Structure and morphology of the Mid-Ocean Ridge in the Red Sea

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Our presentation describes the structures and morphologies associated with seafloor spreading in the Red Sea inferred from bathymetric, gravity, magnetic and unpublished seismic data. We show that it is consistent with an Arabia-Nubia Euler pole located within the 95% confidence of Ar-Rajehi et al, (2010) Euler pole and the tectonic model initially proposed by Girdler (1984). At the Red Sea scale, our model shows that a spreading axis extends along most of its length, even though it is mostly covered by allochthonous Middle Miocene salt and Late Miocene minibasins originally on the Red Sea margins. In the northern Red Sea, oceanic basement is only exposed through small windows within the salt, forming a series of deeps. The seafloor segments symmetrically bisect the new ocean in the south, progressively becoming more oblique towards the Sinai triple junction. Right-stepping transform faults that cluster near Jeddah, Zabargad and Ikhwan Islands offset the ridge axis as spreading is getting more oblique towards the Euler Pole. The southern and central Red Sea segments display a well developed mid-ocean ridge flanked by landward-dipping volcanic basement, typical of slow spreading ridges. There is no such ridge in the north, where basement is flat and deep along the ultra-slow, magma poor spreading segment, and where mantle exhumation is likely. Transpression and transtension along transform faults accounts for the exhumation of the mantle on Zabargad Island as well as the collapse of a pull-apart basin in the Conrad deep.

We hereby propose a brand new structural model for the Red Sea and discuss the effect of the Danakil microplate on the ridge morphology. We finally show that the Arabia-Nubia-Danakil triple junction is around 18°N, further north than previously described.

Keywords: Red Sea, Tectonic, Mid-Ocean Ridge, Geodynamic, Oceanic Crust, Transform Faults, Rifted Volcanoes

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