Geophysical Research Abstracts,
Vol. 11, EGU2009-13102, 2009
EGU General Assembly 2009


# Long-term erosion and exhumation rates across different climatic zones in the Indian NW-Himalaya

A. Deeken (1), J.K. Hourigan (2), R.T. Thiede (3), E.R. Sobel (1), and M.R. Strecker (1)

(1) University of Potsdam, Potsdam, Germany (a-deeken@web.de), (2) University of California, Santa Cruz, USA, (3) ETH Zurich, Zurich, Switzerland

Concepts have been developed that explain the changeover from tectonically to erosionally controlled exhumation processes in the tectonic evolution of the Himalayan orogen. However, the degree to which climate-driven erosion controls the late Cenozoic development of the southern Himalayan front is still a matter of debate. The Himalaya forms an orographic barrier with strong gradients both perpendicular to and along strike of the orogen. Thus, quantifying whether or not precipitation, erosion, and deformation patterns are correlated over geologic time should provide important insights into the evolution of the orogen.

To constrain spatial and temporal variations in erosion and along strike variations in the timing and magnitude of deformation in the NW-Himalaya, we are establishing a dataset of multiple low-temperature thermochronometers. Together with published thermochronological data, our new mineral cooling ages will be integrated with 3D-thermo-kinematic models.

On a first sampling campaign, we collected 40 bedrock samples along an approximately 100 km long transect between the Kishtwar- and the Larji-Kulu-Rampur-Windows. The transect is oriented perpendicular to the Himalayan chain, and extends from the southern Himalayan front at Dharamsala, characterised by concentrated monsoonal precipitation, to the arid interior of the orogen.

We present ca. 30 new apatite fission track (AFT) and ca. 30 new zircon (U-Th)/He-ages (ZHe) from 3 vertical profiles, which span between ca. 2400 m and ca. 3600 m. In our preliminary results, both AFT- and ZHe-ages within each vertical profile are linearly correlated with sample elevation. The southern frontal range is characterized by both young AFT- and ZHe-ages (1-4 Ma and 6-14 Ma, respectively), indicating rapid cooling from the middle Miocene on, with cooling rates accelerating in the Pliocene/Quaternary. 100 km to the north (north of the Tandi Syncline) AFT-ages (7-9 Ma) are considerably older, whereas ZHe-ages range between 11 and 15 Ma, implying lower, but more constant cooling rates during the last 15 Ma compared to the frontal range. Surprisinlgy, in the central part of our transect (south of the Tandi Syncline) AFT- and ZHe-ages contrast strongly. Although AFT-ages (1-4 Ma) are as young as the southermost samples, ZHe-ages (12-19 Ma) are slightly older than the northernmost samples, suggesting that cooling rates in the middle profile have varied significantly over time.

Our young cooling ages at the frontal range are consistent with low-temperature thermochronological data from the High Himalayan Crystalline in other parts of the orogen. However, if our preliminary cooling patterns prooves to be robust, we expect interesting insights into the development of this part of the Himalaya using 3D-thermo-kinematic modelling.