

117-5 - Booth No. 219: CENOZOIC STRUCTURAL
FRAMEWORK AND CRUSTAL SHORTENING OF
THE TETHYAN HIMALAYA, HIMACHAL
PRADESH, NORTHWESTERN INDIA

 Monday, September 23, 2024
 8:00 AM - 5:30 PM
 Hall D (Anaheim Convention Center)

Booth No. 219

Abstract

The Tethyan Himalayan sequence (THS) is the structurally highest lithotectonic unit of Indian affinity within the Cenozoic Himalayan orogen. In the NW Himalaya of the Himachal Pradesh, India, the Neoproterozoic–Cretaceous THS is thought to have relatively modest deformation despite the unit commonly recording early collision-related shortening. This lack of significant deformation contrasts that of other Himachal lithotectonic units closer to the foreland. In addition, burial depths of the Himachal THS estimated from structural reconstructions (~10 km) and basal metamorphic pressures (7–8 kbar, ~28 km lithostatic burial) conflict. To address these issues, we performed geologic mapping, thermochronology, and restored new balanced cross sections along two transects across the Himachal THS to better constrain its deformation state and timing, stratigraphic thickness, and burial extent. Along the Spiti and Pin valleys, the THS is shortened by seven NE-dipping thrusts and one SW-dipping thrusts that mostly form fault-propagation folds. The Mata Nappe region (NE of Spiti Valley) has been reinterpreted as a thrust pop-up structure, consistent with structural observations. Along this transect, the estimated THS thickness measured from the basal Akpa granite and Haimanta Group to the uppermost-exposed Tandi Group is ~12.3 km. Restoration of one cross section along this transect yields a minimum shortening of ~30 km (~22% strain). Farther SE along Sutlej Valley, the THS is cut by three SW-dipping thrusts and several S-dipping normal faults. The estimated thickness of the exposed Akpa granite and Haimanta Group is ~8.5 km. Restoration of one cross section along this transect yields a minimum shortening of ~8 km (~21% strain). Thrusts mapped along both transects are interpreted to branch from a single decollement formed by the South Tibet detachment and Great Counter thrust. Our THS shortening estimates added to those for other Indian rocks in the Himachal Himalaya (Webb, 2013) yields a total minimum estimate of ~515–537 km. Preliminary zircon (U-Th)/He dates along Spiti and Pin valleys generally young towards the SW from ca. 42–5 Ma. These results confirm: (1) relatively minor shortening of the Himachal THS that was likely compensated by duplexing of other units; and (2) the discrepancy between THS burial estimates, which may be a product of non-lithostatic pressure.

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