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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the relationship between open cellular convective cloud patterns and the spatial distribution of precipitation" *by* T. Yamaguchi and G. Feingold

Anonymous Referee #2

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This manuscript explores the hypothesis that the spatial distribution of precipitation is an important element of the closed-to-open cell translation. Small areas of precipitation are not sufficient to bring about the transition, even for substantial precipitation rates. Only with increasing areal coverage of precipitation does the transition occur. This paper is methodologically sound, and the figures and writing are clear. I only have a few comments that I would like the authors to address.

The authors introduce the topic by showing a heavy drizzling overcast case from VOCALS, yet the DYCOMS–II RF02 case all the simulations are based on is quite different. This VOCALS boundary layer in Fig. 1 is very deep and probably quite decoupled. In

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contrast, all simulations are based on DYCOMS–II, which is much shallower and less decoupled (see Fig. 3 of Ackerman et al., MWR, 2009). The two DYCOMS–II intercomparison cases (RF01 and RF02) are rather predisposed to thinning and breakup from excessive model entrainment. For example, the UCLA model needed to have the subgrid-scale fluxes drastically reduced in order to avoid excessive entrainment. The sensitivity of the DYCOMS–II case makes me wonder if it is a representative choice for exploring the authors' hypothesis. I would like the authors to speculate on how or whether the conclusions derived from this case will differ from the deeper and more decoupled SEP cloud systems.

The authors should clarify that they are addressing only the aerosol–cloud–precipitation mechanism driving cloud breakup, and not the warming–deepening mechanism of Wyant et al. (1997).

Although this is purely a modeling study, the authors should discuss how this hypothesis might be tested observationally. I would think that drizzle cell statistics from the C-band radar during VOCALS would be a good place to start.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 25651, 2014.