Deep structure of the Pará-Maranhão/Barreirinhas passive margin in the Equatorial Atlantic (NE Brazil)

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Résumé :
The Pará-Maranhão/Barreirinhas margin, North Brazil, is a pull-apart passive margin, with two strike-slip borders, formed during the opening of the Equatorial Atlantic Ocean during Cretaceous time. Its geometry and evolution are speculative due to the lack of information on the crustal structure and the crustal nature. We present here the profiles of the MAGIC (**M**argins of br**A**zil, **G**hana and **I**vory **C**oast) deep seismic experiment, a joint project between French and Brazilian universities, research institutes and the industry. We perform forward modelling through combined interpretation of the multichannel seismic and of the main reflected and refracted of these phases recorded by the OBSs. The final P-wave velocity models reveal distinct structural domains from onshore Brazil towards the Atlantic Ocean characterized by variations of the crustal thicknesses and velocities: (1) an unthinned continental crust below the São Luís Craton, where the crust is 33 km thick, (2) a 60 km wide necking domain below the Ilha de Santana Platform; (3) offshore, east of the continental slope, a 10km-thick deep sedimentary basin underlain by a 5km thick crust with velocity of 6.2-6.9 km/s that we interpret as an exhumed lower continental crust, on the top of an Anomalous Velocity Layer (AVL) probably made of intrusions of mantle-derived melts into the lower continental crust, or a mixture of them; (4) eastwards, the limit of the previous domain is marked by NW-SE aligned volcanoes and the disappearance of the AVL. The sedimentary succession becomes thinner (6 km) overlaying a proto-oceanic crust characterized by seismic velocities higher than “normal” oceanic crust in its upper part, but in continuity with the velocity described in the previous domain; (5) followed by a more characteristic but thin oceanic crust.

The middle/lower continental crust seems not only to have a crucial role in the genesis of the passive margin but also to be involved in the genesis of the first oceanic crust.

Mots-Clés : Equatorial Atlantic Ocean, Pará-Maranhão/Barreirinhas margin, Northeast Brazil, passive margin, crustal structure, lower continental crust, proto-oceanic, wide-angle seismic

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