Data assimilation for improving short-range DNI forecasting

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Abstract

Solar panels and solar power plants are getting increasingly more popular. The amount of energy that can be obtained from solar power systems depends on incoming solar radiation, which in turn is highly related to the meteorological conditions, in particular clouds. Optimization and management of solar power plants and energy distribution systems can therefore benefit from accurate forecasts of cloudiness.

The HARMONIE-AROME km-scale forecasting system has been used to provide short-range forecasts of cloudiness, Global Horizontal Irradiation (GHI) and Direct Normal Irradiation (DNI). The impact of utilizing different data assimilation and initialisation methods have been investigated as well as the sensitivity to the use of satellite data in various forms. The studies so far has been carried out over a Southern-European domain with data from the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) onboard the geostationary Meteosat Second Generation (MSG) satellites. The future plan is to adopt our studies to a North-European domain where a combination of data from geostationary and polar orbiting satellites is necessary to obtain good coverage. Furthermore, the benefits from using an ensemble system for this application will be investigated.

Encouraging results regarding the use of cloud initialisation for short-range cloud forecasts will be shown for Southern-Europe, although needs for further improvements regarding the procedure applied are identified. As expected, the use of data from the SEVIRI instrument proved to be beneficial for data assimilation over this Southern domain where the geostationary MSG has good coverage and resolution.