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Continuous and active growth of the Lesser Himalayan duplex in Kishtwar window, NW Himalaya

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Two end-member kinematic models of crustal shortening across the Himalaya are still debated: one assumes localized thrusting along a single major thrust fault, the Main Himalayan Thrust (MHT) with non-uniform under-plating due to duplexing, and the second one advocates for out-of-sequence thrusting in addition to thrusting along the MHT and under-plating. Furthermore, several studies argue that all crustal shorting during the Quaternary is accommodated within Sub-Himalayan fold and thrust belt.

In this study, we combined tectonogeomorphic field observations, topographic analysis and luminescence dating of the Quaternary alluvium from the Kishtwar region in NW Himalaya. We have used 30m SRTM data to analyze the regional geomorphic parameters of the area and found that the river Chenab shows, as previously reported, significant changes in the longitudinal river profile, hypsometric integral, valley width and normalized steepness indices across the Kishtwar window situated $\sim$ 150 km inside the Himalayan front. Unadjusted hypsometry, high ksn values, and several non-lithological knickpoint zones in the Chenab river profile hints towards possible ongoing neotectonic activity especially at the western margin of the window. We combined our morphometric analysis with field observation and field data on rock strength and observed tilted Quaternary deposits along the Chenab valley. We have observed faults disrupting Quaternary fluvial sequences and $\sim$20[U+05AF] NE-tilted fluvial sequence of pebble conglomerate and coarse sand layers in the vicinity the town of Kishtwar. Even, the observed knickpoints within the window do not correspond to significant changes in the substrate rock strength and therefore hint about their non-lithologic origin. We also observed changes in the drainage pattern of Chenab, as it was frequented by large landslides (despite being located in a fairly-low rainfall region) and landslide-dammed lakes throughout the Kishtwar window and downstream.

Previously published young (<3 Ma) apatite fission track ages from the Lesser Himalayan duplex in the Kishtwar Window suggest higher exhumation over million-year timescale. Therefore, our findings possibly hint towards a protracted tectonic uplift process – and the quaternary tilted deposits suggests that this deformation is active until today or very recent. Moreover, frequent low-magnitude mid-crustal (8-30 km) seismic events, steep channel gradients, high angle bedrock foliations of the Lesser Himalayan duplex, multiple knickpoints and young AFT ages within the Kishtwar window hints about active shortening accommodated due to movement along a mid-crustal ramp of the MHT.

We are processing the OSL samples obtained from the deformed sand and silt layers within the alluvium. We are hopeful that we will be able to chronologically constrain the late Quaternary deformation with the new luminescence ages.