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Determination of the Quaternary evolution of Nepalese-Himalayan faults inferred from luminescence thermochronometry

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The Himalaya mountain range is the result of continental collision between the Indian and the Eurasian tectonic plates. Despite decades of research, the tectonic evolution of the Himalayas is still debated, in part because of the difficulty of constraining rates of tectonic change over the Quaternary, and because different models conflict in their explanation of the tectonic processes that build the High Himalaya (HH). Here we apply the recently developed luminescence thermochronometry technique over a large geographical area of Nepal to resolve deformation at sub-Quaternary timescales.

In comparison with other thermochronometric systems, luminescence thermochronometry has a very low closure temperature ($\sim$30°C) and thus offers the potential to constrain cooling histories precisely over recent –Quaternary– timescales, and to document recent fault activity through measuring differential denudation across them. Applying this new technique to a set of samples from the Nepalese-Himalaya will provide insights into the cooling histories, which can be converted to exhumation histories, of the Himalayan fold-and-thrust belt.

More than 80 samples have been collected along five transects in Western and Central Nepal, selected to record exhumation rate changes on each side of the major thrusts and faults that shape the Nepalese landscape. Specifically, a transect in the foreland foothills of the Himalayas, across the Siwaliks, gives information on the Main Frontal Thrust (MFT) and the Main Boundary Thrust (MBT); whilst four other transects, collected along four catchments draining the High Himalaya, provide information on the Main Central Thrust (MCT) and the South Tibetan Detachment System (STDS).

Preliminary results indicate variations in exhumation rates across the different tectonic structures. Whilst potentially relating to local surface process and/or climatic differences (i.e. fluvial incision rates, glacial erosion, differences in precipitation, etc.), these data could also indicate recent tectonic deformation, which would potentially imply Quaternary fault reactivation within these regions. Comparison of results between the foreland –Siwaliks– and the hinterland –High Himalaya– will allow constraint of how Himalayan shortening is distributed across the range during the Quaternary.