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Reconstruction of environmental chanees in Holocen in Siberian Arctic, Russia

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The study of Arctic palaeoenvironmental records enables qualitative and quantitative estimations of past climate changes and provides basis for prediction of future changes in the region. The timing of Holocene climate events in North Atlantic region is relatively good studied. In contrast to it, at present there are very few quantitative palaeoclimatic data for eastern Siberia and proxy records from northern Eurasia mostly document environmental changes at low temporal resolution, and are derived from pollen studies. Due to relatively small magnitude of temperature changes throughout the Holocene, reconstructions based on a single proxy must be interpreted with caution. More reliable estimate of the Holocene climate changes can be obtained only by averaging results inferred from several proxies. The basis, however, of all quantitative reconstruction approaches are regional calibration datasets from which the empirical reconstruction model (i.e. the transfer function) will be established.
A 380 cm long sediment core from Lake Temje (Central Yakutia, North-Eastern Russia) was studied to infer Holocene palaeoenvironmental change in the extreme periglacial setting of eastern Siberia during the last 10,000 yrs. Data on sediment composition were used to characterize changes in the depositional environment during the ontogenetic development of the Lake Temje. The analysis of fossil chironomid remains and statistical treatment of chironomid data by the application of a newly developed transfer functions provided inferences of mean July air temperatures (TJuly) and water depths (WD). We obtained a qualitative and quantitative reconstruction of Holocene climate in Central Yakutia and recognized three stages of palaeoenvironmental changes: The early Holocene between 10 and 8 kyr BP was characterized by colder-than-today and moist summer conditions. Cryotextures in the lake sediments document full freezing of the lake water during the winter time. A general warming trend started around 8.0 ka BP in concert with enhanced biological productivity and fluctuating lake level. Reconstructed mean TJuly were equal or up to 1.5 °C higher than today between 6,700 and 5,000 yrs BP. During the entire late Holocene after 4,800 yrs BP, reconstructed mean TJuly remained below modern value, consistent with climate deterioration. Limnological conditions did not change significantly. The inference of a mid-Holocene climate optimum supports conceptional scenarios of Holocene climatic change in the subpolar part of eastern Siberia and gives evidence of climate teleconnections to the North Atlantic realm.
Investigation of lakes, located in the interfluve of Korotaiha and Bolshaya Rogovaya rivers in the east side of Bolshezemelskaya tundra, Russia using modern hydrobiological and palaeoecological methods has shown that the major compositional changes in diatom, cladoceran and chironomid communities are synchronous. The chironomid-inferred summer temperature show an increase during the last 100 years, which can be related to the end of LIA in the region and support previous investigations.