9th Annual ffA Technology Conference

11th February 2015

Teric
from ffA

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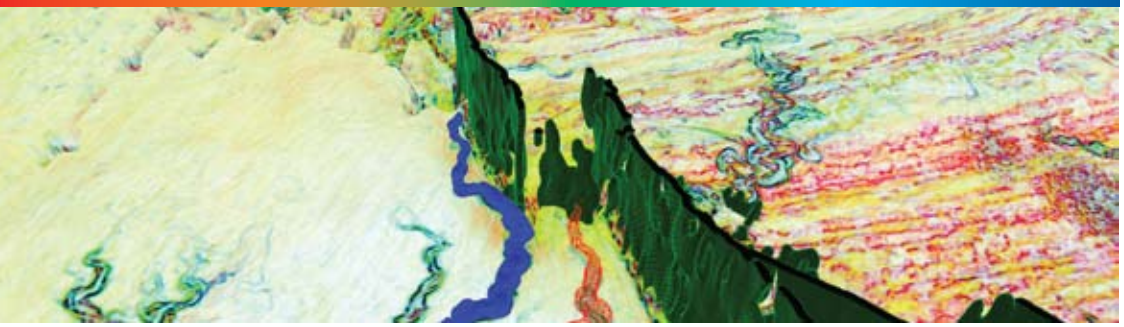
DoubleTree Hilton, Beach Blvd, Aberdeen
11th February 2015

GeoTeric from ffA

09.30	Registration, Welcome Breakfast & Refreshments	
10.15	ffA	Introduction
10.30	E.ON	Fault Expression
11.00	Break	
11.15	Statoil	Interpretation of Seismic Geo-morphology via Spectral Decomposition: North Sea Example
11.45	ffA	GeoTeric 2015.1
12.15	Lunch	
13.15	Corfield Geoscience	Prospect Generation Using GeoTeric
13.45	Centrica	In Pursuit of the Truth – Examples of GeoTeric Usage
14.15	Break	
14.30	Chevron	The Influence of Volcanic Rocks on Rosebank Field Development Decisions – New insights from Ocean Bottom Node seismic data
15.00	DONG Energy	Using Spectral Decomposition to Characterise Depositional Environments in the Faroe-Shetland Basin
15.30	Round-Up	
15.45	Drinks Reception	



Introduction

Jon Henderson

ffA

It is shaping up to be a testing year for all of us in the oil and gas business. When facing challenging financial conditions, the need to condition our decision making with relevant, detailed and accurate information about the subsurface becomes even more acute. At the same time budgetary constraints can make acquiring new data or full scale reprocessing difficult to justify. In some respects this is a positive environment for technologies such as GeoTeric, which can help reveal the wealth of untapped information that often exists within the data that we already have access to. It is therefore opportune for us to be able to put together a showcase, in the form of the 9th ffA Technology Conference, that highlights the different ways in which our customers have been using GeoTeric to add value to their business.

At least I hope that is what we will see! Although the ffA Technology Conference is hosted by ffA we make no attempt to vet or condition what the speakers at the conference have to say about GeoTeric. This makes it possible for the conference to be a truly open forum where everyone who attends, including us, can learn and gain new insights into the disparate goals we are setting out to achieve.

In addition to how the software is being used by our customers, the other important aspect of the ffA Technology Conference is that it gives us an opportunity to let you know what is going on in ffA from a wider business perspective. This includes going through some of the highlights of the past 12 months, such as our expansion into Asia and Australia.

However, the key thing for all of us is the present and future of GeoTeric technology. Despite the impact that the fall in oil price will obviously have on the industry, through 2015 we intend to continue to grow and increase the amount that we are investing in our technology. We have always strived to listen to the users of our software. To take this approach to the next level, in 2014 we formed the GeoTeric R & D consortium and in 2015 we are expanding our software development and support teams so that we can continue to be very responsive as the number of people using GeoTeric continues to grow. The true impact of this expansion on development will not be seen until later in 2015 but at the Technology Conference we will be launching the first of our 2015 software releases. This has been imaginatively named GeoTeric 2015.1 and during the day there will be plenty of opportunity to see all that is new.

Putting all these aspects together, I think that we have one of the strongest programmes ever, so I hope you enjoy the Conference and come away with new ideas and new insights into what can be achieved with your seismic data through utilising our technology to make the most of your expertise.

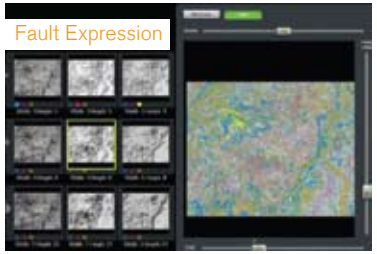
Fault Expression Workflow: Case Study of a Norwegian North Sea Field

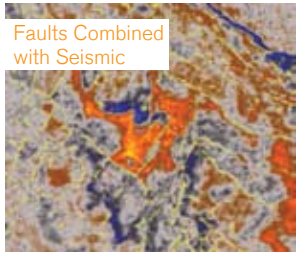
Balazs Badics, Anthony Avu & Sean Mackie

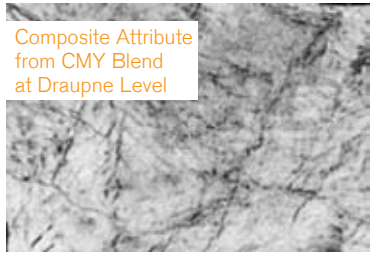
Located at the northern end of the Utsira High and occupying the western margin of the less explored Stord basin, the study area has been dominated by the extension of the Viking Graben, syn-depositional structuring of the major source rocks, uplifts and erosion. The organic-rich Upper Jurassic Draupne and Heather Formations are the main proven source rocks of the Norwegian North Sea. The Draupne formation is a rich oil-prone, immature to early oil mature source rock in the area, representing a 25 m thick condensed section over the Utsira High and thickening to 150-300m towards the deep grabens. The underlying Heather formation is also oil-prone, 30 to 400m thick, more mature source rock with significant thickness variations.

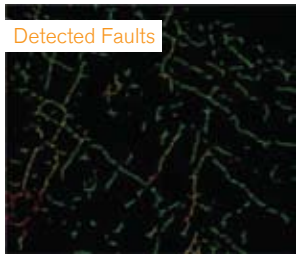
In characterising the vertical organic richness variations of these major source rocks using biostratigraphy, organic geochemical data and petrophysical logs, a clear understanding of the faulting captured by the seismic data within the study area was paramount.

To this end, we applied the Fault Expression workflow which utilised a CMY blending technique where 3 different edge attributes that have highlighted different areas of the fault are blended into a composite image and further into a composite edge attribute which we used to guide the fault interpretation and imaging.
The workflow has been efficient in providing a quick and objective analysis as well as vital fault maps over the entire study area.









Data Courtesy of PGS Megasurvey

Interpretation of Seismic Geo-morphology via Spectral Decomposition: North Sea Example

Abul Fahimuddin, John Thurmond & Ingrid Sylliaas

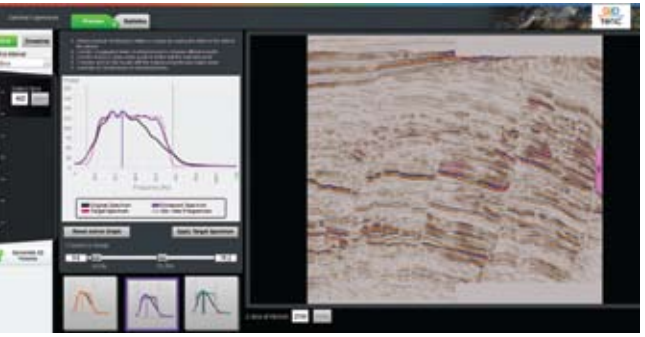
Spectral decomposition of 3D seismic data and subsequent RGB Blending of relevant frequency cubes have been useful in delineating various geomorphological bodies (i.e. fluvial channels and wave-dominated beach ridges) in Oseberg area, North sea. These interpreted geomorphological bodies are co-visualized together with geological outcrop and other geophysical data types. In this way, we are in a position to predict sand-rich tidal channels, otherwise could not de-ciphered directly from standard 3D seismic data analysis. In addition, by using the high resolution seismic frequency attribute maps, it is possible to delineate the E-W pro-grading coal filled swales which is important for effective reservoir management. And the proper placement of the well is being de-risked by utilizing these frequency-rich attributes in addition to various other types of data.

GeoTeric 2015.1

Gaynor Paton, Julia Frick & Andrea Cruise

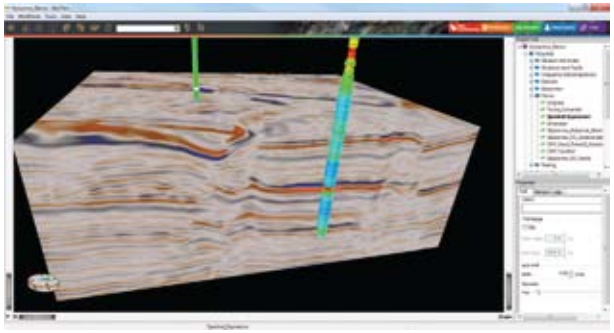
GeoTeric continues to evolve and the latest release will be available in February. The 2015.1 release continues to be powered by our progressive research, services-proven workflows and feedback from GeoTeric customers.

New functionality in GeoTeric 2015.1 includes the Spectral Expression tool. This is an Example Driven spectral shaping tool which allows you to interactively optimise the spectral content of your data within GeoTeric's unique Geological Expression tool framework. This tool expands GeoTeric's data conditioning empowering users to get the most out of their data.



Integration continues to be important, and we are pleased that GeoTeric is the first commercial link into Decision-Space as part of the iEnergy Partnership Program. This link enables our Landmark clients to seamlessly move data back and forth between GeoTeric and DecisionSpace. This not only improves workflow integration between the two technologies, but also reduces the amount of time spent on data management.

GeoTeric's Link for Petrel has also been extended and improved. It now has easier initialization without the need for a reference cube, and well data can now be transferred across the link. This gives GeoTeric broader, simpler and faster integration with Petrel.



In addition, the interpretation tools within GeoTeric continue to improve giving you easier tools to work with enabling you to achieve the desired interpretation objectives. This includes modifications to the Adaptive Horizons and the fault picking functionality.

2015 will see continued development in GeoTeric powered by our continued commitment to research, improved workflows and attention to customer needs.

Prospect Generation Using GeoTeric

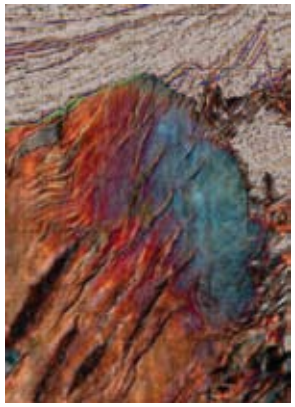
Stephen Corfield

Corfield Geoscience Ltd

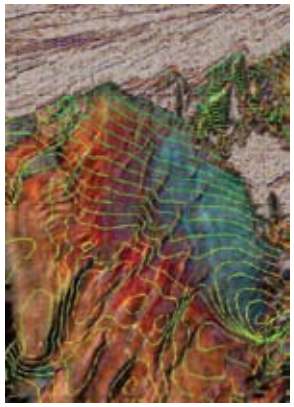
This talk is an overview of a workshop that was held in the ffA offices in Aberdeen in the autumn of 2014. The initial aim of the workshop was to give an overview of prospect generation in order to improve communication between ffA staff and their clients. However, GeoTeric has evolved considerably in recent years and, importantly, it is now possible to autotrack horizons. This removes the requirement of exporting and importing between a standard interpretation platforms such Petrel.

Therefore, the workshop was expanded to include a test of whether the whole prospect generation workflow could be undertaken with the sole use of GeoTeric. In addition to considerably expanding the functional use of GeoTeric, the exercise also highlighted functions that could be improved in the software. The database consisted of four public domain 3D volumes from the Taraniki basin in New Zealand. In order to simulate a frontier exploration exercise, the datasets were interpreted "blind" with no wells, interpreted horizons or knowledge of any hydrocarbon discoveries (if any). The results of the four exploration teams will be presented in addition to the GeoTeric workflows that evolved during the workshop.

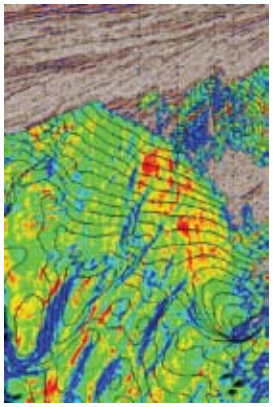
A tilted fault block from the Tariniki Basin



Frequency colour blend



Frequency colour blend with contours



Instantaneous amplitude

In Pursuit of the Truth – Examples of GeoTeric Usage

Mark Ackers, Centrica Energy

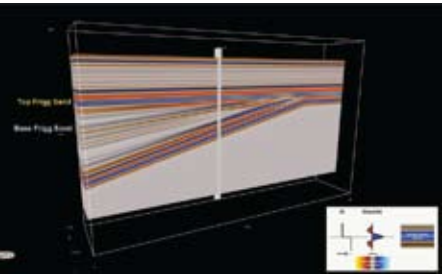


Figure 1: (a) Wedge model generated with a 30Hz Ricker wavelet

The extraction of geological information from seismic data is the goal of most geoscientists. GeoTeric provides the tools to do this in a qualitative manner, assuming that the seismic data has been processed to give a true representation of the subsurface.

In Centrica, GeoTeric is used throughout the E & P value chain, in the exploration phase for noise cancellation, attribute generation and spectral decomposition of regional volumes through to development and production projects where improved quantification of the reservoir zone is desirable. It is often the case that the vertical resolution of the seismic data is too poor to image the target reservoir accurately, and so spectral enhancement is performed on the noise-cancelled data.

One of the most utilised tools in GeoTeric for the extraction of geological information is spectral decomposition and the subsequent RGB blending of band-limited magnitude volumes. However, the quantification of the information contained in the resultant RGB blend is not straight-forward and is an area of current investigation. Figure 1 illustrates a wedge model that can be used for the quantification of thickness variations observed in an RGB frequency blend.

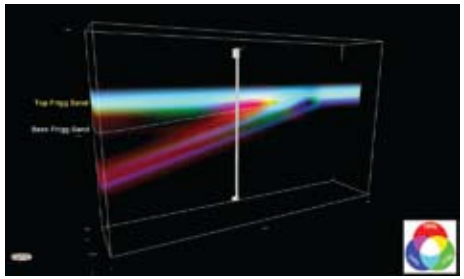


Figure 1: (b) RGB blend generated from wedge model shown in (a).

GeoTeric also provides some tools for QC and remedial processing of seismic data in addition to the standard noise cancellation workflow, and this capability has been used to demonstrate data issues to stakeholders.

Examples of the workflows described above will be discussed.

The Influence of Volcanic Rocks on Rosebank Field Development Decisions – New Insights from Ocean Bottom Node Seismic Data

Benedict Preu (1), Francesca Fazzari (2), Shona Poppitt (1)

(1) Chevron North Sea Limited, Chevron House, Hill of Rubislaw, Aberdeen 15 6XL
(2) Chevron Energy Technology Company, Chevron House, Hill of Rubislaw, Aberdeen 15 6XL

Sub-volcanic and intra-volcanic seismic imaging provide unique challenges for interpreters. The inhomogeneous character of basalts and volcaniclastics attenuate high frequencies and scatter the seismic signal prohibiting clear visualisation of target zones. Structural and stratigraphic attributes like conventional coherence and continuity show limited success to enhance imaging and their benefit is mostly restricted to highlighting the gross igneous units, without differentiation between different flow types. This limited lithofacies information from seismic data is insufficient to allow for rapid updates in reservoir characterisation in developing basins. In particular, in the basin located west of the Shetland Islands, where alternating sequences of volcanic material and clastic systems characterise the depositional system, a detailed understanding of the igneous overburden is essential for optimal development of the reservoir.

One of the discoveries located west of the Shetlands is the Rosebank Field located in Block 213 on the northwest edge of the UK continental shelf (UKCS) in approximately 3,600 ft (1,100 metres) of water. It was discovered in August 2004 by the 213/27-1Z well which encountered two oil and gas accumulations with a total net pay of 169 ft (52 m). These two reservoirs comprise the shallower Palaeocene-aged Colsay (C1 and C3) sands which form- the principal Rosebank reservoirs, composed of braided fluvial (C1) and intermixed fluvial-deltaic (C3) systems. Since these sands are interstratified with several hundred meters of volcanic material (Figure 1), in order to achieve reservoir scale characterisation of both C1 and C3, enhanced seismic imaging is required.

(continued)

While characterisation and static modelling of the field was initially based on streamer seismic data, Ocean Bottom Node (OBN) technology significantly improved the sub- and intra-volcanic seismic imaging of Rosebank. The Rosebank OBN data was acquired in two stages. The first stage was acquired in 2010 and was planned as a trial of the technology. As a result of the imaging improvements in stage 1 the project team initiated data acquisition across the remainder of the field in 2011.

Here, we will present first results of the OBN data interpretation focussing on the Rosebank Volcanics section. The primary goal of this work was to decipher the internal layering of the Rosebank Volcanics and to assess potential implications on reservoir characterisation due to the variable volcanic overburden. The usage of conventional "Fast Fourier Transform" (FFT) and high-resolution spectral decomposition on the high quality Ocean Bottom Node (OBN) data allowed for the first time visualization of volcanic subunits in the Rosebank overburden. Furthermore, improved structural imaging related to spectral enhancement gave opportunity to interpret continuous events in the volcanics. This study revealed a complex stacking pattern of igneous layers from various sources.

These results will form the basis for future work to distinguish basalts and volcaniclastics in the overburden. Detailed understanding of the ratio of basalt, volcaniclastics and shale will unlock a step change in reducing uncertainties associated with depth and volcanic thickness for Rosebank and potential future volcanic discoveries. Further, the correlation between the volcanic seismic & geological facies may facilitate a potential drilling time reduction during development by avoiding prolonged periods of drilling basalt, and subsequent cost savings.

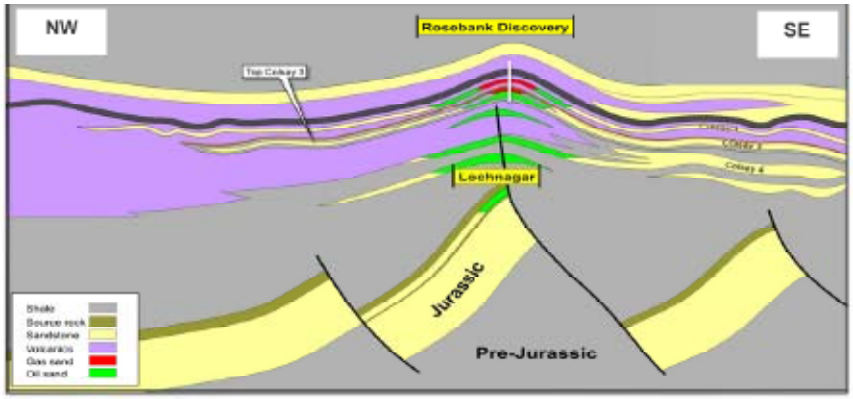


Figure 1: Conceptual sketch of Rosebank reservoir sands embedded into thick volcanic sequences; not to scale.

Using Spectral Decomposition to Characterise Depositional Environments in the Faroe-Shetland Basin

K.A. Wright, A. Ross & J. Christensen

DONG E&P UK Ltd

The ability to analyse seismic data in the frequency domain through spectral decomposition allows the user to extract additional geological information that may otherwise be missed using more traditional methods; such as amplitude extraction and attribute analysis. Within DONG Energy, it has become an integral part of our standard G&G work flow and has been routinely applied to a significant number of our licensed blocks across the West of Shetlands. This includes the example we present here, located in the Faroe-Shetland Basin and which consists of Palaeocene age siliciclastic and volcanic rocks. By using spectral decomposition as an enhanced seismic attribute, in combination with more conventional seismic interpretation methods, it has been possible to identify distributary channels and volcanic vents that have previously been inferred from seismic reflection data. This has led a better understanding of the depositional environment and therefore more complete reservoir models which can lead to a better understanding of potential field development outcomes. However, spectral decomposition cannot be used in isolation, and it is a key requirement to 'ground truth' observed patterns, most easily by observing subtle or barely visible features in the original seismic reflection data. DONG Energy believes spectral decomposition is an attractive tool to translate geophysical data into an visual representation of the subsurface geology.

Do you require GeoTeric training, but your office does not have enough participants to warrant an in-house training course? Here is your solution. Book your place on one of our GeoTeric Public Training Courses. We are running Intermediate and Advanced training courses at our Software & Services office in Aberdeen, UK.

GeoTeric Public Training Dates - 2015

3rd - 5th March:	**Intermediate**
12th - 14th May:	**Advanced**
4th - 6th August:	**Intermediate**
13th - 15th October:	**Advanced**
10th - 12th November:	**Intermediate**

For any further questions, or to book, please email us at:
info@GeoTeric.com