VECTOR SPHERICAL RADIATIVE TRANSFER MODEL MCC++: LINEARIZATION WITH RESPECT TO SURFACE PROPERTIES

O.V. Postylyakov

A.M. Institute of Atmospheric Physics, Moscow, Russia, ovp@ifaran.ru

Application of radiative transfer models to optical remote sensing show that remote sensing requires extra characteristics of radiance field in addition to the radiance intensity itself. Development of retrieval algorithms, analysis of retrieval errors and simulation of spectral measurements are in need of derivatives of radiance with respect to atmospheric properties under investigation. Models, which solve equation in derivatives of radiance simultaneously with transfer equation in radiance, have been termed linearized. Gained experience proved that a simultaneous solution of these equations can be greatly faster than the traditional algorithm of the finite difference approach based on multiple runs of a radiative model with perturbed optical properties.

The radiative transfer model MCC++ implements Monte Carlo algorithms for multiple scattering simulation and takes into account aerosol and molecular scattering, gas and aerosol absorption, and Lambertian surface properties. The model takes into account polarization and sphericity of the atmosphere. The MCC++ model is capable to calculate the derivatives of radiance (weighting functions) with respect to absorption (gas concentration) in all atmospheric layers simultaneously with intensities.

A new version of the model became capable to calculate derivatives of radiance with respect to surface properties and was extended to take into account bidirectional reflectance distribution function (BRDF) of surface. New features of the MCC++ model allow to improve accuracy of radiance modeling related to aerosol and to study causes of differences of aerosol data-sets. They are especially significant in modeling of data of nadir-viewing satellite instruments for retrieval of aerosol and surface properties and may be applied for interpretation of backscattered radiance measurements of GOME, OMI, TOMS, and polarimetric measurements of POLDER.