Is Opening of the Gulf of Mexico Restricted to the Jurassic?

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ABSTRACT

Many studies have inferred that opening of the Gulf of Mexico was counter-clockwise and restricted to the Jurassic Period. If so, opening of the Gulf of Mexico may have occurred in a back-arc setting, but would require that back-arc extension was both counter-clockwise and at a high angle to the related subduction zone, which is atypical for back-arc basins. Alternatively, the eastward relative migration of the Caribbean Plate since the middle to late Cretaceous may have been balanced, in part, by the southwards relative migration of North American microplates out of the Gulf of Mexico region. This mode of mass balance, dubbed the pirate mode in the western Caribbean context, would explain counterclockwise opening of the Gulf of Mexico younger than the middle to late Cretaceous. Possible evidence for late Cretaceous and Cenozoic extension in the Gulf of Mexico includes: (1) crustal scale normal faulting and thinning in the Corsair rift zone of the northwest Gulf of Mexico, (2) basin depths deeper than predicted by lithosphere cooling models in the western Gulf of Mexico, and (3) reports of paleocanyons in the stratigraphic record of marginal basins in the southwest Gulf of Mexico. Consequently, the suggestion that pirate mode tectonics played a role in the opening of the Gulf of Mexico may be credible and carries major implications for the formation of both primary hydrocarbon systems and tectonic permeability within the western Gulf of Mexico.