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Upper mantle structure of Kumaon-Garhwal Himalaya using body wave finite-frequency tomography

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We perform a finite frequency tomographic inversion to image the upper mantle structure of Kumaon-Garhwal Himalaya using teleseismic body-waveform data recorded by the 50 broadband seismic stations in the region during April 2005 and June 2008. Relative travel time residual of direct P-wave is measured in both the high (0.2-2.0 Hz) and low (0.125-0.3 Hz) frequency band for ∼1000 earthquakes. A range of resolution tests are used to find the optimal damping values and it shows that the maximum vertical resolution is achieved in the depth range of 100-300 km. Our finite-frequency, multiscale images shows the lateral variation of velocities from lower to higher Himalaya. Although, we did not notice frequency-dependent as well as azimuthally dependent travel-times beneath the region. But we observe a distinct travel time residual in the two Himalayan belts: the positive residual (∼0.80 s) in the higher Himalaya suggesting low velocity anomalies, whereas the outer Himalaya is characterized by negative residual (∼0.50 s) leads to high velocities anomalies. Otherwise, the average travel time residual varies mostly in the range of between + 0.25 s and - 2.5 s in the reaming part of the region. Our results demonstrate low velocity bodies which extend down to about 100 km depth starting from higher Himalaya and its continues same signature up-to Tibet. Higher Himalaya sequence of Garhwal Himalaya is characterized by high attenuation reported in the previous studies and lower velocity found from the present study. The high attenuation and low velocity could be the indicator of low viscosity and partial melt and hence we suggest that lower crustal flow might be present beneath Garhwal Himalaya like Tibetan scenario.