An Efficient Method for Estimating the Surface Solar Irradiance Based on Satellite-Observed Scattered Solar Radiation

*Keiichi Nishizawa[1]

1. Central Research Institute of Electric Power Industry

In order to estimate cloud optical thickness, which substantially affects the surface solar radiation, we intend to analyze the scattered solar radiation observed from satellites. For the inverse analysis of cloud optical thickness, “bidirectional reflectivity” of the earth-atmosphere system at 0.51 mm in wavelength has been calculated by using Rstar6b (a radiative transfer model developed by the University of Tokyo) for various sets of related parameters (i.e., cloud optical thickness, ice cloud fraction, solar zenith angle, satellite zenith angle, azimuth angle difference between sun and satellite, and surface albedo). The results from these calculations have been compiled into a six-dimensional look-up table. By using the table, the cloud optical thickness to reproduce the satellite-observed scattered solar radiation can be estimated very efficiently. When the surface global solar radiation is estimated from the obtained cloud optical thickness, however, uncertain variables, such as the surface albedo and ice cloud fraction, are anticipated causing considerable errors in the estimations.

Keywords: satellite observation, scattered solar radiation, surface solar irradiance

