Lithospheric Anisotropy of the Indian Continent

V. Pavan Kumar and K . S . Prakasam

National Geophysical Research Institute(CSIR),Uppal Road ,Hyderabad
Email: pa1kumarv@gmail.com
HP : +919703049050

We investigate the lithospheric structure and potential mechanical coupling between the crust and upper mantle along the Himalayan arc and underneath peninsular India using shear wave splitting measurements on core-refracted phases(like SKS,SKKS,PKS,PKKS). For each event recorded at a given seismological station we measured the orientation of the polarization plane of the fast S wave (phi), assumed to be a proxy for the orientation of the a axis of olivine, and the delay (*dt*) between the arrival time of the fast and slow S waves.

We accomplished shear wave splitting measurements by analyzing a comprehensive data set recorded at 81 Digital broad band stations deployed across NW Himalaya, Uttaranchal Himalaya, National Capital region, Ganga basin and southern India. A total number of 572 (SKS+SKKS+PKS) earthquakes with magnitude >= 5.5 in the epicentral distance range of 850 to 1350 were processed for this study.

At the scale of the Indian plate, the majority of the stations show a ~**NNE–SSW** orientation of phi over hundreds of kilometres, from southern tip to the northern part of the Dharwar craton, Delhi Aravali fold belt and Ganga basin This direction closely parallels the trend of the Indian plate motion, with respect to a fixed Eurasian plate, as defined through the NUVEL1A plate model. Along the Himalayan arc, from Ladakh in the northwest, to the Shillong plateau in the east, the orientation of phi rotates to become **~EW,** perpendicular to the plate motion as defined through NUVEL1A.

From these results, we infer the dominance, beneath the Indian lithosphere, of the asthenospheric flow in aligning minerals in the sheared lithosphere–asthenosphere boundary layer, masking any compression induced anisotropy expected to be normal to this direction. Closer to the collision front in northern India, the anisotropy may in part, be due to the foliation planes of the Himalayan fold and thrust belt aligning the a axis of olivine perpendicular to the compression axis, but more likely to the turning of the relative asthenospheric flow along the strike caused by the downthrusting Indian lithosphere acting as a barrier.

The continent-wide consistency of results strengthens the understanding that the Indian lithosphere has distinct anisotropic signatures, contrary to the hitherto assumed isotropy and allows one to interpret the results in a coherent framework of Indo-Eurasian convergence.