



Evaluation of the broadband surface solar irradiance derived from SCIAMACHY effective cloud fraction

Ping Wang (1), Piet Stammes (1), and Richard Mueller (2)

(1) Royal Netherlands Meteorological Institute (KNMI), Climate Research and Seismology Department, De Bilt, Netherlands (wangp@knmi.nl), (2) Climate Monitoring Satellite Application Facility, German Meteorological Service (DWD), Offenbach, Germany.

Broadband surface solar irradiances (SSI) are, for the first time, derived from SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CartographY) satellite measurements. The retrieval algorithm, called FRESCO (Fast REtrieval Scheme for Clouds from Oxygen A band) SSI is using the Heliosat relation for the consideration of clouds on the solar irradiance. In contrast to the standard Heliosat relation, the cloud index is replaced by the effective cloud fraction derived from the FRESCO cloud algorithm. The MAGIC (Mesoscale Atmospheric Global Irradiance Code) algorithm is used to calculate clear-sky SSI. The SCIAMACHY SSI product is validated against the globally distributed BSRN (Baseline Surface Radiation Network) measurements and compared with the ISCCP-FD (International Satellite Cloud Climatology Project Flux Dataset) surface shortwave downwelling fluxes (SDF). For one year of data in 2008, the mean difference between the instantaneous SCIAMACHY SSI and the hourly mean BSRN global irradiances is -4 W/m^2 (-1%) with a standard deviation of 101 W/m^2 (20%). The mean difference between the globally monthly mean SCIAMACHY SSI and ISCCP-FD SDF is less than -12 W/m^2 (-2%) for every month in 2006 and the standard deviation is 62 W/m^2 (12%). The correlation coefficient is 0.93 for SCIAMACHY SSI and BSRN global irradiances and is greater than 0.96 for SCIAMACHY SSI and ISCCP-FD SDF. The evaluation results show that the SCIAMACHY SSI product achieves similar mean bias error and root mean square error as the surface solar irradiances derived from polar orbiting satellites with higher spatial resolution.