

We thank referee #1 for reviewing our manuscript and for giving comments and suggestions. Our answers are given in blue, below, while the original text of the review was kept in black.

Referee #1 Evaluations:

Scientific significance: Excellent

Scientific quality: Excellent

Presentation quality: Excellent

I have no additional major comments. The authors did a nice job of addressing the first reviews. My only technical suggestion would be to lighten the gridlines in the figures. There are many colors and shapes for the spectra (which cannot be avoided given the amount of data that need to be represented), but the gridlines somewhat draw attention away from the spectra themselves and make the plots a bit busy. Perhaps making them dashed and/or a lighter grey color would be less distracting and emphasize the spectra.

The gridlines in the spectra plots were already dotted. However, in the revised version, we changed their thickness from 0.5 pt to 0.3 pt and also made them slightly lighter in color (Figures 3, 5, 6, 8, 9, and 11).

We thank referee #3, Russel Schnell, for reviewing our manuscript and for giving comments and suggestions. Our answers are given in blue, below, while the original text of the review was kept in black.

Referee #3 Evaluations:

Scientific significance: Excellent

Scientific quality: Excellent

Presentation quality: Excellent

Line 610: The authors comment on the high concentration of organic INP in the marine atmosphere compared to those in the ocean waters. They suggest that enhancements of marine organic material between the marine concentrations and atmospheric concentrations would have to be several orders of magnitude to explain the observed atmospheric concentrations.

In fact, such enhancements are well documented to explain the "orders of magnitude" the authors state is required to explain their observations. What they have observed is a phenomenon that was studied in the 1960s and 1970s related to marine bubble bursting jets that highly concentrate surface microlayer organic material and bacteria and eject them into the atmosphere.

The authors should become familiar with the publications of D.C. Blanchard. One that addresses the enhancement of organics and bacteria between marine waters and air is:

"Jet drop enrichment of bacteria, virus, and dissolved organic material, Duncan C. Blanchard, Pure and Applied Geophysics, Volume 116, pages 302–308 (1978).

He and his associated have other papers on the subject.

I suggest the manuscript should be modified to reference and discuss the earlier measurements on the enhancement process. This addition will nicely address one of the unanswered items posed by the authors enhance the veracity of their measurements. And their courage to present observations that some might construe as faulty measurements as the results seem counterintuitive.

With this small modification, I suggest this important paper is ready for publication and that it will be well received and referenced many times as it contains such a wealth of important Arctic relevant information.

In the revised manuscript, we added a paragraph that describes the findings by Blanchard (1978) as suggested by the referee:

"However, studies about the enrichment of bacteria and organic matter exist. Blanchard (1978) describes that in jet drops, which are produced when bubbles burst at the air-water interface, bacteria can get enriched by a factor greater than 10^3 . While several factors, including the type of bacteria themselves, control the EF of bacteria, the findings by Blanchard (1978) suggest that similar EFs may also apply to INP, since bacteria are a major contributor to seawater ice activity, as described in the introduction." (L462-L466)

In the summary, where the results of the closure calculations are summarized, the findings presented in Blanchard (1978) are taken up again: "However, literature suggests that such EFs greater than 10^3 may be possible for INP." (L591-L592)

Note to the authors: If this was my paper, I would change the title to read something along the like of "Are all the most active terrestrial and marine ice nuclei observed during the ... of biological origin?"

We thank the reviewer for the suggestion, but the authors prefer to retain the original title.