

The Value of Re-Processing Vintage Seismic Data: A Case Study From the Caspian Sea

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ABSTRACT

This paper aims to illustrate the value of re-processing a legacy dataset in the Caspian Sea. Specifically, the careful application of an updated processing flow has delivered considerable improvement in imaging a stratigraphic trap. In this instance, re-processing of legacy seismic data has benefitted from new processing algorithms, particularly broadband and de-multiple techniques. The marine towed streamer dataset was acquired and processed in 1995 using conventional processing techniques available. This vintage processing flow involved minimal de-noise, and partial migration using DMO and post stack time migration. The vintage data suffers from inconsistent amplitudes, strong bubble energy and significant multiple and noise contamination, all of which impacted the geophysicists' ability to image the stratigraphic pinch out. Several 2D lines totalling 250 km in length were re-processed using an updated broadband processing flow. Specific care was taken to reduce the wavelet duration and side lobes through de-ghosting, zero-phasing and de-bubble of the source wavelet. Ensuring the consistency of the data phase is particularly important to resolve a stratigraphic pinch out. De-multiple steps including SRME and radon were important given the shallow water depth. Re-processing successfully increased the usable bandwidth by 15Hz at the target. The increased resolution allowed more reflectors to be confidently identified and the stratigraphic pinch out to be successfully imaged. Interpretability was also improved due to the reduced noise content and better amplitude fidelity. In some areas the 2D image remains affected by distortions caused by sea bed canyons indicating remaining limitations of 2D acquisition and possible need for pre-stack depth migration. This work has had several follow on business impacts. Firstly, the re-processed stacks provide a much improved representation of the subsurface geology, ultimately reducing the risk of exploring in the area. Additionally, the new processing sequence described here has been used to inform vendor re-processing of a greater number of 2D lines from the same area, further delivering value from the existing seismic database. Thirdly, re-processing provided geophysical insights on acquisition parameters for a possible future survey. This case study demonstrates the importance of specialist studies of legacy datasets to maximise value and highlights the importance of systematic seismic fitness reviews.