Rejuvenated Seismic Data Available to Boost Exploration in the Flex Trend

**Dataset improves knowledge in GoM subsalt.**

CONTRIBUTED BY PGS

Newly reprocessed 3-D streamer and OBC data covering 1,158 sq miles (3,000 sq km) have been added to PGS' Flex Vision dataset in the Gulf of Mexico (GoM), now covering 2,703 sq miles (7,000 sq km). Industry interest in these high-resolution depth images has stimulated processing of a further 3,861 sq miles (10,000 sq km) across the Flex Trend. South Timbalier, Ship Shoal, Grand Isle, Ewing Bank and the northern part of Green Canyon are now reprocessed, providing clearer images of existing fields and proven undeveloped reserves.

Flex Vision provides tailored images using Kirchhoff for shallower targets, delivering broad frequency content and reliable amplitudes, and reverse time migration (RTM) for regional understanding and to unlock deeper plays. Due to oilfield infrastructure, new seismic acquisition in the area is difficult and expensive, so rejuvenation of legacy seismic data is a cost-effective solution. To exploit near-field suprasalt reserves, high-resolution seismic images are needed to accurately position existing and new plays. Prolonging the life of subsalt fields, such as Mahogany and Hickory, is only possible by improving models and discovering deeper prospects from superior seismic images, such as those offered by Flex Vision.

Salt model building for better understanding of salt geometry

The data, re-mastered from field tape with full source and receiver deghosting applied, create a broadband dataset. PGS' unique dual convolutional and wavefield-modeled surface related demultiple flow uses Separated Wavefield Imaging (SWIM) to both attenuate the complex multiples associated with the Flex Trend and accurately image the shallow-water bottom.

A full-waveform inversion (FWI) approach was used to build the sediment velocity model. The salt velocity model was built using innovative salt modeling con-
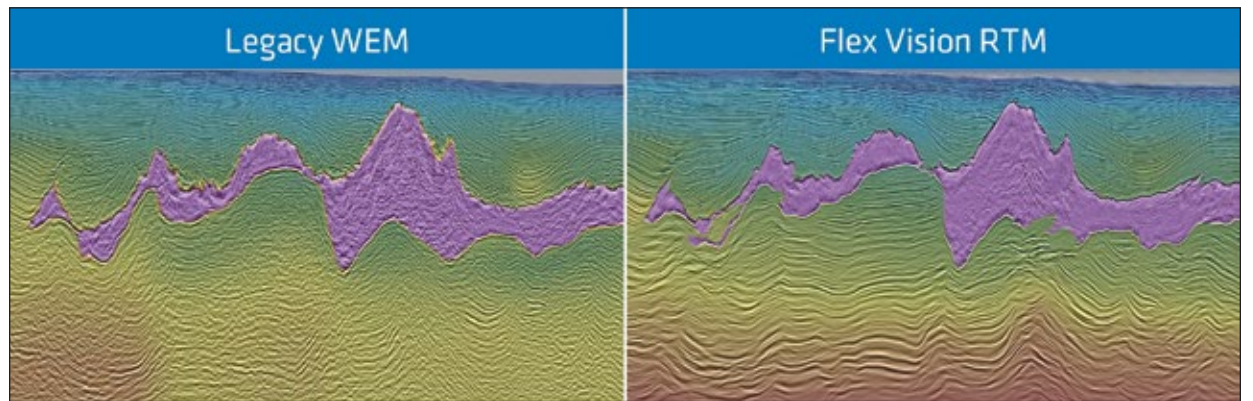
A comparison of legacy WEM with Flex Vision RTM illustrates how Flex Vision allows mapping of Paleogene and older systems down to 40,000 ft. (Image courtesy of PGS)

cepts based on a geological understanding of the salt tectonics associated with the extensional-compressional regime characterized by the Roho basins. Based on this concept, salt scenario testing used a lean salt approach, which dramatically improves the subsalt imaging. Following tomography, the subsalt sediment velocities were calibrated using well information. Roho basins kinematically balance updip extension and downdip compression along low angle detachments. Individual Roho systems may have different kinematic directions while interfering with neighboring basins and result in complex salt geometries along their fringes. The complexity of salt bodies results from multiple deformation events between salt flow and extensional/compressional movement in the basins. This interpretation revises the role of salt keels replacing massive salt feeders with welded salt delivery systems.

The complex salt geometry was competently handled using an accurate velocity model and RTM to reveal structures in the subsalt. Mode converted waves interfere with the imaged subsalt producing sands and were attenuated by modeling and migrating the mode conversions and adaptively subtracting them from the image. A structural version of the RTM is available for mapping and understanding the deep structures.

One contiguous flex trend dataset

Flex Vision delivers a comprehensive and geologically conformable dataset in complex salt architecture. The accurate velocity model was used in the migration to produce broadband Kirchhoff prestack depth domain images and a 35 Hz RTM volume. The Kirchhoff data provide a high-resolution shallow section revealing subtle shallow stratigraphic and structural traps as well as shallow gas hazards. The imaging is amplitude versus offset compliant with available angle stacks and migrated gathers for reservoir characterization. The 35 Hz RTM volume images the Miocene play fairways and potential in the Lower Tertiary. The structural RTM is ideal for mapping sediments terminating against salt walls and determining the structure of the section below 39,370 ft (12,000 m), giving regional context and a broad understanding of the structural and depositional framework. Depositional systems transit this 3-D volume from north to south, into the prolific hydrocarbon province of the deepwater GoM. Flex Vision will cover 11,583 sq miles (30,000 sq km) and will therefore be instrumental in improving understanding of these systems, giving explorers an edge over their competitors. ∎

INDUSTRY NEWS
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GeoTomo Announces Partnerships

GeoTomo LLC, a provider of advanced land near-surface and subsurface seismic processing and imaging software products and services, and Z-Terra, a provider of interactive depth imaging and velocity model building software products and services, have announced the availability of an integration between seismic data processing software products and services to advance land time and depth processing workflows.

The direct connection between GeoTomo's GeoThrust and TomoPlus software and Z-Terra's full depth imaging system, which includes RTM, WEM, Gaussian and fast beam migration and beam tomography along with conventional Kirchhoff and ray-based tomography, allows companies to quickly optimize and apply advanced anisotropic processing workflows. The workflow begins with raw field data continuing through final images and deliverables. The complete interactive processing workflow consists of geometry building and QC, travel time tomography, signal enhancement and anisotropic prestack time migration to near-surface, subsurface velocity model building and updating and prestack anisotropic depth migration.

In addition, GeoTomo and HSB Geophysical, a provider of comprehensive well log modeling software tools and services, have announced the availability of seismic data processing software products and services to easily leverage knowledge garnered from well logs into time processing and interpretation workflows.

The direct connection between GeoTomo GeoThrust and TomoPlus software and HSB geophysical toolkits greatly enhances the processing and interpretation workflow of the GeoTomo user. TIPS is a software tool used throughout the industry that delivers an interactive integration of seismic and well log data for comprehensive AVO analysis and for performing seismic well ties. The comprehensive integration of these tools with TIPS, enables companies to verify their time processing workflows with well logs to ensure the images are compatible with the geologic response.

INOVA Geophysical Announces Deals

INOVA Geophysical Equipment Ltd. has announced the sale of 5,000 channels of G3i HD, INOVA's cable-based land recording system to India based, Mahaabala Geo Pvt Ltd. The deal also includes six of the new INOVA ShotPro HD for use alongside the G3i HD acquisition system. The system will be used for providing 3-D seismic data acquisition services to the logistically difficult terrain in the state of Tripura, India. INOVA's G3i HD cable acquisition system is designed to maximize return on investment by reducing equipment related downtime and minimizing the impact of harsh environmental and operational conditions. It supports high channel count, advanced vibroseis acquisition for all 2-D, 3-D or time-lapse 4-D seismic programs.

INOVA Geophysical also has announced the strengthening of its partnership with Mitcham Industries by agreeing to deliver 20,000 Quantum nodes during the

current fiscal year. This large purchase is initially slated to be part of a vast nodal based seismic acquisition project to be undertaken in Europe and will become available to Mitcham's rental clientele immediately following.

SAExploration Completes Milestone Project

SAExploration Holdings Inc. has announced it has successfully completed the largest shallow- water ocean-bottom marine project in the company's history. Contracted to SAExploration by a major national oil company, the project, located in the Arabian Sea off the coast of India, utilized more than 20 vessels. These included three ocean-bottom node (OBN) deployment vessels and two seismic source vessels operating in dual source/simultaneous source mode. A total of 5,400 ocean-bottom nodes and in excess of 1,300 km of rope were deployed on the project to acquire approximately 1,200 sq km of full fold seismic data.

Fugro Succeeds with New Seep Survey License Sales Offshore Newfoundland

Fugro and partner Amplified Geochemical Imaging (AGI), are reporting recent success selling multiple licenses for data from frontier regions offshore east coast Canada. The data was acquired during two separate hydrocarbon seep surveys in the Orphan Basin (2017) and Carson Basin (2018), both situated on the continental margin of Newfoundland.