



Impact of direct aerosol effect parametrization on short term weather forecast

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Analysis of the impact of direct aerosol effect on the short-term meteorological forecast allows not only to better understand the nature of individual aerosol episodes and their impact on the local environment and climate. But also, it can reveal uncertainties in the models, therefore it can lead to improvements of product quality of the forecast.

Research carried out in the scope of this work, was based on the GEM-AQ model forecast. This model uses the aerosol module, on the basis of which an optical module was developed, allowing to determine the spatial distribution of aerosol optical depth values.

The case studies included three aerosol episodes that were observed over the area of Poland, between 2015 - 2017. The first episode, 09-10.08.2015, was related to the inflow of aerosols of organic origin. The second, 03-04.04.2016, concerned the inflow of Saharan dust. The last one represented a typical Polish smog situation that occurred on 09-10.01.2017. As part of the research, simulations with and without the use of an optical module were performed. For the reference data, ECMWF ERA5 reanalysis was chosen. The analysis covered three forecasted meteorological parameters: irradiance flux, temperature and pressure. The results are presented in the form of difference field maps (grid to grid).

Also, in order to better understand the effect of a direct aerosol effect on the short-term forecast, additional statistical analysis was performed for the areas where the highest optical depth values were observed.

Highest impact of implementation was observed for short wave irradiance. Highly visible in all three episodes. Minor improvement in forecasted temperature, especially visible in the second episode. The lowest improvements (occurred locally) were observed in forecasted near surface pressure.