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50-kyr vegetation history in the western Verkhoyansk Mountains region (NE Asia) reconstructed from fossil pollen data

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A detailed radiocarbon-dated pollen record from Lake Billyakh (65°17'N, 126°47'E; 340 m a.s.l.) situated in the western part of the Verkhoyansk Mountains, about 140 km south of the Arctic Circle is presented. A set of 53 surface pollen samples representing tundra, cold-deciduous forest and taiga was collected in northern and central Yakutia communities to verify the accuracy of the quantitative biome reconstruction method and to obtain a more precise attribution of the identified pollen taxa to the main regional biomes. The adjusted method is then applied to the pollen record from Lake Billyakh to gain an objective reconstruction of vegetation and environments since about 50.7 kyr BP. The results of the pollen analysis and pollen-based biome reconstruction suggest that herbaceous tundra and steppe communities dominated the area from 50.7 to 13.5 kyr BP. The lowest pollen percentages of woody taxa and the highest values of Artemisia pollen attest that the 31-15 kyr BP period as the driest and coldest interval of the entire record. A relative high content of taxa representing shrub tundra communities and the presence of larch pollen recorded prior to 31 kyr and after 13.5 kyr BP likely indicate interstadial climate amelioration associated with the middle and latest parts of the last glacial. An increase in pollen percentages of herbaceous taxa around 12 kyr BP suggests broader distribution of drier communities in response to the colder and drier than present climate of the Younger Dryas. The onset of the Holocene is marked by the highest values of shrub taxa, mainly Betula sect. Nanae/Fruticosae. Pollen percentages of arboreal taxa increase gradually and reach maximum values after 7 kyr BP. The latter maximum mainly reflects the spread of Pinus sylvestris in central Yakutia as a response to the mid-Holocene climatic optimum. The quasi-continuous presence of larch, shrubby birch and alder pollen throughout the whole record is the most striking feature of the pollen record. Noticeable variations in larch pollen percentages point to multiple short-term warming episodes, which might be synchronous with Dansgaard-Oeschger cycles in the North Atlantic records.
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