

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-258

Anonymous Referee #3

Referee comment on "Mapping gaseous dimethylamine, trimethylamine, ammonia, and their particulate counterparts in marine atmospheres of China's marginal seas – Part 1: Differentiating marine emission from continental transport" by Dihui Chen et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-258-RC1>, 2021

Chen et al. present a very interesting study about gaseous and particulate amines in the ambient environment of China's marginal seas. Such data are rare and strongly needed. Especially the fact that these important compounds are measured simultaneously in the gas and particulate phase over a certain series is very exciting. Hence, this study is highly relevant. The general style is good and the English very well readable.

However, several things should be considered before publication:

My major concern lies within the question of the sensitivity of the instrument. Regarding the detection limits of the instruments and partly some time ranges where concentrations were below the LOD, I am wondering how applicable is the method for amine measurements in low concentrated (e.g. remote marine) areas. The concentrations reported here are in part significantly higher than reported in other marine regions and I think with the LODs of the here applied method, the amines would not be detectable. Please comment on the limits of the here presented technique! In this context, please compare the concentration values achieved here with literature data (especially of marine locations).

Line 20 "we identified marine emissions of the gas species originating from continental transport..." sounds confusing. Is it marine or continental? Please clarify (and shorten the sentence)

Line 35; please add which numbers (16%, 34%) belong to which species.

The introduction mixed amine sources in seawater and in the atmosphere. Please be more correct. For example, the first sentence of the intro states that the atmospheric amines are derived from the degradation of glycine betanine.... But the latter processes happen in the seawater (not in the atmosphere as appears from the sentence).

Line 57: Please explain, why this is not the case for the continental atmosphere.

Line 82: Do you mean, that 1) higher concentration levels of nutrients result in higher concentrations of amines?

Line 83: why is 3) "... periodically enhance long-range transport..." an advantage here?

Line 89: unclear expression: "identifying marine sources from continental transport..." do you mean distinguish the sources?

Line 118: in Context with my main comment: please give the LOD converted to the atmospheric measurements (in $\mu\text{g}/\text{m}^3$).

Line 150: is $0.002 \mu\text{g}/\text{m}^3$ the LOD?

Line 155: "extremely low" please be more precise here and give numbers. Also, please compare with other published amine measurements in marine regions (see main comment).

Line 161: Explain the amines in relation to "onshore" and "offshore" winds more detailed and refer to the corresponding Figures.

Line 175: I am wondering if the times when the concentrations were below LOD are included in the given average values (e.g. for example setting the concentration to $\frac{1}{2}$ LOD for times when the analytes could not be detected). Otherwise the mean data represent too high concentrations. A Table listing the mean (min-max) values for the gas and particulate amines for the different "campaigns" would help.

Line 185: From Fig.1 it looks as if DMA gas shows a similar behaviour as TMS gas. Please show the correlations reported in this passage (e.g in the supporting information). Otherwise, the differences between TMA gas and DMA gas are not easily understandable.

Line 192: Please define "campaign A" and "campaign B" and the "costal station" more concise. Use the same descriptions concerning these separate "campaigns" consistently in the text and in the Figures. 20-22. Dec is "campaign B" = "port-anchoring period"?

Line 227/228: Do these references state that the amines (or TMA) are transferred via primary sea spray? Please state this more clear. Connected to this: has a primary sea spray transfer (Line 236) been shown for (gaseous and/or particulate) amines?

Line 256: It is highly speculative to comment on changing amine concentrations in the seawater, if such values were not measured. What means not "directly"? Same for line 265

Line 270: What is meant with "scenarios"? Do you mean "hypothesis"? Please explain.

Line 278: What is meant with "increasing" and "decreasing" period?

Line 276 and following (chapter 4.2 and 4.3): I find it difficult to follow and understand the estimations and conclusions from the given information. I suggest adding some more details. Why is it justified to estimate the DMA gas in this way? This part is very descriptive and little explanatory. For example: The good correlation is mentioned (Line 280) but what can be concluded from that and why? What is the explanation that TMAH+ decomposed into DMAH+ (Line 283)? I have the feeling that the interrelationships and conclusion in 4.2 and 4.3 should be elaborated more strongly. The connections were much better illustrated in chapter 4.4.

Line 360: Did you exclude emissions of seabirds because the peaks were persistent for a long time under strong winds? Or what else is the reason? If so, maybe add "... were therefore unlikely to be derived..." (Line 361)

Line 362: why "alternatively"?

Line 369: undetectable chemical conversion? What is meant by that?