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On the Calibration of Seismic Attributes for Reservoir Characterization and Monitoring

Seismic data is often used in modern reservoir characterization and monitoring of performance, although it is not often calibrated to each individual situation. Using seismic data, well logs, and other information, from four reservoirs, we have obtained "ideal" attributes for each environment, each selected or designed to match the physical properties of the reservoir and to capture the reservoir quality of interest. We also identified pitfalls in some techniques.

One pitfall concerning the use of phantom horizons in evaluating attributes comes from the Stratton field, South Texas. Alternatively, the Wamsutter area of Wyoming demonstrates a good use of phantom horizons with a new approach to using coherency information, as well as new methods for identifying what appear to be pressure compartments in tight formations. Integration of log data and seismic attributes, including a new method of obtaining seismic facies, is demonstrated in Boonsville field, North Texas. The time-lapse seismic study of Teal South reservoir in the Gulf of Mexico demonstrates the importance of the pressure-dependences of the reservoir matrix and its fluid content, and of the apparent and inadvertent depletion of nearby reservoirs in pressure communication with the produced reservoir.

In all of the cases studied, the ability of seismic data to improve the reservoir characterization through the careful calibration of attributes, based largely on knowledge of the physics of the process or the nature of the features of interest, is clearly demonstrated, and is likely to prove useful to other investigators in their fields.