Results from new technology and workflows for fast track reservoir characterisation of a Palaeocene deep marine turbidite field.

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Abstract Summary

The Brenda field in UK North Sea Block 15/25b (see Figure 1) has undergone very rapid exploration and appraisal in 2004 and is now poised to move into development and production phases over the next 18 months.

Over 12 "cluster" penetrations of the Palaeocene Upper Balmoral reservoir have been drilled and a substantial amount of reservoir data has been collected. The objective of the project required fast assimilation and integration into operations to ensure that each well was targeted and optimally drilled with the benefit of the enhanced understanding of the previous data collected.

We describe the combination of rock physics driven seismic interpretation of attributes, and new technology for "inversion of inversion" for reservoir characterisation used to fast track the Brenda field previously considered non economic.

The Brenda net oil reservoir varies from 15m- 30m in thickness trapped by a combination of structural and stratigraphic elements and our understanding of the relative importance of the two major controls and modifiers such as hydrostatic gradients is still evolving.

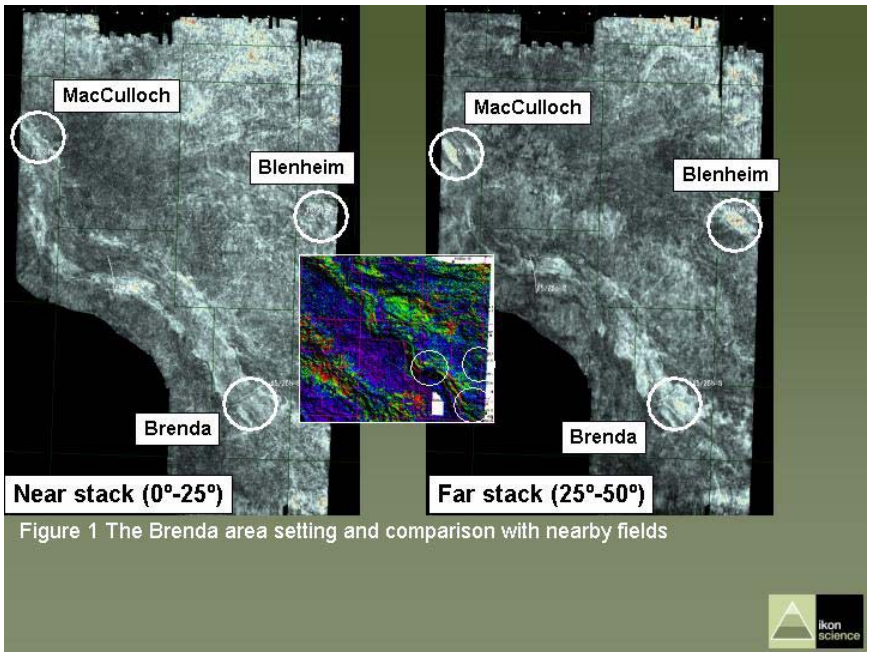

Figure 1 The Brenda area setting and comparison with nearby fields

Introduction

The Brenda field in the Central North Sea UK sector was discovered in the 1990's by well 15/25b-3 drilled by Conoco and considered economic due to its apparently small size and thin reservoir interval.

In 2003, the field was re appraised and the well flowed at over 3,500 bopd. An aggressive appraisal program followed. Because of the unusually rapid pace of drilling the workflow to evaluate the field

evolved on the job and was driven by the rock physics analysis (Figure 2) and 3D partial stack attributes, with a high degree of success.

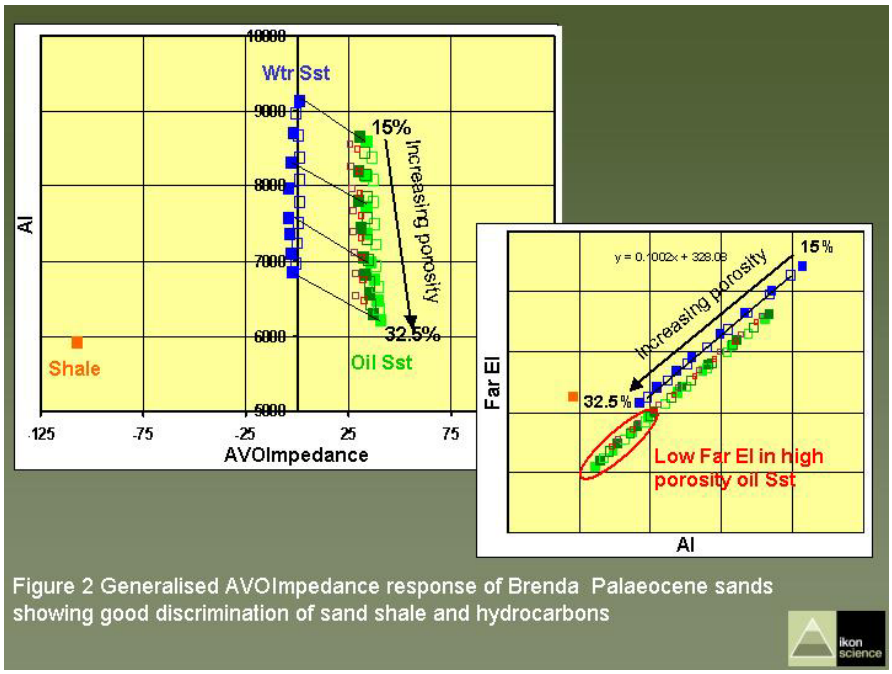

Figure 2 Generalised AVOImpedance response of Brenda Palaeocene sands showing good discrimination of sand shale and hydrocarbons

Method

The production drilling of requires long reach horizontal production wells. Given the low relief of the field and its subtle nature it is necessary to characterise the 3D porosity and shale distribution (see Figure 3) in the field, in three major facies groups: - Overbank, Channelised fill and Terminal lobe. Each facies has its geophysical and geological challenges ranging from detectability criteria in the Overbank, trapping mechanisms in the well connected channels and net to gross determination in the Terminal lobes. Superimposed on the litho-facies issues are the numerous small scale faults and discontinuities which are important because they can provide both barriers to, and conduits for, fluid flow in the reservoir and subsurface.

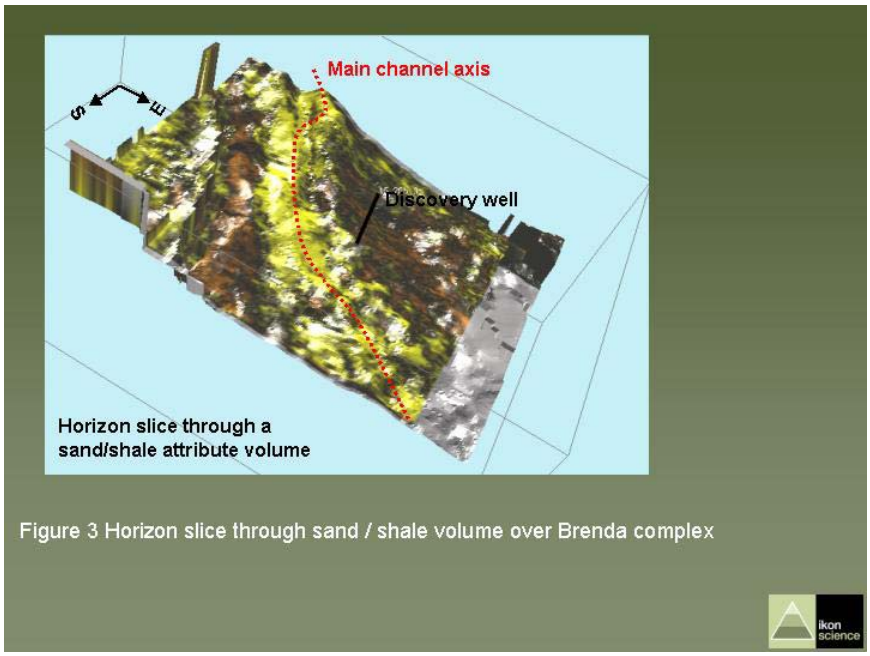

Figure 3 Horizon slice through sand / shale volume over Brenda complex

Results/Conclusions

We show an approach using rock physics, seismic interpretation, inversion, and “Inversion of Inversion” methods (see Figure 4) combined with automated fault and discontinuity picking and analysis.

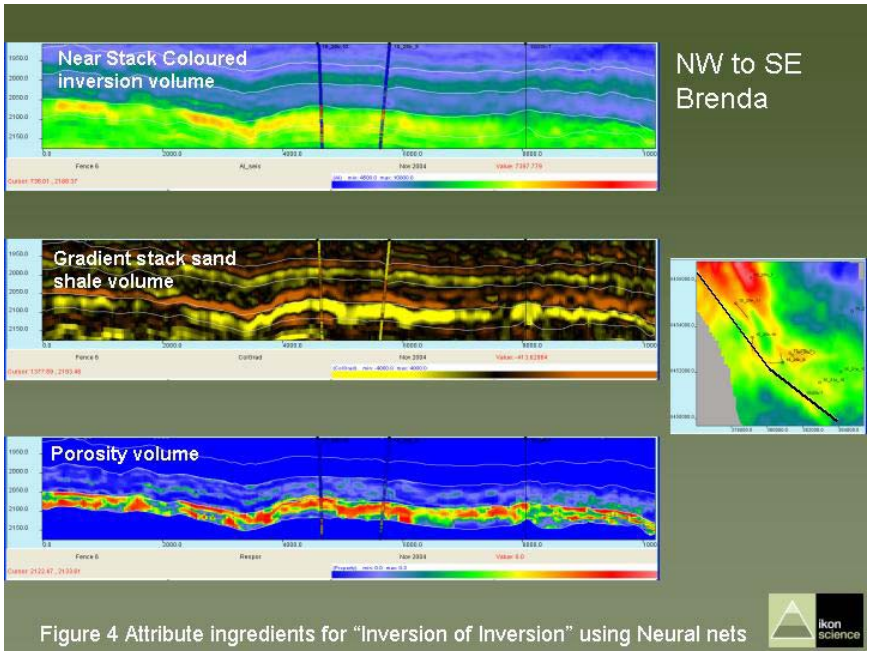

Figure 4 Attribute ingredients for “Inversion of Inversion” using Neural nets

The project is “live” and evolving. We hope that it will provide our audience with a good reality check into how current methods, technologies and workflows for the next generation of North Sea fields to reduce reservoir uncertainty and reduce development costs.

The project shows it is possible to rapidly detect and quantitatively map external and internal trapping elements including a thin reservoir pay, very small scale faults and lithology changes in an anastamosing sand and shale channel levee system (see Figure 5).

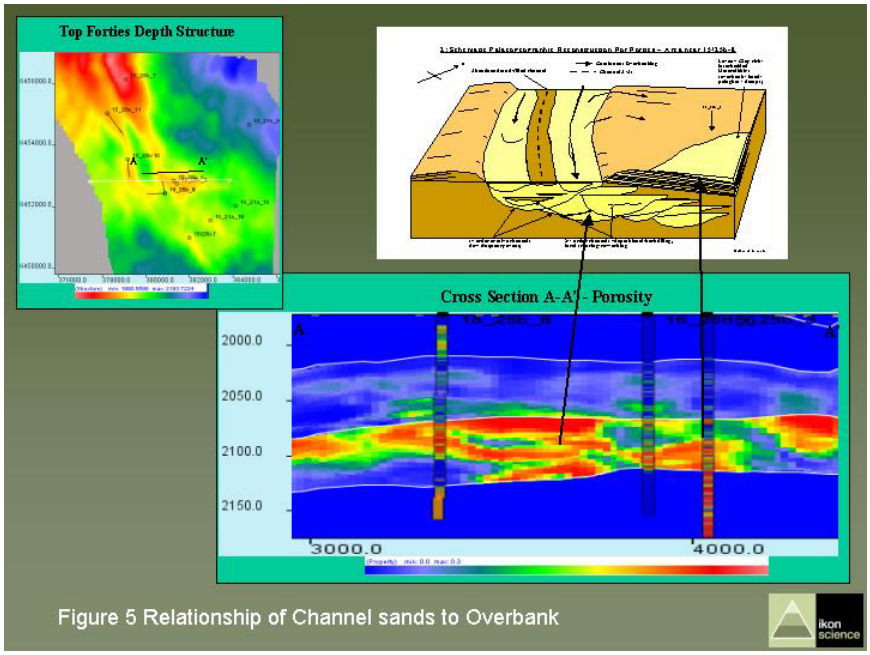

Figure 5 Relationship of Channel sands to Overbank

Acknowledgments
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