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Comment

Interactive comment on “Evaluation of the GEM-AQ model in the context of the AQMEII Phase 1 project” by J. Struzewska et al.

Anonymous Referee #3

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General comments

The paper presents an evaluation of the advanced and comprehensive air-quality model system GEM-AQ. The model has been run over Europe for the year 2006 at a horizontal resolution of 0.2 deg., and results are given for surface concentration values of ozone and PM10. Verification is carried out for the maximum 8-hour running average zone concentration and daily mean PM10 concentration against station data.

The paper is scientifically interesting, thorough and well written. Publication is recommended after minor revision.

Specific comments

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The measurement stations used are grouped as rural, suburban or urban stations. However, the horizontal resolution of 0.2 deg. is somewhat coarse and unable to resolve most urban features, and therefore the urban stations should probably not have been included in the data set used for verification. I encourage that either these stations be left out of the presented evaluation results, or in case the authors can argue that the urban stations selected are not influenced much by unresolved urban features this should be explained in the paper.

In section 1 Introduction, it is described that air-quality results from the previous day is used as initial conditions for the air-quality module. Since there is no air-quality data assimilation in the model system, this procedure implies a risk of bias. The authors are encouraged to comment on this.

The air-quality model is implemented on-line with the meteorological model used, which is indeed admirable. However, I find that only little description is devoted to the meteorological part of the model, e.g. procedures for meteorological data assimilation and initialization, and I would recommend including additional information on these matters.

An integration time step of 600 s is used. It would be nice with a discussion of this value which I find somewhat large.

The verification is limited to 8-hour running average ozone concentration and 24-hour PM10 concentration. However, in order to represent the diurnal cycle, and especially the afternoon ozone peak on warm summer days, the authors are encouraged to show also verification results at higher temporal resolution, e.g. hourly average concentrations, or at least include a discussion on this issue in the paper. This applies also to other local air-pollution episodes.

At many places, verification results are given with four significant digits, e.g. MAGE $16.53 \mu\text{g}/\text{m}^3$. Considering the inherent model uncertainties, I recommend reducing the accuracy with which such values are given.

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In section 4.1 Ozone it is speculated that transport of ozone from the upper troposphere might be too weak at high latitudes, but then it is also stated that analysis of effects of the vertical structure is beyond the scope of the study which focuses on surface concentrations only. I agree that three-dimensional aspects of air-quality modelling can be essential for air-quality modelling, and accordingly I think that this deserves more discussion. I assume that there is a background for the authors' suspicion?

In section 5 Summary and Conclusions, it is concluded that the variability of air-pollution species depend on regional climate. Since "climate" is generally understood as long-term averages such as over 30 years, the current study of only one year (2006) is not sufficient for such a deduction. See also last sentence of the abstract.

Technical corrections

Section 3.1.2 Temporal variability of ozone concentrations Define "J-values".

Section 3.2.1 Spatial distribution of PM10 concentrations P. 10, line 9: "(...) except for of eastern Germany (...)" => "(...) except for eastern Germany (...)".

Section 5 Summary and Conclusions MBE values are given without units. Please correct. P. 18, lines 6 and 12: Add comma "," after "Pearson correlation" to enhance readability. P. 18, line 17: I suggest replacing "viable" with e.g. "possible". P. 18, line 20: I suggest replacing "explanation" with e.g. "investigations".

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 1471, 2015.

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