

Reply to referee #1

We sincerely thank the referee for the valuable feedback that we used to improve the quality of this manuscript. According to these suggestions, we have supplemented several references and corrected some mistakes in our previous draft marked in yellow. Our point-by-point responses are listed below:

R1: ...What I am missing here, however, is a reference to previous work published on benthic methane and sulfur cycling and the corresponding element fluxes from Eckernförde Bay, as well as a reference towards the potential impact of submarine ground water discharge.

Authors: We sincerely appreciate the valuable comments. We have checked the literature carefully and added references (Bussmann et al., 1999; Bertics et al., 2013) on “sulphate reduction” and “submarine groundwater discharge” to section “4.3.2 Low oxygen events” of the ms, which would favour us to better explore various possibilities affecting bottom DMS concentrations at BE.

R2: ... no sulfide or sulfate data were measured or presented, but besides dissolved DMS compounds, also particulate phases were measured, which should be reflected by the title.

Authors: Thank you for pointing this out. We have modified the title to “A decade of DMS, DMSP and DMSO measurements in the southwestern Baltic Sea”, which now refers to both dissolved and particulate sulphur compounds. Corresponding changes have also been made in the abstract.

R3: L18: replace ‘essential’ by ‘important’ sources.

Authors: Done.

R4: L60: replace (www links) by reliable permanent sources.

Authors: www link was replaced with Lennartz et al. (2014).

R5: L127: ‘hold’ instead of ‘true’.

Authors: Done.

R6: L21: SCOPE studies on the topic?

Authors: L21: Thank you for this point. Indeed, the SCOPE (Scientific Committee on Problems of the Environment) book series covers many aspects of the global sulfur cycle, see e.g., the studies presented in SCOPE books #19, #39, and #48. However, we think that the cited (more actual) references are better suited to justify our line of argument.

R7: L123: approach (Ref)?

Authors: We have added the reference of Reissmann et al. (2009).

R8: L495: Is there a better reference available?

Authors: The given link refers to the Boknis Eck database where all data discussed in our ms are archived.

R9: Fig.1: Mention source for map details.

Authors: We have added this information in the caption of Fig. 1.

R10: Fig.2: Homogenize number format (e.g.,'62.5') and bars given in parts e and f (captions) Mention how plots were generated (software).

Authors: According to the suggestion, we have re-adjusted number formats and bars in fig. 2e and 2f. In addition, we added the information on how the plots were generated in the captions of fig. 2 and fig. 3.

R11: Fig.6: What do you think about a further figure in comparing your results with previous studies? I would love to see that, indeed.

Authors: Thank you for your suggestion. In fig. 6 we provided mean seasonal variabilities of DMSP_p, DMSO_p and Chl *a*/relative dinoflagellate abundance in the mixed and bottom layers at BE, respectively. To our knowledge, this is the first time linking DMSP_p and DMSO_p variabilities to dinoflagellate abundance in the bottom layer, as most studies are focused on the surface/mixed layer (e.g., Table 2 in the ms). Among these time-series studies, only those provided simultaneous DMSP(O) and Chl *a* data could be compared to ours. Therefore, Vila-Costa et al. (2008), Speeckaert et al. (2018), Dixon et al. (2020) and Bepari et al. (2020) are included. Considering the unavailability of original data and/or different sampling strategies in the cited time series studies, we think these studies are not comparable to our study. Instead, we chose to make a comprehensive table (Table 2) which includes all existing time-series DMS/P/O data.

R12: Fig.7: Replace all symbols by open ones, to allow for a recognition of the number of data generated - Fig.7 c: Start all text at the axes with capitals.

Authors: Yes, we have made all suggested modifications in the fig. 7 in the revised ms.

R13: Check the format of references: e.g. Wolfe et al. - Check for missing journals titles in the reference list: e.g., Toole et al., Rahmstorf et al., Richir et al., Song et al. . .

Authors: We feel sorry for our carelessness. We have corrected these references and checked others as well.

Reply to referee #2

We feel great thanks for the referee working on our manuscript and these comments are really helpful to improve the quality of this ms. According to these nice and precise suggestions, we have made corresponding corrections/additions to the ms (marked in yellow). Also, supplementary material of Chemtax in terms of input and output ratios is added. Our specific responses are as follows:

R1: Line 12 and entire document: What is the rationale in using the class name for prymnesiophyceae, while all other groups were kept unspecific? Please harmonize all phytoplankton groups throughout the manuscript to prymnesiophytes.

Authors: Yes, the referee is right. We should keep all phytoplankton groups unspecific. Corresponding changes from prymnesiophyceae to prymnesiophytes have been made throughout the ms.

R2: Line 101 how long after sampling was the filtration done?

Authors: Sampling of filtration was immediately started as soon as returning to the lab and this process usually took no more than one hour. Therefore, the entire time would be around 3 hours (2 h returning journey + 1 h filtration process).

R3: Line 116: Please give more details about the CHEMTAX® approach, did you use different depths, years etc. Please give input and output ratios for the data set.

Authors: All the phytoplankton pigments are dealt with the same input ratio matrix and we have added this information in the ms. Input and output ratios are given in Table S1 as supplementary material.

R4: Line 283 ff and Line 319ff Discussion about 4.3.1 The Major Baltic Inflow events and 4.3.2 Low oxygen events: The paper would benefit, if the two events would be better introduced at the beginning of each chapter including previous literature about associated findings with these type of events. This would be helpful to understand the rationale behind the expectation of changes also for the sulphur compounds.

Authors: We added text as well as relevant references to the ms at the beginning of sections 4.3.1 (The Major Baltic Inflow events) and 4.3.2 (Low oxygen events) in order to introduce these events.

R5: Please check the references for consistency

Authors: We have examined and corrected every reference in the ms to keep the consistency.