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Modeling of the Himalayan Foreland Tectonics

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The foreland fold thrust belt of the Himalayan orogen has believed to evolve as a consequence of the collision tectonics and subsequent thrust sheet movement towards the foreland part of the evolving mountain chain. The main tectonic features in this part of the Himalayas comprise the boundary thrusts (e.g. MBT, HFT etc.) of regional dimensions that control the overall tectonic framework. The present paper is an attempt to understand the growth of the Himalayan wedge and its internal deformation which has resulted due to the crustal shortening. The sandbox analogue modeling has been proved to be the most expressive method to study these aspects in the orogenic areas.

A variety of experiments have been carried out in isotropic cohesion less materials (in the present case pure sand) to study the various aspects of the thrust wedges. Variation in the basal coefficient of friction by using different basal detachment materials (e.g. mylar sheet, acetate film and the sand paper) and their combinations has been studied to understand the growth of thrust wedges and the significant topographical changes on the surface of these wedges. It is observed in various experiments carried out for the current study that the coefficient of basal detachment plays a significant role in the overall development of the foreland fold thrust belts. The experiments also throw significant light on the evolution and expansion of the orogen and the causes of neotectonic and landslide activities along the specific areas. It is observed that the orogenic exhumation is due to intense erosion controlled by both natural tectonic as well as increased anthropogenic activities.

The internal deformation within these thrust wedges is chiefly achieved by the structural thickening by developing a variety of small to large-scale deformational structures. The present study reveals that the wedge taper angle, which is fixed for the deforming material (sand in this case) and the basal detachment (mylar sheet, acetate film and the sand paper) is to be maintained and in order to do so the naturally grown wedges continuously change the wedge slope and the wedge surface through time.