

Interactive comment on “A comparative study of the response of non-drizzling stratocumulus to meteorological and aerosol perturbations” by J. L. Petters et al.

Anonymous Referee #3

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The authors construct a suite of large-eddy simulation (LES) of non-precipitating VOCALS stratocumulus-topped boundary layers, observationally constrained by Era–Interim reanalysis and VOCALS observations. The study seeks to quantify the relative importance of meteorological vs. aerosol perturbations in simulation outcomes such as liquid water path, optical depth, and shortwave cloud forcing. The manuscript concludes that the impact from variations in meteorological factors tend to dominate impact from variations in aerosol factors. The research methodology is sound, and the paper will be a nice contribution to the growing literature on this topic. I have a few, mostly minor, comments.

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Comments:

1. Although the manuscript focuses on nonprecipitating stratocumulus, the authors should include Wang et al., 2010, ACP “Modeling microphysical and meteorological controls. . .” and Mechem et al., 2012, JAS “Thermodynamic and aerosol controls. . .” who explicitly address similar sensitivities in precipitating VOCALS cloud cases and come to similar conclusions as to the relative importance of meteorological vs. aerosol factors.
2. Page 27120, lines 13–14, “reasonable” to omit SGS fluxes. I think “necessary” might be a better term. The fact that LES modelers can just throw out the SGS terms (e.g., Stevens et al. 2005) and call it “OK” is somewhat disturbing. Isn’t this just masking some other problem, perhaps excessive numerical diffusion? (just a comment. . . no need to respond.)
3. Page 27124, lines 4–5 and onward. The vertical resolution of the Era–Interim data is not ideal for resolving the q and θ jumps. The authors should quantify the uncertainty in these estimates.
4. Page 27125–27126, lines 20–29 and 1–9. It is not clear that the aerosol variability is constrained from the VOCALS observations. And I do not understand how or whether these numbers rigorously correspond to a 1-sigma variability.

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