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Interactive Comment

Interactive comment on "The role of the retention coefficient for the scavenging and redistribution of highly soluble trace gases by deep convective cloud systems: model sensitivity studies" *by* M. Salzmann et al.

Anonymous Referee #3

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This manuscript addresses the importance of knowledge of the retension coefficient for soluble chemical species when hydometeors freeze. Unfortunately, we have little laboratory or field experiment data available to specify the values of these coefficients. The paper shows that the shape of the initial profile of soluble tracer is very important is determining how critical the retension coefficient may be. For example, for a tracer initially only in the boundary layer, much of this material will be rained out before it reaches the freezing level. Therefore, the retenion coefficient value is not particularly important in this case. The results of the simulations for various tracer initial profiles

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Interactive Discussion

Discussion Paper

in different environments are very worthwhile. However, the paper is complicated by including simulations with two different initialization schemes (large-scale forcing and warm bubble). The topical marine case (TOGA-COARE) is initialized using the large-scale forcing technique, the High Plains of the US case (STERAO) is done with a warm bubble and the southern Great Plains (ARM) case is done both ways. I do not think a general conclusion that warm bubbles overestimate the influence of the retension coefficient can be made from the cases simulated here. The contrast is made in the paper between the LSF cases and the STERAO case (warm bubble). However, the STERAO storm developed in a relatively dry environment which produces a high cloud-base. As a result there is relatively little cloud water compared with the more moist environment storms. I don't think this is a fair comparison. The difference are not just do to the different type of initialization. The paper needs to be reworked to eliminate this false impresssion.

Specifically, in Section 5, the contrast is made between the ARM LSF run on the STERAO bubble run. Instead, the focus here should be on comparing the ARM LSF and ARM BUB runs. It would be expected that the two methods of initialization would produce differences in the simulation of the same storm. Which is the better representation of the observed convection? In this regard, it is unclear why the ARM BUB run contains less cloud water than the ARM LSF run. If the LSF run is a better representation of reality, it would seem like the initial profile used in the ARM BUB run may have had insufficient water vapor. Would a profile from a somewhat different time be more appropriate or representative of the environment in which the storm developed? The authors should comment on the reasons for the deficiency of the bubble simulation. Perhaps a better simulation can be made, and then the authors could revist the question of differences in the importance of the retension coefficient in this case.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 10773, 2006.