The Complex Interaction between Sedimentation and Structural Evolution Observed in the Eastern Offshore of Trinidad and Tobago

Kevin Meyer*
Talisman Energy Inc, Calgary, AB, Canada
kmeyer@talisman-energy.com

and

Adrian Ruiter, Dave Mundy, Kim Safton
Talisman Energy Inc, Calgary, AB, Canada

Predicting presence and thickness of sedimentary packages has proved challenging in the poorly imaged, complex structures of the Tertiary Fold and Thrust Belt, offshore Eastern Trinidad. Until recently, only limited well penetrations existed on onshore eastern Trinidad and the adjacent offshore areas. Recent well penetrations have been critical in developing a detailed and reliable structural/depositional model for the Oligocene and Miocene intervals, the current exploration targets for hydrocarbons.

Prediction of sediment distribution in eastern Trinidad is complicated by the interplay through time of factors such as local tectonism, eustatic sea levels, sediment delivery pathways and source, and receiving basin size and shape. The effect of local tectonism on sediment supply is interpreted to have been the major control on sediment distribution in the Oligocene and Miocene strata of Eastern Trinidad. This interpretation is based on a link between sedimentation and the structures created as a result of the arrival of the Caribbean Plate in the region. The larger scale effect that the Caribbean plate had on eastern Trinidad appears to be the creation of a foreland style basin associated with crustal down warping during the Early Oligocene. The immediately subsequent arrival of the thrust belt itself, with its emergent, active folds and faults created a series of piggyback basins that had a significant influence on sedimentation styles. The links between the structural and sedimentation histories created significant lateral and temporal variability through time. The most significant changes in sedimentation patterns include:

1) Wide variation in depositional patterns, including the location and areal extent of sediment depo-centers. It appears that receiving basins changed in size and shape through time as a result of the varying influences of the Caribbean plate. This interaction created a significant variation in the location and thickness of the sediments through time.

2) Styles and environments of deposition were also affected by the apparent change in basin size and styles. Significant decreases in basin size changed their access to shelf derived sediments creating significant variability in basin fills, ranging from starved or shale-filled basins to very thick successions of coarse grained clastics. Depositional mechanisms were also influenced, the much larger Early Oligocene basins having better developed turbidite and debris flow deposits, while the more confined, smaller, younger basins typically have poorly developed debris flows and slumps.

3) Probably the most significant effect on these sediments was deformation and/or removal of sediments as a result of immediately post-depositional thrusting and erosion. Erosion of the uplifted highs was an additional source of sediment for the younger depo-centers diluting the input from the continental shelf. The younger Miocene to recent strike-slip event that affected the region modified the already highly deformed thrusted sediments and led to the additional instances of over thickening or removal of strata across the Eastern offshore area

Our increased understanding of the structural history and the effect it has on sediment supply and distribution, deformation and accommodation has allowed the development of a geologic model that attempts to predict sediment distribution and aid in the identification of geological trends in the Eastern offshore of Trinidad. It is our hope that this model will promote continued exploration in these prospective intervals in the region.