The Paleo-Bathymetry of Base Aptian Salt Deposition and the Composition of Underlying Basement on the Northern Angolan Rifted Margin

Leanne Cowie[1], Nick Kusznir[1], Ricardo Angelo[1], Gianreto Manatschal[2], and Brian Horn[3]

[1]University of Liverpool
[2]Universite de Strasbourg
[3]ION

Abstract

The bathymetric datum with respect to global sea level for Aptian salt deposition on the deep-water Angolan rifted margin and the composition of underlying basement are hotly debated. Quantitative analysis of deep seismic reflection and gravity anomaly data together with reverse post-breakup subsidence modeling has been used to investigate ocean-continent transition structure, continent-ocean boundary location, crustal type and the palaeo-bathymetry of Aptian salt deposition. The analysis has been applied to the ION-GXT CS1-2400 deep long-offset seismic reflection profile and the P3 and P7+11 seismic cross sections of Moulin (2005) and Contrucci et al. (2004) offshore northern Angola. The palaeo-bathymetry of base Aptian salt deposition has been determined using reverse post-breakup subsidence modeling consisting of the sequential flexural isostatic backstripping of the post-breakup sedimentary sequences, decompaction of remaining sedimentary units and reverse modelling of post-breakup lithosphere thermal subsidence. We predict that Aptian salt was deposited between approximately 0.2 km and 0.6 km below global sea level, and that the inner proximal salt subsided by post-rift (post-tectonic) thermal subsidence alone, while the outer distal salt formed during syn-rift, prior to breakup, resulting in additional tectonic subsidence. Our analysis argues against Aptian salt deposition on the Angolan margin in a 2-3 km deep isolated ocean basin, and supports salt deposition on hyper-extended continental crust formed by diachronous rifting migrating from east to west, culminating in the Late Aptian. Gravity inversion to give Moho depth and crustal thickness, RDA analysis to identify departures from oceanic bathymetry and subsidence analysis shows that the distal Aptian salt is underlain by hyper-extended continental crust rather than exhumed mantle or oceanic crust.