

Seismic Attributes for Regional Reconnaissance: Deep Gas Interval, Northern Gulf of Mexico Shelf

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Regional reconnaissance of seismic data for potential prospects on the Gulf of Mexico Shelf is common practice when preparing for lease sales or evaluating potential partnerships. However, simply screening for bright amplitudes, with conformance to structure and “flat spots”, may not be adequate for Miocene and older sediments (the so-called “Deep Gas” interval). Reservoir sands do not generally exhibit “bright” amplitudes. Further, geo-pressured shales, which may make exploratory drilling impossible or un-economic, are quite common.

When screening seismic data for potential prospects, interpreters are interested in determining: (1) presence and distribution of reservoir quality sand, (2) presence of trap (geometry and seal), (3) presence and distribution of hydrocarbon in the reservoir, (4) discriminating producible gas from low saturation gas, and (5) where prospects can be drilled safely and economically.

High AVO gradients can be a direct indicator of reservoir sands with hydrocarbon. Changes in AVO intercept along such a reservoir horizon can indicate changes in pore fluid. Comparison of broad-band acoustic impedance determined from near angle and full-stack inversion may be useful in discriminating producible gas from low saturation gas in a reservoir sand. An increase in vertical pressure gradient may be a direct indicator of reservoir seal. Low excess vertical pressure gradient (one PPG or less) indicates close proximity to hard pressure (seal failure) where exploration drilling may be impossible or un-economic.

Accurate, high resolution seismic velocity model data are critical to prediction of pore pressure as well as acoustic impedance trends. These are best determined from high resolution 2D/3D reflection tomography.
