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Exposure of the Lesser Himalayan Duplex in Central Nepal

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In central Nepal, between the Main Central thrust and the Main Boundary thrust, only Lesser Himalayan rock is exposed in structurally complex relationships; whereas in other regions of Nepal, Lesser Himalayan rocks are buried under klippen of Greater Himalayan rock. Thus, central Nepal along the Modi Khola south through the Kali Gandaki River and the village of Tansen is one of the few locations along the Himalayan thrust belt where the entire Lesser Himalayan duplex is exposed. This location is critical to determining the kinematics of the thrust belt. The purpose of this study is to determine the structural architecture of central Nepal using the collected structural data, incorporating available age data, drawing and balancing cross sections and testing variations in shortening given different stratigraphic assumptions. The two balanced cross sections are constructed from the same topography but have different underlying assumptions and decisions made during the development. We tested whether major changes in the stratigraphy and simplifications regarding the evolution of the Lesser Himalayan duplex affected the amount of shortening.

Cross section 1 has a shortening estimate from the Main Central thrust to the Main Boundary thrust, including motion on the Main Central thrust, of 359 km or 77.8%. Cross section 2 has a shortening estimate of 371 km or 78.4% over the same region. These shortening estimates do not include meso-scale and micro-scale shortening in the Lesser and Greater Himalayan rocks nor do they include intra-Greater Himalayan faults. The percentage of shortening between the two cross sections is the same and the amount of shortening is not significantly different. These are striking outcomes given the different choices made when constructing the cross sections especially with regards to the stratigraphy. This suggests that the different choices made when drawing a cross section may be fairly unimportant for the estimate of shortening and percentage of shortening. In addition, in these particular cross sections, the Ramgarh/Munsiari thrust is not exposed in the footwall of the Main Central thrust. Because this thrust is regionally present in the footwall of the Main Central thrust at least from Himachal, India to east Bhutan, it seems likely that this thrust must also be present in central Nepal. The Ramgarh/Munsiari thrust is also present in the valley to the west, the Kaligandki valley and the east, the Marsyandi valley. Thus, the Ramgarh/Munsiari thrust must have been faulted out at the surface or the trailing branch line of the fault has been eroded. Without knowing the regional importance and the presence of the Ramgarh/Munsiari thrust sheet, the amount of shortening would be underestimated. The thrust in the proximal footwall of the Main Central thrust is the next thrust below the Ramgarh/Munsiari thrust called the Trishuli thrust, which carries the entire Lesser Himalayan sequence.