

Subducting continental lower crust and crustal thickness variations in the intermediate seismic zone of Pamir-Hindu Kush from Moho underside reflection pmP

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The Pamir - Hindu Kush region is an orogenic belt presenting two continental converging subduction zones where the Indian and Asian plates collide. Understanding of the regional tectonic history, however, has been hampered due to limited seismological investigations. In this study, we use the Moho underside reflection pmP phases to constrain the crustal thickness variations in the intermediate seismic zone (36-37°N, 69-72°E). The events characterized by focal depth deeper than 100 km and magnitude greater than 5.8 (Mw) are selected. The crustal thickness is determined by identifying depth phase pP along with the Moho underside reflection pmP. The measured thickness in this study varies spatially from 58.1 to 76.2 km, with some uncertainty most likely resulting from the estimation of the average velocity of P-wave (~6.21 km/s) in the crust. The strong Moho variation implies a large structural deformation of the crust, reflecting a complex collision-related mountain building history. We also detect two strong reflections from deep interfaces down to ~97 km below the southernmost Pamir. According to our direct observations and waveform modeling, we further explain the two reflections are perhaps a result of underplating of the subducted Asian lower crust below this region. Our observations here will be complementary to other seismic results such as receiver functions.

Keywords: Moho, Intermediate earthquake, Pamir-Hindu Kush, Lower crust, Crustal thickness

