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# Seismic imaging of South India from high resolution Rayleigh wave group velocity tomography

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We present a comprehensive study of Rayleigh wave group velocity tomography in South India. South India is a stable continent comprising of Precambrian terrains such as the eastern Dharwar craton (EDC), the western Dharwar craton (WDC), the southern Granulite terrain (SGT), and the Cuddapah basin. The data used for analysis were recorded at 51 broadband stations operated during 2009-2012 across this region. Based on the analysis a total of 781 unique earthquake events with shallow to moderate depths were chosen. The epicentral distance was from $5^o$-$30^o$ and magnitude $M_s$ >= 4.5. This attributed to a total of 4873 source-station raypaths for which the dispersion curves were calculated to obtain Rayleigh-wave group velocity maps for time periods from 10-200 secs. Due to the high ray coverage over the southern terrain, we obtained a high resolution of $0.5^o$-$1^o$ across all time periods. The tomographic velocity maps show a thinner crust (∼35 Km) in the late Archean (∼2.7 Ga) EDC and relatively higher (∼40-50 Km) in adjoining terrains (mid-Archean and Proterozoic). The mid-Archean (∼3.36 Ga) WDC has a thicker crust (∼50 Km). Furthermore, the local group velocity dispersion curve obtained for each grid cell from 10-200 seconds were inverted for shear wave velocity models. The shear wave velocity models gave a quantitative image of the crust as well as the lithospheric root. The mid-Archean WDC has a thicker lithosphere with lithosphere-asthenosphere(LAB) around an average of 160-180 Km. The southern root of the lithosphere of WDC continued till northern province of SGT which showed higher LAB compared to the thickness in the rest of SGT (∼140 Km). The LAB in late Archean EDC along with the Cuddapah province was found to be flat and thinner (∼140-160 Km) compared to WDC. The coastal areas showed a thin LAB (∼110-130 Km) except in the WDC boundary. The southernmost tip showed a very thin LAB (100-110 Km). This observation suggests that the average crustal and lithospheric thickness of WDC is more compared to the EDC. This can infer that the WDC after it's cratonization has remained mostly inert, while EDC might have undergone tectonothermal changes in the Proterozoic.