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Comment on acp-2022-601

Anonymous Referee #2

Referee comment on "Non-volatile marine and non-refractory continental sources of particle-phase amine during the North Atlantic Aerosols and Marine Ecosystems Study (NAAMES)" by Veronica Z. Berta et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-601-RC2>, 2022

This paper combines FTIR and AMS measurements to characterize marine and continental sources of and atmospheric processing resulting in particulate amines. However, the analysis is severely hindered by the scant FTIR data points and insignificant correlations, so that the conclusions of the analysis are not strongly supported by the evidence presented. A major interpretation is that the FTIR and AMS see different, but complementary, amine components, but additional discussion is needed to further explain the lack of correlation between these two measurements.

Readability would improve with consistent treatment of significant vs non-significant correlations including complete set of statistics (including number of points) and adding implications at the end of each paragraph. Long descriptions of numbers from a table without consistent interpretations are not effective.

Specific comments:

176: The time series in Fig1 shows dynamic changes in amine concentrations, but I wonder what an average over a dynamic period really means. The authors claim that the highest concentration for continental periods was Autumn with a mean of 54 ± 49 ng m⁻³. Fig 1f shows that the concentration during this cruise is particularly dynamic and the large standard deviation here suggests that is the case. There are separate time periods of high concentrations (around Sept 1 and Sept 5) while other periods remain quite low. I suggest considering a different metric – median – or analysis (back trajectories during specific periods of strong amine enhancement) – to characterize the variability here.

190 The "inability of AMS to detect non-refractory components" should be the "inability of the AMS to detect refractory" components. The AMS measures non-refractory

components. Generally, the discussion of the lack of correlation between the AMS and FTIR is insufficient, and a few questions remain. If the issue was that the AMS does not detect the amines on refractory NaCl, we would expect the FTIR amines to be higher than the AMS CxHyN, so this hypothesis is inconsistent with the relationship between FTIR and AMS data.

Other potential sources of the discrepancy: What is the size distribution of submicron particles during these cruises, and how does the size transmission of particles for the AMS and FTIR compare? Could transmission to the sampler affect the relative measurements of amines?

In Section 2.4, it is noted that FTIR absorbance is not sensitive to secondary or tertiary groups in amines – those that are more likely to form particles. (e.g. Murphy et al., 2007; <https://doi.org/10.5194/acp-7-2313-2007>). If the particles consist of secondary or tertiary amines, the AMS mass would be higher than the FTIR mass. In line 381, add that the FTIR is not sensitive to the secondary and tertiary amines even if they do remain on the filter for analysis. Further discussion in the differences and similarities between the measurement methods and sensitivities would strengthen the argument that these two measurements are indeed complementary, rather than inconsistent.

195 CxHyN fragments are typically sandwiched between more common ion fragments containing carbon, hydrogen, and oxygen atoms, so if the CxHyN peaks are not well separated, one might expect the OM and CxHyN to be correlated for this reason. The analysis was done using mass spectra from W-mode in the TOF with higher resolution and diminished sensitivity compared to the typically-used V-mode. Could you include a representative peak fitting (in the supplement) to convince the readers that W-mode captured the CHN ion fragments with minimal interference from other ions?

Fig 1. Air mass categorizations (continental vs marine) do not agree between the FTIR and AMS for Nov8-Nov10. Consistent y-axis scaling would help readers better compare seasons.

210: These are not strong correlations. In Fig 3h, for example, FTIR amine groups = 0 for almost the full range of observed wind speeds for early spring. With so few data points for the FTIR, these correlations are weak, and the R values should not be overinterpreted.

PMF analysis (described in methods section) does not appear in the main text.

CCN measurements (described in supplement) does not appear in the main text

Many supplementary figures and tables are not referenced in the main text.