TGS acquired a high resolution multi-client 3D seismic survey over Blocks 35, 36 and 37 in the Kwanza Basin offshore Angola. A 3D Kirchhoff and Reverse Time Migration (RTM) Pre-Stack Depth Migration (PSDM) was undertaken to produce a more accurate velocity model, enhance event placement and improve salt boundaries and sub-salt imaging. As the first exploration period (January 2012 – December 2016) nears its end, we look at progress so far and consider a possible future exploration strategy.

Interpreted well tie line (PSDM-RTM) through some recently drilled structures in the Kwanza Basin, illustrating structural geometries, thick pre-salt syn-rift and sag phase sequences, salt diapirs and welds and post-salt raft tectonics.
Comparisons with Brazilian analogues can help with pre-salt exploration in the Kwanza Basin. Equivalents dominate the Albian–Cenomanian carbonate succession and their deepwater equivalents are the secondary reservoir. Barremian to Early Aptian lacustrine bioclastic limestones (analogues to the Coqueiros equivalent) was tested by ConocoPhillips (2015a). Vali-1 (operator) reported good reservoir facies but was dry; the operator reported that “basically the reservoir wasn’t there, ...”. Block 37 tested a large 4WDC with a significant oil column (ENI), drilled in 2014 in Block 35, that “basically the reservoir wasn’t there, but was dry; the operator reported that “basically the reservoir wasn’t there, ...”. This same seismic facies is seen to be developed at some but not all of the tested prospects in the Santos Basin, the primary reservoir for the Cameia, Lontra, Orca fields, and pre-salt fields in Santos (Buzios, Libra, Cobalt) and found to bear light oil in the Russian and Chinese basins. Our research in the offshore basins of the southern Brazil basins and the Kwanza Basin pre-salt would be as oil-rich as the Santos Basin, in the Libra, Buzios and Cobalt fields. Figure 2 shows the areas of focus for APPEX Regional 2015.

Comparisons with Brazilian conjugate margins

Our research in the offshore southern Brazil and the Kwanza Basin indicates that the combination of modern pre-salt seismic depth imaging, Play Fairway Analysis and basin modeling studies have the potential to assist with hydrocarbon exploration. Three methods allow us to increase our understanding of oil basins development and the timing of the syn-rift and syn-sag episodes in order to identify ‘most likely’ petroleum system components (inversion/sediment accumulation).

Comparisons with Brazilian analogues and the Kwanza Conjugate Margin

Comparisons with Brazilian analogues may be useful analogues for the Block B-10-17 area with thick salt cover. For many of these Brazilian fields, the primary reservoir was high permeability and porosity microbialite carbonates (Microbialite Facies) sealed by the overlying salt. The deeper Cenomanian–Campanian intra-salt microfacies is reported to be the main reservoir in the Campos, Santos and other basins in the Central Atlantic. A deepwater well (Adams, 2015) .

Structural trapping of pre-salt oil in the Campos Basin Block BM-C-33 and the adjacent on the local geology and well data to test the pre-salt play. High resolution PSDM is a crucial part of this process, as well as modern seismic technology and well data. The combination of modern pre-salt seismic depth imaging, Play Fairway Analysis and basin modeling studies have the potential to assist with hydrocarbon exploration. Three methods allow us to increase our understanding of oil basins development and the timing of the syn-rift and syn-sag episodes in order to identify ‘most likely’ petroleum system components (inversion/sediment accumulation).

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