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Weichselian periglacial environments in the northeastern extremety of Europe

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Traditional reconstructions of Weichselian environments saw the Peri-Uralian plains as arena either of Late Weichselian glaciation or of predominant aqueous activity which is incompatible with the latest finds of Upper Palaeolithic human activity in the Peri-Uralian Arctic and Subarctic. Now it is proven that the last ice sheet disintegrated before 50 ka BP (Svendsen et al., 2004) and early humans arrived in the Arctic as early as ca 40 ka BP (Svendsen and Pavlov, 2003). Therefore, to understand the natural setting of early human invasions into northeastern European Russia a re-evaluation of periglacial evidences is necessary. Spatially diverse data obtained from sedimentological studies, photogeological interpretation and dating results from various sedimentary formations appear instrumental for assessing the palaeo-environment.

Weichselian periglacial events are dated back to ca 80-90 luminescence ka BP when the huge ice-dammed water body called Lake Komi inundated all lowlands below 100 m isohypse in front of an arctic ice sheet (Mangerud et al., 2004). Some 70 ka BP the lake was replaced by a fluvial network that drained the stagnant ice fields recognized as the “Third Terrace” above the present floodplain. Judging from sediment sections in the Yamal Peninsula, wind-blown sand covers started to develop already during MIS 4. A Mid-Weichselian climatic amelioration around 50-30 ka BP can be traced by the “Second Terrace” and from the many gullies with finds of bones of mammals. Pollen record and relict permafrost features indicate that treeless, permafrozen landscapes predominated in the present zone of boreal forest. Nevertheless, a general humidification at around this time is evident from fluvial gravels and diamictic solifluction sheets.

Quite different features emerged in the northeast of the Russian Plain during MIS 2. Fluvial sediments are almost absent except for some thin (1-2 m) sand and gravel accumulations caused by local low-energy streams. The discontinuous sedimentary mantle from this period consists largely of various aeolian sands and loess-like silts (Astakhov et al., 1999; Mangerud et al., 1999) with rare wisps of soliflucted diamicts. Dune sands, up to 20 m thick, occur mostly along the Barents Sea coastline, whereas loess-like silts gravitate to the Uralian piedmonts. Most widespread upon all arctic landscape elements are thin (1-3 m) sheets of laminated cover-sand similar to niveo-aeolian deposits described in the Netherlands and elsewhere. Typically the aeolian sands are accompanied by conical residual hillocks with armored deflation summits.

Finds of organic remains in surficial sediments younger than 27 and older than 14 radiocarbon ka BP are rare. The aeolian sands and silts have yielded a number of luminescence dates in the range of 33 to 13 calendar ka BP (Mangerud et al., 2002). Macrofauna and a sparse shrub vegetation reappeared after 14 radiocarbon ka BP (Mangerud et al.1999). Another indication of a cold and continental climate is remnants of fossil glacier ice which have survived within arctic diamict sheets for at least 50 ka (Astakhov and Svendsen, 2002).

We conclude that most of the Weichselian time the northeastern European Russia was a treeless, landscape with permafrost. An especially dry, frosty and generally inhospitable environment appeared during MIS 2 when the Barents Sea Ice Sheet produced strong katabatic winds across the polar desert. The only period suitable for human invasion from the south was during the MIS 3 when a higher precipitation rate could support meager arboreal vegetation along river valleys. A minor climatic amelioration after 15 radiocarbon ka BP led to formation of the “First Terrace” along the rivers and numerous thermokarst lakes surrounded by shrub land. Only sparse mammal bones, but no traces of human activity are known from the final Pleistocene until the Neolithic times.

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