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Noise Attenuation Study for High Productivity Vibroseis Acquisition: an Example from Saudi Arabia

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ABSTRACT

The new generation of 3D land seismic data has shifted the focus of noise attenuation from the field to the data processing center. The goal of the seismic field crew is no longer to provide shot records with the best signal- to-noise (S/N) ratio. No longer are large field arrays used to attenuate unwanted surface waves. No longer is the utmost care taken to minimize noise sources near the active spread. It is now left in the hands of the data processing shop to leverage the improved sampling and separate the signal from the noise. This abstract reviews some of the methods of attenuating noise on this new generation of data.

The recent advances in seismic recording technologies opened the door to high density seismic data acquisition systems. The increase in available recording channels allows seismic survey designers to reduce source and receiver spacing while at the same time maintaining or increasing inline and crossline offsets to better sample the seismic wave field. To make this high density recording viable compromises are required. The source effort at each source point is reduced, the receiver effort at each receiver point is reduced, and high productivity shooting methods are employed to be able to collect the data in an acceptable time frame. These compromises all work together to degrade the S/N ratio of the recorded field traces.

It is in the data processing center that the noise must be attenuated and the signal preserved such that pre-stack image gathers suitable for such processes as pre-stack inversion can be generated. We will review some of the tools used to achieve the goal of signal preservation, recovery and noise removal or reduction on a recent high density 3D survey.

The use of dense seismic data collection coupled with a high productivity shooting method results in very low S/N ratio on the recorded traces and presents significant issues for data processing. The data processor is now solely responsible for the task of removing noise while also preserving the signal. The additional noise attenuation steps make the processing more involved.