**Geopressure Impact on Seismic Interpretations: Case Histories from the Gulf of Mexico**

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The effect of subsurface geopressure on seismic velocity is significant, but not well documented. Understanding how this effect influences seismic attributes and their calibration is important to seismic interpretations, particularly the prediction of pore fluids.

In clastic sediments, stresses are the driving mechanism in determining changes of porosity, fluid content and the geopressure profile. As a result, pore pressure changes have a substantial impact on the petrophysical properties especially Vp, Vs and density. There is a distinct velocity behavior between the normally pressured and geopressured sedimentary sections. This is revealed by study of seismic velocities (RMS) at numerous CMP's and sonic velocity slowness of several wells drilled on the shelf (High Island-Galveston) and deep water (Garden Banks) areas in the Gulf of Mexico. Plotting average velocities versus depth shows a pivot zone where the gradient revolves within the transition zone from the normally pressured to the geopressured sections. Therefore, any time-depth conversion method needs to consider the slope difference above and below the top of geopressure (TOG).

Separating sands and shales, we see each has its own velocity profile. In the normally pressured section, both shale and sand velocities tend to exponentially increase with depth. The wet sands mostly follow this trend throughout the entire section. Shale velocity on the other hand increases with depth down to the top of geopressure (referred to as the normal compaction trend), then decreases below the TOG. Therefore, a clear velocity split dominates between the wet sand and shale at the transition zone and below.

Surprisingly, in numerous gas wells, the velocity trends of the shale and gas sands show a clear crossover at the pressure transition zone and gas sand becomes faster than shale below the TOG. The disparity between gas sand and shale velocities explains and validates the high-impedance sand (Class1), near-zero impedance sand (Class 2), and low impedance sand (Class 3) as suggested by Rutherford and Williams (1989).

It is recommended that seismic velocities be discretely managed under the three categories of normally pressured, transition, and geopressured zones. This will improve the interpretation of time-depth conversion, structural mapping, synthetic ties, Poisson's ratio calculation and, more importantly, AVO assessments.