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Tectono-metamorphic discontinuities in the Greater Himalayan Sequence and their role in the exhumation of crystalline units

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The Greater Himalayan Sequence (GHS) shows an impressive continuity running for more than 2000 kilometers. Large volumes of granites were intruded in its upper portion, below the South Tibetan Detachment System. The deformation within the crystalline rocks is referable to pervasive non-coaxial deformation mainly related to a top-to-the south sense of shear developed in the time span of activity of the STDS and MCT.
Several shear zones/faults have been recognized within the GHS, usually regarded as out of sequence thrusts with respect to the MCT. However, geological investigations in Western Nepal allow the authors to identify different generations of shear zones with different kinematics and, moreover, different ages.
A high-temperature top-to-the SW shear zone (Toijem shear zone) has been documented in the core of the GHS in lower Dolpo (western Nepal), whose activity has been constrained at $\sim$ 26 Ma by U-Pb on monazite (Carosi et al., 2010) before the onset of shearing of the MCT. Going in the Mugu-Karnali valley an even thicker (up to 4 km) and top-to-the SW shear zone (Mangri shear zone) has been recently detected in the middle part of the GHS. It separates the upper part of the GHS (with the occurrence of sillimanite along the main foliation) from a lower part mainly made by kyanite-bearing gneiss and micaschist. The age has been constrained by U-Pb on monazite at $\sim$ 25-17 Ma. The difference in Pressure experienced by the hanging-wall and footwall rock is at least $\sim$ 2 Kbar.
The two shear zones are responsible for the exhumation of the hanging wall rocks before the well-known period of exhumation by extrusion or channel flow of the GHS by the contemporaneous activity of the Main Central Thrust and South Tibetan Detachment System.
By connecting the study shear zone with similar tectonic-metamorphic discontinuities in central Himalaya it is evident the occurrence of a regional-scale feature, the High Himalayan Discontinuity, separating the sillimanite-bearing gneiss and schist in upper part of the GHS from the kyanite bearing gneiss and schist in the lower part. This discontinuity triggered the earlier exhumation of the GHS, before the classical onset of Main Central Thrust.

Carosi, R., Montomoli, C., Rubatto, D., and Visonà D., 2010, Late Oligocene high-temperature shear zones in the core of the Higher Himalayan Crystallines (Lower Dolpo, Western Nepal). Tectonics, 29, TC4029, doi:10.1029/2008TC002400.