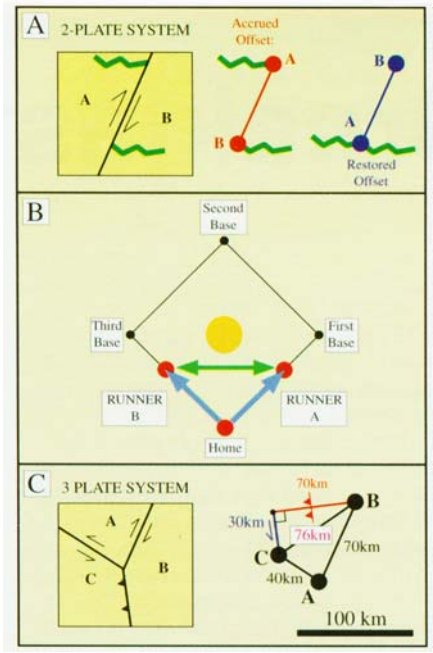


Figure 1. Examples of vector displacement diagrams for two and three-plate systems.

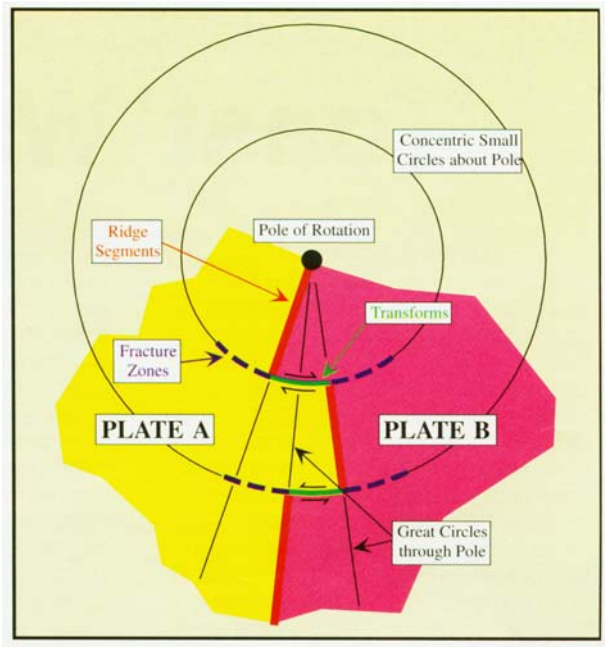


Figure 2. Relationships between pole of rotation, great circles, ridge segments, small circles, transforms and fracture zones in a two-plate system.

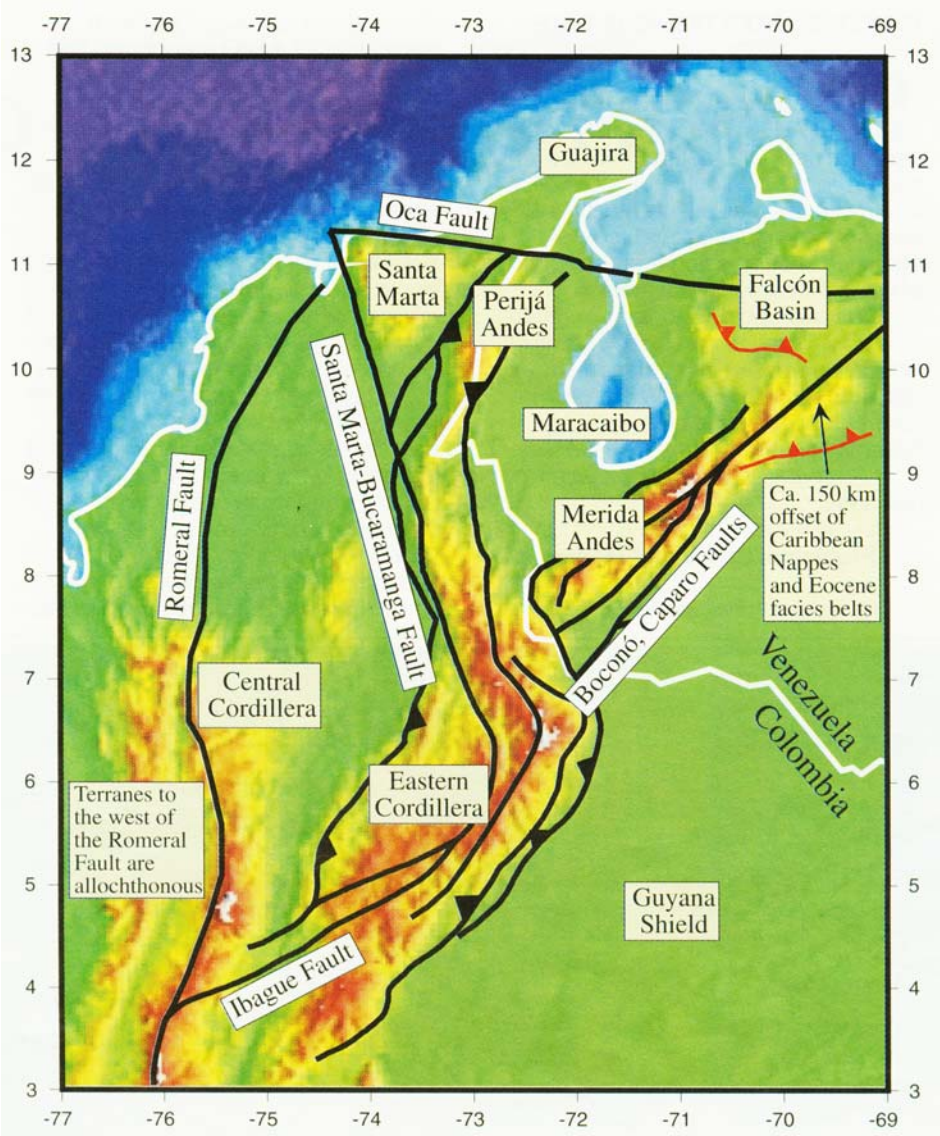


Figure 3. Map of northern South America showing main crustal blocks, separated by lithospheric fault zones, under relative motion during Late Oligocene to Recent Andean Orogeny.

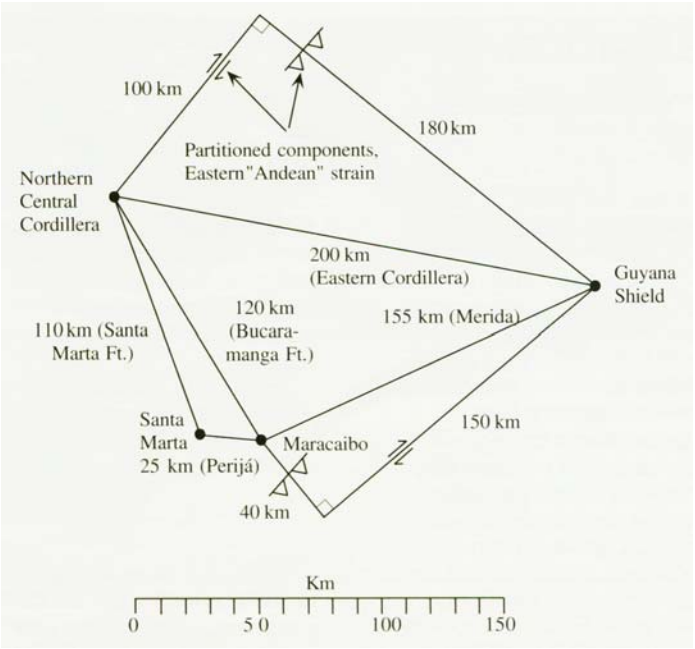


Figure 4. Vector "nest" restoring displacements of northern Andean blocks along faults during Andean orogenesis. Heavy dots denote blocks, tie lines restore net azimuth and magnitude of fault displacements, moving back in time. Mérida Andes and Eastern Cordillera deformation is shown partitioned into strike-orthogonal and strike-parallel components.

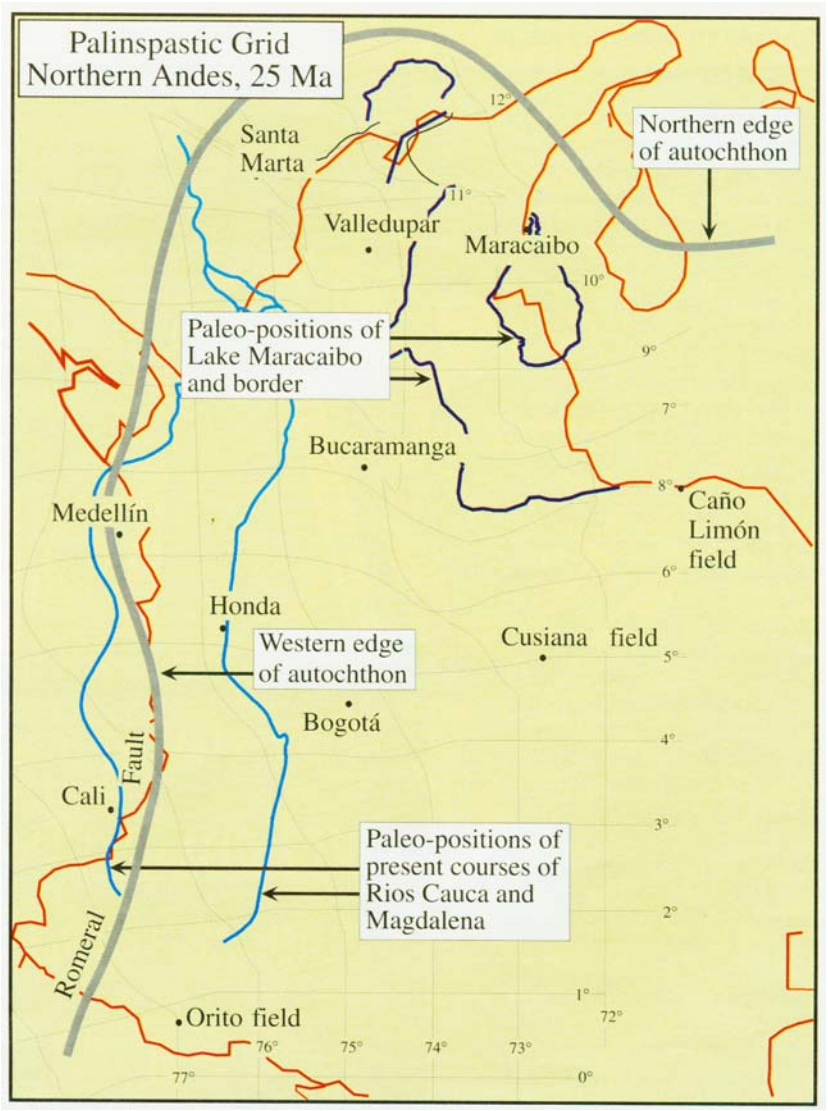


Figure 5. Oligocene reconstruction of pre-Mesozoic continental basement, northern Andes, based on vector displacements from Figure 4. "Retro-deformed" longitude/latitude grid is created by smoothing the lines across block boundaries after block restoration. Red outline is present day South America; cities, fields, rivers and geographic features (blue) are shown in palinspastic coordinates

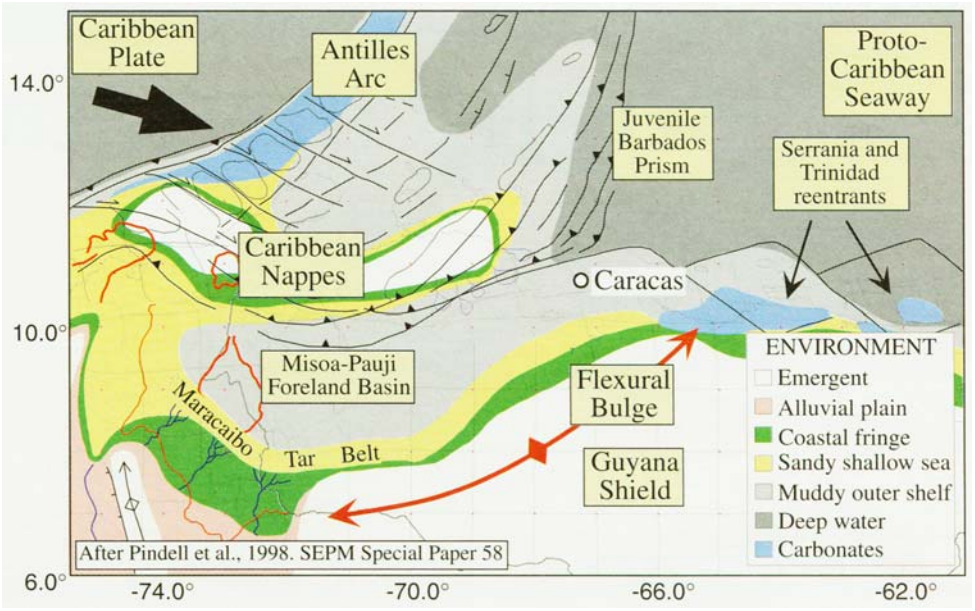


Figure 6. Paleogeographic map of western Venezuela and northern Colombia, showing the position of the Caribbean Plate and main depositional units during Eocene time. Note the similarity with today's Persian Gulf.

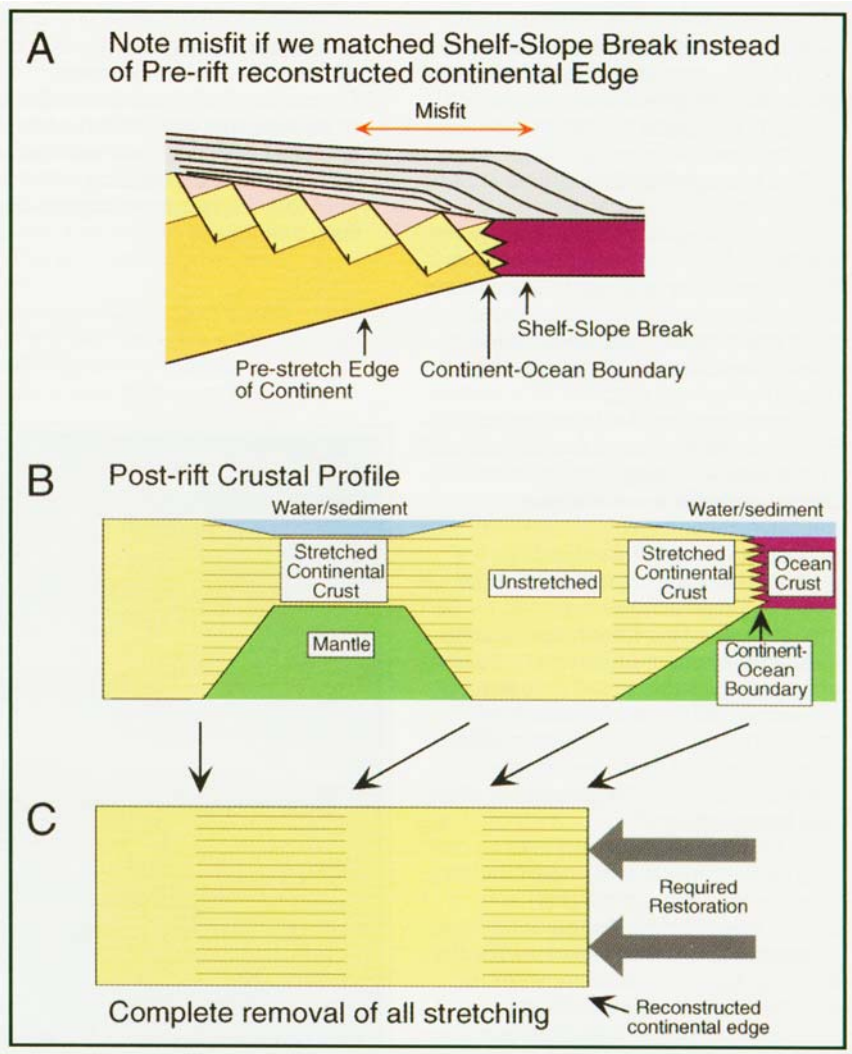


Figure 7. a. Cartoon section showing how passive margin sediments (deltas, turbidites, carbonate banks) can prograde far beyond the original position of the continental edge. 7b and 7c show a simple method of estimating and restoring crustal extension during rifting and passive margin formation. The cross-sectional area of the stretched crust (hatch-pattern) must equal that of the unstretched crust after sediment, water and mantle have been removed from the cross section.

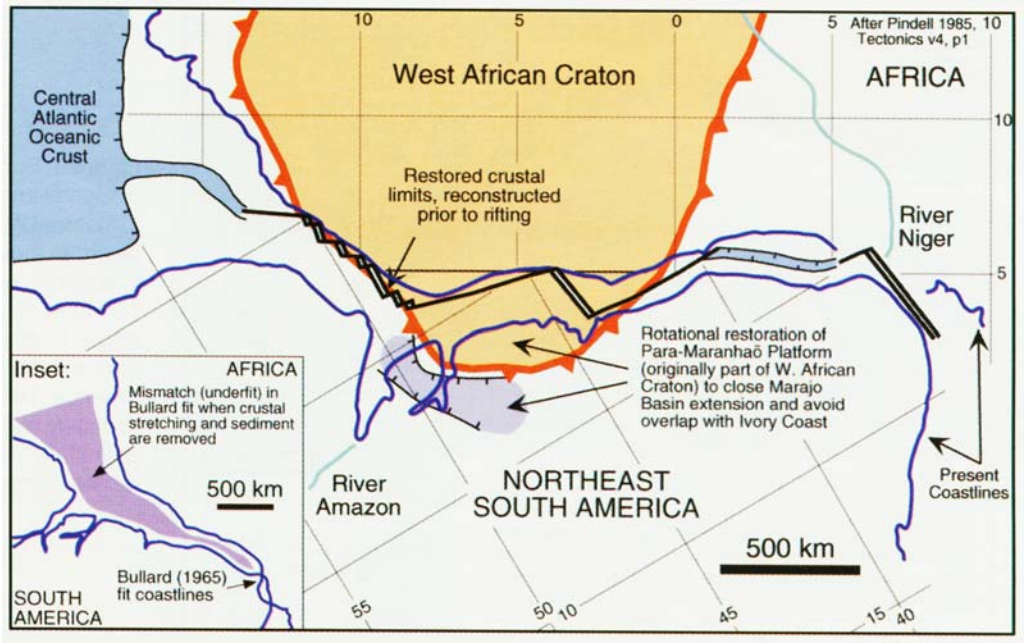


Figure 8. Pre-Aptian Equatorial Atlantic reconstruction in which the restored pre-rift limits of continental crust (i.e., methodology of Figure 7) are juxtaposed. Note resulting simple geometry for Aptian rifting. Inset: Bullard (1965) reconstruction of the two continents, which realigned the 2,000 m isobaths of today's passive margins (not shown), showing the pre-rift limits of continental crust for each, as well as the large region of continental underfit in the absence of the sedimentary sections.

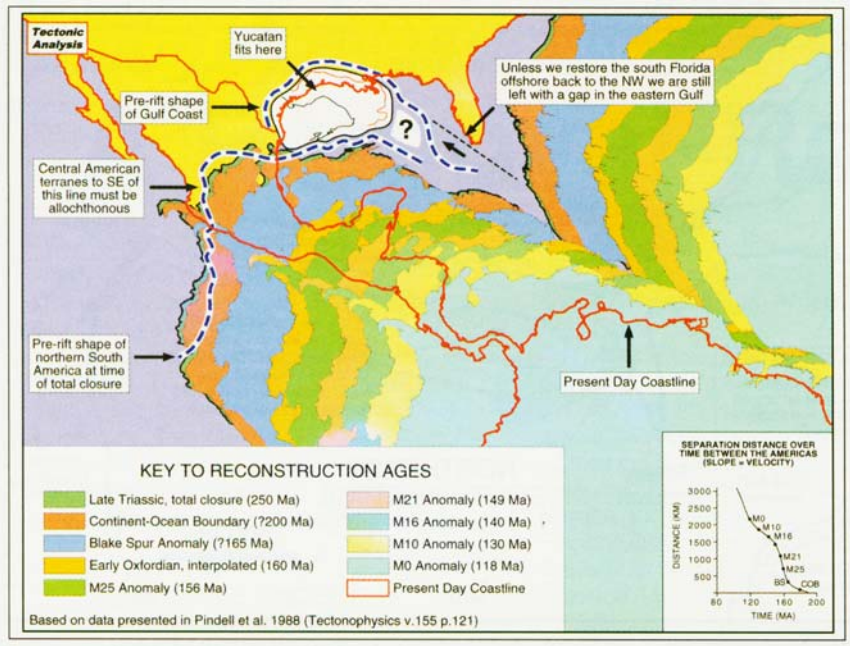
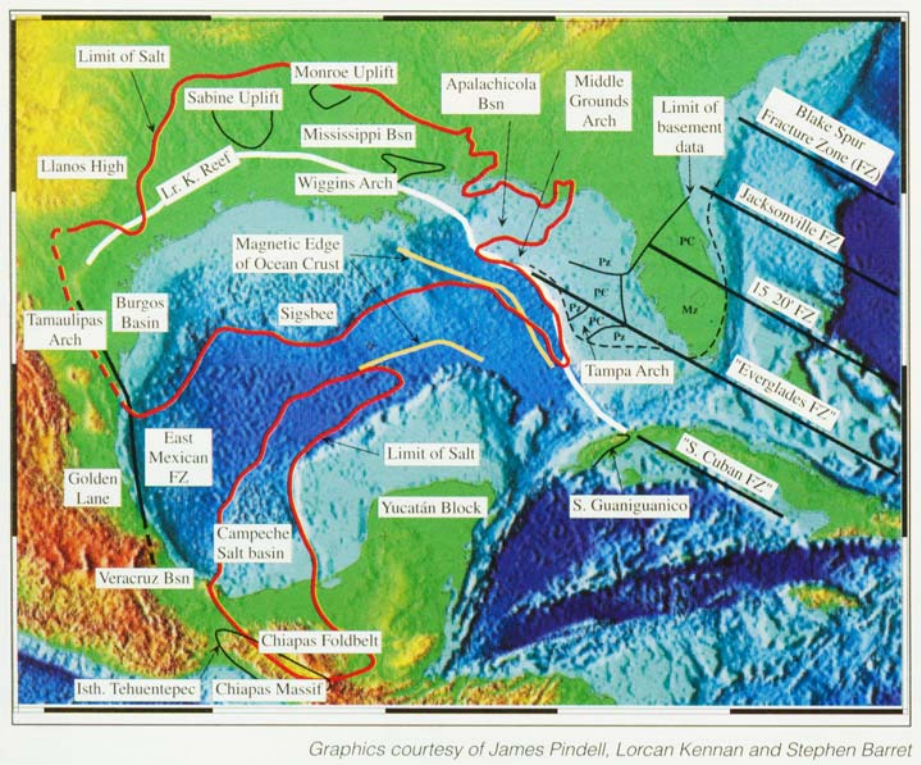


Figure 9. Successive pre-Aptian reconstructions of Gondwana and North America, using the Equatorial Atlantic fit of Figure 8. This analysis provides a quantitative framework in which to build more locally detailed models of the evolution of the Gulf of Mexico and surrounding areas. Note pre-Andean/pre-rift restoration of the northern Andes on the Triassic position of South America: This defines how much of Mexico is definitely allochthonous versus how much is potentially -- but not necessarily -- autochthonous.



Graphics courtesy of James Pindell, Lorcan Kennan and Stephen Barret

Figure 10. Present day map of the Gulf of Mexico region, showing key geological elements addressed in this month's article. Note the abrupt terminations of known basement units in southern Florida that we consider were truncated by transcurrent motion on our "Everglades Fracture Zone." Also note the change in trend of East Mexican Marginal Fault Zone supporting the concept of two stages of Gulf evolution; basement structure contour data preclude any east-west faults in Mexico from entering the Gulf during the sea-floor spreading stage. Digital bathymetry/relief after Sandwell and Smith (1997), other features from multiple sources.

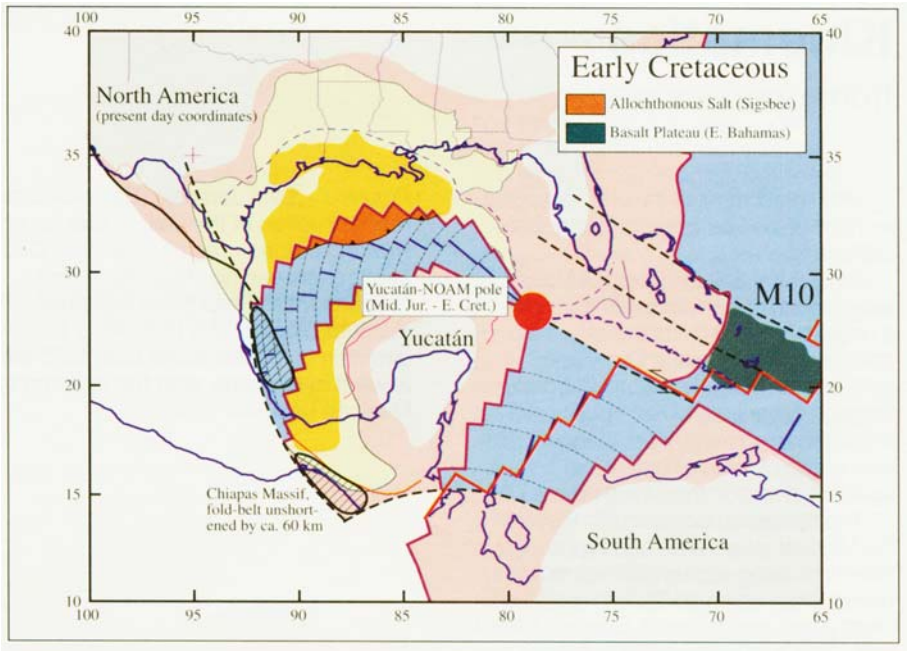


Figure 11. Early Cretaceous (Valanginian) reconstruction of the Gulf of Mexico and Proto-Caribbean region. Post-Gulf formation stage, when seafloor spreading in the Gulf had ceased but was continuing in the Proto-Caribbean seaway.

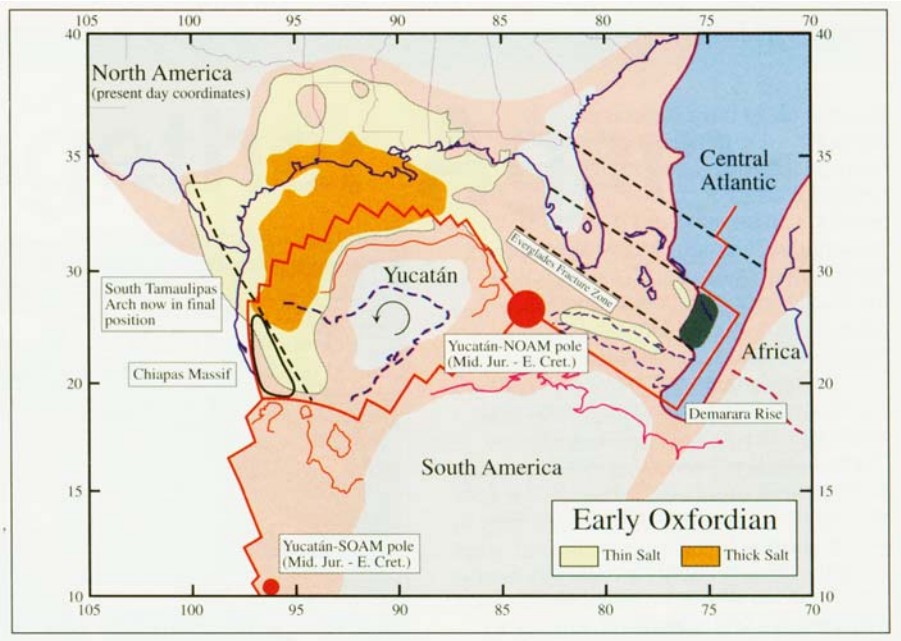


Figure 12. Late Jurassic (Early Oxfordian) reconstruction of the Gulf of Mexico and Proto-Caribbean region ("salt fit"). Onset of seafloor-spreading stage. Note that Chiapas Massif has been transferred to Yucatan Block at this time. Also, bulk strain direction in Mexico shifts from ESE-ward to S-ward at this time, with the opening of the Mexican back-arc basin.

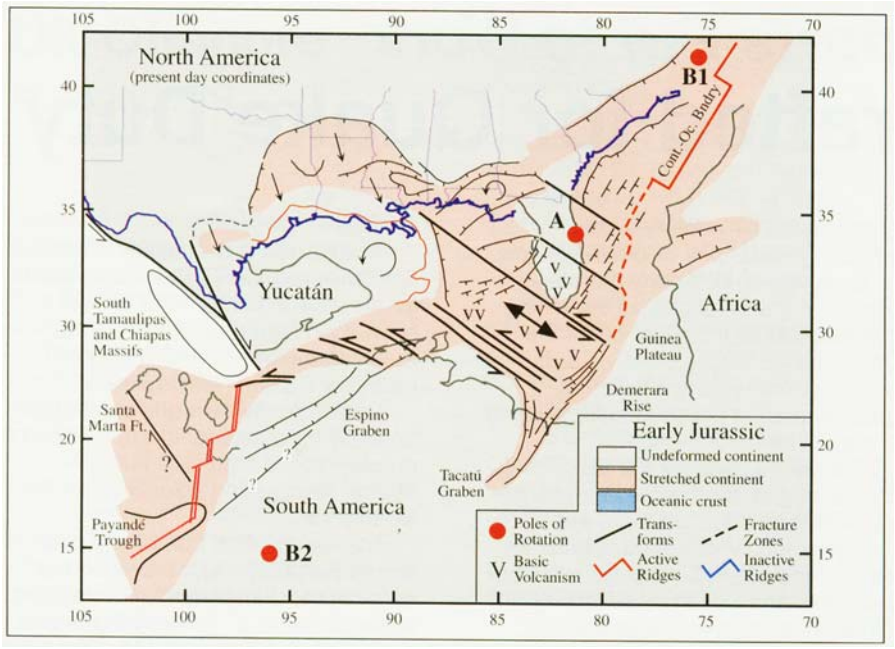


Figure 13. Jurassic reconstruction of the Gulf of Mexico and Proto-Caribbean region. Onset of "syn-rift" stage.