Geophysical Research Abstracts,
Vol. 11, EGU2009-8991, 2009
EGU General Assembly 2009

Continental break-up history of conjugate poor magmatic margins from seismic reflection (oriental Gulf of Aden)

J. Autin (1), S. Leroy (1), E. d'Acremont (1), M.-O. Beslier (2), A. Ribodetti (2), N. Bellahsen (1), Ph. Razin (3), and C. Robin (4)

(1) Université Pierre et Marie Curie, Laboratoire de Tectonique, Paris cedex 05, France (julia.autin@upmc.fr), (2) Geosciences Azur, OOV, B.P. 48, 06235 Villefranche/Mer cedex, France, (3) EGID, University of Bordeaux 3, 33607 Pessac cedex, France, (4) Geosciences-Rennes, University of Rennes I, Bat 15, Campus de Beaulieu, 35000 Rennes, France

The Gulf of Aden is an oceanic basin separating Arabia from Somalia. The rifting started 35 Ma ago followed by oceanic spreading from 17.6 Ma. The gulf orientation (N75°E) and the kinematics (about N30°E divergence) mark an oblique rifting where normal faults striking between N70°E (rift axis parallel) and N110°E (perpendicular to the divergence), are due to an extension direction probably evolving from N20°E to N160°E.

The accurate 3D structure of the margins and the influence of structural inheritance or thermal and rheological evolution need to be better constrained. In order to answer this question, we mapped the tectonic features of the first-order segment between Alula-Fartak and Socotra Fracture Zones of the eastern Gulf of Aden continental margin.

The Encens cruise (Leroy et al., 2006) take place in this area where the syn-rift structures are well exposed. Multibeam bathymetry, 360 channels seismic reflection (10 km spaced profiles), gravity and magnetism data were gathered. Furthermore one reflection seismic profile was processed with a pre-stack depth migration method. This excellent-quality dataset will permit us to image the structure of the margin and to propose an evolution from rifting to the onset of oceanic spreading.

These results complement the field work realized onshore on conjugate margins (Oman and Socotra). Thus the land evolution can be correlated to the distal evolution. The style of deposit seems completely different in the proximal and in distal parts of the margin. Indeed fault controlled syn-rift carbonate systems, well developed onshore, are not really well expressed offshore.

After the major syn-rift structuration in grabens and horsts, the deformation localised where the crust is the thinnest. This occurred in the distal margin graben (DIM) at the northern boundary of the Ocean-Continent Transition (OCT) represented by the OCT ridge. At the onset of the OCT formation, a differential uplift induces a landslide on the top of the deepest tilted block and the crustal deformation is localised in the southern part of the DIM graben, where the continental break-up finally occurs. The OCT ridge may be exhumed serpentinised mantle intruded by magma material confusing the OCT geometry. Indeed, the spreading is followed by magmatic events during post-rift time (flows, sills and volcano-sedimentary wedge), whose timing is constrained by analysis of sedimentary cover of the OCT ridge, correlated with onshore stratigraphy.

The structural scheme of the area provides a faults organization, which can be compared to analogic models of oblique rifting. Furthermore refraction and seismological studies, providing MOHO depth, will constrain the lithospheric scale analogue models.