Geophysical Research Abstracts
Vol. 13, EGU2011-4239, 2011
EGU General Assembly 2011

Short-term irradiance forecasting based on post-processing tools applied on WRF meteorological simulations

Angel Rincón (1,2), Oriol Jorba (1), Jose Maria Baldasano (1,2), and Luca Delle Monache (3)

(1) Barcelona Supercomputing Center, Earth Sciences, Barcelona, Spain (oriol.jorba@bsc.es), (2) Environmental Modelling Laboratory, Technical University of Catalonia, Barcelona, Spain, (3) Research Applications Laboratory, National Center for Atmospheric Research, USA

The increased contribution of solar energy in power generation sources requires an accurate estimation of surface solar irradiance conditioned by geographical, temporal and meteorological conditions. The knowledge of the variability of these factors is essential to estimate the expected energy production and therefore help stabilizing the electricity grid and increase the reliability of available solar energy. The use of numerical meteorological models in combination with statistical post-processing tools may have the potential to satisfy the requirements for short-term forecasting of solar irradiance for up to several hours to days ahead and its application in solar devices.

In this contribution, we present an assessment of a short-term irradiance prediction system based on the WRF-ARW mesoscale meteorological model and two post-processing tools in order to improve the overall skills of the system for an annual simulation of the year 2004 over Spain. The WRF-ARW model is applied with 4 km x 4 km horizontal resolution and 38 vertical layers over the Iberian Peninsula. The hourly model irradiance is evaluated against more than 90 surface stations. The stations are used to assess the temporal and spatial fluctuations and trends of the system in the northeast of the Peninsula evaluating different post-processes: Recursive statistical method and Kalman Filter Predictor Bias. Results using the Kalman Filter show an annual reduction of the RMSE in 8% and 83% of bias. The REC method shows an annual reduction of 2% of RMSE and 35% of bias. A previous evaluation of the WRF-ARW model without post-process shows significant errors in spring and summer greater than 4 MJ m-2 d-1. The evaluation shows an overestimation due to the lack of atmospheric absorbers different than clouds, e.g. aerosols, not considered in the meteorological model. When comparing stations at different altitudes, the overestimation is enhanced at coastal stations (less than 200m) up to 1000 W m-2 h-1. These results allow us to analyze the strengths and weaknesses of the irradiance prediction system and its reliability in the estimation of energy production from solar devices.