

East, West, Which Is Best? Brazilian Versus West African Transform Margin Hydrocarbon Play Elements

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Exploration success along the West Africa margin between Sierra Leone and Chain FZs prompted a review of the conjugate South American basins and play elements. The area is well-illustrated with modern potential fields data and published maps. We determined a structural signature associated with Ghanian (Jubilee) and Sierra Leone (Venus) slope fan reservoir systems and located similar features on the conjugate margin. Oil families correlate to structural compartments defined from grav-mag data so we also analyzed oil-to-source indicators. Of our oil samples from Brazil's Foz do Amazonas to the Potiguar and offshore Ivory Coast, about 80% have been typed to families (hence depositional environments) of origin.

Correlation from Para Maranhao/Foz do Amazonas and the Ivory Coast relates oils derived from a mixed (lacustrine and marine) kerogen assemblage and/or source rocks deposited in a sag basinal setting; or alternatively, mixed in the reservoir from lacustrine (Aptian) and marine (Upper Cretaceous) sources. Brazil's Potiguar and Ceara basins show a proximal to distal basin trend from lacustrine (syn-rift I to syn-rift II) to more marine source. Ceara exhibits both Aptian transitional marine and Neocomian/Barremian lacustrine fresh-brackish sources. Potiguar contains a little of everything but distal offshore sources are syn-rift II lacustrine and more Cretaceous marine/mixed with African affinities. As with correlations between Greater Campos and Aptian Salt Basin oils, we infer West African syn-rift sources corresponding to basin geometries in Ceara-Potiguar. Extrapolation of Brazilian source trends to West Africa prefers coast-parallel graben for the younger syn-rift II to marine source and coast-orthogonal graben for the older syn-rift I source.

Despite complexity resulting from transform motion overprinting earlier extension, structural features are clear at scales of 6-8 km and larger. We extrapolated these elements into the undrilled Brazilian margin across thinned continental and transitional crust and limited prospectivity to areas with a minimum total sediment isopach of 3 km. Our mapping suggests that Brazilian exploration can benefit from West African reservoir system models even as West African exploration benefits from Brazilian source rock data.