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Holocene environmental changes in southern Kamchatka, Far Eastern Russia, inferred from a pollen and testate amoebae peat succession record

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ABSTRACT

High resolution palaeoenvironmental records in Far-Eastern Russia are rare, and the Kamchatka Peninsula is among the least studied areas of the region. This paper describes a record spanning the last ca. 11,000 yr, obtained from a bog in the southern part of Kamchatka. The radiocarbon dated core was analysed for pollen, testate amoebae, charcoal and loss-on-ignition (LOI).

The vegetation during the early Holocene was dominated by grasses (Poaceae), birch (*Betula*) and heath (Ericaceae p. p.). Around 10,300 cal yr BP there was a substantial change in the vegetation cover to shrub alder (*Alnus viridis* s.l.) stands with sedges and ferns (Polypodiophyta) as well as herbs such as meadow rue (*Thalictrum*) in the understory. In the surroundings of Utka peatlands started to form. The variations in the vegetation cover were most probably caused by climatic changes. At the beginning of sediment accumulation, before 10,300 cal yr BP, the composition of the vegetation points to cooler summers and/or decreased annual precipitation. Around 10,300 cal yr BP, changes in vegetation occurred due to rising temperatures and/or changed water regimes. Increased abundancies of dry indicating testate amoebae after 9100 cal yr BP point to intermediate to dry soil conditions. Between 8600 and 7700 cal yr BP tree alder (*Alnus incana*) was widely spread at the site which probably indicates optimal environmental conditions. The tephra layer at 381–384.5 cm (ca. 8500 cal yr BP) produces a strong impact on the testate amoebae assemblages. At 7700 cal yr BP there was a sudden drop of *A. incana* in the local vegetation. From this time on, *A. incana* and also *A. viridis* decrease continuously whereas *Betula* gradually increases. The upper part of the sequence (after 6300 cal yr BP) shows higher abundancies of meadowsweet (*Filipendula*) and sweet gale (*Myrica*) pollen. After 6300 cal yr BP, changes in testate amoebae demonstrate variable soil moisture conditions at the site. Between 3700 and 1800 cal yr BP, wet conditions dominate as dry indicating testate amoebae decrease. After 1800 cal yr BP soil conditions become more variable again but this time with dry dominating testate amoebae.

In contrast to surrounding regions, there is no evidence of trees such as spruce or larch growing in the surroundings of the site even though those trees are characteristic of many eastern Siberian sites. This difference might be because of the maritime influence of the Okhotsk Sea. Even dwarf pine (*Pinus pumila*), which is currently widely dispersed in northern Kamchatka, became part of the local vegetation only during the last 700 yr.

1. Introduction

Terrestrial vegetation at high northern latitudes is an important component of the global climate system. The changing configuration of northern biomes, particularly the position of the northern tree line and the amount of carbon stored in frozen soils and peat deposits, is intricately linked to the heat and carbon balance of the earth through various feedback mechanisms. Identifying the existence and timing of past episodes of climate-related vegetation change in these areas is thus of great importance in a global-change perspective (MacDonald et al., 2000).

However, Late Quaternary studies in the Kamchatka region have mainly focussed on aspects such as volcanology and tephrochronology

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