The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC3
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Comment on tc-2022-43

Anonymous Referee #3

Referee comment on "Late Holocene glacier variations in the central Tibetan Plateau indicated by the $\delta^{18}O$ of ice core enclosed gaseous oxygen" by Jiule Li et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-43-RC3, 2022

This paper contains some clever ideas for interpreting climate records from ice cores in (relatively) warm regions. However, it has 3 basic problems. First, the analytical method is not fully described, and some of the results are very hard to understand if all the analyses are accurate. Second, the paper deduces correlations between various climate records, but does not validate these correlations statistically. Third, some basic physics is invoked but not described. For example, there is no explanation for how water and O2 can exchange isotopes fast enough to influence the isotopic composition of O2 in trapped gases.

Specific concerns include:

Total air content was determined by an indirect qualitative method and was apparently not checked against robust observations. (Section 2.2)

In Figure 2, the data does not constrain annual layer thicknesses well. Bomb radioisotopes are invoked but the data are not included.

The analytical method for measuring and standardizing d18O of O2 was not fully described.

Figure 3: The relation between TSI and air content is not validated by a simple x-y plot showing the relationship between the 2 properties, or other approaches. The high value for air content comes around 1640, but there is no TSI maximum at this time.

Table 1: the authors do not explain how they measured d15N, which is needed to

calculate d18Oatm. I could not find information about the reference gas.

Figure 4: there is no statistical documentation for a relationship between climate and d18Obub. Also in Fig. 4: d18Obub reaches +2 per mil, which would require a firn column thickness of about 200 meters thick at certain times. This seems unlikely to say the least.

Fig. 5. There is no statistical evidence showing coherency between Tangguula and other records.

Lines 220-225: There is no evidence that water and O2 exchange isotopes fast enough to impact the isotopic composition of O2 in ice cores. At least the authors do not make a case that extensive exchange is plausible.