

Interactive comment on “Effects of the interaction of ocean acidification, solar radiation, and warming on biogenic dimethylated sulfur compounds cycling in the Changjiang River Estuary” by Shan Jian et al.

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Question 1. Lack of reference to the existing literature: There are now a good number of published papers out there that report the effects of OA on DMS and related compounds, but the authors have only cited a handful. In particular, the works of Archer et al. (Arctic mesocosm), Webb et al. (various mesocosms), and Hopkins et al. (various mesocosms and shipboard studies), Hussherr et al. (shipboard) are not mentioned at all, which seems a little odd. To me, it is important to place your findings within the context of the existing literature. They do mention a few examples, but with some errors

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in referencing: e.g. Avgoustidi et al. 2012 is given in the reference list, but they also mention Avgoustidi 2006 in the text but not the list of references.

Reply: Thanks for the reviewer's comment. We have added these new literatures in the revised manuscript. "Other climatic ecological stressor or factors would probably alter the effects of ocean acidification on the production and consumption process of DMS in both direct and indirect ways (Arnold et al., 2013; Archer et al., 2013; Webb et al., 2016; Hopkins et al., 2010; Hussherr et al., 2017)." (Page 3 Line 10) "Archer, S. D., Kimmance, S. A., Stephens, J. A., Hopkins, F. E., Bellerby, R. G. J., Schulz, K. G., Piontek, J., Engel, A.: Contrasting responses of DMS and DMSP to ocean acidification in Arctic waters, *Biogeosciences*, 10, 1893–1908, <https://doi.org/10.5194/bg-10-1893-2013>, 2013." (Page 14 Line 30-32) "Webb, A. L., Malin, G., Hopkins, F. E., Ho, K. L., Riebesell, U., Schulz, K. G., Larsen, A., Liss, P. S.: Ocean acidification has different effects on the production of dimethylsulfide and dimethylsulfoniopropionate measured in cultures of *Emiliana huxleyi* and a mesocosm study: a comparison of laboratory monocultures and community interactions, *Environ. Chem*, 35, 405–420, <https://doi.org/10.1071/EN14268>, 2016." (Page 20 Line 20-23) "Hopkins, F. E., Turner, S. M., Nightinale, P. D., Steinke, M., Liss, P. S.: Ocean acidification and marine biogenic trace gas emissions, *P. Natl. Acad. Sci. USA.*, 107, 760–765. <https://doi.org/10.1073/pnas.0907163107>, 2010." (Page 17 Line 18-19) "Hussherr, R., Levasseur, M., Lizotte, M., Tremblay, J., Mol, J., Thomas, H., Gosselin, M., Starr, M., Miller, L. A., Jarniková, T., Schuback, N., Mucci, A.: Impact of ocean acidification on arctic phytoplankton blooms and dimethyl sulfide concentration under simulated ice-free and under-ice conditions, *Biogeosciences*, 14, 2407-2427, <https://doi.org/10.5194/bg-14-2407-2017>, 2017." (Page 17 Line 20-23) "Avgoustidi (2006)" has been replaced with "Avgoustidi (2012)" in Page 10 Line 27.

Question 2. Lack of appreciation of the 'bigger picture': Why do we perform these kinds of experiments? Ultimately, it is to generate data that may be utilised by modellers within earth system models. Some recognition/discussion of this would be useful. At

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least, some discussion of published studies (Six et al., Schwinger et al.) to provide the reader with an understanding of the potential DMS-climate feedbacks resulting from OA. Otherwise why do we care?

Reply: Thanks for the reviewer's comment. We agree with the reviewer's comment and have added the relevant literature in the manuscript. "Six et al. (2013) and Schwinger et al. (2017) estimated changes in future DMS emissions with Earth system model and indicated that global warming can be amplified by reduced production as a result of OA. Therefore, the research on biogeochemical cycle of DMS can help to better understand the feedback effect between the OA and global warming. Moreover,..." (Page 3 Line 3-6) "Six, K. D., Kloster, S., Ilyina, T., Archer, S. D., Zhang, K., and Maier-Reimer, E.: Global warming amplified by reduced sulphur fluxes as a result of ocean acidification, *Nature Clim. Change*, 3, 975–978, <https://doi.org/10.1038/nclimate1981>, 2013." (Page 19 Line 25-27) "Schwinger, J., Tjiputra, J., Goris, N., Six, K. D., Kirkevåg, A., Seland, Ø., Heinze, C., Ilyina, T.: Amplification of global warming through pH dependence of DMS production simulated with a fully coupled Earth system model, *Biogeosciences*, 14, 3633–3648, <https://doi.org/10.5194/bg-14-3633-2017>, 2017." (Page 19 Line 17-19)

Question 3. Language weaknesses: The entire paper needs language checking. The structure of the paper needs some consideration - for example, large chunks of the 'Results' text would probably be considered more suitable for the 'Discussion'. I would recommend that the authors carefully consider all of the above and the detailed points raised by Reviewer #1 before even considering resubmitting this paper. In its current form, it is far from suitable for publication.

Reply: Thanks for the reviewer's comment. We have adjusted the structure of the 'Results' and 'Discussion'. "The concentrations of DMSPp showed significant differences among three treatments ($p \leq 0.008$) for high-temperature treatments and minimal differences under ambient temperature treatments. Results from two-way ANOVA illustrated the interaction between temperature and pH on DMSPp concentration ($p = 0.001$). This indicated that the pH and temperature influenced the biological produc-

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tion of the dimethylated sulfur compounds in seawater.” has been pulled together into: “4.2 The effect of the interaction between OA and environmental factors”. The revised content appears in Page 13 Line 17-26: “The concentrations of DMSPp showed significant differences among three treatments ($p \leq 0.008$) for high-temperature treatments and minimal differences under ambient temperature treatments. Results from two-way ANOVA illustrated the interaction between temperature and pH on DMSPp concentration ($p = 0.001$). This result indicated that temperature could regulate the effect of pH on the biological productions of DMS and DMSPp in seawater. In addition, Todgham and Stillman (2013) reported that multiple stressors could influence performance independently (additive) or interactively (antagonistic or synergistic). We can infer that OA and warming play a synergistic role in the production of dimethylated sulfur compounds. This result is consistent with that reported by Six et al. (2013) who showed that global warming could be amplified through pH dependence of DMS production. Therefore, global environmental change manifesting in OA and warming may not result in a decreased DMS as suggested by the effect of elevated CO₂ in isolation” In order to improve the level of English, the manuscript has been edited for language by EnPapers: <http://www.enpapers.com/>

In short, we have carefully considered the reviewers’ comments and suggestions and conducted the revision seriously. We are very thankful to the reviewers for all the valuable comments and helpful suggestions to improve this manuscript.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-453>, 2017.

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Fig. 1. CERTIFICATE_OF_ENGLISH_EDITING