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6th International Conference of Multidisciplinary Approaches (iCMA), 2019
Faculty of Graduate Studies,
University of Sri Jayewardenepura,
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ISSN: 2386 – 1509

CRUSTAL STRUCTURE OF MANNAR SUB BASIN - SRI LANKA USING 2D GRAVITY MODELLING

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Abstract

The boundary between lower crust and upper mantle which is known as Mohorovićič discontinuity marks one of the most distinct manifests in differentiated Earth as major changes in seismic wave velocity, density, and rheology across it. Sri Lanka occupies a unique position in Gondwana break-up and Mannar basin offshore, which is located between approximately 78^0 E to 81^0 E longitudes and 7^0 N to 9^0 N latitudes. A prominent north-east south-west gravity anomaly can be observed in the region of Mannar Sub Basin. In order to study the Mohorovičić discontinuity of this region, the 2D forward gravity modelling method is used. Interpreting 2D Seismic survey details of SL-01 and SL-05 can identify high intense layer sandwiched between sedimentary columns. Furthermore, studying the Barracuda well log, this layer can be recognized as a volcanic layer and densities vary from 2.6-2.8 kg m^{-3}. The effect of the volcanic layer can be observed as a positive gravity anomaly in the observed anomaly and playing a major role in identifying the mantle intrusion to the lower crust. Interpreted seismic Two-way Travel Time (TWT) data were converted to depth domain by stack velocities which primarily used to create seismic images. The density contrast between the upper mantle and lower crust set to be 0.5 kgm^{-3}. The crustal thickness and the Moho in the middle of the basin identified to be 5-6 km and 15-17 km, respectively. The main conclusion arrived from the results of this study is that Mannar Basin is a failed-rift basin formed before or during Gondwana Breakup. The mechanism behind its formation is crustal thinning associated with continental rifting and results of the study also indicate the upwelling of the mantle into the crust which has not developed until the formation of an oceanic crust to initiate a spreading centre.

Keywords: mohorovićič discontinuity, gravity modelling, failed-rift basin, density contrast, seismic velocity