New Kinematic Model of the Early Opening of the Equatorial Atlantic Realm : background and implications

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Résumé

The initial phase of the Pangea breakup between the African and South American plates is one of the emblematic examples of continental breakup, inspiring Wegener's theory of continental drift, early work on plate tectonics (Le Pichon, 1968), as well as the definition of transform plate boundaries (Wilson, 1965). The early spreading of the Equatorial Atlantic Ocean has been debated due to the absence of magnetic anomalies related to the Early Cretaceous quite zone, and an incomplete fracture zone record, hidden by volcanic overprint and/or partially subducted, and all previous reconstructions were undermined by the difference in orientation between the transform margin of the northern and southern parts of the Equatorial Atlantic. This study proposes a novel kinematic reconstruction dedicated to the Equatorial Atlantic rifting. Our approach integrates seismic and gravimetry data from the margins, as well with the interpretation of the Cretaceous Jurassic Line (CJL, separating the Equatorial oceanic crust from the Central Atlantic one) as a former transform fault. We propose a new segmentation of the Equatorial Atlantic, with the St Paul Fracture Zone delineating the northern and southern Equatorial Atlantic domains. Based on the CJL and continental transform margins of the northern Equatorial Atlantic, we propose an opening history of the northern Equatorial Atlantic in two phases. A primary Early Cretaceous phase involves strike-slip movement between West Africa and the Guyana block independent from the opening of the South Atlantic ocean. This rifting phase is accommodated by introducing

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intraplate deformation in the Amazon basins. In the Albian, a kinematic reorganization associated with the northward propagation of the South Atlantic leads to a secondary and final opening phase of the entire Equatorial Atlantic. This new model enhances the understanding of the regional tectonics and kinematics history, with potential implications on the Lesser Antilles Arc subduction geohazards, and on the evolution of the triple junction between the Equatorial Atlantic, Central Atlantic, and proto-Caribbean oceans. This study sheds contemporary light on the persistent difficulty of kinematic reconstructions, and the improvements that can be expected from new data especially in the deep ocean, almost 60 years after the first approaches.

Mots-Clés: Kinematic, Equatorial Atlantic Ocean