



Application of Aerosol Forecasts for Solar Energy Industries

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To raise the efficiency of renewable energy production and to integrate the growing solar energy sector into existing power supply systems, reliable predictions of solar irradiance are needed for 1-3-day forecasts of energy yields and consumer demands.

Accurate information about clouds, aerosols and water vapour is necessary to calculate ground level irradiance. While water vapour forecasts are already performed with classical weather models, prediction of aerosol distribution is still a matter of research. Especially in mostly cloud-free regions, which are of special interest for larger solar energy facilities, aerosol forecasts are of great importance to obtain accurate irradiance predictions. As first test approach we selected the MM5-based EURAD chemistry-transport model (European Air Pollution Dispersion Model, developed by the University of Cologne for air quality monitoring purposes), which predicts aerosol distributions distinguishing between many different species.

In a case study forecasted AOD (aerosol optical depth) based on the EURAD system was validated with ground based measurements for July-Nov 2003 in Europe. Results show slight underestimations of AOD in summer and in southern Europe. However, they remain within accuracy requirements for input data of irradiance calculations.

Using these forecasted aerosol loads and additional atmospheric information from satellite and models, irradiance values were calculated via the radiative transfer routine libRadtran (library of radiative transfer). The results were then compared to ground and satellite based irradiance measurements. Several examples will be presented.