



## Late differentiation of proximal and distal margins in the Gulf of Aden

F. Bache, S. Leroy, E. d'Acremont, J. Autin, L. Watremez, and S. Rouzo

ISTEP (UMR 7193 - CNRS), Laboratoire de Tectonique, Université P. et M. Curie, Paris VI, France

Non-volcanic passive margins are usually described in three different domains (Boillot et al., 1988), namely (1) the continental domain, where the basement is structured in a series of basins and basement rises, (2) the true oceanic domain, where the bathymetry is relatively smooth, and (3) in between them, a transitional domain referred to as the oceanic-continental transition (OCT), where the basement is partly composed of exhumed mantle.

The Gulf of Aden is a young and narrow oceanic basin formed in Oligo-Miocene time between the rifted margins of the Arabian and Somalian plates. The distal margin and particularly the OCT domain were previously studied considering a large set of data (Leroy et al., 2004; d'Acremont et al., 2005; d'Acremont et al., 2006; Autin, 2008). This study focalises on the sedimentary cover identified on seismic reflexion profiles acquired during Encens-Sheba (2000) and Encens (2006) cruises. Sedimentary stratal pattern and seismic facies succession suggest that the differentiation between the proximal and the distal margins occurred very late in the formation of the margin, after the deposition of  $\sim 2$  km of "syn-OCT" sediments which filled the distal margin grabens. A high position of the proximal and distal margins during rifting and "syn-OCT" sediments deposition could be proposed. The major implication of this evolution should be a shallow nature of "syn-OCT" deposits. The lack of boreholes doesn't permit to affirm this last point.

Comparable observations have been described on other passive margins (Moulin, 2003; Moulin et al., 2005; Labails, 2007; Aslanian et al., 2008; Bache, 2008). For some authors, it shows the persistence of a deep thermal anomaly during the early history of the margin (Steckler et al., 1988; Dupré et al., 2007). These observations could be a common characteristic of passive margins evolution and are of major interest for petroleum exploration.

Aslanian, D., M. Moulin, O. J.L., P. Unternehr, F. Bache, I. Contrucci, F. Klingelhofer, C. Labails, L. Matias, H. Nouzé, and M. Rabineau, 2008, Brazilian and African Passive Margins of the Central Segment of the South Atlantic Ocean: Kinematic constraints: Tectonophysics, v. doi: 10.1016/j.tecto.2008.12.016.

Autin, J., 2008, Déchirure continentale et segmentation du Golfe d'Aden oriental en contexte de rifting oblique: Ph. D. thesis, Université Pierre et Marie Curie, Paris VI, 310 p.

Bache, F., 2008, Evolution Oligo-Miocène des marges du micro océan Liguro Provençal.: Ph. D. thesis, Université de Bretagne Occidentale/CNRS/IFREMER. <http://www.ifremer.fr/docelec/notice/2008/notice4768-EN.htm>, Brest, 328 p.

Boillot, G., J. Girardeau, and J. Kornprobst, 1988, The rifting of the Galicia margin: crustal thinning and emplacement of mantle rocks on the seafloor (ODP Leg 103). In Boillot, G., Winterer, E.L., et al., Proc. ODP, Sci. Results, v. 103, College Station, TX (Ocean Drilling Program), p. 741-756.

d'Acremont, E., S. Leroy, M. O. Beslier, N. Bellahsen, M. Fournier, C. Robin, M. Maia, and P. Gente, 2005, Structure and evolution of the eastern Gulf of Aden conjugate margins from seismic reflection data: Geophys. J. Int., v. 160, p. 869-890.

d'Acremont, E., S. Leroy, M. Maia, P. Patriat, M. O. Beslier, N. Bellahsen, M. Fournier, and P. Gente, 2006, Structure and evolution of the eastern Gulf of Aden: insights from magnetic and gravity data (Encens-Sheba MD117 cruise): Geophys. J. Int., v. 165, p. 786-803.

Dupré, S., G. Bertotti, and S. Cloetingh, 2007, Tectonic history along the South Gabon Basin: Anomalous early post-rift subsidence: Mar. Pet. Geol., v. 24, p. 151-172.

Labails, C., 2007, La marge sud-marocaine et les premières phases d'ouverture de l'océan Atlantique Central: Ph. D. thesis, Université de Bretagne Occidentale, Brest.

Leroy, S., P. Gente, M. Fournier, E. d'Acremont, P. Patriat, M. O. Beslier, N. Bellahsen, M. Maia, A. Blais, J.

Perrot, A. Al-Kathiri, S. Merkouriev, J. M. Fleury, P. Y. Ruellan, C. Lepvrier, and P. Huchon, 2004, From rifting to spreading in the Gulf of Aden: a geophysical survey of a young oceanic basin from margin to margin: *Terra Nova*, v. 16, p. 185-192.

Moulin, M., 2003, Etude géologique et géophysique des marges continentales passive: exemple de l'Angola et du Zaïre: Ph. D. thesis, Université de Bretagne Occidentale/IFREMER. <http://www.ifremer.fr/docelec/doc/2003/these-82.pdf>, Brest, 320 p.

Moulin, M., D. Aslanian, J. L. Olivet, I. Contrucci, L. Matias, L. Géli, F. Klingelhoefer, H. Nouzé, J. P. Réhault, and P. Unternehr, 2005, Geological constraints on the evolution of the Angolan margin based on reflection and refraction seismic data (Zaiango project): *Geophys. J. Int.*, v. 162, p. 793-810.

Steckler, M., A. B. Watts, and J. A. Thorne, 1988, Subsidence and basin modeling at the U.S. Atlantic passive margin, in R. E. Sheridan, and J. A. Grow, eds., *The Atlantic Continental Margin: U.S.*, v. *The Geology of North America*, V1-2, Geological Society of America, p. 399-416.