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Breakup and subsequent deformation in the Equatorial Atlantic region

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Analysis of seismic reflection, gravity, magnetic and well data on both sides of Equatorial Atlantic margins indicates that continental breakup was preceded by the development of numerous dextral strike-slip fault zones, some bounding pull-apart basins. Undeformed continental crust was about 30 km thick. This crust thinned down to almost 6 km beneath several pull-basins, but only 20-30 km beneath the rest of the pull-apart basins. Stratigraphic thickness/vertical thickness ratios vary from 1/3 to 1/10 between these end member pull-apart basin types. Highly-stretched pull-apart basins have acted as major “wounds” that controlled the local locations of future continental breakup. Mildly-stretched pull-apart basins, together with a plethora of dextral strike-slip faults associated with them, served as candidates for linkages between major “wounds” during the development of breakup trajectories.

The breakup trajectory had a complex geometry, containing multiple segments controlled by strike-slip, oblique-slip and normal faulting. Although some continental faults apparently influenced the locations of oceanic transform faults during subsequent sea-floor spreading, such cases are less numerous than those for which continental faults exerted little or no influence on transform locations. There is no evidence for kinematic linkage among continental faults and oceanic transform faults/fracture zones in the entire study area.

Development of proto-oceanic crust was characterized by disorganized sea-floor spreading, during which time spots of oceanic crust were left behind the younger spreading and blobs of continental crust became surrounded by oceanic crust. The Ghana Ridge area provides examples of such exotic blocks of continental crust, some of which are located over 100 km from the actual continental margin.