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Interactive comment on "Turbulence effects on warm rain formation in precipitating shallow convection revisited" *by* Axel Seifert and Ryo Onishi

Anonymous Referee #2

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The authors propose a new parameterization of warm rain formation, using collection kernels which account for turbulence intensity and including turbulence properties in autoconversion parameterization. Then they compare the new parameterization using 1-D bin model of warm microphysics and finally apply to LES of cumulus convection, using two different collection kernels documented in the literature. The main results show a remarkable dependency of the simulations result on the collection kernel applied. In the conclusions the authors underline necessity of more observations and DNS studies.

The results, which suggest that our knowledge of collection coalescence in warm rain process is not sufficient to unambiguously implement into LES are not surprising, yet

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Discussion paper

valuable. The paper is written clearly, quality of the presentation is excellent. However, in the opinion of the reviewer, there are several points which should be discussed or analyzed in more detail, especially in the context of the overall negative conclusion of the study.

In particular:

Why enhancement factors for autoconversion and time t10 are presented for Onishi kernel only? How they differ for Ayala-Wang kernel? Accumulated surface precipitations in 1D for both kernels agree with the proposed parameterization, but are very different. This additional analysis, supplementing that of Onishi and Seifert (2016) discussed in the present text would be of value.

Analysis of LES results is insufficient. In particular, the authors discuss basic microphysical and cloud field parameters between 24 and 30 hours of simulations (Figs. 6 and 8) without paying sufficient attention to cloud patterns, cloud fields, vertical profiles. In effect information on the effects of proposed parameterization / collection kernels on convection dynamics is partially missing. Figure 5 suggests that for several cases there is a significant variability within the last hours of the simulations, which is confirmed in transition times presented in Fig. 7. Extended discussion of the differences would add to the paper.

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