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Please fill in your abstract title.	Using AVO to Evaluate a Norwegian Thin Pay

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Pierre-olivier	Lys	Total E&P
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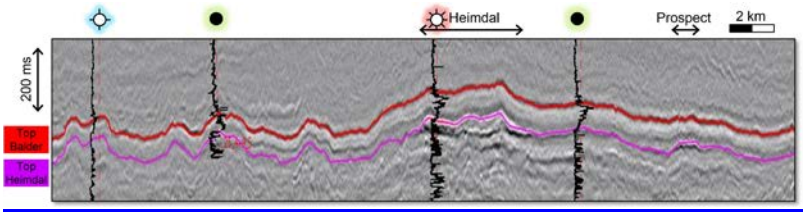
Abstract

Objectives/Scope:
In mature areas, modern seismic acquisition together with in-depth understanding of the rock physics and its seismic signature provide opportunities to turn old prospects into economic discoveries. This paper is based on a Paleocene prospect of the Norwegian Northern North Sea whose interpretation has been entirely revisited. Improved seismic data, availability of nearby analogues and comprehensive use of seismic amplitudes and AVO allowed to re-evaluate this thin pay and predict its hydrocarbon content.

Methods, Procedures, Process:
The prospect had been identified several years ago as a low relief differential compaction high of the very thick and sand rich Heimdal formation. It is located close to the Heimdal gas field, discovered early 70's and to the nearby more recent oil discoveries of Tir, Vilje or Jotun.

The original interpretation carried out on full stack data had led to a non-economical gross rock volume (GRV) with no remarkable amplitude characteristics. Angle stacks of a new broadband seismic dataset highlighted an AVO anomaly that could lead to a bigger GRV. AVO-based methods helped tackle the poorly constrained geometry.



Results, Observations, Conclusions:
The seismic response of the prospective pay-interval was then re-interpreted as the combination between a top hydrocarbon (HC) sand and an interpreted fluid contact close to the top of the massive sand body. Because of the different elastic properties of the three layers involved (shaly seal, HC and brine sands), the overall seismic response undergoes significant variations with incidence angle.

Top reservoir reflectivities variations with angle were modelled with different fluids, substituted and/or in-situ. Taking advantage of the peculiar AVO behaviors, top reservoir could be tracked on a single volume irrespective of its fluid content (i.e. shale/brine or shale/HC) as well as the top of the brine sand on another volume irrespective of its immediate overburden (i.e. shale/brine or HC/brine). As a result, top and base of the hypothesized pay interval could be interpreted independently. The top reservoir was updated shallower and thickness estimated free of tuning virtually down to zero thickness. Amplitudes were extracted at a selected angle and displayed versus un-tuned thickness. Differences between these experimental tuning curves were interpreted as differences in reservoir properties. By comparison with gas and oil proven fields, a thin oil bearing reservoir was prognosed.

Novel/Additive Information:
Finally, thanks to the proper combination of novel seismic acquisition, processing, detailed conditioning, rock physics and careful selection of data for what they respond to, the well that was subsequently drilled confirmed the pore fluid. It also proved right the picking strategy used to characterize a pay thinner than seismic resolution. The discovery is currently considered for development.