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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of tropospheric chemistry schemes for use within global models" *by* K. M. Emmerson and M. J. Evans

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We thank reviewer #1 for their enthusiastic and helpful comments. We address their comments in turn.

Comment 1. S19279 Page 19962 Is this another simplification to ensure that the gas phase schemes themselves are correct?

We have not included heterogeneous reactions in our comparison as the models differed greatly over their representation of these reactions and we wanted to focus our attention on the gas phase chemistry. The reviewer is correct that our first conclusion is somewhat dependent on this assumption. Had we included a heterogeneous phase uptake of N2O5 we would have been less sensitive to this gas phase reaction. However

it is important to note that models which have not included heterogeneous chemistry but have included a gas phase N2O5 + H2O reaction have probably been getting a reasonable representation of NOx concentrations for the wrong reason.

We add these lines to the conclusions.

P 19972 L 16. "This is to some extent a result of our gas-phase only model simulations. If we had included the heterogeneous sink of N2O5 the simulation would appear less sensitive."

Comment 2. S102080 Page 19962.

We agree with the reviewer in that differences may occur if the model runs had been started at noon and such differences may over-emphasize the importance of the night time chemistry. We included the following sentences:

P 19963 L 5. "It should be noted that initializing the model at midnight may emphasise the importance of night time chemistry and this is discussed later in the paper."

P 19970 L 11. These are most significant for the biogenic cases. "As the simulations are initialized at midnight they may tend to overestimate the differences between the model's night-time chemistry, however, these differences exist between the schemes and appear significant."

Comment 3. S102080 Page 19967

We agree that the removal of the N2O5+H2O reaction removes all hydrolysis, and thus extends the NOx lifetime. We include the following sentence

P 19962 L 16. In order to provide a consistent assessment, we have switched off all heterogeneous chemistry. "This will tend to increase the lifetime of NOx in the simulations due to the removal of N2O5 hydrolysis which is a significant sink for NOx (Dentener et al., 1993) however as our objective is a consistent evaluation of the gas-phase schemes this is not a significant problem."

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We also change the title of the paper to "Comparison of tropospheric gas-phase chemistry schemes for use within global models"

Comment 4 S102080 Page 19969.

We agree with the reviewer that the chemistry of isoprene in complex and badly defined. However, the objective of this paper is not to provide any solution to this problem rather to show the range of solutions that the global modelling community are using. A more extensive study of the chemistry of isoprene and its representation in models is obviously suggested by this study.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 19957, 2008.

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Interactive Comment