Predictability of Solar Radiation for Photovoltaics systems over Europe: from short-term to seasonal time-scales

Matteo De Felice (1), Marcello Petitta (2,3,4), and Paolo Ruti (1)

(1) ENEA, Energy and Environment Modelling, Roma, Italy (matteo.defelice@enea.it), (2) ENEA, UPRSE, Roma, Italy, (3) EURAC; Institute for applied remote sensing, Bolzano/Bozen, Italy, (4) Sapienza Innovazione, Roma, Italy

Photovoltaic diffusion is steadily growing on Europe, passing from a capacity of almost 14 GWp in 2011 to 21.5 GWp in 2012 [1]. Having accurate forecast is needed for planning and operational purposes, with the possibility to model and predict solar variability at different time-scales.

This study examines the predictability of daily surface solar radiation comparing ECMWF operational forecasts with CM-SAF satellite measurements on the Meteosat (MSG) full disk domain. Operational forecasts used are the IFS system up to 10 days and the System4 seasonal forecast up to three months.

Forecast are analysed considering average and variance of errors, showing error maps and average on specific domains with respect to prediction lead times. In all the cases, forecasts are compared with predictions obtained using persistence and state-of-art time-series models.

We can observe a wide range of errors, with the performance of forecasts dramatically affected by orography and season. Lower errors are on southern Italy and Spain, with errors on some areas consistently under 10% up to ten days during summer (JJA). Finally, we conclude the study with some insight on how to "translate" the error on solar radiation to error on solar power production using available production data from solar power plants.

[1] EurObserver, "Baromètre Photovoltaïque, Le journal des énergies renouvables, April 2012."