New method for retrieving the aerosol characteristics from satellite limb scattered solar radiance measurements

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Satellite measurements of limb scattered solar radiance (LSSR) (SOLSE, LORA, OSIRIS, SCAIMACHY, etc.) contain the information on characteristics of gaseous and aerosol composition of the atmosphere. The interpretation of such measurements with respect to gaseous and aerosol characteristics is a complicated problem as the outgoing radiance depends on many optical (and microphysical) characteristics of aerosols and clouds, the content of absorbing gases and the surface (cloud) reflectivity. The solution of the inverse problem on retrieving the aerosol extinction and scattering coefficients and scattering phase function as independent unknown functions of wavelength, altitude and scattering angle from LSSR measurements is of small perspective. In developed method, these functions are coupled by statistical aerosol models, which are used as additional a priori information in the solution of the inverse problem. As a result, the number of unknowns can be essentially decreased. Examples of constructing the microphysical and optical statistical models of stratospheric and tropospheric aerosol are given. On the basis of developed radiation code for spherical atmosphere, the numerical modeling of the solution of inverse problem by proposed method has been performed. The information content of LSSR measurements (four channels in atmospheric windows in visible and near IR ranges are used) and the accuracy of retrieving the aerosol extinction coefficient and the asymmetry factor in different conditions of satellite experiment are analyzed and compared with traditional approach.