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# Anomalous Subsidence at the Ocean Continent Transition of the Gulf of Aden Rifted Continental Margin

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It has been proposed that some rifted continental margins have anomalous subsidence and that at break-up they were elevated at shallower bathymetries than the isostatic response predicted by classical rift models (McKenzie, 1978). The existence of anomalous syn- or early-post break-up subsidence of this form would have important implications for our understanding of the geodynamics of continental break-up and sea-floor spreading initiation.

We have investigated subsidence of the young rifted continental margin of the eastern Gulf of Aden, focussing on the western Oman margin (break-up age 17.6 Ma). Lucazeau et al. (2008) have found that the observed bathymetry here is approximately 1 km shallower than the predicted bathymetry. In order to examine the proposition of an anomalous early post break-up subsidence history of the Omani Gulf of Aden rifted continental margin, we have determined the subsidence of the oldest oceanic crust adjacent to the continent-ocean boundary (COB) using residual depth anomaly (RDA) analysis corrected for sediment loading and oceanic crustal thickness variation.

RDAs corrected for sediment loading using flexural backstripping and decompaction have been calculated by comparing observed and age predicted oceanic bathymetries in order to identify anomalous subsidence of the Gulf of Aden rifted continental margin. Age predicted bathymetric anomalies have been calculated using the thermal plate model predictions of Crosby and McKenzie (2009). Non-zero RDAs at the Omani Gulf of Aden rifted continental margin can be the result of non standard oceanic crustal thickness or the effect of mantle dynamic topography or a non-classical rift and break-up model.

Oceanic crustal basement thicknesses from gravity inversion together with Airy isostasy have been used to predict a "synthetic" gravity RDA, in order to determine the RDA contribution from non-standard oceanic crustal thickness. Gravity inversion, used to determine crustal basement thickness, incorporates a lithosphere thermal gravity anomaly correction and uses sediment thicknesses from 2D seismic data. Reference Moho depths used in the gravity inversion have been calibrated against seismic refraction Moho depths.

The difference between the sediment corrected RDA and the "synthetic" gravity derived RDA gives the component of the RDA which is not due to variations in oceanic crustal thickness. This RDA corrected for sediment loading and crustal thickness variation has a magnitude between +600m and +1000m (corresponding to anomalous uplift) and is comparable to that reported (+1km) by Lucazeau et al. (2008). We are unable to distinguish whether this anomalous uplift is due to mantle dynamic topography or anomalous subsidence with respect to classical rift model predictions.