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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: A new SIze REsolved Aerosol Model (SIREAM)" *by* E. Debry et al.

E. Debry et al.

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The reply to referee #2 was submitted as a short comment, I would like to make an additional answeer to one referee #2 's question, which came afterward with referee #1 's questions. In the sequel I only quote referee #2 's comment to which I adress an additional answeer. The short comment reply remains relevant for other comments.

5) Having not studied cloud activation schemes I am a little confused by the first two paragraphs of Section 2.3.1. In the first paragraph the default value of the critical diameter for cloud activation is given as dactiv = 0.7μm. In the second paragraph, however, it is stated that the activated distribution has a median diameter of 0.4μm. Are these values correct? If so please could the authors state if are they dry or wet diameters and better explain how they are related?

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The activation diameter (dry) determines the aerosol bins whose mass will transfered to the aqueous module in case clouds are detected in the given cell. If the average dry diameter of the aerosol bin is greater than the activation diameter, then all its mass goes into the aqueous phase which consists in a bulk phase in order to reduce computational burden. Nevertheless the VSRM module can simulate a size resolved aqueous phase.

When the aqueous phase is reduced to one bulk section, the average diameter of cloud droplet is taken equal to 20 micrometers. Once aqueous chemistry is solved, we need to redistribute the generated aqueous mass to those aerosol bins that were activated.

This step is to my opinion similar to the redistribution step of "quasi-stationary method" for condensation/evaporation. There are various possibilities to achieve this step depending on assumptions made. For example one can merely redistribute aqueous mass uniformly on activated aerosol bins. Our choice is to assume the aerosol distribution to have a bimodal shape (not mono modal as we stated at first). This assumption is only used to compute the fraction of the bulk aqueous mass that will fall in each activated aerosol sections.

The median diameter and variance for both modes are respectively 0.4 micrometers and 1.8 for first mode, 2.5 micrometers and 2.15 for second one. Kathleen Fahey showed in her PhD-Thesis the low impact of this assumption.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11845, 2006.