Response to Reviewer #1

We are grateful to the reviewer for comments. Please find our responses below. Reviewer's comments are in italics and our responses in normal style. Manuscript file with highlighted changes is available.

1 Minor Comments

Ll. 1 – 17, 515 – 530: Explicitly state how much subgrid-scale fluctuations accelerate convergence.

Thanks to a suggestion from the Reviewer 2, we realized that SGS motion causes depletion of aerosols and super-droplets near the surface. This caused a decrease in cloud droplet concentration, what resulted in an increase in precipitation. We did a new set of simulations with SGS motion and with aerosol relaxation that counters the depletion. Results are in agreement with simulations without SGS motion. Therefore, we no longer believe that SGS motion helps accelerate convergence.

Ll. 228 – 231 and Sec. 2.1: How well do the initialization method capture the large tail of the droplet size distribution? The large tail is most important for the initialization of precipitation, and hence the higher-order moments of the droplet size distribution. A figure showing higher moments of the initial droplet size distribution for different numbers of simulated particles would reveal if there is a dependency on the initial conditions. I suspect these higher moments are not converged, so the subsequent simulations struggle to converge. All moments of the initial droplet size distribution should agree for a fair comparison.

In the Supplement, we added a plot of the first 11 moments of the initial distribution in box simulations. These are representative also of the 2D cloud simulations, because they use the same initialization method. Moments agree very well between simulations

with different numbers of super-droplets, so this does not explain differences in results for different number of SDs.

Ll. 295 – 296: The reference to Grabowski and Abade (2017) is misleading. First, their paper is about a subgrid-scale model for supersaturation fluctuations, and does not primarily focus on velocity fluctuations. Second, subgrid-scale models for velocity fluctuations in Lagrangian models exist for much longer (e.g., Weil et al. 2004). Third, how is the subgrid-scale model coupled? Does it obtain some information on subgrid-scale turbulence kinetic energy?

We did not intend to say that the model was devised in Grabowski and Abade (2017). Various types of the Ornstein-Uhlenbeck processe had been used before to model turbulence. We give this reference, because it contains the exact equation we use in our simulation. For example, the Weil et al. (2004) model is different. Now, we give the number of equation in Grabowski and Abade (2017) that is relevant, and we no longer call the model GA17, but OU (for Ornstein-Uhlenbeck).

2 Technical comments

*I repeat my previous comment: "When narrative citations (**?**) are used, a semicolon should not separate the individual references, but a comma or an 'and'." The authors claim that the GMD LaTeX template allows this, but it causes grammatically wrong sentences. For instance, instead of writing "In line with conclusions of Schwenkel et al. (2018); Unterstrasser et al. (2020), multi-box simulations show [...]" the authors should write "In line with conclusions of Schwenkel et al. (2018) and Unterstrasser et al. (2020), multi-box simulations show [...]". The semicolon separates the sentence in two meaningless parts. Only because one can create such citations with the template, they are not correct!*

We have fixed narrative citations.