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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulating gas-aerosol-cirrus interactions: Process-oriented microphysical model and applications" *by* B. Kärcher

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1. I will leave out Figure 1.

2. I will briefly describe the comparisons carried out and discuss the model performance on a general level.

The APSC has been tested against analytical solutions of (1) the mixing equations with a mixing rate decaying inversely proportional with time; (2) the condensation equations in the diffusion limit; and (3) the coagulation equations assuming a constant coagulation rate coefficients.

It is of course impossible to check the coupled system of equations treated in the APSC against analytical solutions, but I do perform plausibility checks beased on time scales

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for individual processes. In addition, it is checked every time step that the total number of each molecular species is generally conserved (in the gas phase and in the particle phase), and that the total number of particles (aerosol and ice) is conserved in phase transitions.

3. I will include the following explanation.

At 1.75 h, the moving center distribution becomes very coarse at small sizes. The last visible grid point in Fig.2 (blue curve) belongs to aerosol particles with a diameter of 0.39 μm; the next grid point (not visible) belongs to particles with a diameter of 6 nm and very low concentrations ($\sim 10^{-7}$ cm^{-3}); in the latter case, the Kelvin barrier does not allow them to grow.

The same happens in the hybrid grid simulation (red curve), but is less obvious in Fig.2. The last visible grid point is at a diameter of 0.37 μm; the four smaller ones (not visible) are at 0.19 μm, 0.1 μm, 0.032 μm, and 0.019 μm and are increasingly affected by the Kelvin barrier. The latter two grid points are associated with low concentrations in the range $10^{-5} - 10^{-6}$ cm^{-3}.

4. + 5. I will take care of both issues and include references.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 4129, 2003.