Qatif 3D Survey: A Case History of a Large Transition Zone survey

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In pursuit of structural imaging and stratigraphic understanding of a producing Jurassic carbonate reservoir, Saudi Aramco is acquiring 1300 km^2 of 3D transition seismic data. Challenges begin with the variety of topographies including sand dunes, sabkhas, transition zone marshes, shorelines, and shallow water depths finishing with deeper marine zones. In addition, the land portions contain very densely populated towns, large agricultural areas and huge power plants. All of these issues demand the application of critical and accurate steps in order to ensure a seamless product free of false structures and processing artifacts.

The acquisition includes four independently configured source types; dynamite, vibrator, shallow and deep air gun. Associated with these are the different seismic receiver types; geophones, marsh phones, hydrophones and dual sensors, Figure 1. These produce an extremely complex processing environment, with unique challenges which must be met before producing a final volume for successful interpretation.
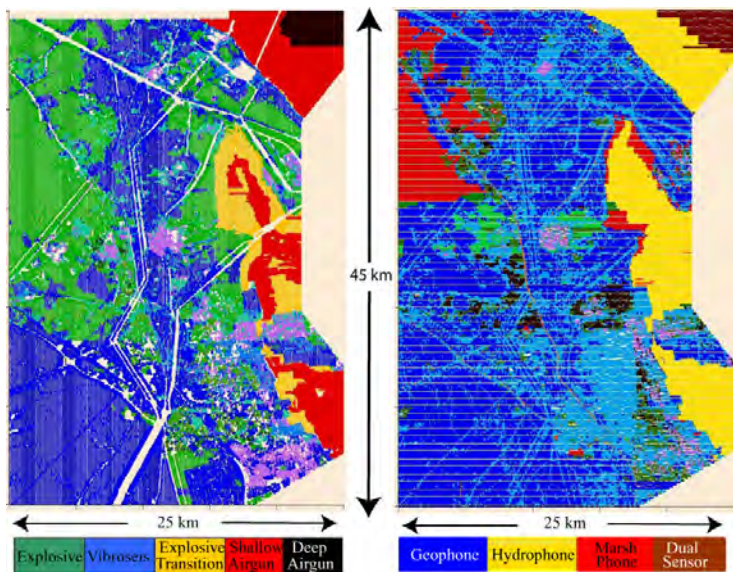

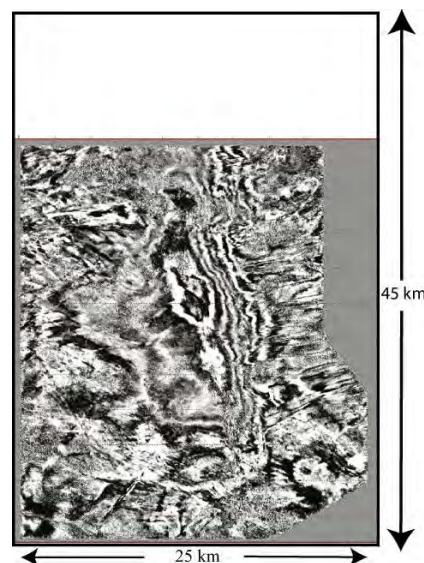Figure 1: Aerial distribution of source and receiver types.

Figure 2: Time slice at 600 ms.

This unique multi-environment processing task requires instrument matching, source matching, dual sensor summation, generation of datum statics corrections for various source and receivers, noise handling for different conditions, velocity analysis, and pre-stack time migration. The time slice extraction from the final volume, Figure 2, shows no source or receiver footprint due to the irregular shooting geometry and transition zone conditions.

This paper will show how the integration of all the different variables in processing produces a final migrated dataset suitable for the interpretation objectives.