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The Cryosphere Discussions

Interactive comment on "Brief Communication: Evidence of a developing Polynya off Commonwealth Bay, East Antarctica, triggered by grounding of iceberg" *by* C. J. Fogwill et al.

Anonymous Referee #2

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General Comments: This paper discusses a newly-formed DSW (Dense Shelf Water) formation region in the western side of large iceberg B9B, based on direct oceanographic observations and a high-resolution regional numerical ocean modeling. The Mertz Glacier Tongue (MGT) and B9B largely changed the position in January-February 2010. This region had been known as one of the most active formation regions of sea ice and DSW around Antarctica. Thus, although it is a very regional change, the direct ocean observations after the MGT calving event are valuable for better understanding the changing Southern Ocean and Antarctic Cryosphere. Ocean modeling would be useful for interpreting the sparse sampling of observations in the space and time if the model realistically could produce ocean circulation and water

masses in the focal region (i.e., the Adelie Depression for this study).

In my reading, unfortunately, the results from observation and modeling did not show the DSW formation in the lee side of B9B. I have seven main concerns, I'm happy if these comments are helpful for revising your manuscript.

[1] Although this paper speculated the local DSW formation in the lee side of B9B from the T-S profiles (Fig.1 B and E), T-S profiles in the Mertz SW region (Fig.1 D and G) have also a similar structure. There is a possibility that DSW is advected from the east.

[2] Showing a summer image in Fig. 1A is misleading. Polynyas in winter and spring have different roles. While winter polynya plays a role in high sea ice and DSW productions, spring polynya is a sea ice melting area. It seems to me that showing winter sea ice concentration or sea ice production is a direct way to indicate an active formation region of sea ice and DSW.

[3] The ocean model failed to reproduce the ocean properties. The observation (Fig. 1 B) shows an increase in summer salinity, but model does not. The temperature profiles are also different between the two.

[4] There are no pronounced differences in ocean velocity. In first place, how can you speculate the polynya activity from ocean velocity? I expect that a (bottom) salinity field is more suitable to show the activity before and after the relocation of B9b.

[5] Figure 1 should be revised. It is too small to see. Larger area which covers the Adelie Depression and the MGT is preferable. Please add bottom contour, grounding line, and ice front line to easily understand the regional configuration. I expect that active sea ice production near the B9B is on the Adelie Bank, not the Adelie Depression. If so, it seems to be difficult for the local water to be dense enough and to be exported from the Adelie Sill (where is the main pathway of DSW formed in the Adelie Depression).

[6] More detail of the model configuration is required in section 2.2. Model description in

the present form was insufficient for me to understand the model setting. My concerns about the model setting are ... (1) Horizontal/vertical resolution (2) Initial condition (the same condition for the two experiment?) (3) Why did you select 2009 and 2012 forcing? How well do the two years represent the conditions before and after the MGT calving/B9B relocation? It is helpful for readers to show maps of surface salinity flux (sea ice production) used for the model. (4) How long was the model integrated for each experiment?

[7] There are several sentences throughout the manuscript to speculate the impact on AABW. I don't think that emphasizing the connection to AABW at many place is important because this paper examined only the polynya near one large iceberg without showing the relative importance in the total DSW and AABW production. Some of them should be removed.

Minor comments

[Introduction] It is helpful for readers to describe the history of the B9B movement (at least after the MGT calving event).

[P5, L20-21] I can't see the salinity recovery in Fig. 1D.

[P5, L21-24] Without discussing the interannual variability, it is impossible to speculate the preconditioning of coastal ocean by the icescape change.

[P7, L13, "The effect this change ..."] I think you can check the ocean circulation change in the model.

[Figure 1] What do the dashed and solid lines indicate? I suggest that figures for the place/icescape and T-S profiles be shown separately to enlarge each figure.

[Figure 2] Background color for depth (only green and blue) does not make sense.

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