The Barque Structure Offshore New Zealand: Improving the Seismic Image Using Prestack Depth Migration

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Abstract

The Barque structure is a large four-way dip closure located in the southern ocean offshore southeastern New Zealand in Petroleum Exploration Permit PEP38259. This permit is situated in the offshore part of the Canterbury Basin towards the southern end of the continental shelf of the basin. Figure 1 shows the geographical location of the permit area.

Significant velocity and seismic imaging issues arise due to large submarine canyons which distort the time image over the structure. In 2009, the Joint Venture acquired nine new lines of 2D seismic over Barque and processed these with prestack depth migration (PSDM). A key element used for this PSDM imaging was a technology to estimate the near water bottom interval velocity of the sediments using geo-mechanical principles. The results showed that this new methodology provided good improvement in the seismic image. The Joint Venture therefore decided to reprocess a vintage grid of 1982 and 1984 lines over the prospect in order to improve the images from the legacy data and aid in mapping the structure.

Here, we present the state of the art seismic reprocessing and imaging workflow, explain the idea of using geo-mechanical principles to estimate the sediments just below the water bottom and show the improvements in imaging gained from the prestack depth migration of the vintage seismic data.