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Comparison of the solar power production from different methodologies at a coastal Mediterranean site

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Solar radiation is a very complex input parameter to address several climatic, meteorological, and solar energy issues. In this preliminary study we compared the hourly solar power production using MSG SEVIRI (Meteosat Second Generation Spinning Enhanced Visible and Infrared) data products DSSF(Down-welling Surface Shortwave Flux), developed by LSA SAF(Land Surface Analysis Satellite Application Facility), and two weather forecast output models and PV-Plant measurements with Nominal Power Peak of 19,85 kWp. The PV Plant is situated at a coastal site in Calabrian region, RICADI (VV) (38,63 LAT, 15,85 LON). Solar radiation datasets are obtained from a satellite based product DSSF with spatial resolution of 3km and outputs of two weather forecast models. WRF (Weather Research and Forecasting) and Rams(Regional Atmospheric Modeling System) are the adopted models running operatively with a 3Km horizontal resolution. Both DSSF and model outputs are extracted at Latitude and Longitude previously defined. We estimate production, and its curve, by using input solar radiation of Satellite data, with the same characteristic of the PV–plant, and the solar radiation predicted of two forecast models. Comparison of measured and simulated energy reproducibility are investigated. The solar radiation performance and accuracy are evaluated for datasets segmented into clear and cloudy sky atmospheric conditions. The RMSE and BIAS for hourly averaged solar electrical reproducibility are estimated including clear and sky conditions and snow or ice cover. Comparison between energy reproducibility by using DSSF product, output of two weather forecast model and PV plant measurements, made over the period October 2013-June 2014, showed a good agreement in this costal site and we demonstrated that the forecast models generally overestimate solar radiation, and so, overestimate the electrical reproducibility from a PV-plant.

Keywords: Solar radiation, Solar Power production , Remote sensing data, MSG- SEVIRI, Weather forecast model, WRF model , RAMS model, Coastal zone.