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Climate of the Past Discussions

Interactive comment on "Impact of mid-glacial ice sheets on deep ocean circulation and global climate: Role of surface cooling on the AMOC" *by* Sam Sherriff-Tadano et al.

Anonymous Referee #2

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Sherriff-Tadano et al. has presented a study about the impact of mid-glacial ice sheet expansion on Atlantic Meridional Overturning Circulation via changing surface winds and surface cooling, based on fully and partially coupled experiments using MIROC model. They found that the relative strength of surface wind and surface cooling depends on the ice sheet configuration, and the strength of the surface cooling can be comparable to that of surface wind when changes in the extent of ice sheet are prominent. In the manuscript, the authors have discussed their results based on a nice review about the existing studies, meanwhile some parts of their own results need to be provided to support their conclusions. In the below, here is listed my comments:

Major comments: 1. In Figure 1, please add a panel for the ice-sheet anomalies between 36ka and 80ka, since it is a key to interpolate the modelling results.

2. Line 116: why to use the CO2 concentration and insolation at 35ka, instead of 36ka? A linguistic error? Or specific reason?

3. Line 170: Please add a reference for the LGM experiment.

4. Line 195-196: Please give the value of AMOC strength in PI experiment.

5. Line 219 and Figure 6: Please add the curve for the modelled PI state.

6. In what area are the NADW formed? Are they consistent among experiments? Any response of the NADW formation in the NORDIC Sea?

7. Line 249: bottom ocean stratification with respective to density? If so, please add the information for density in Figure 4.

8. Line 271: In addition to Figure 10, please show the convection map as that in Fig. 7c.

9. Also in Line 271: please add a figure for the statement 'colder water occupies the subsurface ocean in MIS3 compared with MIS3-5aice.' , in either Main text or SI.

10. In Table 1: please add the information also for the PI and LGM experiments together with their references.

11. In Figure 11, how to address the impact of stronger surface winds on the northward ocean heat transport and surface cooling in the northern North Atlanic? Any indications based on the experiments in this study?

Minor comments: Line 37: 'Project' to 'Projects'

Line 210: please refer to Figure 2d, for the warmer surface around Alaska

Line 303: '.' has been double used.