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Interactive comment on "Theoretical basis for convective invigoration due to increased aerosol concentration" *by* Z. J. Lebo and J. H. Seinfeld

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We again thank Dr. Fan for his comments regarding the manuscript and address the pertinent issues below.

In regard to the discussion on domain size and resolution, we feel it is only justified to compare analogous studies. Given the use of a detailed bin microphysics scheme in our study it is only fair to compare the resolution employed here with that of prior studies using bin microphysics for deep convective clouds. We understand that higher resolution simulations have been performed using bulk microphysics on an extensive domain. However, computationally, it is not feasible to perform the same simulations with bin microphysics. Again, we will clarify the discussion surrounding resolution in the revision to ensure that it is clear that our arguments are in reference to similar studies.

Moreover, in the revision of the manuscript, we will modify the discussion regarding the simulated results to ensure that it is clear that the results are specific to the ambient conditions used and relatively moderate vertical wind shear.

We feel that it is important to include the details of the microphysics used in the current study since this is the first time that the model has been used in this configuration.

A reference to *Fan et al.* (2007) will be included in the revision to the manuscript.

In reference to the comment on the threshold size for rain, the bulk microphysics scheme uses the autoconversion parameterization of *Khairoutdinov and Kogan* (2000) to predict the conversion of cloud droplets to rain drops. On the other hand, the bin model allows for a continuous distribution of liquid cloud particles and we use a threshold size of 50 μm to distinguish between rain and cloud water. Sensitivity tests show that the changes in the domain-averaged rain water mixing ratio for an increase in the CCN number concentration are insensitivity to changes in the rain water threshold size by 1 or 2 bins.

References

Fan, J., R. Zhang, G. Li, and W. Tao (2007), Effects of aerosols and relative humidity on cumulus clouds, *J. Geophys. Res.*, *112*(D14204), doi:10.1029/2006JD008136.

Khairoutdinov, M., and Y. Kogan (2000), A new cloud physics parameterization in a large-eddy simulation model of marine stratocumulus, *Mon. Wea. Rev.*, *128*, 229–243.

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