Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2017-32-RC2, 2017

Ocean Science
Discussions
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Interactive comment on "Dimethylsulfoniopropionate (DMSP) and dimethylsulfide (DMS) cycling across contrasting biological hotspots of the New Zealand Subtropical Front" *by* Martine Lizotte et al.

Anonymous Referee #2

Received and published: 23 June 2017

The manuscript reports on measurements of dimethyl sulfur compounds DMSC (DMS and DMSP) concentrations and their cycling rates on both sides of the Subtropical Front near New Zealand. The study is part of the SOAP experiment and intends to relate DMSPC dynamics to hydrographic and biological characteristics. To do so, measurements concentrate in three different areas that are investigated with a Lagrangian approach. The DMSP availability hypothesis is used as the major driver for the interpretation of most of the data, yet with uneven fit. The authors conclude that, as previously suggested, oceanic fronts generate hotspots for the production and emission of dimethyl

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Discussion paper

sulfur.

Even though no great advances in knowledge are provided that can be of applicability to a broad range of regions of the global ocean, the study is timely and the data valuable. The manuscript is well written and properly contextualized and referenced. I do not have major concerns towards publication but provide here below some questions and suggestions that may help improve the robustness and argumentation.

Methods, equation 1 and L206-213, also L541-550: SRD is calculated from daily-averaged irradiance. Is it taken for the 24 hours prior to sampling? Or is it the 24 hours of the sampling day? The rationale of the SRD concept related to DMS (as from Vallina & Simó 2007) relies on the previous 24 hours, which is the time over which photobiological and photochemical processes led to the observed DMS concentration.

L241-258: Provide details of how 35S-DMSPd loss was measured – I guess it was by removal of 35S-DMS, transformation of all the remaining 35S-DMSPd into 35S-DMS, which is trapped onto H2O2-soaked filter. Am I right?

L341-342: How was the cryogenic trap cooled to -20°C?

Results, L464-466: A bacterial DMS production rate (from DMSPd only) of 27 nmol/Ld is astonishingly high, more so when DMS concentration is 3 nmol/L and DMSPd is <10 nmol/L. It actually seems suspicious of mistake. I guess you have repeatedly checked up.

Discussion, L562: Cytosolic DMSP concentration should be given in fmol/um3 or similar (i.e., intracellular concentration) since pg/cell does not say much given the enormous size range of phytoplankton.

L616: The papers by Tortell et al. that emphasize DMS increases across oceanic fronts should be cited.

L643-669: To what extent the 50-fold range in DMSPd consumption rate constants cannot be due to methodological uncertainties in either DMSPd concentrations or the

35S experiments? This range factor seems very large, and the turnover at station 5 seems super fast (turnover time 1 h). More so when there is no correlation to bacterial abundance or production. I agree that bulk bacterial production holds less potential to drive DMSPd consumption than taxon-specific production, but a critical view of uncertainties is warranted. By the way, the range of turnover times shown in Table 3 for the present study is 0.1-1.6 d – if the fastest was 1 h, this should read 0.05-1.6.

L699-703: The relationship between the DMSPd-to-DMS conversion efficiency and rates of bacterial leucine incorporation is intriguing. You claim this is because as bacteria increase their C incorporation, they do it by cleaving more DMSP to use its C. I am not persuaded by the argument. Bacteria also increase their S demand, when increasing C incorporation. Why not taking up DMSPd as both a C and a S source? From the subsequent arguments, should we understand that abundance of other labile C forms (and potentially org S forms), bacteria exhibited low DMSP assimilation rates and rather they cleaved quite a share of the available DMSPd? But DMS yields were not particularly high either. Please clarify your arguments.

You could also invoke phycosphere-associated processes. In blooms like these there may be many bacteria closely associated to microalgae and therefore exposed to even higher concentrations of DMSP.

L778: Give range or std dev.

L775-787: To support the idea that phytoplankton-mediated DMS production largely contributed to gross DMS production, note that, in the DISCO experiment, Steinke et al. (AME 2002) found that the majority of potential DMSP-lyase activity occurred in particles >10 μm, namely dinoflagellates.

Figure 5: Correlation between DMSPt and chlorophyll a is quite strong indeed. One would expect it even stronger with DMSPp, since it is better associated with algal cells. Perhaps it does not deserve another graph but some mention to the regression facts.

Table 1: All variables are reported “in blooms” and in the vicinity (N or S of). But chlorophyll concentrations are not any lower in the vicinities. So, what is the definition of bloom? Same for nutrients and DMSP:Chla.

I like the data compilation in Table 3.

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