THE UPLIFT EVENT OF THE NORTHEASTERN TIBETAN PLATEAU RECORDED BY BRANCHED GDGTS PALEOTHERMOMETER DURING THE LATE MIocene

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Introduction

A great deal of research based on qualitative evidence has demonstrated that the Late Miocene was a crucial epoch in the expansion of the northeastern Tibetan Plateau (NE TP). This has included studies of sediment accumulation rates and thermochronologies. Nonetheless, the expansion history of the NE TP remains uncertain on account of the exiguity of the existing quantitative paleoaltitudinal records. Terrestrial paleotemperature records are helpful in evaluating and calculating the paleoaltitude changes (Hren et al., 2010; Bai et al., 2018). Here we present a terrestrial paleotemperature record for the period spanning ~12.7–5.2 Ma based on glycerol dialkyl glycerol tetraethers (GDGTs) extracted from the Mojiazhuang (MJZ) section (Xining Basin), on the northeastern margins of the Tibetan Plateau.

Results

Three paleothermometers based on bGDGTs exhibit similar results (Fig. 1), and can be divided into two major stages: a sustained cooling period from 12.7 to 7.9 Ma, and a relatively stable period from 7.9 to 5.2 Ma. During the cooling period, the paleo-MAATs (mean annual air temperature) fall from ~24°C to ~12°C. Of particular note is the fall of ~8°C in the paleo-MAATs within the ~10.5 to ~8 Ma period. After 7.9 Ma, the paleo-MAATs appear less variable.

Conclusions

The remarkable cooling event (of ~8°C) during this period observed in the Xining Basin would have been unlikely to have been simply a response to changes in global temperatures (~1-2°C). Under the circumstances, surface uplift has to be considered the most likely factor leading to such a dramatic cooling in the Xining Basin. By comparing the sea surface temperature record, we conclude the Xining Basin experienced an uplift of at least ~1.1 km during ~10.5 to 8 Ma.
Figure 1 Reconstructed paleotemperatrue and paleoenvironmental records based on GDGTs proxies.

References