Proceedings of the IGCP-440 and LEGENDS International Symposium and Field Workshop on "The Role of Sri Lanka in Rodinia and Gondwana Assembly and Break-up", March-April 2003, Centenary Publication, Geological Survey & Mines Bureau, Sri Lanka, (K.V.W. Kehelpannala, Ed.) pp. 44

Seismic Imaging the Crust and Mantle Discontinuity Structure Beneath the South India

S.S. Rai
N.G.R.I., Uppal Road, Hyderabad-500007, India
E-mail: ssrai_ngri@rediffmail.com

We investigate the nature of seismic strain markers in the crust and mantle beneath South India, analysing the waveforms from teleseismic events recorded over a 32 station broadband temporary network operated during 1999 - 2002. The network encompasses largely Archaean and Proterozoic terrains of South India. Receiver function analysis of teleseismic waveforms suggests significant difference in the crustal structure. The eastern Dharwar Craton, Deccan Volcanic Province and Cuddapah basin show very similar crustal thickness 33-39 km. The western Dharwar Craton (WDC), however, has thicker crust (42-51 km). The crustal thickening in WDC occurs in step fashion, Moho offsets coinciding with surface expression of N-S elongated shear zones. The thickest crust (~ 60 km) is observed beneath the Nilgiri Hills. Elsewhere, in the Southern Granulite Terrain (SGT), crust is 40-53 km thick. Considering 20-30 km crustal exhumation in the southern part of WDC and SGT, we speculate possibly 70-90 km thick crust across WDC-SGT during Archaean. This suggests of a Himalayan-type geodynamic framework for the evolution of granulite terrain. We apply a three-dimensional stacking method to the receiver function to determine the location of mantle discontinuities using the IASPI91 velocity model as the reference. The 410 km and 660 km discontinuities are well defined at their respective depths except the depression in 660 km discontinuity by about 30 km in the Proterozoic Granulite terrain. The other transition zone discontinuity at 520 km is also observed at a few places. The images also reveal the presence of 8 degree and 220 km discontinuity in South India. These seismological observations along with other geophysical measurements serve as a focal point to model the Precambrian geodynamic framework for south India.