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Exploring for Deep Gas in the Gulf of Mexico Shelf and Deepwater using Chimney Processing

Gas chimney processing is a new concept which uses multi-dimensional, multi-trace and multi-attributes along with an artificial neural network to focus on vertical chaotic seismic disturbance in 3-D data. This leads to creation of a new volume highlighting chimneys. This method can also be used in seismic data to detect other features such as faults, salt, sand-filled channels and other stratigraphic features.

Large scale vertical migration**,** dominating the Gulf of Mexico shelf (> 10,000') has been known for years from geochemical maturity data. Also it has been documented that this vertical migration often occurs via faults. Detecting and confirming such vertical migration has been very difficult. Gas chimney processing offers the opportunity to highlight these vertical disturbances in the seismic record and thus predict favorable traps or fault blocks for gas accumulation in the deep subsurface. We show examples from the GOM where gas chimneys are directly linked to the presence of hydrocarbons.

Combining chimney cubes with seismically derived "fault cubes" can aid in determination of leaky versus sealing faults We show how different types of chimneys are related to different seal characteristics and how to constrain charge and seal uncertainty for hydrocarbon exploration and prospect ranking. Use of chimney cubes for distinguishing high flux (mud prone) chimneys from low flux (mineral prone) seeps will be discussed. This has a significant application in assessing seal effectiveness. We demonstrate how chimney cubes can be used to distinguish active hydrocarbon migration along faults. Finally, we discuss potential new applications of chimney cube as a tool for validation and confirmation of the interpretation derived from other data. The emphasis is on how chimney cube interpretation can be used in an integrated workflow.