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Application of 3D variation-density interface inversion of gravity anomalies in South China Sea

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The South China Sea (SCS) is a marginal basin with extremely complicated crustal structure and whose evolutional history is associated with continental rifting and seafloor spreading. The gravity data are among the most important data sets for studying deep crustal structures and the tectonic evolution. Density interface inversion by gravity anomalies can effectively estimate the depth of Moho interface. However, the Moho interface inversion in SCS are facing challenges due to the density contract of crust-mantle vary in three dimensions, which are associated with the complicated crustal structure (co-existing oceanic crust, continental crust and transitional crust). The regular inversion methods always assume the density contract on both sides of the interface would be constant, which is quite unrealistic since actual strata densities vary both vertically and laterally. To meet the challenges of 3D variation of density in SCS, we present an improved 3D variation-density interface inversion of gravity anomalies based on Parker–Oldenburg method. We first construct two variation density models with exponential density–depth relationships, which expressed the variation of stratum density depending on the depth in oceanic and continental crust respectively. Meanwhile, to minimize multiple solutions for potential field inversion, we collect deep seismic sounding data and employ the gravity inversion by joint using seismic data to be constraint for depth of Moho. Finally, we have estimated the depth of Moho interface which infers the tectonic significance in SCS. The inversion results agree well with seismic data in SCS show this approach is more effective and precise to quantitative estimate the depth of interface.
Keywords: South China Sea; Gravity anomalies; Density interface inversion;