



Deep structure of the northeastern Gulf of Aden margin from wide-angle seismic network: Encens cruise

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Rifting in the gulf began ca. 35 Ma ago, synchronous to the onset of the Afar hotspot activity. First magnetic anomaly identified is A5d, suggesting that the oceanic spreading started at least 17.6 Ma ago (e.g. d'Acremont et al., 2006).

Encens seismic experiment (February-March 2006, Leroy et al., 2006) in the northeastern Gulf of Aden provides crustal-scale images of the velocity structure across three second-order segments between Alula-Fartak and Socotra fracture zones. Each of these segments was instrumented with 10-15 km, evenly spaced ocean-bottom seismometers (OBS, a total of 35) complemented onshore by an array of seismometers. 8000 shots from the 8410 in³ (~ 138 l) source on board R/V L'Atalante (Ifremer) have been recorded, providing an extensive dataset, with offsets up to 180 km. Excellent-quality data from this dense source and receiver coverage enable the modeling of the P-waves across and along the strike of the ocean-continent transition (OCT) and continental margin.

We focus on westernmost segment using all available data: bathymetry, gravity, wide-angle seismics (OBS and land-stations), multichannel seismic (MCS) and heat flux measurements. Coincident MCS data are used to better constrain the structure down to the basement, and the crustal structure is eventually validated through the modeling of synthetic gravity anomalies.

Our results indicate a progressive continental crust thinning over more than 100 km

(thicknesses run from 35 km to 7 km oceanward). The thinned continental crust features two tilted blocks at the bottom of the continental slope. The onshore seismometers data provide clear waves reflected at the Mohorovicic discontinuity constraining the slope of the crust-mantle interface. The oceanic crust has P-wave velocities ranging from 6 to 7.2 km/s. The lithospheric mantle has particularly low P-wave velocity (less than 8 km/s) and density (3.1 g/cm^3). All these results should be included in a conceptual model of deep margins structures.