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Quantitative estimation of Southern Siberia climate for the last eight centuries from high resolution analysis of Lake Teletskoye sediments

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The climatic evolution of the Altai Mountains (Southern Siberia) during the last eight centuries was reconstructed by high resolution analysis of the Lake Teletskoye sediment. ^{137}Cs and ^{14}C ages suggest an average sedimentation rate of about 1 mm per year for wet deposits. X-ray fluorescence technique on synchrothron radiation (SR XRF) is used for high-efficient scanning analysis of wet samples with 1 mm resolution.

Sedimentary proxies of climatic parameters are worked out based on regional instrumental meteorological records for the last 160 years. The most useful proxies are the X-Ray density, which correlates well with mean annual precipitation and runoff, Br content (fluctuated identical with loss-on-ignition, which is interpreted as total organic carbon content) appears to be well correlative with mean annual temperature variations. Due to different geochemical signatures of source clastic material, Sr/Rb ratios in Lake Teletskoye sediments can be used as an index of lateral sediment supply (a signal of local precipitation). By the extending of a correlation model over the past 800 years several distinct intervals of regional climate changes might be distingiushed in Lake Teletskoye sediment records. Climate appears to be warmer and more humid than today between 1210 and 1390 AD. Between 1390 and 1580 AD regional climate became more cool and arid. Climate conditions were cool and dry between 1580 and 1810 AD, whereas after 1810 annual average temperatures seem to have increased.

The results derived from the palynological studies of the lake sediments are in the good agreement with general climate fluctuations distinguished by the sedimentary

analysis including cool climate conditions of Little Ice Age revealed on the same time interval.

The detail numerical approximation for both annual air temperature and annual precipitation was obtained by method of artificial neural networks used to get the functional dependence as non-linear multiple regression with regulated smoothness of exit function. Time series of density, Sr/Rb ratio and Br content based on mentioned Cs scale were calibrated using instrumental records of the Barnaul meteostation from 1840 to 1991 AD. Oscillations of temperature are shown below. Smoothed version (lower curve) is similar to above mentioned qualitative summaries. The work was supported by the Russian Foundation for Basic Research, Grants No. 03-05-64949; 05-05-64719-à.