# PROCEEDINGS OF SPIE

# Earth Resources and Environmental Remote Sensing/GIS Applications XIII

Karsten Schulz Ulrich Michel Konstantinos G. Nikolakopoulos Editors

5–7 September 2022 Berlin, Germany

Sponsored by SPIE

Cooperating Organisations Cranfield University (United Kingdom) OpTecBB (Germany) International Society for Photogrammetry and Remote Sensing European Association of Remote Sensing Companies

Published by SPIE

Volume 12268

Proceedings of SPIE 0277-786X, V. 12268 SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Earth Resources and Environmental Remote Sensing/GIS Applications XIII, edited by Karsten Schulz, Ulrich Michel, Konstantinos G. Nikolakopoulos, Proc. of SPIE Vol. 12268, 1226801 © 2022 SPIE · 0277-786X · doi: 10.1117/12.2664675 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 XIII*, edited by Karsten Schulz, Ulrich Michel, Konstantinos G. Nikolakopoulos, Proc. of SPIE 12268, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510655393 ISBN: 9781510655409 (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.



**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

vii Conference Committee

#### SESSION 1 SENSORS AND PLATFORMS

12268 03 On the field geometrical characterization of illegal micro-dumps by means of RPAS survey with depth camera [12268-2]

#### SESSION 2 ENVIRONMENTAL MONITORING CONCEPTS

- 12268 07 Evaluation of the NEON dataset for the automatic detection of treetops and delineation of tree crowns in American and German mixed forests [12268-7]
- 12268 08 An approach for determination of sea surface plastic waste transport routes using Copernicus Marine Service products [12268-9]

#### SESSION 3 REMOTE SENSING FOR ARCHAEOLOGY, PRESERVATION OF CULTURAL AND NATURAL HERITAGE

- 12268 0A Synergistic use of UAV and TLS data for precise rockfall monitoring over a hanging monastery [12268-11]
- 12268 0B HBIM for cultural heritage: the case study of Panayia Karmiotissa church [12268-12]
- 12268 0C The use of digital twin models to document cultural heritage monuments [12268-13]

## SESSION 4 SATELLITE RS AND GROUND-BASED NONDESTRUCTIVE TECHNOLOGIES IN CIVIL AND ENVIRONMENTAL ENGINEERING I

12268 0D	Assessing the root system of urban trees by geostatistical analysis of GPR data [12268-14]
12268 OE	Integrated health monitoring of masonry arch bridges by remote sensing and ground penetrating radar technologies [12268-15]

12268 OF Training data generation for machine learning using GPR images [12268-17]

## SESSION 5 SATELLITE RS AND GROUND-BASED NONDESTRUCTIVE TECHNOLOGIES IN CIVIL AND ENVIRONMENTAL ENGINEERING II

- 12268 0G Automatic damage detection of bridge joints and road pavements by artificial neural networks ANNs [12268-18]
- 12268 0H A novel bridge monitoring system implementing ground-based, structural and remote sensing information into a GIS-based catalogue [12268-20]
- 12268 01 Implementation of an interoperable BIM platform integrating ground-based and remote sensing information for network-level infrastructures monitoring [12268-21]
- 12268 0J Satellite remote sensing and integrated technologies for infrastructures monitoring: advances and perspectives of ASI's satellite-data exploitation [12268-22]

#### SESSION 6 INFRASTRUCTURES AND URBAN AREAS

- 12268 OK Multiparametric microsensor monitoring platform of the Enceladus Hellenic supersite: the PROION project [12268-23]
- 12268 0M The study of urban heat island effect in Cyprus using Sentinel-3 data [12268-26]
- 12268 00 Comparison of the IRS and SPOT satellite data for shoreline mapping: the case of Katakolo bay, Ilia Prefecture, Greece [12268-6]

#### SESSION 7 HAZARD MITIGATION GEOLOGIC APPLICATIONS I

- 12268 OP National scale classification of landslide types by a data-driven approach and artificial neural networks [12268-28]
- 12268 0Q Assessment of landslide susceptibility in Garhwal Himalayas using random forest model [12268-29]

#### SESSION 8 PROCESSING METHODOLOGIES

- 12268 0S Vegetation phenology from Sentinel 2 data: a GIS open source application [12268-32]
- 12268 0T Exploring fusion techniques in U-Net and DeepLab V3 architectures for multi-modal land cover classification [12268-33]
- 12268 0V Assessment of decadal land use land cover change using random forest classifier in Google Earth engine for Himachal Pradesh, India [12268-36]

#### SESSION 9 HAZARD MITIGATION GEOLOGIC APPLICATIONS II

12268 0WTen-year wildfire mapping using satellite imagery: the case study of Western Greece [12268-37]12268 0XSentinel-1 and ALOS data for lineament extraction: a comparative study [12268-38]12268 0YApplying self-organizing maps to characterize hyperspectral drill core data from three ore<br/>prospects in Northern Finland [12268-39]

#### POSTER SESSION

12268 10	Synergy of UAV data and in situ measurements for the shoreline mapping in Arkoudi beach, Western Greece [12268-42]
12268 11	The potential of spectral unmixing method applied to PRISMA hyperspectral images in the identification of Li minerals: an evaluation for prospecting purposes [12268-43]
12268 12	The influence of DSM on rock-fall simulation: a case study from Western Greece [12268-44]
12268 13	Spatiotemporal changes of land use in Henan section of the Yellow River Basin from 2008 to 2017 [12268-45]
12268 15	Application of chaotic sequences to expand the spectrum [12268-49]
12268 16	Application of ranking correlation in synthesis of resistance-resistant signals [12268-50]
12268 19	Impacts of urbanization on groundwater resources in Jebel Ali, Dubai [12268-54]

### **Conference Committee**

Symposium Chair

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

Symposium Co-chair

Lorenzo Bruzzone, Università degli Studi di Trento (Italy)

#### **Conference** Chairs

Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
Ulrich Michel, ROSEN Germany GmbH (Germany)
Konstantinos G. Nikolakopoulos, University of Patras (Greece)

#### Conference Programme Committee

Maria Libera Battagliere, Agenzia Spaziale Italiana (Italy)
Markus Boldt, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
Dimitri Bulatov, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)
Valerio Gagliardi, Università degli Studi di Roma Tre (Italy)
Pierre Karrasch, Technische Universität Dresden (Germany)
Pablo H. Rosso, Leibniz-Zentrum für Agrarlandschaftsforschung, ZALF, e.V. (Germany)
Ana Claudia Moreira Teodoro, Universidade do Porto (Portugal)

Kyriacos Themistocleous, Cyprus University of Technology (Cyprus) Christine Wessollek, Technische Universität Dresden (Germany)