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An application of a multi model approach for solar energy prediction in Southern Italy

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The accuracy of the short and medium range forecast of solar irradiance is very important for solar energy integration into the grid. This issue is particularly important for Southern Italy where a significant availability of solar energy is associated with a poor development of the grid.
In this work we analyse the performance of two deterministic models for the prediction of surface temperature and short-wavelength radiance for two sites in southern Italy. Both parameters are needed to forecast the power production from solar power plants, so the performance of the forecast for these meteorological parameters is of paramount importance.
The models considered in this work are the RAMS (Regional Atmospheric Modeling System) and the WRF (Weather Research and Forecasting Model) and they were run for the summer 2013 at 4 km horizontal resolution over Italy. The forecast lasts three days. Initial and dynamic boundary conditions are given by the 12 UTC deterministic forecast of the ECMWF-IFS (European Centre for Medium Weather Range Forecast - Integrated Forecasting System) model, and were available every 6 hours. Verification is given against two surface stations located in Southern Italy, Lamezia Terme and Lecce, and are based on hourly output of models forecast.
Results for the whole period for temperature show a positive bias for the RAMS model and a negative bias for the WRF model. RMSE is between 1 and 2 °C for both models.
Results for the whole period for the short-wavelength radiance show a positive bias for both models (about 30 W/m2 for both models) and a RMSE of 100 W/m2.
To reduce the model errors, a statistical post-processing technique, i.e the multi-model, is adopted. In this approach the two model's outputs are weighted with an adequate set of weights computed for a training period. In general, the performance is improved by the application of the technique, and the RMSE is reduced by a sizeable fraction (i.e. larger than 10% of the initial RMSE) depending on the forecasting time and parameter. The performance of the multi model is discussed as a function of the length of the training period and is compared with the performance of the MOS (Model Output Statistics) approach.

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