

New Plate Kinematic Evolution on the South and Equatorial Atlantic Oceans: Geodynamic Implications and Passive Margins Genesis

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The opening of the Equatorial and South Atlantic Oceans is still a matter of debate, particularly as it concerns the locations and quantities of the intraplate deformation (Aslanian & Moulin, GJI submitted). We propose and present here a new plate kinematic evolution of the Equatorial and South Atlantic Oceans from the tightest reconstruction to Chron C34, which takes into account all available geological and geophysical constraints (Moulin et al., ESR 2009). This new precise model highlights and presents:

1. A northwards propagation of the South American intraplate deformation, in agreement with Eagles (GJI 2006). We slightly rejuvenated the ages of this propagation and refined the plate reconstructions
2. A new age for the opening of the Equatorial Ocean, contemporaneous of the opening of the Central segment (112 Ma - Late Aptian / Early Albian) and in agreement with the main phase of rifting dated at the Alagoas stage (Late Aptian) according to intensive onshore and offshore geological exploration
3. The persistence of an intraplate deformation in the Paraná area until the Santonian / Campanian boundary (~84 Ma - Chron C34), in agreement with the results of Gibert et al., (JGR 1989) and Campan, (PhD Thesis 1995).

This new plate kinematic evolution provides a new canvas on which the problem of the continental margin genesis can be addressed:

1. It gives a revisited interpretation of the conjugate Rio Muni - Sergipe Alagoas margins
2. The consequences induced by the tightest kinematic reconstruction are tremendous for the genesis of continental passive margins that marked the break-up area (age, timing, constraints on movements) and on the timing of the first evolution of the oceanic crust. As Aslanian et al., (Tectonophys. 2009) already have shown, it seems most improbable that the continental crust maintains, in the Central segment, its integrity throughout this thinning process, which seems to mainly concern the lower/middle continental crust
3. It emphasises the role of the kinematic «buffer» Santos block, located between the salty Aptian Central segment in the North and the Volcanic Hauterivian Austral segment in the South. The detailed kinematic history of the wide Santos-São Paulo Basin and its narrow conjugate Namibe margin, which involved two continental microblocks, and no ridge jump, has important consequences on the formation of these margins and must have important outcomes for further oil discoveries (Moulin et al., AAPG Bull. submitted).