

*Response to Reviewer #2,*

*Thank you for your thoughtful critique of our work, and the suggestion of many helpful references. We have followed your suggestions in many places, including the conversion of bacterial productivity data to carbon units, inclusion of DMSPp data, and discussion of previous studies from areas outside of the NESAP. Below we provide a detailed response to all of the reviewer's comments, indicating the changes that have been made. Line numbers refer to those of the revised manuscript (supplement to this response), which includes all tracked changes.*

Interactive comment on “Patterns and drivers of dimethylsulfide concentration in the northeast Subarctic Pacific across multiple spatial and temporal scales” by Alysia E. Herr et al. As the title indicates, this manuscript describes DMS and DMSP spatial and temporal distribution patterns with high-resolution field data collected in coastal waters of the NE Pacific. The DMS patterns are compared to historical field data in a publicly available database, collected mostly in previous decades and further offshore. Measurements of some of the rates involved in DMS cycling allow for interpretation and discussion of the likely controls (or drivers) of the next patterns observed. No single physical or biological parameter accounted for the DMS/P variability observed and described as a whole in the region; rather probable controls change in relative importance within subregions, as has been shown in other studies. This variability only confirms the already described complexity of the DMS/P/O biogeochemical system at any one place and time. The manuscript is very well written and is a pleasure to read. . However, the authors should decide whether they will focus this report on the NE Pacific ONLY and hence solely references for this region will be used. Right now, the manuscript ignores many references to similar conclusions in other regions or even in nearby SE Bering Sea (Barnard et al.) while occasionally using references from other regions to support its own conclusions (eg. North Sea, Southern Ocean). The authors miss a unique chance to strengthen the conclusions of this manuscript.

Page: 3 -Line 1: what is L11? Lana et al. 2011? Please check throughout ms

*We have now defined this acronym at first appearance: pg 2, line 14*

-Line 18: Holligan et al 1987 first reported the link between DMS and fronts; even if it was not in NESAP waters but NAtlantic waters .

*We added this reference and others: pg 3, line 21-22*

Page: 6 -line 7: Please report BP data in carbon units, not leucine units so they can be compared with PP data and with other studies.

*Done: pg 6, line 9-10; Fig. 4, 6, 7*

-Line 8: Hence, as done previously by Kiene et al, DMSPp can be estimated such that the DMSP/chl ratios are estimated with both parameters in the particulate fraction; only makes a difference where and when [DMSPd] are high. Fig 4 shows a match for DMSPt and DMSPd measurements; hence, DMSPp can be calculated.

*We have added DMSPp values to figures: pg 6, line 12-13; Fig. 4, 6, 7*

-line 9: with a GC-FPD discrete method

*Added: pg 6, line 10-11*

-line 12: sampleS

*Corrected: pg 6, line 16*

-line 15: “The estimation formulas” used?

*Corrected: pg 6, line 20*

Page: 7 -line 6: where were the SSS and SST matches obtained from? The PMEL data set does not provide them.

*Nearly all PMEL data for this region provides matched SSS and SST. The percentage of DMS data obtained from this source with matched SSS and SST values has been added: pg 7, lines 10-11.*

Page: 8 -line 21-22: I had come to assume that L11= Lana et al 2011. If yes, please reword this sentence

*Corrected: pg 8, line 31*

-line 23: please insert “The PMEL” data were first...

*Corrected: pg 8, line 31*

-line 32: replace ‘that’ with ‘those’

*Corrected: pg 9, line 9*

Page: 10 -similar DMS/P-NPP relationship by Bell et al for the North and South Atlantic along the AMT transect and by Matrai et al for the Barents Sea. Should be addressed in the Discussion.

*This is a relatively minor result based on our high resolution underway data. We did not include this topic in the discussion, as we believe it would dilute our discussion of contrasting DMS cycling regimes.*

Page: 11 -2nd paragraph: because similar conclusions of prymensiophytes vs other phyto groups and DMS/P patterns were drawn by Barnard et al 1984? in the SE Bering Sea, they should be definitively mentioned in the Discussion.

*Thank you for pointing out this oversight. We have added a reference to this study on pg 17, line 5, and point out the similar results directly on pg 17, line 35; pg 18, line 1.*

Page: 15 -line 1: something is missing before 'and'; or remove 'and'; or replace by 'a'?

*Corrected: pg 15, line 11.*

Page: 16 -section 4.1 and elsewhere: Since references beyond the NESAP are already included, other -mostly older- very pertinent references have been suggested in this review and should be included to strengthen the arguments made.

-line 11: but not in polar waters (Turner et al for southern ocean; Matrai et al for Barents Sea)

*Have added references: pg 16, line 19.*

line 13: please insert after 'physiological state' “, as previously shown by Gabric et al. (1999)” [Barents Sea]

*Done: pg 16, line 22.*

-line 14: please insert 'e.g.' in front of the refs listed, as there are other pertinent refs as well

*Done: pg 16, line 23*

-line 27: please insert 'and elsewhere' after NESAP

*Done: pg 17, line 5*

-line 31: which studies? add references!

*Done: pg 17, line 5*

Page: 17 -line 6: waterS

*Corrected: pg 17, line 16*

-somewhere in this page: A similar conclusion on the influence of prymensiophytes in 3 coastal domains just a bit north in the NE Pacific was reported by Barnard et al 1984. Please include.

*Done: pg 17, line 35; pg 18, line 1..*

-line 19: update the McParland and Levine ref, as the ms has moved on in its review process –

*Corrected: pg 17, line 32*

-line 26, after the Sunda et al. 2002 ref. Please address the observation that a post-bloom = also when bacterial activity is highest and DMSPd > DMSPp, as phyto cells become leakier (eg, Matrai and Keller 1993 and Malin et al 1993 for cocco blooms; Stefels et al review as well)

*We have now added some brief discussion of this: pg 18, lines 17-19*

Page: 18 -line 3: add a few references after 'cell lysis' for all processes mentioned -line 6: instead and/or in addition to the variables reported herein? -line 8: which 'studies'? add refs (e.g., xxx)

*Done: pg 18, lines 12-14*

-line 9: is this only for coastal waters of the NESAP? Or elsewhere also? Please specify. This is not a new observation for other regions (e.g., Turner et al Southern Ocean, Matrai et al. Barents Sea)

*Done: pg 18, lines 31-32*

-line 21: please insert "in other regions" after 'previous studies'!

*Done: pg 19, line 18*

-line 29: please insert "in other regions" after 'previous studies'

*Done: pg 19, line 24*

-line 31-32: check punctuation

*Reworded: pg 19, 26-27*

Page: 19 -line 2: please convert to carbon units!

*Done: pg 19, line 29*

-line 7: it IS possible

*Corrected: pg 19, line 32*

-line 21-23: delete this paragraph. It is naive and does not add anything

*Done.*

Page: 20 -section 4.5: Both Hind et al 2011 and Deutsch et al 2009 in the Eastern SPacific and globally, respectively, combined Longhurst provinces and DMS-based algorithms to test their predictions. Both studies should be referenced and included here as they discussed the strngths and weaknesses of such DMS predictive algorithms. Hind et al. also include many of the variables discussed in this study, even the presence of eddies and upwelling.

*We have included the reference to Hind. Perhaps the reviewer is referring to the paper by Derevianko et al. 2009, on which Deutch was an author. This paper examines model performance, but does not include Longhurst provinces (it is a global study). We have added two other papers that do utilize provinces (Belviso et al. 2011, and Royer et al. 2015): pg 19, line 2.*

Page: 22 -line 1: supportS

*This section was otherwise edited based on the other referee's comments.*

-line 1: please insert "in summer" after 'hotspots'

*Done: pg 22, line 31*

-line 10: By US NSF rules, shouldn't all data be submitted to a long-term data repository? .

*We have the data prepared for submission to the PMEL data server. However, the site is currently unavailable due to the partial US government shut-down. These data included paired ancillary variables.*

Page: 24-32 References -check subscripts and italics for scientific names throughout -format references; remove all caps throughout

*Corrected.*

Page: 34 -please insert "(in parenthesis)" at the end of the Table 2 title. That's what is in (xxx), right?

*Corrected (should be clear what's in parentheses now): pg 38, lines 2-3.*

Page: 41 -Fig 4d y-axis: why not DMSPp/chl a? both are particle-bound variables These are discrete stations.

*We have now changed this to DMSPp/chl a : pg 45, line 4*

-Fig 4f: can you please report BP in Carbon units? otherwise it cannot be compared with PP or other studies

*Corrected: pg 45*

Page: 42 -Fig 5: the y-axis scale is missing

*Corrected: pg 46*

Page: 43 -same comments as for Fig 4

Page: 44 -same comments as for Fig 4

*Corrected: pg 47, 48*

Page: 46 -Fig 9: Given the tables, fig 8 and the fact that the differences in the DMS flux estimates is so small, this figure does not add much and could be removed

*We have chosen to keep this figure, as it demonstrates areas where concentrations vary significantly from PMEL data.*