Structural data from lower Dolpo (western Nepal)

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Structural investigation in Lower Dolpo (Western Nepal) led to recognize the main tectonic setting of the area. A NE-SW structural transect confirms the presence of the three main tectonic units building up the chain that from bottom to top are represented by the Lesser Himalaya (LH), the Higher Himalayan Crystalline (HHC) and the Tibetan Zone (TZ). Different metamorphic and structural evolution have been recognized along the study transect in the TZ and in the HHC. The TZ is characterized by two main deformation phases both developed under a low-grade metamorphic facies of metamorphism. An increase of both metamorphism and deformation has been detected moving across the TZ approaching towards the lower HHC.

The HHC has been deformed under amphibolite facies metamorphism and the main fabric is represented by an S_2 mylonitic schistosity. It is worth noting the occurrence of a ductile shear zone in the middle part of the HHC (Tojem shear zone) with a top to the south sense of shear. It divides the HHC in two units. The main differences between the two units are the presence of sillimanite developed after the main Barrovian minerals and leucogranite bodies in the upper unit. The Higher Himalayan Cryistalline has been interpreted as an extruding wedge of crystalline rocks bounded by the MCT at the base and by the STDS at the top (Burchfiel et al. 1992, Hodges et al. 1992, Graseman et al. 1999, Gruijc et al. 1996, 2002).

By the way even if the STDS has been traced for several hundred kilometers along the Himalayan chain, in this area the contact is reported to be transitional (Fuchs and Frank 1970, Fuchs 1977). In the study area the two tectonic units get in touch through a thick sequence of carbonatic rocks and our data point out the presence of a metamorphic jump passing from the upper TZ to the lower HHC. The biotite-bearing marbles of the metapelite sequence of the TZ get in contact with the underlying diopside- and forsterite-bearing marbles of the sillimanite-bearing metapelite sequence of the HHC. In addition in the TZ the strain increases towards the boundary between HHC and TZ and the deformation mechanisms change from pressure solution to crystalline plasticity going down from Ordovician limestones to the marbles of the "Dhaulagiri Limestone". The contact zone is characterized by asymmetric folds and kinematic indicators with a top-to-the NE vergence, connected to a down-to-the NE tectonic transport.On the basis of these features we regard the boundary between HHC and TZ as a high strain extensional zone, linked to the STDS.

References

Burchfield BC, Z Chen, KV Hodges, Y Liu, L Royden, C Deng and J Xu. 1992. The South Tibetan Detachment system, Himalayan Orogen. Extension contemporaneous with and parallel to shortening in a collisional mountain belt. *Geological Society of America, Special paper* **269**: 1-41

Fuchs G and W Frank. 1970. The geology of West Nepal between the rivers Kali Gandaki and Thulo Bheri. *Jahr der Geol Bund Wien* **18**: 1-103

Fuchs G. 1977. The geology of the Karnali and Dolpo regions, Western Nepal. *Jahr der Geol Bund Wien* **120**: 165-217

Grujic D, L Hollister and R Parrish. 2002. Himalayan metamorphic sequence as an orogenic channel: insight from Bhutan. *Earth and Planet Sci Letters* **198**: 177-191

Graseman B, H Fritz and JC Vannay. 1999. Quantitative kinematic flow analyses from the Main Central Thrust Zone (NW Himalaya, India): implications for a deceleratimg strain path and the extrusion of orogenic wedges. *J Struct Geol* **21**: 837-853

Gruijc D, M Casey, C Davidson, LS Hollister, R Kundig, T Pavlis and Schmid. 1996. Ductile extrusion of the Higher Himalayan Crystalline in Bhutan: evidence from quartz microfabrics. *Tectonophysics* **260**: 21-43

Gruijc D, LS Hollister and R Parrish.2002. Himalayanmetamorphic sequence as an orogenic channel: insight from Bhutan. *Earth and Planet Sci Letters* **198**: 177-191

Hodges KV, BC Burchfiel, LH Royden, Z Chen and Y Liu. 1992. The metamorphic signature of contemporaneous extension and shortening in the central Himalayan orogen: data from the Nyalam transect, southern Tibet. *J Metamorphic Geol* **11**: 721-737