

Response to Referee #2

The authors would like to thank the reviewer for the feedback. The replies to the comments are given below. Reviewer comments are highlighted in blue with our responses in black fonts.

1. Line 211: Please clarify if the whole 2D-S spectrum was considered for estimating the observed ice number concentrations. It is good practice to remove particles smaller than 200 μm while reporting the number concentration of ice particles from the 2DS probe as the shattering removal algorithm may not remove all the artifacts. Authors can add a few lines on these uncertainties.

Thank you for bringing up this point. One of the main outcomes of our study is the fact that secondary ice production shifts the ice particle size distributions to smaller sizes, which can then alter the whole microphysical evolution of the simulated mixed-phase clouds. When the effect of the collisional break-up process is considered in our simulations, the mode of the cloud ice size spectrum drops below 100 μm (supplement Fig. S4), which would be completely unconstrained from observations if ice particle sizes less than 200 μm would be discarded.

We of course understand the concern nevertheless. The 2D-S data were compared with the rotator position and the inlet velocity – if the rotator was not pointing into the wind or the inlet was blocked with rime the data would have been filtered. Analysis of probe imagery carried out by the experimentalists during the CLACE 2014 campaign and inter-arrival time (IAT) histograms did not reveal the presence of shattered particles, likely because of the much lower velocity at which this probe was aspirated ($\sim 15 \text{ ms}^{-1}$) compared to those during aircraft deployments. We will make this point more clear in the text.

2. Line 258: Define ERA5

Thank you, this is now corrected in the text.

3. Line 261: Define MODIS

Thank you, corrected.