Geophysical Research Abstracts, Vol. 9, 03237, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03237

Structure and evolution of the north-eastern Gulf of Aden margin

J. Autin (1), S. Leroy (1), E. d'Acremont (1), M.-O. Beslier (2), A. Ribodetti (2), E. Courrèges (3), J. Perrot (4), N. Bellahsen (1)

(1) Laboratoire de Tectonique, UPMC, Paris, France, (2) Geosciences Azur, OOV, Villefranche/Mer, France, (3) IFREMER, Brest, France, (4) UniversitÈ de Bretagne Occidentale, Brest, France (julia.autin@lgs.jussieu.fr / Fax: + 33 1 44274143 : Phone: + 33 1 44275260)

The Gulf of Aden is a young and narrow oceanic basin that separates Arabia from Somalia. The rifting started around 35 Ma ago followed by oceanic accretion from 17.6 Ma (Anomaly 5d). During the rifting, normal faults that strike between 070˚E (rift axis parallel) and 110˚E (perpendicular to the divergence), are due to a stress field characterized by an extension direction probably evolving from 020˚E to 160˚E. Together with the orientation (075˚E) and the kinematics (about 030˚E divergence) of the Gulf, the fault network can be interpreted as the result of the oblique rifting. However, the precise 3D structure of the margins needs to be refined to better constrain the mechanics of such rifts as well as the influence of various parameters such as structural inheritance or thermal and rheological evolution.

The Encens II cruise (in February-March 2006 aboard the R/V L'Atalante) is located on the north-eastern non-volcanic passive margin of the Gulf of Aden, where the syn-rift structures are well exposed onshore and are covered by thin post-rift sediments offshore. This margin is segmented by two major transform faults (Alula Fartak and Socotra F.Z.); a second-order segmentation is observed in these first-order segments.

During the cruise, multi-beam bathymetry, 360 channels seismic reflection (densely spaced profiles) , seismic refraction (dense network of 35 OBS and seismic stations onshore), gravity and magnetism data were gathered. In particular, two reflection seismic profiles were processed with a pre-stack migration method. This dataset permits us to understand the structure of the margin and to reconstruct the 3D evolution from oblique rifting to the onset of oceanic spreading. The high resolution seismic reflection data allows us to better map the sediment organization. While penetrative seismic data provides information on the MOHO geometry. Thus, we are able to propose a 3-dimensional structural model for the margin with special emphasis to the normal fault propagation history and the 3-D shape of the depocenters within each segment. Furthermore, we provide new insights on the Ocean Continent Transition nature and structure: the amount of extension (crust width and thickness) and chronological arguments (sediment nature and structure).

These results complete the field work realized onshore on both margins (Oman and Socotra). Thus, the onshore and offshore data lead to a 3D model of the conjugate margin structure that allows us to discuss the continental rheology and the break-up mechanisms. Refraction and seismological studies, providing MOHO depth, will constrain future lithospheric analogue models of oblique rifting.