



## **Late Quaternary changes in vegetation, Indian monsoon and westerly circulation derived from the pollen data from the Himalayan lake Tso Kar, NW India: An attempt of quantitative reconstruction and comparison with model simulation results.**

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Accurate reconstruction of late Quaternary vegetation cover and climate is necessary for better understanding of past environmental dynamics, the role of vegetation feedbacks in glacial-interglacial climate variations, and for validating vegetation and climate models. Surface and pollen data together with satellite-based measurements allow calibrating the modern-analogue method for quantitatively reconstructing past land cover from fossil pollen data. Palynological and sedimentological investigation of a sediment core from Tso Kar, an alpine lake situated in the Ladakh area of the Indian Himalaya at the limit of the present-day Indian summer monsoon, was performed in order to reconstruct post-glacial regional vegetation and climate dynamics (Demske et al., 2009; Wünnemann et al., 2010). The pollen record indicates that alpine desert vegetation reflecting dry and cold conditions dominated the area prior to 14 kyr BP. The spread of alpine meadows and local aquatic vegetation is a weak sign of climate amelioration after 14 kyr BP. Pollen influx values suggest a strengthening of the summer monsoon and the reduced activity of westerly winds. The subsequent change towards drier desert-steppe vegetation likely indicates more frequent westerly disturbances and an extremely weak monsoon about 12.5–11.8 kyr BP during the Younger Dryas. A major increase in humidity is inferred from the development of steppe and alpine meadows in response to the strengthening of the summer monsoon between ca. 10.9 and 9.2 kyr BP. The subsequent development of the alpine meadow, steppe and desert-steppe vegetation points to a moderate reduction in the moisture supply, which can be linked to the weakening of the summer monsoon between 9.2 and 4.8 kyr BP. The highest water levels of Tso Kar around 8 kyr BP probably reflect combined effect of both monsoonal and westerly influences in the region. An abrupt shift towards aridity occurred after 4.8 kyr BP in line with a further weakening of the Indian Monsoon. In the current study we compare the Tso Kar fossil record with modern pollen, climate and vegetation cover data from the region in order to quantify past changes in vegetation and climate. The pollen-based reconstruction is further compared with the modeled changes in climate and vegetation cover through the past 8000 years.