REPLY TO REVIEWER #2:

We thank the reviewer for the comments that helped us to improve the manuscript.

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

In the revised version we have included the corresponding plots for the Ayala-Wang kernel and extended the discussion of the enhancement factor for the autoconversion rate.

The different autoconversion enhancement factors for the two kernels and the quality of the fits is shown by Fig. 2 in which also the Reynolds number dependency is shown in more detail. The results for the Ayala-Wang kernel show somewhat higher enhancement factors compared to Seifert et al. (2010), mostly due to the improved treatment of the collision efficiency (cf. Onishi and Seifert 2016). The Onishi kernel shows much lower enhancement factors and the maximum is shifted to larger (mean) droplet radii compared to the Ayala-Wang kernel. The Re_λ-dependency reveals that especially for the Onishi kernel the value of the exponent, $p = -1/8$, is really just a fit with limited physical meaning as the actual slope has significant dependencies on $\bar{r}_c$ and Re_λ. This more complicated behavior is consistent with the analysis presented by Onishi and Seifert (2016) who showed that the Reynolds number dependency of the kernel varies with Stokes number (e.g. their Figure 2). For the Ayala-Wang kernel the numerical data shows a steeper increase with Re_λ compared to the parameterization. This is mostly because we kept the exponent at $p = 1/4$ as in Seifert et al. (2010), although the extended range of the dissipation rate in the current study would ask for a slightly higher exponent. The dependency on dissipation rate is assumed to be linear in Eq. (10) and this is confirmed for the Onishi kernel, but for the Ayala-Wang kernel the ϵ-dependency becomes weaker for high dissipation rates.

Analysis of LES results is insufficient. In particular, the authors

discuss basic micro- physical 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.

The different assumptions for the collection kernel and the resulting modification of the warm rain process do not fundamentally change the behavior of the cloud dynamics, i.e., an enhancement of the warm rain process by taking into account turbulence effects on collisions has a very similar effect on cloud patterns, cloud fields, vertical profiles etc. as a change in the cloud droplet number. The latter experiments have been extensively described and discussed in the literature, e.g., by Stevens and Seifert (2008), van Zanten et al. (2011), Seifert and Heus (2013), Seifert et al. (2015) and others. Therefore we present only those aspects of the simulations which help us to learn something new and gain a deeper understanding of the interaction of turbulence and warm rain processes. An example is the response of the accretion-autoconversion ratio to the different kernel assumptions discussed in section 5.3 and 5.4. Specific aspects of the cloud dynamics for the turbulence effects, like the fact that the highest dissipation rates are observed near cloud top, are already discussed in Seifert et al. (2010) and Wyszogrodzki et al. (2013) and there is no reason to repeat this in the current manuscript. A more detailed analysis of the resolved in-cloud turbulence and its effect on rain formation would be very interesting and, in our opinion, new, but is beyond the scope of the current manuscript.