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3D Seismic Data in Shallow Waters of Arabian Gulf - Acquisition and Processing Challenges

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SUMMARY

A large shallow-water seismic survey offshore Qatar was acquired for targets at 2000-4000ft. The main processing challenges in this environment are complete multiple removal and detailed velocity analysis in the presence of velocity inversions.

During 2006 and 2007, Maersk Oil Qatar acquired a large seismic survey offshore Qatar. The acquisition parameters were selected for best coverage of shallow targets in order to enable optimal processing and therefore best resolution at approximately 2000-4000ft. Due to a complex set of platform and pipeline installations covering multiple fields in the area, twelve smaller OBC surveys were acquired to complement streamer data to ensure continuous data coverage around platforms.

Although seismic processing is still ongoing, it is evident from preliminary results that the new data have higher resolution than previously available data. Using the currently available data for daily operational work has significantly improved interpretation and understanding of structural elements.

The objective for further data processing is (1) complete multiple removal, including both surface-related and inter-bed multiples, and (2) detailed velocity analysis in the presence of velocity inversions. A simple synthetic model without multiples is shown in upper panel of Figure 1, and equivalent model generated to include both water-bottom multiples and inter-bed multiples in shown in lower panel of Figure 1. This type of modelling significantly adds to understanding of the nature of the multiples, and together with well data, corridor stacks and elastic modelling ensures better QC and optimization of demultiple methods. Well velocity log in Figure 2 (black) shows the complexity of the velocity distribution in this area. RMS velocity calculated from the well velocity (Figure 2, blue) is used to recognise velocity picks influenced by multiples (Figure 2, red).

As the processing progresses, further noise reduction and improved fault imaging will allow utilization of these data for operational support and for reservoir characterisation in this challenging environment of shallow water, hard seabed, interchanging fast and slow formations and multiple generators in shallow overburden.

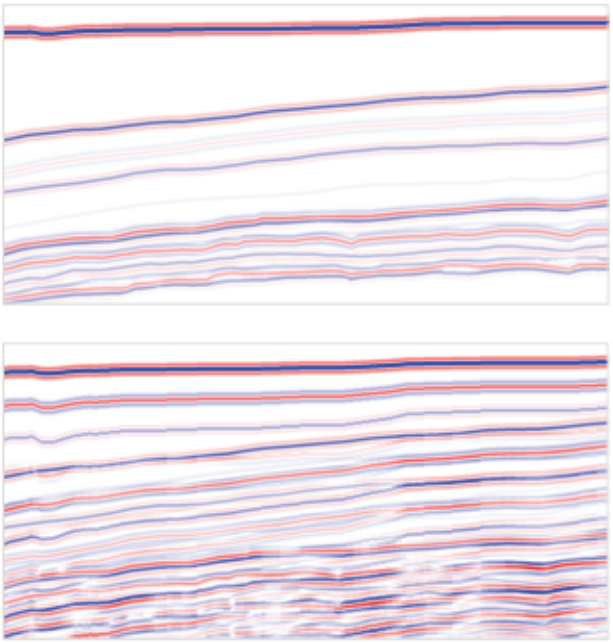

Figure 1: Synthetic data without multiples (upper) and with multiples (lower).

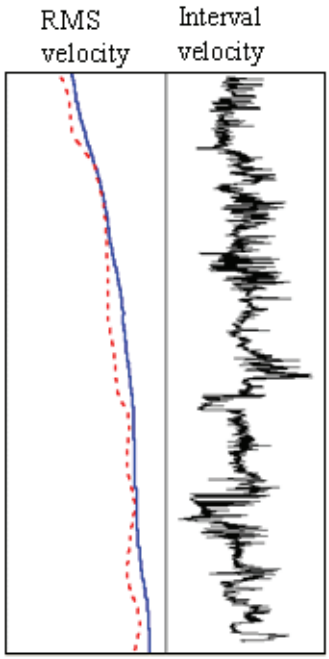

Figure 2: Well velocity (black), RMS calculated from well velocity (blue), stacking velocity influenced by multiples (red)