



Verification of sectoral cloud motion based global and direct normal irradiance nowcasting

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The successful integration of solar electricity from photovoltaics or concentrating solar power plants into the existing electricity supply requires an electricity production forecast for 48 hours, while any improved surface irradiance forecast over the next upcoming hours is relevant for an optimized operation of the power plant. While numerical weather prediction has been widely assessed and is in commercial use, the short-term nowcasting is still a major field of development. European Commission's FP7 DNICast project is especially focusing on this task and this paper reports about parts of DNICast results.

A nowcasting scheme based on Meteosat Second Generation cloud imagery and cloud movement tracking has been developed for Southern Spain as part of a solar production forecasting tool (CSP-FoSyS). It avoids the well-known, but not really satisfying standard cloud motion vector approach by using a sectoral approach and asking the question at which time any cloud structure will affect the power plant. It distinguishes between thin cirrus clouds and other clouds, which typically occur in different heights in the atmosphere and move in different directions. Also, their optical properties are very different - especially for the calculation of direct normal irradiances as required by concentrating solar power plants. Results for Southern Spain show a positive impact of up to 8 hours depending of the time of the day and a RMSD reduction of up to 10% in hourly DNI irradiation.

This paper will especially look into the verification of this scheme at other locations in Europe and Northern Africa (BSRN and EnerMENA stations) with different cloud conditions and for both global and direct irradiances. This is motivated by the use of the scheme not only in concentrating solar power plant forecasting tools, but also for the nowcasting of global irradiances in a smart grid environment at a regional utility and therefore on the local transformer scale (ORPHEUS project of European Commission in the FP7 programme). Also, it will look into a better temporal resolution of nowcasts - this is driven by user requests which firstly asked for hourly nowcasts only in the grid integration of concentrating solar power, but asking now for higher temporal resolution once the power plants are operating and more experience is available on operation scheme alternatives.