

PROCEEDINGS OF SPIE

Remote Sensing of Clouds and the Atmosphere XXIII

**Adolfo Comerón
Evgueni I. Kassianov
Klaus Schäfer
Richard H. Picard
Konradin Weber**
Editors

**12–13 September 2018
Berlin, Germany**

Sponsored by
SPIE

Cooperating Organisations
European Optical Society
European Association of Remote Sensing Companies (Belgium)
CENSIS—Innovation Centre for Sensor and Imaging Systems (United Kingdom)
ISPRS—International Society for Photogrammetry and Remote Sensing
EARSeL—European Association of Remote Sensing Laboratories (Germany)
Remote Sensing & Photogrammetry Society (United Kingdom)

Published by
SPIE

Volume 10786

Proceedings of SPIE 0277-786X, V. 10786

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

Remote Sensing of Clouds and the Atmosphere XXIII, edited by Adolfo Comerón, Evgueni I. Kassianov,
Klaus Schäfer, Richard H. Picard, Konradin Weber, Proc. of SPIE Vol. 10786, 1078601
© 2018 SPIE CCC code: 0277-786X/18/\$18 · doi: 10.1117/12.2519742

Proc. of SPIE Vol. 10786 1078601-1

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 *Remote Sensing of Clouds and the Atmosphere XXIII*, edited by Adolfo Comerón, Evgueni I. Kassianov, Klaus Schäfer, Richard H. Picard, Konradin Weber, Proceedings of SPIE Vol. 10786 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

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

ISBN: 9781510621558
ISBN: 9781510621565 (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
Copyright © 2018, 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. 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/18/\$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

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article 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

vii	<i>Authors</i>
ix	<i>Conference Committee</i>
xi	<i>Introduction</i>

SESSION 1 LIDAR, RADAR, AND PASSIVE ATMOSPHERIC MEASUREMENT TECHNIQUES I

10786 03	Validation activities for the level 2 geophysical products of the EUMETSAT Polar System-Second Generation (EPS-SG) visible/infrared imager (METimage) [10786-1]
10786 04	Strategies for shortwave radiances comparison of CERES instruments aboard the JPSS1 and Terra/Aqua satellites [10786-2]
10786 06	High-resolution satellite aerosol optical depth retrieval and its variability over highly industrialized hotspots in the Po Valley, Italy [10786-4]
10786 07	Evaluation of rainfall forecasts combining GNSS precipitable water vapor with ground and remote sensing meteorological variables in a neural network approach [10786-5]
10786 08	Information content analysis for a novel TES-based hyperspectral microwave atmospheric sounding instrument [10786-7]
10786 09	SHARC method for fast atmospheric correction of hyperspectral data [10786-8]

SESSION 2 LIDAR, RADAR, AND PASSIVE ATMOSPHERIC MEASUREMENT TECHNIQUES II

10786 0A	Comparing reflection signatures in radio occultation measurements using the full spectrum inversion and phase matching methods [10786-9]
10786 0B	Smart Air Quality Network for spatial high-resolution monitoring in urban area [10786-10]
10786 0C	Potential sources of reactive gases for the West of Moscow Oblast [10786-11]
10786 0F	Sensing of parameters of lightning discharges on the South of the European part of Russia [10786-45]

SESSION 3 ATMOSPHERIC PROFILING OF AEROSOL, TRACE GASES, AND METEOROLOGICAL PARAMETERS

- 10786 0G **Four years of IASI CO₂, CH₄, N₂O retrievals: validation with in situ observations from the Mauna Loa station** [10786-15]
- 10786 0H **Climatology of aerosol optical depth at mid-continental US site: ground-based observations** [10786-16]
- 10786 0L **A first measurement of the planetary boundary layer top in Cali-Colombia: elastic LiDAR application** [10786-21]
- 10786 0M **Aerosol profile measurements in the coastal zone of Antarctica: instrumentation and preliminary results** [10786-47]

SESSION 4 REMOTE SENSING OF CLOUDS

- 10786 0O **Shallow cumulus macrophysical properties at midcontinental US site: integrated multiyear active and passive observations** [10786-23]
- 10786 0P **Qualification of a new short-term cloud forecasting method for the optimization of Earth observation satellite programs** [10786-24]
- 10786 0R **Calculation of cirrus clouds backscattering for lidar studies within the physical optics approximation** [10786-26]
- 10786 0U **Spatio-temporal distribution of rainfall and aerosols over urban areas of Karnataka (Best Student Paper)** [10786-29]
- 10786 0V **On development of cross-platform software to continue long-term observations with the Brewer Ozone Spectrophotometer** [10786-48]

POSTER SESSION

- 10786 0W **Standards VDI 4211 and VDI 4212 on passive FTIR and DOAS remote sensing techniques** [10786-6]
- 10786 0X **Development status of optical imaging technology in scattering media** [10786-30]
- 10786 0Z **Thin semitransparent cloud removal in the coastal area of the South China Sea using an atmospheric correction method** [10786-32]
- 10786 11 **Study of influence of ice crystals orientation in cirrus on solar radiation transmission** [10786-34]
- 10786 14 **Analysis of climate change caused by aerosol-cloud-radiation interaction** [10786-38]
- 10786 16 **Low-level jet observational study for the Brazilian nuclear reactor region** [10786-40]

10786 1A **Characteristics of lightning activity in the North Caucasus according to the LS 8000 from 2009 to 2016** [10786-46]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five 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.

Adzhieva, Aida A., 0F, 1A
Alparone, Luciano, 06
Beigl, M., 0B
Benevides, P., 07
Berg, Larry K., 00
Bespalov, Dmitry A., 0F
Beu, Cássia M. L., 16
Bilal, Muhammad, 06
Boldyrev, Anton S., 0F, 1A
Borde, R., 03
Borovoi, Anatoli G., 0R
Borovski, A. N., 0C
Bruchkouski, I., 0M
Bryukhanov, Iliia D., 11
Bryukhanova, Valentina V., 11
Budde, M., 0B
Camy-Peyret, Claude, 0G
Carlström, Anders, 0A
Catalão, João, 07
Céspedes, Jonnathan, 0L
Cheng, Xuemin, 0X
Cromwell, Erol, 0H
Cross, Sylvain, 0P
Cyrus, J., 0B
Dodamani, B. M., 0U
Dongre, Prateek Kumar, 08
Dzhola, A. V., 0C
Elokhov, A., 0M
Emeis, S., 0B
Espindola, Felipe D. C., 16
Flynn, Connor, 0H
Garzelli, Andrea, 06
Goldie, David, 08
Gratza, T., 0B
Grechko, E. I., 0C
Grimm, H., 0B
Hank, M., 0B
Hao, Qun, 0X
Hao, Zengzhou, 0Z
Hargrave, Peter, 08
Havemann, Stephan, 08
Hinterreiter, S., 0B
Hodges, Gary, 0H
Höfert, Norbert, 0W
Ignatyev, Vladimir V., 1A
Ivanov, Dimitry A., 09
Kanaya, Y., 0C
Kassianov, Evgueni, 0H, 0O
Katkovsky, Leonid V., 09
Kleiss, Jessica M., 0O
Konoshonkin, Alexander V., 0R, 11
Krasouski, A., 0M
Kustova, Natalia V., 0R
Landulfo, Eduardo, 16
Li, Xiaojuan, 0Z
Liandrat, Olivier, 0P
Liuzzi, Giuliano, 0G
Lolli, Simone, 06
Long, Charles N., 0O
Maas, Peter, 0W
Mao, Zhihua, 0Z
Martenov, Anton O., 09
Masiello, Guido, 0G
McComiskey, Allison, 0H
Melo-Luna, Carlos Andrés, 0L
Miranda, Pedro M. A., 07
Monroe, Justin, 0H
Morris, Victor, 0O
Mukundan, M., 0S
Münkel, C., 0B
Nakata, M., 14
Nico, Giovanni, 07
Nie, Eugene V., 11
Nizar, Sinan, 0U
Orlando, Angiola, 08
Pesch, M., 0B
Petersen, E., 0B
Petterson, Mats I., 0A
Philipp, A., 0B
Phillips, P. L., 03
Postlyakov, Oleg V., 0C, 0M, 0V
Priestley, Kory J., 04
Rainjonneau, Serge, 0P
Rasch, Joel, 0A
Rasheed, M., 0S
Redelstein, J., 0B
Reina, John H., 0L
Richter, Andreas, 0W
Riedel, T., 0B
Riesterer, J., 0B
Riihimaki, Laura, 0H, 0O
Riley, Erin A., 0O
Roussel, Guillaume, 0P
Samokhvalov, Ignaty V., 11
Savinykh, Vladimir V., 0V
Schäfer, Klaus, 0B, 0W
Schlüssel, P., 03
Schnelle-Kreis, J., 0B

Sen Jaiswal, Rajasri, 0S
Serio, Carmine, 0G
Shapovalov, Vitaliy A., 0F, 1A
Shi, Liangliang, 0Z
Shishko, Victor A., 0R
Shukurov, K. A., 0C
Sievert, Thomas, 0A
Siliuk, Volha A., 09
Siva, M., 0S
Spezzi, L., 03
Sudiwala, Rashmikant, 08
Szewczyk, Z. Peter, 04
Thirumala Lakshmi, K., 0S
Thomas, Chris, 08
Thomas, Susan, 04
Timofeev, Dmitriy N., 0R
Turishev, L., 0M
Turpin, Mathieu, 0P
Uhrner, U., 0B
Umreika, S., 0M
V. S., Neela, 0S
Vendfra, Sara, 0G
Vivone, Gemine, 06
Vu, Viet, 0A
Wang, Difeng, 0Z
Wang, Y., 0M
Wang, Zheng, 0Z
Watts, P. D., 03
Weber, Konradin, 0W
Werhahn, J., 0B
Withington, Stafford, 08
Zhang, Linfeng, 0X
Zhang, Yiwei, 0Z
Zhivotenyuk, Ivan V., 11
Zhu, Qiankun, 0Z
Ziegler, V., 0B
Zuev, Sergey V., 11

Conference Committee

Symposium Chair

Christopher M. U. Neale, University of Nebraska-Lincoln
(United States) and Daugherty Water for Food Institute
(United States)

Symposium Co-chair

Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und
Bildauswertung (Germany)

Conference Chairs

Adolfo Comerón, University Politècnica de Catalunya (Spain)
Evgueni I. Kassianov, Pacific Northwest National Laboratory
(United States)
Klaus Schäfer, Atmospheric Physics Consulting (Germany)

Conference Co-chairs

Richard H. Picard, ARCON Corporation (United States)
Konradin Weber, Fachhochschule Düsseldorf (Germany)

Conference Programme Committee

Aldo Amodeo, Istituto di Metodologie per l'Analisi Ambientale (Italy)
Christoph C. Borel-Donohue, U.S. Army Research Laboratory
(United States)
Young Joon Kim, Gwangju Institute of Science and Technology
(Korea, Republic of)

Session Chairs

- 1 Lidar, Radar, and Passive Atmospheric Measurement Techniques I
Evgueni I. Kassianov, Pacific Northwest National Laboratory
(United States)
- 2 Lidar, Radar, and Passive Atmospheric Measurement Techniques II
Evgueni I. Kassianov, Pacific Northwest National Laboratory
(United States)

- 3 Atmospheric Profiling of Aerosol, Trace Gases, and Meteorological Parameters
Adolfo Comerón, Universitat Politècnica de Catalunya (Spain)
- 4 Remote Sensing of Clouds
Klaus Schäfer, Atmospheric Physics Consulting (Germany)

Introduction

Understanding of the complex atmosphere-surface interactions requires a greater integration across developments in remote sensing sensors, advances in retrieval algorithms, and model improvements. The papers in these proceedings highlight the important role of such integration and provide a wide-ranging overview of the latest discoveries in the connected fields of remote sensing, atmospheric and surface characterization, environmental monitoring, and model enlargement. These discoveries, together with future needs, maintain and ensure a high level of international interest. Active participation of internationally recognized experts and up-and-coming researchers in four oral sessions and one poster session with stimulating discussions and new research ideas is one of the valuable features of the meeting. For example, Professor Volker Wulfmeyer (Univ. Hohenheim, Germany) in his impressive keynote talk discussed both outstanding challenges related to the dynamic land-atmosphere feedback and the significant progress that has been made in synergy of remote sensing and model simulations.

The meeting with strong international representation was held in Berlin, Germany, an attractive city with famous Brandenburg Gate that welcomes visitors from around the world.

We are very grateful to the SPIE staff for the warm welcome and excellent meeting arrangement. The meeting could not have happened without highly appreciated inputs from all participants, followed by high-quality papers which we really appreciated and were delighted to review.

Adolfo Comerón
Evgueni I. Kassianov
Klaus Schäfer
Richard H. Picard
Konradin Weber

