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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global 2-D intercomparison of sectional and modal aerosol modules" *by* D. K. Weisenstein et al.

Anonymous Referee #2

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This paper tests 2 versions of sectional and 3 versions of modal aerosol modules calculations on sulfate aerosol physical properties in a global 2-D sulfur model setting. This work expends from previous box model intercomparisons by the same group. The comparisons are well conducted and helpful recommendations are made. However I do have some comments about the weaknesses and recommend minor revisions.

1. In the introduction, the authors explain the necessity of modeling aerosol mcrophysics for troposphere and stratosphere together in a 3-D model like GMI, which seems a justification of this work which grows out from the box model. However, this study does not use a 3-D model but a 2-D, and does not realistically deal with the troposphere at all. It should clearly narrate why a 2-D model is used instead of 3-D, and what we can learn from the 2-D study in the future 3-D applications. I wonder why the

GMI 3-D model is not used.

2. Page 1, bottom: “More recent modelsĚ” but Whitby et al., 1991 is not more recent than Penner et al. 2001, 2002. I know this reference is for the modal representations, but the actual recent tropospheric aerosol models uses this representation should be referenced.

3. Page 2, about “non-sulfate particles are not important in much of the stratosphere”: Recent studies (e.g., by M. Fromm) have shown that biomass burning in the boreal regions can inject smoke aerosol into the stratosphere that sometimes could be mis-identified as “volcanic aerosols”.

4. Page 5 and Figures 4 and 5: I don’t understand why “total sulfur” is used here. Sedimentation only applies to particles, not gases. It seems to me that plotting the total sulfur is meaningless other than making the difference a little smaller.

5. Page 5, 2nd last paragraph and Figure 5b: The definition of this % should be clarified. Is this the relative percentage if the percentages, e.g., (delta AER/AER)/(delta UM/UM), or is it (delta AER/delta UM)?

6. I suggest use the same color convention through out the figures for consistency. For example, red line for AER40 for all relevant figures.

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