High Velocity Zones in Deep Mini-Basin Miocene Sediments, Eugene Island, Northern Gulf of Mexico

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Multi-azimuthal tomographic modeling and well check-shot validation of wide azimuth seismic data within an area of Eugene Island and Ship Shoal Island, offshore Louisiana, has shown anomalously high velocity zones in Miocene sediments not associated with salt. These sediments, which can exhibit velocities of between 13,000-16,000 ft/sec, occur in mini-basins adjacent to salt diapirs in the northern half of the project and at depths of between 17,000 and 20,000 feet. Although well control is poor away from the salt, several wells were found to penetrate these mini-basins, in particular the Eugene Island 151 #1 well, drilled to a depth of 17,000 feet MD, and the South Marsh Island 23 #J001 well, which was drilled to over 20,000 feet MD. Sonic logs of both wells clearly show evidence of a higher-than-normal velocity zone not directly associated with salt.

Although these mini-basin sediments can have anomalously high velocity characteristics, they should not to be confused with salt remnants, welds or other salt structures. Indeed, these sediments exhibit seismic reflection characteristics more common to marine clastics, such as sub-parallel bedding, cross-cutting and channeling. An explanation of what we see seismically may be found in this area's rate of deposition, depth of burial, age, salt influence and with consideration for the dynamics of fluid movement. Within such an environment, it is thought that these high velocity zones are accurately reflecting well cemented, lower porosity diagenetic sands of the Lower Miocene. This study will review our methods and findings, including the use of inversion-derived data volumes such as acoustic impedance, porosity, shale content, pore pressure and others.