17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 57

Three Dimensional Crustal Velocity Structure of Tehri, Garhwal Himalaya

Rajni Modi[1], S. Mukhopadhyay[2], M L Sharma[3]

[1]Seismology Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400 085, INDIA
[2]Dept. of Earthquake Engineering, IIT Roorkee, Uttarakhand, INDIA

Abstract

We estimated a three-dimensional (3D) structure of crustal velocity of Tehri, Garhwal Himalaya using seismic data of local earthquake events collected from January 2008 to December 2015 by a seismological network of 12 re-mote stations. The network is spread over an area of nearly 100 km × 80 km around Tehri dam. The study area between 29°50´N to 31°50´N latitude and 77°50´E to 80°E longitude, falls in the Garhwal Himalayan region of the central seismic gap between Main Central Thrust (MCT) and Main boundary Thrust (MBT). Inversions were performed simultaneously for P- and S-wave velocity anomalies and source coordinates. Dataset for tomographic inversions consists of 3543 local earthquake events with 29451 P- and 28692 S-wave picks. Results of inversion include P- and S-wave velocity anomalies and revised locations of earthquake sources. Tomograms of P- and S-wave velocity anomalies point to strong lateral heterogeneities in the region of investigation. Several zones of low velocity are depicted in the Lesser Himalayan region of the study area which indicates the presence of fluid filled structures in the region. Our velocity model shows that the Uttarkashi earthquake of 1991 is located at the transition zone of a high and a low velocity anomaly. Tomographic inversions could well resolve the investigated area up to a depth of 20 km.

Keywords: Tomography, Local earthquake data, Three-dimensional velocity model, Crustal velocity structure, Travel time inversion, Garhwal Himalaya