

## ***Interactive comment on “Influence of anthropogenic emissions and boundary conditions on multi-model simulations of major air pollutants over Europe and North America in the framework of AQMEII3” by Ulas Im et al.***

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We would like to thank the reviewer for the careful read of the manuscript positive feedback. Below, we reply to the comments from the reviewer:

Comment: - Table 1. You are ordering runs according to groups, not according to models. After a more thorough look many of the groups use the same model, sometimes even on the same resolution. What is the use of an ensemble of groups running the same model? Ideally this should give exactly the same results unless someone makes

C1

an error or the model version is different. - Linked to the previous bullet: you end the conclusions with raising the issue of the impact of different model parameterization. However, you do not include such information. You should include a description of important model facts and add a discussion on these linking them to your results. - Based on this information, perhaps some model runs should be removed from the ensemble (too many of the same model? Too simple parameterizations for some species?). Response: We have now updated and extended Table 1, providing more information on the mode specific spatial and vertical resolutions as well different chemistry and aerosol mechanisms. We have also added more information on the differences between the versions of the same models (e.g. CMAQ and WRF-Chem) by each group (Lines 152-170). The models or the versions of the same models differ from each and therefore, we think model removal is not necessary.

Comment: In the abstract you describe daily maximum 8h mean ozone. Is this what you show and evaluate in the tables and figures? Or is it monthly/annual means? You need to clarify this (in all figures/table legends as well as in the methods) or (/and) only include results in the abstract which you are actually showing as results in figures/tables. Response: The model evaluation is based on monthly means, as described in the beginning of section 3.1. and the cation of Table 3 and the captions of Fig. 1 and 2. We have calculated the impact on daily maximum 8hr O3 in order to show a policy impact of these reductions.

Comment: The RERER value analysis is interesting. It would be of great value if you describe the ozone RERER value based on monthly values (daily max 8h mean or mean), since ozone formation capacity/local contribution is seasonally dependent. Perhaps you can come up with a smart way of illustrating these rather than just adding more table values. - I don't see the point of showing figures 11 (GLONAM-BASENAM) to 14 (EUREURBASEEUR). I would much rather see geographically resolved RERER values as a complement to the other figures. Response: We thank the reviewer for his interest in the RERER analyses and we agree that is can be more emphasized in

C2

the paper. Therefore, we have now, as suggested by the reviewer, produced spatial distribution maps for O<sub>3</sub> and PM<sub>2.5</sub> (Fig. 17) as well as monthly time series of the response for these pollutants (Fig 18) and added discussions on these results (Lines 578-606). On the other hand, we would like to keep Figs 11 and 14 to be consistent in the flow.

Comment: Line 221-224. The method of first taking difference then calculating mean is only valid if you are working with means. How do you treat the daily maximum 8h mean? Is the method valid for this metric (if that is what you are showing in the figures for ozone). Response: The figures and tables only show the differences in monthly and annual means of the pollutants. Daily maximum 8hr ozone is only presented in the text as an additional information. As written in the text, we look at the difference in the mean of daily maximum 8hr ozone, but these are not presented in tables or figures.

Comment: Table 1. The number of simulations (scenarios) is different when comparing the table to the method text (for Europe). An x is missing in the table (grey area for north America-region). Response: We thank the reviewer for the careful read. We have now corrected these.

Comment: Table 3. You state unit: % for NMB and NMGE, but the values in the table are clearly without unit. You should not have different units for North America and Europe (for RMSE in this case). Response: We agree with the reviewer and we have now corrected the units in Table 3 caption.

Comment: You have a supplement but you do not refer to it in your manuscript. Response: We thank the reviewer for pointing out this missing part. We have now referred to the supplement in various parts of the manuscript (Lines 194, 418-419, 520-521).

Comment: The figure legend of S3 is incorrect. Response: We have now corrected the figure caption.

Comment: Section 2, first paragraph is messy and repetitive. Response: We have now

C3

reorganized this paragraph (Lines 171-190).

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1231>, 2018.

C4