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New satellite project Aerosol-UA: Remote sensing of aerosols in the atmosphere

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Description and technical details of the new space satellite project Aerosol-UA onboard recently designed orbital platform YuzhSat are discussed. The project should provide information on the terrestrial atmospheric aerosol to quantify the spatial distribution and microphysics of particles in order to study the aerosol impact on the climate change and planet energy budget modeling. The aerosol remote sensing concept of the project is based on precise orbital measurements of the intensity and polarization of sunlight scattered by the atmosphere and the surface using the scanning polarimeter ScanPol simultaneously with the wide-angle multispectral imager-polarimeter MSIP. The multi-channel scanning polarimeter ScanPol is based on the concept of the Aerosol Polarimetry Sensor of NASA Glory project. The ScanPol polarimeter is designed for remote sensing of aerosol and cloud properties and it will allow to measure polarimetry Stokes parameters I, Q, U within the spectral range from the ultraviolet UV to the short-wave infrared SWIR spectral bands in a wide range of phase angles. The spectral channels of the ScanPol are used to estimate the tropospheric aerosol absorption capacity, the aerosol over the ocean and the land surface, the color of the ocean, the signals from cirrus clouds, stratospheric aerosols caused by major volcanic eruptions, and the contribution of the earth's surface. The multispectral wide-angle imager-polarimeter MSIP will register images on the state of the atmosphere and surface in the same scan area of the ScanPol polarimeter. MSIP instrument includes five optical channels with wide field of view across flying trajectory. Three cameras are polarimetry and two are photometric. Polarimetry channels will measure Stokes parameter I, Q and U. Two photometric channels of the MSIP will serve to obtain image in eight spectral wavebands to retrieve the atmosphere aerosol optical depth. The main advantages of the Aerosol-UA project are: (1) polarization is a relative measurement that can be made accurately; (2) polarimetric ScanPol measurements can be stably calibrated on the orbit; (3) polarization change with scattering angle and wavelength gives information on size, refractive index and shape of aerosol; (4) synergy of scanner and imager will produce new quality of data on aerosol properties. The project Aerosol-UA is planned to be realized at new satellite platform developed in Yuzhnoye SDO.