REGIONAL CRUSTAL MODEL OF MANNAR BASIN USING SEISMIC AND GRAVITY INTERPRETATION

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Abstract

Continental crust thinning and oceanic crust generation processes play a major role in the classification of sedimentary basins. The current study presents a regional crustal model for the Mannar basin offshore Sri Lanka based on seismic reflection details incorporate with forward and inverse modelling of satellite-derived observed gravity data. To determine the density contrast between subsurface layers interpreted in 2D seismic images, high-resolution density logs of Dorado and Barracuda exploratory wells were accessed and averaged. The density of water column, sedimentary layer and the volcanic layer which was sandwiched between sedimentary columns were assigned as $1.03 gcm^{-3}$, $2.5 gcm^{-3}$, and $2.9 gcm^{-3}$ correspondingly. To create correlated subsequence depth models, density values for crust and mantle were assigned as $2.67 gcm^{-3}$ and $3.4 gcm^{-3}$. Interpreted 4 major horizons were converted to depth domain using existing velocity details along the seismic surveys conducted in the region of interest. This model contains the details of 32 2-dimensional subsurface models along the average 220km length extended seismic lines, which were accessed from Petroleum Resources Development Secretariat (PRDS) data repository. Crustal thickness details from derived models were interpolated using universal kriging algorithm integrated with IHS Kingdom software. The derived regional crust model contains the details of thinned continental crust from 1 km to 34 km considering both landmasses situated both sides of the offshore basin. While global crust 5.1 model assigned 10 km to 30km of crustal thickness for the study area, explained that resolution plays a major role in determining the accuracy of regional results. Based on the subsurface models and the contour map of thinned crust further verified the Mannar basin as a failed-rift basin, which passively thinned the continental crust without creating oceanic crust by a relevant spreading centre. Derived crust model can be used as a base model to furthering future geophysical and geological research interest in the Mannar basin.

Keywords: Crustal thinning, Gravity modelling, Mannar basin, Seismic interpretation