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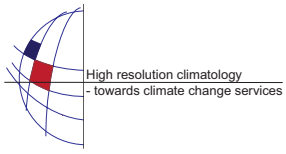

A stochastic post-processing method for solar irradiance forecasts derived from NWPs models

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Solar irradiance forecast is an important area of research for the future of the solar-based renewable energy systems. Numerical Weather Prediction models (NWPs) have proved to be a valuable tool for solar irradiance forecasting with lead time up to a few days. Nevertheless, these models show low skill in forecasting the solar irradiance under cloudy conditions. Additionally, climatic (averaged over seasons) aerosol loading are usually considered in these models, leading to considerable errors for the Direct Normal Irradiance (DNI) forecasts during high aerosols load conditions. In this work we propose a post-processing method for the Global Irradiance (GHI) and DNI forecasts derived from NWPs. Particularly, the methods is based on the use of Autoregressive Moving Average with External Explanatory Variables (ARMAX) stochastic models. These models are applied to the residuals of the NWPs forecasts and uses as external variables the measured cloud fraction and aerosol loading of the day previous to the forecast. The method is evaluated for a set one-moth length three-days-ahead forecast of the GHI and DNI, obtained based on the WRF mesoscale atmospheric model, for several locations in Andalusia (Southern Spain). The Cloud fraction is derived from MSG satellite estimates and the aerosol loading from the MODIS platform estimates. Both sources of information are readily available at the time of the forecast. Results showed a considerable improvement of the forecasting skill of the WRF model using the proposed post-processing method. Particularly, relative improvement (in terms of the RMSE) for the DNI during summer is about 20%. A similar value is obtained for the GHI during the winter.