Geophysical Research Abstracts
Vol. 19, EGU2017-2153-5, 2017
EGU General Assembly 2017

A New Physical Model to Estimate Solar Irradiance Componets on the Earth's Surface from Satellite Images

Dr. Marco Cony, Dr. Ralf Wiesenberg, Irene Fernandéz, and Marta Jimenez
AF Aries Energía, Madrid, Spain (marco.cony@afconsult.com)

The present study describes a new model designed to estimate the incident solar radiation at the Earth's surface from geostationary satellites images (AFASat). In this new physical model proposed, the effect of Rayleigh scattering, aerosols and Earth's surface topography are taken into account. Water vapor absorption is also introduced by means of its climatological effects on shortwave radiation. Cloud albedo, ground albedo and absorption are derived from brightness measurements on the assumption that they both are linearly related to the brightness. However, this simple consideration applied to individual images elements represents quite accurately the bulk effect of clouds and reflectance.

AFASat model uses the Heliosat-3 method and add others environmental factors to estimate with relative precision the solar radiation that arrives at the Earth's surface. Comparisons with daily radiation measurements from ground data station located in Europe, Africa and India (BSRN) showed that the satellite estimates were, on the average, within 2% of the ground measurements for global horizontal irradiance and less than 7% for direct normal irradiance. The hourly variations monitored by the satellite also followed very closely the variations measured on the ground. This study has shown that model is sufficient for the determination of the incident solar radiation when the high spatial and temporal coverage of a geostationary satellite is used. The AFASat is highly appropriate for such those projects that required an analysis of the solar resource assessment as such as TMY report (Typical Meteorological Year).