Solar Power Forecasting System using WRF meteorological model

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In the field of Energy production, short-range forecast for period on the order of hours to days are necessary to smoothly run transmission and distribution systems, plan maintenance, protect infrastructure and allocate units. In particular, forecasting the renewable energy resources on a day to day basis enables integration of increasing capacities of these variable resources. Despite the potential for numerical weather prediction (NWP) models to produce accurate forecasts across time scales, current NWP models often do not provide the most appropriate quantitative forecasts for the solar energy industry. The Weather Research and Forecasting model (WRF) is the open-source worldwide most used meteorological model. Because weather predictions internally only require the global horizontal irradiance (GHI) for the model's energy budget, the direct normal irradiance (DNI) and diffuse (DIF) components are not commonly output to the user. GHI is much less sensitive to aerosol optical properties than DNI and DIF, and sometimes NWP models do not account for atmospheric aerosols in the radiative transfer equation. To solve this problem, a new version of WRF, called WRF-Solar, has been developed to making the model appropriate for solar power forecasting and comprise 1) developments to diagnose internally relevant atmospheric parameters required by the solar industry, 2) improved representation of aerosol–radiation feedback, 3) incorporation of cloud–aerosol interactions, and 4) improved cloud–radiation feedback. The model builds on the WRF modeling framework seeks improvement in GHI and DNI forecasts across a range of scales by blending different forecasting methods into a unified forecast. A field test to compare the observed and forecast DNI obtained by Solar WRF has been performed during last months in Sicily. Here we describe some specific WRF-Solar characteristics and present results characterizing the model performance during both clear-sky and

cloudy conditions.