Tectono-metamorphic discontinuities within the Greater Himalayan Sequence, a local or a regional feature?

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The Greater Himalayan Sequence (GHS) has been considered as a coherent tectonic unit bounded by the South Tibetan Detachment and the Main Central Thrust. However thrusts within it have been recognized in several places and have been mainly interpreted as out of sequence thrusts (Mukherjee et al., 2012). Recent integrated studies allow to recognise several ductile shear zones in the core of the GHS along the belt, with top-to-the SW sense of shear (Higher Himalayan Discontinuity, HHD: Montomoli et al., 2013). U-Th-Pb in situ monazite ages provide ages older than the Main Central Thrust. HHD was active since 28-26 Ma (Montomoli et al., in press). Different P and T conditions have been often recorded in the hanging-wall and footwall of the HHD. Moreover the activity of the HHD since the Oligocene affected the metamorphic path of the GHS: when the hanging wall was exhumed the footwall continued to be buried reaching its peak conditions later than the hanging wall. Kinematics, P-T-t evolution and geochronology are the key tools to detect the occurrence of the HHD within the GHS along the Himalayan belt and several tectonic discontinuities have been recognized along the Himalayan belt from western Nepal to Bhutan, through Sikkim and Eastern and Central Nepal. Some discontinuities, such as the "Bhanuwa Thrust", the "Tama Kosi P-T-t-d discontinuity" and the "Hidden discontinuity 1" (Fig. 1) correspond in fact to the Main Central Thrust and are localized at the base of the GHS. The other discontinuities, localized within the GHS, divide the GHS into two portions an upper one (Upper Greater Himalayan Sequence- GHS_u) and a lower one (Lower Greater Himalayan Sequence- GHS_l (Fig. 1) (Montomoli et al., 2013).

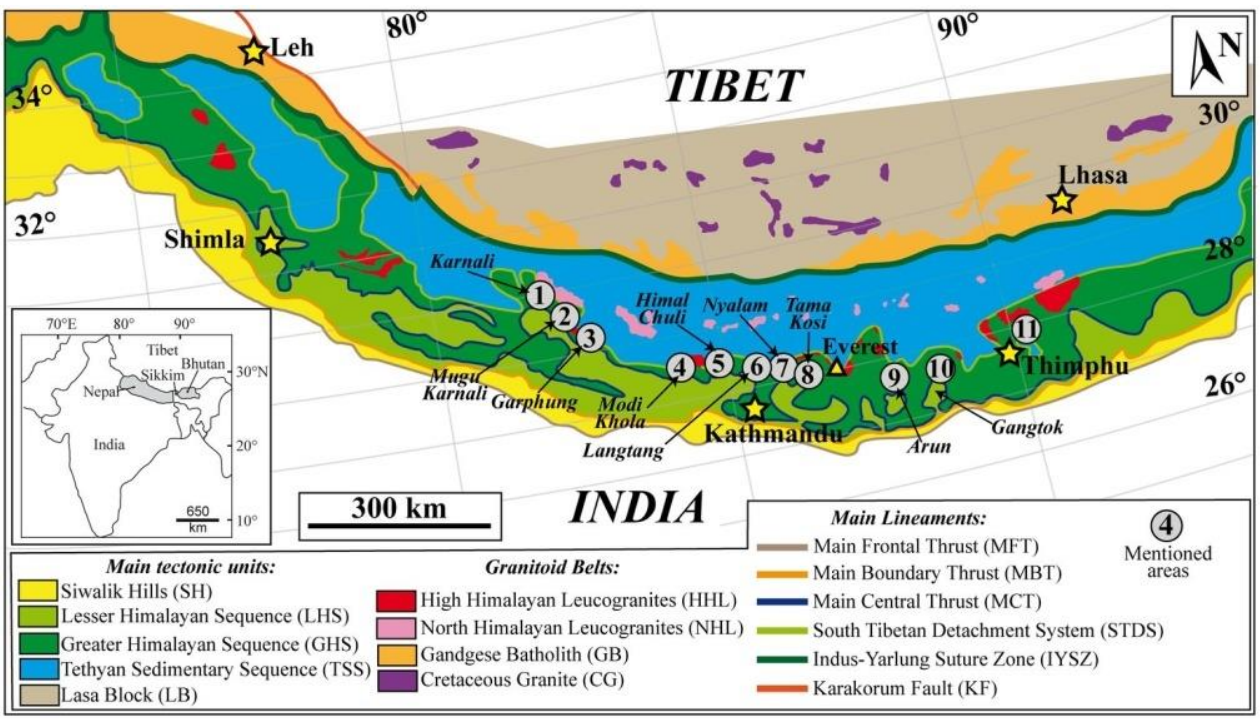

Figure 1. Schematic geological map of the Himalayan Belt. Numbered grey dots represent the location of the main tectonic and metamorphic discontinuities recognized along the belt: 1) Metamorphic discontinuity; Yakymchuk and Godin, 2012; 2) Mangri Shear Zone; Montomoli et al. 2013; 3) Tojiem Shear Zone; Carosi et al. 2010; 4) Bhanuwa and Sinuwa Thrusts; Corrie & Kohn, 2011; Martin et al. 2010; 5) Himal Chuli; Larson et al. 2010; 6) Langtang Thrust; Fraser et al. 2000; Harris and Massey 1994; Kohn 2008 and reference therein; 7) Tama Kosi; Larson et al.

2013; 8) High Himal Thrust; Goscombe et al. 2006 ; Imayama et al., 2012; Hidden Discontinuity 1, Hidden Discontinuity 2; Groppo et al. 2009; 9) Age Discontinuity; Rubatto et al., 2012; 10) Bhutan Discontinuity; Swapp & Hollister 1991. SH: Siwalik Hills- Sub-Himalayan Molasse; LHS: Lesser Himalayan Sequence; GHS: Greater Himalayan Sequence; TSS: Tethyan Sedimentary Sequence; LH: Lhasa Batholith; HHL: High Himalayan Leucogranite; NHG: North Himalayan Leucogranite; GB: Gandgese Batholith; CG: Cretaceous Granite; MFT: Main Frontal Thrust; MBT: Main Boundary Thrust; STDS: South Tibetan Detachment System; MCT: Main Central Thrust; IYSZ: Indus Yarlung Suture Zone; KT: Karakorum Fault).

The correlation of the HHD with other discontinuities recognized in the GHS led to propose that it is a tectonic feature running for several hundreds kilometers, documented at the regional scale with the following characteristics:

- it is a ductile shear zones showing a contractional top-to-the S and SW sense of shear;
- it divides the GHS in two portions; an upper GHS and a lower GHS;
- the upper GHS is made of sillimanite-kyanite bearing migmatites with a high-degree of melting;
- the HHD started its activity before the initiation of the MCT, at 28-26 Ma and continued up to 17 Ma;
- the HW and FW rocks attained peak metamorphic conditions in different times. The FW attained peak metamorphism later than the HW;
- the HW often registered lower P with respect to the FW;
- the HW underwent earlier exhumation, i.e. before MCT and STD activities.

The actual proposed models of exhumation based mainly on the MCT and STD activities are not able to explain the occurrence of the HHD. Any model of the tectonic evolution of the GHS should account for the occurrence of the HHD and its consequences on the tectonic and metamorphic path.

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