

# ***Interactive comment on “Comparing the spatial patterns of climate change in the 9<sup>th</sup> and 5<sup>th</sup> millennia B.P. from TRACE-21 model simulations” by Liang Ning et al.***

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Received and published: 7 November 2018

Yan et al examine TRACE-21 GCM simulations and conclude that internal variability explains climatic anomalies at the beginning of the 5th Millennium B.P. Ning et al also examine TRACE-21 simulations and find that there is a pattern of air temperature, precipitation & SST anomalies similar to those seen in the 9th Millennium B.P., which resulted from freshwater forcing and a shutdown of the AMOC. Freshwater forcing in the 5th Millennium is not a plausible explanation for the similarity in the climatic anomaly patterns and so some other mechanism is required. Ning et al conclude that precessional forcing is the most likely explanation, noting that the area of maximum cooling in

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the North Atlantic in the early 5th Millenium BP remains cold through most of the later Holocene, with only minor fluctuations. It is possible that such minor fluctuations result from internal variability superimposed on the long-term orbitally-driven changes, and so there is nothing inherently incompatible between the conclusions of Ning et al and Yan et al. Given that 2 reviewers suggest only minor revisions to the Ning et al manuscript, the suggestion that the paper be withdrawn is unacceptable. Reviewer #1 notes that “this is a very good paper and could be published in CP after minor revisions”; reviewer #2 states that: “I would recommend that the present manuscript may be accepted for publication after some minor revisions”. We are willing to revise the paper as reviewers suggest, and can cross-reference to Yan et al’s paper, but do not accept that the paper is unsuitable for Climate of the Past. The fact that we compared a longer interval (4000-4500) with the preceding interval has no bearing on our conclusions; it is quite clear from Figure 7 that the anomaly around 4.2ka B.P. is part of a longer period of cooling, and is similar to other anomalies that occurred over the last few millennia. Our goal was not to prove or reinforce conventional dogma about a purported “4.2ka B.P. event” but to objectively examine a long-term model simulation that spans this period of time. The model simulation does not rely on specific paleoclimate records, so it should not be surprising that such data are “not presented, listed or discussed”. It is clear from the analysis we present that there were areas with anomalously low precipitation, and other areas that were unusually wet in the late 5th millennium B.P. It would involve a much more extensive analysis to compare specific sites with model-derived estimates of P-E, and that is surely something that could be carried out in the future. However, the claim that there are 300 synchronous high-resolution proxy records indicating drought at 4.2ka B.P. (and another 200 at lower resolution. . .?) is preposterous fiction.

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

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