

Palaeolimnological evidence for recent climatic change in lakes from the northern Urals, arctic Russia

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Abstract

The recent sediments from two deep arctic lakes, Mitrofanovskoe and Vanuk-ty, situated in the permafrost belt within the Bol'shezemel'skaya Tundra in the northern Ural region, were studied for diatoms, chironomids, spheroidal carbonaceous particles and stable lead isotopes. The magnitudes and rates-of-change in diatom and chironomid assemblages were numerically estimated. Instrumental climate records were used to assess statistically the amount of variance in diatom and chironomid data explained by temperature. August and September air temperatures have a statistically significant effect on diatom composition at both lakes. At Mitrofanovskoe Lake, major compositional changes in diatom and chironomid assemblages occurred at the turn of the 20th century and might be related to the regional increase in temperature. Chironomid-inferred air temperature also increased by approximately 1°C since the early 1900s. At both lakes diatom compositional changes, coincident with the increase in June and September temperatures, also occurred in the late 1960s. These compositional changes are correlated with the increase in diatom production, sediment organic content and diatom species richness, and are likely to be a diatom response to the lengthening of the growing season. These changes are also correlated with the circum-Arctic temperature increase from the 1960s. A chironomid response to the late 1960s temperature increase was less pronounced at both lakes. Pollution levels are relatively low and pollution history is unrelated to ecological changes. Both lead isotopes and spheroidal carbonaceous particles show a clear atmospheric pollution signal, peaking in the 1980s. © Springer 2005.

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Keywords

Bol'shezemel'skaya Tundra, Chironomids, Climate change, Diatoms, LOESS regression, Palaeolimnology, Spheroidal carbonaceous particles