

## **Understanding the root cause of poor seismic data through modelling**

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### **ABSTRACT**

Enabled by ongoing advances in computer technology and processing algorithms, pre-acquisition feasibility studies using synthetic data are becoming more and more accepted in the marine environment. For marine acquisition the near-surface is relatively simple acoustic medium which simplifies the computational task for synthetic modeling, enabling large-scale 3D seismic simulations for various scenarios to be run within a reasonable time frame. In comparison for onshore acquisition the near surface is a much more complex elastic medium which makes finite- difference simulation modelling significantly more compute intensive.

Through developments in modeling and inversion technology a suite of tools are now available which allow us to build complex near-surface models without having to revert to full elastic finite-difference modelling. Consequently multiple near-surface models may be generated in a relatively short period of time.

This paper demonstrates how it is possible to gain an understanding of the onshore near-surface in absence of direct measurements such as uphole surveys. We can utilize the existing seismic data to support near-surface model building and the generation of realistic synthetics. By varying the parameters of the Earth model and comparing synthetic data with the real seismic data it is possible to gain an understanding of the mechanisms behind the noise trains visible on the real seismic data. We can then analyze how to optimize selection of acquisition parameters and data processing schemes with respect to both signal and noise.

Such analyses can include evaluation of the effects of geometry, fold, arrays and noise interference introduced by high productivity techniques. The paper gives a case-study example of such a workflow approach where it was used to uncover the potential root cause of poor legacy seismic data quality.