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Quantitatively reconstructing paleoaltitudes of the Tibetan Plateau using biomarkers

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Altimetry is the key approach to quantify and reconstruct elevation history of geomorphologic evolution, especially the uplift process of the Tibetan Plateau (TP). Using biomarker indices, we have established the relation between δ^2H_{alk} and GDGTs, and altitude, for surficial soil samples taken from key sites on the TP (Bai *et al*., 2011, 2015, 2017 and 2020). MBT'_{5ME}-MAT values exhibited a strong relation with altitude on the southern TP (Bai *et al*., 2018), suggesting that GDGTs can more reliably reconstruct the paleoaltitudes than can δ^2H_{alk} values. Bases on MBT'_{5ME}-MAT values in critical moments or periods, we could provide new evidence for understanding the growth, expansion and uplift patterns of the TP. This work has included: I. The paleotemperature of the Wuyu Basin at ~15 Ma was reconstructed as 10.38±1.47°C, the corresponding paleoaltitude is lower than that of ~1 km asl calculated using hydrogen-oxygen isotopes (Bai *et al*., 2018); II. The paleotemperature of the Xining Basin dropped by ~10°C during the ~10.5-8 Ma period, suggesting that these cooling events signaled the regional uplift (~1.2 km) of the Xining Basin (Chen *et al*., 2019); and III. We concluded that the lake surface of the Jilong Basin during the Late Miocene to Mid-Pliocene was 2.5±0.8 km, and that the surrounding mountains exceeded 3.6±0.6 km, implying that the central Himalayas underwent a rapid uplift of ~1.5 km after the Mid-Pliocene (Chen *et al*., 2020), yet there is a systemic altitudinal overestimation when isotopic paleoaltimeters are used. Combined application of the paleoenvironmental and paleoecological records for periods of uplift on the TP, we will further reveal the TP's uplift history and the evolutionary processes of its monsoonal-arid environment.

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