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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Initiation of coalescence in a cumulus cloud: a beneficial influence of entrainment and mixing" *by* W. A. Cooper et al.

Anonymous Referee #1

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This paper is very well written and organized; it includes the relevant references and the figures are clearly marked. However, the content is not sufficiently new to warrant its publication in its present form.

As the authors state, entrainment, mixing, and the resulting differing supersaturation histories were all investigated in the 1980s (by the lead author on this paper and others) to explain observed broadening of the droplet spectrum during the condensation phase. The ostensibly new feature here is that in order to form raindrops the few large droplets so produced must find themselves in regions of sufficiently high liquid water content that further collisions become probable. This is fairly obvious and was implicitly included in the earlier work.

No data are shown against which to compare the calculated spectra or the precip-

itation process described here and there is no observational way to link those two. The attempt to single out individual mechanisms responsible for rapid precipitation evolution results in the finding that every little bit helps—giant CCN, entrainment, the right trajectories—-again, solidifying what we have always known and emphasizing the point that it is futile to continue to look for a magic bullet. No significant improvement in predictive skill comes from these studies because a few random events make the difference and these are basically unpredictable.

I do not recommend publication of this paper unless it is drastically shortened to a note of a few paragraphs, comprising the summaries of key points (Sections 5.5 and 6.6). This topic has reached a scientific dead end, and further investigations are not likely to make any significant impact on our ability to forecast details of rain development in small Cu.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10557, 2011.