Abstract

In present study the estimation of effective elastic thickness (Te) is carried out by using gravity-topography coherence and seismic anisotropy which provides unique constraints on the rheology and deformation of the Indian Shield. It is based on independent observations of mechanical and seismic anisotropy. The resolution of Te map is much higher in case of spatial domain hence adopted here. The Te in the southwestern Indian Ocean is estimated by using gravity forward and inverse modeling, and flexure modeling - Te inversion. The estimated Te shows low values (1-6 km) along the Chagos-Laccadives Ridge (CLR) implying its proximity to a spreading ridge at the time of creation. The Te values along the Mascarene Plateau (MP) shows a spatial variation with seafloor age from north (Te~4 km) to south (Te~20 km). These findings substantiate the earlier results and suggest that the reunion was created due to intra-plate volcanism. Elastic thickness (Te) structure of Indian shield is obtained by using isotropic fan wavelet method. The Te structure of the whole Indian shield is estimated by using an improved isotropic fan wavelet land ocean deconvolution methodology and the results are compared with global published Te estimates in Archean, Proterozoic and younger geological provinces. It reveals low (0-45 km), intermediate (45-70 km) and high (70-100 km) values of Te respectively in both Archean and Quaternary, Proterozoic and Tertiary provinces of the Indian shield. The anisotropy in the flexural response of the Indian Shield is also estimated by using 2D isostatic coherence response function between Bouguer gravity and topography as a function of azimuth by way of multispectrogram analysis. Coherence anisotropy pertaining to the mechanically weak directions is mostly oriented along N45°E. It can thus be seen that the coherence anisotropy direction is in very good agreement with the absolute plate motion (APM), which suggests that the strain fields accumulating in the Indian Shield over the years have been due to the last major tectonic episode. Hence, it can be inferred that the lithosphere in the Indian Shield is mechanically anisotropic.

Keywords: *Effective Elastic Thickness, Chagos-Laccadives Ridge (CLR), Indian Ocean, Mascarene Plateau (MP), Indian Shield.*