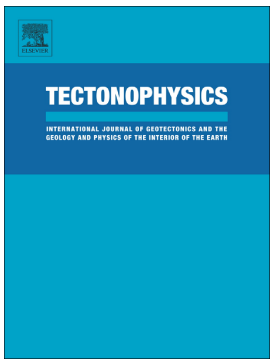


# Tectono-sedimentary evolution of the eastern Gulf of Aden conjugate passive margins: Narrowness and asymmetry in oblique rifting context

Nonn Chloé, Leroy Sylvie, Khanbari Khaled, Ahmed Abdulhakim

PII: S0040-1951(17)30400-6
DOI: doi:10.1016/j.tecto.2017.09.024
Reference: TECTO 127637

To appear in: *Tectonophysics*

Received date: 30 June 2017
Accepted date: 26 September 2017

Please cite this article as: Nonn Chloé, Leroy Sylvie, Khanbari Khaled, Ahmed Abdulhakim , Tectono-sedimentary evolution of the eastern Gulf of Aden conjugate passive margins: Narrowness and asymmetry in oblique rifting context. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tecto(2017), doi:10.1016/j.tecto.2017.09.024

# Tectono-sedimentary evolution of the eastern Gulf of Aden conjugate passive margins: narrowness and asymmetry in oblique rifting context

Nonn Chloé[1], Leroy Sylvie[1], Khanbari Khaled[2], Ahmed Abdulhakim[3,1]

*1 - Sorbonne Universités, UPMC, ISTEP UMR 7193, CNRS, 4 place Jussieu, 75252 Paris Cedex 05, France*
*2 - Department of Environmental and Earth Sciences, Sana'a University, Sana'a, Yemen*
*3 - Seismological and Volcanological Observatory Center, Herran Garden, 82187 Dhamar, Yemen.*

**Abstract**

Here, we focus on the yet unexplored eastern Gulf of Aden, on Socotra island (Yemen), Southeastern Oman and offshore conjugate passive margins between the Socotra-Hadbeen (SHFZ) and the eastern Gulf of Aden fracture zones. Our interpretation leads to onshore-offshore stratigraphic correlation between the passive margins. We present a new map reflecting the boundaries between the crustal domains (proximal, necking, hyper-extended, exhumed mantle, proto-oceanic and oceanic domains) and structures using bathymetry, magnetic surveys and seismic reflection data. The most striking result is that the magma-poor conjugate margins exhibit asymmetrical architecture since the thinning phase (Upper Rupelian–Burdigalian). Their necking domains are sharp (~40-10 km wide) and their hyper-extended domains are narrow and asymmetric (~10-40 km wide on the Socotra margin and ~50-80 km wide on the Omani margin). We suggest that this asymmetry is related to the migration of the rift center producing significant lower crustal flow and sequential faulting in the hyper-extended domain. Throughout the Oligo-Miocene rifting, far-field forces dominate and the deformation is accommodated along EW to N110°E northward-dipping low angle normal faults. Convection in the mantle near the SHFZ may be responsible of change in fault dip polarity in the Omani hyper-extended domain. We show the existence of a northward-dipping detachment fault formed at the beginning of the exhumation phase (Burdigalien). It separates the northern upper plate (Oman) from southern lower plate (Socotra island) and may have generated rift-induced decompression melting and volcanism affecting the upper plate. We highlight multiple generations of detachment faults exhuming serpentinized subcontinental mantle in the ocean-continent transition. Associated to significant decompression melting, final detachment fault may have triggered the formation of a proto-oceanic crust at 17.6 Ma and induced late volcanism up to ~10 Ma. Finally, the setting up of a steady-state oceanic spreading center occurs at ~17 Ma.

**Keywords (6 max):** Gulf of Aden; oblique rifting; conjugate rifted margins; crustal domains; asymmetry; volcanism