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## **Tuning 3D volumes to geology: the use of 'reservoir metrics' in the processing of seismic data for the development of non- to marginal amplitude plays**

New technologies are proliferating that can help calibrate 3D, 4D and 4C volumes to lithology and fluid content, even in areas where classical 'bright spot' technologies fall short. An emerging variation of this approach is to optimize the seismic processing workflow in ways that tune the final seismic volume to the geology being imaged. These tuned volumes can then be used to better measure critical reservoir information such as water saturation, Vshale or porosity.

This is accomplished by optimizing 'reservoir metrics' unique to a particular processing project. The first step is to create reasonable synthetic seismograms that tie the seismic volumes to the wells. Simultaneously, sequence stratigraphic correlations are made throughout the field, with special attention paid to the 'target' reservoirs. The next step is to tune the processing sequence to better image the reservoir using one of two general approaches: the first is map based, the second volume based.

The map-based approach distills log-derived reservoir properties into a single average value for each reservoir penetration, and crossplots those values with "non-amplitude" seismic attributes from the same interval. The second approach uses neural networks to create pseudo-logs from one or more 3D volumes and then compares these to the actual logs from existing wells. In both cases, seismic processing parameters are selected which maximize the 'goodness of fit' between actual and predicted reservoir properties. The method is illustrated with relevant examples.