

Confirming Depth Models using Differential Wide Aperture Seismic

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Accurate determination of the sub-surface seismic wavespeed is important both for pre-stack depth migration or for precise depth conversion, particularly for field definition. Normal moveout (NMO) “velocity” analysis is a relatively poor discriminant of the sub-surface wavespeed. Fortunately, the moveout correction used in standard reflection processing is also relatively insensitive to errors in the determination of the wavespeed. However, such is not the case for migration, or depth conversion.

The near-normal reflection seismic technique provides excellent control on the structure of the reflection horizons in the time domain, but relatively low resolution of the wavespeed. Conversely, the use of diving waves in the wide aperture seismic (WAS) technique provides excellent control on the sub-surface wavespeed, but lower resolution imaging of the structure. Combining both techniques, using the following sequence, makes sense: (1) Processing of the reflection seismic data to produce a seismic depth section. (2) Interpreting key horizons, and determining interval wavespeeds from the Dix equation. (3) Constructing an elastic model for the subsurface. (4) Ray tracing through this model, to calculate arrival times, amplitudes and phases for selected shot locations. (5) Comparison of the ray traced times and amplitudes with the recorded shot gathers, especially comparing the higher amplitude diving waves and refracted phases.

This poster presentation will illustrate the application of wide aperture seismic to the confirmation of sub-surface wavespeeds.