

Ground-based pyranometer observations and their application through Himawari-8 validation toward EMS

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Observations from the new geostationary satellite Himawari-8 (H-8) are expected to contribute in further developing an efficient photovoltaic system for Japan through an improved energy management system (EMS). However, accurate comparisons with ground trusting observations are essential to assess their uncertainty. In this study, we evaluated the H-8 surface solar radiation (SSR) data using observations from CM21 recorded at the Chiba site of SKYNET station (35.63°N, 140.10°E) in Japan. Although good agreement was found between H-8 and CM21 data, we found that insufficient consideration of clouds caused the uncertainty in the H-8 data. The data were affected by clouds more than 20 km away from the site. To remove the influence of the clouds, we calculated the standard deviation of H-8 data in the region of 40 km X 40 km. We found that the correlations between H-8 and CM21 data tend to be stronger, when a stricter standard deviation threshold was used. In addition, the H-8 data tend to show systematically overestimation, even under clear-sky conditions. By calculating global solar irradiances as a function of aerosol optical depth using a radiative transfer model, the underestimation can be explained by aerosol effects, which have not been taken into account in the H-8 data.