Broadband Data: How Changes in Seismic Techniques Have Changed Geologic Interpretation

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ABSTRACT

One of the biggest changes in seismic data in the last decade has been the advent of so called “broadband” data. The interpretation of geology from seismic data is fundamentally dependent on the bandwidth of the seismic data. Ten years ago bandwidth enhancement focused on increasing seismic resolution through achieving better high frequency content in the data, allowing thinner bed formations to be interpreted and mapped. A number of methods were suggested - some that could aid the interpretation of geologic formations even though they appeared to contradict some basic limitations of seismic data. Today, many geologic interpretations are not conducted on the raw seismic data with the intent of simply mapping structure, but a deeper understanding of geology and rock properties is required. This is determined from attributes which are derived and extracted from 3D seismic volumes. It’s important to understand that seismic attributes may have very different spatial and temporal bandwidth from the underlying seismic data. More interpretation is conducted on inversions of seismic data to highlight different rock properties, and in many cases it is the bandwidth at the low frequency end of the spectrum which is more important for successful inversion and interpretation. “Broadband” data today tends to suggest that the low frequencies have been enhanced (as well as the highs). In this paper we will briefly review high frequency bandwidth enhancement, then show how low frequency broadband data is achieved both offshore and onshore, and discuss why the low frequency component of the spectrum is important for attribute interpretation, inversion and improved understanding of underlying geology. Moving forward, we will review what the next advances in seismic acquisition are likely to be, and how these may further impact our geologic interpretation in the future.