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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Redistribution of trace gases by convective clouds – mixed-phase processes" *by* Y. Yin et al.

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General comments

This is well-presented study exploring parameter space in the treatment of gas uptake by hydrometeors, especially ice. As the authors note, there is little consistent information on uptake and retention coefficients required by models, despite earlier studies showing the values of these parameters can have a large impact on transport of gases to the upper troposphere. Yin et al. have chosen to conduct a sensitivity study to map out the conditions under which the gas transport is most sensitive. This approach is very useful, and the figures summarizing their findings are good (particularly Fig. 6 and 7). Their results also suggest where new studies are most needed (e.g., measurements of retention coefficients for highly soluble gases, since the uncertainty is largest

in those cases). Overall, this study has been carefully done and thoughtfully presented, with clear interpretations of results and discussions of their significance.

Specific comments

My main concern about the general applicability of this work is the choice of dynamical model, which is very simple. I wondered how realistic the simulation was. However, it is clear they chose this case for direct comparison with their earlier study of vertical redistribution of trace gases in warm clouds. Perhaps the authors can add some comments regarding how the choice of dynamic model and cloud case might influence (or not) their general conclusions. I suspect there will be some impact, because as they note "differences in the development of hydrometeors and precipitation have an important influence on the efficiency of gas transport". The microphysical processes in turn feed back to the dynamics so these aspects are always coupled.

Technical corrections

There is a typo in the caption of Figure 4 (dissipation).

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 875, 2002.