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Strike Line Methodology as an Effective Exploration Tool
(Looking for Elephants in Bolivia).

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Strike Line Methodology as an Effective Exploration Tool

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Abstract

In the mid-1990s, Repsol, through its daughter company YPF-Maxus, was actively exploring for large gas fields in the fold and thrust belt of Bolivia. Building off its regional knowledge along trend in Argentina, the company had acquired three large concessions in what has turned out to be a very successful play. This presentation highlights some of the technical difficulties we overcame while using surface geology and 2D seismic data to identify drillable prospects.

Exploring in fold and thrust belt regions is made difficult by two main factors: complex geology and expensive seismic acquisition. We used a method we call strike line methodology in the Southern Sub-Andean fold and thrust belt of Bolivia in the initial exploration stages to reduce the cost of identifying prospects with seismic and improve the overall quality of the data. This same technique can be applied in many fold and thrust belts.

The strike line methodology consists of splitting the seismic acquisition campaign into two phases. During the first phase, long regional strike lines are located along the backlimbs of the exposed folds using surface geology maps to keep the lines in the Tertiary age outcrops. We get the best quality data in these rocks and it is cheaper to shoot in the flatter terrain. During the second acquisition phase, we shoot dip lines and, usually, a forelimb strike line over any culmination identified from the backlimb lines. In this way, we do not waste exploration budget on acquiring the more expensive dip line data over non-prospective areas.

Interpreting the seismic data set is an iterative process that incorporates surface geology, balanced cross sections, and forward modeling to constrain the final results. Interpretation is done on non-migrated stack sections since these should tie in the time domain. These time surfaces are then map-migrated to depth, which both shifts the culminations in space and collapses the area of the closure. Forward 3D modeling of the final structural interpretation validates the ability of the off-structure strike lines to image the crest of structures, especially in steep dip areas.

The discovery of the multi-TCF gas field Margarita is the result of dedicated work from many people still working for Repsol YPF. The earliest advocate of the strike line methodology and chief promoter of the Bolivia play is Daniel Figueroa (Buenos Aires). Credit also goes to Rene Manceda, Alfredo Otero (Santa Cruz), and Wicaksono (Buenos Aires).

Biography

Bruce Blake has worked for Repsol YPF principally as a geophysicist since 1988 in various trends around the world including the Gulf of Mexico, Indonesia, Bolivia, Trinidad and west Africa. Prior to joining Maxus, he worked for Hunt Oil and Houston Oil & Minerals. He received a B.S. in Geophysics from Texas A&M in 1977. His main areas of interest are structural interpretation, depth conversions, and seismic attribute (AVO) response.