## PROCEEDINGS OF SPIE

# Environmental Effects on Light Propagation and Adaptive Systems VI

Karin Stein Szymon Gladysz Editors

5–6 September 2023 Amsterdam, Netherlands

Sponsored by SPIE

Cooperating Organisations Cranfield University (United Kingdom)

Published by SPIE

Volume 12731

Proceedings of SPIE 0277-786X, V. 12731

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

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 Environmental Effects on Light Propagation and Adaptive Systems VI, edited by Karin Stein, Szymon Gladysz, Proc. of SPIE 12731, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510666917 ISBN: 9781510666924 (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.

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

#### v Conference Committee

#### SESSION 1 TRIBUTE TO ANTON KOHNLE: IN-MEMORIAM SESSION

- 12731 04 An electrooptical propagation and signature experiment in a humid environment [12731-3]
- 12731 05 Improving Cn2 calculations during stable conditions using an ultrasonic anemometer [12731-4]

#### SESSION 2 FIELD TRIAL OF NATO SET 304

- 12731 08 Turbulence characterization and investigation of correlations to meteorological parameters: results from NATO SET-304 field trial in Le Fauga-Mauzac, France [12731-7]
- 12731 09 Measuring and modeling the influence of atmospheric turbulence on a 2-µm laser beam [12731-8]
- 12731 0A Optical turbulence on 1-km horizontal path with short and medium IR Gaussian laser beams [12731-9]
- 12731 OB **Performance of phase diversity phase retrieval for horizontal path long-range imaging** [12731-10]

#### SESSION 3 PROPAGATION IN MARITIME ENVIRONMENT

- 12731 OC High-resolution modeling of the spatiotemporal variations in aerosol extinction in a complex coastal area [12731-12]
- 12731 0D Comparison of atmospheric optical turbulence measurements from a scintillometer and a sonic anemometer [12731-13]
- 12731 OE Laser beam propagation over the sea surface: experimental data and verification of simulations [12731-14]

#### SESSION 4 FIELD TRIALS

12731 OF	Propagation geometry and its effect on peak scintillation of intensity (Invited Paper) [12731-16]
12731 0G	Turbulence and transmission effects on laser beam propagation in the SWIR and LWIR bands [12731-17]

12731 OH Does atmospheric turbulence affect long-range terrestrial laser scanner observations? A case study in alpine region [12731-18]

#### SESSION 5 TURBULENCE MITIGATION

12731 01	Event based sensor versatility for long range surveillance imaging (Invited Paper) [12731-19]
12731 OJ	Mitigation of inter-modal crosstalk in the holographic wavefront sensor through the implementation of a multi plane light conversion [12731-20]
12731 OK	A compact pointing assembly for a CubeSat to ground station free-space optical communication based on a Risley prism scanner coarse and a tip/tilt mirror fine pointing

 [12731-21]
12731 OL Optical demultiplexing with fractal-structured beams in turbulent atmospheric environments [12731-22]

#### SESSION 6 NUMERICAL WEATHER PREDICTION AND WAVE OPTICS SIMULATIONS

- 12731 OM Sensitivity study on the number of height levels used in a numerical weather model to determine the vertical profile of C<sup>2</sup>n [12731-23]
- 12731 ON A multi-physics ensemble modeling framework for reliable C<sup>2</sup>n estimation [12731-24]
- 12731 00 Beyond Taylor's frozen turbulence hypothesis in ground-layer turbulence [12731-25]

#### SESSION 7 FREE-SPACE OPTICAL COMMUNICATIONS

- 12731 OP Power in the fiber for atmospheric turbulence-affected laser beams [12731-26]
- 12731 0Q Performance analysis of OOK and PPM modulation schemes in MIMO-FSO links under gamma gamma atmospheric turbulence [12731-27]

#### POSTER SESSION

- 12731 OR A study on the automatic extraction of trajectory for LIDAR data correction [12731-29]
- 12731 0S Turbulence mitigation pipelines evaluation [12731-30]