PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 7111

, "Front Matter: Volume 7111," Proc. SPIE 7111, Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing IV, 711101 (30 October 2008); doi: 10.1117/12.817427

SPIE.

Event: SPIE Remote Sensing, 2008, Cardiff, Wales, United Kingdom

PROCEEDINGS OF SPIE

Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing IV

Upendra N. Singh
Gelsomina Pappalardo
Editors

16–18 September 2008
Cardiff, Wales, United Kingdom

Sponsored by
SPIE Europe

Cooperating Organisations
EARSC—European Association of Remote Sensing Companies
EOS—European Optical Society
Technium OptIC (United Kingdom)
NASA—National Aeronautics and Space Administration (United States)
WOF—Welsh Opto-electronics Forum (United Kingdom)

Published by
SPIE

Volume 7111

Proceedings of SPIE, 0277-786X, v. 7111

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

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing IV*, edited by Upendra N. Singh, Gelsomina Pappalardo, Proceedings of SPIE Vol. 7111 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X

ISBN 9780819473424

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 © 2008, 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/08/\$18.00.

Printed in the United States of America.

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

SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent 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 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 four 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. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

vii Conference Committee

SESSION 1 LASER REMOTE SENSING TECHNOLOGIES AND METHODS

- 7111 02 **Broadband lidar technique for precision CO₂ measurement (Invited Paper)** [7111-01]
W. S. Heaps, NASA Goddard Space Flight Ctr. (United States)
- 7111 03 **Single-frequency glass waveguide lasers (Invited Paper)** [7111-02]
S. Taccheo, Univ. of Swansea (United Kingdom) and Politecnico di Milano (Italy);
G. Della Valle, Politecnico di Milano (Italy); D. Milanese, Politecnico di Torino (Italy)
- 7111 04 **Solid-state 2-micron laser transmitter advancement for wind and carbon dioxide measurements from ground, airborne, and space-based lidar systems** [7111-03]
U. N. Singh, M. Kavaya, G. Koch, J. Yu, S. Ismail, NASA Langley Research Ctr. (United States)
- 7111 05 **CW and Q-switched 2.1 μm Tm³⁺/Ho³⁺/Yb³⁺-triply-doped tellurite fibre lasers** [7111-04]
B. D. O. Richards, The Univ. of Leeds (United Kingdom); Y. H. Tsang, D. J. Binks, The Univ. of Manchester (United Kingdom); J. Lousteau, A. Jha, The Univ. of Leeds (United Kingdom)
- 7111 07 **Lidar and resource assessment for wind power applications: the state of the art** [7111-06]
P. J. M. Clive, SgurrEnergy Ltd. (United Kingdom)
- 7111 08 **Airborne measurements of ground reflectance at 1.6 μm** [7111-07]
A. Amediek, A. Fix, G. Ehret, Institut für Physik der Atmosphäre, DLR (Germany)

SESSION 2 SPACE LIDAR

- 7111 09 **Laser remote sensing opportunities in planetary science (Invited Paper)** [7111-09]
J. A. R. Rall, NASA Headquarters (United States)
- 7111 0A **Case studies and comparisons of the CALIPSO aerosol optical depth measurements and aerosol type estimates (Invited Paper)** [7111-10]
A. Omar, NASA Langley Research Ctr. (United States); M. Vaughan, Science Applications International Corp. (United States); C. Kittaka, NASA Langley Research Ctr. (United States) and Science Applications International Corp. (United States); D. Winker, NASA Langley Research Ctr. (United States)
- 7111 0D **Determination of cloud and aerosol layers using CALIPSO and image processing** [7111-13]
A. N. Alias, M. Z. MatJafri, H. S. Lim, K. Abdullah, N. Mohd. Saleh, Univ. Sains Malaysia (Malaysia)
- 7111 0E **Comparison of correlative measurements of CALIPSO LIDAR and the #21 EARLINET station (CIEMAT-Madrid)** [7111-14]
F. Molero, M. Pujadas, CIEMAT (Spain)

- 7111 OF **Lidar surface elevation and digital elevation map (DEM) of the CALIPSO LIDAR data over Peninsular Malaysia** [7111-15]
A. N. Alias, M. Z. MatJafri, H. S. Lim, K. Abdullah, N. Mohd. Saleh, Univ. Sains Malaysia (Malaysia)

SESSION 3 AEROSOLS AND CLOUDS

- 7111 OH **Lidar detection of temporal and spatial anomalies of multiple clouds (Invited Paper)** [7111-18]
C. E. Davidson, Science and Technology Corp. (United States); A. Ben-David, U.S. Army Edgewood Chemical Biological Ctr. (United States)
- 7111 OI **EZ LIDAR measurement results in the frame of Indian Monsoon TIGER-Z NASA campaign** [7111-19]
S. Lolli, Leosphere (France); E. J. Welton, NASA Goddard Space Flight Ctr. (United States); L. Sauvage, Leosphere (France)

SESSION 4 NOVEL LIDAR/RADAR TECHNIQUES

- 7111 OM **Measurements of large distances using dispersion methods** [7111-24]
V. I. Grigoryevskij, M. V. Grigoryevskaya, Institute of Radioengineering and Electronics (Russia); M. T. Prilepin, Institute of Physics of the Earth (Russia); V. V. Khabarov, S. P. Golovachev, Institute of Radioengineering and Electronics (Russia)
- 7111 OO **Compensating for volume and vector averaging biases in lidar wind speed measurements** [7111-26]
P. J. M. Clive, SgurrEnergy Ltd. (United Kingdom)
- 7111 OP **Midterm pollution monitoring with a backscattering lidar, sunphotometer, and air quality indexing stations** [7111-27]
F. J. S. Lopes, Instituto de Pesquisas Energéticas e Nucleares (Brazil); G. L. Mariano, Instituto Nacional de Pesquisas Espaciais (Brazil); E. Landulfo, A. S. Torres, W. C. de Jesus, W. M. Nakaema, E. G. Larroza, S. T. Uehara, P. Sawamura, Instituto de Pesquisas Energéticas e Nucleares (Brazil); M. P. P. M. Jorge, Instituto Nacional de Pesquisas Espaciais (Brazil)

POSTER SESSION

- 7111 OQ **Cloud optical depth measurement comparison between a Raman-Mie and Mie elastic lidar** [7111-21]
Y. Wu, S. Chaw, B. Gross, F. Moshary, S. Ahmed, City College, CUNY (United States)
- 7111 OR **Two-wavelength backscattering lidar for stand off detection of aerosols** [7111-29]
Z. Mierczyk, M. Zygmunt, A. Gawlikowski, A. Gietka, M. Kaszczuk, P. Knysak, A. Młodzianko, M. Muzal, W. Piotrowski, J. Wojtanowski, Military Univ. of Technology (Poland)

- 7111 OS **The use of lidar as optical remote sensors in the assessment of air quality near oil refineries and petrochemical sites** [7111-30]
J. Steffens, Univ. de São Paulo (Brazil); E. Landulfo, Instituto de Pesquisas Energéticas e Nucleares (Brazil); R. Guardani, C. A. Oller do Nascimento, Univ. de São Paulo (Brazil); A. Moreira, Petróleo Brasileiro S.A. (Brazil)

Author Index

Conference Committee

Symposium Chairs

Guido D'Urso, Università degli Studi di Napoli Federico II (Italy)
Steven P. Neeck, NASA Headquarters (United States)

Conference Chair

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

Conference Cochair

Gelsomina Pappalardo, Consiglio Nazionale delle Ricerche (Italy)

Program Committee

Albert Ansmann, Leibniz-Institut für Troposphärenforschung e.V.
(Germany)
Arnoud Apituley, Rijksinstituut voor Volksgezondheid en Milieu
(Netherlands)
Andreas Behrendt, Universität Hohenheim (Germany)
Giovanna Cecchi, Istituto di Fisica Applicata Nello Carrara (Italy)
Fernando Congeduti, Istituto di Scienze dell'Atmosfera e del Clima
(Italy)
Martin J. Endemann, European Space Research and Technology
Center (Netherlands)
Pierre H. Flamant, École Polytechnique (France)
Animesh Jha, University of Leeds (United Kingdom)
Gary W. Kamerman, FastMetrix, Inc. (United States)
Philippe L. Keckhut, Service d'aéronomie (France)
Gennadii G. Matvienko, Institute of Atmospheric Optics (Russia)
Doina N. Nicolae, National Institute of Research & Development for
Optoelectronics (Romania)
Valentin B. Simeonov, École Polytechnique Fédérale de Lausanne
(Switzerland)
David M. Winker, NASA Langley Research Center (United States)

Session Chairs

- 1 Laser Remote Sensing Technologies and Methods
Animesh Jha, University of Leeds (United Kingdom)
- 2 Space Lidar
Upendra N. Singh, NASA Langley Research Center (United States)

- 3 Aerosols and Clouds
Jonathan A. R. Rall, NASA Headquarters (United States)
Yongxiang Hu, NASA Langley Research Center (United States)
- 4 Novel Lidar/Radar Techniques
Eduardo Landulfo, Instituto de Pesquisas Energéticas e Nucleares
(Brazil)
Ali H. Omar, NASA Langley Research Center (United States)