

Interactive comment on “Parameterizations for convective transport in various cloud-topped boundary layers” by M. Sikma and H. G. Ouwersloot

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The manuscript describes improved parameterizations for constituent transport due to boundary layer clouds. It is generally well-written and the work is sound. It should be published after minor revisions, mostly to clarify the work.

General comments:

1. The abbreviation SCu is used for shallow cumulus. This is easy to confuse with stratocumulus. Maybe ShCu would be a better choice, or shallow cumulus could be spelled out each time.

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2. p.10719 line 22 and following paragraph: It is not clear to me what is being claimed here or its relevance to the rest of the paper. Are you claiming a universal relationship between cloud and core area? Should this not be affected by changes in lapse rate, surface flux partitioning, etc., at least in some extreme cases? Furthermore, what does this ratio have to do with the rest of the paper? If such a relationship holds, why do you use two different functional forms for the cloud and core parameterizations?

3. There should be more attention to uncertainty and significance of the results. Some of the coefficients are compared to very slightly different values in the literature, but without information about, for example, the uncertainty of the fits used to derive them.

Specific comments:

1. The first sentence of the abstract suggests a more general study than what is presented. It might be better to say something like, "We investigate the representation of transport of atmospheric compounds by boundary-layer clouds..."

2. p.10714 lines 2-4: It is not clear that forced clouds produce no transport. They can be quite deep in some cases, and may detrain. You should simply say that you neglect them here.

3. p.10719 line 13: Please clarify the sentence. The number of clouds decreases, the total area stays constant, so the area of each cloud must increase. Right?

4. p.10721 line 25: I don't understand what this has to do with an overestimate of cloud fraction. Cloud fraction must always be greater than or equal to core fraction, regardless of how well they are estimated. Please clarify.

5. p.10724 line 9: It should be kept in mind (of the authors and readers) that the effects of segregation are usually quite small and depend on the reaction and mixing time scales. Are the effects significant here?