Integrating Multibeam Data in the Structural 2-D Seismic Interpretation Workflow: Examples From the Mexican Gulf of Mexico

Roel Dirkx[1], Kevin Goldsmith[1], Jennifer Halliday[1], and Cian O' Reilly[1]

[1]TGS, Surbiton, United Kingdom.

ABSTRACT

Broadband long-offset 2D seismic data, acquired and processed through 2015-2016, covering the entire Mexican Gulf of Mexico (MGOM) provide a high quality image of complexly deformed sediments, but interpreters can still experience difficulties understanding the geometry and extent of some of these structures. Multibeam data is conventionally used to identify risk at the seabed prior to installing subsea infrastructure. Here we demonstrate that the integration of multibeam data into the interpretation workflow adds significant value to the interpretation results. Whereby the high resolution multibeam data is used to generate detailed maps of geological structures with a geomorphic expression at the seabed. The Gigante multibeam survey (approx. 500,000 km2) covers the MGOM and extends into parts of the US GOM. The data, acquired and processed in 2015-2016, provide a high quality image of the geomorphic expressions at seabed of the various geological domains that characterize the MGOM. The geometry of the seabed in the Mexican Ridges (MR) and Salina del Istmo (SdI) areas is indicative of deformation mechanisms that were recently or are still in operation. A series of elongated linear topographic highs in the MR province formed as a result of gravitationally driven fault propagation folds. In the SdI area, the seabed is locally deformed by salt canopies and diapirs which form shorter curvilinear bumps. Digital Elevation Model (DEM) attributes, including slope, aspect, plan and profile curvatures, derived from the multibeam bathymetry data can be used to construct a workflow to automatically extract the shape and extent of these geomorphic expressions. The resultant maps give an accurate representation of the boundaries of, and trends within, present day geological domains and give information about fault, fold and salt body shape. Three key examples will be presented as case studies to demonstrate how the integration of multibeam data with 2D seismic data can be used to reliably correlate complex structures across 2D seismic lines. This improves structural interpretation confidence, as well as providing a high resolution present day analogue for guiding development of paleo-structure maps.