Crustal Thickness and OCT Location for the Central and Equatorial Atlantic Rifted Margins Derived from Gravity Inversion

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Satellite gravity anomaly inversion, incorporating a lithosphere thermal gravity anomaly correction, has been used to map Moho depth, crustal thickness and continental lithosphere thinning factor for the Central and Equatorial Atlantic and its continental margins. Continental lithosphere thinning factors and crustal thickness from gravity inversion provide independent estimates of ocean-continent transition (OCT) location, predictions of margin asymmetry and failed breakup basins. Superposition of illuminated satellite gravity data onto crustal thickness maps from gravity inversion provides improved determination of pre-breakup conjugacy and breakup trajectory of the North and South American and West African margins. For the Equatorial Atlantic, crustal thickness mapping from gravity inversion clearly shows the partitioning of margins into rift and transform segments and their conjugate margin relationship. In the south-east Central Atlantic composite maps of crustal thickness and illuminated free-air gravity show significant re-tectonization of Jurassic ocean crust by oceanic transform re-organization in the Cretaceous. The south-east US-Bahamas Atlantic margins show a complex margin structure with embayments of highly thinned crust. The US margin shows segmentation with rapid along-strike changes in oceanic crustal thickness immediately out-board of the OCT. Input data used in this study is satellite gravity, digital bathymetry and NOAA-NGDC sediment thickness. Gravity inversion to determine Moho depth and crustal thickness variation is carried out in the 3D spectral domain and incorporates a lithosphere thermal gravity anomaly correction for both oceanic and continental margin lithosphere (Chappell & Kusznir 2008). Failure to incorporate a lithosphere thermal gravity anomaly correction gives a substantial over-estimate of crustal thickness predicted by gravity inversion. A correction is made for crustal volcanic addition due to decompression melting during breakup and sea-floor spreading.