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The Guinea Marginal Plateau – Correlations from Seismic and Potential Fields of Differential Atlantic Breakup*

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Abstract

New definition from an integrated interpretation of seismic with residual gravity and magnetics defines the Guinea Plateau as a volcanic margin that developed contemporaneously to Jurassic Central Atlantic spreading (Figure 1). The volcanic margin is delimited to the north and east by obliquely rifted margins. Support for the Jurassic volcanism is provided by gravity modelled Moho structure that shows areas of uplift indicative of magmatic upwelling and extrusion of volcanic flows (Figure 2). The offshore Jurassic rift axis can be traced from Dakar in the north down to the Guinea Fracture Zone. In the vicinity of the volcanic extrusive flows the rift axis is expressed more weakly but defined by prominent reflectors resembling SDRs. Later Cretaceous Equatorial Atlantic opening is defined by clear dextral fault offsets that deformed the earlier Jurassic margin. The bathymetric expression of the Guinea Marginal Plateau's Outer High occupies a position over the continent-ocean boundary indicating the feature formed during the Cretaceous breakup of the Demerara Plateau.

Correlation of seismic, potential fields, and onshore geology, enables mapping of the extent of the eastern Jurassic offshore rift section and is defined as an inverted inner rift margin sequence. This axis terminates against a prominent anomaly that correlates to the onshore Freetown Layered Igneous Complex (F.L.I.C.), described by Barrie et al., (2010). Obliquely rifted Palaeozoic structures are clearly defined in seismic and residual gravity on the northern margin of the Guinea Fracture Zone. The Mesozoic F.L.I.C. is part of a larger regional CAMP trend expressed in the Moho Model and residual magnetics that supports palaeomagnetic reconstructions (Ruiz-Martinez et al., 2012) and extends north to at least the Dakar Dome and associated magmatism (Long and Cameron, 2016). These findings generally concur and spatially fit well with Reuber et al.'s (2016) interpretation of a constructive volcanic margin on the north-east side of the Demerara Rise. The extended continental margin of the Guinea Plateau has important consequences on

source maturation in a deep water setting as described by Cameron et al., (2018). An axis of long-term magmatism is defined by the potential fields which correlates with the offshore component of the Bové Basin and reported onshore seeps. Together they characterize an inboard non-rift associated basin play system (Cameron et al., 2018). The Guinea Marginal Plateau represents an important junction of volcanic-rift, non-rift, and transform margins developed progressively through the geological record of Central Atlantic and Equatorial Atlantic spreading.

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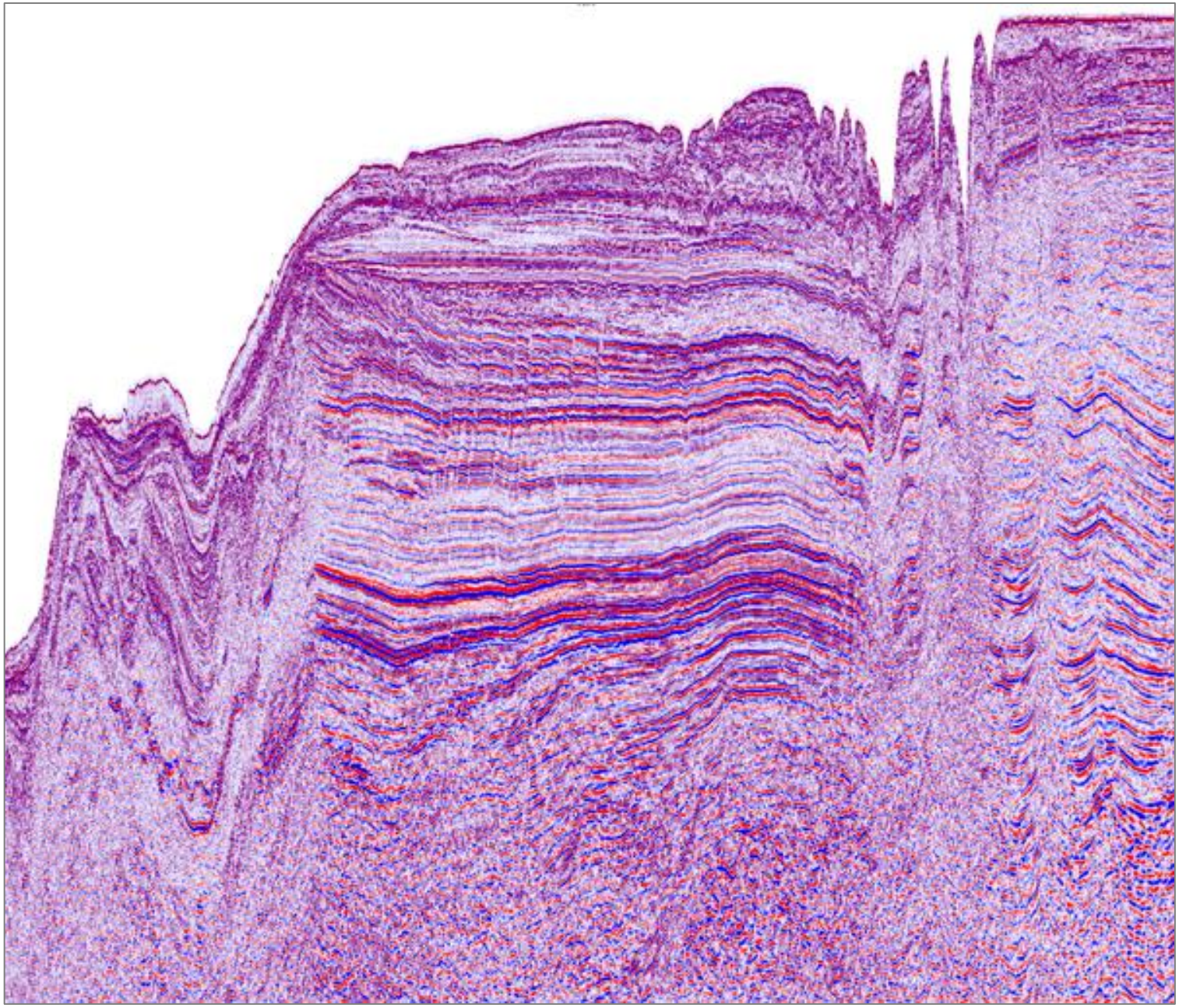

Figure 1. A regional TGS line across the Guinea structure: Marginal Plateau towards shore (right).

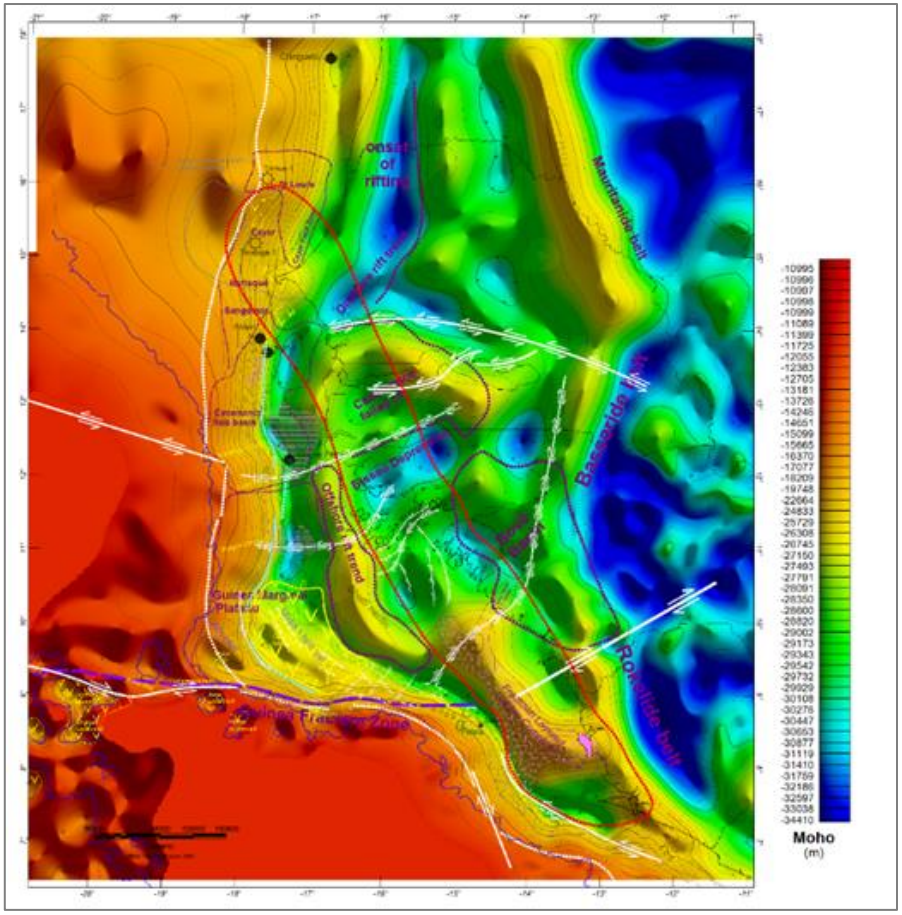

Figure 2. Final gravity modelled Moho for the North West African Margin.

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