Depth Domain Inversion

Amplitude inversion technique can improve the fidelity of rock property estimation.

**Contributed by Schlumberger**

Conventional methods of amplitude inversion assume that amplitudes in the seismic image are correctly located and can be inverted to elastic parameters from which a true representation of rock properties can be derived. However, complex geology, often combined with limitations imposed by surface seismic acquisition geometries, can lead to inadequate illumination of subsurface targets, which can have detrimental effects on the amplitudes and phase of the migrated image.

Conventional amplitude inversion techniques do not compensate for these amplitudes and phase variations. Consequently, imprints of nongeological effects, including illumination variations in amplitude or phase. Amplitude inversion techniques do not compensate for these amplitude and phase variations. Including such effects resulting from the acquisition geometry and complex geology. The output from the Depth Domain Inversion is an example of where structural interpretation can be significantly improved after depth domain inversion. (Images courtesy of Schlumberger)

The new workflow was applied to produce a reflectivity image corrected for illumination effects that provided imprints of nongeological effects, including illumination variations. Analysis of amplitudes extracted along key horizons showed a correlation with variations in illumination. Conventional amplitude inversion techniques do not compensate for these variations in amplitude or phase.

The new workflow was applied to produce a reflectivity image corrected for illumination effects that provided improvement in the continuity of major events. A significant increase in bandwidth delivered overall sharpening of the reverse time migration (RTM) image, revealing details of minor events previously unseen. The workflow also produced an AI volume corrected for the imprint of the acquisition geometry and complex overburden, enabling an improved structural and quantitative interpretation, compared to the time domain inversion.

Further details of the technique and data examples from the GoM case study are being presented in the paper “Depth Domain Inversion Case Study in Complex Subsalt Area,” which is being presented at 15:45 on Wednesday in Room N104 as part of a technical session on subsalt and sub-basalt exploration and development.

A special presentation on Schlumberger Depth Domain Inversion Services will take place followed by a cocktail reception at Schlumberger booth 940.

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