

Review#2

The manuscript presents an analysis of archived model data that participated in the PMIP project. The authors propose the Laurentide ice sheet resulted in more stretching of the polar vortex (PV), which contributed to colder and more variable temperatures in eastern North America south of the ice sheet.

I found that the revised manuscript is greatly improved from the original submission. I would just advise the authors that the WAF looks a bit strange to me from the different models as shown in Figure 1. This doesn't surprise me as models struggle with this. Kretschmer et al. 2018 show the WAFz at 100 hPa in Figure 2 for stretched SPV events. I was looking for a good figure showing the climatology but wasn't successful. In general it is up over northern Asia and downward over northern North America. See also Figure 1 from Cohen et al. (2007). I just ask that the authors be mindful of the differences from what they show in the PMIP models and what the observations show. A supplementary figure on the difference between the model climatology and that derived from ERA5 might provide some useful context to the reader.

We thank the reviewer for this greatly relevant comment. In response, we have calculated the WAF from the ERA5 dataset (for the period of 1940 to 2024), and added a new figure, Fig S3, to compare the simulated WAF for PI and ERA5. A common feature between the PI simulation and ERA5 data is the spatial pattern, showing positive WAF over Eurasia and negative values over the N America continent. The main differences are the stronger WAF magnitudes of ERA5 data for both positive and negative values. We have mentioned this differences in text. Please note that we calculated the WAF for the PI climate state, rather than a composited WAF for weak SPV.

References:

Cohen, J., M. Barlow, P. Kushner, and K. Saito, 2007: Stratosphere-Troposphere coupling and links with Eurasian Land-Surface Variability, *J. Climate*, 20, 5335–5343.

Thanks for this reference, we have added it and discussed throughout the manuscript.