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Structurally distinct domains in the Indian NW-Himalaya, constrained by AFT and ZHe thermochronology

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The Himalayan orogen is commonly divided into orogen-parallel, faultbound structural units that extend along the entire length of the orogen. However, significant along-strike variations of the Himalayan architecture occure, and topography, local relief and the distribution of precipitation vary from west to east. We apply apatite fission-track (AFT) and zircon (U-Th)/He (ZHe) thermochronometry to constrain spatial and temporal variations in exhumation, and along strike variations in the timing and magnitude of deformation in the Indian NW-Himalaya.
We present ca. 28 new AFT and 30 new ZHe cooling ages from the Chamba-Zanskar region that is situated between the Kishtwar and the Larji-Kulu-Rampur windows. The approximately 100 km long sampling transect across the High Himalaya is oriented perpendicular to the major structures of the Himalayan orogen. The transect extends from the southern Himalayan front, that is characterised by concentrated monsoonal precipitation, to the arid interior of the orogen. The bedrock samples were collected in the hanging wall of the MCT from 3 vertical profiles, which span between 2400 m and 3600 m.
Our new cooling ages constrain the exhumation history of the Chamba-Zanskar region spanning from the Miocene until present. ZHe and AFT cooling ages range between 6.4 and 18.1 Ma, and 1.7 and 9.3 Ma, respectively. Our new data reveal spatial-temporal variation in the exhumation between the frontal range and the more internal compartments of the High Himalaya. AFT ages, and to some degree ZHe ages at the southernmost frontal range are all young (<3.7 Ma and <9.2 Ma, respectively) despite the high vertical offset (2870 m) between the samples. At the internal ranges to the north, ZHe ages as well as AFT ages are older (9.4-18.1 Ma and 3.8-9.3 Ma, respectively), and sytematically increase with sample elevation. Our preliminary interpretation of these observations is that as a consequence of moderate exhumation rates at earlier times (Miocene) isotherms were sub-horizontal (forming an age/elevation relationship), whereas the frontal range has been affected by more deep-seated and rapid exhumation over the last couple of Ma causing more advected isotherms, which are running sub-parallel to the firstorder topography (no age/elevation relationship).
Our new data provide insight in lateral variations in exhumation along strike of the northwesternmost segment of the Himalaya in space and time. In contrast to most other regions of the NW Himalaya, the Chamba-Zanskar region is characterized by rapid exhumation along the southernmost frontal range in the hanging wall of the MCT-MBT, whereas to the northwest and to the southeast, at the tectonic Kishtwar and Larji-Kullu-Rampur windows, focused denudation is concentrated in a narrow belt $\sim$100 km north of the orogenic front.