## PROCEEDINGS OF SPIE

# Polarization Science and Remote Sensing XI

Meredith K. Kupinski Joseph A. Shaw Frans Snik Editors

21–22 August 2023 San Diego, California, United States

Sponsored and Published by SPIE

**Volume 12690** 

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 *Polarization Science and Remote Sensing XI*, edited by Meredith K. Kupinski, Joseph A. Shaw, Frans Snik, Proc. of SPIE 12690, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510665941

ISBN: 9781510665958 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org

Copyright © 2023 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.

 $\hbox{Publication of record for individual papers is online in the SPIE Digital Library.}$ 



**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

### POLARIMETRIC REMOTE SENSING

	I CLARIMETRIC REMOTE SENSING
12690 02	Remote sensing solar simulation laboratory for polarimetric scene simulation [12690-1]
12690 03	A laboratory-aided empirically-driven polarimetric bidirectional reflectance distribution function model [12690-3]
12690 04	Single-view shape and depth from closed-form polarization models for depolarization-dominated objects [12690-4]
12690 05	Contrast enhancement through an air-water interface with polarization imaging [12690-5]
	BIOMEDICAL POLARIMETRY
12690 06	Complete Mueller polarimetry: do we need it for biological tissues diagnosis? (Invited Paper) [12690-39]
	MATHEMATICS OF COHERENCE AND POLARIZATION
12690 07	Introduction to the wave description of geometric phase [12690-9]
12690 08	Geometry and topology in 3D polarization (Invited Paper) [12690-10]
12690 09	Geometric phase vs propagation phase [12690-12]
	POLARIMETRIC IMAGE QUALITY AND CALIBRATION
12690 0A	Improved polarimetric calibration using a microcontroller-driven rotating analyzer [12690-13]
12690 OB	Production of high-resolution reference polarization images from real world scenes [12690-15]

	POLARIZATION PROPERTIES OF MATERIALS
12690 OC	Mueller polarimetry for quantifying the stress optic coefficient in the infrared [12690-16]
12690 0D	Utilizing the PReMA polarization metric to quantify surface roughness [12690-17]
12690 OE	Developing a reconstruction algorithm for 3D birefringence from tomographic polarimetry [12690-18]
	ASTRONOMICAL POLARIMETRY
12690 OF	Polarimetric modeling and assessment of science cases for Giant Magellan Telescope-Polarimeter (GMT-Pol) (Invited Paper) [12690-20]
	POLARIMETRIC METROLOGY AND INSTRUMENTATION I
12690 OG	The effect of experimental errors on optimized polarimeters [12690-24]
	POLARIMETRIC METROLOGY AND INSTRUMENTATION II
12690 OH	Feasibility analysis and Mueller matrix retrieval strategy for a scene-adaptive modulated imaging polarimeter (Invited Paper) [12690-25]
	POLARIZATION IN EARTH REMOTE SENSING I: JOINT SESSION WITH CONFERENCES 12685 AND 12690
12690 01	Differences in ice and water LWIR spectral polarimetry at room temperature [12690-29]
	POLARIZATION IN EARTH REMOTE SENSING II: JOINT SESSION WITH CONFERENCES 12685 AND 12690
12690 OJ	Simulating ground-based polarimetric responses using AirMSPI observations from the FIREX-AQ campaign [12690-30]
12690 OK	Disk-resolved and disk-integrated polarization state of moonlight as a function of lunar phase [12690-31]

### **POSTER SESSION**

12690 OL	Concept and demonstration for a method of integrating depolarization in a slit homogenizer for spectrometry applications [12690-36]
12690 OM	Deep learning approach to vehicle pose estimation from polarimetric image data [12690-37]