

Central North Sea – Application of new imaging technologies to legacy data

The Central North Sea is a mature basin containing a large number of oil and gas fields, some of which have been in production for decades. Naturally the area is well covered by many vintages of 3D towed streamer seismic data with some areas also having dual azimuth coverage. Recent and ongoing developments in the area of seismic processing mean that comprehensive reprocessing of the existing datasets can continue to provide significant imaging uplift through the application of new imaging technologies.

The dataset described here was acquired in several phases between 2001 and the present day. Consistent parameters were used for each acquisition, including long offsets (minimum 6km) and common azimuth. Each vintage was processed shortly after acquisition to anisotropic PreSTM. In 2015 the entire pre-processed dataset of $\sim 35,000\text{km}^2$ was used to perform anisotropic PreSDM model building and imaging to produce a new contiguous reference dataset. Many issues however were not fully resolved in the seismic data, including limited bandwidth, residual surface and internal multiples and imaging problems caused by shallow channels, gas and salt.

Recent technology developments can now be used to address many of these issues. Full source and receiver de-ghosting applied to field data can be used to improve the bandwidth. New short-period and internal multiple attenuation methods significantly reduce the level of residual multiple while preserving primaries. Full waveform inversion that includes absorption effects by simultaneously inverting for Q in addition to velocity resolves many of the original imaging distortions. Data after reprocessing shows marked improvement in AVO results and usable angle ranges.

Figure 1 illustrates the impact of these technologies on the bandwidth, multiple attenuation, primary preservation and imaging when compared to the vintage data. In addition, assessing the impact of processing on reservoir attributes was a key element of the quality control process with AVO and inversion products generated at all key processing stages (**Figure 2**).

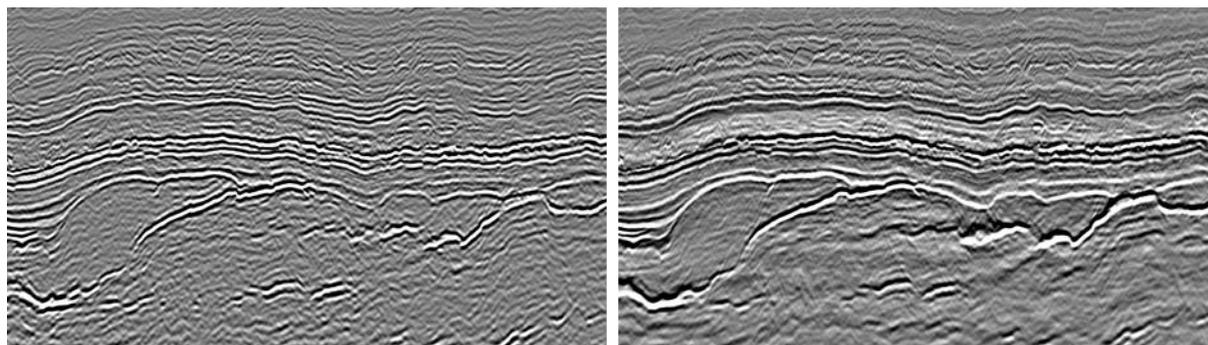


Figure 1: Example inline display for legacy (left) and pilot reprocessing (right) showing the improvements in bandwidth, primary preservation and multiple content.

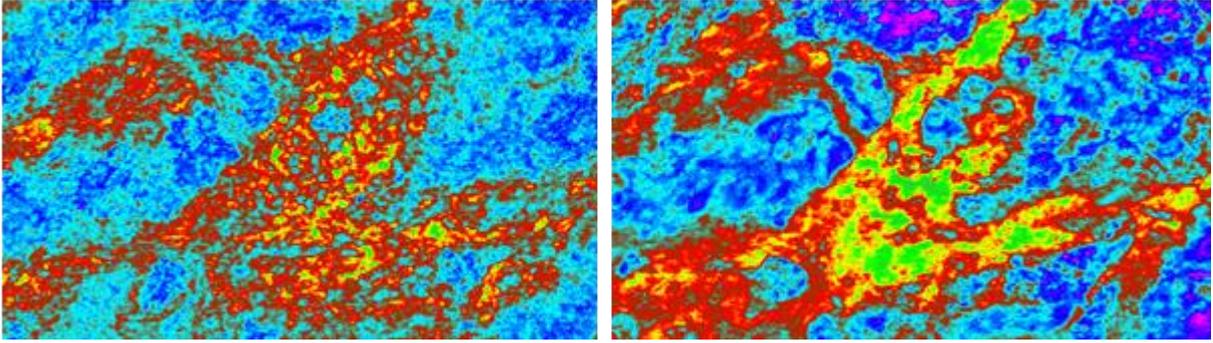


Figure 2: *VP/VS ratio: Legacy (left) and reprocessing (right). The pilot reprocessing shows a clear step-change improvement in the definition of lithology compared to the legacy processing.*

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