

## **Use of Biostratigraphy and 3D Seismic Data to Reinterpret Depositional Environments of the Lower Cruse in the Southern Basin of Trinidad**

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### **Abstract**

In the Southern basin of Trinidad about 60% of the hydrocarbons produced to date come from the Cruse Formation. The Cruse represents a progradational sequence of deep water turbidites to shallow water (deltaic) sediments. The top of this sequence is marked by an unconformity that is overlain by the Forest Formation, which represents another progradational sequence of prodelta to shallow water deltaic sediments.

Sequence stratigraphic models previously placed upper bathyal Lower Cruse deposits in the lowstand systems tract, slope fans and basin floor fans of a third order cycle. This upper bathyal setting for Lower Cruse sedimentation extends for over 100 km from the Gulf of Paria in the West to the Maloney Field on the East Coast of Trinidad.

This sequence stratigraphic model has now been revised based on recent integrated work using paleobathymetries, log motifs, and seismic attributes where some middle neritic sediments previously interpreted to be Middle Cruse have now been identified as a slumped facies within the Lower Cruse. The Lower Cruse continues to be interpreted as lowstand deposits but the thick sand deposits have now been interpreted to have been deposited in mini-basins on the slope and constitute low stand slope fans. Regionally the Lower Cruse interval is dominated by claystones and occasionally by thick sands.

Spectral decomposition was used to further understand the stratigraphic setting of the Lower Cruse. Various tuning cubes were generated for the interval and it was observed that each frequency was tuned at a different thickness. A low frequency of 10 Hz and a time window of 100 ms illustrated a channelized system with a sand trend from SW – NE and source direction from the SW. Spectral decomposition was also used to calculate the thickness of the sand (513 feet) within the system. This value was in close comparison to the sand thickness derived from the geological model. A SW-NE trending progradational feature was mapped using seismic data, which internally exhibited bidirectional downlap that created potential closure in an up dip direction. An exploration well has been proposed to 12,500 ft to test the validity of this stratigraphic trap.