INVESTIGATION OF AZIMUTHAL VARIATION IN SURFACE WAVE GROUP VELOCITIES AND ASSESSMENT OF ANISOTROPY IN THE WESTERN PART OF HIMALAYA-TIBET COLLISION ZONE

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The broadband data recorded at regional distances on stations located in the southern part of the Himalayan region is utilized to assess the azimuthal variation in surface wave group velocities. We used 52 earthquakes of magnitude range 5.0 to 7.2 recorded during the period 2006 – 2010. These earthquakes are located in the northern, western and eastern part of the NW Himalaya and further north in the Tibetan plateau. The data is divided into different clusters/groups making the ray path of each cluster sampling different structural elements. These clusters are well separated from each other and located at different azimuths from recording stations in the western Himalayan syntaxis zone and surrounding parts of Himalaya and Tibet. The paths between clusters and recording station cover different zones with different orientations respective to the strikes of major structural elements of the Himalaya. These paths are perpendicular as well as parallel to the tectonic discontinuities and some paths also cover the western part of Indo-Gangetic plain. Most of the ray paths sample the Himalayan region, and partly the south Tibetan detachment zone and the Indo-Tsangpo suture zone, as well as the Karakoram fault zone and Tibetan plateau regions.

For each cluster, the dispersion curves of both Rayleigh and love waves are obtained from each earthquake event and then average trend is calculated for one cluster of events. Weighted averaging of computed dispersion curve for a group of events of a single cluster is obtained based on the fitting of higher order polynomial and also the standard deviation is computed. For both Rayleigh and Love waves, the observations are performed for periods in the range 4-80 sec, and most of the data are within the period range 10 to 50 sec. The variation of fundamental group velocity for the events of single cluster is small however a higher variation is exhibited among different paths. There is high variation at intermediate period ranges for different paths. This variation is for both waves although higher variation is found in case of Rayleigh waves. The paths passing through the Indo-Gangetic plains indicates very low velocities for both Rayleigh and Love waves for periods less than 15 sec. It is observed that the waves passing perpendicular to the major structural elements have high variation in velocities in the period range 10 to 30 sec and specifically due to the low velocities of Rayleigh waves. These differences are measured to assess the anisotropic behaviour of the medium for different periods. Also the group velocities are inverted to obtain the structure properties mainly for the crustal part. The variation of group velocities and inverted shear wave velocities in different depth sections are weighted to account for the effects of anisotropy, tectonics and partially fluid saturated zones.

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