

Interactive
Comment

***Interactive comment on* “East Siberian Sea, an arctic region of very high biogeochemical activity” by L. G. Anderson et al.**

Anonymous Referee #1

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This is a study with important new data for the East Siberian Sea region, which has not often been sampled before because of its bad accessibility. I recommend that the data and its interpretation be published in Biogeosciences. Unfortunately, the manuscript has not been written with much care. The authors should improve on this considerably. Below I have given some suggestions for this, but the work of the authors should go further. The results can be discussed in more depth.

Section 3.2.1 Primary Production I think the calculations are overly simplified. The authors assume a mean undersaturation of 100 μatm . It should be easy to calculate the real mean value. Also the remaining calculations consist of several assumptions which should be easy to avoid by using firm data or estimates. For example, what is the origin of the 30 m used? The calculations as they appear in the manuscript

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result in a very uncertain figure for the primary production, which cannot convincingly be compared with other estimations. If a more reliable figure for the primary production will be obtained, this should be brought into perspective, i.e., what is the magnitude compared to adjacent regions and compared to the Arctic Ocean.

Section 3.2.2 Fate of organic matter The part of this section treating methane is confusing. It should be restructured to better convey the message, which as it is now, can only with a lot of effort be extracted from the text. Moreover, in the abstract different information is given for the explanation of the CH₄ distribution.

In many Figures, the axis descriptions are much too small to be readable, including Figs. 2, 3, 4, 6, 7, 8, 9, 10, 11. This should be improved.

Minor comments and typos

Many occurrences in the text: In cases like (e.g., Anderson et al., 2006), a comma should be placed after: e.g. (but also after: i.e.).

P1138, L11 ... (CO₂), over-saturating ...

P1138, L17 delete: even tough

P1138, L18 ... column, but dominates ...

P1139, L26-27 This is a strange sentence, which does not clearly have a goal. It is sufficient to say that there has been a large decrease in summer sea ice coverage. Please rephrase.

P1140, L4 low saline (instead of fresh)

P1140, L6 delete: has a strong impact on the current system which. This is repeating from a few lines earlier.

P1140, L12 ...Wrangel Island,

P1140, L15 presented (instead of illustrated)

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P1140, L20 continental slope (instead of shelf slope)

P1140, L23 ... by primary production in summer ...

P1140, L24 the origin of high salinity bottom water. This part of the sentence is not clear. What do you mean with this? Please explain more.

P1141, L3 have (instead of has)

P1142, L10 Could you please give an indication what the uncertainty of the calculated $f\text{CO}_2$ is?

P1142, L14 PANGAEA

P1142, L16 was (instead of were)

P1143, L6 Fig. 3a

P1143, L17 during (instead of under)

P1143, L27-28 Change sentence to: A large region with bottom temperatures close to the freezing point was observed (Fig. 3d).

P1144, L1 warmer (instead of: above zero degrees)

P1144, L14 significant (instead of clear)

P1144, L15-17 The sentence: "This offset ... Anderson, 1997)." Does not seem to be appropriate here. Why is it here? One cannot compare fresh water with water of salinity 24. Water with salinity 24 in the ESS has TA of close to $1800 \mu\text{mol/kg}$.

P1144, L20-22 Change to: The linear fit (Fig. 6a) is caused by the fact that the impact of biological production and decay of organic matter in oxic waters is relatively small, at least in this salinity range. Note that the data presented here cannot identify whether alkalinity mixing of fresh water and sea water is conservative, because there is no fresh water value given, and neither values for waters with salinities between 0 and 15.

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P1144,L22-23 This contention should be toned down, as the deviations of TA from the theoretical mixing line may be as large as 50 $\mu\text{mol/kg}$ (see Fig 6a).

P1144, L24 no formal (instead of: a less)

Bottom of P1144 As to DIC and TA mixing, a simple linear relationship with salinity is not expected because of different source of fresh water in the region.

P1145,L1 How is the DIC deficit defined? Previously in the manuscript, a deficit has not been described.

P1145,L7 possible (instead of likely)

P1145,L25-26 This contention sounds strange here and leads to confusion. I suggest to end the sentence with a colon (:) and add the following paragraph to that.

P1146, 2nd paragraph. Accompanying the uptake of phosphate is that of silicate. This might be mentioned here as well.

P1147,L1 straightforward

P1147,L8-9 which means (instead of: that gives)

P1147,L9 by (instead of or)

P1148,L2-3 Please rephrase this sentence. It is not clear what is meant here.

P1148,L4 This must be 73°N, isn't it?

P1148,L5-6 I think the high phosphate values are overlapping with the minimum oxygen and pH regions.

P1148,L9 overall

P1148,L9-11 Please rephrase this sentence, it is grammatically unsound.

P1148,L17 In the marine environment, . . .

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P1148,L24 comma after water

P1148,L25 commas after CH4 and sediment

P1148,L26 "can be up to 3-7 orders of magnitude" Please rephrase.

P1149,L4 In (instead of At)

P1149,L9-14 This sentence is too long, and not well readable. Please rephrase and use possibly two shorter sentences to convey the information.

P1149,L16-17 "twice as high" As compared to 2008? Then this should be added.

P1150,L4 saturation (instead of solubility)

P1150,L6 . . . decreased in water diluted with river runoff, the latter of which has . . .

P1150,L7 delete: that of

P1150,L13 Whether (instead of if). Twice.

P1150,L18 delete been; delete likely

P1150,L21 delete In this contribution

P1150,L22 illustrates

P1150,L24 exist ; which (instead of that)

P1150,L25 which (instead of that)

P1150,L26 dominate Please use a different word, as this occurs three times within three lines.

P1151,L9 What is meant with under non-seawater condition?

P1151,L25 Consequently,

P1151,L26 Please change to something like: . . . not favorable. This is in line with

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observations of TA which show conservative behavior and thus . . .

P1152,L1 with (instead of by)

P1152,L2 from

Figures

Fig. 2 Please provide a valid reference (web site) for the sea ice map by the University of Bremen

Fig. 4 The contour labels in and the dates above the figures are too small. Please indicate where the Beaufort Sea is situated (as mentioned in the text, page 1143)

Fig. 5 This figure is only very shortly touched upon on page 1144, where moreover the information gained from it can also e found in other plots (e.g. Fig.3). I think Fig. 5 can be deleted as it does not add any useful info.

Fig. 7 Please add to the caption that these are all samples, not only surface samples

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