Century-resolved 1 Myr history of paleogeographic changes in Lake Khubsugul (Mongolia), reconstructed from geochemical markers in lake bottom sediments

M. PHEDORIN[1,4], A. FEDOTOV[1], E. GOLDBERG[1], K. ZOLOTAREV[2], O. SAEVA[3] AND M. GRACHEV[1]

[1]Limnological Institute of the Siberian Branch of Russian Academy of Science, Russia (mix@lin.irk.ru)
[2]Institute of Nuclear Physics of the Siberian Branch of Russian Academy of Science, Russia (K.V.Zolotarev@inp.nsk.su)
[3]Novosibirsk State University, Russia (vigaro@gorodok.net)
[4]Institute of Geophysics of the Siberian Branch of Russian Academy of Science, Russia (mikeph@mail.ru)

Some basic and trace elements were measured in bottom sediments from Lake Khubsugul (Mongolia). The goal of the investigation is to reconstruct paleovariations of geological and geochemical processes in lake/catchment basin during Holocene and Pleistocene and to estimate paleoclimatic parameters of the region. The method for analysis of the sediments was X-ray fluorescence using synchrotron radiation (SR-XRF). Wet and non-destructed fragments of the core were measured in scanning mode; continuous records obtained cover 45 meters of the core (900 kyrs) with 1 mm resolution (ca. 20 years). From the initial XRF data the concentrations of 20 chemical elements from range K-Mo were determined employing modified fundamental parameters procedure.

Results obtained prove that the records of some biogenic and abiogenic elements trace the main patterns of planetary climate changes. In particular, spectral analysis of the records reveals basic orbitally-modulated cycles (100, 41, 23 и 19 kyrs). Abrupt and significant oscillations are also found at the millennial timescale. The geochemical records are the evidences of “switching” geochemical sources of terrigeneous supply to the lake and of changing biogeochemical processes within the lake. The major mechanism for these changes we see in significant lake-level variations during Pleistocene due to regional moistening changes (also marked in autigenic minerals formed). The geochemical records allow quantitative estimations of the precipitation/evaporation balance in the lake.

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Record of the weathering timescale in Himalayan rivers

C. POMIES[1], M. BICKLE[1], E.T. TIPPER[1], H.J. CHAPMAN[1], I.J. FAIRCHILD[2] AND N. HARRIS[3]

[1]University of Cambridge, UK
[2]University of Birmingham, UK
[3]Open University, Milton Keynes, UK

The timescale of weathering in one of the main Nepalese river catchment is investigated by using U-series. The $^{230}Th/^{238}U$ and $^{234}U/^{238}U$ activity ratios were measured in the dissolved and particulate load as well different size fractions of the bedload in the Marsyandi main stream and major tributaries.

In the highest part of the Marsyandi catchment the mean residence time of the weathering products infered from $^{238}U/^{232}Th$ and $^{230}Th/^{232}Th$ activity ratios of different bedload size fractions average 226 to 265 Kyr (fig. 1). These relatively long residence times imply that part of the weathering took place at depth by groundwater circulation.

Dissolved loads however sample a much shorter and recent process (100 years) probably directly linked with surface weathering. Our results show that each component of the river system; dissolved load, suspended load and bedload may result from temporally distinct weathering processes.