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Rodolfo Carosi, Chiara Montomoli, Salvatore Iaccarino



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“20 years of geological mapping of the metamorphic core across Central and Eastern Himalayas”

Rodolfo Carosi⁽¹⁾, Chiara Montomoli⁽²⁾, Salvatore Iaccarino⁽¹⁾

⁽¹⁾ Dipartimento di Scienze della Terra, v. Valperga Caluso, 35 10125 Torino, Italy

⁽²⁾ Dipartimento di Scienze della Terra, v. S. Maria, 53 56126 Pisa, Italy

Abstract

The largest crystalline unit representing the mid-crust in the Himalayan belt is the Greater Himalayan Sequence (GHS) which stretches all over the 2400 km of length of the belt. The GHS, recognised since the first geological explorations of the Himalayas, has been considered for a long time as a coherent tectonic unit, exhumed by the contemporaneous shearing along the Main Central Thrust and the South Tibetan Detachment System in the time span ~ 25-17 Ma. A multidisciplinary approach, integrating geological mapping, structural analysis, petrology and geochronology allowed to better constraints on its internal architecture characterised by several levels of tectonic-metamorphic discontinuities on the regional scale with a top-to-the-S/SW sense of shear and active since ~ 40 Ma. The GHS is consequently divided in three main tectonic units exhumed progressively from the upper part to the lower one by ductile shear zones, later involving the Lesser Himalayan Sequence.

Above the Main Central Thrust a cryptic tectono-metamorphic discontinuity (Higher Himalayan Discontinuity; HHD) has been recognized and mapped in Central-Eastern Himalaya. The mapping of the HHD has been allowed by the use of a multidisciplinary approach involving structural analysis, geochronology and petrography. A new map of Western Nepal is presented.

In this framework the popular models of exhumation of the GHS mainly based on the contemporaneous activity of the two bounding shear zones (Main Central Thrust and the South Tibetan Detachment) and considering the GHS as a coherent tectonic unit, should be reconsidered. An in-sequence shearing tectonic model, from the deeper to the upper structural levels, further affected by out-of-sequence-thrusts, is more appropriate to explain the deformation, metamorphism and exhumation of the mid-crust in the Himalayan belt.

Geological mapping of the Himalayan belt is very far away to be exhaustively completed. Anyway during the last 20, and particularly during the last few years, it has been notably improved due to a new multidisciplinary approach.

Keywords: Himalaya; geological maps; tectonic and metamorphic discontinuities; Greater Himalayan Sequence; exhumation; ductile shear zone; in sequence shearing.

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