The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC1
https://doi.org/10.5194/tc-2021-390-RC1, 2022

Comment on tc-2021-390

Anonymous Referee #1

Referee comment on "Reversal of ocean gyres near ice shelves in the Amundsen Sea caused by the interaction of sea ice and wind" by Yixi Zheng et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-390-RC1, 2022

The authors claim that they identified Thwaites gyre for the first time. They conducted idealized simulations to investigate how sea ice affects gyre strengths and directions, which possibly impact the amount of warm mCDW intruding into ice shelf cavities. This is a nice paper. I do not have many concerns except for one point (see below).

Major comments
(1) If you would like to state that this paper identifies Thwaites gyre, the authors should provide a bit more detail about the observations and structures of the gyre. For example, vertical sections (T, S, Velocity), the ratio between barotropic and baroclinic components, etc.

Minor comments
Lines 35-40 Authors define PIB gyre. However, I think that Schodlok et al., 2012 do not argue the importance of small gyre circulation in front of PIG. They showed the importance of gyre circulation, which is larger than small gyre circulations discussed in this manuscript, which is confusing to me. A better definition of PIB gyre may be required.

Lines 35-43 It would be nice to see a paragraph on simulated gyre structures (or at least directions) in observations and the existing simulations. For example, you mention Schodlok et al., 2012 show that the strength of the PIB gyre is the main determinant of heat transport. Can you judge from their papers if they simulate gyres in front of PIG? Do previous models show gyres in the same direction or do some models show opposite circulation? As far as I can find, simulated circulation in Nakayama et al., 2014 (Ocean Modeling) is also reversed. Do you find some other examples? Additionally, do you also find something similar to Thwaites gyre in the existing model simulations? If not why? I understand that the authors added a few sentences on this point in the Discussion (Line 351-360) but it would be nice if you could summarize existing model studies with a focus on the representation of eddies in from of Pine Island, Thwaites, etc in the Introduction. Reviews on existing model studies would be helpful.

Lines 361-362: See major comment above.

Figure 7: Sea ice coverage is indicated by shaded patches. It is a bit confusing as initially, I thought white patches are sea ice. Maybe you could state “No sea ice“ or something similar to clarify?