Interactive comment on “Composition and Vertical Flux of Particulate Organic Matter to the Oxygen Minimum Zone of the Central Baltic Sea: Impact of a sporadic North Sea inflow”

by Carolina Cisternas-Novoa

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In this study the authors use a wide range of analyses to investigate the vertical structure of suspended and sinking particulate matter composition in two stratified basins of the Baltic Sea following the MBI of 2014-2015. The data set is large and interesting, but I concur with the first reviewer’s assessment that the study lacks a clear focal message. For this reason I would encourage the authors to streamline the text when making their revisions.

My principal scientific comment about the paper would be that the authors have not acknowledged the possibility that vertical profiles of dissolved and particulate constituents in the Gotland Basin may be influenced by displacement effects. Following the MBI of 2014-2015, the sub-halocline water column of the GB experienced significant turbulent mixing between ‘old’ and ‘new’ water masses. A lot of the changes in water chemistry that occurred during 2015 were caused by displacement of old, stagnant water by water masses associated with the MBI (see e.g. Myllykangas et al., ESD 8, 2017). For example, the low concentrations of Si(OH)4 and PO4 in the deepest samples of the GB (Fig. 2A) are very likely due to enhanced contribution of oxic, low-nutrient water at this depth, and not due to scavenging of these constituents onto MnOx particles as suggested by the authors for phosphate (Line 464 and in the Conclusions). Displacement may have also influenced the vertical structure of suspended and sinking particulate matter, so this angle should be included when interpreting the results. In addition I would urge the authors to check their text thoroughly for typographic, spelling and grammatical errors. I have highlighted a few in my minor comments but there are likely several more.

Kind regards, Tom Jilbert

AR: We agreed with the reviewer that the displacement effects associated with the 2104/2015 MBI might have influenced the vertical profiles of dissolved and particulate constituent. Therefore, we add this aspect to the discussion (L478-484) of the vertical profile of nutrients (L504-510), vertical profile of particulate organic in the water column, and particulate organic matter fluxes (L554-558).

However, even when we acknowledge that the net effect of the MBI in the particulate organic matter (POM) distribution and export efficiency is a combination of physical effects and biogeochemical changes; this does not modify our conclusion. Our results suggest that changes in the water chemistry related to the MBI and the consequent transport or in-situ formation of MnOx due to the favorable redox conditions may impact the distribution, degradation, and of export of POM in the GB

We thank Dr. Tom Jilbert for his useful comments and corrections. We fixed all the mistakes pointed out and carefully revised the manuscript to avoid future spelling and grammatical errors.

Minor comments

Line 61: spelling: ”allochthonous”

AR: We corrected the spelling mistake.

Line 95: spelling and grammar: the correct spelling is ”Fårö”; Use “In the LD” rather than “At the LD”

AR: We corrected the grammar mistake

Line 110: rephrase (difficult to understand)

AR: We rephrased the sentence.

Line 156: grammar: Use “consisted of” rather than “consisted in”

AR: We changed the preposition

Line 166: what is the meaning of “caped”?

AR: We changed the word “capped” for “covered”

Line 181: grammar: Use “in duplicate” rather than “in duplicated”

AR: It has been fixed

Line 220: rephrase (difficult to understand)

AR: We rephrased the sentence

Line 321: spelling “below”

AR: We fixed the spelling of “below” in the ms

Line 354: what is the meaning of “and similar to the water column”?

AR: For clarity, we modified this sentence to “similar to the water samples,”

Line 356: word missing: “MnOx like were...”

AR: We fixed the sentence

Line 357: Remove colon (:) before “TEP”

AR: We removed the colon

Line 358: Define ESD

AR: We added the definition of equivalent spherical diameter (ESD) to the text.

Line 362: Avoid staring a sentence with an acronym

AR: This has been fixed

Line 375: add space before bracket. Also “Redfield’s” should be “Redfield ratio”

AR: We fixed those mistakes

Line 390: DI should be introduced and defined in the Methods section

AR: We added the definition and calculation of the DI to the method section.

Line 432: grammar: “may be enhanced”

AR: We changed this line

Line 437: typographic errors

AR: We fixed the typographic error

Line 444: typographic errors

AR: We fixed the typographic error

Line 451: “compounds” plural

AR: We corrected the word to “compounds”

Line 453: spelling: “phosphorus”

AR: We corrected the spelling of “phosphorus” in the ms.

Line 464: Rephrase and check grammar, tenses, etc.

AR: We rephrase and corrected the grammar of this paragraph.

Line 468-470: these statements belong in Results rather than Discussion

AR: We moved the statement to the results section

Line 489-90: typographic errors

AR: We modified this paragraph and fixed the errors.

Line 519: Mn2+ is not an electron acceptor

AR: We fixed this mistake

Line 526: PN and CSP are not compounds. Rephrase.

AR: We changed “compounds” to “components of POM”

Line 597: Nisken bottle, not CTD

AR: We replaced CTD by Niskin bottle

Table 2: should the units be “cells/mL)”?

AR: We modified how we showed the units to (cell ml-1)

Fig. 4: are these all the sampling depths for MnOX-like particles? If samples from other depths were studied but yielded zero particles, these should also be included in the plot

AR: We added all values to figure 4, included the depths with low abundance or zero particles