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Discussions

Interactive comment on "Apparent discrepancy of Tibetan ice core δ^{18}O records may be attributed to misinterpretation of chronology" *by* Shugui Hou et al.

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The manuscript entitled "Apparent discrepancy of Tibetan ice core δ18O records may be attributed to misinterpretation of chronology " by Hou et al. presents a new high-resolution δ18O record from the Chongce ice core from the Tibetan Plateau (TP) on the basis of the previously published timescale (Hou et al., 2018). The record covers the middle and late Holocene (the past ~7 kyr). Although the Chongce ice core is very close to the Guliya ice core (~30 km away), the Holocene pattern in the Chongce δ18O record is clearly different from the original Guliya δ18O record (Thompson et al., 1997). As such, the authors attributed the observed discrepancy between the Holocene δ18O records of the Guliya and the Chongce ice cores to a misinterpretation of the Guliya ice core chronology. Given the fact that the Guliya record (covering the

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past $\sim$130 kyr based on its original timescale) has been widely used as an important climate reconstruction/benchmark (cited nearly 1000 times), even after its chronology was questioned by Cheng et al. (2012), the new observational data obtained near Guliya and the new insights about Guliya chronology are fascinating and thus deserve to be published. However, I have a few suggestions for improvement pending on which I recommend acceptance of this paper. âĂć The authors imply that they could not get the original dataset of the Guliya and other Tibetan ice core records that were used in several published papers. Please contact the authors of the original papers again to get the original datasets, instead of using digitizer software or other approximate approaches. âĂć The interpretation of Tibetan ice core δ18O data solely as a temperature proxy needs to be further validated. The apparent positive relation observed between ice core δ18O and local temperature from instrumental records cannot be mechanically extrapolated to explain the relation on much longer timescales, for example, the Holocene (e.g., Liu et al., 2015; Shao et al., 2017). This claim is crucial to Tibetan ice core researches, including this paper, and should be more rigorously backed up with empirical data and/or model simulations. âĂć In the past decade, more and more evidences demonstrate that the temporal pattern of the precipitation δ18O changes on orbital-scale, including the Holocene, broadly follows Northern Hemisphere summer insolation (NHSI) inversely in the westerlies (e.g., Bar-Matthews et al., 2003; Cheng et al., 2012a, 2016a; Cai et al., 2017; Mehterian et al. 2017), Indian Monsoon (e.g., Zhang et al., 2011; Cheng et al., 2012b; Cai et al., 2015; Kathayat et al., 2016; Han et al., 2017), East Asian Monsoon (e.g., Cheng et al., 2016b) climatic regimes, as well as within the Tibetan Plateau (e.g., Cai et al., 2010, 2012; Zhang et al., 2011). Cheng et al. (2012) proposed two possibilities: (1) Both the Guliya and Kesang relationships (nearly opposite on orbital-scale) could be valid, with differences related to the different elevations and localities of the sites. (2) Alternately, differences could be reconciled if the low excursions in Guliya δ18O were, instead, correlated to high excursions in CH_4 (or higher NHSI). Notably, all aforementioned precipitation δ18O records show a consistent inverse δ18O–NHSI relationship on orbital (possibly millennial) timescale with rather similar amplitudes, in line with the latter possibility. As such, the authors should take the above observations into consideration. In other words, a detail comparison of the Guliya ice core record with the NHSI or a large number of precipitation δ18O records remains one of valid (or better) approaches to establish a more reliable Guliya ice core chronology. Additionally, the new dates from the bottom of the Guliya ice cap indeed show some last glacial ages (Thompson et al., 2018; Zhang et al., 2018; as well as the data in Figure S2), which are consistent with the chronology of the 'Guliya-Cheng' (rather than the 'Guliya-New') reconstructed on the basis of a comparison with other precipitation δ18O records from both Westerlies and Asian Monsoon climatic domains. âĂć Broadly, the amplitude of δ18O variations on orbital (or glacial-interglacial) scale is about $\sim$8 ‰ in the Westerlies (e.g., Bar-Matthews et al., 2003; Cheng et al., 2012a, 2016a; Mehterian et al., 2017) and Indian Monsoon (e.g., Cai et al., 2010, 2012, 2015; Kathayat et al., 2016) domains, and $\sim$4 ‰ in the East Asian Monsoon domain (e.g., Cheng et al., 2016b). In addition, the climate during the interglacial time periods, including the Holocene, is fairly stable as inferred by a wide range of proxy records, including various precipitation δ18O records. Provide the 'Gyliya-New' chronology was factual, the prominent multi-millennial changes around the mid-Holocene as characterized by $\sim$10 ‰ δ18O change (larger than the large regional glacial-interglacial amplitude) would be an unconceivable anomaly (Figure 4), which requires a proper explanation.

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