ELASTIC PROPERTIES OF SALT

Jingjing Zong
Natural Sciences and Mathematics/ Geophysics, University of Houston, Houston, Texas
jzong@uh.edu

Salt plays a significant part in the geology of the Gulf of Mexico area (GOM). In this thesis, I use lab measurements, well-log data, and surface seismic to determine the properties of salt crystal and rocks.

In the lab, we have undertaken ultrasonic measurements on salt samples from various locations. The pure halite crystals from the Goderich salt mine, Canada, demonstrate shear-wave splitting and compressional-wave variations which indicate cubic anisotropy. The stiffness values are calculated. Our samples from the Hockley and the Bayou salt mine have fractures, and aligned domains, but no obvious anisotropy. The density ranges from 2.16 - 2.22 g/cc. The confining pressure experiments are conducted on the Louisiana salt cores. The velocities under 0 - 4000 psi are 4.4 - 4.8 km/s for P-waves and 2.5 - 2.8 km/s for S-waves.

We acquired a 1.2 km seismic line over Hockley Salt Mine. From refraction crossover analysis of one shot gather, we find depth for the top of anhydrite with the stacking velocity of 5.5 km/s occurs around 50 m (164 ft).

We analyzed 142 well logs from boreholes drilled through salt in the GOM. We find an empirical relationship for P-wave velocity of salt versus depth. Further studies are need for optimizing the empirical relationship. For salt density vs. velocity, our log data are similar to Gardner's, although we find a cluster, not a monotonic relationship.

These studies provide more information for salt velocity model building and a general understanding of salt properties.

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