

Interactive comment on “Effects of organic coating on the nitrate formation by suppressing the N₂O₅ heterogeneous hydrolysis: A case study during wintertime in Beijing-Tianjin-Hebei (BTH)” by Lang Liu et al.

Anonymous Referee #2

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This paper presents the implementation of N₂O₅ hydrolysis on organic-coating particles in WRF-Chem, and analyzes the impact of such implementation on the simulation of nitrate and other aerosol particles. Overall, nitrate concentration is reduced due to this newly-added pathway for N₂O₅ heterogeneous hydrolysis.

While the parameterization for N₂O₅ hydrolysis on organic-coating particles is not new, it appears that this paper is among the first to add this parameterization into WRF-Chem. I recommend the paper to be published after addressing the following comments.

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Discussion paper



During the study time period of Feb 10 to Feb 26, there were multiple times that RH values are below 40% (especially during daytime). For sulfate particles at least, their phase is regulated by the hysteresis loop - solid sulfate will not become liquid until RH is above 80% and liquid sulfate particle will not become solid until RH is below 40%. Hence, there is another possible pathway to suppress N₂O₅ hydrolysis - that is - the inorganic particles can be in solid phase even without organic coating. Authors should at least mention how the particle phases are treated in the model? Are all sulfate particles in aqueous phase? And discuss additionally possible pathway. The following paper is recommended for the discussion. Wang, J., A. A. Hoffmann, R. Park, D. J. Jacob, and S. T. Martin, 2008. Global distribution of solid and aqueous sulfate aerosols: effect of the hysteresis of particle phase transitions, *J. Geophys. Res.*, 113, D11206.

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