Three Dimensional Structural Analysis of a Salt Cored Convergent Transfer Zone in the South Timbalier Block 54, Offshore Gulf of Mexico

Bose, Shamik [1]; Mitra, Shankar [1] (1) ConocoPhillips School of Geology and Geophysics, University of Oklahoma, Norman, OK.

The Louisiana style of faulting is characterized by short arcuate regional and counter-regional growth fault systems that commonly form complex transfer zones above shallow, Miocene level salt bodies. South Timbalier Block 54 (ST 54) constitutes one such area where a convergent transfer zone is present between a basin-ward dipping regional and a landward dipping counter-regional fault. 3D seismic data along with well logs have been used to interpret the structure of four offshore blocks adjacent to ST 54. The interpreted horizons have been converted to depth using a velocity cube created from time surfaces, check-shots and well tops. A 3D structural model using depth converted horizons, balanced cross sections and well tops has been constructed to accurately represent the subsurface structure. The interpretation reveals that the eastern and western flanks of the structure contain different thicknesses of salt in the footwalls of the main regional and counter-regional faults, but the salt rises to a much shallower stratigraphic level within the transfer zone, thus forming a collapsed crestal structure. The secondary antithetic and synthetic faults adjacent to the two main faults and also extending into the transfer zone, are responsible for accommodating slip between the main faults. Kinematic restorations of a series of cross sections across the structure provide possible answers to the evolution of the transfer zone with respect to the flow and evacuation of salt. Analog clay models have also been used to gather insight on the formation of the structure, secondary fault systems and the flow of mobile substrate. Wet clay, underlain by silicon polymer fluid which acts as an analog of salt, is placed above two flat overlapping base-plates. One of the base-plates is pulled away from the other along a low angle slope towards the direction of extension. The surfaces of the clay models have been scanned with a 3D laser scanner in order to develop a virtual 3D model for accurate measurements of topography, fault slips and relief changes. The models reveal that convergent transfer zones form when there are lateral variations in the thickness of the silicon fluid. Understanding the evolution of the structure in ST 54 helps us perceive similar structures in other areas of the Northern Gulf of Mexico and helps establish the relationship between salt evacuation and transfer zone development.