Relations between the South Tibetan Detachment and leucogranite emplacement in Western Nepal: consequences for exhumation of the Greater Himalayan Sequence

Chiara Montomoli[1], Rodolfo Carosi[2], Dario Visonà[3], Salvatore Iaccarino[1], Antonio Langone[4]

[1] Dipartimento di Scienze della Terra, University of Pisa, Pisa, Italy, chiara.montomoli@unipi.it
[2] Dipartimento di Scienzedella Terra, University of Torino, Torino, Italy
[3] Dipartimento di Geoscienze, University of Padova, Padova, Italy
[4] Istituto di Geoscienze e Georisorse, CNR, Pavia, Italy

The South Tibetan Detachment System divides the lower rocks of the Greater Himalyan Sequence (GHS), deformed under medium to high-grade metamorphic conditions from the overlying medium-low-grade to non metamorphic rocks of the Tethyan Himalayan Sequence (THS). It show a complex architecture being characterized by a lower ductile shear zone, affecting the upper part of the GHS (Carosi et al., 1998) and the amphibolites facies rocks at the bottom of the THS (lower THS) and by an upper brittle fault, above which the very-low-grade to non metamorphic rocks of the THS (upper THS) crop out. According to most workers the High Himalayan granites (HHG), located in the upper part of the GHS, intrude and are deformed by the lower ductile shear zone of the STDS.

We report data from a geological transect located in Western Nepal where the STDS shows a peculiar structural setting.

In the study area the upper portion of the Greater Himalayan Sequence is made by gneiss, migmatites and calcsilicates.

The THS is characterized by a lower portion made by garnet and cordierite bearing gneisses. P-T pseudosection modelling, reveal as the observed assemblage is stable in the range of 0.53-0.65 GPa and 610-720°C.

The upper portion the THS is made by biotite-bearing quartzites, impure limestone, metarenites and subordinate metapelites with a metamorphic assemblage of calcite, quartz, muscovite, biotite ± chlorite and scapolite, indicating greenschist facies conditions. Detrital zircon ages indicate a depositional age from upper Jurassic to lower Cretaceous.

The boundary between the GHS and the THS is intruded by a large leucogranitic body showing a crystallization age at 23-24 Ma (Bertoldi et al., 2011; Carosi et al. 2013), constraining the time of youngest shearing event between the two tectonic units.

Dykes from the upper portion of the granite intrude the low-grade metamorphic rocks of the THS causing contact metamorphism within few meters from the granite contact. The low grade foliation in the THS is overgrown by biotite and muscovite. The intrusion closest samples show static crystallization of amphibole, clinopiroxene and annealing of calcite-plagioclase-quartz (± kfeldspar) matrix. On these samples, in order to quantify the depth of pluton emplacement, a set of geothermobarometric methods have been applied. A broad consistency of all the methods points out a T of equilibration around 600-640°C and a P of nearly 0.5 GPa.

Structural relations and time of emplacement of the leucogranite cast doubts on the exhumation models widely adopted till now for the Himalayan belt. According to Montomoli et al. (2013) the MCT in the study area has been active later than 18 Ma and as a consequence STD and MCT were active in different time precluding their contemporaneous activity and the tectonic models based on it.

References

Bertoldi, L., Massironi, M., Visonà, D., Carosi, R., Montomoli, C., Gubert, F., Naletto, G. and Pelizzo, M.G., 2011, Mapping the Buraburi granite in the Himalaya of Western Nepal: remote sensing analysis in a collisional belt with vegetation cover and extreme variation of topography, Remote Sensing of Environment ,115, 1129-1144.

Carosi, R., Lombardo, B., Molli, G., Musumeci, G. and Pertusati, P.C., 1998, The South Tibetan Detachment System in the Rongbuk valley, Everest region. Deformation features and geological implications, Journal of Asian Earth Sciences, 16, 299-31.

Carosi, R., Montomoli, C., Rubatto, D. and Visonà, D., 2013, Leucogranite intruding the South Tibetan Detachment in western Nepal: implications for exhumation models in the Himalayas, Terra Nova, 25, 478-489.

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