IU. BARANOV, V. P. KOZOLUPENKO, V. S. MEZHEVOV, IU. E. SIZOV, and A. A. KHAKHLEV, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 19, No. 7, July 1992, pp. 718, 719.

A monostatic biaxial Doppler lidar based on a hybrid CO_2 laser with an intracavity telescopic beam expander is reported. The lidar is characterized by a laser pulse energy of 100 mJ, a pulse duration of 3-5 microsec, and a pulse repetition frequency of up to 10 Hz. The lidar is designed to measure the radial wind velocity component in the lower troposphere at distances of 3-6 km.

A93-10247   Experimental implementation of a fast-response Hartmann sensor (Eksperimental'naia realizatsiia bystrodeistvuiushchego datchika Gartmana). V. V. APOLLONOV, G. V. VDOVIN, V. V. KIIKO, S. V. MURAV'EV, and S. A. CHETKIN, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 19, No. 7, July 1992, pp. 703–708.

A fast-response automated Hartmann sensor is presented which describes the wavefront as an expansion in terms of the lowest aberrations. This sensor is capable of detecting tilt vectors of the wavefront with a dimensionality of 38 and a 'cyclicity' of 625 Hz, and of expanding the monitored wavefront using a basis of 19 Zernike polynomials with a wavefront reconstruction frequency of 45 Hz. The possibility of using this sensor for determining the dynamic and statistical characteristics of light beams distorted by a turbulent atmosphere is also discussed.

A92-54534   Functional relationships between total scattering and backscattering for the derivation of the atmospheric extinction profile from data of lidar sounding (Funktsional'nye zavisimosti mezhdu polnym i obratnym rasseianiem dlia vosstanovleniia profilia pokazatelia oslableniia atmosfery po dannym lidarnogo zondirovaniia). V. A. KOVALEV, *Optika Atmosfery i Okeana* (ISSN 0235-277X), Vol. 5, No. 5, May 1992, pp. 534–538.

The feasibility of using, in the processing of lidar data, a variable indicatrix of backscattering to increase the accuracy of determinations of the extinction profile in an inhomogeneous atmosphere, is evaluated. Approximate relationships are derived between the total aerosol scattering and the backscattering values, based on published experimental data. Examples are presented for the restoration of an extinction profile when both the constant and the variable phase functions are used.

A92-53934   Atmospheric optics, ozonometry, and trace gas constituents (Atmosfernaia optika, ozonometriia i malye gazovye komponenty). G. P. GUSHCHIN and A. M. BROUNSHTEIN, EDS. *Leningrad, Gidrometeoizdat* (Glavnaia Geofizicheskaia Observatoriia imeni A.I. Voeikova, Trudy, No. 533), (ISSN 0376-1274), 1991, 178 pp. For individual items see A92-53935 to A92-53942. (ISBN 5-286-00557-8).

The papers presented in this volume provide an overview of recent theoretical and experimental research in the field of atmospheric optics, ozonometry, and trace gas constituents. Topics discussed cover observation techniques, instrument design, and analysis and interpretation of observation data. Papers are presented on a one-dimensional nonstationary model of the effect of pollution on the thermal structure of the atmosphere; a study of the dynamic properties of large-scale air streams using Reynolds and Richardson criteria; carbon dioxide in the atmosphere; and total ozone fluctuations from data of ground-based observations.