Interactive comment on "A decade of methane measurements at the Boknis Eck Time-series Station in the Eckernförde Bay (Southwestern Baltic Sea)" *by* Xiao Ma et al.

Anonymous Referee #2

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GENERAL COMMENTS

The paper by Ma et al. titled: "A decade of methane measurements at the Boknis Eck Time-series Station in the Eckernförde Bay (Southwestern Baltic Sea)" investigated the CH4 temporal variability (from 2006 to 2017) in the whole water column at the Boknis Eck Time-series Station located in the Eckernförde Bay (SW Baltic Sea). In this system the concentration of CH4 increases with depth due principally to the fluxes from the sediments. Sporadic elevated CH4 concentrations (up to 696 nM) have been observed in the upper layer coinciding with Major Baltic Inflow events. During the period studied the Eckernförde Bay is an intense but highly variable source of atmospheric CH4. The

manuscript is very interesting and as the authors state, time-series measurements of CH4 are still sparse, reason why the study can contribute to have a better knowledge of the behaviour of this greenhouse gas in coastal systems, hot spots of CH4 emissions.

The data are well presented and the discussion of the dataset is comprehensive and conclusive. However, from my point of view, I have some suggestions to render the work more attractive to readers. Therefore, I suggest its publication after minor revisions. Since part of the behaviour of CH4 is attributed to contributions of more saline water from the North Sea and that it is a seasonal study with significant variations in temperature, it is convenient to include the variations of temperature and salinity in Figures 2 and 3. Throughout the manuscript it have been discussing about good and bad correlations between the different variables studied, however, hardly any statistical data (p values, r2) are provided to indicate the good or bad degree of these correlations. I think it would be convenient to include a table with the annual intervals of variation and mean values and deviation of the studied variables including salinity, temperature and wind speed.

SPECIFIC COMMENTS

Pg. 1 Ln 27. Missing "l" in oil. Pg2 Ln 52. Include "temperature increment" in . . . .. which is one of the most rapid temperature increment in large marine ecosystems. Pg 3 Ln 74. HgCl2 was added to the sample once it was sealed with rubber stopper and aluminium caps? Was the measurement done with a gas-tight syringe? In that case, could a small pore have been left in the rubber stopper to facilitate gas exchange? Pg 3 Ln 83. The concentrations of CH4 standards used should be indicated, because although the average concentration is 51.2 ± 84.2nM, there were some sporadic samples with very high concentrations (more than 600 nM) and those concentrations should be within the calibration line. Pg 3Ln 89-90. The accurate in dissolved oxygen and Chla measurements should be indicated. How were temperature and salinity measured? What was the precision of these measurements? Pg 4 Ln 112-113. What H2S concentrations were measured? It would be interesting to include these values Pg 4 Ln 115. Indi-

cate the value of the DO concentration that was obtained in the surface waters. This upwelling has also been appreciated in other variables such as nutrients?

Pg 4 Ln 115-116. Since the authors write about behaviour of temperature and salinity, it would be convenient to include graphs of these variables in Figures 2 and 3. Pg 5 Ln 124. What is the reason that in BE the Chla has elevated concentrations only in the upper layers in March and not occupied the whole water column as other works realised in this system? Are Chla and Secchi depth well related to the entire study? Perhaps it could be included in the figure of the Chla the Secchi depth graph. If we look at figure 2 in 2006 and 2012 the Chla occupies the entire water column. What could have happened in these years for the Chla behaviour to be different? Pg 5 Ln 130. To show seasonal and inter-annual variations, a table could also be presented showing the variation interval and annual mean value of each variable. Figures 2 and 3, although very illustrative, have been made with interpolations and do not show the specific data that it is interesting to know. Pg 5 Ln 154. Is there any work in the area where CH4 benthic fluxes have been measured? If so, it would be interesting to include the value. Pg 6 Ln 166-167. Was the water more turbid? Did Secchi's disc reach less depth? Pg 6 Ln 178. What is the r2 of the relation between salinity and CH4? Pg6 Ln 184. Include variation of dissolved oxygen values to change from hypoxic to oxic condition in the bottom layer. Pg 6 Ln 189. Include the correlation coefficient (r2) of the relation between salinity and CH4 in November 2013. Pg 6 Ln 199. Include the correlation coefficient (r2) of the relation between salinity and CH4 in March 2014. Pg 7 Ln 213-214. Since CH4 saturation has been obtained from the surface methane concentration and equilibrium concentrations of CH4 in seawater, it is obvious that surface CH4 saturations are directly proportional to its concentrations in the surface water, I would omit this from the manuscript.

Figures:

In the figures the letters and numbers are in Arial and not in Times New Roman like the rest of the manuscript. Figure 1. The quality of the figure must be improved.

Figures 2 and 3. The axis titles should appear with capital letters as: Depth, not depth and Dissolved oxygen not only oxygen. It should be convenient to include isolines in these figures for a better appreciation of the concentration variations. Figures with temperature and salinity variations should be included.

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2020-107/bg-2020-107-RC2-supplement.pdf

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2020-107, 2020.