

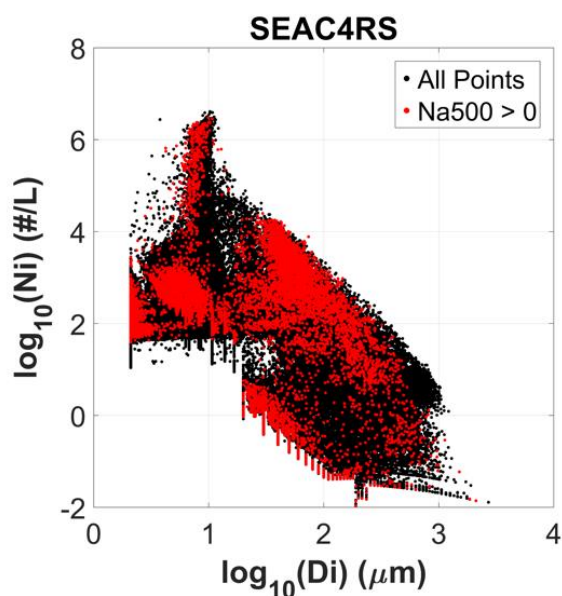
General Comments:

This reviewer thanks the authors for a diligent job in responding to the review comments. They have demonstrated that it is unlikely that small ice crystals comprise a significant fraction of the aerosol particle concentration having sizes > 500 nm (Na_{500}). For example, Fig. R3 shows that Na_{500} is generally > 28 times higher than small ice or $N_i(1-3 \mu\text{m})$, showing that it is unlikely that N_i affects Na_{500} significantly.

However, this extended analysis has revealed some interesting relationships, one of which is worth including in the article or Supplement as described below.

Specific Comments:

1. Figure R2 (pasted below) plots the \log_{10} of N_i against the \log_{10} of D_i (the mean maximum dimension of the ice particle size distribution, or PSD) for all samples

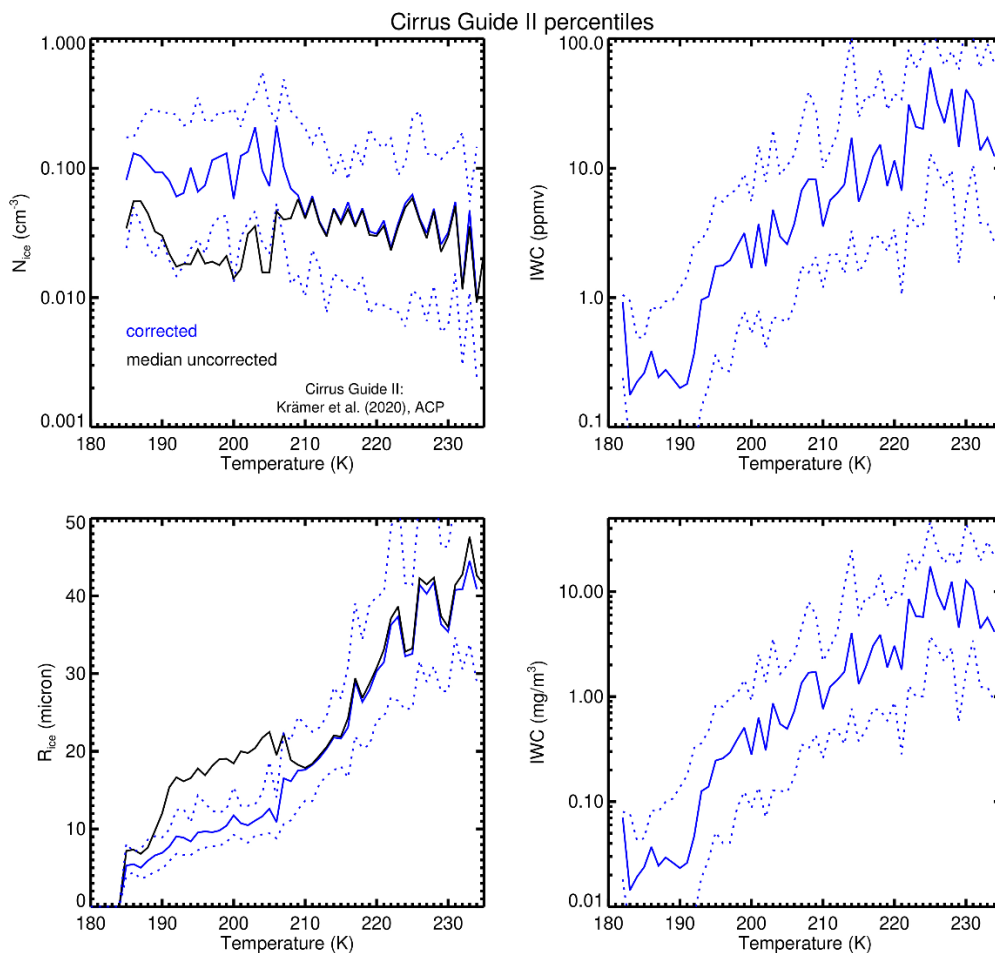


obtained during the SEAC4RS field campaign (black dots) and for only Na_{500} samples (red dots). Homogeneous ice nucleation (hom) tends to produce higher N_i than heterogeneous ice nucleation (het), and when hom strongly dominates over het, D_i tends to be smaller as well. This is shown in the EGU sphere preprint by Mitchell and Garnier (a remote sensing study of cirrus clouds): <https://doi.org/10.5194/egusphere-2024-3814>. For example, see their Figures 16 and 17 where N_i is relatively high when D_i is relatively low. This same relationship is expressed in Fig. R2, albeit from in situ

measurements. The “spike” in Fig. R2 corresponding to the highest Ni with relatively small Di ($D_i < 12 \mu\text{m}$) may be from cirrus clouds where hom is most active relative to het, where vapor competition effects keep Di relatively small. This is the clearest in situ evidence that I am aware of that arguably shows the influence of hom on cirrus cloud microphysics, and it would be worth including in either the article or Supplement so that future studies could relate their findings to this result.

2. Thank you for relating the cirrus dataset in this paper to the cirrus climatology of Krämer et al. (2020). It might be worth mentioning that the Krämer et al. climatology was recently corrected; see Krämer, M., Rolf, C., and Spelten, N.: The Cirrus Guide II In-situ Aircraft Data Set, B2SHARE-EUDAT, <https://doi.org/10.34730/70b8b58472c9444d9a54e1bafc2b09cf>, 2025.

Last December I was informed by Dr. Krämer that there was a bug in the code that processed the ATTREX and POSIDON PSD data. This affected values of Ni and R_{ice} for temperatures $< 210 \text{ K}$, as shown below. IWC was not affected.



3. Figure S3 in the Supplement provides a nice description of cirrus cloud properties related to altitude and latitude for this NSF – NASA dataset. I think members of the cloud modeling and remote sensing community would be interested to know how this compares with the cirrus cloud climatology of Krämer et al. (2020). Please consider plotting the 25, 50 and 75 percentiles of IWC, N_i , and D_i as functions of temperature for direct comparison with corresponding corrected results from Kramer et al. (2020). Although D_i may not be directly proportional to the mean volume radius R_v (used in Krämer et al. and referred to as R_{ice}), temperature trends may still be meaningful.

As mentioned in (2) above, the Krämer et al. (2020) values have changed for N_i and R_v for $T < 210$ K, and the corrected dataset referenced in (2) should be used. It would be interesting if the 25, 50, and 75 percentiles for corrected Krämer et al. N_i and R_v , along with IWC, could also be plotted (perhaps using another color) for comparison. This is only a suggestion, but it would be useful information, especially since parts of the published Krämer et al. (2020) climatology are no longer valid.