**Atmospheric
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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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We appreciate the comments and suggestions of the five anonymous referees which have led to important improvements of the original manuscript. Details regarding these changes are outlined in the replies to the individual referees. Major changes in the revised version are (in summary):

- The description of the uptake calculations in Section 2 has been shortened (as suggested by Referee #1). The description of the microphysics scheme has been extended (see replies to Referees #2, #4, and #5).

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- Section 3 has been re-arranged and extended (see reply to Referee #2)

- The ARM A BUB case is now discussed in more detail (Sect. 3.2.1 of the revised manuscript, Sect. 5, Figs. 10 and 12c) based on suggestions by Referees #2, #3, and #4. The discussion has been directed more towards a comparison between the ARM A LSF and the ARM A BUB case (as suggested by Referee #3).

- Fig. 12 regarding the role of the microphysical processes has been added and the discussion in Sect. 5 has been extended (based on a suggestion by Referee #2)

- A motivation for using idealized tracers (Sect. 6) and a motivation for re-setting the tracer mixing ratios (Sect. 3.1) have been included in the revised manuscript (see replies to Referees #4 and #5).

- The high time averaged near-surface hydrometeor mixing ratio for the ARM A LSF run were identified as an artifact due to spurious condensation which occurred prior to the onset of deep convection (discussed in Sect. 5 of the revised manuscript; see also reply to Referees #4 and #2). In the revised manuscript, the first 18 h (prior to the onset of deep convection) have been removed from the time average in Fig. 8b (Fig. 6b of the original manuscript).

- Based on a suggestion by Referee #2, domain averaged profiles of "T2 released" in liquid hydrometeors have been added in Fig. 8 of the revised manuscript (Fig. 6 of the original manuscript) and are discussed in Sect. 5.

- Further changes have been made as indicated in the replies.

During the course of the revisions we discovered the need for additional technical corrections which were not explicitly requested by the referees:

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- In the original manuscript it was erroneously stated that the horizontal domain size was $278 \times 278\,\text{km}^2$. This is true for all runs except the STERAO run in which the horizontal domain size was $148 \times 148\,\text{km}^2$ (Sect. 3.2.2 of the revised manuscript).

- The IWP and LWP in Fig. 9 of the original manuscript were automatically scaled and did not fit the y-axes on the right hand side of the plot. Since the point of this figure was to show that high LWP and IWP lag the occurrence of high vertical velocities, this correction does not influence the discussion of the figure in the text.

- In Eq. 5, indices have been added to k_{ret}, and k_{ret} has been moved inside the brackets reflecting how the retention coefficient is actually implemented in the model.

In addition to these technical corrections, we found that thin clouds also develop in parts of the inflow region of the STERAO storm (see reply to Referee #4).

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