

## IAA Study Group Status Report

### Responsible Commission:

COMMISSION 1: Space Physical Science

### Study Number and Title:

1.9 Satellite remote sensing of aerosols in the Earth atmosphere

### Short Study Description (repeat from Study Group Proposal):

#### Overall Goal:

The polarimetry satellite remote sensing purpose and place in the investigation of temporal and spatial distribution of physical parameters of troposphere and stratosphere aerosol and cloud particles in the Earth atmosphere including evaluation their influence on climate, ecology and weather.

#### Intermediate Goals:

1. Long-term satellite global monitoring and database creation of optical, micro- and macrophysical and chemical characteristics of aerosol and cloud in the Earth atmosphere, their spatial and temporal distribution.

2. Precise quantitative determination of aerosol input to the Earth climate system energy balance.

3. Determination of industrial aerosol impact on Earth climate change and ecology.

#### Methodology:

Forming an international study group, draft a detailed schedule of the study.

Agreement on a study report outline.

Assigning individual responsibility for parts of the study report.

Assigning editor to coordinate individual parts and compile a coherent study report.

Work to be conducted through on-line collaboration and study group meetings held in the course of annual International Astronautical Congresses and the IAA Spring meetings.

Time Line: 5 Years

Final Product: Report, publications

Target Community: Scientists, engineers, Governments at large, local authorities, Space Agencies, UN, and European Commission

Support Needed: TBD

Potential Sponsors:

National Academy of Sciences of Ukraine; Yuzhnoye State Design Office, State Space Agency of Ukraine (SSAU); NASA; CNES; European Commission, ESA

### Progress in past six months:

The main objective of the Aerosol-UA project is the investigation of aerosol impact on climate variability. The mission payload includes the multispectral Scanning Polarimeter (ScanPol) and the MultiSpectral Imaging Polarimeter (MSIP) on board the YuzhSat satellite platform. The two Aerosol-UA instruments, combined together, can provide multi-angular (along-track) measurements of the polarized radiance with the considerable swath (60° provided

by MSIP). Besides the aboard calibration function, the ScanPol provides the possibility for the instruments cross-calibration since their fields of view are partly overlapped.

The works during past six months were concentrated on design, construction and calibration of the experimental model the MultiSpectral Imaging Polarimeter (MSIP). Website of the mission has been updated and re-designed.

For the purposes of calibration and validation future mission data, the aerosol parameters and behavior in the atmosphere over Ukraine are monitored and analyzed.

The Ukrainian State Space Program for 2020-2024 should be discussed by new Parliament and we expect increased support for finishing the Aerosol-UA payload in the framework of this Program.

**Website Study Information update:** (please give any update regarding Study Group Membership, documents, Study Plan and Schedule):

Aerosol-UA Project website has been re-designed:

<https://aerosol-ua.mao.kiev.ua/index.php/en/>

Some web pages still under updating process.

**Documents:**

New published papers on the Study topic

Milinevsky, G., Y. Oberemok, I. Syniavsky, A. Bovchaliuk, I. Kolomiets, I. Fesianov, Y. Wang. Calibration model of polarimeters on board the Aerosol-UA space mission. *Journal of Quantitative Spectroscopy and Radiative Transfer*, Volume 229, May 2019, Pages 92-105. <https://doi.org/10.1016/j.jqsrt.2019.03.0079>

Dubovik, O., Z. Li, M.I. Mishchenko, D. Tanre, Y. Karol, B. Bojkov, B. Cairns, D.J. Diner, W.R. Espinosa, P. Goloub, X. Gu, O. Hasekamp, J. Hong, W. Hou, K.D. Knobelspiesse, J. Landgraf, L. Li, P. Litvinov, Y. Liu, A. Lopatin, T. Marbach, H. Maring, V. Martins, Y. Meijer, G. Milinevsky, S. Mukai, F. Parol, Y. Qiao, L. Remer, J. Rietjens, I. Sano, P. Stammes, S. Stammes, X. Sun, P. Tabary, L.D. Travis, F. Waquet, F. Xu, C. Yan, and D. Yin, 2018: Polarimetric remote sensing of atmospheric aerosols: instruments, methodologies, results, and perspectives. *J. Quant. Spectrosc. Radiat. Transfer, Journal of Quantitative Spectroscopy and Radiative Transfer*, Volume 224, 2019, Pages 474-511, ISSN 0022-4073, <https://doi.org/10.1016/j.jqsrt.2018.11.024>.

Shelestov, A., A. Kolotii, T. Borisova, O. Turos, G. Milinevsky, I. Gomilko, T. Bulanay, O. Fedorov, L. Shumilo, L. Pidgorodetska, L. Kolos, A. Borysov, N. Pozdnyakova, A. Chunikhin, M. Dudarenko, A. Petrosian, V. Danylevsky, N. Miatselskaya, V. Choliy. (2019): Essential variables for air quality estimation, *International Journal of Digital Earth*. <https://doi.org/10.1080/17538947.2019.1620881>

**Issues requiring resolution?** (recommend approach):

**Product Deliveries on Schedule?** (If modified explain rationale):

Report, publications

**Study Team Member Changes?** (List any Study Team Members that you wish to discontinue, and provide names plus contact coordinates of any Members you wish to add on the second page of this Study Update form.) Note: Complete contact information including email, tel. and fax must be provided for all additions. Only Members with complete contact information will be listed and receive formal appointment letters from the IAA Secretariat.)

**To add:**

--

**Name of person providing Study Group Status** (Study Group Chair or Co-Chair):

Study Group Chair

**Dr Yaroslav Yatskiv**

E-mail: yatskiv@mao.kiev.ua

**Status Report Date: September 07, 2019**