Using 2-dimensional seismic modelling to support observed DHIs the Columbus Basin, Trinidad

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The presence of direct hydrocarbon indicators (DHIs) has been proven to be a good criterion when assessing the technical risk and uncertainty of undrilled hydrocarbon prospects in Trinidad's Columbus basin. Cross-cutting reflectors (CCRs), also known as flat spots, are great as fluid indicators but can present themselves on seismic data for several reasons. It is therefore important to test their validity as a hydrocarbon indicator. This presentation uses a case study to demonstrate how integrating 2-dimensional (2D) seismic modelling together with common seismic interpretation and analysis of an unpenetrated segment can be used to support the validity of using an observed CCR to represent a gas water contact (GWC) and help determine its depth and uncertainty range.

The segment was identified as a three-way dip closure trapped against normal fault with good amplitude conformance and an accompanying CCR. Attribute analysis such as amplitude extractions and a series of amplitude versus depth plots were generated for the segment. These were then used to assess the possible depths of the GWC. An analogous offset well was identified, and rock property analyses were carried out on the well for use in the 2D model. The 2D model of the segment in a strike orientation was generated using similar frequency content as the real seismic data and compared with the initial observations to determine both the validity and depth of the CCR.

The analysis supported the use of the observed CCR as the GWC for the segment. The model observations had a high correlation with the real data. These observations were then used to determine a final GWC uncertainty range and better inform the technical risk profile of the segment. Key learnings on the frequency of data used and the importance of alternative datasets were highlighted as part of this study.