Geophysical Research Abstracts
Vol. 20, EGU2018-19423, 2018
EGU General Assembly 2018

The penultimate interglacial vegetation and climate of the northeastern Russian Arctic inferred from the Lake El'gygytgyn pollen record

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A high-resolution pollen record from Lake El'gygytgyn, northeastern Russia, presents dynamics of vegetation and climate between 240.5 and 181.5 ka (Marine Isotope Stages MIS 7.5-6.6). The penultimate interglacial vegetation was characterized by mixed herb and shrub (mainly alder and birch) dominated plant communities. Pollen-based biome reconstruction shows that the vegetation landscape was generally open due to the high affinity scores of the TUND (tundra) biome. The warm intervals (MIS 7.5, 7.3 and 7.1) were marked by an increase in the CLDE (cold deciduous forest) biome scores and a synchronous decrease in the STEP (cold steppe) biome scores. The climatic optimum occurred during MIS 7.1. It was marked by the highest CLDE biome scores and lasted ∼10 ka, possibly favored by the high precession-related summer insolation and a legacy of the preceding mild stadial. In contrast, MIS 7.5 and 7.3 were characterized by shorter durations (∼4 ka) and lower summer temperatures. The preceding cold glacial/stadial might have led to an extensive distribution of permafrost that further hindered subsequent vegetation development during warm intervals. The MIS 7.4 and 6.6 were cold and wet, triggered by low obliquity values and coevally low precession-related summer insolation. As a result, these periods were marked by a significantly reduced summer temperature and an enhanced snow-ice albedo feedback. This study provides potential scenarios for future climate pattern and allows a better understanding of the relationship between vegetation, climate, and external/internal forcings in the high northern latitudes.