# Oil & Natural Gas Technology

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# Quarterly Research Performance Progress Report (Period ending 01/31/2013)

## Structural and Stratigraphic Controls on Methane Hydrate occurance and distribution: Gulf of Mexico, Walker Ridge 313 and Green Canyon 955

**Project Period: 10/01/2012 – 09/30/2015**


Submitted by:
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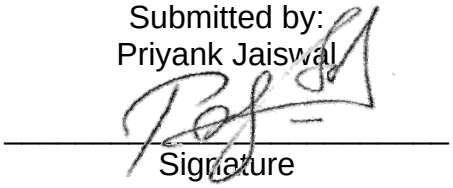

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## Executive Summary

This quarterly progress summarizes the progress made towards Phase 1, Subtask 2.1 –Data Processing. Seismic profile under consideration is a 2D line extracted from 3D survey. The headers have been extracted from the SEGY headers for creating navigation database in the processing software.

## Background

The overall objective is to identify and understand structural and stratigraphic controls on hydrate accumulation and distribution in leased blocks WR313 (WR: Walker Ridge) and GC955 (GC: Green Canyon) in the Gulf of Mexico using seismic and well data. The effort shall be completed in three phases. In the first phase, the objective is to create a large-sale (resolution in the order of Fresnel zone) P-wave velocity model using traveltime inversion and a corresponding depth image using pre-stack depth migration (PSDM). In the second phase, the objective is to refine the resolution of the P-wave velocity model created in the first phase to the order of seismic wavelength using full-waveform inversion and simultaneously create P-wave attenuation model. The third phase has two objectives. The first objective is to create a hydrate distribution map with the help of P-wave velocity and attenuation model created in the second phase and standard rock physics modeling method. The second objective is to jointly interpret the saturation map, Full-Waveform Inversion (FWI) velocity and attenuation, and the PSDM image to determine the structural and stratigraphic controls on hydrate occurrence and distribution.

## Phase 1, Subtask 2.1

The project is initiated by meticulously studying the details of headers values in the seismic gathers provided by M/S/ CGG Inc. Additional information from CGG on navigation was also acquired for QC purpose.

First, the data headers were scanned for corroborating byte locations with key navigation parameters. The most critical step was to correctly retrieve 3D geometry from SEGY file and recreate it such that the gathers can be eventually prepared for 2D migration and inversion. Accurate location of source and receiver is essential for processing steps such as binning. The shot gathers that have been donated for this research is neither along inline or source line; it comprise a composite 2D profile which crosses the key wells in the blocks. As a result they have traces from in-lines and cross-lines.

At this stage geometry and header information of the dataset from leased block GC955 have been successfully loaded. Figure 1 shows Sources (red) and Receivers (blue) that have contributed to the profile under investigation.

## SOURCE RECEIVER LOACTION

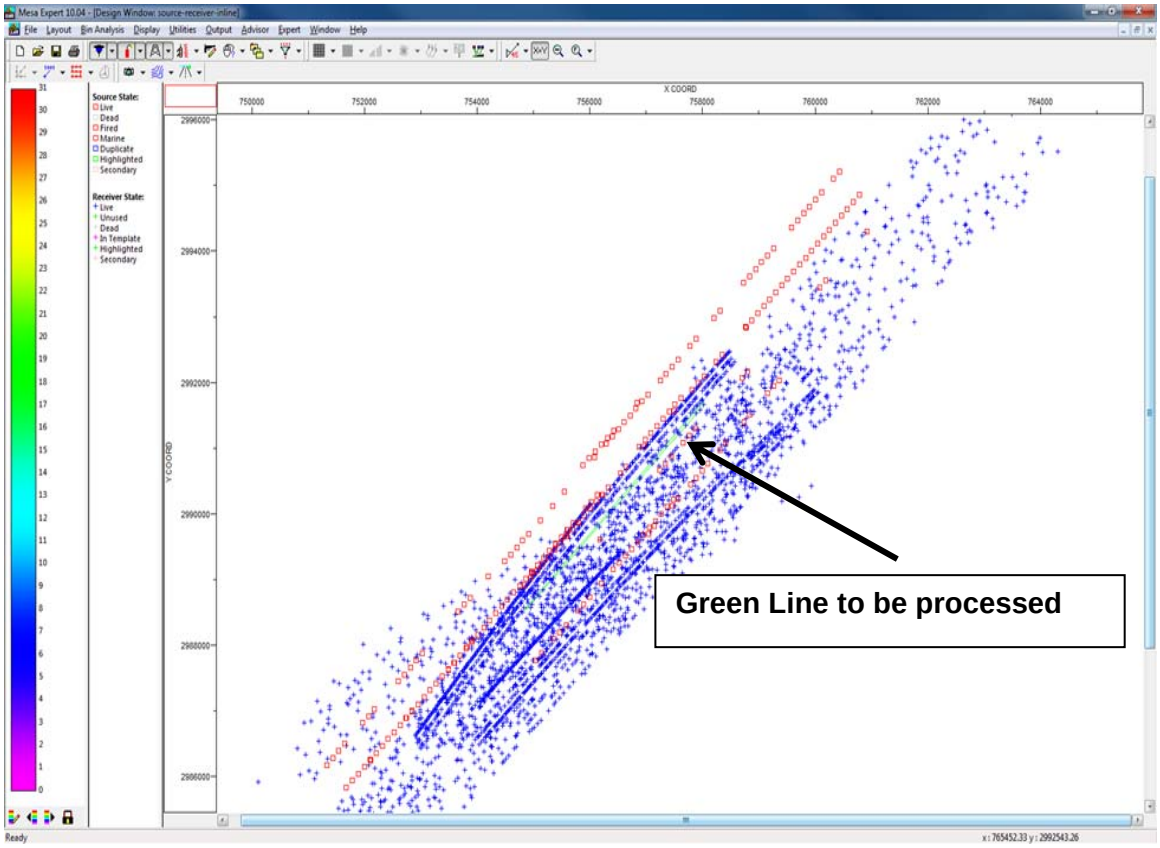


Figure 1. Source and receiver location that contribute to the current dataset. The 2D profie which will be the outcome of processing of the data cluster is marked in green.

The data will be processed as narrow azimuth 3D dataset. In order to do the processing, allocation of 3D bins for midpoints is imperative. The shot gathers were loaded in ProMAX, and the geometry was extracted. Bins are created according to the navigation geometry (Figure 2). The extracted geometry creates headers that are necessary for further processing in ProMAX. The following figure shows plot of midpoints. The concentration of midpoints is denser towards the center as compared to the edges. This is because around the edges fewer receivers are available in the given volume to make the source-receiver midpoints.

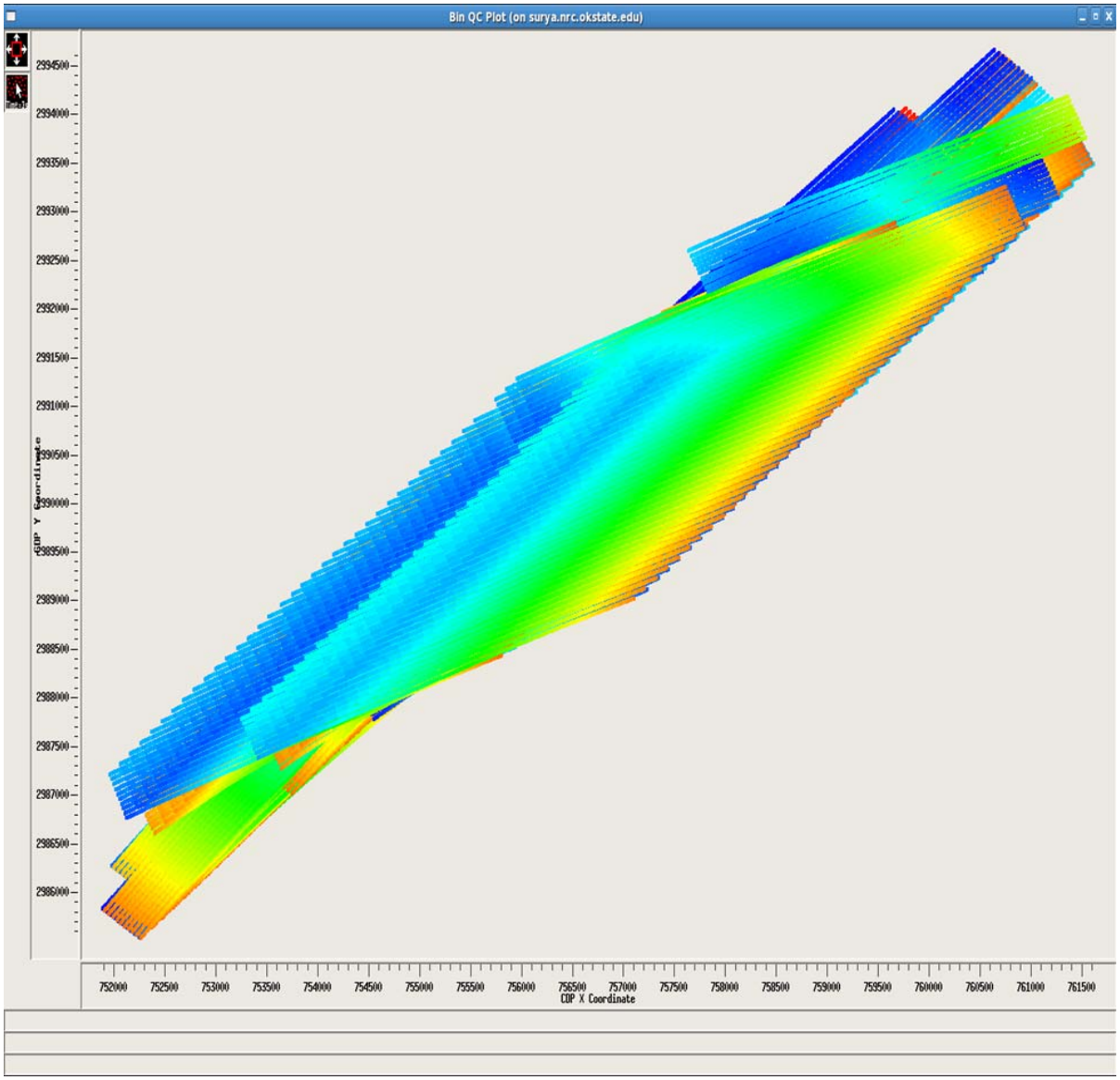


Figure 2. Midpoint display in ProMAX.

Pre-Processing of the leased block GC995 dataset will follow. This will entail selection of optimum parameterization of gains, processing frequencies, and deconvolution. Processing will get the data ready for inversion as well as depth migration, which will later be used for structural and stratigraphic interpretation.

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