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Climate of the Past Discussions

Interactive comment on "Climate changes recorded by Hani Peat in Northeast China over the past 13.8 cal ka BP" *by* Ge Shi et al.

Anonymous Referee #2

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The authors use two peat cores collected 20 m apart from Hani peatland in Northeast China to reconstruct climate, in particular East Asian summer monsoon variations, during the last 13,000 years. One of the cores was dated by AMS 14C dates on concentrated pollen grains. The main proxies they use include LOI (OM%), interpreted as reflecting vegetation productivity, and Rb/Sr, interpreted as reflecting chemical weathering. These two proxies were analyzed on these two separate cores, while the chronology for the second core was based on correlation of LOI results from both cores. They conclude that the summer monsoon increased from the early to mid-Holocene and then decreased from the mid- to late Holocene. Then they interpret these changes were due to the combined influences from insolation and ice volume.

I have several major concerns about the manuscript.

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The proxy interpretation as presented in the manuscript is too simplistic and lacks support from peatland/peat accumulation process. I don't think that LOI/OM alone can be directly used as climate proxy without constraints from other data and information. Peatland vegetation and plants should produce peat with near 100% in-site OM (except perhaps minor components of biogenic silicates, such as from phytoliths in some plant tissues), almost entirely independent of peatland plant species composition or vegetation productivity. On the other hand, the mineral/inorganic component (= 100% - OM%) is mostly derived from outside of the peatland from the surrounding landscapes, which may potentially reflect regional climate. However, the mineral materials could be transported either by fluvial process, such as streams and overland flows, or by eolian input by winds. For example, an increase in mineral content (that is, decrease in OM%) could be caused by flooding (that is, wet environment and high precipitation), or by wind-blown dust input (that is, in a dry environment and low precipitation, due to sparse vegetation and mobilized/exposed top soils). Therefore, distinguishing these two opposite causes, often with additional independent proxies (such as pollen/vegetation), is essential for meaningful climate interpretations.

Rb/Sr ratios pretty much reflect the same process as mineral content (100% - LOI/OM%), but their difference could reflect the sensitivity of these two proxies to erosion (physical weathering) and chemical weathering on the surrounding watershed.

The authors explicitly indicate that they would not discuss the two mineral deposition events at 11.3-10.3 ka and 2.0-1.4 ka. Actually these two intervals should be interpreted as the same way as other intervals with low OM contents, likely caused by either fluvial or eolian process, but at large magnitudes. The authors should consider these two periods along with other fluctuations to generate a consistent interpretation. In any case, I don't think the proxies they use are adequate and robust enough to make convincing climate reconstructions.

Despite that the authors identify existing problems and open questions about the Asian summer monsoon by citing many references, I don't think that the record presented

here contribute much to the debate, due to the shortcoming of the proxy they use (see comments above). Also, they have to rely on previous work to distinguish temperature from precipitation changes, such as on page 5 lines 22-28, which also limit the new contribution from this study.

As such, I don't think that the large-scale climate discussions about insolation and solar forcing (Figs. 7 and 8) are supported by the evidence and arguments.

The number of references is excessive. The authors cite >5 pages of references for a 7-page manuscript! Most references are not needed.

In summary, based on the above considerations, I do not recommend the publication of the manuscript without additional analyses and improved proxy interpretations.

Specific comments: Page 1 Line 26: insolation = incoming solar radiation, so "solar insolation" is redundant.

Line 26: "ka" often refers to 1000 year BP. Here it is better to say "kyr".

Page 2 Line 9: delete "." after "China"

Line 17: I don't think Gorham (1991) is an appropriate reference for "studying past climate changes", as this is a seminal paper on peatland carbon stocks and their sensitivity to climate change, but not proxy/paleoclimate studies.

Line 18-20: this excessive citation is not needed.

Line 24-26: again too many references, which are unnecessary.

Line 29: I don't think "YD" has been defined (Younger Dryas). Define abbreviation when first used.

Page 3 Line 3: Hani peatland, not Hani peat.

Line 4: probably use "peatland", rather than "swamp", as they are different. Swamp is too specific for woody peat-accumulating system with fluctuating water table.

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Line12: I'm not sure that these references are suitable for vegetation types, even though they may mention vegetation types, but likely were based on other sources. Also, move "." to the end of the sentence.

Line 21-22: why bothering with dating pollen grains? The peat contains high OM, and you should either find identifiable macrofossil or bulk peat for dating. If worrying about potential organic material from aquatic plants (usually not abundant on that type of peatlands), then pollen grains could come from aquatic plants as well (unless you pick specific types of pollen grains, such as large pine or spruce pollen grains). I don't necessarily question the results, but it just appears to me the effort is unnecessary.

Line 25-26: I think Bacon program would generate an age model, assigning age to every depth, so I'm not sure you need a plotting program (OriginPro) for interpolation.

Line 29: for LOI analysis, I'm not sure that weighted and grounded samples are necessary, unless grounded dry samples were also used for other analysis.

Page 4 Line 8. Delete "annual"

Line 21-22: These two mineral layers should be discussed in order to understand other changes in OM% (that is, mineral content). See my general comment above.

Line 12-15: this simplistic interpretation of LOI/OM is incorrect. No matter how productive is the peatland, if no external input of mineral materials, there will be no change in OM%. See my general comments above.

Line 18-21: This interpretation doesn't consider the transport process. Humid condition may cause great transport of fluvial-derived mineral materials, while dry condition may cause great source and transport of wind-blown mineral/dust. See my general comments above.

Page 7 Line 21: "major funding support"

Line 22: change "indoor" to "lab"?

Page 8 Too many references, and some of them are probably not necessary.

Page 14 Table 1. -indicate the unique dating lab ID number for each date, not just sample number. -indicate the depth range, such as 127-128 cm, or 126-127 cm?

Figure 1 Detail map of study site is essential to understand the potential sources of mineral materials, through fluvial or eolian inputs.

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