Atmos. Chem. Phys. Discuss., 3, S1164–S1165, 2003
www.atmos-chem-phys.org/acpd/3/S1164/

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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Received and published: 4 August 2003

Review of ŞSimulating gas-aerosol-cirrus interactions: Process-oriented microphysical model and its applications,Ť by. B. Karcher, submitted to Atmos. Chem. Phys. (Discuss).

This paper discusses the development of a numerical box model that treats size- and composition-distributed aerosols in the liquid and solid phases and some basic applications of the model.

Overall, the paper describes a useful tool with some unique features, developed after a lot of work, and presents interesting applications. I recommend publication of the paper after the following suggested revisions and tests are performed.

1. Paragraphs 2-4 and Figure 1 of the paper distract from the paper and appear unnecessary. I would remove these. Similarly, Section 4 of the paper, ŞPossible model extensionsŤ is unnecessary and does not add to the paper.

2. Page 2. ŞĚcontains features such as coagulation and nucleation of aerosol particles that are typical processes in codes simulating the tropospheric aerosol.Ť Some additional papers applicable to this comment include Toon et al. (J. Atmos. Sci., 45, 2123-2143, 1988); Binkowski and Shankar, JGR 100, 26191-26209, 1995; Jacobson (Atmos. Environ. 31, 131-144, 1997; JGR 107, D19, 4366, doi:10.1029/2001JD002044, 2002).

3. Page 5. What are some of the original references behind Equation 7. It would also be clearer if a different symbol was used for Jf versus jf.

4. Page 16. For each major equation listed that is solved (e.g., Equation 13), please state that the solution method is described in Section 3.6 (or state the solution method with the equation). Otherwise, one is left wondering what the method is until the end.

5. One weakness of the paper in its current state is that there are no comparisons with high-resolution numerical solutions or exact analytical solutions. One way to generate a high-resolution numerical solution is to take a very short time step, then replicate the solution at a longer step. Please show at least one example with multiple processes acting together.

6. Page 11. What is the effect of the treatment of the burial coefficient in Equation 22. Please show a sensitivity test that illustrates its effect.

7. The conclusion is somewhat lengthy. It can be shortened.

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