Biogeosciences Discussions

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Comment on bg-2021-296

Anonymous Referee #1

Referee comment on "Variations and environmental controls of primary productivity in the Amundsen Sea" by Jianlong Feng et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-296-RC1, 2021

In this paper, the authors aim to examine the variations in and environmental controls of primary productivity in the Amundsen Sea based on a bioregion approach. They divided the study area into nine bioregions based on cluster analysis, and examine the environmental controls for NPP in different regions. This paper has the potential to offer new insights into how and why environmental factors affect NPP differently in different regions. However, if any, such insights are largely lost in the fragmented and disorganized presentation of results and discussions and inconsistent application of analysis methods. The authors presented their results as if certain environmental factors only affect NPP in certain bioregions, for example NPP is affected by Fe and dissolved ions in bioregion 3 and 5, but is largely controlled by SST and sea ice thickness in bioregion 8 and 9. However, the impacts of SST, sea ice, Fe and other factors on NPP should exist for all bioregions, but at different relative importance. When analyzing these factors, the authors used correlation analysis and presented correlation coefficients only for some environmental factors in some bioregions. It should be applied to all environmental factors for all bioregions, and all results should be reported regardless their statistical significance. Only in this way, one can make meaningful comparison on how environmental controls differ in different bioregions. In addition, this study is largely descriptive on the variations of NPP and environmental controls without any meaningful discussion and exploration of why such differences exist. Based on these concerns, I would not recommend its publication without major revisions in the ways I outlined above.

Specific comments:

- The numbering of the bioregions seems rather random to me, which makes it difficult to follow the results. It would be better if they are numbered in some logical way, for example along the latitudinal gradient.
- 5: I don't think this is an effective visualization. Please present these data either in a

table format, or as a map matrix.

- Lines 307-308: It is not clear to me why these four bioregions were selected. If it is based on long term NPP trend (those with NPP increase), as the paper seems to indicate, why did you exclude bioregion 1?
- 7-10: The clustered bar charts are very difficult to read. Particularly for Fig. 9 and 10, they are impossible to read. Consider an alternative chart type, e.g. line charts.
- Lines 300-301: The seasonal cycle of Fe you described is only true for bioregion 9, and I do not see much seasonal variation of Fe in other bioregions. Could you please explain why Fe concentrations would show seasonal cycles?
- For Fig. 11, how did you calculate the annual NPP? Did you use the usual calendar year? It is better to use July-June, rather than Jan-Dec, because July-June year could cover the whole growing season for each year. Otherwise, a shift of max NPP from Jan to Dec, as you mentioned before, could create an artificial jump in NPP observed in Fig. 11a (Bioregion 3).