

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-61

Anonymous Referee #1

Referee comment on "Micro-spectroscopic and freezing characterization of ice-nucleating particles collected in the marine boundary layer in the eastern North Atlantic" by Daniel A. Knopf et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-61-RC1>, 2022

This manuscript is well written. The experimental study of INPs from Graciosa is rare and invaluable. Though the data is limited to a single summer season based on a few samples, the result is well presented and worth it for the science community. The authors clearly address the necessity of future study, and this reviewer agrees with the addressed outlook. The study topic is relevant to the journal scope as ACP supports many INP-related papers. This reviewer supports the publication of this paper in ACP and has only several technical comments.

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P2L53-54: Later in this manuscript, the authors mention PCF and potential pre-activation. Then, in general, the ice formation pathway can be modulated by not only ambient conditions but also particle physical properties, correct? This point can be clarified here.

P3L75-77: The reviewer believes that the majority of past studies focus on IMF because IMF is the dominant ice nucleation path in the atmosphere. The authors might want to briefly explain how important (dominant) DIN is compared to IMF for the reader.

P4L114: How low were ambient particle numbers? Does the ENA site offer the total aerosol particle concentration data?

P4L119: Why this particular stage ($D_{50} = 0.56$ micron) was selected for sampling and subsequent analysis?

P4L129: Has the impact of precipitation been considered in the 10-day back trajectory? Heavy precipitation may have washed out aerosol particles in the given air mass (if they traveled near the surface)?

P5L151: It may be worth providing a reference (or brief description) of the k-means cluster method here for the reader who is not familiar with CCSEM/EDX.

P6L187: the particle temperature - presuming the measured substrate surface temperature is equivalent to it?

P10L318: All identified INPs were in supermicron size because of the image resolution limit of the optical microscope for ice nucleation experiments, or is it the nature of INPs for the samples used in this study? The reviewer is aware that the authors cite some papers (e.g., Knopf et al., 2014). Regardless, this point can be perhaps briefly clarified in the manuscript.

P11L346-347: How did the authors estimate $\sim 250 \text{ cm}^{-3}$ of aerosol particle concentration? Taking particle density in the examined cross-section of the substrate and sampled air volume to estimate it in the unit volume of sampled air? This procedure can be clarified in the text. Did the estimate show any variation in different sampling periods (i.e., D1, D2, N1, and N2)?

Table 2: $>10,000$ particles per mm^2 cross-section seems plenty. Were there any particles agglomerated upon impaction on substrates and miscounted as supermicron particles?

Figure S1. The ENA site is located right next to the airport and access road. Thus, there must have been some inclusions of particles from these sources on the authors' samples. This point can be addressed in the supplement figure caption.