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Late Pleistocene to Holocene vegetation transition in the Eastern Pamir inferred from palynological data from Lake Karakul, Tajikistan

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Arid Central Asia is characterized by large differences in altitude, leading to a complicated climate history regarding regional patterns. Although an increasing number of local studies have been conducted in the recent years, few datasets cover regional climatic changes since the Last Glacial Maximum. Nevertheless, existing studies reveal significant spatial differences, calling for a higher number of data points in order to decipher climatic changes in the arid Central Asia region over time.
Here we present the first palynological study from the late Pleistocene (approximately 29 cal kyr BP) to Holocene in the high Pamir Mountains. A 10.86 m long sediment core was retrieved from the shallower eastern basin of Lake Karakul, which is located in an endorheic basin at 3915 m above sea level in the eastern Pamir. The lake represents a valuable archive due to its remoteness and near absence of human influence. Modern vegetation in the catchment is sparse due to the harsh climate with mean annual temperatures of -3.8°C and a mean annual precipitation of 82 mm.
The pollen record suggests three pollen assemblage zones (PAZ) and shows a clear dominance of Artemisia (40 to 80 %) and Chenopodiaceae (5 to 25 %), while other taxa are mainly recorded with values below 5 %. PAZ 1 (28.6 – 15.3 cal kyr BP) reflects variable Artemisia and Chenopodiaceae percentages and maximum values in herbs such as Caryophyllaceae and Lamiaceae as well as in the arboreal taxa Pinus and Alnus. The long distance transported arboreal pollen throughout the LGM and late glacial are assumed to point towards a strong Westerly influence. PAZ 2 (14.3 – 6.9 cal kyr BP) reveals maximum values of shrubby Ephedra spp., typical steppe taxa, increases in Cyperaceae and Asteraceae and a rapid decline in arboreal taxa, indicating warm and dry conditions in the early to mid-Holocene, and weakened Westerly influence. PAZ 3 (6.1 cal kyr BP to present) reflects an increase in meadow taxa such as Asteraceae and Brassicaceae and decreases in Ephedra spp., and thereby implies a turn towards colder and moister conditions in the late Holocene. Our record adds to the discussion of shifts in climate dynamics and moisture availability in Central Asia in the region of the Eastern Pamir since the late Pleistocene.