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Mid- to late Holocene hydroclimatic changes on the Chinese Loess Plateau: evidence from n-alkanes from the sediments of Tianchi Lake

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We have reconstructed the history of mid-late Holocene paleohydrological changes in the Chinese Loess Plateau using n-alkane data from a sediment core in Tianchi Lake. We used P_{aq} (the proportion of aquatic macrophytes to the total plant community) to reflect changes in lake water level, with a higher abundance of submerged macrophytes indicating a lower water level and vice versa. The P_{aq} -based hydrological reconstruction agrees with various other lines of evidence, including ACL (average chain length), CPI (carbon preference index), C/N ratio and the n-alkane molecular distribution of the sediments in Tianchi Lake. The results reveal that the lake water level was relatively high during 5.7 to 3.2 ka BP, and decreased gradually thereafter. Our paleohydrological reconstruction is consistent with existing paleoclimate reconstructions from the Loess Plateau, which suggest a humid mid-Holocene, but is asynchronous with paleoclimatic records from central China which indicate an arid mid-Holocene. Overall, our results confirm that the intensity of the rainfall delivered by the EASM (East Asian summer monsoon) is an important factor in affecting paleohydrological changes in the region and can be considered as further evidence for the development of a spatially asynchronous “northern China drought and southern China flood” precipitation pattern during the Holocene.