

PROCEEDINGS OF SPIE

28th International Symposium on Atmospheric and Ocean Optics: Atmospheric Physics

Gennadii G. Matvienko
Oleg A. Romanovskii
Editors

4–8 July 2022
Tomsk, Russia

Organized by

V.E. Zuev Institute of Atmospheric Optics SB RAS (Russian Federation)
Institute of Solar-Terrestrial Physics SB RAS (Russian Federation)
A.M. Obukhov Institute of Atmospheric Physics RAS (Russian Federation)
M.A. Sadovsky Institute of Geosphere Dynamics RAS (Russian Federation)

Sponsored by

V.E. Zuev Institute of Atmospheric Optics SB RAS (Russian Federation)
Photonics journal (Russian Federation)

Published by
SPIE

Volume 12341

Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 12341

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

28th International Symposium on Atmospheric and Ocean Optics: Atmospheric Physics, edited by
Gennadii G. Matvienko, Oleg A. Romanovskii, Proc. of SPIE Vol. 12341, 1234101
© 2022 SPIE · 0277-786X · doi: 10.1117/12.2658109

Proc. of SPIE Vol. 12341 1234101-1

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.

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 *28th International Symposium on Atmospheric and Ocean Optics: Atmospheric Physics*, edited by Gennadii G. Matvienko, Oleg A. Romanovskii, Proc. of SPIE 12341, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510657540
ISBN: 9781510657557 (electronic)

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time)
SPIE.org
Copyright © 2022 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at 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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

SPIE. DIGITAL LIBRARY
SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- 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.

Contents

xix *Conference Committee*

Part One

MOLECULAR SPECTROSCOPY AND RADIATION PROPAGATION IN THE ATMOSPHERE AND OCEAN

- 12341 02 **The chromatic correction of zoom lenses for LWIR spectral range** [12341-6]
- 12341 03 **Impact of water vapor continuum absorption on carbon dioxide radiative forcing at upper and bottom boundaries of the atmosphere in Lower Volga Region** [12341-7]
- 12341 04 **Light focusing by Fresnel phase plates with an inclined zone profile** [12341-17]
- 12341 05 **Three-dimensional computer modeling of the electromagnetic wave propagation process in a supersensitive nanophotonic pressure microsensor** [12341-23]
- 12341 06 **Spectroscopic testing of type of orientation of H₂O molecules in a layer adsorbed on the surface of nanopores in SiO₂ airtgel** [12341-30]
- 12341 07 **Determination of diffuse and direct irradiance under cumulus clouds using pyranometer data** [12341-38]
- 12341 08 **Modeling of horizontally inhomogeneous cloudiness using bounded cascade method** [12341-43]
- 12341 09 **Using the nonlinear layer model for estimation of characteristics of high-power ultrashort laser pulse beams propagating along an aerospace path** [12341-47]
- 12341 0A **Measurement of the cross-polarized component of the reflected field from liquids in the range of 25-40 ghz** [12341-61]
- 12341 0B **Modeling of the atmospheric transmission of UV radiation with use of different data on water vapor absorption lines** [12341-63]
- 12341 0C **Numerical simulations of self-channeling and filamentation of spatially pre-modulated high-power femtosecond laser pulse in air** [12341-65]
- 12341 0D **Estimating optical turbulence strength using measurements of wavefront distortions** [12341-70]
- 12341 0E **Emulation of atmospheric turbulence for image stabilization of laser radiation on the stand of adaptive optical system** [12341-72]
- 12341 0F **Image jitter meter for low intensity radiation** [12341-73]

- 12341 OG **Frequency parameters of wavefront variations from optical measurement data** [12341-91]
- 12341 OH **Year-to-year changes in atmospheric and ionospheric variability in the 24th solar cycle** [12341-98]
- 12341 OI **Comparison of the characteristics and scale of turbulence in the flame during the burning of plant combustible materials in semi-field and laboratory studies** [12341-102]
- 12341 OJ **Investigation of the effect of deviations from the Kolmogorov-Obukhov model in the spectra of refractive index fluctuations in a supersonic airflow on optical radiations** [12341-104]
- 12341 OK **Optical vortices in the turbulent atmosphere** [12341-105]
- 12341 OL **Results of measurements of surface turbulent flows** [12341-115]
- 12341 OM **Parameters of water molecule absorption lines in the 6760–7430 cm⁻¹ spectral region** [12341-132]
- 12341 ON **Measurements of the O₂-broadening and shifting parameters of the HDO-16 and HDO-17 spectral lines in the 6400-7000 cm⁻¹ region** [12341-134]
- 12341 OO **Contribution of backscattering by small-scale irregularities in wave reflection from a randomly inhomogeneous multiscale ionospheric layer** [12341-139]
- 12341 OP **Studying variations in atmospheric constituents over the Baikal Natural Territory from the long-term data of Aura MLS measurements** [12341-142]
- 12341 OQ **The use of spectral parameters of temperature fluctuations in estimating the structure constant of turbulence** [12341-144]
- 12341 OR **Investigation of the Raman scattering spectra of ZnGeP₂ crystals** [12341-151]
- 12341 OS **High-speed heteroepitaxial In_{0.52}Al_{0.48}As/In_{0.53}Ga_{0.47}As/InP PIN photodiodes with superlattice structure** [12341-152]
- 12341 OT **Adaptive optics for Cr: CdSe laser with a moving active element** [12341-155]
- 12341 OU **Simulation of phase correction of sinusoidal distortions in the adaptive optical system with finite operation speed** [12341-156]
- 12341 OV **Estimation of the profile of the transversal wind velocity from spatio-temporal statistics of images of objects illuminated by laser radiation** [12341-160]
- 12341 OW **Atmospheric stability above 6-m Big Telescope Alt-Azimuthal site** [12341-164]
- 12341 OX **The problem of measuring the global tilt from laser guide star** [12341-168]
- 12341 OY **Measurements and spectral analysis of overlapping absorption lines spectra of pure NH₃ in the range 6611.6 - 6613.5 cm⁻¹** [12341-169]

- 12341 0Z **Filamentation of femtosecond laser radiation in the air at the aberration focusing regime**
[12341-175]
- 12341 10 **Experimental studies of a level of turbulence over a heated surface** [12341-179]
- 12341 11 **Regularities of propagation of amplitude-modulated high-power femtosecond laser radiation in the air** [12341-180]
- 12341 12 **The influence of turbulence on propagation of femtosecond laser pulses along 100-m path**
[12341-181]
- 12341 13 **Remote excitation and detection of two-photon fluorescence using femtosecond laser pulses**
[12341-182]
- 12341 14 **Adaptive formation of the orbital angular momentum of synthesized beams in a turbulent atmosphere** [12341-183]
- 12341 15 **Acoustic signals from water aerosol with nanoparticles during filamentation of a femtosecond pulse** [12341-188]
- 12341 16 **Universal similarity function in the Monin-Obukhov theory in the extremely stable turbulent boundary layer** [12341-192]
- 12341 17 **Integral-optical polarization converters based on birefringence and dichroism effects**
[12341-196]
- 12341 18 **Investigation the dependence of the photoelectric current of an InGaAs/InAlAs photodiode on the surface geometry** [12341-202]
- 12341 19 **Propagation of vortex beams in discrete scattering media** [12341-203]
- 12341 1A **Phase correction of coherent multi-ring Laguerre-Gaussian light beams under turbulent conditions** [12341-205]
- 12341 1B **Sources of errors in detection of contaminants in the atmospheric aerosol by IR-lidars**
[12341-207]
- 12341 1C **Numerical investigation of dynamic coherent beam combining in turbulent atmosphere with taking into account the double-pass delay** [12341-218]
- 12341 1D **Adaptive phase correction of laser beam under conditions of incomplete phase conjugation in turbulent atmosphere** [12341-223]
- 12341 1E **Propagation of optical pulses in natural waters** [12341-224]
- 12341 1F **Modeling the characteristics of radio waves propagating in an inhomogeneous ionosphere with allowance for the Earth's magnetic field and the altitude dependence of the effective frequency of electronic collisions** [12341-228]
- 12341 1G **Simulation of pointing the intensive speckle of a laser beam onto the target by means of SPG algorithm** [12341-229]

- 12341 1H **Compensation of the optical axis mission of the transmitter and receiver based on backscattered radiation** [12341-250]
- 12341 1I **Deformable piezoelectric mirrors with high density of control elements** [12341-251]
- 12341 1J **Modeling of laser pulse propagation in clouds taking into account multiple scattering** [12341-257]
- 12341 1K **Calculation of SO₂-CO₂ line broadening coefficients** [12341-262]
- 12341 1L **Retrieval of ¹³CH₄ atmospheric content and CH₄ isotopologues ratio from ground-based measurements of solar spectra** [12341-264]
- 12341 1M **Temporal correlation of temperature fluctuations in a stratified atmosphere** [12341-269]
- 12341 1N **On the shape of the power spectra of intensity fluctuations of a laser beam crossing a vortex flame** [12341-274]
- 12341 1O **Influence of wind fields with macroscopic velocity gradients on the IR CO₂ band emissions outgoing from a planetary atmosphere** [12341-286]
- 12341 1P **Radiative transfer in the middle and upper atmosphere of Earth taking account line-mixing in the IR CO₂ bands** [12341-291]
- 12341 1Q **Effect of the topological charge of a vortex light beam of a high-power femtosecond radiation on the statistical characteristics of the filamentation domain geometry in the turbulent atmosphere** [12341-292]

OPTICAL INVESTIGATION OF ATMOSPHERE

- 12341 1R **Possibilities of using mirror scanners in polarizing lidars** [12341-3]
- 12341 1S **Multichannel catadioptric system of the video camera for unmanned miniature drones** [12341-4]
- 12341 1T **Piezoelectric bimorph mirrors with various number of electrodes for scattered laser beam focusing** [12341-5]
- 12341 1U **Matrix polarization lidar for studying the Asian dust: optimal design and calibration problem** [12341-14]
- 12341 1V **Studies of spatiotemporal distribution of polycyclic aromatic hydrocarbons and sub-10 μm particulate matter above the water area of Lake Baikal in the autumn of 2021** [12341-19]
- 12341 1W **Differential absorption lidar for ozone sensing in the upper troposphere-lower stratosphere at Siberian Lidar Station** [12341-24]
- 12341 1X **Comparison of observations of total ozone content over Tomsk (2006-2020) obtained using three spectrophotometers** [12341-25]

- 12341 1Y **Dependence of the concentration of small gas impurities in the air basin of the Southern Baikal region on synoptic and meteorological conditions according to the Listvyanka station** [12341-26]
- 12341 1Z **Simulation of the lidar overlap function for a biaxial scheme** [12341-27]
- 12341 20 **Model calculations of ozone content in the atmosphere** [12341-29]
- 12341 21 **Application of small particle counters for estimation of parameters of condensations activity of atmospheric aerosol** [12341-32]
- 12341 22 **Possibility of recording the unbiased scatter lidar signals in the altitude range of 30÷100 km on the main SLS lidar** [12341-33]
- 12341 23 **Photon counting system with automated detection and selection of photodetector discrimination thresholds** [12341-34]
- 12341 24 **Analysis of turbulence model effect on the position of the combustion zone in a swirling flow** [12341-42]
- 12341 25 **Assessment of blue light impact on human internal organs by heart rate variability** [12341-44]
- 12341 26 **Changes in the structure of pulse signals under the impact of optical radiation of three colors** [12341-45]
- 12341 27 **Possibility estimation of determining carbon dioxide sources by the spaceborne lidar** [12341-50]
- 12341 28 **Possibility estimation of determining carbon dioxide sources by airborne lidar** [12341-51]
- 12341 29 **Estimate of contribution from different variability scales to variations in aerosol characteristic on Spitzbergen Archipelago** [12341-53]
- 12341 2A **Statistical estimates of how continental outflows influence aerosol characteristic over the Arctic Ocean** [12341-54]
- 12341 2B **Investigations of the corner-reflection effect at soundings of cirrus clouds by a scanning lidar** [12341-55]
- 12341 2C **Negative polarization phenomenon for large randomly oriented particles of irregular shapes** [12341-56]
- 12341 2D **Spatial distribution of anthropogenic tracers in the snow cover of the Southern Baikal region** [12341-57]
- 12341 2E **Simulation of the transfer function of a Fabry-Perot interferometer for incoherent Doppler wind lidar** [12341-59]
- 12341 2F **Ozone deposition on the water surface of Baikal near the coastal zone** [12341-62]

- 12341 2G **Trends in total, tropospheric and stratospheric NO₂ contents based on results of ground-based and satellite (OMI) measurements** [12341-68]
- 12341 2H **Results of comparison of characteristics of atmospheric aerosol over the Southern Ocean according to the data of expeditionary measurements and MERRA-2 reanalysis** [12341-71]
- 12341 2I **Composition of carbonaceous aerosol collected in the 83rd and 84th cruises of the RV Akademik Mstislav Keldysh** [12341-76]
- 12341 2J **Comparison of the results of joint measurements of wind velocity by Stream Line and WPL coherent Doppler lidars** [12341-82]
- 12341 2K **State of stratospheric aerosol layer in 2021 using observations at Siberian Lidar Station in Tomsk** [12341-84]
- 12341 2L **Variability of aerosol optical characteristics of the atmosphere according to long-term ground-based measurements in the Middle Urals** [12341-86]
- 12341 2M **Numerical simulation of WCF droplets trajectories using Ansys Fluent** [12341-88]
- 12341 2N **Lidar estimation of the vertical profile of the structural characteristic of the refractive index of the atmosphere** [12341-89]
- 12341 2O **The phenomenon of atmospheric mirror reflection** [12341-101]
- 12341 2P **Wide-range near and middle-IR range spectrometer for medical research** [12341-107]
- 12341 2Q **Study of relationship of radiation attenuation coefficient due to midges with meteorological parameters of atmosphere for summer 2018 conditions** [12341-113]
- 12341 2R **Estimating the height of the turbulent mixing layer from height-time distributions of the Richardson number** [12341-120]
- 12341 2S **Lidar localization of clear air turbulence** [12341-122]
- 12341 2T **Calculating the coordinates of the lidar sensing object** [12341-125]
- 12341 2U **Verification of GPM IMERG data on the total precipitation in Western Siberia in the warm season** [12341-130]
- 12341 2V **Analysis of the embedded convection of frontal cloud systems based on satellite and ground-based measurements** [12341-131]
- 12341 2W **Relationships between aerosol absorption, scattering and extinction of radiation in combustion and pyrolysis smokes** [12341-136]
- 12341 2X **Optimization of mean wind estimation methods from wind lidar's conical scan data** [12341-147]
- 12341 2Y **Validation of the algorithm for reconstructing the Earth surface reflection coefficients from MODIS data** [12341-148]

- 12341 2Z **Estimation of the quality of the atmospheric optical communication channel based on scattered radiation between the ground surface and an unmanned aerial vehicle** [12341-149]
- 12341 30 **Development of mobile lidar system for monitoring of tropospheric ozone and aerosol** [12341-158]
- 12341 31 **Comparison of lidar and satellite (MetOp and Aura) measurements with Suomi data** [12341-159]
- 12341 32 **Comparison of lidar and satellite measurements against quasi-triennial seasonal model of vertical distribution of ozone concentration** [12341-161]
- 12341 33 **Possibilities of using electro-optical modulators in Doppler wind lidar** [12341-162]
- 12341 34 **Main cycles of variability of the aerosol condensation activity in Tomsk in 1998 - 2021** [12341-163]
- 12341 35 **Seasonal behavior of the relationship of aerosol condensation activity with the relative content of volatile components in its composition** [12341-170]
- 12341 36 **Relationship of the aerosol condensation activity with concentration of particles in the nanometer size range** [12341-171]
- 12341 37 **Main statistical moments of a number of physico-chemical parameters of tropospheric aerosol in the background region of the south of Western Siberia in the air mass from the Aral-Caspian arid region according to the results of many-years flying experiments** [12341-172]
- 12341 38 **Complex refractive index in the model of the vertical profile of aerosol optical characteristics in the troposphere of Western Siberia** [12341-174]
- 12341 39 **Optical-microphysical characteristics of winter smogs according to measurements in the Academgorodok of Tomsk in 1997-2022** [12341-176]
- 12341 3A **Microphysical parameters of smoke aerosols based on the results of inversion of aerosol scattering and extinction coefficients in a big aerosol chamber of IAO SB RAS** [12341-177]
- 12341 3B **Results of the development of software and hardware for automation of lidar measurements** [12341-186]
- 12341 3C **Coplanar and non-coplanar laser communications over an atmospheric channel with UV scattering** [12341-193]
- 12341 3D **Results of ship-based lidar studies of atmospheric aerosol fields over the water area of Lake Baikal** [12341-194]
- 12341 3E **Multilayer antireflection optical coatings based on Nb, Si and Al oxides for nonlinear ZnGeP₂ crystals** [12341-195]
- 12341 3F **Method for estimating the influence of broken cloudiness on the reconstruction of the reflection coefficients of cloudless fragments of the Earth surface through cloud gaps** [12341-201]
- 12341 3G **Light backscattering matrix for atmospheric crystals of an irregular shape with different refractive indices within the physical optics approximation** [12341-206]

- 12341 3H **Determination of suspended aerosols in the atmospheric air according to the dust analyzer Atmos on the example of the Sevastopol City** [12341-208]
- 12341 3I **Investigation of the influence of the type of charge on the characteristics of the shock tube** [12341-209]
- 12341 3J **Some results of full-scale experiments to study the effect of forest fires on atmospheric characteristics** [12341-211]
- 12341 3K **Study of the effect of external pressure pulsations on the flame** [12341-213]
- 12341 3L **Reconstructing the ozone concentration profile using machine learning methods** [12341-215]
- 12341 3M **Effect of magneto rheological polishing of ZnGeP₂ on surface roughness** [12341-221]
- 12341 3N **Optical breakdown threshold of nonlinear GaSe and GaSe:In crystals at a wavelength of 2.1 microns** [12341-222]
- 12341 3O **Optical scheme optimization for a coherent doppler lidar** [12341-241]
- 12341 3P **Peculiarities of calculating a database of light backscattering matrices on hexagonal ice particles of cirrus clouds larger than 100 μm by the physical optics method** [12341-244]
- 12341 3Q **Use of pure-rotational Raman scattering in measurements with a mobile Mie-Raman lidar** [12341-245]
- 12341 3R **Interannual variability of CO₂ content in the atmosphere of the south of Western Siberia according to satellite observations in 2014-2021** [12341-246]
- 12341 3S **Estimates of the terrestrial gross primary production for the south of Western Siberia in 2014-2021 according to OCO-2 and OCO-3 data** [12341-247]
- 12341 3T **Temperature dependence of the optical strength of a ZnGeP₂ single crystal** [12341-248]
- 12341 3U **Application of vegetation indices in fire hazard forecasting from satellite images** [12341-252]
- 12341 3V **Solution of the problem of electromagnetic scattering by ice particles of cirrus clouds for 0.355 μm lidar and 94 GHz radar of satellite EarthCARE** [12341-256]
- 12341 3W **Solution of the light scattering problem by small atmospheric ice crystals by discrete dipole approximation and comparison with the physical optics approximation** [12341-258]

Part Two

- 12341 3X **Data bank of light scattering matrices over the all scattering directions for atmospheric ice particles of cirrus clouds, calculated within the approximation of geometric and physical optics** [12341-260]

- 12341 3Y **An assessment of long-range aerosol transport from the Aral-Caspian arid region** [12341-265]
- 12341 3Z **Verification of ERA5 reanalysis data for the interpretation of lidar investigation of high-level clouds** [12341-277]
- 12341 40 **Correlation of satellite and subsatellite measurements of forest undergrowth height** [12341-279]
- 12341 41 **Use of lidar signals of Raman scattering for retrieval of aerosol microphysical characteristics** [12341-283]
- 12341 42 **Use of lidar signals of Raman scattering for reconstruction of atmospheric optical parameters** [12341-284]
- 12341 43 **Elemental composition of aerosol in 80th/84th cruises of RV Akademik Mstislav Keldysh and at station Cape Baranov in 2019-2020** [12341-290]
- 12341 44 **Determination of the lower limit of applicability of the physical optics method by the discontinuous Galerkin time domain method** [12341-293]
- 12341 45 **Simulation of a scanning lidar signal for the case of a mixture of quasi-horizontally oriented hexagonal particles and randomly oriented particles of arbitrary shape** [12341-294]
- 12341 46 **Development of a photodetector module for recording signals in the near-IR region in an extended dynamic range** [12341-295]

OPTICAL INVESTIGATION OF OCEAN

- 12341 47 **Photic zone in the deep region of the Black Sea according to 4D IOPs model data** [12341-11]
- 12341 48 **Baikal regional algorithm of diffuse attenuation coefficient based on HawkEye standard level-2 products** [12341-12]
- 12341 49 **Results of salinity recovery in the Sea of Azov according to in situ data and regional biooptical parameters** [12341-13]
- 12341 4A **Design of a dispersive element for submersible spectral instruments** [12341-15]
- 12341 4B **Satellite optical characteristics, suspended particulate matter, and particle fluxes in the surface layer of the White Sea** [12341-22]
- 12341 4C **The meter of backscattering in aquatic environment measurement: methods and device for in situ monitoring** [12341-49]
- 12341 4D **Interannual variability of surface salinity in the Kara Sea according to satellite data** [12341-58]
- 12341 4E **Total suspended matter distribution features in the north-eastern part of the Black Sea in spring-summer period of 2021** [12341-87]

- 12341 4F **On the influence of Atlantic Multidecadal Oscillation and North Atlantic Oscillation on the temperature regime of the Black Sea region** [12341-96]
- 12341 4G **Atmospheric correction according to the MODIS and VIIRS satellite data with considering the atmospheric pollution factor by a combination of different types of aerosol** [12341-109]
- 12341 4H **Experimental determination of the sea water extinction coefficients in inhomogeneous subsurface water layers from the depth profiles of the airborne lidar return signal power** [12341-135]
- 12341 4I **Dynamics of dissolved carbon and optical characteristics of dissolved organic matter in the Siberian rivers** [12341-157]
- 12341 4J **Hydrophysical researches of Manzherokskoye Lake water after dredging** [12341-166]
- 12341 4K **Development of UAV complex for environmental safety of coastal sea waters** [12341-197]
- 12341 4L **Automatic selection of digital hologram registration parameters** [12341-214]
- 12341 4M **Preliminary results of using the holographic facility to study the ecology of coastal plankton in Lake Baikal** [12341-216]
- 12341 4N **Spectral light absorption by particles and dissolved organic matter in Arctic Ocean in summer 2020** [12341-225]
- 12341 4O **Modelling system for short-term forecast of weather and air quality above a city** [12341-226]
- 12341 4P **How hydrometeorological factors influence on phytoplankton biomass and chlorophyll-a concentration in the southern part of Kalamitsky Bay in spring: an analysis of relationship** [12341-227]
- 12341 4Q **The Black Sea level trends according to altimetry data after removing dynamic noise** [12341-231]
- 12341 4R **Estimation of primary production for the southeastern Baltic Sea from chlorophyll a concentration and water column photosynthetic parameters** [12341-253]
- 12341 4S **Verification and modification of satellite algorithms for evaluation of suspended matter concentration in the Kara Sea** [12341-254]
- 12341 4T **Results of hydroptical and hydrochemical investigations of the surface layer of water obtained at the transition from the Baltic to the White Sea in June 2021** [12341-261]
- 12341 4U **Spectral bio-optical properties of the Black Sea coastal waters (near Sevastopol) in summer 2020-2021** [12341-266]
- 12341 4V **Statistical characteristics of variations in sea ice concentration in straits of the northern sea route in the recent decades** [12341-267]
- 12341 4W **Bio-optical properties of the optically complex waters of the Powell Basin** [12341-270]

- 12341 4X **Colored dissolved organic matter of the Kara and Laptev seas in the case of eastern distribution of Ob and Yenisei River runoff** [12341-272]
- 12341 4Y **Vertical particle fluxes in the Barents Sea on materials of short-time operation of automatic deep-water sedimentary observatory** [12341-273]
- 12341 4Z **Influence of suspended particulate matter on the optical properties of seawater in the western Eurasian Arctic shelf** [12341-275]
- 12341 50 **Regional features of seasonal variability of phytoplankton in the Black Sea studied by remote sensing data.** [12341-281]
- 12341 51 **Study of seasonal and long-term phytoplankton variability in the Caspian Sea based on remote sensing data.** [12341-282]
- 12341 52 **Estimation of water-atmosphere carbon balance in the coastal zone of Lake Baikal based on the CO₂/CH₄ fluxes** [12341-287]

PHYSICS OF THE TROPOSPHERE

- 12341 53 **Seasonal variability of surface atmospheric pressure over the territory of Russia for 1950-2021** [12341-1]
- 12341 54 **Base height estimation for low and high-level clouds from MODIS data** [12341-2]
- 12341 55 **Temperature regime of the atmospheric boundary layer over Siberia** [12341-9]
- 12341 56 **Air humidity in the atmospheric boundary layer over Siberia** [12341-10]
- 12341 57 **Geophysical effects caused by the explosive eruption of the Hunga-Tonga-Hunga-Haapai volcano on January 15, 2022** [12341-16]
- 12341 58 **Comparative analysis of satellite and continuous surface measurements of gas impurities in the air basin at the Listvyanka station, Lake Baikal** [12341-28]
- 12341 59 **Atmospheric effects caused by the fall of the Izhevsk bolide on November 17, 2021** [12341-31]
- 12341 5A **Comparison of the contributions of turbulent and mesoscale processes to the wind field of the atmospheric surface layer** [12341-35]
- 12341 5B **Effect of antiphase of turbulent heat fluxes at close levels in the atmospheric surface layer** [12341-36]
- 12341 5C **Estimation of derivatives of mixed moments of turbulent and meso-scale wind vector components in the atmospheric surface layer** [12341-37]
- 12341 5D **Estimation of temperature difference between two observation sites at different heights in the atmospheric boundary layer** [12341-39]

- 12341 5E **Extreme temperature inversions in the planetary boundary layer** [12341-40]
- 12341 5F **Continuous monitoring of boundary layer height over Nizhny Novgorod** [12341-41]
- 12341 5G **GPR study of the Murochinsky burial ground and the Khutor settlement in the Kyakhtinsky district of the Republic of Buryatia** [12341-46]
- 12341 5H **Measurements of carbon dioxide fluxes in the surface layer of the atmosphere in the area of the Fonovaya Observatory** [12341-60]
- 12341 5I **Statistical analysis for the location of specular-reflecting layers in high-level clouds over Western Siberia according to MODIS data** [12341-64]
- 12341 5J **Microparticles variations concentration during the mass explosions at the Lebedinsky quarry** [12341-69]
- 12341 5K **Numerical modeling of the concentration of small gas components of the atmosphere in the area of the Fonovaya Observatory** [12341-74]
- 12341 5L **Analysis of cloud base height variability in Western Siberia based on reanalysis and observational data over the period 2000-2020** [12341-75]
- 12341 5M **Moisture content of the troposphere from GPS observations and water vapor radiometer measurements** [12341-77]
- 12341 5N **Interannual variability of seasonal fields of characteristics of moisture cycle in the troposphere in the Mediterranean-Black Sea region** [12341-78]
- 12341 5O **Seasonal dynamics of vertical gradients of surface atmosphere on the East coast of Baikal** [12341-81]
- 12341 5P **Parametric estimates of the kinetic energy in the atmospheric boundary layer from minisodar measurements** [12341-83]
- 12341 5Q **Generation of kinetic energy of the pulsating component of the wind speed in the atmospheric boundary layer** [12341-90]
- 12341 5R **Analysis of geoelectric sections and surface impedance of the layered medium of Palestine and Tanzania** [12341-92]
- 12341 5S **Features of the number-size distribution of atmospheric aerosol particles by measurement data on the South-Eastern coast of Lake Baikal (st. Boyarsky) in 2021** [12341-93]
- 12341 5T **Modeling of atmospheric circulation and transport of impurities from natural and industrial sources in the Baikal region** [12341-94]
- 12341 5U **On the influence of cosmic radiation on cloudiness, precipitation, air temperature, and humidity at the South coast of Crimea** [12341-95]
- 12341 5V **Multi-channel installation for observation of electric field of electrokinetic nature generated by tides on shoreline of Lake Baikal** [12341-97]

- 12341 5W **Empirical orthogonal functions in heat contents of the World Ocean energetically active zones** [12341-106]
- 12341 5X **Results of route measurements of aerosol and gas impurities in the water area of Lake Baikal** [12341-110]
- 12341 5Y **Dynamics of characteristics of the troposphere over Central Yakutia according to atmospheric radiosounding data in the 24th solar activity cycle** [12341-111]
- 12341 5Z **Dynamics of the kinetic energy flux density vector in the lower 200-meter layer of the atmosphere** [12341-112]
- 12341 60 **Dynamics of total kinetic energy components in the atmospheric boundary layer from minisodar measurements** [12341-114]
- 12341 61 **Electric field of the undisturbed atmosphere in Tomsk** [12341-121]
- 12341 62 **Semiparametric and semi-nonparametric estimates of the kinetic energy in the atmospheric boundary layer from minisodar measurements** [12341-123]
- 12341 63 **Changes of meteorological quantities and background activity of ionizing radiation during the passage of mesoscale convective complexes** [12341-124]
- 12341 64 **Simulation of downward solar radiation and profiles of meteorological parameters using model complex WRF-Solar under summer conditions in Tomsk** [12341-128]
- 12341 65 **Transport model: microplastic in Lake Baikal** [12341-133]
- 12341 66 **Forecast of meteorological values based on the model of a multilayer perceptron** [12341-137]
- 12341 67 **The estimation of seasonal variation of retrieval error in tropospheric temperature microwave profiling** [12341-138]
- 12341 68 **10-year trend of vertically integrated water vapor over Ulan-Ude** [12341-140]
- 12341 69 **Natural potentials in cryolithozone during magnetic storms in the swamps** [12341-141]
- 12341 6A **Mathematical modeling of contaminant transfer in the atmosphere** [12341-143]
- 12341 6B **Estimation of the methane release intensity from the Arctic shelf bottom sediments** [12341-150]
- 12341 6C **Numerical simulation of the effect of aerosols on the electric parameters of thunderclouds in Nizhny Novgorod region** [12341-153]
- 12341 6D **Comparison of dynamics of convective systems and lightning activity over territories with different aerosol load** [12341-154]
- 12341 6E **Mechanisms of gas formation in eruptive clouds** [12341-167]

- 12341 6F **Geoelectric section of the Selenga river water area based on the results of VLF-LF radio impedance soundings** [12341-178]
- 12341 6G **The results of synchronous measurements of ozone deposition fluxes in forest and grasslands in the coastal zone of the Lake Baikal** [12341-185]
- 12341 6H **The study of air quality at cold weather in Tomsk City with complex of WRF/CAMx models** [12341-187]
- 12341 6I **Adaptation of the method of fluid location of the atmosphere for the analysis of observations from moving measuring platforms** [12341-189]
- 12341 6J **Comparison of the results of ground-based measurements of atmospheric radiation in 5 mm band of molecular oxygen with two spectroradiometers** [12341-190]
- 12341 6K **The dynamics of the surface atmospheric layer influence on the variability of the TV signal level in the city of Ulan-Ude** [12341-191]
- 12341 6L **Results of AOD measurements and aerosol dispersion composition in atmosphere of the Baikal region during wildfires in summer 2021** [12341-198]
- 12341 6M **Analysis of aerosols influence on parameters of thunderclouds in numerical mesoscale simulations** [12341-200]
- 12341 6N **A local observation data assimilation in mesoscale numerical weather prediction models** [12341-204]
- 12341 6O **Comparison of inverse and data assimilation problems in the inverse modeling of atmospheric chemistry** [12341-210]
- 12341 6P **Assessment of secondary radiation from the earth surface by availability of uranium-238** [12341-220]
- 12341 6Q **The relationship between the concentrations of some atmospheric pollutants and meteorological parameters** [12341-230]
- 12341 6R **Verification of the developed small-scale mathematical model of turbulent flow and impurity transfer** [12341-249]
- 12341 6S **A thunderstorm near Yakutsk on July 1, 2020, according to measurements by three instrumental systems** [12341-259]
- 12341 6T **Potential sources and mechanism of invasions of extremely cold and extremely warm air in the Moscow region** [12341-268]
- 12341 6U **Notes on environmental forecasting in the current conditions** [12341-271]
- 12341 6V **Bifurcation effects in finite element simulation of atmospheric fields in and above a forest stand** [12341-276]
- 12341 6W **Numerical theoretical modeling of the aerosol atmospheric pollution and electric field strength relationship basing on the GMC IDG RAS data** [12341-278]

- 12341 6X **The humidification anomalies in the large-scale river basins on the East European Plain in the period of early 20th century warming: circulation factors and analogues in the modern climate** [12341-280]
- 12341 6Y **Association between measured air pollution levels in the troposphere and surface air with COVID-19 hospitalization in Tomsk, Russia, 2022** [12341-288]
- 12341 6Z **Modern trends of the macroscale atmospheric circulation in the river runoff variability in the north of the East European Plain** [12341-289]

PHYSICS OF THE MIDDLE AND UPPER ATMOSPHERE

- 12341 70 **Simulation of changes in the meridional circulation of the middle and upper atmosphere during transitional QBO phases** [12341-8]
- 12341 71 **On the role of extratropical volcanic eruptions in Arctic ozone depletion** [12341-21]
- 12341 72 **Long-term measurements of total NO₂ and O₃ column contents at stations of the A. M. Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences: observational methods, long-term trends and interannual variations of the species** [12341-48]
- 12341 73 **The variations in SME index during the main phase of magnetic storms during CIR and ICME** [12341-52]
- 12341 74 **Study of the dynamics of the ions and electrons concentration in the lower ionosphere during x-ray flares** [12341-79]
- 12341 75 **Interactions of stationary planetary waves during winter 2008-2009 and 2018-2019 sudden stratospheric warmings** [12341-80]
- 12341 76 **Geminid meteor shower and active impact on the ionosphere** [12341-99]
- 12341 77 **Destructive manifestation of space weather variations when launching Starlink satellites** [12341-100]
- 12341 78 **Spatial distribution of the World Ocean heat contents response to solar impact** [12341-108]
- 12341 79 **Ozone anomaly in winter-spring 2019-2020 in the Arctic and over north of Eurasia using data of Aura MLS observations** [12341-116]
- 12341 7A **Lidar monitoring of stratospheric aerosol over Tomsk in 2021** [12341-117]
- 12341 7B **Investigations of the thermal regime of the stratosphere over Tomsk in 2021 based on lidar monitoring** [12341-118]
- 12341 7C **Experimental and theoretical study of Schumann resonance** [12341-127]
- 12341 7D **Influence of ionospheric disturbances on GNSS scintillations at auroral latitudes** [12341-129]

- 12341 7E **Amplitude and phase changes of the LF radio signal of the transmitter JJY40 registered in Yakutsk and Tixie Bay during the solar eclipse on June 10, 2021** [12341-145]
- 12341 7F **Numerical modeling of the ionospheric response to the solar eclipse of June 10, 2021 over the settlement of Zhigansk** [12341-173]
- 12341 7G **Features of estimating ionospheric delay from carrier phase observations of dual-frequency GLONASS signals** [12341-184]
- 12341 7H **Simulation of the influence of solar proton events on propagation of VLF radio signals in the polar region** [12341-212]
- 12341 7I **Gravito-photophoretic mechanism of soot aerosol vertical transfer in the stratosphere and mesosphere** [12341-217]
- 12341 7J **Analytical description of horizontal gradients of ionospheric electron density in the calculation of ionospheric delay of GNSS signals** [12341-219]
- 12341 7K **Retrieval of daytime O and H distributions at the altitudes of the mesosphere - lower thermosphere from satellite measurement data** [12341-232]
- 12341 7L **Analytical criteria for satisfying the condition of photochemical equilibrium of odd oxygen and hydrogen families at mesospheric altitudes** [12341-233]
- 12341 7M **Large-scale travelling ionospheric disturbances registered using oblique incidence sounding data during magnetic storms in 2006-2011** [12341-243]
- 12341 7N **Impact of seismic events in the southern Baikal region on the troposphere according to radiometer data ATMS/SNPP** [12341-255]
- 12341 7O **Smoothing and extracting trend and cyclic components of time series** [12341-285]
- 12341 7P **Estimates of TEC change caused by solar flares** [12341-296]

Conference Committee

Conference Chairs

- Gelii A. Zherebtsov**, Institute of Solar-Terrestrial Physics, SB RAS
(Russian Federation)
- Gennadii G. Matvienko**, V.E. Zuev Institute of Atmospheric Optics, SB
RAS (Russian Federation)
- Sergey N. Kulichkov**, A.M. Obukhov Institute of Atmospheric Physics,
RAS (Russian Federation)
- Igor V. Ptashnik**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- Aleksey V. Sokov**, Shirshov Institute of Oceanology, RAS
(Russian Federation)
- Sergej B. Turuntaev**, Institute of Geosphere Dynamics, RAS
(Russian Federation)

Organizing Committee

- Oleg A. Romanovskii**, V.E. Zuev Institute of Atmospheric Optics, SB
RAS (Russian Federation)
- Semyon V. Yakovlev**, V.E. Zuev Institute of Atmospheric Optics, SB
RAS (Russian Federation)
- Ol'ga V. Kharchenko**, V.E. Zuev Institute of Atmospheric Optics, SB
RAS (Russian Federation)

Program Committee

- G. G. Matvienko**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- G. A. Zherebtsov**, Institute of Solar-Terrestrial Physics, SB RAS
(Russian Federation)
- I. V. Ptashnik**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- V. A. Banakh**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- B. D. Belan**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- V. V. Belov**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- V. P. Budak**, National Research University "Moscow Power
Engineering Institute" (Russian Federation)
- O. G. Chhetiani**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)

- N. F. Elansky**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)
- G. I. Gorchakov**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)
- Gen Inoue**, National Institute for Environmental Studies
(Russian Federation)
- V. P. Kandidov**, Lomonosov Moscow State University
(Russian Federation)
- V. Kurkin**, Institute of Solar-Terrestrial Physics, SB RAS
(Russian Federation)
- N. K. Kulichkov**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)
- A. N. Lyakhov**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- A. Medvedev**, Institute of Solar-Terrestrial Physics, SB RAS
(Russian Federation)
- Valentin Mitev**, Centre Suisse d'Electronique et de Microtechnique
(Switzerland)
- I. I. Mokhov**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)
- M. V. Panchenko**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- V. V. Penenko**, Institute of Computational Mathematics and
Mathematical Geophysics, SB RAS (Russian Federation)
- Yu. N. Ponomarev**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- O. A. Romanovskii**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- G. M. Rugnikov**, Institute for System Dynamics and Control Theory, SB
RAS (Russian Federation)
- V. A. Semenov**, A.M. Obukhov Institute of Atmospheric Physics, RAS
(Russian Federation)
- V. P. Shevchenko**, Shirshov Institute of Oceanology, RAS
(Russian Federation)
- Ove Steinvall**, National Defence Research Institute
(Russian Federation)
- I. A. Sutorikhin**, Institute for Water and Environmental Problems, SB RAS
(Russian Federation)
- G. F. Tulinov**, Institute of Applied Geophysics (Russian Federation)
- R. V. Vasilyev**, Institute of Solar-Terrestrial Physics, SB RAS
(Russian Federation)
- A. A. Zemlyanov**, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)

Session Chairs

- 1 Molecular Spectroscopy and Radiation Propagation in the Atmosphere and Ocean
I. V. Ptashnik, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
A. A. Zemlyanov, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- 2 Optical Investigation of Atmosphere
G. G. Matvienko, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- 3 Optical Investigation of Ocean
V. P. Shevchenko, Shirshov Institute of Oceanology, RAS
(Russian Federation)
- 4 Physics of the Troposphere
B. D. Belan, V.E. Zuev Institute of Atmospheric Optics, SB RAS
(Russian Federation)
- 5 Physics of the Middle and Upper Atmosphere
A. N. Lyakov, Institute of Geospheres Dynamics, RAS
(Russian Federation)