The Morocco-Canaries Atlantic Margin - A Classic Rifted Margin or a More Complex Failed-Breakup Basin?

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Abstract

The COB offshore southern Morocco is traditionally thought to lie between the Moroccan coast and the Canary Islands. OCTek gravity inversion, however, shows a ribbon of thick crust extending NE from the Canaries, one interpretation of which is that the Canaries are located on a rifted continental block or "micro-continent", rather than on oceanic crust. We have tested this hypothesis via:

- Further analysis of the gravity inversion results
- Geodynamic analysis of four regional seismic transects between the Moroccan coast and the Canaries, focused on backstripping, with supportive structural forward-modeling
- A new plate-reconstruction model for the N. Africa - N. America Atlantic margins

Best-case crustal-thickness and thinning-factor maps have been produced from the gravity inversion. These incorporate corrections for regional dynamic topography and volcanic addition during rifting and breakup. From these maps, profiles of integrated extension across the conjugate N. Africa - N. America margins have been calculated to constrain the pre-breakup rifting phase of the new plate-reconstructions. Backstripping analysis of basement-subsidence suggests that, in the area between Morocco and the Canaries, oceanic crust is only likely to be present in the far north. Thinning-factors decrease southwards, suggesting that Morocco and the Canaries are primarily separated by highly thinned continental crust rather than oceanic crust. This is compatible with the "V-shaped" rift-basin and thinning-factor distribution identified by gravity inversion. Further backstripping analysis of the Jurassic-Tertiary stratigraphy along the Moroccan coast suggests that the whole area is currently supported by ~500m of dynamic uplift, possibly initiating during the Late Cretaceous. This result is compatible with the assumptions used in the gravity inversion. A likely origin for the dynamic uplift is the proximity of the Canaries magmatic province. Incorporating dynamic uplift into the backstripping model allows us to make predictions of palaeobathymetry and depositional environments back from the Tertiary into the Jurassic. Finally, all of the preceding work has been incorporated into a new plate-reconstruction model, which highlights (i) pre-breakup stretching, (ii) Atlantic propagation into the Morocco-Canaries "V-shaped" basin, (iii) separation of Africa and America west of the Canaries, (iv) a failed-breakup basin between Morocco and the Canaries.