

# Visualizing Rock Properties from the Gulf of Mexico

by

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Understanding geophysical rock properties is a key component in order to accurately tie seismic to well data in the Gulf of Mexico. In this clastic environment, rock-property analysis provide a mechanism for integrating pore-fluid and lithologic distributions to stratigraphic models. Analyses include Vp and density trends (maps and volumes) for sand and shale in the regimes above and below the onset of abnormal pressure, depth to the first-occurrence of abnormal pressure, sand-volume distribution, and other rock properties that contribute to a better understanding for finding the *invisible* hydrocarbons. To realize these goals, it is essential to have a statistically significant set of data adequately resolving the variations in geologic trends. Combining these data with state-of-the-art visualization tools creates a new amplitude interpretation toolkit for petroleum exploration and development.

The objective is to enable explorers to make rapid amplitude and AVO judgments about hydrocarbon prospects. Seventy-five rock properties have been derived from GDC's proprietary welllog database. These data are made available through an interactive PC-based AVO toolkit named TIPS™ and a visualization system named VR Viewer, where VR means Virtual Reality (see Figure 1). The toolkits are designed and developed to allow explorers to access, model, and correlate measured rock properties with proprietary in-house seismic and borehole information. Regional trends, rock property data, individual LAS well data, fluid substitution models, and trend curves from individual well studies allow interactive - where one finds the answer before forgetting the question - prediction of seismic AVO response for a prospect or exploration idea. The data and tools are easy to learn, understand, and use. They allow an explorer, a geotechnical expert, or a manager to determine anticipated AVO response for a new prospect quickly and easily. The displays are dynamic and are user controlled in the same way a computer game is navigated. Key rock properties maps can be toggled on or off. The wells in the area and the logs for key signature wells are displayed. The visualization can be projected in a stereo enabled visualization theater, or evaluated on a PC screen. User-specified rock-property horizons and volumes can be added to enhance understanding. This is the power of visualization.

The value of visualizing rock properties hinges on the ability to predict how rock properties vary. With quality rock-property data and easy to use toolkits, one can determine what exploration tools should be used to find the hidden reserves. This is accomplished by comparing the properties of a proprietary prospect to the regional trends identified and packaged for a VR Tour (see Figure 2). Alternatively, maps of rock-property at 200 foot depth-slices can be converted to a volume, or a pseudo 3-D seismic survey. Since these data are SEG-Y format, they can be evaluated using a standard interpretation workstation for extracting rock-properties (Vp Sand, Vp Shale, etc.) along paleo boundaries or any other surface the explorer has in mind. This type of work allows users to be more informed and better prepared – resulting in a competitive advantage.

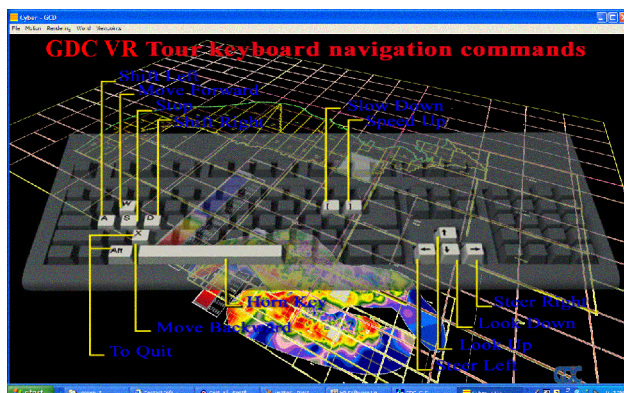


Figure 1. Navigation Commands for a VR (Virtual Reality) Tour of Gulf of Mexico Geophysical Rock Properties Maps.

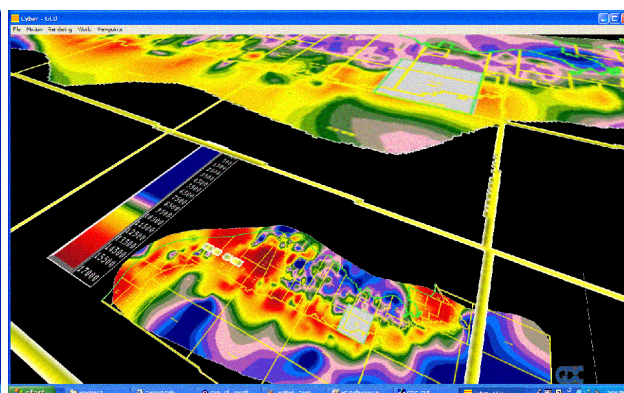


Figure 2. Diving into Mud Weight Maps, which can be toggled to any of the other Rock Property Map in the Database.