

Major point 1 - quantitative investigation:

It was recommended to investigate the impact of few weak ice nucleation events in more details. This detailed investigation is still lacking, the reference to figure 1 is not satisfactory, since here just one specific temperature (frost point 197.4K) is represented.

However, I was asking for an analysis of the occurrence of these rare events of weak ice nucleation; it is not clear how often these events occur, e.g. for different temperature intervals, and how large the difference to the “standard nucleation events” would be. This kind of analysis is still missing.

A much more quantitative discussion would push the 1-D model too far. The parcel and 1-D model used in this paper show that the tail of the distribution of temperature histories toward those producing fewer particles is very important for initiating sedimentation. To study quantitatively how often it happens would require a 2- or 3-D model. Regarding figure 1, I have run the model at other temperatures and obtained similar distributions.

Minor point 2 - ice nucleation:

It was recommended to discuss the representativity of very high heterogeneous IN concentrations, since the typical background values are in order of $\sim 10L^{-1}$ (DeMott et al., 2003); this issue is still missing in the discussion. In addition, it was recommended to mention that it is not clear if the measurements by Cziczo et al. (2013) are representative for ice crystal measurements in the extratropics. Also this discussion is missing in the revised version.

A sentence has been added to the paper (p. 11): “The range of ice nuclei concentrations in Figure 2 is intended to illustrate model behavior rather than assert what concentrations are in the atmosphere.” A discussion of how representative the Cziczo et al. data are for other times and places is beyond the scope of this paper.

Editor’s comments:

I have changed figure 2 along with the explanation in the caption that the lines are from a personal communication, 2014. I thought it best to leave the middle curve from your 2009 paper so that the values are not entirely from a personal communication. I changed the mention of outflow cirrus to lee wave cirrus and weakened the statement about possible shatter a bit.