

Tectonic and Metamorphic Evolution of the Central Himalayan Domain in Southeast Zaskar (Kashmir, India)

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The southeastern part of Zaskar is located at the transition between two major Himalayan domains of contrasting metamorphic grade, the High Himalayan Crystalline Sequence (HHCS) and the Tethyan Himalaya (TH). The transition between the TH and the HHCS is marked by a very rapid, although perfectly gradual, decrease in metamorphic grade, which coincides with a major tectonic structure, the Zaskar Shear Zone (ZSZ).

It is now an established fact that the relation between the HHCS and the TH is not one of basement-cover type, but that the metasedimentary series of the HHCS represent the metamorphic equivalent of the lowermost sedimentary series of the TH. This transformation of sedimentary series into metamorphic rocks, and hence the differentiation between the TH and the HHCS, is the consequence of crustal thickening associated to the formation of, large scale, south-west vergent, nappes within the Tethyan Himalaya sedimentary series. This, Middle Eocene to Oligocene, episode of crustal thickening and associated Barrovian metamorphism is followed, shortly after, by the exhumation of the HHCS as a, large scale, south-west vergent, nappe. The exhumation of the HHCS nappe is associated with the activation of two contemporaneous structures, the Main Central Thrust at its base and the Zaskar Shear Zone at its top. Extensional movements along the ZSZ, caused the Barrovian biotite to the kyanite zones to be sheared and telescoped within the ~1 km thick shear zone. Decompression associated to the exhumation of the HHCS induced the formation of leucogranitic magmas through vapour-absent partial melting of the higher-grade rocks.

The combination of geothermobarometric data with a geometric model of the ZSZ allowed us to constrain the net slip at the top of the HHCS to be at least 35 ± 9 kilometres. A set of arguments however suggests that these movements might have been much more important (~ 100 km).

Geochronological data coupled with structural observations constrain the duration of ductile shearing along the ZSZ to 2.4 ± 0.2 Ma between 22.2 ± 0.2 Ma and 18.8 ± 0.1 Ma.

This study also addresses the consequences of synorogenic extension on the metamorphic, tectonic and magmatic evolution of the upper parts of the High Himalayan Crystalline Sequence.