Geophysical Research Abstracts
Vol. 21, EGU2019-335-1, 2019
EGU General Assembly 2019

Imaging the Lithospheric Structure in the Precambrian cratons of Gondwanaland

Pousali Mukherjee and Kajaljyoti Borah
Indian Institute of Science Education and Research Kolkata, Department of Earth Sciences, India (pousalidata@gmail.com)

Investigating the lithospheric character of Precambrian cratons is essential to understand their formation and evolution. The Gondwana was an accretion of several cratons, viz., South America, South Africa, Antarctica, Australia, Madagascar and the Indian subcontinent along with Sri Lanka. The break up of Gondwanaland during the Mesozoic, led to the gradual rifting of these different cratons over geologic time. In this study, we are numerically modelling and imaging the lithosphere to understand the differences in the nature of the crust and upper mantle of the Precambrian Gondwanaland. To image the Precambrian cratons, body wave tomography and P-wave receiver function have been used. The data consists of teleseismic earthquakes with epicentral distances lying between 30 degrees and 95 degrees and having magnitude more than 5.5. We observe three dimensional variations in P wave velocity anomalies in the Lithosphere and upper mantle, which has helped us to understand and differentiate the faster lithosphere from the slower lithosphere. Seismically fast but neutrally buoyant upper mantle anomalies reflect a permanent high buoyancy of the lithosphere, which could result from plume triggered delamination of deep lithospheric roots. The Receiver function technique has helped to constrain the depth of the Moho, the composition of the lower crust and detailed velocity modelling has been done using Neighbourhood Algorithm method. The new results reveal that the geometry of the Moho is not uniform across the various Precambrian cratons and significant differences occur within the Archean and Proterozoic, including presence of a high velocity layer (> 7 km/sec) at the base of the lower crust in some cases. The Moho Depth is varying from 25 km to as thick as more than 50 km. We suggest that the the buoyancy of the upper lithosphere and episodic destruction of the deep lithosphere plays a significant role in craton stabilization over time. Delamination during early Cretacious and Late Cenozoic played a significant role in changing the composition of the lithosphere. Evidence for the presence of mid lithospheric discontinuity in the mantle was also observed in the modelling and imaging of the Precambrian cratons, which could be attributed to change in radial anisotropy,low velocity minerals. The relation between crustal thickness, Moho, elevation and density is also compared for the different Precambrian cratons. By looking at the variations in the different geophysical paramaters, the formation and evolution of the Precambrian cratons of Gondwanaland and how these cratons respond to various geodynamic processes can be answered.