EGUsphere, referee comment RC2
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# Comment on egusphere-2022-504

Anonymous Referee #2

Referee comment on "Dimethyl sulfide cycling in the sea surface microlayer in the southwestern Pacific – Part 2: Processes and rates" by Alexia D. Saint-Macary et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-504-RC2, 2022

**Review for the article id egusphere-2022-504 titled "DMS cycling in the Sea Surface Microlayer in the South West Pacific: 2. Processes and Rates" by Saint-Macary et al.**

In the manuscript, the authors have presented a study on DMS cycling in sea surface microlayer in the southwest pacific, east of New Zealand. In-situ observations were made over a fortnight in austral autumn at six stations, with incubation experiments carried out at five stations. The manuscript explains the observed changes in DMS and DMSP concentrations during the incubation experiments and explores the effect of other environmental factors such as irradiance, biological species composition, etc. The manuscript is well structured and although there are missing details and most sectional conclusions are speculative, the main outcome that DMSP and DMS cycling in the SML are insufficient to maintain DMS enrichment concurrent with elevated air-sea loss is an important result. I recommend that the paper be published condition to some changes as suggested below.

Major points:

- The incubation experiments are performed under three conditions (a) In presence of irradiance, (b) dark, and (c) dark with DMDS added. The effect of other environmental stressors is not clear. For example, the variation of irradiance between the sites is mentioned as an uncertainty mentioned later in the paper, but should be made clear that it is not considered in the methodology section. It is also not clear what the role of wind is when comparing the onboard experiment with the sea-air fluxes from paper 1. Although the authors mention that the enrichment would not explain the sea-air fluxes of DMS, the contribution factor would also depend on the local wind speed, would it not?
- A problem with drawing the main conclusion is the low sample size. Most of the conclusions are derived from just two datapoints per sample (T0 and T6) and hence the

validity of the results over a larger number of datapoints, or over different timescales can be questioned. Considering the contrasting results from previous studies in the same study region, one wonders whether those results and the current results are biased by sampling issues. It would be better for the authors to explain more in detail the differences from the earlier studies and the drivers of these differences, rather than say that this study confirms the lack of SML DMS playing a major role in the sea-air flux.

- The observations are taken during the austral autumn. Are the results valid for other seasons? The role of light is clearly shown through the incubation experiments and hence there should be a larger effect during the other months, providing that the other parameters stay the same. However, the biogeochemistry of the area could also show a change. Hence the title could be more specific to point the season – for example, 'DMS cycling in the Sea Surface Microlayer during Austral Autumn in the South West Pacific: 2. Processes and Rates'.
- The manuscript is dependent on the publication of the SM1 submitted manuscript. It is not just heavily referenced in this paper, but several details regarding the setup and analysis are missing assuming the publication of the first manuscript. This assumption also means that the manuscript should not be published unless the first one is published.

**Minor points:**

Considering this is a sister paper to the first one which is also in review, it would be useful for the reader to highlight in the abstract what the results are with respect to the paper part one and also include what are the main results from the first paper.

L110. Change "5-m" to "5 m". Table 1; Specify time zone.

Including all available DOIs in the references – these details are missing in multiple places.

L339. What are the correlation values?

L233. Please define "EF DMS."

Label set A (light) and set B (dark) in figure 4 for quick understanding.

Figures 2a and 2b, also in figures 3a and 3b please mention which set? (A, B, or C)

In figure 4, where is set C?

L59 consumption **'is'** also elevated

L118 photosynthetic irradiance recording system **was** placed next to the deck

L135 DMS **pre-concentration** at −110 â□□ on a Tenex® trap

L-163,164 Which data is the normally and non-normally distributed data used in this experiment? Please provide proof that it was normally and non-normally distributed considering the small number of samples.

L-218 **sets** A and B at each station, except for 3-SAW where it was higher in set B (dark).

L-338 current study, **which is** consistent with previous regional estimates

L-354 There are no **conflicts** of **interest.**

L-28 emission to the atmosphere **is** the net result of production and consumption by **various** biological, photochemical

L-70,71 **which may, directly and indirectly, influence DMSP and DMS**

L-78 light may enhance both DMS production and consumption, and so the net effect of these processes may be particularly significant in the SML

L-79 Although solar radiation dose is an important factor **in** determining temporal

L-95 The Sea2Cloud voyage took place **from** the 16 to 28 March 2020 (austral autumn)

L-110 **an Automatic Weather Station measured windspeed, 25.2 m above the sea level**

Figure 1., color bar title?

L-118 photosynthetic irradiance recording system **was** placed next to the deck

L-136, 137 **The detector's daily sensitivity and detection limit were confirmed using VICI®**

Highlight the most important results in tables 3, 4, and 5.

The following references can also be added to state the effect of nutrients, and various environmental factors on the production of DMS from DMSP and also for the production of DMSP.

- Interactions of anthropogenic stress factors on marine phytoplankton https://doi.org/10.3389/fenvs.2015.00014
- Production of atmospheric sulfur by ocean plankton: biogeochemical, ecological and evolutionary links **DOI:**1016/s0169-5347(01)02152-8
- Biogenic production of DMSP and its degradation to DMS – their roles in the global sulfur cycle **DOI:**1007/s11427-018-9524-y