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Application and verification of the NMMB/BSC-CTM forecast for solar energy

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In the beginning of April 2014, northern Europe was affected by a mineral dust intrusion. On 4 April 2014, the power prediction for German solar installations was estimated as 21 GW, whereas the measured power production merely reached 11 GW. This strong overestimation significantly affected the hourly price in the wholesale electricity market: prices were firstly assessed at around 27 € /MWh but rapidly reached a level close to 150 € /MWh after recognizing the lack of solar output.

It has been found that a large proportion of the uncertainty of existing NWP models can be attributed to the lack of accurate aerosol data used in order to model solar radiation. Despite the advancements in the modelling of aerosol-cloud interactions, current meteorological models use parameterizations made mostly for climate considerations (generally monthly-based).

In this contribution, we analyse model results of the direct radiative effect of mineral dust over Germany at the beginning of April 2014. For that, the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM) is applied on a regional domain at 0.1° horizontal resolution. The NMMB/BSC-CTM is a new on-line chemical weather prediction system coupling atmospheric and chemistry processes. In the radiation module of the model, mineral dust is treated as a radiatively active substance interacting both short and longwave radiation. The impact of the mineral dust outbreaks on meteorology is discussed by comparing model forecasts meteorological observations. The analysis focuses on the performance of the NMMB/BSC-CTM to simulate the radiative effects of a mineral dust intrusion far from source regions. Model results would help to illustrate the added value of on-line models for long term analysis of solar resource. On-going developments: integration of anthropogenic sources and implementation of indirect radiative effects will be also presented.