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Atmospheric Chemistry and Physics Discussions

Interactive comment on "MATRIX (Multiconfiguration Aerosol TRacker of mIXing state): an aerosol microphysical module for global atmospheric models" *by* S. E. Bauer et al.

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First of all we would like to thank Jeff Pierce and an anonymous reviewer for their constructive comments. As we followed basically all their suggestions to improve the manuscript, we only want to clarify or comment on two of their comments here in this reply.

Reviewer #2 raised questions about MIDAS and QMOM: MIDAS uses moments as parameters and obtains “surrogate” analytic representations of the aerosol in the form of either multimodal lognormal or multimodal modified gamma distributions [Wright 2000]. In the future MIDAS may be used in cases that an analytic representation of the aerosol is required. The method uses fewer moments than

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multimodal distribution parameters enabling an average to be taken over multiple distributions each of which is consistent with the tracked moments. Nevertheless, the use of MIDAS requires that at minimum several (e.g. 4-6) moments be tracked; thus the method may be useful in connection with future QMOM representations of the aerosol that involve tracking additional moments beyond number and mass.

Currently, we are working with a 1pt version of the QMOM, as stated in the paper. This is number and mass mean diameter. This means that the aerosol population is represented by a monodisperse distribution. In this sense our method is very similar to: Pirjola et al (2003) and we should expect similar accuracy as these authors achieved in their box model. So this is an indication of the accuracy of 1 pt quadrature (see figure 1 of Pirjola et al. (2003)), which suggest results fall between sectional models employing 54-99 sections. This high accuracy is achieved because, like us, these authors use separate (monodisperse) populations to represent the AKK, ACC and coarse modes. Otherwise the 1pt quadrature results are equivalent in accuracy to about 30 sections, see Upadhyay and Ezekoye (2003).

Jeff Pierce commented on the setup of our NO-MIC calculation. In that sensitivity experiment we basically try to run a simulation without ‘microphysics’, excluding as well any processes of aerosol mixing by condensation. It was not our intension to ‘fake’ a bulk mass aerosol model in that experiment.

References: Wright, D.: Retrieval of optical properties of atmospheric aerosol from moments of the particle size distribution, J. Aerosol Sci., 31, 1-18, 2000.

Pirjola, L., Tsyro, S., Tarrason, L., and Kulmala, M.: A monodisperse aerosol dynamics module, a promising candidate for use in long-range transport models: Box model tests, J. Geophys. Res. 108, 4258, doi:10.1029/2002JD002867, 2003.

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