

## 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 antropogeneous 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: 3 to 5 Years

Final Product: Report, publications

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

Support Needed: TBD

Potential Sponsors:

National Academy of Sciences of Ukraine; State Space Agency of Ukraine (SSAU); NASA; CNES; European Commission

### Progress in past six months:

The works are on the stage of construction of the spectropolarimeter ScanPol and design of multispectral imager-polarimeter MSIP.

The spectropolarimeter ScanPol will provide precise orbital measurements of the intensity and high accuracy polarization of sunlight scattered by the aerosols in atmosphere and cloud/land surace. The components of the ScanPol polarimeter have been computer-designed and created, including the optical-mechanical and electronic assemblies and the scanning mirror controller. A preliminary investigation of the

scanning mirror unit has been performed. The results have shown that the proposed combination of mirrors allows compensating the reflection polarization from the mirror metal coatings. The ScanPol polarimeter optical-mechanical unit equipped with a multichannel optical information reader has been built and prepared for a laboratory test.

The optical layout of the multispectral imager-polarimeter MSIP has been modelled. MSIP will serve as monitor for weather conditions and to register polarimetric images along the ScanPol polarimeter ground track. We expect to process the data from ScanPol polarimeter and PanCam multi-spectral polarimetric camera by new GRASP inversion algorithm that shows promising results for developing multi-instrument aerosol measurements. Methods for the validation of satellite data using a mobile sunphotometer station as well as for the calibration of aerosol polarimetry have been further evolved..

Panoramic camera PanCam will serve to distinguish scene "aerosol/cloud" with one pixel of ScanPol spatial resolution and (optional) to measure aerosol optical depth and aerosol size estimation over ocean. We continue to study aerosol parameters and behavior in the atmosphere over Ukraine. We have recently published the review of remote sensing of aerosol in the terrestrial atmosphere from space: new missions including the state of Aerosol-UA mission progress (<http://aasp.kiev.ua/index.php?text=v5-11-16-Milinevsky>).

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

Aerosol-UA Project website <http://aerosol-ua.mao.kiev.ua/index.php/en/main>

Documents:

New papers on the Study topic

Milinevsky, G., Ya. Yatskiv, O. Degtyaryov, I. Syniavskiy, Yu. Ivanov, A. Bovchaliuk, M. Mishchenko, V. Danylevsky, M. Sosonkin, V. Bovchaliuk. 2015. Remote sensing of aerosol in the terrestrial atmosphere from space: new missions. *Advances in astronomy and space physics* 5: 11-16. – ISSN 2227-1481.

[http://aasp.kiev.ua/index.php?text=2015v5i1\\_content](http://aasp.kiev.ua/index.php?text=2015v5i1_content)

A. V. Soina, G. P. Milinevsky, Y. M. Yampolski. 2015. Seven-day variations in the atmospheric aerosols. *Radiophysics and Radio Astronomy* 20(2): 109-121.

<http://journal.ri.kharkov.ua/index.php/ra/article/view/1207>

Syniavskiy I. I., Milinevsky G. P., Ivanov Yu. S., Sosonkin M. G., Danylevsky V. O., Rosenbush V. K., Bovchaliuk A. P., Lukenyuk A. A., Shymkiv A. P., Mishchenko M. I. 2015. Methodology, hardware implementation, and validation of satellite remote sensing of atmospheric aerosols: first results of the AEROSOL-UA space experiment development. *Space Science and Technology* 21(3): 9-17.

<http://www.mao.kiev.ua/index.php/ua/vydannia/knititem>

**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.)

See second page.

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

Study Group Chair

**Dr Yaroslav Yatskiv**

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**Status Report Date: September 23, 2015**

## Study Team Membership Changes

Effectivity Date:

September 24, 2015

### **Discontinue:**

Name

Current email address

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### **Add:**

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