

High Resolution 3D Seismic Survey

near the envisioned CO₂ storage site at P18-4

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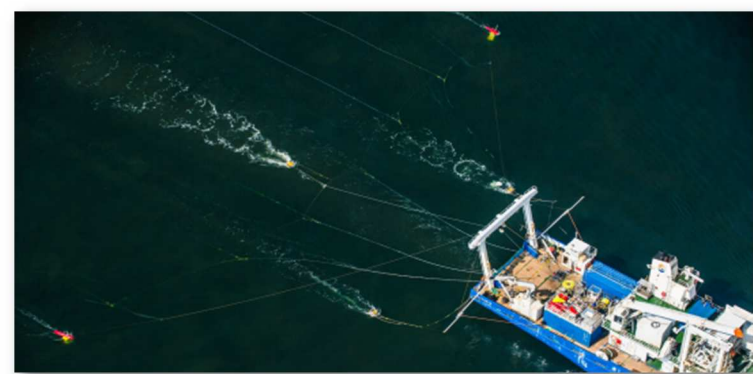
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INTRODUCTION

This poster describes the data acquisition and processing of a high resolution 3D seismic survey off-shore Rotterdam in the Netherlands. The new deployment concept that was tested with this survey results in high-quality 3D images of the shallow subsurface at relatively low cost, particularly in comparison with conventional 3D seismic data acquisition. Initially, this pilot survey aims to demonstrate the use of high-resolution 3D seismic for risk assessment and monitoring in CO₂ storage. However, we expect that the technology will ultimately be applied in a much wider range of activities. A review of the data shows that this data acquisition concept will be very well suited for identification, delineation, and characterization of shallow gas presence for exploration and hazard assessment purposes.

FIRST HIGH RESOLUTION 3D

To our knowledge this is the first high resolution 3D seismic survey that has been acquired off-shore in the Netherlands. Target of the survey was the upper thousand meters of the overburden in the vicinity of the P18-4 gas field. The depleted gas field is the candidate CO₂ storage site for the ROAD2020 CCS demonstration project.



The 3DHRS spread deployed behind the RV Pelagia. Small changes in geometry are devastating on the data quality and need to be taken into account during processing.

OBJECTIVES

Our pilot survey aims to demonstrate the use of high resolution 3D seismic for risk assessment and monitoring in CO₂ storage. However, we expect that the technology will ultimately be applied in a much wider range of activities. Review of the data shows that this data acquisition concept will be very well suited for identification, delineation, and characterization of shallow gas presence for exploration and hazard assessment purposes.

ACQUISITION

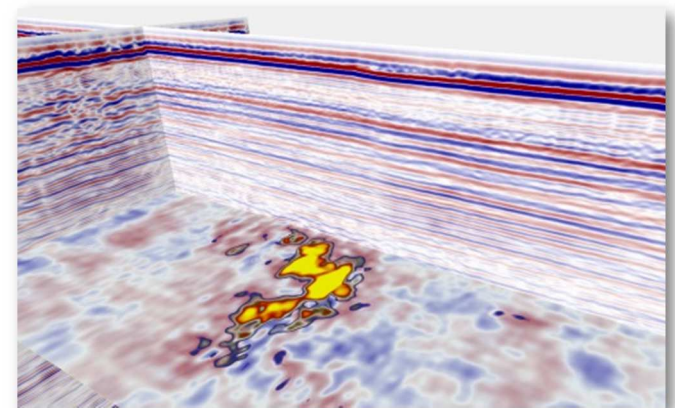
The data acquisition took place in April 2014 and was carried out in a partnership of TNO, Deltares, and the Netherlands Institute for Sea Research (NIOZ). The acquisition planning, data processing, and imaging has been carried out jointly by ConocoPhillips and TNO.



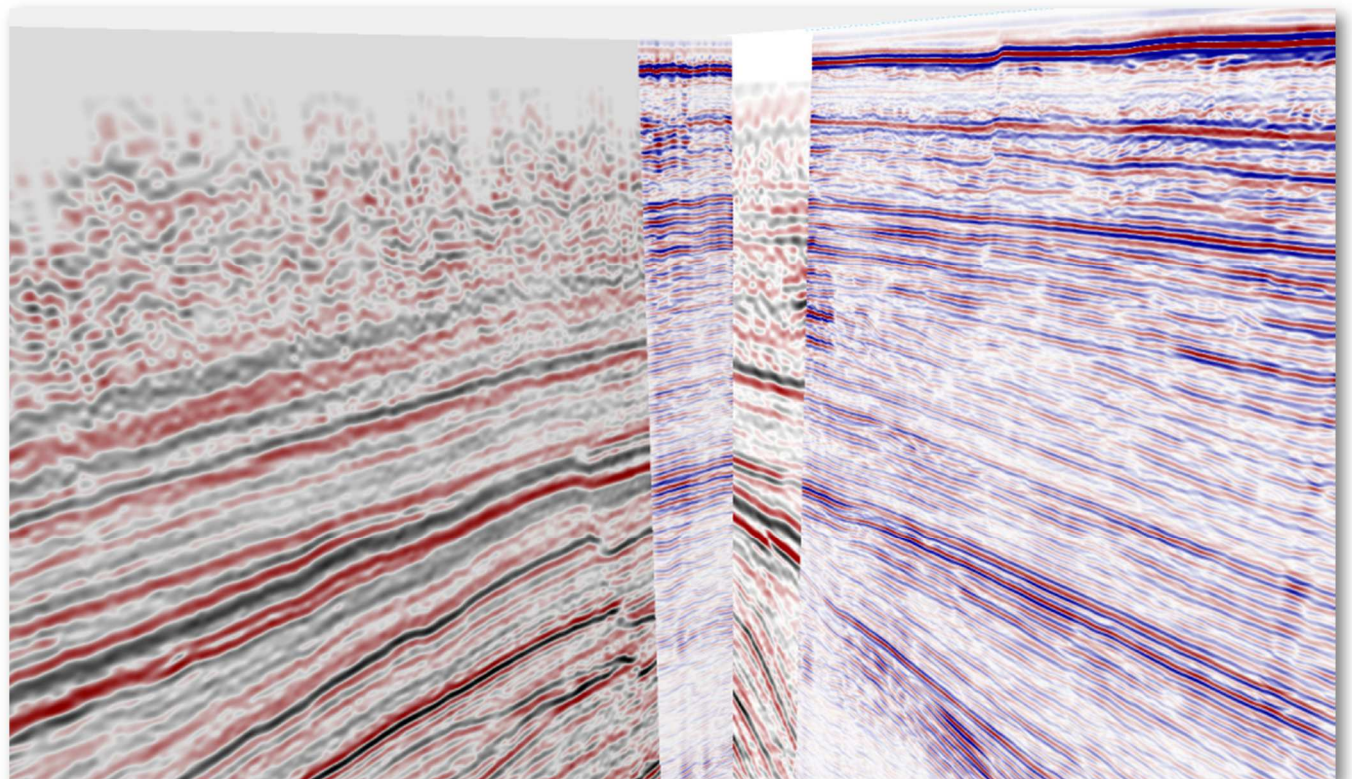
The RV Pelagia with the 3DHRS spread in operation near the coast of The Hague. In the distance the P18 platform can be seen.

PROCESSING

Data processing and imaging was carried out by TNO and ConocoPhillips. Major differences from typical seismic processing practice include retaining frequencies up to 300 Hz, having short intervals between sources and receivers, and relatively large static shifts. Processing included removing the source signature with an inverse filter. Correcting for data gaps by using super-gather distance weighted smoothing. Pre-stack time migration, followed by full and offset-limited stacks.



Time slice through a bright spot as imaged by the 3DHRS.



Conventional 3D seismic and the newly acquired 3DHRS combined in one image. Note the difference in resolution and imaging especially in the shallow parts. Tuning effects are thought to brighten horizons.

CONCLUSIONS

The data shows that the concept as deployed is capable delivering data with the resolution and dense coverage that is required to identify and delineate the shallow anomalies and structures related to gas presence and migration paths. We expect that the data will provide ample opportunities for study of a rich variety of shallow anomalies for years to come. Moreover, we are working towards a full-scale deployment of this new data acquisition concept. We expect that the results of this first survey will convincingly demonstrate the feasibility and benefits of our concept for high resolution 3D seismic acquisition.

ACKNOWLEDGEMENTS

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