



Vegetational and climatic changes on the Russian Plain at the Eemian/Weichselian transition

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Palynological data from peat sections and lake deposits spanning the Last Interglacial and the beginning of the Last Glacial Epoch indicate that on the central Russian Plain the Eemian (Mikulino)/Early Weichselian (Valdai) transition was marked by a sequence of secondary climatic oscillations of various magnitudes and duration. Pollen profiles from the Last Interglacial on the central Russian Plain show a distinctive sequence of the forest communities, reflecting an increase in temperatures towards the warmest ("optimum") phase of the interglacial followed by a gradual cooling. During the optimum phase of the Last Interglacial, a broad-leaved forest dominated by *Carpinus*, *Quercus*, *Ulmus* and *Tilia* with lower levels of *Acer* and *Fraxinus* occupied the middle latitudes of the Russian Plain. During the post-optimal part of the Last Interglacial, climatic cooling and increasing humidity brought about a decline in the broad-leaved forest and the spread of coniferous forest of *Picea* and *Abies*, along with *Pinus sibirica* on the northeastern part of the Plain. During this final forest phase of the interglacial, smaller climatic oscillations can be inferred from changes in arboreal pollen content and composition in high resolution pollen sequences of the region (e.g. Butovka, Ples). A rapid climatic deterioration, manifesting an onset of the Weichselian (Valdai) Glacial, was accompanied by decreasing humidity and increasing continentality of climate. This substantially colder and drier climate led to a decline of mesophilic plants and an increase in abundance and diversity of the xerophytes and of plants growing at present under highly continental climates. Reconstructions based on the palaeofloras from Nizhnyaya Boyarschina section suggest that during the first Early Glacial cold stage winter temperatures were 14°C and summer temperatures 4°C lower than those of the interglacial optimum. Usually two intervals of climatic amelioration can be distinguished in the pollen profiles from the Russian Plain, which span the early part of the Last Glacial. These two relatively warm intervals are marked by an increased role for forest communities on the landscape. The forests were similar to the present-day taiga communities in West Siberia, but the vegetation also included a variety of periglacial elements. Higher representations of dark-coniferous trees (*Picea* + *Abies* + *Pinus sibirica*) indicate that the second phase was warmer than the first one. Based on its stratigraphic position and inferred features of climate and vegetation, the second warm interval can be attributed to the Verkhnevolzhskiy (Upper Volga) Interstadial in the Russian Plain (Grichuk, 1961), which is correlated to the Brørup Interstadial in West Europe, or to Oxygen Isotope substage 5c (e.g. Mangerud, 1989). We can also tentatively correlate it with warm Dansgaard-Oeschger event 23 (DO 23) as reflected in the oxygen isotope record from the Northern Greenland deep ice-core (NorthGRIP Members, 2004). A slighter and shorter warming within the first cold stage of the Early Weichselian (Valdai) probably was of an interphasial rank and corresponded to the warm part of a shorter DO 24 in the NorthGRIP oxygen-isotope curve. Likewise, a slight increase in warmth in the final part of the Last Interglacial, inferred from the changes in pollen composition, might correspond to the warming at the onset of DO 25.