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Discussions

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Interactive comment on "Comparing the spatial patterns of climate change in the 9th and 5th millennia B.P. from TRACE-21 model simulations" *by* Liang Ning et al.

Liang Ning et al.

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Reviewer #1 In this paper, Ning et al. studied the spatial patterns of temperature, precipitation, and circulation anomalies during the latter part of the 9th and 5th millennia B.P. by using model simulations. They suggested that the long-term decline of insolation caused the cooling of North Atlantic passing a threshold around 4500 years B.P., and lead to a reduction in the AMOC and associated teleconnections across the globe. The result will help us to a better understanding of the 4.2 ka event. I think this is a very good paper and could be published in CP after minor revisions. Here are my comments and suggestions. We really appreciate the valuable comments and suggestions

from the reviewer. In this revision, we carefully addressed all the concerns from the reviewer, and we hope that the reviewer finds this revision satisfactory.

1. line16-17: I can't understand this kind of discription. You are discussing the climate change during the late 9th and 5th millennia BP, but use 9200-8800 versus 8800-8000a BP, 4800-4500 versus 4500-4000 a BP to defined them. It makes me confused. In this study, one major motivation is to compare the spatial patterns from cold event due to external forcing ("The 8.2ka BP event") with cold event due to internal variability superimposing on long-term decline ("The 4.2ka BP event"). Because the model cannot reproduce the exact timing of the cold events as the reconstruction, we can only select the timing with temperature decrease around the 8.2ka BP and 4.2ka BP in the simulation to represent these two events.

2. The English is generally good, however, I think it could still be benifit from a native English speaker. For example, line 42, "around" better be "superimpose"; line 61: "about" should be "drought"; line 62: "have" should be "had"... Thank you for these suggestions, but the text as written is correct.

3. line 65-70: here talk about the record of 4.2 ka drought. I suggest to move this paraghraph to the end of the first paraghraph. We amended the first paragraph to improve the discussion.

4. line 85: positive NAO, or negative NAO? Negative NAO. We added this information in line 85.

5. line 143-145: unclear. Do you mean the temperature during (4800-4500 a BP) minus temperature during (4500-4000 a BP) ? or the inverse? The differences between the two periods mean the temperature during period (4500-4000 a BP) minus the period (4800-4500 a BP). We clarify this in the manuscript.

6. line 152-154: consistent with paleoclimate reconstructions (Tan et al., 2018, EPSL) that indicate a weaker East Asian monsoon (Wang et al., 2005). This pattern is similar

to the situation during the LIA in China (Tan et al., 2018, QSR), and some of the megadroughts happened in recent centuries (Cook et al., 2010). We appreciate the reviewer providing this information. We have added the discussion into the manuscript, and also cited the corresponding references.

7. line 172-173, why do you choose 8.8 ka as a dividing line? why not 8.5 ka? From the temperature time series (Fig. 1a) the abrupt changes occurred around 8.8 ka BP, and this timing is also confirmed by the first principal component of REOF analysis on the SST (Fig. 4a). Therefore, we chose 8.8 ka BP as the dividing line. We added this clarification into the manuscript.

8. line 188, revise "from" to "during"? No change made.

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Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2018-132, 2018.