**Reviewer Comments to 'Modeling Collision-Coalescence in Particle Microphysics:.." by Zmijewski et al.**

As LCM has recently emerged as a next-generation cloud model, its rigorous assessment becomes very important. The present work carried out an important task of examining the numerical convergence, by extending the previous works such as Unterstrasser et al. (2017, 2020) and Dziekan and Pawlowska (2017). Simulations are carried out carefully, and the paper is generally well-written.

This paper provides valuable information to cloud modelers and is thus suitable for publication. On the other hand, the authors need to be more careful in drawing conclusions through deeper analysis, as the general validity of the conclusion is important for cloud modelers. The paper also lacks a proper explanation for the cause of the results. Most importantly, there is no clear explanation for why $\langle P \rangle$ and $\sigma$ do not converge with $N_{SD}^{bin}$ in 2D cumulus congestus (CC) simulations, contrary to the case of box simulations. Furthermore, the paper fails to elucidate why the decrease of $\langle P \rangle$ is caused by the increase of σ in CC simulations. The hypothesis that 'A smoother spatial distribution of the DSD, together with mixing may lead to more precipitation' (L347) does not provide proper evidence (The convergence with $\Delta t_{coal}$ does not prove this hypothesis). It lacks an in-depth analysis of how DSD or σ develops with time within a cloud in both dynamics and kinematic simulations. They also argued that the increased variance negatively affects precipitation without proper evidence (L350).

To clarify the difference between CC and box simulations, I suggest carrying out another set of simulations; that is, the multi-box simulations with mixing between boxes, possibly using isotropic turbulence simulation. It can bridge the gap between box and CC simulations and helps to clarify the effect of mixing between grids, as suggested by the authors. For example, one can examine how DSD and σ are modified by directly comparing them with box simulation results. The direct comparisons of P and σ are not possible between box and CC simulations. One of the most serious drawbacks of this paper is that there are no one-to-one simulation results for CC simulations, so one cannot assess how close the simulation with $N_{SD}^{bin} = 10^5$ is to reality. The multi-box simulations allow one-to-one simulations that can be used as the reference simulation. It also supports the generality of the present result from CC simulations.

*Other Comments,*

L40: a more detailed reference model ?

L125: There is no explanation of how the initial DSD is assigned for the LCM and SCE simulations, and how they are consistent with one-to-one simulations.

L162: I cannot understand why the authors suddenly discussed the LES model here.

L227: proportional to $N_{SD}^{bin-1}$? (L227)

L260: I do not agree that dimensionality does not affect numerical convergence. If mixing between grid boxes is important for numerical convergence, as argued by the authors, the number of neighboring grids is different between 2D and 3D.

L309: The difference in CWP is clear between LR, MR, and HR, contrary to the statement.

L348: Reference is required for 'lucky droplets'.

L365: only at large $N_{SD}^{bin}$

Fig. 2: σ does not converge with increasing $N_{SD}^{bin}$. What it shows is that σ approaches the result from one-to-one simulation. Without one-to-one simulation, the results are not that different from those from CC simulations (Fig. 9)

Fig. 2: I cannot see that $\langle m \rangle$ is smaller for $N_{SD}^{bin}$ = $10^2$ for $r > 50$ μm.

Fig. 5: The authors selected LR, MR, and HR based on $\langle P \rangle$, but Fig. 5 shows the frequency histogram of $P$.

Fig. 5: Horizontal axis is bin center? (P/$10^2$ ?)

Fig. 6: Isn't it natural to produce smoother variations, if the ensemble size of dynamical simulations is larger than that of kinematic simulations (= 20)? I also think that the authors should provide information on the ensemble size of box simulations and dynamic CC simulations (D) in the manuscript.