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Adventures with Hyper-Resolution:
A 3D Case History

Abstract:

This 7-year old example 3D from North Texas illustrates the advantages of using hyper-resolution seismic data and shows some of the processing and interpretational pitfalls that accompany using the method for stratigraphic traps.

With porosity at the top of the Caddo limestone being one of the main objectives in the area, synthetic seismograms with varying wavelets were used to model the bandwidth of the 3D that would be necessary to image the target.

The 3D was shot using explosives as a source, with a conventional recording geometry and the I/O II acquisition system. Processing consisted of a conventional flow also, the exception being that extreme care was taken with the velocities and statics, key to focusing the higher frequency components of the seismic data. This care paid off. Much higher frequencies were seen in the data than were hoped for; the signal and noise crossed over at about 160hz. This data provided an excellent tie to the synthetics, including the porosity signature in the Caddo. Resolution at 150hz is surprising: sub-10' lime markers are imaged in shales, and 10' shale markers can be seen in carbonates. Cross-sections from logs were compared to the seismic data to make sure the relationship between seismic porosity and log porosity was holding. Finally, a porosity map was prepared and compared to all 25 wells penetrating the Caddo. The match was excellent.

Two drilling locations were identified to test the data integrity. The first drilled exactly as predicted, while the second was a seismic bust, porosity wise. The talk post-mortems the second well, examining generally held assumptions about processing procedures and their implications to high-resolution data.