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Re-Evaluation of Field X Located in Northern Lake Albert Basin to Refine the Structural Interpretation

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Abstract : Field X is located on the Eastern shores of L. Albert, Uganda, on the rift flank where the gross sedimentary fill is typically less than 2,000m. The field was discovered in 2006 and encountered about 20.4m of net pay across three (3) stratigraphic intervals within the discovery well. The field covers an area of 3 km2, with the structural configuration comprising a 3-way dip-closed hanging wall anticline that seals against the basement to the southeast along the bounding fault. Field X had been mapped on reprocessed 3D seismic data, which was originally acquired in 2007 and reprocessed in 2013. The seismic data quality is good across the field, and reprocessing work reduced the uncertainty in the location of the bounding fault and enhanced the lateral continuity of reservoir reflectors. The current study was a re-evaluation of Field X to refine fault interpretation and understand the structural uncertainties associated with the field. The seismic data, and three (3) wells datasets were used during the study. The evaluation followed standard workflows using Petrel software and structural attribute analysis. The process spanned from seismic- -well tie, structural interpretation, and structural uncertainty analysis. Analysis of three (3) well ties generated for the 3 wells provided a geophysical interpretation that was consistent with geological picks. The generated time-depth curves showed a general increase in velocity with burial depth. However, separation in curve trends observed below 1100m was mainly attributed to minimal lateral variation in velocity between the wells. In addition to Attribute analysis, three velocity modeling approaches were evaluated, including the Time-Depth Curve, Vo+ kZ, and Average Velocity Method. The generated models were calibrated at well locations using well tops to obtain the best velocity model for Field X. The Time-depth method resulted in more reliable depth surfaces with good structural coherence between the TWT and depth maps with minimal error at well locations of 2 to 5m. Both the NNE-SSW rift border fault and minor faults in the existing interpretation were reevaluated. However, the new interpretation delineated an E-W trending fault in the northern part of the field that had not been interpreted before. The fault was interpreted at all stratigraphic levels and thus propagates from the basement to the surface and is an active fault today. It was also noted that the entire field is less faulted with more faults in the deeper part of the field. The major structural uncertainties defined included 1) The time horizons due to reduced data quality, especially in the deeper parts of the structure, an error equal to one-third of the reflection time thickness was assumed, 2) Check shot analysis showed varying velocities within the wells thus varying depth values for each well, and 3) Very few average velocity points due to limited wells produced a pessimistic average Velocity model.

Keywords : 3D seismic data interpretation, structural uncertainties, attribute analysis, velocity modelling approaches
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