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Mineralogical and isotopic data provide clues to climate change during the late Quaternary – a case study from Tso Moriri Lake, NW Himalaya (India)

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We present high resolution studies on radiocarbon dated lake sediments from Tso Moriri Lake, NW Himalaya (78°14'-78°25'N and 32°40'-33°02'E; altitude: 4600 m, max depth: 105m). This lake is situated in the transition zone between both mid latitude westerlies and Indian summer monsoon zone, thus it is a key site to reconstruct past climate variability.

Detailed mineralogical and isotopic (organic and carbonate) investigations were carried out on the core sediments with the aim of reconstructing past environmental changes. The hydrochemical data from Tso Moriri Lake reveals that the balance between water input (precipitation+snowmelt) and evaporation (I/E ratio) controls the lake water isotopic (δ18O and δD) composition and authigenic carbonate precipitation. The TOC in conjunction with isotopic data (δ13Corg and δ15N) of the core sediment provides evidence of the origin of lacustrine organic matter. Since the lake is oligotropic, the organic productivity can be regarded as being dependent on climatic conditions, e.g., sediment from the basal part of the core (>19.5 cal ka BP) shows low TOC which corroborates unfavourable growth conditions and consequently low productivity. In contrast, the increasing trend of TOC after 19.5 cal ka BP indicates climate amelioration, favourable for the organic productivity. Additionally, isotopic data (δ18O and δ13C) from the bulk carbonate minerals (calcite/aragonite) shows high covariance (r=0. 89) for the whole core indicating the evaporation effect to be a controlling factor for carbonate precipitation. The multiproxy investigations suggest that the periods between 16.5-11 and 3-0 cal ka BP were drier and monsoon intensification occurred between 11-8 cal ka BP.