

Late Pleistocene and Early Holocene vegetation and climate history in the Verkhoyansk Mountains (Yakutia, Russia) derived from pollen records



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Introduction: Despite increased palaeoenvironmental studies in Northern Yakutia (Andreev et al. 2002, Schirmer et al. 2002), little is known of past climatic and environmental fluctuations during the **Middle and Late Weichselian (Karginsky Interstadial and Sartan Stadial)**. New pollen and radiocarbon data from a loess-like sediment from the **Verkhoyansk Mountains** (Fig.1-3) document the Late Pleistocene and Early Holocene environmental history of that area.



Fig.1: General map of Russia

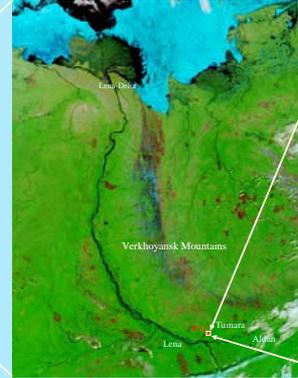


Fig.2: Studied area at the Tumara River valley (63°N 130°W)

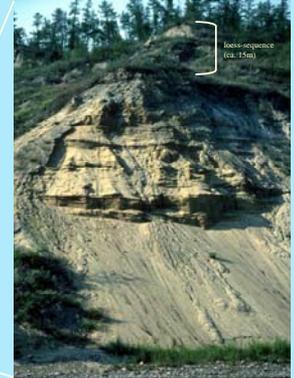


Fig.3: Sampled section near P12 (Foto: S.Popp 2003)

The investigation area: The climate of this region is extreme continental and arid. In Yakutsk the absolute minimum temperature reaches -64°C, absolute maximum +38°C and average annual is -10.2°C. Annual precipitation is 180-250 mm, but more than 350-400 mm vapours from June to September. In some dry years evaporation from water surface exceeds the precipitation 6-7 times. Today larch (*Larix dahurica*) forests with herbs dominate the vegetation (Fig.4). Few other trees (*Betula pendula*, *Pinus sylvestris*, *Picea obovata*) and shrubs like *Alnus fruticosa*, *Pinus pumila*, *Betula nana* also grew in the area.



Fig.4: Recent taiga vegetation with *Larix dahurica*, *Pinus sylvestris*, *Betula pendula*; Djanushka River (Foto: S.Popp 2003)

Results and interpretation: The pollen spectra (see Fig.5) shows that open tundra- and steppe-like Poaceae and Cyperaceae associations with some other herbs like Caryophyllaceae, Asteraceae, Ranunculaceae dominated the area about 48-40 ¹⁴C ka BP. Steppe-like communities with *Artemisia*, Cichoriaceae, *Thalictrum*, and rare shrubby tundra communities with *Salix* and *Betula* sect. *Nanae* were also present in the vegetation cover. The presence of *Salix* pollen, Polypodiaceae and *Lycopodium* spores in PZ-I and PZ-IIa reflect the existence of relatively wet habitats in the area during this interval. *Linum perenne* pollen grains in PZ-I indicate the existence of dry habitats in the area as well. This species reflect that temperatures were at least 12.5°C during the growing season. This relatively warm interval corresponds well with the **Karginsky Interstadial (Middle Weichselian, Stage 3)** recorded in Siberia.

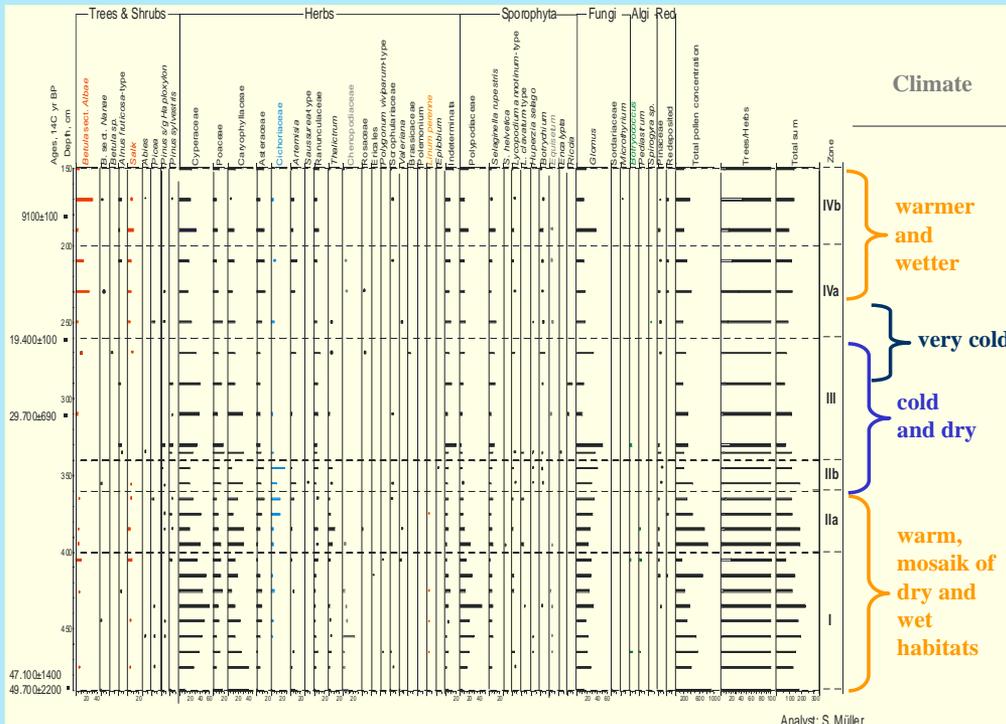


Fig.5: Percentage pollen diagramm

A decreasing content of *Salix* pollen (shrubby tundra communities) in PZ-IIb and the presence of *Artemisia*, Cichoriaceae and *Thalictrum* pollen (steppe-like communities) may reflect some rather dry climate interval. The falling concentration of pollen and spores in PZ-III probably reflects further deterioration of climate conditions. According to ¹⁴C dates there is a hiatus in the P12 section. The decrease of pollen and spore concentration reflects further deterioration of the environmental conditions. The pollen spectra from a nearby situated section P8, radiocarbon dated to ca. 23 ka BP contain large amounts of *Artemisia* pollen and *Selaginella rupestris* spores. This relatively cold and dry interval corresponds well with the **Sartan Stadial (Late Weichselian, Stage 2)** recorded in Northern Eurasia. In this period, especially at about 19 ¹⁴C ka BP (**Late Glacial Maximum**) the pollen concentration significantly decreased. Many pollen taxa completely disappeared from the spectra pointing to extremely severe environment. Higher tree pollen contents (mostly *Salix* and *Betula* sect. *Albae*) in the sediments during the PZ-IV period accumulated after 9 ¹⁴C ka BP, at the **Late Glacial/Early Holocene Transition** reflect favourable climatic conditions for the development of a taiga vegetation cover during that interval. The increase of contents of other pollen and spore taxa support this assumption. This data are in good agreement with other pollen records from the Northern Eurasia (e.g. Pisarcic et al. 2001; Andreev et al. 2002).