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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mapping the drivers of uncertainty in atmospheric selenium deposition with global sensitivity analysis" *by* Aryeh Feinberg et al.

Anonymous Referee #1

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General comments:

This paper represents an excellent uncertainty analysis of simulating the atmospheric chemistry and deposition of Se species. The uncertainty analysis is thorough, fully described, and discussed in detail. The authors recommend, based on this analysis, that the highest leverage point in uncertainty reduction in future work is the quantification of emissions of Se because the output of highest interest is deposition to agricultural soils. This is a relevant conclusion, and it is supported by the results. Overall, the quality of this paper is high and it is satisfactory in all aspects.

Specific questions:

While it is likely not a factor for the main conclusions, the boundary conditions for the model represent the year 2000. How might inter-annual differences or recent trends in these assumed conditions propagate to outputs like atmospheric Se lifetime? For example, via particle abundance, meteorology, etc.

In the absence of better information, the authors scale Se emissions spatially using the spatial distribution of S emissions. This is certainly a reasonable starting point. Given the large uncertainties in emissions magnitudes, how would the spatial uncertainty in S:Se ratio compare? The authors mention that the magnitude and spatial distribution of emissions are the most important uncertainties to constrain, but how do those two compare to each other?

The reactions modeled are assumed to have no temperature dependence (rates for 298K used). Most of the atmosphere, however, is significantly colder than this. How would the unquantified temperature dependence affect the given results?

The range of photolysis frequencies are scaled from 0-2 times with a uniform distribution. Photolysis frequencies in general vary substantially between chemical species; why are these rates treated on a relatively narrower range than the reaction rates, which do vary over orders of magnitude?

Technical corrections:

None

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