The Main Central Thrust Zone in Western Nepal

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The Main Central Thrust covers a key role in the dynamic of the Himalayan belt and it has been traced for more than 2000 km from NE India to Pakistan and an open debate exists regarding the different criteria used to define and map it (Searle et al., 2008 and references therein).

The Main Central Thrust Zone (MCTZ) has been studied along several sections in western Nepal, Dolpo region. Here the MCTZ is represented by a thick highly-deformed zone several kilometers thick. The main fabric is a pervasive mylonitic ductile foliation overprinted by later ductile/brittle and brittle shear zones developed during the exhumation of the Greater Himalayan Sequence.
The ductile deformation developed under non-coaxial deformation in which stable porphyroclast analysis, following Passchier (1987) and Wallis (1995), points to simple shear and pure shear acting together during exhumation and to an increase in simple shear component of deformation approaching the high strain zone (Carosi et al., 2007, Larson & Godin, 2009). Shear planes strike N110-120 and moderately to steeply dip to the NE: stretching lineation trend N40-50 and plunge 50-60° to the NE. Kinematic indicators indicate a top-to-SW sense of shear.

Brittle reverse faults and n-type flanking folds (Fig.1) have been recognized overprinting the ductile mylonites. Brittle faults are associated to centimetre up to decimetre thick cataclasites and drag folds pointing to a top-to-the SW sense of shear. Foliated cataclasites are often associated to shear planes as well as Riedel shears. These brittle structures testify a later compressive reactivation of the MCT zone after the main ductile phase at upper structural levels (Mcfarlane, 1993; Harrison et al., 1997; Catlos et al., 2002; 2004).

An inverted metamorphic sequence has been recognized along the study sections.

P-T conditions have been constrained using geothermobarometers in high temperature mylonites while to constraint the P-T conditions during the ductile to brittle tectonic evolution of the MCTZ zone fluid inclusion analyses have been performed on quartz lenses from kyanite bearing gneisses and micaschists sampled from the Main Central Thrust Zone and in quartz inclusions trapped in garnet crystals.

The studied fluid inclusions, found either in isolated clusters and along trails, are two-phase (liquid water + liquid carbonic fluid) at room temperature. They usually show a constant ratio between the liquid water and the carbonic fluids and they are characterized by quite regular negative crystal shapes even if sometimes irregular morphologies have been observed. Microthermometric analyses point CO_2 homogenization temperature (Th-CO_2) ranging between 9.7 and 11.8 °C, while CO_2 melting temperature (Tm-CO_2) is always below the triple point of the pure CO_2 and varies between –58.6 and –59°C, suggesting the presence of CH_4 and/or N_2 coexisting with CO_2. Clathrate dissociation temperatures have been observed between 10.2 and 10.6°C.

The isochores for representative fluid inclusions, computed using Bakker's (1999) method, based on the adaptation of Bowers and Helgeson's (1983) equation of state, compared with the geothermobarometric data and mineral assemblages in the host rock, indicate lower pressure- temperature conditions for their trapping in accordance with the retrograde P-T evolution found in the MCT zone of Garhwal Himalaya (Sachan et al., 2001).

The study sector of the MCT zone recorded a metamorphic event at higher PT conditions up to amphibolite facies followed by a lower grade metamorphism and deformation acquired during exhumation reaching the PT conditions of 2-4 Kbar and 300-400°C at nearly 14-17 Ma determined through Ar/Ar datings on white micas and biotites recrystallized along the mylonitic foliation pointed out a cooling age for the MCTZ (Montomoli et al., in prep.; Vannay & Hodges, 1996).

The presence of reverse thrusts overprinting the mylonites of the MCT zone could also suggest that deformation after the MCT activity proceeded both toward the foreland and by out of sequence thrusts.

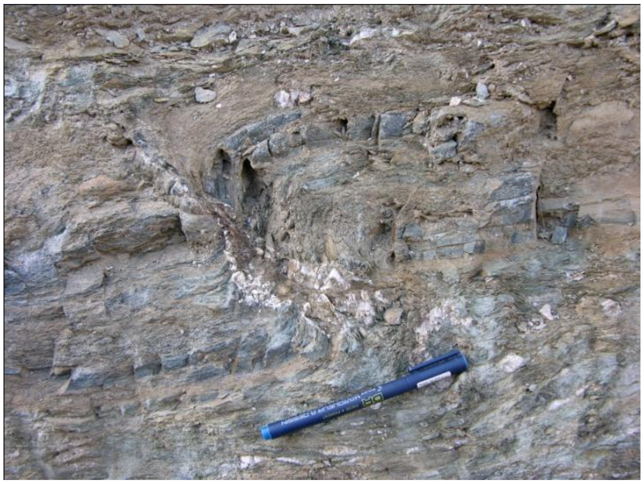

Figure 1. N-type flanking fold showing a top - to - the –SW sense of shear in phyllites of the Main Central Thrust Zone. Cross-cutting element is a quartz vein.

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