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# Denudation of the Ladakh Himalayas revealed by low temperature thermochronometry

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Deciphering the effects and/or influence of climatic versus tectonic activity in the topographic evolution of mountain belts is often difficult due to the complex feedback mechanisms involved.

This study focuses on the Ladakh Batholith, in Ladakh, northern India and more specifically on the denudational history of the region as revealed through the application of low temperature thermochronmeters and simple topographic modelling.

The Ladakh Batholith of the north-west Himalayas forms part of the Transhimalayan batholith sequence and has been considered a buttress against which much of the Himalayas has been deformed. Although compositionally variable, the batholith is relatively undeformed and appears ideal for investigating exhumation linked to changing climate and tectonics at the margins of an evolving mountain system.

Recent investigations of the low temperature thermal history of the southern part of the Ladakh Batholith using apatite fission track (AFT) has, however, yielded an inverted age-elevation relationship. Samples from near the Indus valley are older than those obtained from profiles higher up the mountainsides. This is at odds with a normal ‘exhumation’ history where valley ages are younger than the peaks, as the valley samples have passed through the appropriate ‘closure’ temperature more recently than those exposed on the mountain peak.

AFT ages from a 1.3 km vertical section yield pooled ages that are all indistinguishable within uncertainty (c. 20 Ma). All samples have high mean track lengths of 14 to 14.4 microns indicating rapid transfer through the partial annealing zone.

Possible explanations include (i) rapid erosion of the peaks causing isotherm deflection followed by a steady decrease in surface relief in the recent past, and (ii) the presence of a major structure between the Indus valley and the peaks. Simple 2D models for both explanations yield inverted age-elevation profiles. The fault necessary for (ii) to hold has not previously been mapped and would imply that the Batholith has not been a bulwark. Data currently being collected using (U-Th)/He thermochronometry will be used to test the feasibility of these models.