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Imaging exhumed lower continental crust in the distal Jequitinhonha basin, Brazil

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Authors: A. Loureiro[1*], P. Schnürle[2], F. Klingelhöfer[2], A. Afilhado[1,3], J. Pinheiro[2], M. Evain[2], F. Gallais[2], N. A. Dias[1,3], M. Rabineau[4], A. Baltzer[5], M. Benabdellouahed[4], J. Soares[6], R. Fuck[6], J. A. Cupertino[7], A. Viana[7], L. Matias[1], M. Moulin[2], D. Aslanian[2] and the SALSA team

1 – Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, Ed. C1, Piso 1, 1749-016 Lisbon, Portugal
2 – Institut Français de Recherche pour l'Exploitation de la MER, IFREMER, REM/GM, Centre de Brest, 29280 Plouzané, France
3 – Instituto Superior de Engenharia de Lisboa – ISEL, Instituto Politécnico de Lisboa, R. Conselheiro Emídio Navarro, 1959-007 Lisbon, Portugal
4 – Laboratoire Géosciences Océan, UMR6538, Université de Bretagne Occidentale, Place Nicolas Copernic, 29280 Plouzané, France
5 – Géolittomer, LETG UMR 6554-CNRS, Institut de Géographie et d'Aménagement Régional de l'Université de Nantes, Campus Tertre, BP 81227, 44312 Nantes CEDEX 3
6 – Instituto de Geociências, Universidade de Brasília, Campus Darcy Ribeiro□, 70910-900 Brasilia, Brazil
7 – Petrobras, Cenpes Research Center, Rio de Janeiro, Brazil

* – corresponding author: Rua Ernesto Vasconcelos, Faculdade de Ciências da Universidade de Lisboa, Ed. C8, sala 8.3.31, 1749-016 LISBOA, Portugal. E-mail: maloureiro@fc.ul.pt

Abstract
Twelve combined wide-angle refraction and coincident multi-channel seismic profiles were acquired in the Jequitinhonha-Camamu-Almada, Jacuípe, and Sergipe-Alagoas basins, NE Brazil, during the SALSA experiment in 2014. Profiles SL11 and SL12 image the Jequitinhonha basin, perpendicularly to the coast, with 15 and 11 four-channel ocean-bottom seismometers, respectively. Profile SL10 runs parallel to the coast, crossing profiles SL11 and SL12, imaging the proximal Jequitinhonha and Almada basins with 17 ocean-bottom seismometers. Forward modelling, combined with pre-stack depth migration to increase the horizontal resolution of the velocity models, indicates that sediment thickness varies between 3.3 km and 6.2 km in the distal basin. Crustal thickness at the western edge of the profiles is of around 20 km, with velocity gradients indicating a continental origin. It decreases to less than 5 km in the distal basin, with high seismic velocities and gradients, not compatible with normal oceanic crust nor exhumed upper mantle. Typical oceanic crust is never imaged along these about 200 km-long profiles and we propose that the transitional crust in the Jequitinhonha basin is a made of exhumed lower continental crust.

Keywords: NE Brazil, South Atlantic Ocean, Passive margins, Wide-angle refraction seismic, PSDM, Crustal structure, Cretaceous breakup, lower continental crust

1 Introduction

The processes that led to the breakup of West Gondwana and the opening of the South Atlantic Ocean are still not fully understood. One of the main hindrances for an accurate reconstruction of West Gondwana is the lack of magnetic anomalies to establish a time-line for the oceanic crust-spreading rate, as the breakup occurred during the Cretaceous Normal Superchron, chiefly in the Central Segment of the South Atlantic Ocean (Moulin et al., 2010). The lack of magnetic anomalies is counterbalanced by the presence of well-marked fracture zones and lineaments that, with the knowledge of the intra-plate deformation on both Africa and South America, tightly constrain the plate movements (Moulin et al., 2010; Aslanian & Moulin, 2012).

The SALSA experiment is aimed at constraining the crustal structure, the segmentation and the