Seismic Facies Classification Using a Visual-Based Method, Part 2: Application to 3-D Seismic Data

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Abstract
In the companion presentation, we showed that a visual-based data-mining technique can be an effective tool for detecting and visualizing spatial patterns inherent in seismic data (i.e., seismic facies). One of the major components of this technique is Self-Organizing Maps (SOM). A SOM is a clustering algorithm that provides a topological mapping of the input data. Research in other fields has shown that SOMs can effectively generate visualizations of high-dimensional data. The companion paper illustrates an application of a visual data-mining technique on 2-D seismic models. In this paper, we demonstrate the application of our technique to seismic facies classification in real 3-D seismic datasets.

We analyzed two intervals, the first including a Jurassic tidal channel and the second containing Devonian pinnacle reefs. Our analyses were undertaken on the seismic traces without making use of any external information to guide the seismic trace assignments, thereby simulating an exploration setting. However, unlike a true exploration setting, well control is available at both levels to ground truth our results. Both results show stratigraphic features that are can be defined in stratal slices or other types of visualization. However, the results from the visual-data mining technique show details of lateral seismic facies variations that suggest the presence of lithologic variability within the stratigraphic bodies being imaged. These results, not readily apparent in the original seismic data, are confirmed by the wireline logs, indicating that this technique successfully identified important, yet subtle, stratigraphic variability in the data.