

Clim. Past Discuss., referee comment RC1
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Comment on cp-2021-20

Anonymous Referee #1

Referee comment on "The 4.2 ka event in East Asian monsoon region, precisely reconstructed by multi-proxies of stalagmite" by Chao-Jun Chen et al., *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2021-20-RC1>, 2021

This manuscript aims for revealing the evolutionary structure of so-called 4.2 ka event mainly by the use of stalagmite records. The authors argued that the ASM during the 4.2 ka event has a weak-strong-weak structure and was possibly associated with the AMOC. The logical structure of this manuscript is built on a local stalagmite record covering the 5040–2920 yr BP in combination with extant stalagmite records and proxy evidence. In general, the results are not intriguing enough and the reasoning is not rigorous to some extent. In fact, Bradley et al. (2019) doubted the existence of the 4.2 ka event, and thought that it is a local event even in the so-called provenance region, the northern North Atlantic region. Rather, a series of multi-decadal- to century-scale fluctuations which superimposed on an overall decline in temperature occurred over the last 5000 years. My concerns are shown as below.

Bradley, R. S. and Bakke, J.: Is there evidence for a 4.2 ka BP event in the northern North Atlantic region?, *Clim. Past*, 15, 1665–1676, <https://doi.org/10.5194/cp-15-1665-2019>, 2019.

What is the accurate criterion for the weak-strong-weak structure? How long does the 4.2 ka event last? Is it a millennial scale, multicentennial, century-scale or interdecadal event? I would suggest that the 4.2 ka event should be placed over a much longer perspective rather than such a short span of several hundred years. The association with Chinese Xia Dynasty and regulation of the ancient floodwaters by Dayu in Chinese history is highly speculative and lacks strong evidence.

A vegetation coverage above the cave is needed to facilitate the understanding of proxy mechanism.

Only a stalagmite record is selected to indicate the AISM change. More evidence is needed to verify their argument.

The inclusion of 8.2 ka event is confusing, when ice sheet does not melt entirely compared to 4.2 ka. When no freshwater was delivered to the ocean.

Lines 224-227: Why is $\delta^{13}\text{C}$ in dripping water controlled by surface precipitation considering modern monitoring is intra-annual? Here a mechanism description is needed.

Lines 299-300: the authors selected the lake proxies as validating evidence. However no necessary information is given, especially as for the dating uncertainties.

Line 308: the argument ice debris with the double peak pored into the NA during the 4.2 ka event is ambiguous. From Fig. 5B, it is hard to identify the so-called double peak structure. The same problem applies the argument in the line 309. Why it is the case when the Greenland temperature synchronously decreased during I and III stage.

Line 310: please indicate the period when a large amount of fresh water injected into the NA.

Line 312: would you show the AMOC intensity or NAO-like curves in Fig. 5 for comparison? To be frank, it is hard to believe the so-called weak-strong-weak AMOC structure as simulated by only one model.

Lines 326-328: Why does Yuexi peatland in southwest China record the dust flux from northern China?

Lines 389-398: I don't believe this section deliver any helpful information considering the floods reflected by SWD is not continuous or event-like. Actually, it is highly possible for floods occurrence every several centuries.