Postglacial climate change in the NE Qinghai-Tibet Plateau deduced from geochemical proxies from the sediments of Lake Qinghai, China

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Geochemical variables stored in the sediments of Lake Qinghai are used for reconstructing past environmental change associated with postglacial climate change in the NE Qinghai-Tibet Plateau. Two sediment cores extracted from the largest water body in China were studied with 1-cm sampling resolution. TN, TOC and C/N ratio indicate past changes in organic productivity of the lake. Variations in inorganic carbon represent changes in carbonate production of the alkaline water associated with lake level and salinity fluctuations. $\delta^{18}O$ values of benthic ostracode shells indicate short-term variations in $\delta^{18}O$ of lake water in the course of the long-term isotopic enrichment trend of the closed lake over the Holocene. Chronology is based on AMS ^{14}C dating of organic fragments and ^{210}Pb and ^{137}Cs dating the last 150-yr sediments. Results indicate that climate during the last deglaciation was overall cold and dry. A permanent expansion of Lake Qinghai occurred from the beginning of the Holocene, as implied by an abrupt termination of a carbonate playa alongside with a 6‰ negative shift in $\delta^{18}O$. The early Holocene hydroclimate regime is characterized by substantially increased seasonality with enhanced summer precipitation alongside with intensified summer evaporation. The sedimentary records suggest that climate warming process appeared stepwise since the last deglaciation and maximized in the early-Holocene in response to the enhancement of summer insolation and seasonality. The increase of regional temperature was largely responsible for the rainfall enhancement from the beginning of the Holocene. The precipitation pattern over the Holocene did not simplistically follow the insolation-related temperature change pattern, as clearly indicated by a range of sedimentological and geochemical proxies.

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