

Interactive comment on “Heterogeneous N₂O₅ reactions on atmospheric aerosols at four Chinese sites: Improving model representation of uptake parameters” by Chuan Yu et al.

Anonymous Referee #2

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Review of “Heterogeneous N₂O₅ reactions on atmospheric aerosols at four Chinese sites: Improving model representation of uptake parameters” This study developed an improved observation-based parameterization of N₂O₅ uptake coefficient and showed that the new parameterization improved the simulation results of NO₂ and NO₃⁻ by the WRF-CMAQ model. The manuscript is generally well written. I think that it can be considered for publication after the authors address the following comments and suggestions.

1. Please clearly indicate the scope of application of the new parameterization. Is it applicable to China only or the whole world? I suggest that you apply the parameteri-

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zation to all the sites shown in Fig. 3 to examine how it performs in other regions of the world. Even within China, please comment on whether the five sites used in this study are representative of China's general environmental conditions.

2. You only evaluated the CMAQ simulation results against NO₂ and NO₃- observations. Since you made many N₂O₅ and ClNO₂ measurements in this study, I strongly suggest that you also compare the simulation results with these data to better evaluate the performance of the new parameterization in CMAQ. In fact, I think the evaluation results of N₂O₅ may more directly reflect the performance of the N₂O₅ uptake parameterization.

3. Line 246-249: Your modeling domain covers the whole China and this sentence implies that you do have observational data in southern China. In this case, it looks strange that you only evaluated the simulation results over the North China Plain. I suggest that you provide a quantitative evaluation in southern China rather than just a speculation here.

4. Line 130-132: Although the detailed configuration of CMAQ has been described in a previous paper, I think it is still helpful to briefly describe some key configurations, especially those related to NO₂/N₂O₅/ClNO₂/NO₃- chemistry.

5. Fig. 2d: Obviously the curve does not fit the data points well. Could you justify why you select this formula?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-1039>, 2019.

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