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Need for Elucidation of Palaeoclimatic Variability in the High Himalayan Mountains: A Multiproxy Approach

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Abstract : The high mountain glaciers are one of the most sensitive recorders of climate changes, because they have the tendency to respond to the combined effect of snow fall and temperature. The Himalayan glaciers have been studied with a good pace during the last decade. However, owing to its large ecological diversity and geographical vividness, major part of the Indian Himalaya is uninvestigated, and hence the palaeoclimatic patterns as well as the chronology of past glaciations in particular remain controversial for the entire Indian Himalayan transect. Although the Himalayan glaciers are nourished by two important climatic systems viz. the southwest summer monsoon and the mid-latitude westerlies, however, the influence of these systems is yet to be understood. Nevertheless, existing chronology (mostly exposure ages) indicate that irrespective of the geographical position, glaciers seem to grow during enhanced Indian summer monsoon (ISM). The Himalayan mountain glaciers are referred to the third pole or water tower of Asia as they form a huge reservoir of the fresh water supplies for the Asian countries. Mountain glaciers are sensitive probes of the local climate, and, thus, they present an opportunity and a challenge to interpret climates of the past as well as to predict future changes. The principle object of all the palaeoclimatic studies is to develop a futuristic models/scenario. However, it has been found that the glacial chronologies bracket the major phases of climatic events only, and other climatic proxies are sparse in Himalaya. This is the reason that compilation of data for rapid climatic change during the Holocene shows major gaps in this region. The sedimentation in proglacial lakes, conversely, is more continuous and, hence, can be used to reconstruct a more complete record of past climatic variability that is modulated by changing ice volume of the valley glacier. The Himalayan region has numerous proglacial lacustrine deposits formed during the late Quaternary period. However, there are only few such deposits which have been studied so far. Therefore, this is the high time when efforts have to be made to systematically map the moraines located in different climatic zones, reconstruct the local and regional moraine stratigraphy and use multiple dating techniques to bracket the events of glaciation. Besides this, emphasis must be given on carrying multiproxy studies on the lacustrine sediments that will provide a high resolution palaeoclimatic data from the alpine region of the Himalaya. Although the Himalayan glaciers fluctuated in accordance with the changing climatic conditions (natural forcing), however, it is too early to arrive at any conclusion. It is very crucial to generate multiproxy data sets covering wider geographical and ecological domains taking into consideration multiple parameters that directly or indirectly influence the glacier mass balance as well as the local climate of a region.

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