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Atmospheric Chemistry and Physics Discussions

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.

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Referees #4 and #2 have brought up a particularly important point regarding the near surface local maxima in cloud water mixing ratio in the ARM LSF run which we would like to clarify immediately; detailed replies to the remaining comments and those of the other referees will follow later.

Referee 4 concludes that our simulation of the ARM case using LSF may be flawed because of the near surface local maxima in cloud water mixing ratio in Fig. 6b. We appreciate that the referee pointed this out in the comparison of the figure as plotted in our draft versus the previous literature. We have

re-checked our simulation results and determined that this local maximum is the consequence of spurious condensation (and later evaporation) occurring exclusively during the first hours of the simulation, prior to the first 24 h slice of the transport calculations. If the first 12 h of the simulation would be excluded from the time averaged profile shown in Fig. 6b, then cloud water mixing ratios would start to rise only above 1 km, in good agreement with the model results presented in Xu et al., 2002 (and also with our interpretation of high cloud water contents in the inflow region being important as suggested by Fig. 7). Note that in Fig. 6f, currently the first 12 h of the simulation are also included. Figs. 6b and f will be changed in a revised version.

We would also like to mention that we had done additional simulations, some of which for brevity were not mentioned in the manuscript. In particular, we find that our results regarding tracer transport and scavenging for the ARM LSF case are robust (i.e., same qualitative and very similar quantitative conclusions) for
- a 2-D run with 250 m constant vertical resolution (in this run spurious condensation during the first hours does not occur)
- a 2-D run in which the original Lin et al. (1983) microphysics scheme was used, which is also part of the standard WRF model.

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

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