Geophysical Research Abstracts
Vol. 15, EGU2013-13408-3, 2013
EGU General Assembly 2013

Late Jurassic breakup of the Proto-Caribbean and circum-global circulation across Pangea

Peter O. Baumgartner (1), Yamirka Rojas-Agramonte (1,2), Maria Sandoval-Gutierrez (1), Franco Urbani (3,4), Dora García-Delgado (5), Grony Garban (4), and Mireya Pérez Rodríguez (6)

(1) University of Lausanne, Institute of Earth Sciences, Lausanne, Switzerland (peter.baumgartner@unil.ch), (2) Johannes Gutenberg-Universität, Institut für Geowissenschaften, Mainz, Germany, (3) Fundación Venezolana de Investigaciones Sismológicas, Caracas, Venezuela., (4) Universidad Central de Venezuela, Escuela de Geología, Minas y Geofísica, Caracas, Venezuela, (5) Centro de Investigaciones del Petróleo, Habana, Cuba, (6) Instituto Superior Politécnico José Antonio Echeverria, Habana, Cuba

Based on earlier plate reconstructions, many authors have postulated a circum-global equatorial current system flowing through the Pangea breakup, the Tethys – Atlantic – Caribbean Seaway, to explain changes in global climate during the Middle and Late Jurassic.

While a Toarcian (late Early Jurassic) breakup is well constrained for the Central Atlantic, the place and timing of initial ocean crust formation between the Americas (Gulf of Mexico or Proto-Caribbean?) is still poorly constrained. Ar/Ar ages (190 to 154 Ma) in the Tinaquillo ultramafic complex (NW-Venezuela) have been interpreted as a result of initial Proto-Caribbean rifting. However, the Tinaquillo is clearly a subconinental block and the cited ages age cannot be related with breakup.

The Siquisique Ophiolite (NW-Venezuela), long known for the occurrence of Bajocian-early Bathonian ammonite fragments found in interpilow sediments, has previously been interpreted as an early Proto-Caribbean remnant. However, the ammonite fragments were recovered from blocks in a Paleogene tectonic mélange, whereas the main Siquisique ophiolite body seems to be of middle Cretaceous age, based on a few Ar/Ar dates and poorly preserved middle to late Cretaceous radiolarians, which we recovered from black cherts interbedded with volcanics.

The best record of Proto-Caribbean rifting and breakup is preserved in the Guaniguanico Terrane of NW-Cuba, which represents a distal Yucatan (N-American) passive margin segment telescoped by Tertiary nappe tectonics. In this terrane middle to upper Oxfordian pelagic limestones encroach on the E-MORB type El Sabalo Basalts which represent the oldest known remnants of oceanic crust clearly identifiable as Proto-Caribbean. Older, syn-rift sediments in the Proto-Caribbean and Gulf of Mexico are known to be deltaic to shallow marine detrital, and evaporitic.

Although oceanic crust seemingly started to form in the early Late Jurassic (158 my), recent plate tectonic reconstructions show important obstructions throughout the Late Jurassic and early Cretaceous between the Central Atlantic, the Proto-Caribbean, and the Colombian back-arc basin, which in turn was separated from the Pacific by a mature arc. Hence, the lack of an open ocean connection makes a trans-Pangean, circum-global current system impossible before the Late Jurassic and unlikely during the Late Jurassic-Early Cretaceous. The least restricted passage between the Americas, most favourable to such a circulation, existed during the early Late Cretaceous, when the Caribbean Large Igneous Province was formed and approached its place between the Americas.

Ribbon-bedded radiolarite is the most common Jurassic pelagic facies on Tethyan ocean floor and in the entire circum-Pacific realm but, is so far unknown from the Central Atlantic and the Proto-Caribbean. Radiolarite occurrences in ophiolite (s.l.) complexes of the Antilles are interpreted to have a Pacific origin like the Caribbean Plate. An east–west directed global current system would account for the higher fertility radiolarian chert on both extremes of the Tethys – Proto-Caribbean Seaway, but is in contradiction with the low fertility facies in the Central Atlantic. Jurassic-Early Cretaceous pelagic carbonates in the Central Atlantic and the Proto-Caribbean are interpreted as the consequence of more oligotrophic surface waters than those of the adjacent Tethys and Panthalassa. The Central Atlantic was a ‘Mediterranean-type’ ocean basin, such as the Modern Red Sea. It was (and still is) a carbonate ocean, characterized by an anti-estuarine circulation. By latest Jurassic time, the Western Tethys changed to calcareous low-fertility facies sedimentation, while in the circum-Pacific realm radiolarite sedimentation continued. It is only by Late Cretaceous times that a global homogenisation of facies is observed, such as the pelagic (marly) limestones or ‘oceanic red beds’.