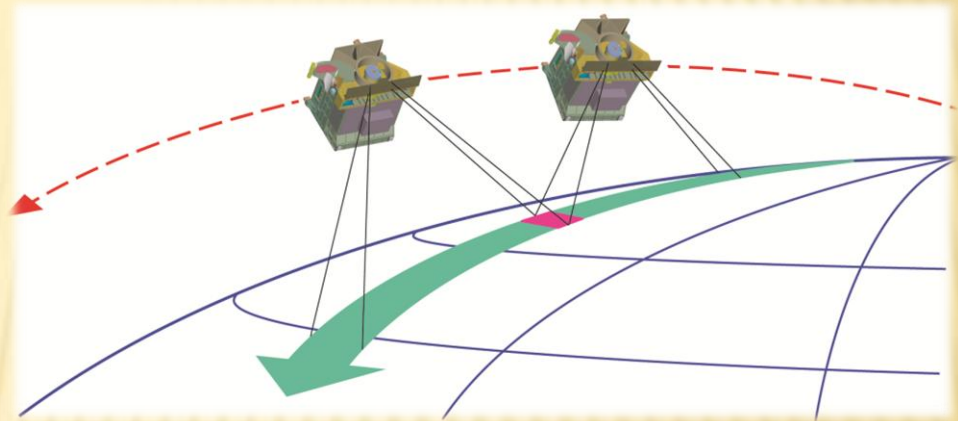


Satellite remote sensing of aerosols in the Earth atmosphere



IAA Study Group 1.9, of 3 March 2014

Ventskovsky Oleg, Yatskiv Yaroslav, Milinevsky Gennadi

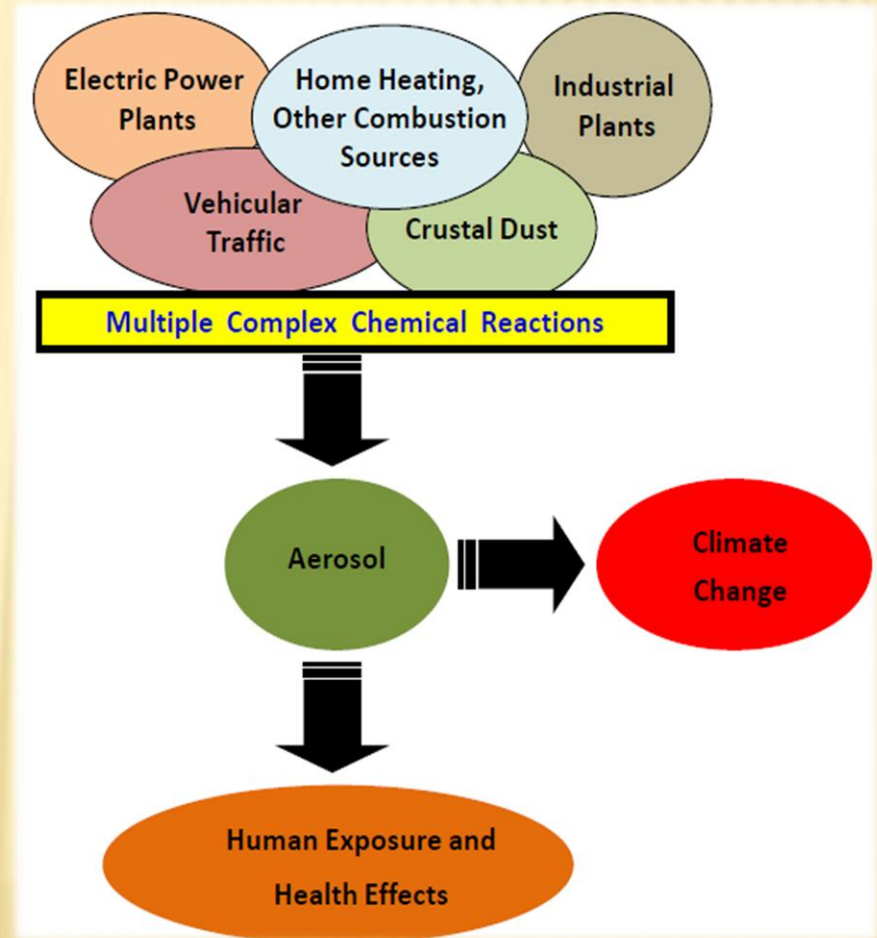
Degtyarev Olexandr, Makarov Olexandr,

Mishchenko Michael, Shakhovskoy Dmitriy,

Sinyavsky Ivan, Bovchaliuk Andrii, Udodov Evgeniy.

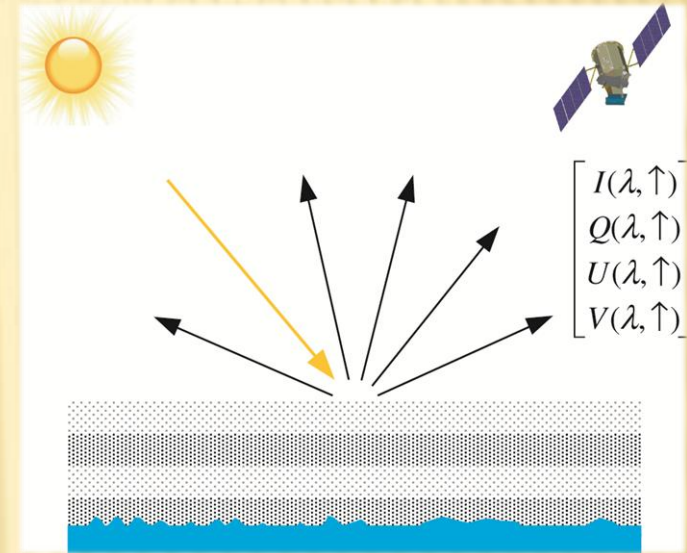
GOALS OF INVESTIGATION

- 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.
- Precise quantitative determination of aerosol input to the Earth climate system energy balance.
- Determination of antropogeneous aerosol impact on Earth climate change and ecology.



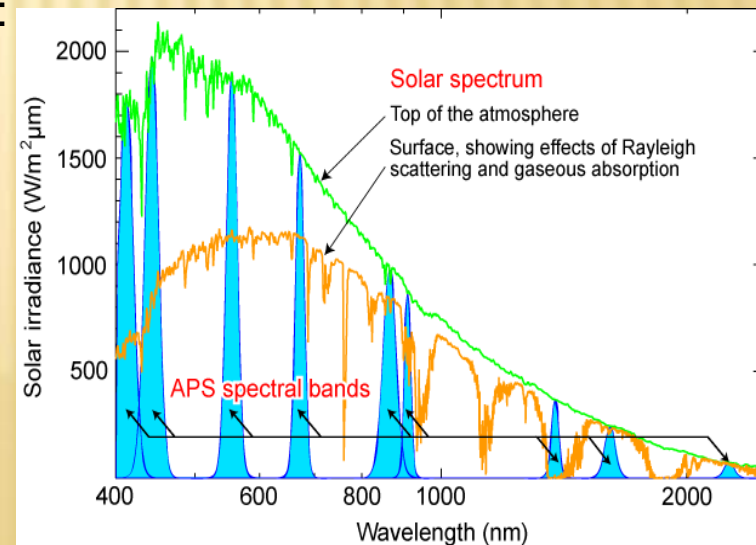
CONCEPT OF MEASUREMENTS

- The aerosol remote sensing concept is based on precise orbital measurements of the intensity and polarization of sunlight scattered by the atmosphere and the surface.
- Capabilities of passive aerosol remote sensing techniques can be classified by:
 1. Spectral range: 370, 410, 555, 865, 1378, 1610 nm
 2. Scattering geometry range ($\pm 60^\circ$ limb)
 3. Number of Stokes parameters (I , Q , U)



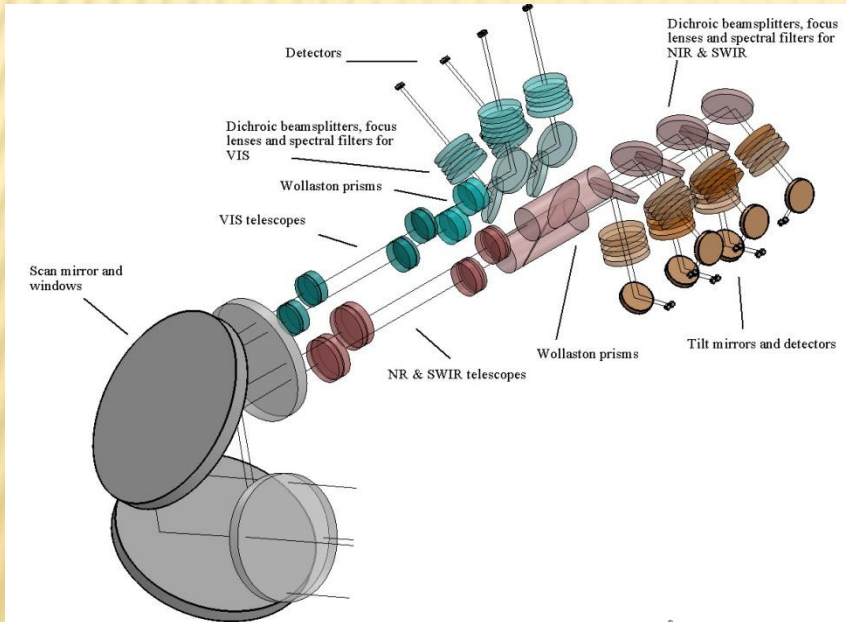
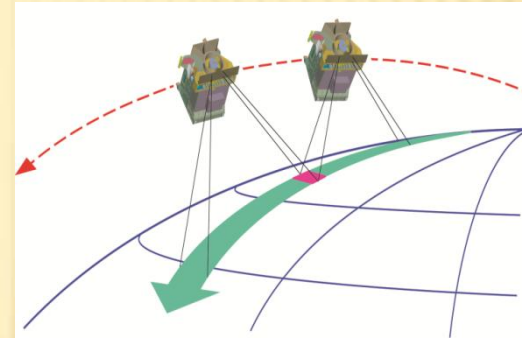
The measurement approach is to use multi-angle multi-spectral polarimetric measurements because:

- Polarization is a relative measurement that can be made extremely accurately.
- The variation of polarization with scattering angle and wavelength allows aerosol particle size, refractive index and shape to be determined.
- Methodological development and new generation algorithms are now available to fully take advantage of more constraining observations (Mishchenko et al. 2011, Kokhanovsky et al., 2010; Dubovik et al., 2011; Hasekamp et al., 2011)



Main instrument for mission – Scanning polarimeter “ScanPol”

Quasi-continuous scanning along the ground track will yield >100 different angular views of each terrestrial scene



End to end optical path of optical and detectors unit

Current status of the instrument development



Laboratory sample of the scanning mirrors unit

PROCESSING AND STORING DATA CENTER CONCEPT



Scientific measurements

```
0123456789;:<=>?@  
ABCDEFGHIJKLMN  
OPQRSTUVWXYZ[\  
]^_`abcdefghijklmnop  
nopqrstuvwxyz{
```

Data



Storage

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



A user got the scientific information in a friendly format



Web-service

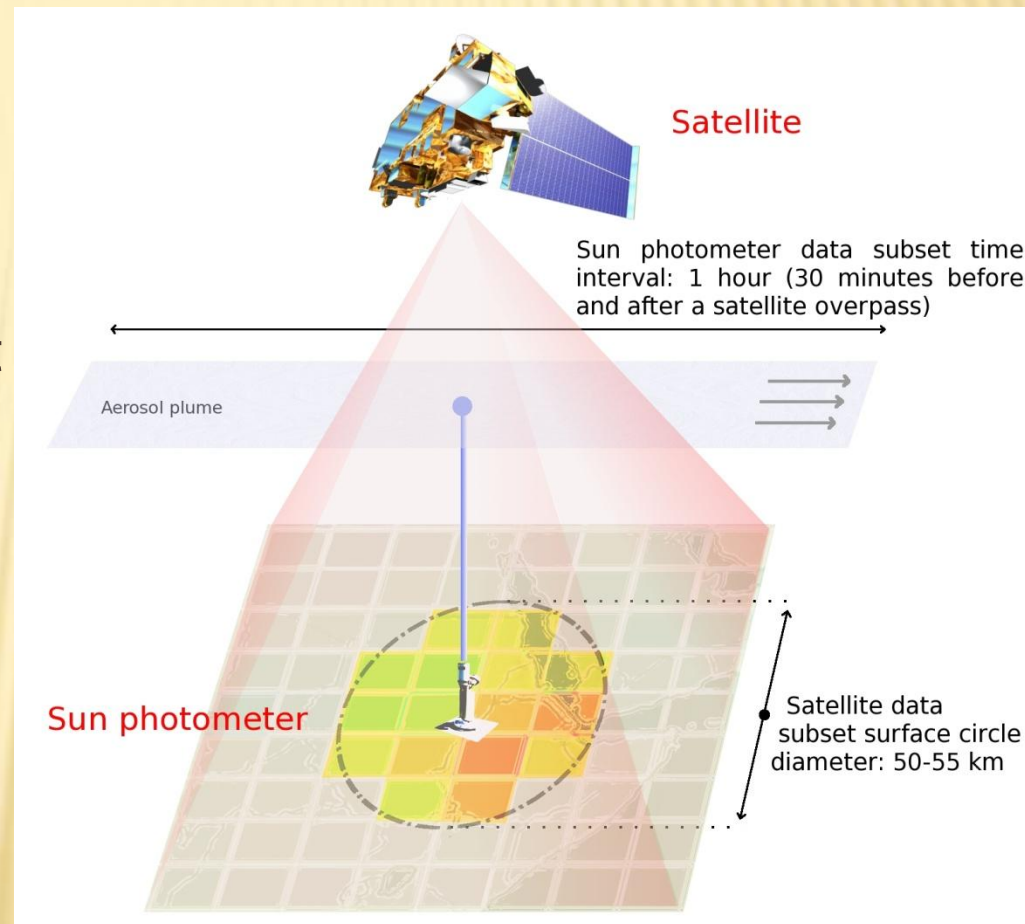


Instrumentation

GROUND-BASED VALIDATION

Data analysis of ground-based and satellite measurements allows to obtain estimation of aerosol physical parameters, perform validation and calibration the parameters obtained by satellite instrument

Concept of technique: the simultaneous or quasi-simultaneous comparison of aerosol parameters obtained by satellite instrument and ground-based sunphotometers from AERONET network (Holben et al., 1998).



WEBSITE ON DEVELOPMENT

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



The screenshot displays the AEROSOL-UA website interface. At the top, a banner features the project logo, the text "REMOTE SENSING OF ATMOSPHERIC AEROSOLS", and "AEROSOL-UA" in large letters, alongside an image of a satellite in orbit. Below the banner is a navigation menu with links: Main, News, Mission, Satellite, Instruments, Participants, Publications, Data Center, Groundbased Support, and Contacts. The main content area is titled "AEROSOL-UA MISSION" and includes a "Mission Concept" section with a sub-header "Aerosol-UA satellite project". This section describes the project's goal: "Remote sensing of aerosols in the Earth atmosphere to study the atmospheric aerosol for climate change investigations". A list of scientific objectives is provided, including monitoring spatial distribution, creating an observational database, and quantifying anthropogenic aerosol contributions. A login form on the right side of the page contains fields for "User Name" and "Password", a "Remember Me" checkbox, a "Log in" button, and links for "Create an account", "Forgot your username?", and "Forgot your password?". A search bar is also visible at the bottom right.

REMOTE SENSING OF ATMOSPHERIC AEROSOLS

AEROSOL-UA

Main News Mission Satellite Instruments Participants Publications Data Center Groundbased Support Contacts

Mission Concept

AEROSOL-UA MISSION

The scientific demands of the project are based on the knowledge that atmospheric aerosols strongly affect the terrestrial climate and environment, their climatic effects being comparable to those of the greenhouse gases. The accurate quantitative assessment of these effects and, especially, of their anthropogenic components is not currently available, thereby making it difficult to formulate scientifically justified social and economic programs.

Scientific objectives:

- monitor the spatial distribution of key parameters of terrestrial tropospheric and stratospheric aerosols
- provide a comprehensive observational database for accurate quantitative estimates of the aerosol contribution to the climate system energy budget
- quantify the contribution of anthropogenic aerosols to climatic and ecological processes

The project is born on a detailed analysis and justification of an aerosol remote-sensing concept based on precise orbital measurements of the intensity and polarization of sunlight scattered by aerosol in the atmosphere and Earth surface.

Aerosol-UA satellite project

Remote sensing of aerosols in the Earth atmosphere to study the atmospheric aerosol for climate change investigations

- properties and distribution of tropospheric and

User Name

Password

Remember Me

Log in

[Create an account](#)

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[Forgot your password?](#)

Search...