

Exhumation history of the Tethyan Himalaya based on apatite (U-Th-Sm)/He dates from the Takkhola graben and the Mustang granite (Nepal)

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The exhumation of the Himalayan arc has been studied intensively throughout the last decades. For the Tethyan Himalaya, however, the youngest exhumation history is still unclear, mostly because of the lack of a significant apatite content in most Tethyan sediments (Crouzet et al. 2007). For this study we are using apatite (U-Th-Sm)/He thermochronology for investigating exhumation and denudation of the Tethyan Himalaya back through time. Apatite (U-Th-Sm)/He thermochronology is sensitive to temperatures of ~40 to 85°C and thus to movements within the upper ~1.5 to 3 km of the earth's crust.

During a recent field campaign, we sampled the Mustang granite and the Takkhola-Graben. The former intrudes the Tethyan marine sediments, but far northwards than other Himalayan leucogranites; the latter is a magnificent graben, which can be seen as an unusual southern part of the normal faulting system affecting the whole Tibetan Plateau, where the faults have the same submeridional orientation (Colchen, 1999), while the timing of the activation of the faulting is still highly debated. The syntectonic filling of the Takkhola-Mustang graben consists of Mio-Pliocene fluvio-lacustrine deposits (Garzzone et al. 2003). These were described as containing significant amounts of apatite, derived from the past erosion of the Mustang granitic body (Adhikari and Wagerich, 2011). Being only up to 1km thick, a post depositional thermal resetting of the apatite (U-Th-Sm)/He system is unlikely, so that the (U-Th-Sm)/He dates of the sediments are expected to have retained their information regarding source area exhumation. We took several sand samples from the Kali Gandaki River draining the present-day exposure of the Mustang granite. Furthermore, we sampled different stratigraphic levels of the Mio-Pliocene sedimentary rocks, i.e., from the Tetang and Takkahola formation deposited between 11 and 7 Ma. One sample was taken at high altitude from a dyke of the Mustang granite, whereas, due to the remoteness of the area, it was not possible to access the main granitic body. This sampling approach will not only provide information about the youngest denudation history of the Mustang granite /Tethyan Himalaya, but will also reveal insights into its past denudation and changes of denudation rates through time for the region past the South Tibetan Detachment.

It is our expectation to link the results to the tectonic behavior of the South Tibetan Detachment or to the newly recognized Western Nepal Fault System. Corroborating our results with other ages and diverse methods will provide a robust constraint on the exhumation history of the Tethyan Himalaya, as well as insights on the U-Th/He dating technique.

References

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