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Indian Summer Monsoon: A Reconstruction Based on Terrestrial Archive During the Last 30 ka from Indian Subcontinent

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Reconstruction of Late Quaternary monsoon variability from the Indian subcontinent using terrestrial archives requires understanding long-term (10^4years) and short-term (10^2-10^3 years) climatic events. Here, we synthesize results gained from environmental magnetism technique to reconstruct Indian Summer Monsoon (ISM) using sediment samples from lakes, playas, loess and mudflats. Most importantly, efforts have been made to understand global, regional and local factors responsible for modulating the ISM at millennial and centennial time-scales. Our study delineates relict proglacial lakes, thus providing one of the most complete records of ISM variability from 25 ka till the beginning of Holocene. Mineral magnetic parameters and its derivatives in association with geochemistry suggest majority of proglacial lakes in the Central Himalaya emerged following the recession of the local Glacial Maximum (>20 ka). The global Last Glacial Maximum (LGM) is represented by appreciable decrease in magnetic susceptibility and magnetic remanence parameter S-ratio around 20 ka, indicating significant reduction in periglacial processes at the expense of aeolian activity in the Central Himalaya, which is manifested in the deposition of loess. The low frequency high magnitude millennial time-scale ISM variability from relict lake records of the Trans Himalaya compares well with δ^{18}O record of GRIP ice core and the Northern Atlantic marine record. For example, the cooling event identified between 25 ka and 22 ka in the lake record corresponds with the cooling event in the GRIP ice core data and the Heinrich event-2 (H2). Similarly, the 16.5 ka - 14.5 ka cooling event corresponds with the Heinrich event-1 (H1) and compares well with the GRIP record. However, high frequency low magnitude centennial scale fluctuations in ISM is attributed to the unstable climatic conditions particularly between 17 ka and 13 ka. These fluctuations probably represent local perturbations influenced by changing snow/ice cover in central Asia, Tibet and the Himalaya, which in turn influenced the regional albedo. A growing body of evidence suggests periods of low solar activity coincide with glacial advance, lake-level fluctuations and sudden climatic changes. Elevated landmass of the Tibetan plateau, lying north of the Trans Himalaya lakes, could have efficiently mediated the effect of changes in solar activity caused due to changing snow cover (albedo) during the existence of these lakes. The presentation will attempt to give an overview of regional ISM variability obtained from the Central Himalayan region to understand synchronicity of events occurred in different geographical domains of Indian subcontinent, particularly in its western, peninsular, eastern and western coastal areas.