

Pioneering an Integrated Gravity Gradiometry-Seismic Approach

ION, ARKex team up to acquire transition-zone data.

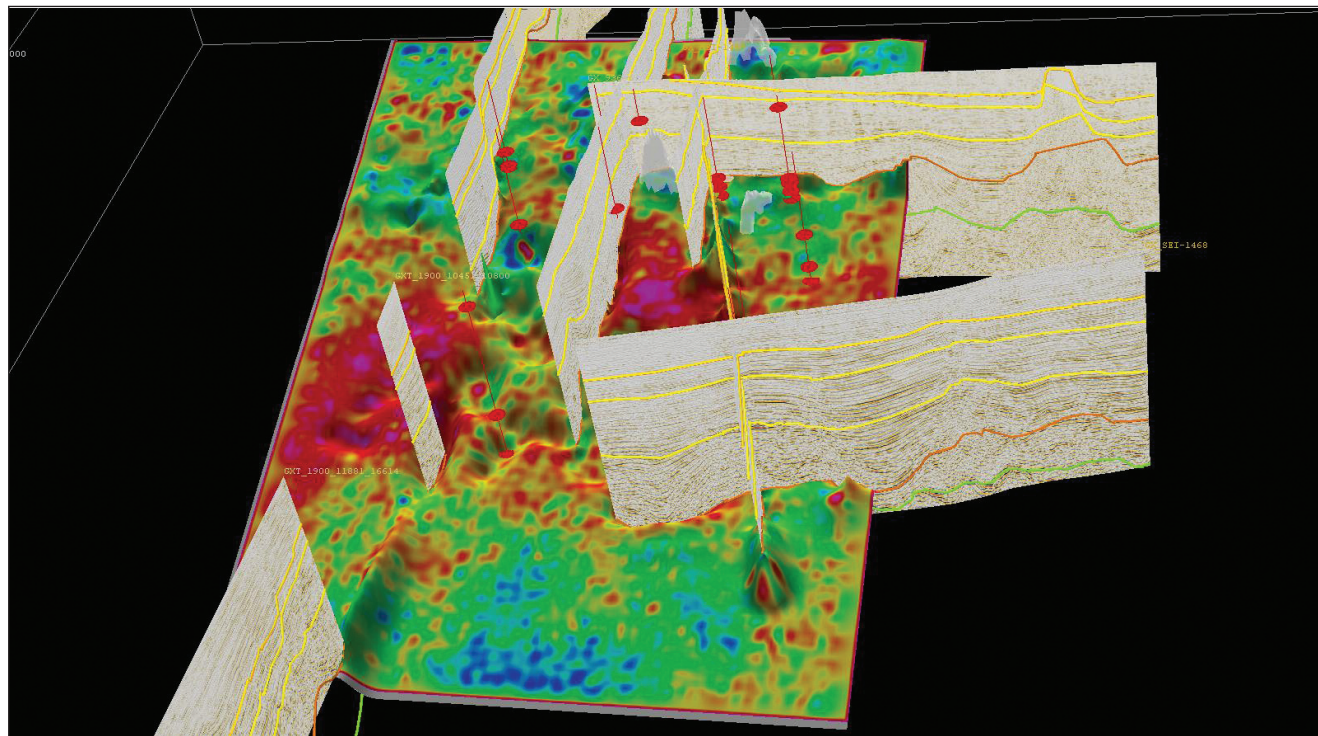
ION and ARKex are working together to integrate ARKex's 3-D Gravity Gradiometry (3DGG) measurements with ION's BasinSPANS data to provide an enhanced geologic understanding in areas in which it is difficult or costly to acquire 3-D data. To prove the value of this multi-disciplinary approach, the two companies have embarked on a gravity gradient survey to construct an interpretation of geologic fabric along the Louisiana Gulf Coast.

Acquiring new 2-D or 3-D seismic data is often costly, time-consuming, and environmentally sensitive. Transition zones in particular present a major technical challenge in joining the interpretation from the onshore to the offshore. Such is the case in this particular study area along the Gulf Coast with GulfSPAN, where there exists a gap between existing, vintage onshore data and newly acquired offshore data.

The 3DGG data was collected by ARKex using its full-tensor gravity gradiometry (FTGG) and is being jointly integrated and interpreted with data from ION's GulfSPAN program to provide 3-D infill between GulfSPAN 2-D regional datasets. Initial results have been extremely encouraging.

The limitations of 2-D seismic are not dissimilar to conventional gravity profiles in that the measurement is two-dimensional, and its ability to construct a 3-D representation of the field will be a function of the line spacing and data sampling interval. FTGG measures the rate of change of gravity in three dimensions. This leads to considerably higher resolution and increased bandwidth, which in turn provides greater accuracy when determining velocity-to-density relationships, a key factor in the integration of seismic and gravity data. This represents a step change in the ability to reduce the uncertainty of the velocity field determination and provides meaningful information at the seismic scale.

The key to unlocking the benefits of FTGG data lie in an integrated workflow where the relative merits of each measurement type are exploited. For example, where 2-D seismic data exists and the data is providing good coherent reflectors, the subsequent seismic interpretation can be used to help calibrate the time-to-depth function that is needed when modeling the FTGG data. The high confidence in the time seismic data interpretation combined with the density information from available wells or suitable analogs determines



The key to unlocking the benefits of Gravity Gradiometry data lies in an integrated work flow where the relative merits of each measurement type are exploited. (Photo courtesy of ION)

the velocity-to-density calibration. This can be further calibrated over several lines until the interpreter has sufficient confidence in the functions to be used. Invariably there will

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be areas in the seismic data that may be lacking sufficient energy to yield a coherent reflector, and this is where the FTGG data is used to drive the interpretation through a

series of modeling iterations using the derived functions.

The resulting interpretation will have benefited from the strengths of each data type used, and the final interpreted earth model will have converged using independent data in a cooperative workflow.

Modern processing and imaging techniques employed by ION can provide significant uplift to legacy seismic data, and the offshore extension of the GulfSPAN data has been extremely successful in providing new insight into the region.

Integration of this new and enhanced data with FTGG is providing a detailed interpretation between lines, improving the understanding of the Miocene and Sub-Miocene growth faults systems to better define the geological fabric of the region. The companies plan to extend this technique to other datasets around the globe.

ION and ARKex are presenting the first results of this joint effort in a Lunch & Learn in the ION data room (Room #352F, Level 3) today from 11:30 a.m. to 1:30 p.m. ■