

## Paleoenvironmental changes for the last 27 kyr in central Asia inferred from geochemical records of Lake Hovsgol sediment.

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Geochemical proxy-records in a continuous 27 kyr (thousand years) core sediment from Lake Hovsgol in northwest Mongolia provides a detailed history of the response of the lake itself and the surrounding watershed to climate change during the last glacial to Holocene period. Principle component analysis (PCA) of 19 major and trace elements, total inorganic carbon (TIC), and total organic carbon (TOC) in the bulk-sediment samples revealed that the 21 chemical components are grouped by four assemblages: Group-1 components - Na, Mg, Ca, Sr, and TIC, hosted in carbonate minerals (calcite, dolomite, and magnesian calcite); Group-2 - Ni, Cu, and Zn, recognized as biophilic trace metals, and TOC; Group-3 - Al, K, Ti, V, Fe, Rb, Cs, Ba, and Pb, composed of rock-forming minerals; Group-4 - Cr, Mn, and As, sensitive to redox condition of sediment.

The four element assemblages were originated from relevant 3 factors in subsidence. The group-1 and group-2 components of authigenic products in the lake are end member on the PC-1 score, whose variation reflects change in water volume of the lake representing precipitation and evaporation (PE) balance. The group-3 components of detrital materials from watershed contribute to the PC-2 score, whose variability indicates erosion/weathering intensity of watershed which might be controlled by the ratio of vegetation cover associated with moisture change. The group-4 components of redox sensitive elements contribute to the PC-3 score, which are not the end member due to a small amount. The first two PC scores possibly suggest a sequential record of paleomoisture evolutions of central Asia.

PE balance of Lake Hovsgol region inferred from the PC-1 score gradually increased during the glacial/interglacial transition. This resembles the climate change of North Atlantic region on the glacial-interglacial scale, yet does not show abrupt climate shift of North Atlantic region on the millennial scale, such as Bolling-Allerod warm period and Younger Dryas cold period. On the other hand, a periodic variation on ~8.7 kyr cycle was observed in the PC-2 score profile of detritus inputs of Lake Hovsgol over the last glacial and Holocene period. The decrease of detritus input of the lake coincided with the timing of dramatic supply of moisture from Asian monsoon regime and North Atlantic region to Baikal watershed to which Lake Hovsgol belongs. Our geochemical records demonstrate that climate system of continental interior Asia was strongly influenced by climate change on a Milankovitch scale as well as a sub-Milankovitch one.