



Seismological Evidence of mafic underplating beneath Central India

Kuntal Chaudhuri, Kajaljyoti Borah, and Ayush Goyal

Indian Institute of Science Education and Research Kolkata, Department of Earth Sciences, Kalyani, India
(kuntal11012@gmail.com)

Crustal shear velocity structure across the Narmada Son Lineament (NSL), a major tectonic feature through Central India, and the adjoining regions have been investigated by the joint inversion of receiver function and Rayleigh wave group velocity data at 17 locations in the study region. The results show significant variations of crustal thickness and average crust shear wave velocity (avg. V_s) in the region, viz. 38-42 km thick crust with avg. $V_s \sim 3.7$ km/s under Deccan Volcanic Province (DVP); 38-42 km thick crust with lower avg. $V_s \sim 3.5$ km/s in the Vindyan Basin; 44 km thick crust with avg. $V_s \sim 3.7$ km/s beneath Bundelkhand craton. Thicker crust (~ 56 km) with avg. $V_s \sim 3.8$ km/s is observed beneath Narmada South Fault (NSF), north of DVP. Observed ~ 4 km thick layer with average $V_s \sim 2.7-2.9$ km/s corresponds to Vindhayan sediment. Presence of High velocity layer ($V_s > 4.1$ km/s) at lower crust beneath most part of the study region suggest the existence of a mafic underplated layer at the base of the crust. The mafic underplated layer is characterized by a high V_s and V_p/V_s ratio, suggesting a mafic rock type at the base of the crust which might have been emplaced at some volcanic episodes in the past. The region also shows no major topographic expression suggesting that it is isostatically compensated by high density, high velocity rocks in the lowermost part of the crust. Upper mantle shear velocity beneath the study region varies between 4.4-4.5 km/s. Majority of the earthquakes in the central part of India occur at the lower crust having a depth of greater than 30 km, suggesting a zone of weakness at the lower crust especially in the southern part of the NSL (NSF).