

Dear Editor,

Thank you for your further comments. Below are our responses. The original comments are in black, and our responses are in blue. The changes made in the manuscript are marked in red.

We look forward to hearing back from you.

Best regards,
Shuang-Ye Wu

Thank you for considering all of my comments and for your clear responses. I have some small mostly technical comments on the revised manuscript but would ask that you consider point #2 below particularly.

1) Abstract, lines 16-19 – the wording still, to me, strongly implies causation (“icebergs increase NPP”) but as discussed in other comments what is shown is an association in the data.

We “softened” our language to focus more on association, rather than causation. The revised language is as follows:

“We found that the presence of icebergs is associated with elevated levels of NPP, but the difference varies in different zones. Grid cells with small icebergs on average have higher NPP than other cells in most iron deficient zones: 21% higher for the SIZ, 16% for the POOZ, and 12% for the PFZ. The difference is relatively small in the CSZ where iron is supplied from melt water and sediment input from the continent. In addition, NPP of grid cells adjacent to large icebergs on average is 10% higher than that of control cells in the vicinity. The difference is larger at higher latitudes, where most large icebergs are concentrated.”

2) Abstract, lines 22-23. About the negative feedback on global warming. Because this would be an important point for carbon cycle science, I would like to ask if you can quantify the potential impact based on the data in the paper. For example, what is the total difference in NPP integrated across the different zones for regions with and without icebergs? Is it at all significant relative to the total global NPP? If not, can the statement about negative feedback be justified? Warming may produce more icebergs, but eventually it would produce less, as ice margins retreat on to land. I have the same comment about the text in the conclusions.

Based on the data used in this paper, it is possible to provide a quantitative estimate on the potential impact of the iceberg on NPP, although with great uncertainties. At the moment, it is a relatively small quantity of additional carbon (~0.05 Gt) produced because of the presence of icebergs. How much this could increase with global warming remains uncertain. However, this may not be insignificant in terms of global carbon cycle. Although global ocean NPP exceeds 100 Gt, most of it goes back to the atmosphere after organisms die. The Southern Ocean, on the other hand, is a place with major downwelling. As a result, the additional carbon could be transported to and stored in deep ocean for much longer period of time. Therefore, the possible increase of icebergs with global warming at least in the near future could potentially provide a negative feedback. We added “in the near future” in the abstract and conclusion to indicate the time frame that this possible feedback could work.

3) Page 3, line 2. "Has" should be "have."

This was corrected.

4) Page 3, line 18. Here and elsewhere, data is a plural word, please check the text.

"Data" was changed to a plural word throughout the manuscript.

5) Page 7, line 25. Are all differences significant? CSZ differences are not, correct? Can you give differences and p values in Table 2?

The main text was changed to "With the exception of the CSZ, the differences in all other zones are statistically significant based on the two-sample Student's t test." The differences are added to Table 2 with their statistical significance indicated.