Depositional age and exhumation of Tethyan Sedimentary rocks intruded by Oligo-Miocene granite

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The STDS separating the lower medium to high-grade metamorphic rocks of the GHS from the overlying THS [1] has a complex architecture. Along many sections of the belt it is characterized by a lower ductile shear zone, affecting the upper part of the high-grade-metamorphic rocks of the GHS [2, 3] and the amphibolites facies rocks at the bottom of the THS (lower THS) (i.e. Checka Formation, [4]; Haimanta Group, [5]; Everest Series, [6]) 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 some workers [7, 8, 9] the High Himalayan granites (HHG), located in the upper part of the GHS, and the North Himalayan Granites located in the North Himalayan domes [10], intrude only the lower ductile shear zone of the STDS.

By the way recently, a leucogranite intruding the upper portion of the GHS and the lower and upper THS has been recognized in Western Nepal [11, 12]. U-Pb ages of monazite and zircon from the main granite and related dykes pinpoint a crystallization age at 23-24 Ma and constraint the youngest shearing event between the two tectonic units (GHS and THS) [12] casting doubts on the exhumation models widely adopted till now for the exhumation of the Himalayan belt.

Dykes from the upper portion of the granite intrude the very-low to low-grade metamorphic rocks of the upper THS. Country rocks are biotite-bearing quartzites, impure limestone, metarenites and metapelites. They are characterized by a metamorphic assemblage of calcite, quartz, muscovite, biotite ± chlorite and scapolite, indicating greenschist facies conditions. Sedimentary structures (i.e. layer parallel and cross bedding) and lumachelle layers are well-preserved. Contact metamorphism has been observed within a few meters from the granite contact and is highlighted by the static growth of muscovite, biotite ± amphibole and epidote, as well as the occurrence of spotted schists.

In the study area, the Tethyan Sedimentary Sequence is deformed by large scale kilometric to metric folds, with rounded hinges and steeply dipping axial planes. Fold axes trend East-West and are very shallowly dipping both towards the East and the West. Axial plane foliation ENE –WSW and dips from 70 to 90° both towards the South and the North. Mineral lineation E-W and dip few degrees both to the E and the W.

To investigate the depositional age of Tethyan Sedimentary rocks intruded by the granite, detrital zircons have been extracted by two samples and dated using a laser-ablation, inductively coupled, plasma mass spectrometry (LA–ICP-MS).

Zircons were separated using standard separation techniques and their internal structures were imaged with BSE and CL techniques. Zircon grains show mainly oscillatory zoning and in minor extent they are characterised by a weak zoning or a sector zoning. Cores with zoning patterns discordant with respect to the rims are common.

U-Pb concordant data span from 100 to 2400 Ma. CL features and radiometric results suggest a detrital origin of the zircon grains. Age spectra point out that the younger data, indicate a depositional age from upper Jurassic to lower Cretaceous.

To constrain the final stages of tectonic evolution of the study area (U–Th)/He thermochronology has been applied on zircons and apatites estracted from samples selected along a North-South profile across the leucogranite and surrounding rocks. Analyses have been performed at Geoscience Center (University of Gottingem, Germany). Preliminary data show that there is a strong correlation between age and elevation profile. Late stages of exhumation have been constrained between 3.8 and 6 Ma.

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