

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-43

Anonymous Referee #1

Referee comment on "Late Holocene glacier variations in the central Tibetan Plateau indicated by the $\delta^{18}\text{O}$ of ice core enclosed gaseous oxygen" by Jiule Li et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-43-RC1>, 2022

This manuscript suggests that the oxygen isotope composition of air bubbles in alpine glaciers can be used as a proxy for aridity versus intervals of snowfall sufficient to maintain a firn layer. The authors describe results from an ice core in the Tibetan Plateau, in which a correlation is seen between the $\delta^{18}\text{O}$ of air bubbles in the ice, and the aridity, as inferred from the presence or absence of a firn layer.

Unfortunately, the analysis is based on simple correlation, and is not rooted in a knowledge of the relevant physical processes such as isotope fractionation by dissolution of oxygen gas in meltwater, or gravitational settling, or kinetic fractionation during disequilibrium dissolution of oxygen gas in liquid water. Thus the proposed proxy is not likely to be reliable. In other words, a mechanistic understanding of the causes of the $\delta^{18}\text{O}$ variations is needed if the proposed aridity proxy is to be reliable and useful.

Indeed, it is quite possible that the observed correlation will not hold up, on other glaciers, because isotope fractionation can easily happen via processes that are not related to aridity.

So this manuscript must unfortunately be rejected. The scientific foundation is simply lacking.