

Replies to the comments of Reviewer 1

Authors appreciate thoughtful comments of Reviewer 1.
Below are the authors' point-by-point replies highlighted in blue.

1. *Comment:* An excellently prepared manuscript in all regards. Excellently presented, well argued, balanced etc. etc.

Reply: Authors thank the overall assessment of our work.

2. *Comment:* Line 110: Typo (repetition): "It was found that the that the...."

Reply: Corrected as per Reviewer's comment.

3. *Comment:* Line 209: "These were cleared with special image processing algorithms." Some minor elaboration on what additional data filtering was applied filtering would be useful (but not essential).

Reply: Given the absence of consensus on 2D data processing in the cloud physics community and a multitude of different processing algorithms, this is a valid question. However, the authors consider that minor elaboration would not be sufficient to address this comment, and its inclusion will be distractive and fuzzy. On the other hand, a detailed explanation of this question deserves a separate paper, and the inclusion of a lengthy explanation in this manuscript in the main text or appendix will unreasonably blow up the size of the paper. Therefore, for the sake of conciseness, the authors prefer to keep the related text without changes. Along this way, four co-authors of this paper are working on the manuscript summarizing the 2D data processing techniques, where this question is elaborated in detail.

4. *Comment:* Figure 1: The images in panel a (top) are an important part of the narrative, but are hard to see. Please make them bigger.

Reply: A high resolution zoomed-in image of cloud particles shown in Fig.1a was put in Appendix A to address the Reviewer's comment

5. *Comment:* Line 520/Figure 6: The details of the BB are hard to see. Maybe add some lines to indicate the times of interest relating to the BB disturbances. Also, could the y-axes be zoomed in to the region of interest -Is the radar profile below 3km needed?

Reply: To address the Reviewer's comment, three arrows were added on the top of the figure, indicating the area of interest with elevated bright bands.

6. *Comment:* The authors try to avoid making strong statements about the exact SIP process at play, but there is a strong sense of preference towards FFD. Given that both FFD and HM processes are very uncertain in terms of process rates, HM could be dominant still.

Reply: In the absence of firm laboratory studies of rates of secondary ice production during FFD and HM processes confirmed by independent research groups, the authors prefer to avoid strong statements about the mechanisms of observed in-situ secondary ice production. Recent lab studies of the HM SIP by Siedel et al. 2024 (<https://doi.org/10.5194/acp-24-5247-2024>) suggested that the rate of this process in past lab experiments was overestimated. However, more studies are still required before reaching a consensus about the significance of the HM mechanism.