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Transformation of longwave and shortwave radiation in the atmosphere.

M.A. Gusakova and L.N. Karlin

Russian State Hydrometeorogical University, St. Petersburg, Russian Federation (gusakova@aari.ru)

Transformation of solar energy and outgoing terrestrial radiation in the atmosphere has been investigated in order to understand the reasons of climate variability. As is known, in recent years a considerable number of works have appeared on various problems of Earth radiation balance. However, energy fluxes at the Earth surface and in the atmosphere have not been investigated in detail.

To examine the distribution of the energy fluxes the satellite data from CERES have been analyzed. The analysis of the radiation fluxes has shown that total solar irradiance for the period 2001 to 2010 has a negative trend. All components of the radiation balance (such as outgoing and incoming longwave radiation, outgoing and incoming shortwave radiation) fluctuate from year to year, with incoming longwave flux at the Earth surface having the greatest amplitude (1.82 W/m2). The fluctuations of energy fluxes have been compared with some climate characteristics such as global surface air temperature, cloudiness, concentration of greenhouse gases including water vapour.

The analysis of both annual and seasonal fluctuations made it possible to assess the influence of incoming solar energy on climate variability. The distribution of energy fluxes in the atmosphere heavily depends on atmospheric composition (greenhouse gases and water vapour), cloudiness and sea ice variability. The research has shown that even the smallest fluctuations in TSI effect global surface air temperature.