

Interactive comment on “Global modeling of heterogeneous hydroxymethanesulfonate chemistry” by Shaojie Song et al.

Anonymous Referee #3

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This manuscript presents a global modeling study of heterogeneous chemistry of hydroxymethanesulfonate (HMS) using the GEOS-Chem model. Recently HMS has been detected in a few measurement studies and its concentrations could reach several micrograms per cubic meters. The current study incorporates HMS chemistry into a three-dimensional chemical transport model and shows the spatial and seasonal variations of the modeled HMS. It discusses the major factors, including emission, decomposition, oxidation and pH calculation, leading to the modeled patterns of HMS, which can be referred to the parameterization of other liquid phase reactions. Overall, this manuscript is very well written and should be published in this journal after addressing a few minor revisions as listed below. 1. There is a measurement paper by Wei et al. recently published (doi:10.1021/acs.estlett.0c00528). They measured HMS in

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Beijing using two analytical methods (ion chromatography and UHPLC-LTQ-Orbitrap mass spectrometry). This paper should be mentioned in the introduction and comparison should also be made with the model results. 2. The authors reported the simulated pH in cloud water. What is the simulated pH in aerosol water? 3. P2L6: What is the major source of dimethyl sulfide DMS? 4. P2L10: Can the authors comment on the relative importance of other hydroxyalkylsulfonate compounds? 5. P9 R27, R28: There is a recent paper by Wang et al. (www.nature.com/articles/s41467-020-16683-x) discussing the fast oxidation of SO₂ by NO₂ and HONO. Are the reaction rate constants comparable to this study?

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