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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The sensitivity of the oxygen isotopes of ice core sulfate to changing oxidant concentrations since the preindustrial" *by* E. D. Sofen et al.

Anonymous Referee #3

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Sofen et al., present simulation results by the GEOS-Chem global atmospheric chemical-transport model to study sensitivity of D17O value of sulfate aerosols to preindustrial oxidant levels. The model was initially fit to produce values measured for present day to derive key parameters (pH of rainwater, metal catalyst levels) and then modeled for preindustrial D17O-sulfate. No reliable proxy exists for the past oxidant levels and D17O-sulfate may provide a robust estimate for this important parameter. It appears, however, that the conclusion of this paper would be that the D17O of sulfate is not only a function of O3 levels but also very sensitive to pH and metal catalyst levels.

Introduction seems a bit thin and could improve a bit in defining the existing problems

and challenges the paper will explore. It appears that one can discuss, in the introduction, that D17O record is not straightforward because despite of O3 increase from PI to PD, D17O decreased in both Greenland and Antarctica from PI to PD. This is opposite from what one expects for a linear response to O3 level.

The paper concludes that the decrease in pH and increase in metal catalyst counteract increased O3 level. From this observation alone, it appears that the D17O of sulfate is probably the most sensitive to metal catalyst loading or pH (NOx and SO42-) of the rainwater than oxidant levels.

I am slightly confused with the logic in the abstract. "The modeled D17O-SO4 is consistent with measurements. . .." Was the model fit to the observation using free parameters (i.e., pH and metals?) to generate consistent D17O values?

The last sentence in the abstract may need more explanation.

The manuscript does not clearly state sensitivity of D17Osulfate for oxidant levels as title suggests. It appears it would be a very powerful proxy if one could constrain the rainwater pH.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20607, 2010.