

Interactive comment on “Effects of aerosol in simulations of realistic shallow cumulus cloud fields in a large domain” by George Spill et al.

Anonymous Referee #2

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The study investigates the impact of aerosol perturbations on shallow cumulus clouds by performing cloud resolving simulations on a larger domain than in previous work, while retaining relatively high spatial resolution. A general invigoration and deepening of convection with increasing aerosols is found, in line with previous work. Additionally, a number of key differences from more idealized simulations are identified that require further work by the community to be resolved. The paper is very well written and structured, and should be ready for publication with only minor revisions.

General comment: The “Results and discussion” section has lots of nice results and figures, but is quite descriptive and it would be good with some more discussion, e.g., comparison with previous work if possible, broader implications? Some of the former is included in the conclusions, but with limited discussion of why some of the differences

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Discussion paper



arise.

Specific comments: Pg. 2, line 8: perhaps something like “Aerosol-induced changes in precipitation efficacy . . .” would make the sentence easier to read.

Pg. 3, line 9: duplicate “the”

Pg. 3, line 18: It would be useful to know how these vertical profiles in the baseline look. Does the model simulate a mix of species? If so, how does this look?

Pg 4, line 7: Fig.ure -> Figure

Pg. 4, line 7-13: this paragraph introduces three figures over 7 lines with very little description or discussion of results. In particular, Figure 3 could need some elaboration to assist the reader in identifying these transient meteorological features. The information in Figure 1 is repeated in Figure 4 – is it really necessary to keep both?

Pg. 6, line 8: but the UM_CASIM_01 seems to make the low-altitude peak more pronounced? Suggest rephrasing to clarify.

Pg.6, lines 2-11: in this paragraph it would be useful to know more about the vertical aerosol profile.

Pg. 10, line 1-3: From “Shown in . . .”; something missing from this sentence. “As shown in . . .”?

Pg. 10, line 18: what “budgets”?

Pg. 12, line 8: please give some examples of what idealized means compared to this study, as the aerosol perturbations applied here could also be considered idealized.

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