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Interactive comment on "Quantification of dimethyl sulfide (DMS) production in the sea anemone *Aiptasia* sp. to simulate the sea-to-air flux from coral reefs" *by* Filippo Franchini and Michael Steinke

Anonymous Referee #2

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Review of the paper "Quantification of dimethyl sulfide (DMS) production in the sea anemone Aiptasia sp. to simulate the sea-to-air flux from coral reefs" by Filippo Franchini and Micheal Steinke

The paper presented net DMS production and DMSP concentrations in cultures of 48h incubated sea anemones Aiptasia sp. with and without its symbiont Symbiodinium. These data together with literature values were used to estimate the gross DMS production within the anemones and the potential amount of anemone derived DMS emitted to the atmosphere.

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This study presents an interesting aspect of the role and influence of sea anemones for the biogeochemical pathways of DMS and DMSP in coral reefs. It shows that even when the production of anemones inside of the polyp is relatively high most of the DMS and DMSP is rapidly consumed and degraded due to microbial activities surrounding the anemones showing again the importance of these sulfur species for the microbial world. Additionally, this study showed that the amount of anemone/coral reef derived DMS for atmospheric processes might be less important than it was thought before suggesting coral reefs as less important hot spots compare with phytoplankton spring blooms in boreal regions. However, the method part of the paper is difficult to understand due to very short descriptions that missing some important details resulting in confusion of the reader. Thus, I suggest publishing this paper after major revision.

Major comments The reader gets easily confused by the different terms “net DMS production” and “DMS gross production” and which of the terms are measured or calculated/estimated. Figure 2 was very helpful to understand but it is mentioned only in the last section of the paper. Please define/specify in your method parts the different terms in one to two sentences and make clear how you determined it.

The anemone gross DMS production calculation is confusing and difficult to understand when it is explained together with the DMS flux calculation in one equation. For a better understanding please explain first the gross DMS production separately and give more information about the different parameter you used in the equation. It is not completely clear why you chose certain parameters. For instance, why you used DMSP from Yancey et al. 2010 when you have directly measured DMSP and biomass in your incubations? Why you chose for NÂňA1, NA2 and so on cell number maximum of 100? Is this a reasonable amount for anemone symbionts in your cultures? And please give more information about your previous study Steinke et al. 2011 regarding DMS and Symbiodinium you refer to in this study. How did you determined TW? And why is P between 0 and 20 % reasonable for your experiment. Why is the equation for gross DMSaq in anemone the same as the coral gross DMS-production equation (p 3,

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L 35)? Did you replace the TW for corals in this equation with the TW of the anemone? Why are the assumptions on p4 L1-7 are reasonable. Please justify. Have you tested it?

In your experiment, anemones were the organisms of interest, but you talked a lot about corals and coral surface area, so the reader gets confused if you want to show the impact of anemones or corals. You also said "Using our measurements of DMSP concentration and DMS production in anemones to extrapolate to coral reef environments has its limitations. . ." (p5, L16). Furthermore, on P5 L28: You said that you "normalized to CSA". How did you normalized? Did you assume that anemone coverage in coral reefs was 100% or you assumed that corals and anemones produce similar amounts of DMS so that the composition of the coral reefs (corals or anemones) didn't matter? Please justify why you can compare anemones and corals and why you can use anemone driven DMS to interpret the amount of DMS produced/released from coral reefs in general. Please say also something about the limitation of this comparison.

In your equation and your Fig 1c, please explain shortly the meaning of the term net DMSaq/gross DMSaq. Does the term say something about the amount of consumed DMS?

The section 2.5 "Data analysis" is very difficult to understand. It needs more details about why and what you were doing with your data. What do you want to say in the first sentence (p4 L10)? Please reword it. Is the mono-factorial analysis well known? Can you shortly say what that mean? What is the R package pse doing, why you used it? The references you gave are very complicated and detailed. It would be great when you give a more general information in your paper. Please, give also a short and general explanation about Monte-Carlo and why you applied it. In the last sentence of section 2.5 (p4 L20-22) is not clear what you have done. Please give more information how you determined the sensitivity of the variables.

Why you didn't determine the net DMSP production? Is this term not interesting?

Minor comments Abstract P1 L10: Please delete the part with the gas chromatograph. I suggest “Here we quantified the net DMS production and the concentration of its cellular precursor dimethylsulfoniopropionate (DMSP) in the cultured sea anemone Aiptasia sp., . . .”

Please show only one number after the decimal place in the abstract, e.g. 44.2 instead of 44.22 (p1 L13) and 6 instead of 6.00.

P1 L15: This sentence is very confusing. You say that you simulated the DMS flux and than you present the results of the gross DMS production. I suggest “We applied these findings to a Monte-Carlo simulation to demonstrate that net aqueous DMS production accounts for only 0.5 – 2% of gross aqueous DMS production. Monte Carlo based estimations of DMS fluxes into the atmosphere showed that reefs may release up to . . .”

Maybe you can write also a discussion sentence about the DMS flux results in the abstract as you have done for DMS gross production.

Section 3.2 You discussed in this section that DMS removal processes under light conditions are faster compared to dark conditions mainly due to microbial consumption. However, in your incubation experiment you didn’t see lower DMS concentration in the light treatments compare to the dark treatments. Maybe you should consider and discuss that your incubation experiments didn’t contain the microbial diversity as natural environments have. You used artificial seawater (axenic?) for the incubation, thus you might miss important DMS consuming microbes in your experiments resulting in similar DMS concentrations in dark and light treatments.

P6 L 1: “an average rugosity of 3”. Can you say what that means? Is 3 much rugosity or only a little bit? Has rugosity a unit?

Fig.1 d: please add the different variables in the figure or color code the dots. It is not clear which point presents which variable in the sensitivity plot. Maybe you can say a

little bit about what the different sensitivity numbers mean in the plot, such as “variables close to 0 have less influence on the simulation than variables lower/higher than 0” or something similar.

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