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Multy-proxy reconstruction of climate and environment on the Karelian Isthmus, northwestern Russia

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The Karelian Isthmus is the approximately 45–110 km wide stretch of land, situated between the Gulf of Finland and Lake Ladoga in the Northwestern Russia, to the north of the River Neva (between 61°21'N, 59°46'N and 27°42'E, 31°08'E). Its northwestern boundary is the relatively narrow area between the Bay of Vyborg and Lake Ladoga. The Karelian Isthmus, can be divided into three landscape units: the lowland area in the north with more than 800 lakes; the central highland, which reaches up to 203 m a.s.l.; and the Neva Lowland (15–25 m a.s.l.) in the south, which is characterized by numerous Holocene terraces. The region has a maritime climate, with mean January temperatures of -9°C, mean July temperatures of +16°C and a mean annual temperature of +3°C. Precipitation is around 600 mm yr-1. Sediments were retrieved from the Lake Medvedevskoye (60°13'N; 29°54'E), Karelian Isthmus, and were subject to multy-ptoxy analysis. For the first time quantitative reconstruction of T July was performed, using chironomid-based inference model (Nazarova et al., 2014).
The studied lake basin formed before 12,650 cal. yrs BP, possibly due to melting of stagnant glacier ice (Subetto et al., 2002, 2003). Although the chronology of this early part of the record is too uncertain to attribute an exact age to the beginning of minerogenic sedimentation in the basins, it is likely that the sediments accumulated fairly rapidly. Shrub, herb and grass communities ('steppe-tundra') and cold and dry climatic conditions dominated in the area until about 11 000 cal. yrs BP. The rapid environmental response to warming at the Pleistocene/Holocene boundary, which is evident in many North Atlantic records at c. 11 500 cal. yrs BP, is not very prominent in our two data sets from the Karelian Isthmus about 10000 cal. yrs BP when climate became distinctly warmer and more humid. High organic productivity in the lakes indicates that soils around the lakes were stable. The delayed response of the lakes and the vegetation to the distinct temperature rise at the Pleistocene/Holocene transition may be explained by a different circulation pattern in this part of Europe compared to that around the North Atlantic. The extreme continentality and strong anticyclonic circulation due to strengthened easterlies south of the Scandinavian ice sheet could have preserved extensive stagnant ice and permafrost in western Russia. The high pressure cell over permafrost regions and/or strengthened easterlies south of the ice sheet could have blocked warm air masses coming from the west as long as 2000 years.
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