A Case History of Broadband Processing of West of Shetland Data

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Abstract

A number of approaches to increasing the bandwidth of seismic data have been adopted over recent years and have predominantly focussed on avoiding the reduction in signal strength and hence S/N at the frequencies associated with the receiver ghost notch. In particular, Williams & Pollatos, 2011, showed test results indicating that a modern, hydrophone only streamer towed deep enough that it is well away from environmental noise, such as sea swell and boat generated noise, can have sufficient S/N to be usable even within the receiver ghost notches. This observation relies on the sea surface not being a perfect mirror. Grion et al, 2013, showed for a 3D data set from the N. Sea that with a flat cable at 30m the difference in data quality between a 4m sea state and a flat calm was small and that both datasets had usable S/N within the receiver ghost notch. This study again suggests that the sea surface does not behave as a perfect mirror.

Sablon et al, 2012, showed the impact of a variable depth streamer on multiple suppression and the modifications to de-multiple algorithms necessary. In this case, the recording geometry included a large change in streamer depth but a significant part of the streamer beyond the near offsets is very deep and gently sloping. In contrast, this paper demonstrates the effectiveness of conventional de-multiple algorithms on a 2D survey from West of Shetland shot with a cable towed with a mild, linear slant of 1m per km of offset from 20m at the near offset to 30m at the far offset. Attenuation of the multiples in this area is well known as challenging because of a hard sea bed with a variable depth and also complex geology including volcanics.

The results indicate that with this recording geometry – moderately deep and with only a mild gradient of cable depth – conventional de-multiple techniques can be used successfully while at the same time allowing broadband post-migration receiver de-ghosting with an overall processing turnaround time comparable to that for conventional processing projects. The complexity of the geology required a range of de-multiple techniques to be used including SRME, SWME (Shallow Water Multiple Elimination) and high resolution Radon.

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References

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