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Can chemical transport models improve global horizontal irradiance forecasts?

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The prediction of global horizontal irradiance (GHI) using numerical weather prediction (NWP) models is well established and used method for GHI forecasting. Error of such a forecast consists from error of the prediction of weather situation (e.g. misrepresentation of cloud cover) and from errors and simplifications used for the parameterization of the atmospheric shortwave radiation processes. Additional statistical postprocessing can help to mitigate these types of errors and further improve the forecasting skill of a GHI prediction. Our goal is to investigate if further improvement can be achieved using additional information from chemical transport models. The GHI is affected by the atmospheric composition but it is unclear whether the skill of chemical transport models is sufficient to bring an improvement to a GHI forecast which can be explained by better description of the physical processes. Our approach is to start by the investigation of statistical relationships between the relevant chemical species (e.g. aerosols) and GHI forecast error and testing if we can get improved forecast by inclusion of the chemical parameters.
We compare the global horizontal irradiation simulations from WRF ARW version 3.5.1 in five nested domains covering the Czech Republic (27 km, 9 km, 3 km, 1 km and 1/3 km horizontal resolution) to the irradiation data from pyranometers located in the Czech Republic. Air pollution simulations from CMAQ 5.0.1 are explored in order to improve the irradiation forecast. In particular we consider the dry aerosols PM 10 and PM 2.5, water aerosol and possibly other variables. We will also try to identify the types of weather causing the high errors of irradiation forecast.