Miocene-Present shortening in the Himalayan Foreland Belt

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The 2500 km-long Himalayan orogen is characterized by continuity of the principal lithotectonic units. However, there is evidence for different convergence rates between the western and eastern parts of the orogen. Present-day precipitation rates and Late Miocene erosion rates indicate an east to west gradient. This study aims to test whether these differences are reflected in the rates of tectonic activity and shortening along the range. To do so we have constructed balanced cross sections for 11 transects across the Siwalik Group.

The Siwalik Group comprises the deformed part of the Neogene foreland basin along the southern orogen margin. The group consists of synorogenic sediments, which date back to ~18.5 Ma and form the youngest and frontal parts of the Himalayan fold-and-thrust belt. Thrust faults in the Sub Himalaya are branches of a major décollement (the Main Himalayan Thrust), which spans the entire Himalaya thrust belt. Several south-verging thrusts define the deformation and shortening in the Siwalik Group: (1) the Main Boundary Thrust (the backstop), (2) the Main Dun Thrusts (duplexes), and (3) the Main Frontal (the toe).

In the last 11 myr, convergence rates of the Indian plate colliding with the Eurasian plate were constant, but varied laterally from ~34 mm/yr in the northwest to ~44 mm/yr in the northeast of India. The Shillong plateau, a basement pop-up structure in front of the eastern Himalaya, is the only active structure in the Himalayan foreland that could accommodate/partition 4–7 mm/yr of this convergence.

By having internally consistent cross sections, the shortening rates obtained will help determine if there are differences in shortening along the Himalaya. By using these internally consistent cross sections, factors that influence shortening may be examined, such as: sedimentation and/or erosion rates, partitioning of convergence, changes in overthrust vs. underthrust rates, and changes in basal friction.

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