

Interactive comment on “Evidence for a widespread climatic anomaly at around 7.5–7.0 cal ka BP” by Mei Hou et al.

Anonymous Referee #2

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Mei Hou et al selected 47 previously published Holocene records sensitive to temperature, humidity, sea level, among others, across the world (mainly SE Asia, Mediterranean/Europe, Arctic, North, Central and South America). The selection was made as follows: “We exclude those records that do not provide convincing evidence of an event across this interval [7.5 – 7.0 kBP]” (sic! Lines 113 ff in the manuscript). Accordingly, the authors conclude that there was a widespread climatic event across the northern hemisphere (or even the world), with dry anomalies in the Asian Monsoon areas, cooling/wetting in the northern mid and high latitudes. They attribute this ‘event’ to a combination of low solar forcing, volcanoes and a rapid retreat of the northern ice sheets.

It is currently very popular to claim global climatic events in the Holocene and coin

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names. Indeed, the question whether or not centennial climate variability across the world was synchronous, and attributable to forced or unforced variability is fundamentally important (cf. Neukom et al. 2019: Nature; for the past 2000 years).

However, as stated in the manuscript (lines 113 ff) Mei Hou et al selected their data sets based on a preconceived idea (that there is an anomaly around 7.5-7 kBP); therefore, it is not surprising that their qualitative analysis does show this event across their regions of interest. If one starts with a grossly biased data set, the Results and Conclusions are grossly biased too. This is a fundamentally critical flaw of this manuscript.

Here I list just a few examples:

- For Kilimanjaro, Thompson et al (2002) report anomalies at 8.3, 5.2, and 4 kBP; 7-7.5 is not mentioned at all. The period in question (7.5-7.0 kBP) does not show anomalous mean or variability. The entire ice record does not have any chronological marker (all ages are model ages!). At the same time, Berke et al 2012 (QSR) show for nearby Lake Victoria (biomarker TT) that there is absolutely no anomaly in temperature or humidity in the period in question. This record is very well dated. For Lake Challa it is the same.
- Sundqvist et al (2014 Climate of the Past) and Briner et al 2016 (QSR) compiled an extensive data set for the Canadian Arctic and Greenland (47 records): absolutely nothing.
- The review by Wanner et al 2012 (QSR): nothing. Wanner et al 2015 (J Geol Soc) and the related Holocene Climate Atlas HOCLAT (Wanner & Ritz 2011): nothing. In contrast: these reviews show that the proxy records from the same area often show conflicting results when it comes to variability/anomalies at finer scales). Noteworthy: Wanner et al. (2015) used objective statistical methods to assess whether climate was 'anomalous' at a given time; an objective approach with statistical testing whether or not the window 7.5 – 7.0 kBP was different (mean, SD) from the preceding or following 500 years period is completely missing in the present manuscript. One may or may not see anomalies or trends presented in the paper, depending on the preconceived idea

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(or hypothesis), and what one strives to show.

- Marcott et al 2013 (Science) have shown that, for the Northern Hemisphere, the peak warmth was around 7.0 kBP; the period 7.5-7.0 were the warmest 500 years in the past 10,000 years, which is in complete contradiction to the idea proposed here.

- In their very comprehensive review, Solomina et al 2012 (QSR) report several glacial advances before, at 7.5 and after the period in question. These 500 years (7.5-7.0 kBP) were not different or anomalous to the periods before or afterward.

- Several high-quality records from Europe (Heiri et al 2015 The Holocene, work by Seppä et al) do not show any anomaly during the period under consideration.

- The same for European/Alpine Flood history: the most comprehensive review (Wirth et al 2015, QSR) does not show any anomaly during the period in question. In contrast: for the southern Alps, L Cadagno, L Ledro (also cited in the ms but by Magny et al) and lake Ghirla show very calm conditions ca 8 – 6.8 kBP. There was a peak for the N Alps (but at 7.6 kBP). In short: nothing anomalous.

- In many of the data sets shown in this manuscript, the period 7.5-7.0 kBP is represented by only 1 (one!) data point. This is not robust.

Moreover: if it turns out that the anomalies reported here were short-lived (centennial) and not synchronous across space in the period 7.5 – 7.0 kBP (which truly seems to be the case according to the Figures presented) then it is more likely that the regional anomalies (if they existed) could be attributable to unforced (internal) climate variability (instead of forced variability; see also Neukom et al 2019, Nature). This should at least be considered and could be tested (formal attribution).

In summary: The manuscript has a fundamental problem with an unacceptable bias in the underlying data set (selection of the records). Moreover, the analysis has been made purely subjectively (by eye or by preconceived idea); any objective statistical test is missing whether or not the period considered (7.5-7.0 kBP) was different from the

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500 years before or after the 'event'. With the approach proposed here, one can claim a 'widespread climatic event' possibly for all 500 years long periods in the Holocene.

This manuscript should not be published without addressing two issues (very serious and major revisions): 1. Unbiased selection of time series to start with (for the Arctic see e.g. Sundqvist et al. and other regional compilations) 2. Robust statistical testing (quantification) of the hypothesis whether or not the period in question was different (mean, SD, maybe other metric) from other 500 years long periods before or after 7.5 kBP. After revisions, the manuscript should go through review again.

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