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Polarimetry as a Tool for Investigation of Clouds in Polar Regions

Victoria Falaleeva, Aleksey Mamontov, Alexander Chernokulsky, and Arseniy Artamonov
A.M.Obukhov Institute of Atmospheric Physics RAS, Moscow, Russian Federation (victory@phystech.edu)

Polar Regions are the most susceptible to climate change. And clouds with their strong impact on the radiative fluxes are important subjects to study. Since clouds are the main polarizing factors in atmosphere, polarized remote sensing seems to be a useful tool for investigation of their macro- and microphysics. The aim of this work is to evaluate the capabilities of passive sounding of the polarized radiation in visible, near- and thermal infrared channels in obtaining information on polar clouds from satellites.

We have calculated the spectra of the Stokes vector for a set of cloudy cases (different effective diameter of ice particles/droplets, cloud phase, cloud height, surface albedo) using the 1-D forward Fast Line-by-Line Model (FLBLM). The numerical experiments show that sensitivity of the linear polarization to the change of cloud structure is about 10% for solar radiation and 1% for thermal one. The vertical structure could be retrieved, if the instruments meet certain requirements, such as high spectral resolution. And FLBLM can be applied for planning the satellite missions.

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