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Eemian and Holocene palaeoenvironmental reconstruction from Arctic Siberia (Bol'shoy Lyakhovsky, Island Laptev Sea region)

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Permafrost deposits are an excellent source for the reconstruction of Quaternary palaeoenvironment in regions without other long-ranging archives. Such deposits are the only palaeoenvironmental source for many parts of NE Siberia. Late Quaternary environments in the Laptev Sea area are also poorly known and detailed multi-proxy palaeoenvironmental studies are important for the region. A number of key sections have been dated (^{14}C, IRSL, and ^{230}U/Th) and analysed for pollen (Andreev et al.

2004, submitted). The studied records cover the last 200 ka. Quantitative reconstructions of past climate variables are especially important for correct understanding past global changes and data/model interactions. The method known as best modern analogue (BMA) approach (Guiot, 1990) has been used to reconstruct climate variables from the Eemian and Holocene pollen spectra. In the present study we used the reference data set of 1173 modern pollen spectra from Northern Eurasia (for details see Tarasov et al. 2005). According to the pollen spectra open Poaceae-Artemisia communities dominated at the beginning of the Last Interglacial (Eemian, Kazantsevo). Some shrubs (Alnus fruticosa, Salix, Betula nana) grew in more protected and moister places. Climate was rather warm (similar to modern conditions) during this time, resulting in the partial melting of Saalian ice wedges. Shrub tundra with Alnus fruticosa and Betula nana s.l. dominated the vegetation in the area during the middle Eemian climatic optimum, when summer temperatures were at least 4-5˚C higher than today. Pollen of shrubs disappeared from Late Eemian records indicating significant climate deterioration. Late Glacial and Holocene sediments are rare in the study region because of the active, thermokarst-related landscape dynamics on the Pleistocene-Holocene transition. Allerød sediments are dominated mostly by sedge and grass pollen. However, the presence of willow and birch pollen points to a relatively warm climate. Similar dated pollen spectra from Tiksi area characterized by large amounts of birch also reflect significant climate amelioration. Pollen-based reconstructions show that the summer temperature reached 8-12˚C (2.5˚C today). Younger Dryas spectra reflect climate deterioration. Early Holocene spectra are dominated by alder, birch, Poaceae, and Cyperaceae. Presence of Salix and Ericales and higher pollen concentration is also notable. Thus, shrub associations dominated the area between c. 9 and 7.6 ^{14}C ka BP. Climate reconstruction inferred a temperature substantially warmer than present (up to 12˚C). After 7.6 ^{14}C ka BP shrubs gradually disappeared from the area and vegetation cover became similar to modern tundra.

Reference: Andreev, A.A., Grosse, G., Schirrmeister, L., Kuzmina, S.A., Novenko, E. Yu., Bobrov, A.A., Tarasov, P.E., Kuznetsova, T.V., Krbetschek, M., Meyer, H. & Kunitsky, V.V. 2004a: Late Saalian and Eemian palaeoenvironmental history of the Bol'shoy Lyakhovsky Island (Laptev Sea region, Arctic Siberia). Boreas 33(4), 319-348.

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