Geophysical Research Abstracts, Vol. 9, 00709, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00709

Geochemical time series from lake sediments of the Central Asia

as chronologies of climate change

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Many lithological and geochemical parameters of sediments contain climate and environmental information. Thin-laminated and fine-grained deposits appear to be the most suitable for high resolution analysis because they record seasonal fluctuations of sedimentation. To calculate transfer functions for temperature and precipitation, we consider geochemical characteristics, which have high analytical accuracy and sufficient variability, and also are connected with sedimentary facies and climate according to geological conception. Selected elements describe essential mineralogical and physical properties of sediments, and reflect a proportion of organic matter and clastic fractions from various sources.

Different geochemical indicators may serve a climatic response in dependence on the object of research. Following indicators are considered for weak altered terrigenous deposits.

- Ca content and Ca/Ti, Si/Ti ratios allow to detect changes in temperature, evaporation and lake level. Ti/Ca and/or Ti/Si ratios may also provide information about erosion in the watershed, annual or seasonal precipitation and fluvial/eolian transport versus productivity of lake.

- Ti together with Rb, Cr and Ni are as proxies of terrestrial supply.

- Rb/Sr ratio may represent changes of weathering rate in the lake watershed, changes

in dry/wet conditions, precipitation and fluvial discharge.

-U, Ba, Br and U/Th ratios are paleoproductivity signals, and U concentration is a proxy for annual precipitation and river discharge.

-x-ray density (XRD) appears to reflect water yield regime and sediment flux,

-and so on.

Following it, a 1500 year long record of annual temperatures and precipitation over the south of western Siberia has been reconstructed from the bottom sediments of Teletskoye Lake, Altai Mountains using an X-ray Fluorescence scanner, providing up to 0.1-mm resolution timeseries of Br content, Sr/Rb ratio and XRD. The artificial neural networks method was applied to convert annual geochemical time-series to annual records of temperature and precipitation using a transfer function trained on meteodata from AD 1840 to 1990.

The work is supported by the Russian Foundation for Basic Research, Grants No. 05-05-39004, 06-05-64931, 06-05-64365.