

Basin Modeling of Hydrocarbon Systems Along the Continental Margin Basins of Angola, Congo, and Brazil

Smith, Phillip R.¹, Ian O. Norton¹, Kevin Bohacs², Chris Tapscott¹, Robert Cunningham¹, Will B. Maze³, Steve Creaney³ (1) ExxonMobil, Houston, TX (2) ExxonMobil Upstream Research Company, Houston, TX (3) ExxonMobil Exploration Company, Houston, TX

Exploration activities offshore the South Atlantic have focused on deepwater areas along the continental slope. Lowering play and prospect risk by using basin modeling has become critical for deepwater exploration economics.

A wide continental margin underlain by transitional crust is interpreted along the South Atlantic salt basins. Thick synrift sediments were deposited in grabens that locally contain rich, lacustrine source rocks. Thick salt was deposited during marine incursion and subsequent restriction of rift basins in the Aptian. Salt was deposited on a gentle surface unlike the previous higher relief, rifted terrain. The local slope of the pre-salt surface, underlying rigid basement highs and compactable thick synrift sediments, played roles in subsequent structural deformation.

Aptian salt distribution and deformation style controlled major Tertiary structural trends. Deformation processes resulted in a complex distribution of Tertiary structures and structural styles. Extensional areas are linked to loading and salt withdrawal on the shelf and upper slope. Contractional trends develop in the lower slope and rise and are often reflected in the water bottom topography. Belts of extensional structures, vertical salt structures, and contractional structures can occur from shallow to deep water. The distribution of structures and structural styles are generally not homogeneous within the belts due to the multiple episodes of salt deformation and the complex interplay between structure and sedimentation. Abundant structuring and the stacked nature of both reservoir and source units within an active hydrocarbon generation area provide for an effective hydrocarbon system (historical success ratio >30%).