

This is the second review of Schäfer et al./egusphere-2023-2907 from the second reviewer

The authors have adequately responded to all of my comments (albeit with minimal modifications to the text) except one of them. The authors still state on line 125 of the tracked changes document that “If the observed concentration of the newly formed ice crystals is larger than the INPC, it can be concluded that SIP was occurring” This statement unambiguously implies that contact freezing is not occurring in the real atmosphere, as the measured INPC only constrains immersion freezing and no other types of primary ice production. However, the authors continue to include contact nucleation in their simulations. I think the authors should explain that the measured INPC is a lower bound on primary ice production and that their simulation without SIP provides something more like an upper bound on primary ice production (unless contact freezing might be even stronger in the real atmosphere than it is in the simulations), and that the observed ice crystal concentrations exceed both estimates.

The fact that the authors cannot replicate the observed ice crystal concentrations when contact nucleation is turned off shows how uncertainties in the representation of primary ice production affect the authors’ conclusions about secondary ice production. The exact roles of each type of ice production process in producing the final ice number may easily be very different from what the authors find here. However, I expect that the cascade of secondary ice production would still occur in any situation and is therefore the most robust and interesting finding here. I encourage the authors to spend a little more time discussing the uncertainties in their findings about secondary ice production which stem from the unconstrained primary ice production, and what would be needed to reduce those uncertainties, perhaps in the conclusions. The authors may also want to emphasize that the amount of secondary ice production they get after doing all sorts of modifications to make it stronger is still a lower bound on the amount that is needed to replicate observed ice concentrations, because primary ice production may still be overestimated.