

Interactive comment on “Gaseous chemistry and aerosol mechanism developments for version 3.5.1 of the online regional model, WRF-Chem” by S. Archer-Nicholls et al

Anonymous Referee #1

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General remarks

The paper describes the implementation a new gas phase chemistry mechanism, an improved parameterization of N_2O_5 heterogeneous chemistry, and new sea spray emissions parameterization for WRF-Chem.

The material presented by the authors is original and sufficiently interesting for a publication in GMD. Although I have no objections against the content of the paper at all, I suggest substantial revision of the paper before the publication in GMD.

First of all, at least a minimum of evaluation of the new scheme against observations is absolutely mandatory in this paper. This applies in particular as the simulation was

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conducted as part of a measurement campaign. Just referring to an unpublished companion paper is definitely not sufficient. Discussion of the model evaluation will also enhance the scientific discussion of the results. Generally, a more in depth discussion of the results seems desirable.

In addition, the authors might consider some minor reorganization of the paper as indicated below. In particular the discussion of the results of the improved marine aerosol emissions seems to have no connection with the main topic of the paper.

Specific remarks

Title of the paper: Be more specific about the scientific topic of the paper or about the implemented mechanism. The additions to WRF-Chem have been implemented in order to achieve some scientific goal. This should also be reflected in the title. On the other hand, it is not necessary to mention the version of WRF-Chem already in the title.

Abstract: Why do the improvements you made make WRF-Chem ‘more suitable’ for the mentioned purposes?

Introduction: The first three paragraphs (until ‘... solved separately’) are true, but there is no relationship to the content of the paper. I suggest removing these paragraphs.

2.3 Marine organic aerosol This issue must be either related more closely to the main topic of the paper. Alternatively, the subject of the marine aerosol could be removed from this paper and be addressed in another short paper in more detail.

4 Analysis of model results: Please add some comparison with observations

First line of 4.1: Please specify ‘very well’.

P. 893, line 20,21: ‘This added NO_3 is likely due to the faster rate of ...’ This can be easily tested. Please discuss the results of a sensitivity study Page 894, lines 6 ff. age 895, lines 10 – 15: These pieces of text just summarize common knowledge and

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obvious features. Looking into regional effects and discussion of a model evaluation against measurements could add to a in depth discussion of the impact of the new implementations on the model results.

4.4. Marine aerosol emissions See my comment on 2.3

Figure 3: It is hard to recognize anything on these stamp-like figures, unless they are enlarged to 200

Figures 8 and 9: The quality of these figures is very poor. A height scale is missing and opacity does not show. I suggest replacing the VAPOR figures.

Interactive comment on Geosci. Model Dev. Discuss., 7, 871, 2014.