

## ***Interactive comment on “On the Freezing Time of Supercooled Drops in Developing Convective Clouds” by Jing Yang et al.***

### **Anonymous Referee #1**

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The authors found that the observed PSDs in fresh developing convective clouds is narrower than predicted. They argued that this is due to the fact that the freezing time for large drops is longer than that for small drops. The idea is interesting, but it is not convincing for me.

1. Based on the observational data, the “first ice” is small. But this might be due to secondary ice production or sampling statistical problem, which has been well discussed in Lawson et al. (2015). The authors did not discuss those possibilities and this would lead misleading if the readers are not familiar with this field.
2. The modeled PSD strongly depends on the ice nucleation parameterizations. By changing to another microphysical scheme, it is possible that the simulated PSD might be better or worth compared with observations. It is difficult to say whether the simu-

lated broader PSDs is because the model does not consider the time-dependent drop freezing or the microphysical scheme.

3. In Fig. 4 and 5, the authors show results for 10, 15 20 m/s, but it is very rare that such high velocity can exist for 120 s in real clouds. For example, as shown in Fig 6, also mentioned by the authors, “the maximum updraft velocity is 7 m/s and mean updraft velocity approximately 3 m/s”. It would be good to see the modeling result for low velocity. In addition, it is also useful to add the value of vertical velocity at different levels in Figure 1 a-e. I guess the velocity is smaller than 10 m/s, if so, the influence of low velocity on freezing time would be small, or even ignorable.

To sum up, the main conclusion of this paper that the observed “first ice” is due to the effect of time-dependent freezing time is not convincing for me. Secondary ice production and sampling statistics which can explain the observed “first ice” are not well discussed in this paper. I’m afraid that this would lead the effect of freezing time not-very-strong speculation or even wrong explanation. In addition, the simulation results might strongly depend on the parameterizations, which makes the comparison (to observational data) less convincing. The vertical velocity used in the model is also too strong compared with the real case, which might enhance the effect of time-dependent freezing process.

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