

Response to Editor Comments

(Note: editor comments in black and our reply in blue)

Lines 63-66 need to be rewritten, it is incorrect to say the CMIP5 could reproduce the observed Arctic ice-free time, as the observations do not show ice-free conditions.

Reply: Done. The sentence is changed to “they could reproduce agreed Arctic ice-free time by reducing the large spread using two different approaches with 30 CMIP5 models” in the revised manuscript.

At the end of the Intro I still think you need to give more justification for the paper than just showing more models. What new knowledge is gained in this assessment? This should be mentioned here.

Reply: In the revised manuscript, the sentences of “So, here we will evaluate all CMIP5 sea ice simulations with more metrics in both Antarctic and Arctic, in an attempt to provide the community a useful reference. Generally speaking, our study show that the performance of Arctic sea ice simulation is better than that of Antarctic sea ice simulation, sea ice extent simulation is better than sea ice volume simulation, and mean state simulation is better than long-term trend simulation. If we want to get the similar result with all CMIP5 sea ice simulations, the number of CMIP5 model we used during analysis should be more than 22.” are added.

Lines 83-86, it would seem appropriate here to reference your analysis of the 15 GISS ensembles to support your assertion that the ensemble spread between models is small. It is my understanding though in the large CESM ensemble that the spread in those ensembles is on the same order as between all CMIP5 models, so you may also want to comment on that (Work by A. Jahn). Thus, while you see little variability between the 15 GISS ensembles, the large (100 ensemble) CESM suggests otherwise.

Reply: In the revised manuscript, the discussion of ensemble spread using the same model is moved to lines 83-86. We agree with the editor’s comment that the large

ensembles may give large spread.

Lines 96, it seems appropriate here to reference studies that have "validated" PIOMAS, and mention that no such similar analysis is available for GIOMAS.

Reply: Done.

There remain instances that the language could be improved by a native english speaker, such as changing statements such as "standard deviation of models bigger than 15% of the observed SIE..." to "standard deviation greater than 15% "

Reply: We tried our best to improve the manuscript, and the statement of "standard deviation of models bigger than 15% of the observed SIE..." is also changed to "standard deviation greater than 15%".

Finally, we hope to express our sincere thanks again for all these valuable comments and suggestions.