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Radiative Transfer Effects near Cloud Edges

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Radiative fluxes in the terrestrial atmosphere are usually studied for cloudy or cloudless sky. The case of partially cloudy conditions is rarely considered because of computational problems related to the simulation of light fluxes in the framework of the 3-D transport theory. This paper is devoted to the consideration of radiative fluxes and light absorption close to the edges of clouds both in cloudy and cloudless parts of the scene analysed. Both transmitted and reflected light fluxes are considered. The influence of cloud shadowing and brightening effects on the radiance distribution in reflected and transmitted light is considered as well. We use a powerful numerical technique, realised in the RADUGA code (Bass et al., 2003; Nikolaeva et al., 2005), which has been developed for radiative transfer processes modelling on multiprocessor computers. The accuracy of the RADUGA code was checked against Monte-Carlo calculations. An excellent correspondence of results obtained using these diverse codes has been found (Nikolaeva et al., 2005). The discrete ordinate method incorporated in the RADUGA code has been widely used for the solution of various neutron and photon transport problems in last 50 years. In this technique the phase function in the scattering integral is represented by the spherical harmonics and a correspondent integral term is replaced by a quadrature sum. Obtained approximate partial differential equations are solved with the use of the special grid scheme (our variant of a so-called weighted diamond difference scheme).