Spectral Detection of Attenuation and Lithology

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Abstract/Excerpt

Traditional seismic interpretation methods rely on imaging where interpreters look for visual structural and stratigraphic features associated with potential reservoirs. This requires the detection, correlation and analysis of seismic features which in turn are better performed on high resolution data. Such techniques rely heavily on amplitude analysis for quantifying reservoir parameters.

Several sophisticated technologies were developed to help improve, support and verify seismic interpretation. The most commonly used are seismic inversion and amplitude versus offset (AVO) analysis [1]. Seismic inversion, in its useful guises as a non-linear deconvolution, attempts to improve amplitude mapping by reducing the effect of interference between close reflectors on their amplitudes. Both inversion and AVO are amplitude-based analysis techniques.

Another important source of information in seismic data is its frequency content. Tools for examining the frequency content of time series data are collectively called spectral analysis. Spectral analysis has established itself as an important tool in seismic data acquisition and processing. In the last two or three decades, applications of spectral analysis to hydrocarbon reservoir detection and characterization emerged [2-5] and have recently intensified [6, 7].

In this paper we explore two complementary ways of employing spectral analysis for hydrocarbon reservoir detection and mapping: attenuation and tuning. We also examine the applications of time-frequency analysis techniques. Finally we present some real data examples.