

Along-strike structural variability of the Eastern Red Sea continental passive margin

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The nature of the lithosphere under the Red Sea is still poorly understood. Field observations show unequivocally that the conjugated margins are continental. Offshore, bathymetric data revealed a central trough in the middle and south of the Red Sea where oceanic crust is exposed. Based on these observations the current consensus is that the lithosphere beneath the Red Sea is predominantly thinned continental crust with a young oceanic crust (< 5 My) restricted to the central trough in the south. This commonly accepted view was challenged by Tapponier et al. in 2013 (AGU, fall meeting 2013) who showed on the basis of a new geophysical survey from the industry that at least 2/3 of the width of the Red Sea is floored by oceanic crust.

Based on the same survey (seismic, wells, potential field data) and field observations (mainly from satellite images) along the Arabian side of the Red Sea we mapped the distinct structural domains (continental and oceanic domains) and described in detail the geometry of the inner part of the margin (continental domain) from Sinai to Aden. The most striking results are (1) that the Red Sea is neither a rift nor a transitional system but a mature passive margin on its entire length which began to subside thermally ~ 13 My ago; (2) the characterization of a gradual increase in magmatic activity to the south during the syn-rift stage (~ 25 -13 Ma) without significant segmentation of the margin along strike. To the North, the margin is characterized by magma-poor-type margin features with seaward dipping normal faults detached in the middle crust and a syn-rift sedimentation siliciclastic dominated. To the South (south of 22N), the margin presents volcanic-type features with landward dipping normal faults and seaward dipping reflectors. These observations suggest that the Red Sea is a particularly suitable place to better understand rift systems with lateral changes in thermal state.

Keywords: Red Sea, structural domains, magma rich vs magma poor passive margin