Abstract: Multi-attribute interpretation in a new, evolving methodology for seismic interpretation that has grown from a necessity to simultaneously evaluate the significance of a large number of seismic attributes in a geologic context. Much of this work is based on Self-Organizing Maps (SOM) discovered by Kohonen (Kohonen, 2001). A mathematical basis has been discovered which frames multi-attribute natural clusters, attribute selection lists, machine learning and geobody interpretation into a framework of survey space, attribute space and neuron topology space (Smith, 2017; Smith and Taner, 2010). Significant progress has been made interpreting seismic surveys for both conventional and unconventional exploration (Roden, Smith and Sacrey, 2015). Resolution below conventional tuning thickness is of interest (Roden and Chen, 2017). We will present results to illustrate the potential of this area.

Comparison of Stratton Field 3D seismic reflection survey, line 79 amplitudes in a standard wiggle trace variable area seismic section (left) and SOM classification section shown in a color block display using a smooth color map (right). Neurons were trained by SOM on multi-attribute training samples of vectors of amplitude (left side of figure) and the Hilbert transform attribute (not shown). The SOM 8 x 8 hexagon neural network topology with smooth color map is shown on the right.
In the center is a panel display of well log curves, VSP trace and seismic trace at well 9 (Odom, 2009, Figure 1.2) spliced into Stratton Field 3D seismic survey line 79. Left of the panel on line 79 is the SOM classification and right of the panel is the rest of the line in wiggle trace variable area display of amplitude. The figure illustrates the new resolution capability of multi-attribute machine learning below conventional tuning and also its discrimination aid as a data classifier.

References:


