



Towards the Application of Aerosol Forecasts in Energy Industries

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In order to raise the effectiveness of renewable energy production and to integrate the solar energy sector into existing power supply systems, reliable near-real-time predictions of direct and global solar irradiance are needed for calculating 1-3-day forecasts of facility yields. Irradiance forecasts are also needed when calculating consumer demands, an essential aspect in controlling both traditional and solar energy power plants.

Precise aerosol information is indispensable to provide accurate clear sky irradiance forecasts. In order to demonstrate the importance of detailed aerosol information, direct irradiance derived from AERONET (Aerosol Robotic Network) ground based measurements of aerosol optical depth (AOD) was compared to irradiance calculated using a standard aerosol setting in a case study over Europe. The analysis shows an underestimation of measurement-derived direct irradiance by the standard scenario-derived direct irradiance for locations in Northern Europe and an overestimation for the Mediterranean region.

Forecasted AOD of the EURAD-System (European Dispersion and Deposition Model) was validated against ground based AERONET AOD measurements for a test period of 15.02. - 22.02.2004. To quantify the effects of varying levels of AOD in their impact on the application in solar energy industry, measured and forecasted AOD were used to calculate and compare spectrally resolved direct, diffuse and total irradiance. For the time period analysed the modelled AOD forecasts of the EURAD-MADE-System slightly underestimated ground based AERONET measurements by -0.07 . This results in a mean overestimation of direct irradiance, whereas diffuse irradiance is generally underestimated. Global irradiance values where direct and diffuse

irradiance errors compensate are very well represented. A regional dependency is obvious: differences between modelled and measured AOD in Northern Europe mostly yield overestimations of AOD and an underestimation of direct irradiance, whereas the situation in Southern Europe is generally the opposite.