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3-D Shear Velocity Image of Crust and Uppermost Mantle Beneath the India-Tibet and the Adjoining Indian Ocean from Ambient Noise

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We present the shear velocity image of the crust and uppermost mantle of India-Tibet and the adjoining Indian Ocean region using primarily ambient noise and very limited earthquake data sets. The velocity image is created from 21615 ray paths at periods from 10 to 70 s with a horizontal resolution of better than 1 degree by 1 degree. These images have substantially higher lateral resolution for the region than currently available. The shear velocity-depth image is created into two parts: firstly generation of group velocity maps at respective periods and then inverting them at respective nodes in terms of depth variation of velocity. Maximum depth of information is $\sim$140 km. At shorter periods group velocities are well correlated with sediment thickness while in the mid and higher periods they are distinct in geological domains like the Indian Shield, Himalayan foreland basin, and the ocean. We present velocity–depth sections along several profiles to map the lateral seismic response to 3-D geological variability. Reliability of our results is established by comparing our results with collocated velocity-depth results in different geological domains on the continent and the ocean. We compare and contrast the velocity images within different geological terrains of India and also with the adjoining Himalaya-Tibet terrains as well the Bay of Bengal and the Arabian Sea. The Moho imaged from the earlier receiver function and refraction studies correlate well with the depth at which shear velocity is $\sim$ 4.2 km/s as derived from the present study. We observe low shear wave velocity between 2.9 to 3.5 in the depth of 20-40 km beneath the Tibet can be explained by the presence of partial melt. We also observe significant Moho depth as well velocity variation from east to west Tibet correlating well the geodynamic framework and recent observations. In the Indian Ocean, we observe significant lateral variability in the deeper structure.