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A client's perspective of recent learnings and improvements from a 3D survey using highly sampled 3C marine streamers

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SUMMARY

A multimeasurement streamer system was used to acquire data for generating a volume with improved resolution and signal-to-noise ratio (SNR) relative to legacy data. The initial data preconditioning flow did not result in the desired uplift in SNR in the 3D/3C receiver-deghosted, wavefield reconstructed product. We illustrate different and new types of noise observed and discuss the mitigation approach and implications for both on-board and shore-based data conditioning. We demonstrate the significant uplift observed in the 3D/3C deghosted and wavefield reconstructed product resulting from extensive testing and additional data preconditioning steps.

Introduction

The seismic industry is increasingly offering broadband marine acquisition solutions. One of them, Schlumberger's multimeasurement streamer system that records pressure and vertical and horizontal particle motion (Robertsson et al. 2008), was recently used to acquire a production 3D/4D baseline survey. The main technical objective was to generate a dataset with improved resolution and signal-to-noise ratio (SNR) relative to the existing legacy data sets. The raw hydrophone and accelerometer data from this system have more noise than commonly seen on conventional array-formed, hydrophone data. The noise level required additional data preconditioning steps in order to enable the full potential of the technology.

Method

At the time of acquisition, the system was an emerging technology; thus, no standard set of default processing parameters existed for the data preconditioning of the individual components. The initial data preconditioning flow did not result in the desired uplift in SNR in the receiver-deghosted, wavefield reconstructed product generated by application of GMP (Generalized Matching Pursuit, Özbek et al. 2010). Consequently, our approach for data conditioning evolved over the course of the survey to keep pace with the quickly developing technology. The strategy included evaluating the potential benefits of attenuating the different noises before or after GMP. In this paper, we illustrate different and new types of noise observed and discuss the mitigation approach and implications for both on-board and shore-based data conditioning.

In conjunction with the expanded data preconditioning flow, we found that extensive testing and fine-tuning of the internal GMP parameters greatly improved the SNR of the final receiver-deghosted, wavefield reconstructed dataset. The main technical objective was achieved for this survey, and learnings from the increased effort will be implemented for future applications of the technology.

Conclusions

We demonstrate the significant uplift observed in the 3D/3C deghosted and wavefield reconstructed product resulting from extensive testing of the data preconditioning and GMP parameters. Collaboration between the client and acquisition vendor was the key to achieving these results.

References

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