



Atmosphere aerosol satellite project Aerosol-UA

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The experiment Aerosol-UA is Ukrainian space mission aimed to the terrestrial atmospheric aerosol spatial distribution and microphysics investigations. The experiment concept is based on idea of Glory/APS mission of precise orbital measurements of polarization and intensity of the sunlight scattered by the atmosphere, aerosol and the surface the multichannel Scanning Polarimeter (ScanPol) with narrow field-of-view. ScanPol measurements will be accompanied by the wide-angle MultiSpectral Imager-Polarimeter (MSIP). The ScanPol is designed to measure Stokes parameters I, Q, U within the spectral range from the UV to the SWIR in a wide range of phase angles along satellite ground path. Expected ScanPol polarimetric accuracy is $\sim 0.15\%$. A high accuracy measurement of the degree of linear polarization is provided by on-board calibration of the ScanPol polarimeter. On-board calibration is performed for each scan of the mirror scanning system. A set of calibrators is viewed during the part of the scan range when the ScanPol polarimeter looks in the direction opposite to the Earth's surface. These reference assemblies provide calibration of the zero of the polarimetric scale (unpolarized reference assembly) and the scale factor for the polarimetric scale (polarized reference assembly). The zero of the radiometric scale is provided by the dark reference assembly. The spectral channels of the ScanPol are used to estimate the tropospheric aerosol absorption, the aerosol over the ocean and the land surface, the signals from cirrus clouds, stratospheric aerosols caused by major volcanic eruptions, and the contribution of the Earth's surface. The imager-polarimeter MSIP will collect $60^\circ \times 60^\circ$ field-of-view images on the state of the atmosphere and surface in the area, where the ScanPol polarimeter will measure, to retrieve aerosol optical depth and polarization properties of aerosol by registration of three Stokes parameters simultaneously in three spectral channels. The two more channels of the MSIP are the intensity channels that serve to obtain images in eight spectral wavebands to retrieve the aerosol optical depth. The main feature of the each MSIP channel is the splitting of the image by a special prism-splitter to four images on the same CCD detector. In that way we can simultaneously measure four polarization components at 0° , 45° , 90° and 135° as images in each of three polarization channels. One of the special features of ScanPol/MSIP concept is calibration of the MSIP using ScanPol data in the same field-of-view with $\sim 1\%$ expected polarization accuracy. The Aerosol-UA experiment is planned to be launched in 2020 at the new satellite platform YuzhSat developed in the Yuzhnoye Design Office. The GRASP algorithm (Dubovik et al. 2014, doi: 10.1117/2.1201408.005558) is planned for Aerosol-UA data processing and AERONET sun photometers observations for validation.

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