PROCEEDINGS OF SPIE

Earth Resources and Environmental Remote Sensing/GIS Applications VII

Ulrich Michel
Karsten Schulz
Manfred Ehlers
Konstantinos G. Nikolakopoulos
Daniel Civco
Editors

27–29 September 2016 Edinburgh, United Kingdom

Sponsored by SPIF

Cooperating Organisations
Innovation Centre for Sensor and Imaging Systems (United Kingdom)
ADS Scotland (United Kingdom)
The Knowledge Transfer Network (United Kingdom)
Visit Scotland (United Kingdom)
European Regional Development Fund (Belgium)
Technology Scotland (United Kingdom)
European Association of Remote Sensing Companies (Belgium)
European Association of Remote Sensing Laboratories (Germany)
The British Association of Remote Sensing Companies (United Kingdom)
Remote Sensing & Photogrammetry Society (United Kingdom)

Published by SPIE

Volume 10005

Proceedings of SPIE 0277-786X, V. 10005

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

Earth Resources and Environmental Remote Sensing/GIS Applications VII, edited by Ulrich Michel, Karsten Schulz, Manfred Ehlers, Konstantinos G. Nikolakopoulos, Daniel Civco, Proc. of SPIE Vol. 10005, 1000501

© 2016 SPIE · CCC code: 0277-786X/16/\$18 · doi: 10.1117/12.2263587

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 SPIEDigitalLibrary.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 Earth Resources and Environmental Remote Sensing/GIS Applications VII, edited by Ulrich Michel, Karsten Schulz, Manfred Ehlers, Konstantinos G. Nikolakopoulos, Daniel Civco, Proceedings of SPIE Vol. 10005 (SPIE, Bellingham, WA, 2016) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510604148

ISBN: 9781510604155 (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 © 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. 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.



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

∨ii	Authors
ix	Conference Committee
xi	Introduction
CECCION 1	CENICODE AND DI ATFORMS
SESSION 1	SENSORS AND PLATFORMS
10005 02	Synthetic aperture ladar based on a MOPAW laser (Invited Paper) [10005-1]
10005 03	Close-range environmental remote sensing with 3D hyperspectral technologies [10005-2]
10005 04	Waveform fitting and geometry analysis for full-waveform lidar feature extraction [10005-3]
10005 05	Modelling and studies of the spectral response of some optoelectronic components
SESSION 2	HAZARD MITIGATION GEOLOGIC APPLICATIONS
10005 07	Remote sensing and GIS analysis for demarcation of coastal hazard line along the highly eroding Krishna-Godavari delta front [10005-6]
10005 08	Analyzing land surface temperature variations during Fogo Island (Cape Verde) 2014–2015 eruption with Landsat 8 images [10005-7]
10005 09	Flood mapping using VHR satellite imagery: a comparison between different classification approaches [10005-8]
10005 0A	Earthquake signature revealed by time series satellite and ground-based data [10005-9]
10005 OB	The magnitude and direction movement in Thailand based on Global Positioning System (GPS) $[10005-10]$
SESSION 3	PROCESSING METHODOLOGIES I
10005 0D	MicMac GIS application: free open source [10005-12]
10005 OE	Integrating satellite imagery-derived data and GIS-based solar radiation algorithms to map solar radiation in high temporal and spatial resolutions for the province of Salta, Argentina [10005-13]

SESSION 4	PROCESSING METHODOLOGIES II
10005 0G	Knowledge-based modelling of historical surfaces using lidar data [10005-16]
10005 0H	Estimation of forest surface fuel load using airborne lidar data (Best Student Paper Award) [10005-17]
10005 01	Spectral identification and quantification of salts in the Atacama Desert [10005-18]
10005 OK	Research on remote sensing identification of rural abandoned homesteads using multiparameter characteristics method [10005-20]
SESSION 5	REMOTE SENSING FOR ARCHAEOLOGY, CULTURAL AND NATURAL HERITAGE
10005 0M	Methodology for locale-scale monitoring for the PROTHEGO project: the Choirokoitia case study [10005-22]
10005 OP	Research on the evaluation method of rural hollowing based on RS and GIS technology: a case study of the Ningxia Hui autonomous region in China [10005-25]
SESSION 6	ENVIRONMENTAL MONITORING CONCEPTS I
10050 0Q	Monitoring of vegetation dynamics on the former military training area Königsbrücker Heide using remote sensing time series [10005-26]
10005 OR	Environmental resilience of rangeland ecosystems: assessment drought indices and vegetation trends on arid and semi-arid zones of Central Asia [10005-27]
10005 OS	Monitoring soil aggregates dynamics at a plot scale using multitemporal image texture and colour analysis [10005-28]
10005 OT	Investigating the capabilities of new microwave ALOS-2/PALSAR-2 data for biomass estimation [10005-29]
10005 OU	Natural and environmental vulnerability analysis through remote sensing and GIS techniques: a case study of Indigirka River basin, Eastern Siberia, Russia [10005-30]
SESSION 7	INFRASTRUCTURES AND URBAN AREAS
10005 OW	Automation of lidar-based hydrologic feature extraction workflows using GIS [10005-32]
10005 0X	An iterative approach to optimize change classification in SAR time series data [10005-33]
10005 0Y	Comparison of multiple methods for detecting changes in urban areas in TerraSAR-X data [10005-34]

10005 OZ	Application of spectral and spatial indices in specific class identification in Airborne Prism EXperiment (APEX) imaging spectrometer data for improved land cover classification [10005-35]
SESSION 8	ENVIRONMENTAL MONITORING CONCEPTS II
10005 10	Accounting for ecosystem assets using remote sensing in the Colombian Orinoco River basin lowlands [10005-36]
10005 11	A webmapping platform for publishing, sharing, and managing EO-derived data for forest protection [10005-37]
10005 12	Monitoring of vegetation condition using the NDVI/ENSO anomalies in Central Asia and their relationships with ONI (very strong) phases [10005-38]
10005 13	Estimated post-flood effects through Sentinel and Landsat data to support civil protection [10005-39]
SESSION 9	ENVIRONMENTAL MONITORING CONCEPTS III
10005 14	Using TanDEM data for forest height estimation and change detection [10005-40]
10005 15	Influence of pansharpening techniques in obtaining accurate vegetation thematic maps (Best Student Paper Award) [10005-41]
10005 16	Monitoring of land degradation from overgrazing using space-borne radar and optical imagery: a case study in Randi Forest, Cyprus [10005-42]
10005 18	A new approach to calculate Plant Area Density (PAD) using 3D ground-based lidar [10005-44]
SESSION 10	ENVIRONMENTAL MONITORING CONCEPTS IV
10005 1A	Effect of horizontal and vertical resolution for wind resource assessment in Metro Manila, Philippines using Weather Research and Forecasting (WRF) model [10005-46]
10005 1B	Mangrove classification through the use of object oriented classification and support vector machine of lidar datasets: a case study in Naawan and Manticao, Misamis Oriental, Philippines [10005-48]
	POSTER SESSION
10005 1E	Experimental study of hyperspectral responses of plants grown on mud pit soil [10005-52]
10005 1G	Flash flood area mapping utilising SENTINEL-1 radar data [10005-55]

10005 1H	Multitemporal analysis of Landsat images to detect land use land cover changes for monitoring soil sealing in the Nola area (Naples, Italy) [10005-56]
10005 11	Mapping growing stock at 1-km spatial resolution for Spanish forest areas from ground forest inventory data and GLAS canopy height [10005-57]
10005 1J	Land cover change detection in Chinese Zhejiang Province based on object-oriented approach [10005-58]
10005 1K	Remote sensing of climate changes effects on urban green biophysical variables [10005-59]
10005 1L	Development of habitat mapping technology using spatial information [10005-60]
10005 1N	Environmental monitoring in peat bog areas by change detection methods [10005-62]

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.

Agapiou, Athos, 0M Albino, André, 05 Allocca, Maria, 1H Andrade, Pedro R., 11

Ang, Ma. Rosario Concepcion, 1A Angelino, Cesario Vincenzo, 13

Anh, L. V., OT

Aralova, Dildora, 0R, 12 Bagtasa, Gerry, 1A Barreau, Christophe, 1E Bergeron, Alain, 02 Bitelli, Gabriele, 09 Boccardo, Piero, 09 Boldt, Markus, 0X, 0Y, 14 Boori, Mukesh S., 0U

Borlongan, Noel Jerome B., OW

Bortoli, Daniele, 05 Cadario, Erich, 0Y Cardoso, Manoel, 11 Castillo, Miguel, 11 Chen, Qiang, 0P Chen, Yang, 0H Cheng, Yi-Hsiu, 04 Chiesi, M., 11

Choudhary, Komal, 0U Christoforou, M., 16 Cicala, Luca, 13 Cigna, Francesca, 0M Claire, M. W., 0l Cousins, C. R., 0l Credoz, Anthony, 1E Cuca, Branka, 0M Cui, Bei, 0K Danezis, Chris, 0M De Giglio, Michaela, 1H

de la Cruz, Roel M., 0W Deng, Hui, 0B Desbiens, Louis, 02 Dida, Adrian I., 1K Dorner, Wolfgang, 0E Duarte, L., 0D

Dubois, Clémence, 0Y, 14
Dubucq, Dominique, 1E
Evers, Mariele, 0U
Exbrayat, Jean-François, 11
Fiscante, Nicomino, 13
Focareta, Mariano, 13
Franci, Francesca, 09, 1H

Gafurov, Dilshod, OR, 12

Gilabert, M. A., 11 Gismatulina, Liliya, 0R, 12

Gomes, A., 08

Gonzalo-Martin, Consuelo, 15

Griffin, A. L., 0T

Hadjimitsis, Diofantos G., 16

Hakala, T., 03 Hammer, Horst, 0Y Harris, J. K., 0I Harris, Sarah, 0H Hédacq, Rémy, 1E Hein, Lars, 10 Hinz, Stefan, 0X, 14 Höfler, Veit, 0G Honkavaara, E., 03

Ibarrola-Ulzurrun, Edurne, 15 Inocencio, Loureal Camille, 1A

Jalbuena, Rey L., 1B
James, David B., 07, 0Z
Jamrus, Uthen, 0B
Jarihani, Ben, 0R, 12
Jetten, Victor, 0S
Joyce, António, 05
Kaasalainen, Sanna, 03
Kakani, Nageswara Rao, 07
Kallepalli, Akhil, 07, 0Z
Karrasch, Pierre, 0G, 0Q
Khoramshahi, E., 03
Khoshelham, Kourosh, 0Z
Kouhartsiouk, D., 16
Kumar, Anil, 0Z

Kuny, Silvia, OY

Kupriyanov, Alexander, 0U

Lai, Jhe-Syuan, 04 Lee, C.-W., 1L Lee, M.-J., 1L Li, Yan, 1J Liu, Dong, 1J

Mandanici, Emanuele, 09 Marcello-Ruiz, Javier, 15 Marchese, Linda, 02 Margottini, Claudio, 0M

Maselli, F., 11 Michel, Ulrich, 1N Middlemiss, Sarah, 11 Mildes, Wiebke, 1N Milodowski, David, 11 Mitchard, Edward T. A., 11 Moghadas, Hamid, 18 Morel, Veronique, 11

Moutinho, O., 0D

Näsi, R., 03

Nevalainen, O., 03

Oh, K.-Y., 1L

Olfindo, Nestor T., Jr., 0W

Ometto, Jean, 11

Osunmadewa, Babatunde A., OR

Papoutsa, C., 16

Paradis, Patrick, 02

Paull, D. J., OT

Peralta, Rudolph V., 1B

Perez, Anjillyn Mae C., 0W

Psomiadis, Emmanouil, 1G

Rahamtallah Abualgasim, Majdaldin, OR

Ramirez Camargo, Luis, 0E

Rejuso, Ma. Victoria, 1A

Remme, Roy P., 10

Rosnell, T., 03

Roveri, Elena, 09

Sanchez-Azofeifa, Arturo, 18

Sánchez-Ruiz, S., 11

Savastru, Dan M., 0A

Savastru, Roxana S., OA

Schulz, Karsten, OX

Spizzichino, Daniele, 0M

Sugimoto, Atsuko, OU

Taheriazad, Leila, 18

Tamondong, Ayin M., 1B

Tapper, Nigel, 0H

Teodoro, A., 08, 0D

Themistocleous, Kyriacos, OM, 16

Thiele, Antje, 0X, 0Y, 14

Tipper, Richard, 11

Tlemçani, Mouhaydine, 05

Toderich, Kristina, OR, 12

Tolentino, Jerome T., 1A

Tsai, Fuan, 04

Turbide, Simon, 02

van der Meer, Freek, OS

van der Werff, Harald, 0S

Vargas, Leonardo, 10

Vieira, D., 08

Viergever, Karin, 11

Viljanen, N., 03

Wen, MeiPing, 0P

Wessollek, Christine, 0G, 0Q

Williams, Mathew, 11

Xu, Saiping, OK

Yebra, Marta, 0H

Yin, Kai, OK, OP

Ymeti, Irena, OS

Yuan, Chao, 0P

Zhang, FeiFei, OP

Zhang, Xiupeng, OK, OP

Zhao, Qianjun, 0K

Zhu, Xuan, 0H

Zhua, Qiankun, 1J

Zoran, Maria A., 0A, 1K

viii

Conference Committee

Symposium Chair

Klaus Schäfer, (Retired) Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research (Germany)

Symposium Co-chairs

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

Iain H. Woodhouse, The University of Edinburgh, Geography and the Lived Environment Research Institute (United Kingdom)

Conference Chairs

Ulrich Michel, Jade University of Applied Sciences Oldenburg (Germany)

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

Conference Co-chairs

Manfred Ehlers, Universität Osnabrück (Germany)
Konstantinos G. Nikolakopoulos, University of Patras (Greece)
Daniel Civco, University of Connecticut (United States)

Conference Program Committee

Thomas Blaschke, University of Salzburg (Austria)

Markus Boldt, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Tilman U. Bucher, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

Dimitri Bulatov, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Ni-Bin Chang, University of Central Florida (United States)

Garik Gutman, NASA Headquarters (United States)

Marguerite M. Madden, The University of Georgia (United States)

Derya Maktav, Istanbul Technical University (Turkey)

Matthias S. Moeller, University of Applied Sciences Berlin (Germany)

Pablo H. Rosso, RapidEye AG (Germany)

Florian Savopol, Natural Resources Canada (Canada)

Jochen Schiewe, HafenCity University Hamburg (Germany)

Wenzhong Shi, The Hong Kong Polytechnic University (Hong Kong, China)
Karl Staenz, University of Lethbridge (Canada)
Christiane H. Weber, Ecole Nationale Supérieure de Physique de Strasbourg (France)

Session Chairs

- 1 Sensors and Platforms
 - **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
- 2 Hazard Mitigation Geologic Applications Kyriacos Themistocleous, Cyprus University of Technology (Cyprus)
- 3 Processing Methodologies I Ulrich Michel, Jade University of Applied Sciences Oldenburg (Germany)
- 4 Processing Methodologies II Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
- 5 Remote Sensing for Archaeology, Cultural and Natural Heritage Ulrich Michel, Jade University of Applied Sciences Oldenburg (Germany)
- 6 Environmental Monitoring Concepts I **Veit Höfler**, TU Dresden (Germany)
- 7 Infrastructures and Urban Areas
 Gisela Häufel, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
- 8 Environmental Monitoring Concepts II Dildora Aralova, TU Dresden (Germany)
- 9 Environmental Monitoring Concepts III Ulrich Michel, Jade University of Applied Sciences Oldenburg (Germany)
- 10 Environmental Monitoring Concepts IV Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Introduction

This proceedings volume contains 43 papers presented at the SPIE Conference on Earth Resources and Environmental Remote Sensing/GIS Applications, formerly known under the title 'Remote Sensing for Environmental Monitoring, GIS Applications, and Geology.' The conference took place 27–29 September 2016 in Edinburgh, United Kingdom, and was the sixteenth conference with this topic after its inauguration in Toulouse, France, in 2001.

The conference sessions with presented papers and interactive posters were grouped into the following themes: Infrastructures and Urban Areas, Processing Methodologies, Hazard Mitigation Geologic Applications, Sensors and Platforms, Environmental Monitoring Concepts and Processing Methodologies. Lively discussions often continued into the coffee breaks. Although the session topics seemed rather diverse, there was a common thread to many papers, i.e., application of remotely sensed data for the protection of our environment, the integration with geographic information systems (GIS) and change detection. There was strong support from the audience to continue these themes for future conferences.

The paper submission and review process were again perfectly organized by the SPIE staff. We like to thank the SPIE staff on-site for their responsiveness and support. We are also grateful to our program committee for their help in the reviewing and session compilation process.

Ulrich Michel Karsten Schulz