Seismic Facies Prediction and Modeling

An Emerson E&P Software Geoscience Service

Rock facies define the internal architecture of the reservoir. The ability to accurately predict and model the distribution of facies in the reservoir results in a better understanding of reservoir quality and behavior. An accurate facies model will be a good predictor of in-place volumes and fluid flow. Facies determination is substantially improved with the use of both seismic and well bore predictive methods. The calibration of the two can be used to construct 3D proportional facies volumes to guide the stochastic simulation of facies models.

Emerson E&P Software facies prediction and modeling services make use of both electrofacies and seismic facies classification procedures to determine the distribution of facies. Both procedures are designed to eliminate or mitigate user bias, allowing the data to drive the facies description. For electrofacies classification, multi-resolution graph-based clustering offers a solution which determines the optimal number of clusters at different resolutions and allows the geoscientist to control the final level of detail to more accurately represent the facies.

Seismic facies classification methods seek to establish a relationship between the rock facies and natural cluster structures in the seismic data. The natural clusters can be determined from an analysis of the waveform shape. Emerson E&P Software seismic facies classification solutions include a wealth of schemes adaptable to different depositional and stratigraphic settings. These solutions include supervised and unsupervised classifications of waveform shape, attribute intervals, and attribute maps using artificial neural networks (Self-Organizing Maps). Multi-attribute schemes are also available using partitional or hierarchical schemes.

Emerson E&P Software facies modeling solutions incorporate the electrofacies and seismic facies predictions into a modeling (chronostratigraphic) framework with optimized grid support for facies modeling. Multiple facies modeling methods (e.g. deterministic modeling, sequential indicator simulation, truncated Gaussian simulation, multi-point simulation, object modeling) combined with trend analysis (1D, 2D, 3D), honor geological and seismic constraints and ensure that the conceptual model is honored.

### Emerson Facies Prediction and Modeling Solutions

- A multi-resolution graph-based electrofacies clustering method that determines the optimal number of clusters at different resolutions and allows the geologist to control the final level of detail in the classification

- Supervised and unsupervised seismic facies classifications based on the Self-Organizing Map Neural Network method, for a more geologically sound classification

- Waveform shape classifications, map and interval attribute classifications, and multi-attribute classifications adaptable to many different depositional and stratigraphic environments

- Chronostratigraphic facies modeling solution with optimal geologic grid support for facies models (preservation of distances and volumes)

- Facies data analysis solutions, including data preparation (e.g. data blocking, smoothing of distributions), trend analysis, seismic-to-well facies classifications, and the creation/combination of multiple facies proportion volumes

- Broad set of facies modeling solutions, including multipoint simulations, truncated Gaussian simulations, etc. with trends

### Emerson Facies Prediction and Modeling Advantages

The Emerson E&P Software Geoscience Services team combines wellbore and seismic facies prediction methods with the most advanced facies modeling solution, enabling oil and gas operators to better understand the reservoir architecture, quality, and behavior.
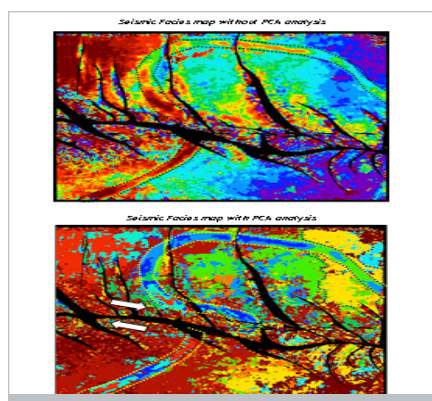
▲ Seismic facies classifications (with and without Principal Component Analysis)
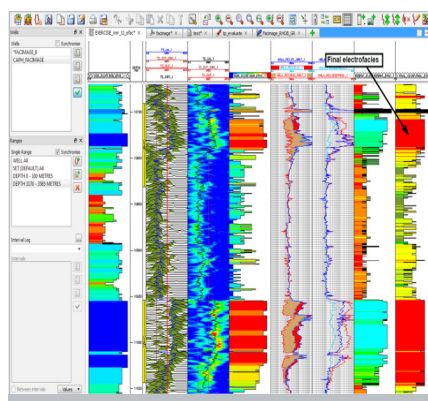
▲ Electrofacies classification for field wide delineation of facies
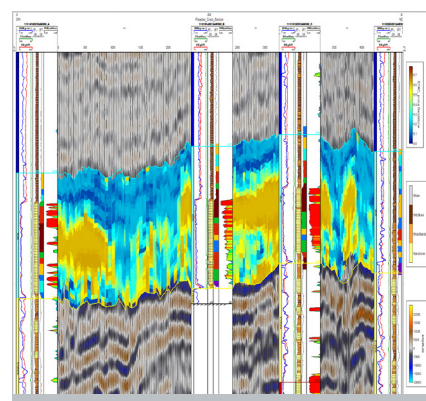
▲ Facies probability volume

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