

Imaging the Indian Continent beneath Tibet: High resolution regional scale velocity model

Siddharth Dey (IPhD), Monumoy Ghosh (CSIR-SRF) and Supriyo Mitra published high resolution regional scale vertically polarised shear-wave velocity model (Sv-IK2024) of India-Himalaya-Tibet to demonstrate the variability in underthrusting of India beneath Tibet (see figure below). This variation influences the long-term evolution of continental mountains and short-term earthquake hazards.

Related Article: S. Dey, M. Ghosh, S. Mitra (2024) 3D shear wave velocity structure of the crust and upper mantle beneath India, Himalaya and Tibet. *Journal of Geophysical Research: Solid Earth*, 129, e2023JB028292. <https://doi.org/10.1029/2023JB028292>

Plain Language Summary:

We perform 1D path-average surface-wave dispersion measurements for 14,706 regional ray-paths (periods between 10s and 120s), and combine these into 2D variation maps, followed by modeling to obtain 3D shear-wave velocity structure beneath India, Himalaya and Tibet. The 2D maps have a 3-5° lateral resolution and the 3D structure has 5%-7% average-velocity uncertainty. The Indian Cratons have high average-crustal-velocity and crustal thickness of 40–50 km, and are underlain by high-velocity upper mantle. The intervening rift-basins are filled with lower-velocity sedimentary rocks. The sedimentary layer thickness in the Himalayan Foreland Basin varies along-arc and is thickest (8-10 km) beneath the Eastern Ganga Basin. The high-velocity (cold, rigid) Indian plate underthrust entire Western Tibet and up to the Qiangtang Terrane in Central-Eastern Tibet (refer to figure below). A mid-crustal low-velocity-layer is present beneath Tibet, which is weak and decouples the deformation of the shallow and deep layers. The upper-mantle beneath Deccan and Raj Mahal Traps has low-velocity overlying a high-velocity layer suggesting plume-volcanism related thermal anomaly. From the velocity-structure and geometry we speculate about the origin of the intra-cratonic Tarim and Eastern Tajik Basins.

