

PROCEEDINGS OF SPIE

# ***22nd International Symposium On Atmospheric and Ocean Optics: Atmospheric Physics***

**Gennadii G. Matvienko  
Oleg A. Romanovskii**  
*Editors*

**30 June–03 July 2016  
Tomsk, Russian Federation**

*Sponsored by*  
SPIE

*Cosponsored by*  
Russian Foundation for Basic Research (Russian Federation)  
Siberian Branch of Russian Academy of Sciences (Russian Federation)  
SP Equipment (Russian Federation)

*Organized by*  
V.E. Zuev Institute of Atmospheric Optics (Russian Federation)  
Institute of Solar-Terrestrial Physics (Russian Federation)

*Published by*  
SPIE

**Volume 10035**  
Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 10035

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

22nd International Symposium on Atmospheric and Ocean Optics: Atmospheric Physics,  
edited by Gennadii G. Matvienko, Oleg A. Romanovskii, Proc. of SPIE Vol. 10035, 1003501  
© 2016 SPIE · CCC code: 0277-786X/16/\$18 · doi: 10.1117/12.2263995

Proc. of SPIE Vol. 10035 1003501-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *22nd International Symposium On Atmospheric and Ocean Optics: Atmospheric Physics*, edited by Gennadii G. Matvienko, Oleg A. Romanovskii, Proceedings of SPIE Vol. 10035 (SPIE, Bellingham, WA, 2016) Article CID Number.

ISSN: 0277-786X  
ISSN: 1996-756X (electronic)

ISBN: 9781510605114  
ISBN: 9781510605121 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445  
[SPIE.org](http://SPIE.org)

Copyright © 2016, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/16/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL LIBRARY**  
[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

# Contents

xix	<i>Authors</i>
xxv	<i>Conference Committee</i>
xxix	<i>Introduction</i>

## Part One

---

### MOLECULAR SPECTROSCOPY AND ATMOSPHERIC RADIATIVE PROCESSES

---

10035 02	<b>Mathematical simulation of brightness fields in broken clouds for observations from Earth's surface and from space in plane and spherical atmospheric models (Invited Paper)</b> [10035-176]
10035 03	<b>The impact of surface heat fluxes on plankton population dynamics during the thermal bar in a freshwater lake</b> [10035-28]
10035 04	<b>A determination of dipole moment function parameters of sulfur dioxide</b> [10035-86]
10035 05	<b>A validation of spectral line parameters of hydrogen sulfide</b> [10035-89]
10035 06	<b>The water vapor absorption in the long wave wing of the rotational band</b> [10035-136]
10035 07	<b>Classification of patients with broncho-pulmonary diseases based on analysis of absorption spectra of exhaled air samples with SVM and neural network algorithm application</b> [10035-137]
10035 08	<b>Distributed architecture of information system for analysis and forecast of natural and climatic processes</b> [10035-138]
10035 09	<b>Qualitative analysis of model chemical kinetics equations for nucleation of molecular complexes in water vapor</b> [10035-140]
10035 0A	<b>Kalman filtering in the problem of noise reduction in the absorption spectra of exhaled air</b> [10035-143]
10035 0B	<b>Possibilities of laser spectroscopy for monitoring the profile dynamics of the volatile metabolite in exhaled air</b> [10035-146]
10035 0C	<b>Systematization of graphically plotted published spectral functions of weakly bound water complexes</b> [10035-151]
10035 0D	<b>The current status of the W@DIS information system</b> [10035-158]
10035 0E	<b>Improved Dunham coefficients of HCl isotopologues</b> [10035-160]

- 10035 OF **The optical radiation transfer in layered atmosphere** [10035-165]
- 10035 OG **Development of distributed file system for storing weather data** [10035-167]
- 10035 OH **The D<sub>2</sub>O absorption spectra in SiO<sub>2</sub> aerogel pores: technical features of treatment** [10035-168]
- 10035 OI **Comparison of two water vapor continuum models in simulation of the longwave fluxes taking into account absorption in cirrus clouds** [10035-184]
- 10035 OJ **Water vapor line broadening induced by hydrogen and helium pressure** [10035-195]
- 10035 OK **Estimation of water dimers contribution to the water vapour continuum absorption within 0.94 and 1.13  $\mu\text{m}$  bands** [10035-231]
- 10035 OL **Broadening and shift coefficients for H<sub>2</sub>O-H<sub>2</sub> system in 8600- 9000  $\text{cm}^{-1}$  infrared spectral region** [10035-234]
- 10035 OM **Line broadening of carbon dioxide confined in nanoporous aerogel** [10035-235]
- 10035 ON **Absorption spectra of ethylene in different SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> aerogels** [10035-242]
- 10035 OO **Critical evaluation of measured rotation-vibration line positions of <sup>14</sup>N<sup>16</sup>O in the X<sup>2</sup> $\pi$  state using Ritz method** [10035-249]
- 10035 OP **GOSAT TIR and SWIR spectra analysis for CO<sub>2</sub> and CH<sub>4</sub> profiles retrieval** [10035-258]
- 10035 OQ **Fluorescent and optical properties of sunflower leaves grown under oil pollution** [10035-271]

---

**OPTICAL RADIATION PROPAGATION IN THE ATMOSPHERE AND OCEAN**

---

- 10035 OR **Solving applied atmospheric optics and acoustics problems by the Monte Carlo method (Invited Paper)** [10035-107]
- 10035 OS **Excitation of local surface modes in semiconductor nanoparticles in visible and near UV regions (Invited Paper)** [10035-85]
- 10035 OT **Estimation of the influence of a cloudy field on satellite observation of the Earth's surface through a single cloud gap** [10035-4]
- 10035 OU **Variations in radio signal phase at propagation in the parabolic layer of disturbed ionospheric plasma** [10035-6]
- 10035 OV **Laser beam distortion propagation through a shock wave arising in a supersonic flows past turret in a homogeneous medium** [10035-8]
- 10035 OW **Coherence deficiency of vortex Bessel beams in turbulent atmosphere** [10035-12]
- 10035 OX **Recognition of whistler patterns in VLF signal spectrograms** [10035-16]

- 10035 0Y **Effects of polarization of optical radiation in the problem for finding refractive indices of layered medium** [10035-18]
- 10035 0Z **Monte Carlo method for non-stationary radiative transfer equation in inhomogeneous media** [10035-20]
- 10035 10 **The history of a global spherical model of the solar radiation transfer in the Earth's atmosphere** [10035-33]
- 10035 11 **Integral momenta of Bessel-Gaussian beams in randomly inhomogeneous medium** [10035-35]
- 10035 12 **Method of estimation of the cross-wind velocity from statistics of energy centroids coordinates of binocular images of topographic objects** [10035-36]
- 10035 13 **On accuracy of radiometric calibration of hyperspectral visible/NIR satellite remote sensing instruments above natural surfaces** [10035-42]
- 10035 14 **Diffraction of short pulsed Laguerre-Gaussian beams** [10035-50]
- 10035 15 **Statistics of pulsed Laguerre-Gaussian beams in a turbulent atmosphere** [10035-52]
- 10035 16 **Coherence degree of a Laguerre-Gaussian laser beam backscattered on a diffuse target in turbulent atmosphere** [10035-53]
- 10035 17 **Photophoresis of fractal-like soot aggregates: possible atmospheric applications** [10035-62]
- 10035 18 **Determining the bottom surface according to data of side-scan sonars** [10035-63]
- 10035 19 **Interannual and seasonal variability of atmospheric inhomogeneities from satellite systems data and it's correlation with atmosphere monitoring** [10035-65]
- 10035 1A **Spatial and temporal characteristics of an adaptive optics system** [10035-67]
- 10035 1B **Numerical model of turbulence with non-Kolmogorov and anisotropic density spectrum of phase fluctuation** [10035-68]
- 10035 1C **Improving the reliability of the method calculating the speed of cross-wind transport of turbulent distortion of optical radiation** [10035-69]
- 10035 1D **Backscatter amplification lidar testing by the image jitter sensor** [10035-72]
- 10035 1E **Automatic processing and interpretation of backscatter ionosphere sounding ionograms** [10035-73]
- 10035 1F **Use of the BSA-lidar for the turbulent spatial and temporal variability in the atmospheric surface layer** [10035-74]
- 10035 1G **Dispersion and spatial autocorrelation of the phase and group signal paths in a randomly inhomogeneous medium with regular refraction** [10035-76]

- 10035 1H **Coherence degree of diffraction-free beams in turbulent atmosphere** [10035-78]
- 10035 1I **All-fiber coherent Doppler lidar** [10035-79]
- 10035 1J **Estimation of effective height changes of Earth-ionosphere waveguide by VLF radio signals phase variations during a solar eclipse** [10035-81]
- 10035 1K **Seasonal variability of the astronomical seeing on the Large Solar Vacuum Telescope** [10035-95]
- 10035 1L **Full-field speckle correlometry of non-stationary systems with temperature-dependent scatter dynamics** [10035-97]
- 10035 1M **Stochastic simulation of 3D distributions for laser pulses scattered in optical media** [10035-98]
- 10035 1N **Monte Carlo simulation of specific features of radiation regime in clouds caused by underlying surface** [10035-99]
- 10035 1O **Analysis of the position angles polarization ellipse and coefficient ellipticity of the Schumann resonance in the daily-season cycle observations** [10035-100]
- 10035 1P **Some approaches to describe the vertical structure of air refraction index variations** [10035-106]
- 10035 1Q **Coherence of optical waves at conic focusing in a turbulent atmosphere** [10035-112]
- 10035 1R **Influence of atmospheric turbulence on quality of multichannel laser radiation and correction for distortion** [10035-125]
- 10035 1S **Site selection for modern ground based large telescopes** [10035-117]
- 10035 1T **Calculation of large cloud formations vector movement based on satellite data** [10035-127]
- 10035 1U **The suitability of the approximation criterion on the first output from the area comparison for distribution probability density of fluctuations of the harmonic signal in Gaussian random noise** [10035-128]
- 10035 1V **Influence of errors in assignment of the optical atmospheric parameters on results of reconstruction of the Earth's surface reflection coefficients from satellite measurements in the visible and near-IR ranges** [10035-141]
- 10035 1W **Features of hyperspectral approach in remote sensing in the region of the Arctic** [10035-150]
- 10035 1X **Development of experimental methods of ecological monitoring using femtosecond lidar systems** [10035-156]
- 10035 1Y **Development of the phase method of measurements of the atmospheric turbulence profile in observations of laser guide stars** [10035-169]

- 10035 1Z **Structure of turbulent air motion inside primary mirror shaft at Siberian Lidar station of IAO SB RAS: experiment and simulation** [10035-173]
- 10035 20 **Statistical estimates of time distribution of the monostatic sodar signal intensity** [10035-174]
- 10035 21 **Estimate of the effect of polarization account on the reflection coefficient of the Earth's surface for atmospheric correction of satellite data** [10035-181]
- 10035 22 **Development of IT integration tools for problems of thematic processing of Earth remote sensing data** [10035-189]
- 10035 23 **Spectral range for analysis of natural gas by Raman spectroscopy** [10035-190]
- 10035 24 **Modeling of kilometers radio wave propagation on high latitudes in summer and winter time** [10035-191]
- 10035 25 **Seasonal change of spatial distribution of transport acoustic noise in Tomsk** [10035-194]
- 10035 26 **The influence of plasmon resonance on the decrease of resonator-less laser generation thresholds** [10035-201]
- 10035 27 **Dispersion of surface plasmon-polaritons in weakly periodic structures** [10035-202]
- 10035 28 **Spatial profiles of statistical moments for collimated laser beams at the end of long atmospheric path** [10035-203]
- 10035 29 **Reflectivity dispersion characteristics of the composite films on the metal substrate** [10035-204]
- 10035 2A **Light fields in the clear natural water as an evidence of own water heterogeneity** [10035-206]
- 10035 2B **Method of evaluation of the radial distribution of the refractive index spectrum in axisymmetric supersonic jet from laser transillumination results** [10035-207]
- 10035 2C **Processing of the information from side-scan sonar** [10035-216]
- 10035 2D **Approbation of method of IR-radiation detection based on ultrasonic thermometry** [10035-221]
- 10035 2E **Influence of energy and repetition rate of the femtosecond laser pulses on the spectral and temporal characteristics of plasma in laser induced breakdown spectroscopy of aqueous solutions** [10035-224]
- 10035 2F **Fluctuations of the orbital angular momentum of vortex laser beam in a turbulent atmosphere: dependence on the turbulence strength and beam parameters** [10035-229]
- 10035 2G **Active mode radiosounding on ionosonde TOMION** [10035-233]
- 10035 2H **Computer simulation of scalar vortex and annular beams  $LG_{0L}$  beams in time-varying random inhomogeneous media** [10035-237]

- 10035 2I **Monitoring electromagnetic fields in the frequency band from 1 kHz to 30 MHz on the ionosonde TOMION** [10035-241]
- 10035 2J **Reaction of the F2 region ionosphere on geomagnetic storms according to the data of the Tomsk ionospheric station** [10035-244]
- 10035 2K **The influence of energy and temporal characteristics of laser radiation on the structure of multiple filamentation domain in glass** [10035-245]
- 10035 2L **Postfilamentation light channels in the air** [10035-248]
- 10035 2M **Postfilamentation channels of terawatt pulses Ti: sapphire-laser in distribution on 150 meter path** [10035-251]
- 10035 2N **The influence of titanium dioxide to nonlinear optical properties of carbon quantum dots** [10035-256]
- 10035 2O **Random wandering of Airy vortex beam propagating in a turbulent atmosphere** [10035-272]
- 10035 2P **Statistical characteristics of common and synthesized vortex beams in a turbulent atmosphere** [10035-254]
- 10035 2Q **Possibilities of crosswind profiling based on incoherent imaging** [10035-255]
- 10035 2R **Estimation of optimal conditions for laser beam focusing in a turbulent atmosphere from a target image** [10035-257]

---

#### OPTICAL INVESTIGATION OF ATMOSPHERE AND OCEAN

- 10035 2S **A statistical model for optical radiation transfer in the ocean-atmosphere system (Invited Paper)** [10035-260]
- 10035 2T **Application of Raman lidar for the spatial and vertical distribution of aerosol and water vapor in Beijing, China (Invited Paper)** [10035-185]
- 10035 2U **Backscatter ratios using lidar sounding over Tomsk and Hefei (Invited Paper)** [10035-110]
- 10035 2V **Properties of cirrus cloud by a three wavelength Raman Mie polarization lidar: observation and model match (Invited Paper)** [10035-108]
- 10035 2W **Measurement of snow characteristics using optical precipitation gauge** [10035-2]
- 10035 2X **Modeling diagnostics of trioxide dialuminum content in gas-aerosol medium** [10035-9]
- 10035 2Y **Retrieval of concentrations of seawater natural components from reflectance spectrum** [10035-10]
- 10035 2Z **Technique for determination of the single scattering albedo of submicron aerosol in the approximation of lognormal size distribution of black carbon** [10035-19]



- 10035 30 **Modified aethalometer for monitoring of black carbon concentration in atmospheric aerosol and technique for correction of the spot loading effect** [10035-21]
- 10035 31 **The Black Sea IOPs based on SeaWiFS data** [10035-24]
- 10035 32 **A method of remote determination of the suspended matter concentration in seawater on the effective wavelength of upwelling radiation** [10035-25]
- 10035 33 **Comparison between the physical-optics approximation and exact methods solving the problem of light scattering by ice crystals of cirrus clouds** [10035-26]
- 10035 34 **Investigation of microphysical characteristics and chemical composition of near-ground aerosol in Barentsburg (Spitsbergen) in the spring and summer seasons of 2011-2015** [10035-27]
- 10035 35 **Inter-annual dynamics of changes in hydrooptical characteristics of ecosystem of the Yenisei basin** [10035-29]
- 10035 36 **Method for retrieval of vertical profiles of wind from Stream Line lidar data with allowance that the noise component of recorded signal differs from white noise** [10035-37]
- 10035 37 **Doppler lidar observation of the gravity waves near Lake Baikal in the summer of 2015** [10035-38]
- 10035 38 **Differences in seasonal average concentrations of aerosol and Black Carbon and particle size distributions from the data of monitoring in Tomsk and under background conditions in 2014-2015** [10035-39]
- 10035 39 **Spatiotemporal visualization of wind turbulence in the atmospheric boundary layer from measurements by the Stream Line lidar** [10035-40]
- 10035 3A **Formaldehyde integral content in troposphere of Moscow region: preliminary results of 6 years of measurements using DOAS technique** [10035-41]
- 10035 3B **Stereoscopic ground-based determination of the cloud base height: camera position adjusting with account for lens distortion** [10035-43]
- 10035 3C **A layout of two-port DOAS system for investigation of atmospheric trace gases based on laboratory spectrograph** [10035-44]
- 10035 3D **Comparison of assessment techniques of fine and coarse component aerosol optical depth of the atmosphere from measurement in the visible spectrum** [10035-46]
- 10035 3E **Impact of urban traffic to diurnal and by day of week variations of aureole scattering phase function** [10035-47]
- 10035 3F **Investigation of relationship between the characteristics of atmospheric aerosol in complex experiment city-background in the middle Urals in 2014** [10035-48]

10035 3G **Analysis of variability and the interrelations between characteristics of atmospheric aerosols according to data of multiyear measurements along eastern route of Russian Antarctic expeditions [10035-49]**

## **Part Two**

10035 3H **Contactless study of the flame structure during diffusion combustion for certain types of liquid hydrocarbon fuels [10035-51]**

10035 3I **Effect of low energy fluctuations on the spectrum of the temperature change in flame [10035-54]**

10035 3J **Calibration of the thermal imager during the experimental study of the plasma jet impact on CO<sup>2</sup> [10035-56]**

10035 3K **Estimation of the turbulence scales in flame during diffusion diesel fuel combustion [10035-57]**

10035 3L **Investigations of the optical properties of cirrus clouds crystals in the case of predominantly azimuthal orientation [10035-64]**

10035 3M **Optical characteristics of Middle East arid aerosol and statistics of its registration over the Black Sea [10035-71]**

10035 3N **Open path measurement of atmospheric pollutants using DOAS method [10035-84]**

10035 3O **Retrieving the microphysical properties of ice clouds from simultaneous observations by a lidar and an all-sky camera [10035-87]**

10035 3P **Influence of cirrus clouds ice crystal's deformation on the backscattering matrix calculated within the physical optics approximation [10035-88]**

10035 3Q **Long-term measurements of characteristics of stratospheric aerosol layer at Siberian lidar station in Tomsk [10035-93]**

10035 3R **Analysis of ground-based and satellite observations of atmospheric gas pollutants over Tomsk region under smoke mist conditions during summer 2012 [10035-94]**

10035 3S **A technique for estimation of the aerosol optical constants and microphysical parameters from the data of scattering and extinction in visible and near IR wavelength range [10035-105]**

10035 3T **Altitude dependence of intensity fluctuations of the laser beam crosses the rotating flame [10035-113]**

10035 3U **Software complex for processing the lidar data obtained at small lidar station of IAO SB RAS [10035-116]**

10035 3V **Validation of lidar measurements of temperature in the lower stratosphere using aerological and satellite data [10035-118]**

- 10035 3W **Modeling of measurements of temperature in the middle atmosphere by spaceborne UV lidar** [10035-120]
- 10035 3X **Optical and microphysical properties of cirrus clouds retrieved from combined lidar and radar measurements** [10035-126]
- 10035 3Y **Integrated monitoring of the atmospheric boundary layer dynamics by remote sensing methods in June 2015 in Tomsk** [10035-131]
- 10035 3Z **Information-algorithmic basis of a program complex for forest fire danger estimation** [10035-134]
- 10035 40 **Climatology of ozone concentrations at separate altitude levels over Tomsk and Sodankylä according to Aura MLS data for 2005-2015** [10035-139]
- 10035 41 **Estimate of microstructure parameters of the coarsely dispersed aerosol based on their statistical relationships with spectral measurements of the aerosol optical thickness** [10035-144]
- 10035 42 **Empirical algorithm for estimation of the optical constants of absorbing aerosol** [10035-145]
- 10035 43 **Construction and analysis of long-term series of aerosol microstructure parameters reconstructed from the data of solar photometry in Tomsk** [10035-147]
- 10035 44 **Humidity effect on occurrence of ozone anomaly in Arctic in April 2011 according to Aura MLS data** [10035-148]
- 10035 45 **Investigations of the seawater beam attenuation distribution nearby wastewater discharge on the Herakleian Peninsula shelf** [10035-149]
- 10035 46 **The first estimates of midgets extinction coefficient of optical radiation for background conditions of summer of Western Siberia** [10035-155]
- 10035 47 **Effect of superweak modulated IR radiation on vegetative regulation of heart rhythm of children with localized forms of pulmonary tuberculosis** [10035-159]
- 10035 48 **The technique of synchronous solar radiation measurements while lidar sensing of Ci clouds** [10035-163]
- 10035 49 **Chemical composition of atmospheric aerosols over background areas of the southern part of Western Siberia observed during the IAO Complex Atmospheric Radiation Experiment carried out in December 2015** [10035-164]
- 10035 4A **Dependence of polarization characteristics of the double scattering lidar return from liquid water content of clouds** [10035-180]
- 10035 4B **Using diffuse solar radiation for estimate of Cu cloud amount** [10035-183]
- 10035 4C **LIDAR complex software** [10035-186]
- 10035 4D **Vertical structure of the aerosol fields of the atmosphere in the period of forest fires over Lake Baikal in 2015** [10035-187]

- 10035 4E **Investigation of a possibility of enhancement of Raman signals from gaseous medium due to plasmon resonance on the Al-grating** [10035-188]
- 10035 4F **Element composition of solid airborne particles deposited in snow in the vicinity of gas-fired heating plant** [10035-193]
- 10035 4G **Long-term variations in submicron aerosol pollution in 2003–2015 in the atmosphere over Beijing** [10035-196]
- 10035 4H **Geochemical peculiarities of soils in Tomsk areas of industrial enterprises locations** [10035-197]
- 10035 4I **Boundary layer in western Siberia according to the data of lidar measurements in Tomsk** [10035-208]
- 10035 4J **Automation of processing and interpretation of experimental data on polarization laser sensing of high-level clouds** [10035-209]
- 10035 4K **Dynamic topography of the vector beam profile at the atmospheric path output** [10035-211]
- 10035 4L **Registration system pulse mode avalanche photodiode photon counting with RS-485 interface** [10035-215]
- 10035 4M **Pulsed light source for nephelometric with optimized parameters in the scattering volume** [10035-217]
- 10035 4N **Possibility of heating safety glasses in optoelectronic devices** [10035-218]
- 10035 4O **Possible to reduce the influence of the background in the measurement of atmospheric transparency nephelometry** [10035-219]
- 10035 4P **Imitation of several layers of clouds to calibrate ceilometer** [10035-214]
- 10035 4Q **Portable meter calibration meteorological visibility range** [10035-213]
- 10035 4R **Empirical orthogonal functions and its modification in the task of retrieving of the total amount CO<sub>2</sub> and CH<sub>4</sub> with help of satellite Fourier transform spectrometer GOSAT (TANSO-FTS)** [10035-210]
- 10035 4S **Investigation of laser plasma temperature and spectral line broadening in femtosecond laser plasma on the surface of barium water solution** [10035-222]
- 10035 4T **Lidar sensing atmosphere by gigawatt femtosecond laser pulses in the continent-ocean transition zone** [10035-223]
- 10035 4U **An effect of uncertainties of input data on determining the thermodynamic parameters of high-temperature carbon dioxide by a polynomial approximation method** [10035-225]
- 10035 4V **Seasonal and interannual variations of aerosol microphysical characteristics in the atmosphere of Primorskii krai, Russia in 2010-2015** [10035-226]

- 10035 4W **Seasonal and interannual dynamics of the optical characteristics of aerosol in the coastal region according to the photometric sensing for the period from 2010 to 2015** [10035-227]
- 10035 4X **Investigation of Asian dust from spectral characteristics of solar radiation scattering and absorption in the atmosphere** [10035-228]
- 10035 4Y **Light-induced thermodiffusion in two-component liquid** [10035-230]
- 10035 4Z **Results of synchronous measurements on meteorological parameter pulsations in the atmospheric surface layer** [10035-232]
- 10035 50 **The effect of droplet cloudy microstructure on the polarization characteristics of double scattering lidar return** [10035-238]
- 10035 51 **Determining the backscattering phase matrix of an aircraft condensation jet** [10035-250]
- 10035 52 **A numeric estimate of the sensitivity of the land-based lidar echo signal to statistical variations of the aerosol scattering coefficient in a cloudless atmosphere** [10035-261]
- 10035 53 **A temporal stability study of calibration functions coefficients in the pure rotational Raman lidar technique during tropospheric temperature measurements** [10035-262]
- 10035 54 **Lidar detector of explosive vapors** [10035-265]
- 10035 55 **Energy density of laser radiation as a factor limiting the sensitivity of the Raman-lidar method** [10035-267]
- 10035 56 **Robust nonparametric estimates of spatiotemporal dynamics of wind velocity from data of minisodar measurements** [10035-268]
- 10035 57 **Analysis of video for the passive method of wind estimations** [10035-269]
- 10035 58 **DIAL-DOAS technique for laser sounding of the gaseous composition of the atmosphere** [10035-276]
- 10035 59 **Siberian lidar station: instruments and results** [10035-277]

---

**ATMOSPHERIC PHYSICS AND CLIMATE**

---

- 10035 5A **Targeted monitoring strategy based on variational data assimilation and decomposition of processes scales (Invited Paper)** [10035-91]
- 10035 5B **Ozone anomaly of 2011 in the northern hemisphere** [10035-275]
- 10035 5C **Airglow intensity variations affected by acoustic-gravity waves at high latitudes** [10035-1]
- 10035 5D **To the theory of influence of the convection currents on the temperature distribution in the Earth's atmosphere** [10035-5]
- 10035 5E **Study of forest fires seasonal dynamics in Yakutia on remote sensing data** [10035-7]

- 10035 5F **Generation of emissions in red and green lines of atomic oxygen with due regard to energetic electron precipitation in the night time mid-latitude ionosphere** [10035-11]
- 10035 5G **Anomalies of acoustic and electromagnetic fields in a seismically active region** [10035-13]
- 10035 5H **Magnetically oriented irregularities of the ionosphere and super dual auroral radar network (SuperDARN)** [10035-14]
- 10035 5I **Lightning according to electromagnetic field observations in Buryatiya** [10035-15]
- 10035 5J **Algorithm of search for possible areas of lightning activity affecting whistler occurrence in a defined region** [10035-17]
- 10035 5K **Study of NDVI vegetation index in East Siberia under global warming** [10035-22]
- 10035 5L **Understanding of counter-gradient heat flux in lower atmosphere based on the second order RANS-approach** [10035-23]
- 10035 5M **Mesoscale structure of tropical cyclones in the northwestern part of the Pacific ocean according to the data of the WWLLN** [10035-30]
- 10035 5N **Correlation of annual average seasonal values of temperature within the atmospheric boundary layer and amount of stratiform low clouds** [10035-31]
- 10035 5O **Long-term changes in average seasonal surface air temperature over Siberia** [10035-32]
- 10035 5P **New cross-platform control software for Brewer Spectrophotometer** [10035-34]
- 10035 5Q **Simulation of solar radiative transfer in the Earth atmosphere taking into account the underlying surface anisotropy** [10035-45]
- 10035 5R **Lidar investigations of the scattering of the upper and middle atmosphere** [10035-55]
- 10035 5S **Influence of lightning discharges and geomagnetic activity variation rate on currents in buried pipelines and pipe-ground potential** [10035-58]
- 10035 5T **Calculation of wind profiles using satellite imagery of smoke plumes** [10035-59]
- 10035 5U **On the thermal influence of thermokarst lakes on the subsea permafrost evolution** [10035-60]
- 10035 5V **Specialized aerosol solver for calculation of photophoretic motion characteristics of soot aggregates** [10035-61]
- 10035 5W **Local inhomogeneity of the magnetic field as a possible factor of influence on the human** [10035-66]
- 10035 5X **Analysis of polar stratospheric cloud observations at Tomsk in January 2016** [10035-70]
- 10035 5Y **Dynamic parameters of the troposphere at occurrence of hazardous weather phenomena in the Black Sea region** [10035-75]

- 10035 5Z **The features of modeling of radiation forcing on the climate in the Arctic region** [10035-77]
- 10035 60 **The influence of solar activity on the seasonal variation of the temperature of high latitude mesopause over Yakutia** [10035-80]
- 10035 61 **Spatial and temporal variations of lightning activity in North Asia in 2009-2014** [10035-82]
- 10035 62 **Estimation smoldering front parameters located on the peat surface using methods of thermography** [10035-83]
- 10035 63 **Features of the elemental composition of snow cover in the area of production primary aluminum emissions** [10035-90]
- 10035 64 **Probable nature of Chizhevsky's "Z-factor" on example of a rare solar event** [10035-92]
- 10035 65 **Methane emission from Western Siberia's wetland ecosystems in the first half of the XXI century** [10035-96]
- 10035 66 **Remote detection of raised radioactivity in gasoerosol release from Belayarsk nuclear power plant** [10035-101]
- 10035 67 **Forecast of icing zones using possibilities of hydrodynamic simulation for the atmospheric boundary layer** [10035-102]
- 10035 68 **Natural and forced under-ice convection** [10035-103]
- 10035 69 **Electric quantities of surface atmosphere in adverse weather conditions** [10035-104]
- 10035 6A **Modelling consideration of amplitude variations of signals of lightning discharges with the availability of disturbances in the earth-ionosphere waveguide** [10035-109]
- 10035 6B **Assessment of changes in hydrology of Siberia in the XXI century** [10035-111]
- 10035 6C **Investigation of variability of the vertical stratification of background aerosol over Tomsk in 2015** [10035-114]
- 10035 6D **Scenario studies of local atmospheric circulations in the Krasnoyarsk region** [10035-115]
- 10035 6E **Lidar investigations of thermal regime of the stratosphere over Tomsk in 2015** [10035-119]
- 10035 6F **Numerical study of direct variational algorithm for assimilation of atmospheric chemistry data into transport and transformation model** [10035-121]
- 10035 6G **Vertical ozone flux in background area of Tomsk region** [10035-122]
- 10035 6H **Interaction of smoldering branches and pine bark firebrands with fuel bed at different ambient conditions** [10035-123]
- 10035 6I **Evaluation of satellite data on soil moisture in the southwest region of the Baikal** [10035-124]

- 10035 6J **Thematic virtual research environment for analysis, evaluation and prediction of global climate change impacts on the regional environment** [10035-129]
- 10035 6K **Effects of atmospheric inversion and stratification in the simulation of gravity currents over steep terrain** [10035-130]
- 10035 6L **Estimation the height of ozone formation in the atmospheric boundary layer** [10035-132]
- 10035 6M **The analysis of influence of atmospheric stratification on the emission plume from operated Beloyarsk NPP** [10035-133]
- 10035 6N **The forecast of the spatial position of convective cells using a data by global SL-AV NWP model** [10035-142]
- 10035 6O **Estimation of the average values of the vertical turbulent diffusion coefficient for areas with different natural and climatic conditions** [10035-152]
- 10035 6P **Validation of the RegCM4/CLM4.5 regional climate modeling system over the Western Siberia** [10035-153]
- 10035 6Q **Threshold values of characteristics of atmosphere instability during thunderstorms** [10035-154]
- 10035 6R **Atmospheric CH<sub>2</sub>O and NO<sub>2</sub> contents during severe heat waves and wildfires in European Russia in 2010 and Siberia in 2012** [10035-157]
- 10035 6S **Radio wave propagation over sea ice covering with varying thickness** [10035-162]
- 10035 6T **Multilevel ultrasonic complexes for monitoring of meteorological and turbulent parameters in the ground atmosphere** [10035-166]
- 10035 6U **Frequency structure infrasound signals from terrestrial explosions low power** [10035-170]
- 10035 6V **Seasonal-daily changes in the parameters of the infrasonic pressure fluctuations in a suburban area** [10035-171]
- 10035 6W **Preliminary results of a comparison of the rotational temperature of the hydroxyl at the height mesopause measured at two different latitudes** [10035-172]
- 10035 6X **Meteorological optical range predictability with the use of high resolution mesoscale models** [10035-175]
- 10035 6Y **Analysis of temporal dynamics of the standard deviation of three wind velocity components from the data of acoustic sounding** [10035-177]
- 10035 6Z **Satellite data assimilation in global numerical weather prediction model using Kalman filter** [10035-179]
- 10035 70 **Geocological assessment of mercury load in the impacted area of the thermal power plant of Seversk** [10035-182]



- 10035 71 **Global meteorological forecast data and instrumental measurement application for simulation of mesoscale atmospheric boundary layer processes** [10035-192]
- 10035 72 **Application of different parameterization schemes of heat and moisture exchange into the underlying surface for the mesoscale model** [10035-198]
- 10035 73 **Evaluation of the complex influence of natural gradient magnetic fields on the dynamics of human brain electrical activity** [10035-200]
- 10035 74 **Detecting the small-scale ionospheric irregularities based on GNSS data** [10035-205]
- 10035 75 **Do the processes in near-earth space influence weather and climate?** [10035-212]
- 10035 76 **Territorial peculiarities of aircraft icing for Tomsk and Novosibirsk International airports** [10035-236]
- 10035 77 **The development of algorithms for atmospheric methane distribution retrieval from IASI/METOP spectra and their validation with MACC/ECMWF reanalysis data** [10035-239]
- 10035 78 **Methane content in the mid-upper troposphere of Western Siberia in 2003-2015: results of the AIRS/AMSU-Aqua** [10035-243]
- 10035 79 **Investigation of temperature inversions in the atmospheric boundary layer based on data by temperature profiler MTP-5** [10035-246]
- 10035 7A **Impact of Atlantic multidecadal variability on anomalous temperature regimes formation in the Northern Eurasia** [10035-247]
- 10035 7B **Registration of ionospheric response to operation of the engine of spacecraft "Progress" according to GNSS data** [10035-259]
- 10035 7C **Electrophysical characteristics of water of the rivers of Siberia and Altai** [10035-263]
- 10035 7D **The reflective properties of marsh vegetation at microwave frequencies** [10035-264]
- 10035 7E **The linear dependence of Fm leaves of plants from the ratio of the total chlorophyll concentration to carotenoid concentration** [10035-270]



## Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Afanasiev, A. L., 12, 4K, 57  
Agafontsev, M. V., 3H, 3I, 3J, 3K, 62  
Agapova, T. M., 2E  
Akhlyostin, A., 0D  
Akhmetshina, A. S., 79  
Aksenov, Valeriy P., 2F, 2O, 2P  
Aksenov, Valery A., 54  
Alipova, Kseniya A., 6Z  
Ammosov, P. P., 60, 6W  
Ammosova, A. M., 60, 6W  
Angarkhaeva, L. Kh., 24, 6S  
Antipov, O. L., 1R  
Antokhin, Pavel N., 3Y, 6F, 6G, 6L  
Antokhina, O. Y., 6G, 6L  
Antoshkin, L. V., 1C  
Anufriev, I. S., 3H  
Apanovich, Z., 0D  
Apeksimov, D. V., 2K, 2L, 2M  
Argunov, Vyacheslav V., 6A  
Arsenyan, T. I., 4K  
Arshinov, Mikhail Yu., 38, 3Y  
Averkiev, A. A., 0F  
Ayurov, D. B., 6S  
Babanin, Eu. A., 28  
Babiy, M. Yu., 2E, 4S, 4T  
Baikov, A. N., 47  
Bakina, O. V., 0N  
Baklykova, E. S., 5W, 64  
Balin, Yurii S., 2U, 3O, 3Y, 4D, 4I, 59  
Banakh, V. A., 0V, 12, 14, 15, 1D, 1F, 1I, 36, 37, 39, 4K, 57  
Baranov, Nikolay A., 76  
Baranovskiy, Nikolay V., 3Z  
Barashkov, T. O., 5X  
Barashkova, Nadezhda K., 67, 6X  
Bart, Andrey A., 67, 6N, 6X, 71  
Bashkuev, Yu. B., 24, 5I, 6S  
Baydarov, D. A., 6H  
Bazhenov, O. E., 40, 44, 59  
Belan, Boris D., 38, 49, 6G, 6L  
Belan, S. B., 46  
Belikova, Marina Yu., 6N  
Belov, Vladimir V., 0R, 0T, 1V, 20, 21, 22, 3Z  
Belyakova, I. A., 47  
Beresnev, S. A., 17, 5V  
Biryukova, Yu. S., 2E, 4S, 4T  
Bobrikov, A. A., 4V, 4W  
Bobrovnikov, Sergey M., 54, 55, 59  
Bocharov, A. A., 25  
Bochkovskii, D. A., 3U, 3V, 3W, 5X, 6C, 6E  
Bogdanova, Julia V., 06  
Bogdanova, S. B., 5D  
Bogdevich, D. V., 2J  
Bogoslovskiy, Nikolay N., 6I, 6Z  
Bogushevich, A. Ya., 6T  
Bolbasova, L. A., 1P  
Borisenko, Alex, 6O  
Borisov, A. V., 07, 0B  
Borkov, Yu. G., 0O  
Borodin, A. S., 5W, 64  
Borodina, Irina A., 6I, 6Z  
Borovoi, Anatoli G., 2U, 2V, 33, 3L, 3O, 3P, 3X  
Borovski, Alexander, 13, 3A, 3C  
Botygin, I. A., 08, 0G  
Botygina, N. N., 1K  
Bruchkouski, I., 3C  
Bryukhanov, Ilya D., 48, 4J, 51  
Bryukhanova, V. V., 4A  
Burkatovskaya, Yu. B., 20  
Burlakov, V. D., 3Q, 59  
Burnashov, A. V., 1X  
Bychkov, Vasily V., 5R  
Cheong, H. D., 4X  
Chered'ko, Nataliya N., 48  
Cheremisin, A. A., 5X  
Cherepanov, O. S., 56  
Cherneva, N. V., 0X, 5G, 5I, 5J  
Cherniakov, Sergei M., 5C  
Chernov, D. G., 34, 38  
Chesnokova, T. Yu., 02, 0I  
Chulichkov, Alexey I., 3B  
Churilova, T., 3I  
Császár, A. G., 0D  
Danova, T. E., 5Y  
Davydov, Denis K., 3R  
Deichuli, V. M., 0L, 0M  
Dembelov, M. G., 24, 6S  
Dementiev, Vitali, 19  
Demidova, K. E., 4H  
Demyanov, V. V., 74  
Dolgii, S. I., 3Q, 59  
Donchenko, Valeriy A., 26, 27, 29  
Doroshkevich, Anton A., 4A, 50  
Druzhin, G. I., 5G, 5I, 5J  
Duchko, A., 0H  
Dudaryonok, Anna S., 0H, 0J  
Dudorov, Vadim V., 2P, 2Q, 2R  
Dzhola, A. V., 3A

Egorov, O. V., 04, 05, 2X, 4U  
 Elizarov, Alexey I., 1T, 3O  
 Elokhov, A., 3C  
 Emelyanov, N. M., 4U  
 Emelyanov, R. T., 0Q  
 Emilenko, Alexandr S., 4G  
 Engel, Marina V., 22, 3Z  
 Eremina, Anna S., 2Q, 2R  
 Erin, Sergei I., 6I, 6Z  
 Eyyuboğlu, Halil Tanyer, 1R  
 Faleychik, Larisa M., 6D  
 Falits, Andrei V., 15, 37, 39, 3Y  
 Fateev, V. N., 3J  
 Fazliev, A. Z., 0C, 0D, 6J  
 Filimonenko, Ekaterina A., 4F  
 Filimonov, Grigorii A., 2F  
 Filinyuk, O. V., 47  
 Filkov, A. I., 6H  
 Firsov, K. M., 0I  
 Foerstner, J., 33  
 Fofonov, Aleksander V., 49  
 Gaar, S. A., 3I, 3J  
 Galanova, N. Y., 0G  
 Galileyskii, Victor P., 3O  
 Gavrilyeva, G. A., 60, 6W  
 Geiko, Pavel P., 3N  
 Genin, D. E., 2D  
 Gerasimov, V. V., 53  
 Gerasimova, L. O., 14, 15  
 Gladkikh, Vladimir A., 3Y  
 Gladkov, S. O., 5D  
 Glazkova, E. A., 0N  
 Golik, S. S., 2E, 2K, 2N, 4S, 4T  
 Golobokova, L. P., 34  
 Gorbatenko, Valentina P., 6N, 6Q  
 Gordov, E. P., 08, 6J  
 Gorlov, Evgeny V., 54, 55, 59  
 Goryachev, B. V., 0F  
 Grechko, E. I., 3A  
 Gribanov, Konstantin G., 0P, 77  
 Gridnev, Yu. V., 22  
 Grigoriev, G. Y., 0F  
 Grigoriev, P. E., 73, 75  
 Grigoriev, Yu. M., 5S  
 Grishin, A. I., 4M, 4N, 4O, 4P, 4Q  
 Grozov, V. P., 1E  
 Gryazin, V. I., 17, 5V  
 Grynko, E., 33  
 Gubin, A. V., 34  
 Holzworth, R. H., 5M  
 Ianchenko, N. I., 63  
 Iglakova, A. N., 1X, 2M  
 Il'in, S. N., 5N, 5O  
 Ilyin, A. A., 2E, 4S  
 Imasu, Ryoichi, 0P, 77  
 Isaev, A. Yu., 5G  
 Isaeva, A. A., 1L  
 Isaeva, E. A., 1L  
 Ishimoto, H., 33  
 Ishin, A. B., 7B  
 Ivanov, V. A., 3A  
 Ivanov, V. I., 4Y  
 Ivanova, G. D., 4Y  
 Ji, Chengli, 2V  
 Kabanov, A. M., 2K, 2L, 2M  
 Kabanov, Dmitry M., 3D, 3G  
 Kablukova, Evgeniya G., 1N, 52  
 Kalchikhin, V. V., 2W  
 Kalinskaya, D. V., 3M  
 Kamardin, Andrei P., 3Y  
 Kan, V. A., 18  
 Kanaya, Y., 3A  
 Kanev, F. Yu., 1R  
 Kapegesheva, O. F., 6Y  
 Kapranov, V. V., 28  
 Kargin, A. B., 2S  
 Kargin, B. A., 2S, 52  
 Karimov, Rustam R., 1J, 5S  
 Kartashova, Elena S., 48  
 Kashirskii, D. E., 04, 05, 2X, 4U  
 Kashkin, V. B., 5B  
 Kashkina, T. V., 74  
 Kasymov, D. P., 62, 6H  
 Kataev, Mikhail Yu., 4R  
 Khaitov, R. K., 2G, 2I, 2J  
 Khamturova, M. Yu., 77  
 Khaptanov, V. B., 24  
 Kharchenko, O. V., 58, 59  
 Kharenkov, Vladimir A., 26  
 Khe, V. K., 4Y  
 Khodzher, T. V., 34  
 Khurchak, A. P., 45  
 Khuriganova, O. I., 34  
 Khutorov, Vladislav, 19  
 Khutorova, Olga, 19  
 Kikhtenko, Andrey V., 54  
 Kim, A., 0Z  
 Kim, D., 4X  
 Kirillov, N. S., 51  
 Kirnos, Ilya V., 0R, 0T  
 Kistenev, Yu. V., 07, 0A, 0B  
 Kizhner, Lubov I., 67, 6I, 6X, 6Z  
 Klemasheva, M. G., 4D  
 Klimeshina, Tatyana E., 09  
 Klimkin, Anton V., 4C  
 Klitochenko, I. I., 0I  
 Knyazkova, A. I., 0B  
 Kobzev, Alexey A., 2W, 69  
 Kochetkova, T. D., 7C, 7D  
 Kochneva, L. B., 17  
 Kokarev, Dmitry V., 3O  
 Kokhanenko, Grigorii P., 2U, 3O, 3Y, 4C, 4D, 4I, 59  
 Kolesnik, E. S., 2G, 2I  
 Kolesnik, S. A., 1O, 2G, 2I, 2J  
 Kolmakov, A. A., 1O  
 Kolosov, Valeriy V., 2F, 2O, 2P  
 Kolotkov, Gennady A., 66, 6M  
 Koltovskoi, I. I., 60, 6W

Komarov, V. S., 5N, 5O  
 Kondratiev, V. V., 63  
 Konoshonkin, Alexander V., 2U, 33, 3L, 3O, 3P, 3X  
 Konstantinova, Daria A., 6Q  
 Konyaev, Petr A., 2H  
 Kopeikin, Vladimir M., 4G  
 Kop'ev, E. P., 3H  
 Kopylov, E. A., 1K  
 Korchemkina, E. N., 2Y, 32  
 Korolkov, V. A., 2W, 6T  
 Korovin, E. Y., 7C  
 Korsakov, Alexey A., 1J, 5S  
 Kotovich, G. V., 1E  
 Kovadlo, P. G., 1K, 1P, 1S  
 Kovalenko, Evgeny O., 2C  
 Kovaleva, S. F., 1X  
 Kovtanyuk, A. E., 0Y  
 Kozlov, Artem V., 3R  
 Kozlov, V. S., 2Z, 30, 34, 38  
 Kozlov, Vladimir I., 1J, 5S, 61  
 Kozodoev, A., 0D  
 Krasnenko, N. P., 20, 6Y  
 Krupchatnikov, V. N., 6J  
 Krutikov, V. A., 08  
 Kryuchkov, A. V., 4L, 4M, 4N, 4O, 4P, 4Q  
 Kuchinskaya, O. I., 2M  
 Kukarenko, E. A., 5M  
 Kurbatskaya, L., 5L  
 Kurbatskii, A., 5L  
 Kurjak, Alexey N., 4C  
 Kurkin, V. I., 1E  
 Kustova, Natalia V., 2U, 33, 3L, 3O, 3P, 3X  
 Kuzhevskaya, Irina V., 67, 6X  
 Kuzin, Viktor I., 6B  
 Kuzmin, D. A., 07  
 Lagutin, Anatoly A., 65, 6P, 78  
 Lanskaya, Olga G., 69  
 Lapteva, Natalya A., 6B  
 Laryunin, O. A., 0U  
 Latushkin, A. A., 45  
 Lavrentiev, N. A., 0C, 0D  
 Lavrentieva, Nina N., 0J  
 Lavrinenko, A. V., 5N, 5O  
 Lavrinov, V. V., 1A, 1B, 1C  
 Lavrinova, L. N., 1A, 1B, 1C  
 Lee, M. E., 2Y, 45  
 Leonovich, L. A., 5F  
 Lerner, M. I., 0N  
 Lezhenin, A. A., 5T  
 Lihtenberger, J., 5J  
 Lisitsa, V. V., 2E, 4S, 4T  
 Liu, Dong, 2T, 2U, 2V, 3L  
 Loboda, E. L., 3H, 3I, 3J, 3K  
 Lomakina, N. Ya., 5N, 5O  
 Loskutov, V. V., 2X  
 Lubo-Lesnichenko, K. E., 34  
 Lugovskoi, A., 0H  
 Lukin, Igor P., 0W, 11, 1H, 1Q  
 Lukin, Vladimir P., 1K, 1P, 1R, 1S, 1Y, 1Z, 2H  
 Lukyanov, Andrey K., 4R  
 Lyapina, E. E., 70  
 Makeev, A. P., 59  
 Makenova, N. A., 1R  
 Maksakova, S. V., 1W, 5Z  
 Makushev, Konstantin M., 65, 6P, 78  
 Malakhova, Valentina V., 5U  
 Malysh, E. A., 0X  
 Mankovskaya, E. V., 32  
 Marakasov, D. A., 12, 2B, 57  
 Marapulets, Yu. V., 5G  
 Marichev, V. N., 3U, 3V, 3W, 5X, 6C, 6E  
 Martynov, O. V., 2Y, 45  
 Matafonov, G. K., 5F  
 Matrosov, I. I., 23  
 Matvienko, G. G., 1X, 2M, 4P, 58, 59  
 Matvienko, O. V., 3K  
 Mayor, A. Yu., 2K, 2N  
 Medvedenko, I. A., 1X  
 Medvedev, Andrey P., 3B  
 Mikhailenko, S. N., 0E  
 Mironova, Daria E., 1M  
 Mitae, A. A., 2G  
 Mochalov, V. A., 5J, 5M  
 Mochalova, A. V., 5J  
 Mokhov, I. I., 6R, 7A  
 Mordvin, Egor Yu., 65, 6P, 78  
 Morozov, Alexander M., 3O  
 Nadeev, A. I., 4L  
 Nagorskiy, Petr M., 69  
 Naguslaeva, I. B., 5I, 6S  
 Nakhtigalova, Daria P., 53, 76  
 Nasonov, Sergey V., 2U, 3O, 3Y, 4D, 51  
 Nasrtdinov, I. M., 02  
 Nechepurenko, Olga E., 6N  
 Nedosekov, D. A., 1O  
 Nee, E. V., 4A  
 Nevzorov, A. A., 59  
 Nevzorov, A. V., 3Q, 59  
 Nikiforova, M. P., 5Y  
 Nikiforova, O. Yu., 47  
 Nikitin, Stanislav V., 3B  
 Nikolaev, V. V., 0A  
 Nosov, Eugene V., 1Y, 1Z  
 Nosov, Victor V., 1Y, 1Z  
 Novikov, P. V., 5X  
 Novoselov, M. M., 4D  
 Odintsov, Sergei L., 3Y  
 Okamoto, Hajime, 33, 3X  
 Okishev, K. N., 4Y  
 Okladnikov, I. G., 6J  
 Onishchuk, N. A., 34  
 Oshlakov, V. K., 1X, 2M  
 Osipov, Konstantin Yu., 4C, 4H  
 Osipov, Oleg S., 0J  
 Osipova, N. A., 4H  
 Panamarev, Nikolay S., 27, 29  
 Panamaryova, Anna N., 26, 27, 29

Panchenko, Mikhail V., 2Z, 30, 34, 3E, 3S  
 Panchenko, Yury N., 54  
 Parygina, Irina A., 4F, 70  
 Pavlinskii, Alexey V., 53, 76  
 Pavlova, A. A., 7C  
 Penenko, Alexey, 6F, 6L  
 Penenko, Vladimir V., 5A, 6D  
 Penin, Sergei T., 66, 6M  
 Penner, loganes E., 3Y, 4D, 4I, 59  
 Penzin, M. S., 1E  
 Perezhogin, Andrey S., 5R  
 Permyakov, M. S., 5M  
 Petrov, A. V., 2K, 2M  
 Petrov, D. V., 23, 2D, 4E  
 Petrova, T. M., 0L, 0M, 0N  
 Pikalov, M. V., 2G, 2J  
 Pkhalagov, Yurii A., 3S, 42  
 Pobachenko, S. V., 73, 75  
 Poddubny, Vasily A., 3F  
 Podlesnyih, A. A., 2N  
 Pogutsa, Cheslav E., 2F, 2O  
 Pol'kin, Vas. V., 3E  
 Pol'kin, Viktor V., 2Z, 3E, 3F, 3G  
 Ponomarchuk, S. N., 1E  
 Ponomarev, Yu. N., 0M, 0N  
 Postnikova, P. V., 35  
 Postnova, I. V., 2N  
 Postlyakov, Oleg V., 13, 3A, 3B, 3C  
 Potalova, E. Yu., 5M  
 Prakhov, A. N., 34  
 Pravdin, V. L., 53  
 Prigarin, Sergei M., 1M, 1N, 2S  
 Prikhodko, L. I., 1G  
 Privezentsev, A., 0D  
 Prokhorov, Igor V., 0Y, 0Z, 18, 2C  
 Proschenko, D. Yu., 2N  
 Provotorov, D. S., 25, 6U, 6V  
 Pryahina, S., 31  
 Ptashnik, I. V., 0K  
 Puchikin, Aleksey V., 54  
 Pustovalov, Konstantin N., 48, 69  
 Pyanova, Elza A., 6D  
 Radionov, Vladimir F., 34, 3G  
 Raputa, V. F., 5T  
 Rasskazchikova, Tatyana M., 3Y, 49  
 Razenkov, I. A., 1D, 1F, 1I, 4M  
 Razmolov, A. A., 0I  
 Reyno, V. V., 3I, 3J, 3K  
 Rodimova, Olga B., 06, 09, 0C, 0D  
 Roldugin, Alexey V., 5C  
 Roldugin, Valentin C., 5C  
 Romanov, I. V., 2G  
 Romanovskii, O. A., 58, 59  
 Rostov, Andrey P., 12, 4K, 4Z  
 Rubleva, T. V., 5B  
 Russkova, Tatiana, 02, 5Q  
 Rybnov, Y. S., 6U  
 Rytchkov, D. S., 16  
 Ryzhakova, Nadezhda, 6O  
 Sadovnikov, S. A., 58, 59  
 Sakerin, Sergey M., 3D, 3F, 3G  
 Samoilov, L. V., 1L  
 Samoilova, Svetlana V., 3Y, 4I, 59  
 Samokhina, Natalia P., 4F  
 Samokhvalov, Ignatiy V., 27, 29, 3N, 48, 4X, 51  
 Sannikov, D. V., 5J  
 Sato, Kaori, 33, 3X  
 Savinykh, Vladimir V., 5P  
 Sazanovich, V. M., 3T  
 Sedinkin, D. O., 4E  
 Selin, A. A., 1K  
 Semenov, V. A., 7A  
 Sennikov, Victor A., 2H  
 Serdyukov, V., 0H  
 Seregin, Ilya N., 5R  
 Sergeeva, Natalia, 6O  
 Shakhova, Tatyana S., 4F, 70  
 Shamanaeva, L. G., 0R, 20, 56, 6Y  
 Shang, Zhen, 2T  
 Shapovalov, A. V., 0A, 0B  
 Sharypov, O. V., 6H  
 Shatokhina, Anastasiya O., 27, 29  
 Shcheglova, A. S., 7D  
 Shchelkanov, N. N., 46  
 Shchipunov, Yu. A., 2N  
 Shefer, Nadezhda A., 4Z  
 Shefer, O. V., 2X  
 Shelekhov, Alexander P., 76  
 Shelekhova, Evgeniya A., 76, 7A  
 Sherstnev, V. S., 08, 0G  
 Sherstneva, A. I., 08, 0G  
 Sherstobitov, M. V., 3T  
 Shevtsov, Boris M., 5I, 5J, 5M, 5R  
 Shikhovtsev, A. Yu., 1K, 1P, 1S  
 Shirokov, I. A., 1G  
 Shishko, Victor A., 3P  
 Shitov, A. V., 5W  
 Shmargunov, V. P., 30, 38  
 Shmirko, K. A., 4V, 4W  
 Shybanov, E. B., 2A, 2Y  
 Sidorova, O. R., 34  
 Simakhin, V. A., 56  
 Simonenkov, Denis V., 49  
 Simonova, A. A., 0K  
 Sitnov, S. A., 6R  
 Sivokon', V. P., 5H  
 Sklyadneva, Tatyana K., 3R  
 Skornyakov, Valery Yu., 5P  
 Skorokhod, Nikolai N., 1T  
 Slabakova, V., 31  
 Smalikhov, Igor N., 36, 37, 39, 3Y  
 Smirnov, Alexander, 3G  
 Smirnov, Sergey S., 3N  
 Smirnova, L. V., 47  
 Sokolov, M. V., 73  
 Solodchuk, A. A., 5G  
 Solodov, A. A., 0L, 0M, 0N  
 Solodov, A. M., 0L, 0M, 0N

Solovyev, Vladimir S., 5E, 5K  
 Solovyov, A. V., 25, 6U, 6V  
 Starchenko, Alexander V., 67, 6X, 71, 72  
 Starikov, V. I., 0L  
 Strelkov, S. A., 1W, 5Z  
 Stykon, A. P., 51  
 Suhareva, N. A., 28, 4K  
 Sukhanov, A. Ya., 58  
 Sukharev, A. A., 0V  
 Sulakshina, O. N., 0O  
 Sushchenko, Andrey A., 18, 2C  
 Sushkevich, T. A., 10, 1W, 5Z  
 Suslin, V. V., 31, 3M  
 Suslyaev, V. I., 7C  
 Sviridenkov, Mikhail A., 4G  
 Talovskaya, Anna V., 4F, 7O  
 Tan, Min, 2T  
 Tao, Zongming, 2V  
 Tarabukina, L. D., 5S, 61  
 Tarasenkov, Mikhail V., 0R, 0T, 1V, 21, 22, 6Y  
 Tartakovsky, V. A., 08  
 Tashchilin, A. V., 5F  
 Telminov, A. E., 2D, 6T  
 Tennyson, J., 0D  
 Teptin, German, 19  
 Terenteva, Mariia V., 72  
 Terpugova, Svetlana A., 2Z, 3S, 42  
 Tikhomirov, A. A., 2W, 6T  
 Tikhomirov, B., 0H  
 Timofeev, V. I., 1X  
 Tivileva, Maria I., 54  
 Tolmachev, Gennadii N., 49  
 Tomshin, Oleg A., 5E  
 Torgaev, Andrey V., 1Y, 1Z  
 Tsvetova, Elena A., 68  
 Tsvyk, R. Sh., 3T  
 Tsydenov, Bair O., 03  
 Tugaenko, V. Yu., 28  
 Turchinovich, Yu. S., 34  
 Tuzhilkin, D. A., 5W, 64  
 Urazova, O. I., 47  
 Ushakova, O. V., 0S  
 Uzhegov, Victor N., 3S, 42, 46  
 Varlamova, Eugenia, 5K  
 Vasiljeva, M. S., 17  
 Velichko, T. I., 0E  
 Veretennikov, V. V., 41, 43  
 Verkhoturov, V. V., 63  
 Vladimirov, B. M., 75  
 Vodinchar, G. M., 0X  
 Voeykov, S. V., 7B  
 Voitsekhovskaya, O. K., 04, 05, 2X, 4U  
 Vokhnik, O. M., 28, 4K  
 Volkov, Nikolay V., 65, 6P  
 Volkov, S. N., 4J, 4X  
 Volkova, Marina A., 67, 6X  
 Volodgin, A. G., 1G  
 Voronina, S., 0D  
 Voropay, Nadezhda N., 6I  
 Vostretsov, N. A., 1U  
 Vrazhnov, D. A., 07, 0A  
 Wang, Bangxin, 2T, 2V  
 Wang, Gengchen, 4G  
 Wang, Yingjian, 2T, 2V  
 Wang, Zhenzhu, 2T, 2U, 2V, 3L  
 Xie, Chenbo, 2T, 2U, 2V, 3L  
 Yakovlev, S. V., 58, 59  
 Yankovich, Elena P., 3Z  
 Yaroslavtseva, T. V., 5T  
 Yarovenko, I. P., 0Y  
 Yasyukevich, Yu. V., 74  
 Yausheva, Elena P., 38, 42  
 Yazikov, Egor G., 4F, 4H  
 Yudin, M. S., 6K  
 Yuvchenko, S. A., 0S  
 Zadvornyykh, Ilya V., 0P  
 Zakharov, V. I., 77  
 Zariyev, A. R., 2D, 4E  
 Zavoruev, V. V., 0Q, 7E  
 Zavorueva, E. N., 0Q, 7E  
 Zemlyanov, A. A., 2K, 2L, 2M  
 Zemlyanov, Aleksey A., 26, 27, 29  
 Zenzin, A. S., 0G  
 Zharkov, Viktor I., 54, 55, 59  
 Zhivotenyuk, I. V., 51  
 Zhong, Zhiqing, 2T, 2V  
 Zhornyak, L. V., 4H  
 Zhukov, A. F., 1U  
 Zhuravleva, Tatyana B., 02, 3R, 5Q  
 Zimnyakov, D. A., 0S, 1L  
 Zimovaya, A. V., 0R, 21  
 Zinovjev, Michael M., 26  
 Zuev, Sergey V., 48, 4B  
 Zuev, Vladimir V., 53, 76, 7A





# Conference Committee

## *Conference Chairs*

**Gelii A. Zherebtsov**, Institute of Solar-Terrestrial Physics  
(Russian Federation)

**Gennadii G. Matvienko**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

## *Organizing Committee:*

**Oleg A. Romanovskii**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**Semyon V. Yakovlev**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

## *Program Committee*

**E. I. Akopov**, SPIE Russian Chapter (Russian Federation)

**L. C. Andrews**, University of Central Florida (United States)

**A. Ansmann**, Leibniz-Institute for Tropospheric Research (Germany)

**K. Asai**, Tohoku Institute of Technology (Japan)

**V. A. Banakh**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**A. Barbe**, Université de Reims Champagne-Ardenne (France)

**B. D. Belan**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**V. V. Belov**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**L. R. Bissonnette**, Defence Research and Development Canada  
(Canada)

**P. Brusaglioni**, Università degli Studi di Firenze  
(Italy)

**Bruce Dean**, NASA Goddard Space Flight Center (United States)

**G. S. Golitsyn**, Institute of Atmospheric Physics  
(Russian Federation)

**G. I. Gorchakov**, Institute of Atmospheric Physics  
(Russian Federation)

**G. Inoue**, National Institute for Environmental Studies (Japan)

**A. P. Ivanov**, B. J. Stepanov Institute of Physics NAS Belarus (Belarus)

**V. P. Kandidov**, Moscow State University (Russian Federation)

**B. A. Kargin**, Institute of Computational Mathematics and  
Mathematical Geophysics (Russian Federation)

**A. Kohnle**, FGAN-FOM (Germany)

**P. G. Kovadlo**, Institute of Solar-Terrestrial Physics  
(Russian Federation)

**V.A. Kovalenko**, Institute of Solar-Terrestrial Physics  
(Russian Federation)

**V. E. Kunitsyn**, Moscow State University (Russian Federation)

**V. I. Kurkin**, Institute of Solar-Terrestrial Physics  
(Russian Federation)

**V. P. Lukin**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**G. G. Matvienko**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**U. G. Ooppel**, Ludwig-Maximilians-Universität München (Germany)

**M. V. Panchenko**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**V. V. Penenko**, Institute of Computational Mathematics and  
Mathematical Geophysics SB RAS (Russian Federation)

**Y. N. Ponomarev**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**A. P. Potekhin**, Institute of Solar-Terrestrial Physics  
(Russian Federation)

**I. V. Ptashnik**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**S. Rahm**, DLR Institut für Physik der Atmosphäre (Germany)

**J. C. Ricklin**, Defense Advanced Research Projects Agency  
(United States)

**M. C. Roggemann**, Michigan Technological University (United States)

**I. V. Samokhvalov**, National Research Tomsk State University  
(Russian Federation)

**U. N. Singh**, NASA Langley Research Center (United States)

**L. N. Sinitsa**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

**O. K. Steinvall**, Swedish Defence Research Agency (Sweden)

**G. F. Tulinov**, Institute of Applied Geophysics (Russian Federation)

**M. A. Vorontsov**, University of Maryland (United States)

**Gengchen Wang**, Institute of Atmospheric Physics (China)

**A. A. Zemlyanov**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

### *Session Chairs*

- 1 Molecular Spectroscopy and Atmospheric Radiative Processes
  - Yu. N. Ponomarev**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
  - L. N. Sinitsa**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
  - T. M. Petrova**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
  - I. V. Ptashnik**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

2 Optical Radiation Propagation in the Atmosphere and Ocean

- V. P. Budak**, National Research University "MPEI"  
(Russian Federation)
- V. P. Belov**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- V. P. Lukin**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- A. A. Zemlyanov**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- V. A. Banakh**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- A. M. Kabanov**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

3 Optical Investigation of Atmosphere and Ocean

- G. G. Matvienko**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- I. V. Samokhvalov**, National Research Tomsk State University  
(Russian Federation)
- V. N. Marichev**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- A. A. Tikhomirov**, Institute of Monitoring of Climatic and Ecological  
Systems (Russian Federation)
- O.A. Romanovskii**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)

4 Atmospheric Physics and Climate

- B. D. Belan**, V.E. Zuev Institute of Atmospheric Optics  
(Russian Federation)
- V. A. Kovalenko**, Institute of Solar-Terrestrial Physics  
(Russian Federation)
- V. V. Penenko**, Institute of Computational Mathematics and  
Mathematical Geophysics (Russian Federation)
- S. A. Kolesnik**, National Research Tomsk State University  
(Russian Federation)
- A. V. Soloviev**, National Research Tomsk State University  
(Russian Federation)
- V. V. Zavoruev**, Institute of computational modeling  
(Russian Federation)



## Introduction

In accordance with the schedule of meeting and conferences approved by the Presidium of the Siberian Branch of the Russian Academy of Sciences (SB RAS) for 2016, the V.E. Zuev Institute of Atmospheric Optics SB RAS and Institute of Solar-Terrestrial Physics SB RAS organized the twenty-second International Symposium titled, "Atmospheric and Ocean Optics: Atmospheric Physics" in Tomsk, Russian Federation, 30 June–3 July 2016.

We thank our sponsors for their contribution to the success of the symposium: Siberian Branch of the Russian Academy of Sciences and the Russian Foundation for Basic Research.

English and Russian were the working languages of the symposium. All poster presentations were in English and oral presentations were made in English and Russian (using synchronous translation via personal audio-equipment).

We conducted four conferences titled:

- A. Molecular Spectroscopy and Atmospheric Radiative Processes
- B. Optical Radiation Propagation in the Atmosphere and Ocean
- C. Optical Investigation of Atmosphere and Ocean
- D. Atmospheric Physics and Climate

The main topics of the Twenty-second International Symposium on Atmospheric and Ocean Optic: Atmospheric Physics included:

- Molecular spectroscopy of atmospheric gases
- Absorption of radiation in atmosphere and ocean
- Radiative regime and climate problems
- Models and data bases for atmospheric optics and physics
- Wave propagation in random inhomogeneous media
- Adaptive optics
- Nonlinear effects at radiation propagation in atmosphere
- Multiple scattering in optical remote sensing
- Image transfer and processing
- Optical and microphysical properties of atmospheric aerosol and suspension in water media
- Transport and transformation of aerosol and gas components in the atmosphere
- Laser and acoustic sounding of atmosphere and ocean
- Diagnostics of state and functioning of plants bio systems
- Structure and dynamics of the lower and middle atmosphere
- Dynamics of the atmosphere and climate of the Asian region

- Physical processes and phenomena in the atmosphere
- Optic techniques for probing the atmosphere

History: A symposium on Atmospheric and Ocean Optics has been held annually since 1994 by the Institute of Atmospheric Optics SB RAS. From 1971 to 2015 the IAO SB RAS organized more than 60 conferences on different scientific topics. The current symposium is the only one in Russia where fundamental problems of propagation in inhomogeneous media and the scattering and absorption radiation are considered. Very few conferences in the world have such a broad spectrum of interest. It is very attractive for participants from many of the 16 countries represented that the official languages of the symposium are Russian and English.

In the fields listed here, the Siberian scientific schools are leaders in our country and well known in the world. This fact can be attributed to the interest in the symposium from the scientists of Russian Federation and other countries of the region.

Present: The Twenty-second International Symposium on Atmospheric and Ocean Optics: Atmospheric Physics was successfully held in Tomsk, Russia, 30 June–3 July 2016.

The program of the symposium included 8 invited and plenary papers, 187 oral presentations, and more than 219 poster presentations during four poster sessions.

**Gennadii G. Matvienko**  
**Oleg A. Romanovskii**