High-Resolution Multibeam Reveals Water Column Anomalies in Deep Water Mexican Gulf of Mexico

Philip Teas[1], Dan Orange[1], John Decker[1], Chris Corona[2], Kelley Brumley[3], and Garrett A. Mitchell[3]

[1]Oro Negro Exploration LLC, Concord, CA, United States.
[2]TGS, Concord, CA, United States.
[3]Fugro Marine GeoServices, Inc, Concord, CA, United States.

ABSTRACT

High-resolution multibeam data acquired in 100% of the Mexican Gulf of Mexico 750m and deeper as part of the TGS "Gigante" program provides unprecedented imaging of water column anomalies. A highly prolific hydrocarbon basin, the Gulf of Mexico contains abundant bubble plumes which are particularly effectively imaged by the 30kHz multibeam echo sounder. With 100% coverage, and occasional 200% coverage, of the seafloor the distribution of active plumes is very well imaged revealing a wide variety of character. Multibeam data is acquired by transmitting a fan-shaped sonar ping and recording return echoes in sectors across the ensonified area. The volume of interrogated water column forms a triangular prism oriented along the vessel path. The fan angle opens to a maximum of 70 degrees on a side; however, during typical survey operations we limit the width of the imaged area, so as water depth increases the angular coverage decreases with a lessening of the percentage of water mass imaged. Thus, although we achieve 100% coverage of the seafloor, the water mass itself is not completely imaged. This caveat notwithstanding, the Gigante survey is the largest continuous survey of water column anomalies that we are aware of providing an excellent opportunity to observe varieties of plumes, imaging quality, artifacts of imaging and to a degree, the ephemeral nature of active plumes. Water column anomalies vary significantly in form including wispy thin plumes rising through the entire water column to denser masses terminating closer to the seafloor. Dense clusters of plumes over large areas are interpreted to be extremely robust areas of bubble venting. It is difficult to completely characterize the various plumes as their position relative to the vessel path impacts how they are imaged. We will demonstrate a variety of plume forms to illustrate the range of features observed. There is a very limited amount of additional data with which to begin to understand the cause for the different types of anomalies. We will also examine artifacts observed in the raw data which appear to cause multiple imaging of the same anomaly. This effect is most prominent near the nadir lines of the survey. Finally, in several areas we imaged the same water column volume on multiple vessel passes allowing us to observe time variant behavior of anomalies; these reveal changes in current direction as well as the ephemeral nature of seeps.