Atmospheric
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Discussions

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**Interactive
comment**

Interactive comment on "A Parameterization of Heterogeneous Hydrolysis of N$_2$O$_5$ for 3-D Atmospheric Modelling: Improvement of Particulate Nitrate Prediction" *by* Ying Chen et al.

Anonymous Referee #1

Received and published: 16 April 2017

Chen et al. have studied a new parameterization of heterogeneous hydrolysis of N2O5 within a 3D model over Germany. Clear improvement of using this parameterization with respect to original parameterizations is shown by comparing against measurements. Sensitivity tests have been performed to study the effect of NH3 emission, reaction constant and organic coating. The paper is well structured and easy for reading. It is recommended for publishing with minor revisions.

General Comments:

The measurement data used to evaluate the model performance are based on 24h filter sampler, but it is interesting to know the detailed temporal evolution at least in the model and have some discussion on the uncertainties related to NOx and N2O5 pre-

diction. This new parameterization of heterogeneous hydrolysis of N2O5 established from many previous laboratory experiments improves the prediction, but large gaps still exists between the model results and the measurement at all stations. Among the reasons given in section 3.1,how about the kN2O5 calculating with overestimated nitrate and what about its impact on the simulation?

Specific Comments:

1. P6, line 27, "is considered as 1.3 times of sulfate mass concentration", does this mean sulfate is not explicitly simulated in the model? What can be the "positive feedback" on line 29?

2. Table 1, SSA abbreviation is not introduced

3. P8, line 5: RH and wind speed have relatively important biais with respect to the measurement on 15-17 and 20-23 during the night. It should be discussed their relative impact on simulation results.

4. P8, line 20, Are the factors calculated based on average concentration during the campaign?

5. P8, line 22, is the 20-30% overestimation due to NH3 overestimation a conclusion from previous study?

6. P8, line 29, please quantify "significant"

7. P8, line 38, what does it mean "higher temporal resolution"

8. Figure 3, the shade cannot be clearly seen

9. Figure 4, why Melpitz is pointed in red?

10. P9, line 30, please quantify "more reasonable".

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2017-105, 2017.