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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of the physical state of tropospheric ammonium-sulfate-nitrate particles on global aerosol direct radiative forcing" *by* S. T. Martin et al.

S. T. Martin et al.

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J. Heintzenberg has provided two opinions, and we are pleased to respond with our own views.

>>The ms rests heavily on a manuscript in preparation (Park et a.l., >>2003). I find this unacceptable.

The mass loading results for sulfate, nitrate, and ammonium (the topic of Park et al.) are similar to previous global modeling results (cited in manuscript and discussed on pages 5407-12). The manuscript provides a brief introduction to the model (pages 5406-7). Furthermore, a validation of predictions against measurements, as relevant to phase transitions (viz. the composition [X,Y] of the aerosol), is given on pages 5410-11 and Figure 6.

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Park et al. provide the sulfate, nitrate, and ammonium burdens for this manuscript. We decided not to duplicate the model description in this manuscript because it is not necessary for our application on phase transitions and in fact would dilute the manuscript's focus. Instead of mass loading, in this manuscript we focused on what is new and important relevant to phase transitions for global aerosol direct radiative forcing.

>>A prognostic treatment of RH is likely to eliminate most of the >>reported LS/US contrast in aerosol effects.

The accuracy of the adverb "likely," as used in J. Heintzenberg's opinion, cannot be evaluated because such work at a level equivalent to our treatment of phase transitions has never been completed. A summary of earlier work is provided on pages 5404-5.

In section 7 of the manuscript, we discuss several factors affecting the accuracy of our calculations. Therein, we state: "Aerosol phase is treated through contrasting assumptions of US and LS behavior, rather than by a prognostic treatment of RH history, which suggests our delta-forcing-US/LS values are upper limits." There are additional factors affecting delta-forcing-US/LS in the other direction (i.e., as a lower limit). Rather than repeat the manuscript, we suggest the reader refer to section 7.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5399, 2003.