

Conjugate Margins of the South Atlantic (West Africa and Brazil): Structural Similarities and Differences, Resulting from Inheritance

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For the conjugate margins of the South Atlantic (West Africa and Brazil), we compare and contrast the structural styles, using data from the subsurface and surface. Our aim is to explain the similarities and differences for both syn-rift and post-rift structures. The area of interest spans the Lower Congo, Kwanza and Benguela basins of West Africa, and the Espirito Santo, Campos and Santos basins of Brazil. All of these formed by Neocomian rifting, at the eastern edge of a Panafrican transpressional orogen, the Ribeira Fold Belt. Because this belt has a sigmoidal outline on a map, rifting and later opening of the Atlantic resulted in major jogs in the coastlines of West Africa and Brazil. Rifting also inherited the dominant eastward vergence of the fold belt, so that most of the master faults of the rift basins dip westward.

In West Africa, on CongoSpan seismic profiles of the continental margin, Neocomian strata lie within rift basins, beneath an unconformable layer of Aptian salt. The master faults of the rift basins dip predominantly westward (in other words, seaward). In the lower crust, the faults curve into low-angle reflectors. We interpret these as Precambrian thrust zones, which reactivated in extension. In their footwalls, the reflection Moho rises locally by several km, accounting for isostatic gravity anomalies. On the Atlantic margin of Brazil, the main master faults of the rift basins also dip westward (in other words, landward on this margin). Again, the Moho rises locally in their footwalls.

The conjugate margins differed progressively, after rifting ceased and the Atlantic Ocean opened. In Brazil, the margin was subject to three or more phases of uplift and exhumation, which we correlate with phases of orogeny in the Andes. Thus we argue that plate-wide horizontal compression was an important factor in the post-rift development of the Brazilian margin. The compression reactivated the Precambrian thrusts, inverting the rift basins. In West Africa, there is also some evidence for compressional reactivation of the margin. We argue that reactivation of Precambrian thrust zones is responsible for uplift and exhumation of the continental interior, especially in the West Congo fold belt, where thrusts are seismically active today. In conclusion, structural inheritance has influenced the geological histories of both margins.