



Determining OCT structure and COB Location of the Omani Gulf of Aden Continental Margin from Gravity Inversion, Residual Depth Anomaly and Subsidence Analysis.

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Knowledge and understanding of the ocean-continent transition (OCT) structure and continent-ocean boundary (COB) location, the distribution of thinned continental crust and lithosphere, its distal extent and the start of unequivocal oceanic crust are of critical importance in evaluating rifted continental margin formation and evolution. In order to determine the OCT structure and COB location for the eastern Gulf of Aden, along the Oman margin, we use a combination of gravity inversion, subsidence analysis and residual depth anomaly (RDA) analysis. Gravity inversion has been used to determine Moho depth, crustal basement thickness and continental lithosphere thinning; subsidence analysis has been used to determine the distribution of continental lithosphere thinning; and RDAs have been used to investigate the OCT bathymetric anomalies with respect to expected oceanic bathymetries at rifted margins.

The gravity inversion method, which is carried out in the 3D spectral domain, incorporates a lithosphere thermal gravity anomaly and includes a correction for volcanic addition due to decompression melting. Reference Moho depths used in the gravity inversion have been calibrated against seismic refraction Moho depths. RDAs have been calculated by comparing observed and age predicted oceanic bathymetries, using the thermal plate model predictions from Crosby and McKenzie (2009). RDAs have been computed along profiles and have been corrected for sediment loading using flexural back-stripping and decompaction. In addition, gravity inversion crustal basement thicknesses together with Airy isostasy have been used to predict a synthetic RDA. The RDA results show a change in RDA signature and may be used to estimate the distal extent of thinned continental crust and where oceanic crust begins. Continental lithosphere thinning has been determined using flexural back-stripping and subsidence analysis assuming the classical rift model of McKenzie (1978) with a correction for volcanic addition due to decompression melting based on White & McKenzie (1989).

Gravity inversion and the “synthetic” gravity derived RDA both show generally normal thickness oceanic crust, with some localised thin oceanic crust. Continental lithosphere thinning factors determined from gravity inversion and subsidence analysis are in good agreement and have been used to constrain COB location along the profile lines. These techniques show that the OCT in the eastern Gulf of Aden, is relatively narrow, with the distance between the COB and the margin hinge measuring less than 100km.