

Interactive comment on “A condensed-mass advection based model for the simulation of liquid polar stratospheric clouds” by D. Lowe et al.

Anonymous Referee #1

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This paper presents an Eulerian method for solution of the condensation/evaporation equation. In contrast to the well-known Lagrangian approach describing the growth/shrinking of aerosols along their trajectories, the Eulerian approach is necessary if the dynamics of aerosols has to be coupled with a (Eulerian) Chemistry Transport Model (CTM). This paper not only addresses this important problem, but gives also a practicable Eulerian solution of the condensation/evaporation equation.

However, there are some points in the paper which are not satisfactory explained and, consequently, have to be revised before the final publication (major revision). I would like to see the revised version before the final publication.

Major comments:

1) Eg. (9) is split in two in order to solve it. So I expect that the sum of eqs. (10) and

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(11) should lead to eq. (9) that is not the case. Furthermore, not every solution of (9) satisfies (10) and (11) simultaneously. Thus, by solving (10) and (11) only a part of possible solutions of (9) can be found. Here, some additional remarks are necessary.

2) It is not easy to understand the WAF-approach described at page 695. What is the definition of the mass flux f^{waf} if compared with eq. (11) ($f^{waf} = p_i H$) In addition, I would recommend to shift this part of the manuscript to the appendix.

3) Even if the idea of testing the MADVEC by comparison with the analytical solutions is very good, the presentation in section 3 has to be improved.

a) Please adjust the notation used in this section on the notation in section 2.1 (e.g. $J = \ln(s/s_r)$ should be replaced by $\mu = \ln(r/r_0)$ because only this case is important for the presented study).

b) Because only eq. (32) is important for the discussion, I would recommend to reduce (remove) the text between eqs. (24) and (31) or to shift this part of the manuscript to the appendix.

4) In the section 2.3, the model physics based on eq. (22) is introduced. The authors should explain at this place the connection of this model physics with the main eqs. (10) and (11). What is definition of H in this context.

5) The questions of the required CPU time and of the tractability of MADVEC for coupling with a CTM are not discussed in the paper. Here, more details are desirable.

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 689, 2002.

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