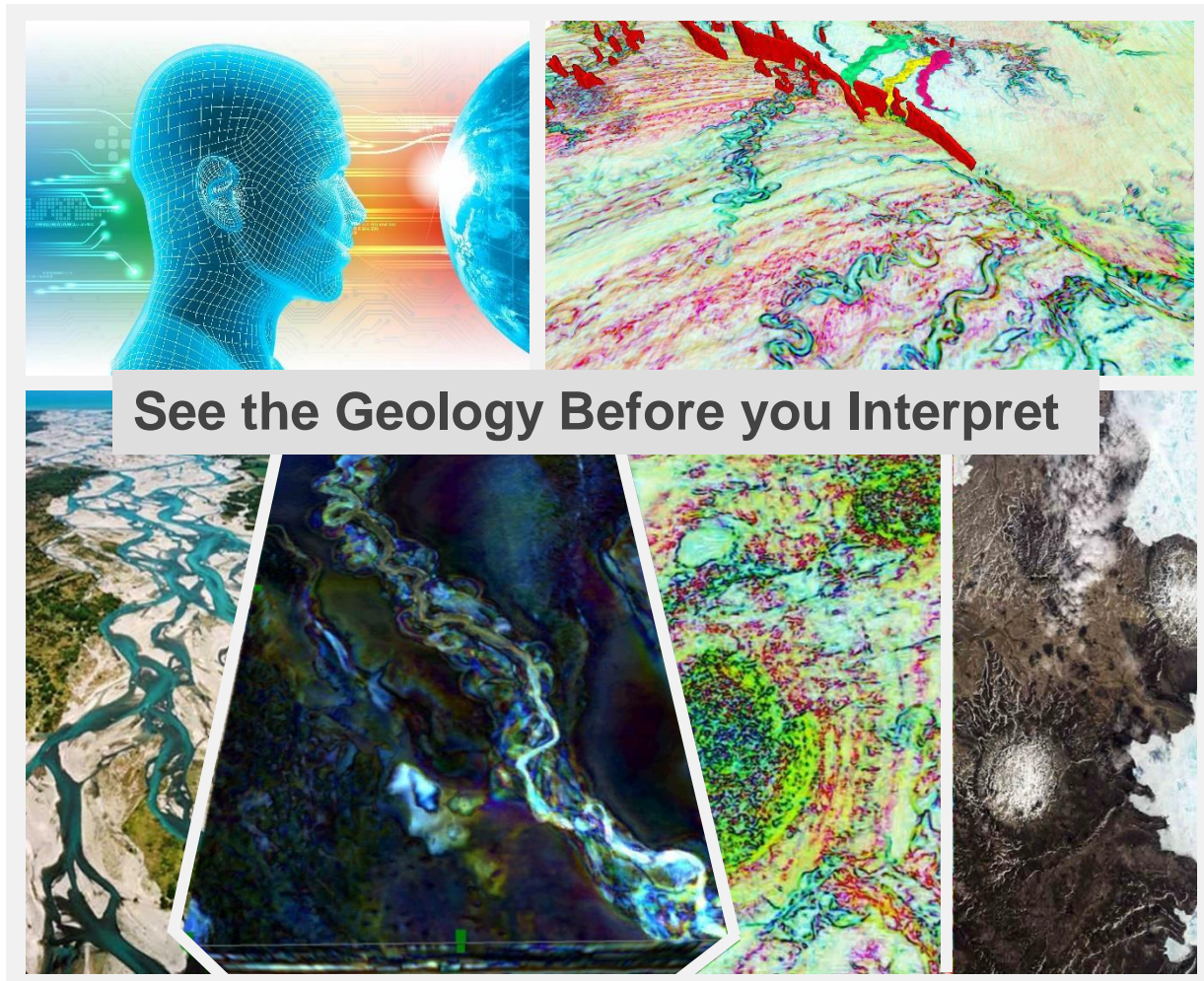

GeoTeric

Overview



Cognitive Interpretation

Reveal the Geology,
Interpret the Data,
Validate your Model.

World Leading Cognitive Interpretation



COGNITIVE by design

GeoTeric is designed to work in tandem with your cognitive capabilities. Interactive workflows utilize your geological and geophysical expertise to maximum effect, increasing the efficiency and accuracy of your daily work, whilst ensuring computers are allowed to do what they do best – process large amounts of data, fast and objectively.



CONDITION your data

Example driven, structurally oriented, data conditioning tools enhance your seismic data – creating a sharper, cleaner image for further Interpretation workflows. Spectral Enhancement tools allow you to improve vertical resolution by increasing the higher frequencies.



REVEAL the geology

Intuitive HD Frequency Decomposition and Multi-Attribute colour blending help you identify and understand the relationship between stratigraphic & structural elements – Maximizing Knowledge of your Prospects enabling Informed Decisions with Minimal Risk.



INTERPRET subsurface structure

GeoTeric's Adaptive Interpretation generates a Regional Structural Awareness creating the most accurate data-following Fault and Horizon surfaces on the market. Preview picks, update surfaces in 3D and generate surfaces on attributes and blends.



CLASSIFY seismic facies

Interrogate the geophysical response with intuitive data-driven and semi-supervised tools, while maintaining geological context. Any classified volume honours all your data available, while incorporating your own expert understanding of what is geologically feasible.



VALIDATE your model

Close the Loop between your geological model and the acquired seismic by forward modelling the seismic response in a fast intuitive way. Understand the geological reasons for the variations in colour within an RGB blend. Validate you hypothesis or rule out geological scenarios.

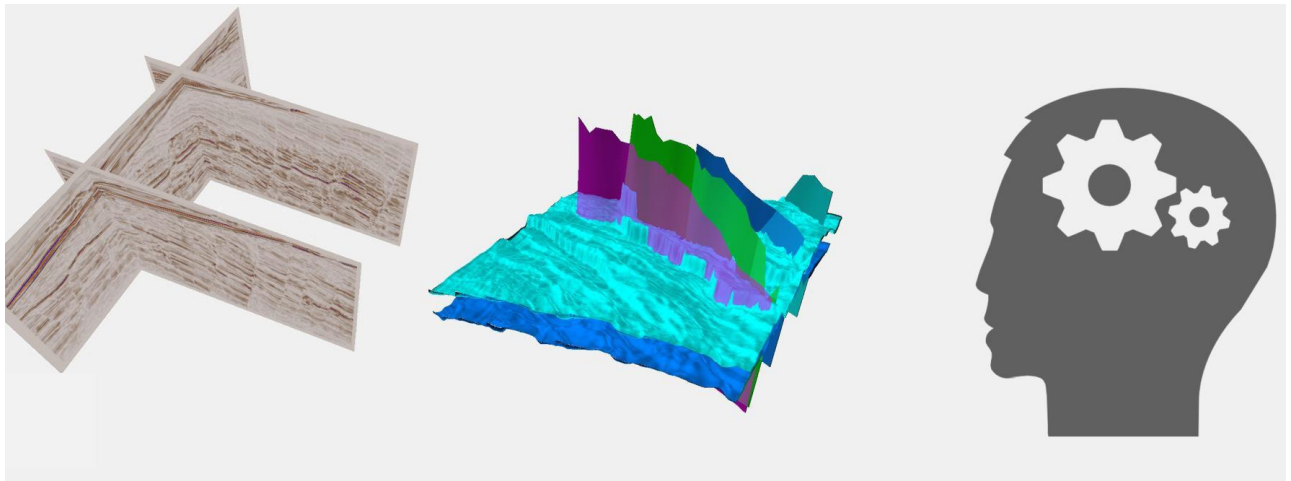


3rd PARTY Integration

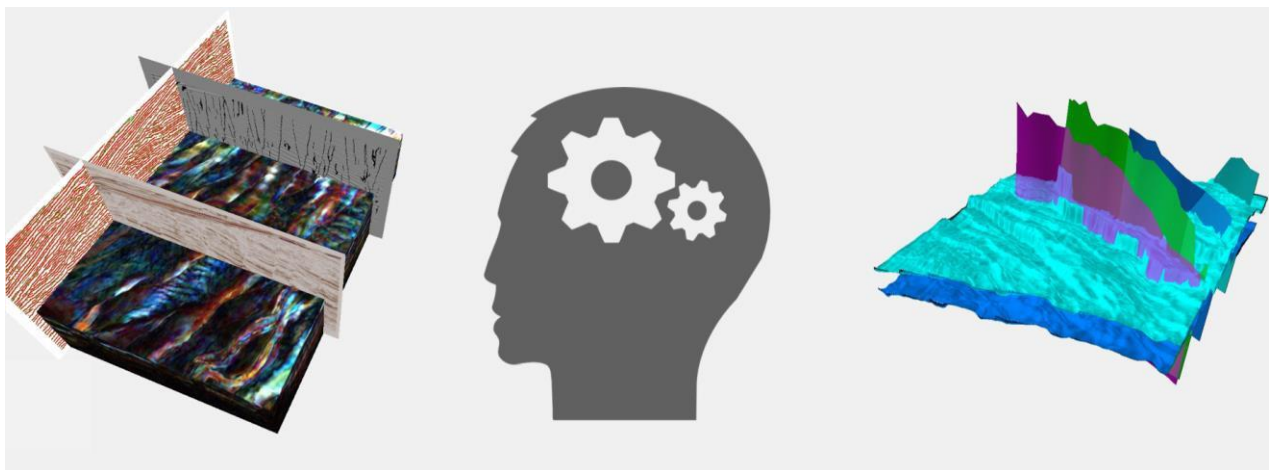
Seamless links to DecisionSpace & Petrel Designed to work in combination with standard interpretation packages to add substantial extra value to traditional interpretation workflows, whilst cutting time and costs. Available on Windows & Linux.

GeoTeric is a Major Software & Service Provider to the Oil & Gas Sector and has earned the business of over 200 global clients including NOC's, Super-Majors, and Independents.

The Only Cognitive Interpretation Solution



Conventional Interpretation workflows require the user to build a structural framework in order to begin to understand the subsurface.

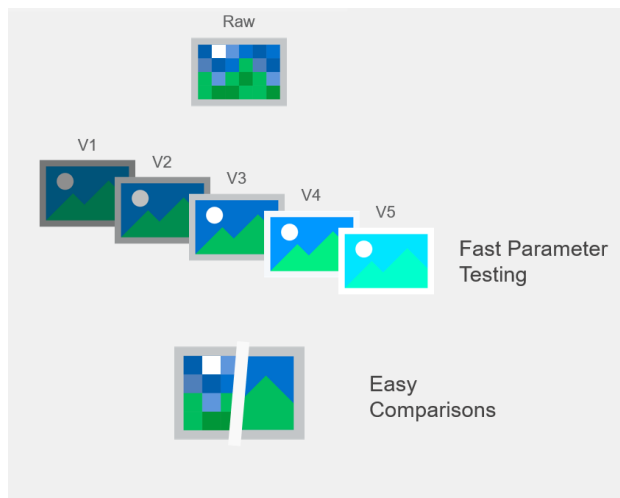


Cognitive Interpretation brings together advanced interpretative processing techniques with the power of human visual cognition so that the geology in the seismic data is revealed before the important structural and stratigraphic elements are defined. This reversal of the conventional interpretation methodology results in significant productivity gains as the interpreters understanding is at a much higher level at the start of the process.

Creating a Cognitive Interpretation system requires the design of the application to take into account both human interaction and the need for data driven objectivity, to be designed with an awareness of human cognition. GeoTeric combines high resolution multi-component visualisation, objective seismic attributes, interactive 3D object delineation and manipulation, and interactive multi-attribute data analysis tools in a way that is intuitive and gets the optimal result quickly.

Through Cognitive Interpretation, GeoTeric enables a more thorough examination of the information obtained in the available seismic data by more effectively utilising the skills of geologists involved in seismic interpretation. This increases the likelihood that a seismic interpretation is an accurate reflection of the imaged geology and allows a deterministic assessment of reservoir heterogeneity to be built into 3D geological models. The end result of Cognitive Interpretation is a huge increase in interpretation productivity, which allows improved volumetric estimation, better informed well planning and therefore a more confident assessment of field economics.

Example Driven Workflows



In order to efficiently analyse large datasets you need to be able to:

- Rapidly Test Different Parameters
- Easily Compare Results

This ensures that that you use the optimal parameters and get the best output volumes possible.

GeoTeric's Example Driven Workflows allow the user to do exactly this all within an extremely easy to use Graphical User Interface.

Do you want to use value add technologies but don't have the time to be trained on new tools?

GeoTeric's Example Driven Framework enables **value add workflows** that ensure **optimal results** with a **minimal learning curve**.

"GeoTeric is easy to learn and intuitive in process. It is a great visualisation and interpretation tool for de-risking purposes"
Petronas

Random	Coherent	Aggressive
5 Iterations	Filter Size 3	Filter Size 3
10 Iterations	Filter Size 5	Filter Size 5
15 Iterations	Filter Size 9	Filter Size 9

Modern Intuitive Easy To Use Enables Great Results Fast

"GeoTeric extracted more information from our project area in a matter of days than I've seen in the last six years"
Lekoil

Original Data ↔ Filtered Data

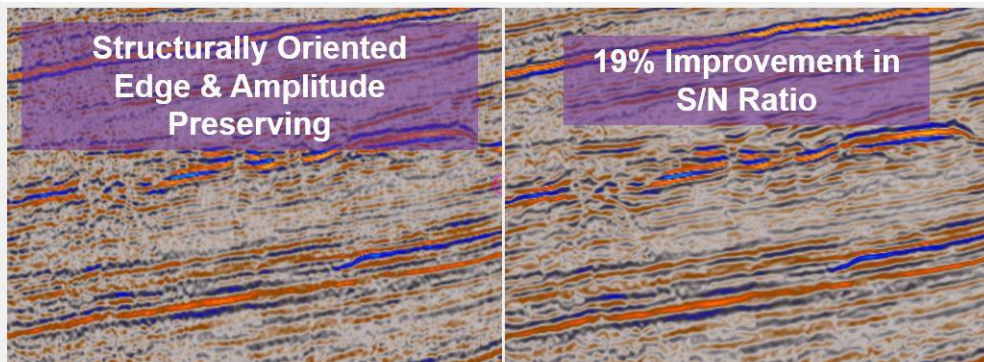
These Example Driven Workflow's empower the Geoscientist to extract the Best Geological Understanding from the available Seismic data.

Best in Class Noise Attenuation

Does your Seismic data contain noise but you don't have the time or budget for reprocessing?

GeoTeric's Best in Class Noise Attenuation algorithm delivers **cleaner data** that enables:

- Better Attributes & Inversions
- Faster and more accurate Auto Tracking



"I use GeoTeric for Noise filtering of Pre-Salt type Seismic data in Brazilian basins. Excellent results were achieved and the resulting filtered data was used for seismic attribute generation with less noise associated and improved Acoustic Inversion."
Petrobras

"GeoTeric is a great exploration tool. The example-driven interface for noise cancellation can help you from seeing nothing to bring out the geology very quickly."
VNG

"By using GeoTeric Data Conditioning I was able to map my horizon much faster and more reliably than before"
ADNOC

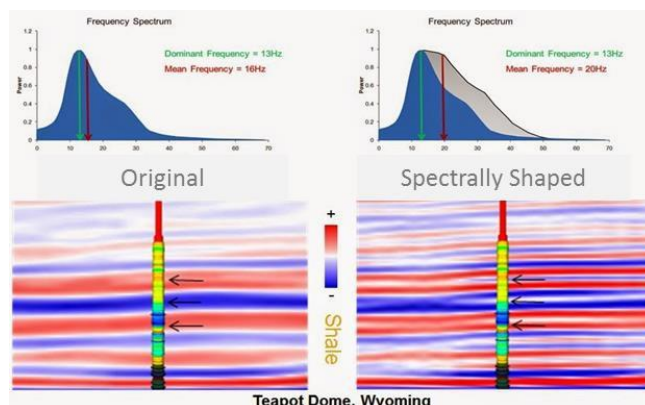
GeoTeric's structurally oriented noise attenuation enables the Geoscientist to significantly improve the signal to noise ratio of their input seismic data while preserving both edges and amplitudes. Combined with the Example Driven Workflow interface this enables the Geoscientist to intuitively fine tune their input data without the need to go back to processing centre. Ensuring that the data is conditioned in the most appropriate way for Stratigraphic, Structural or Reservoir analysis.

Key Benefits:

- Easy to use Example Driven Interface
- Test on the fly before processing the full volume
- Ability to fine tune interactively to optimise the output
- Interactive comparison of results with the original input data including difference volumes
- Two stage approach allows the user to target different noise characteristics in a single workflow

In addition Spectral Shaping can be applied to the data. Spectral Shaping improves vertical resolution enabling Thin Bed analysis and detailed reservoir investigations.

Spectral enhancement also allows for enhanced imaging of faults, of all scales, as well as improved attribute extraction/analysis and more accurate event thickness estimation.



Industry Leading Frequency Decomposition

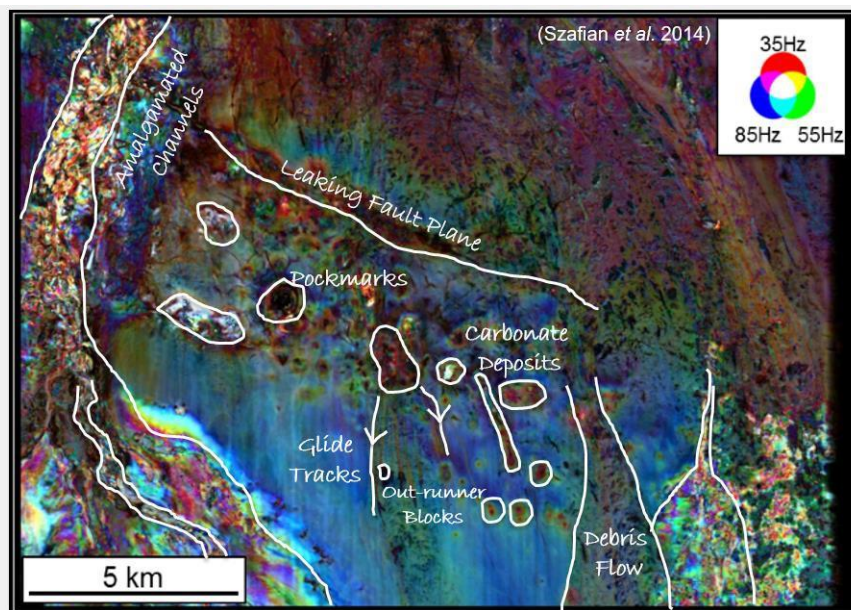
Can't see the full picture using your existing tools?

GeoTeric has been **leading the Industry** in Frequency Decomposition for the last 15 years.

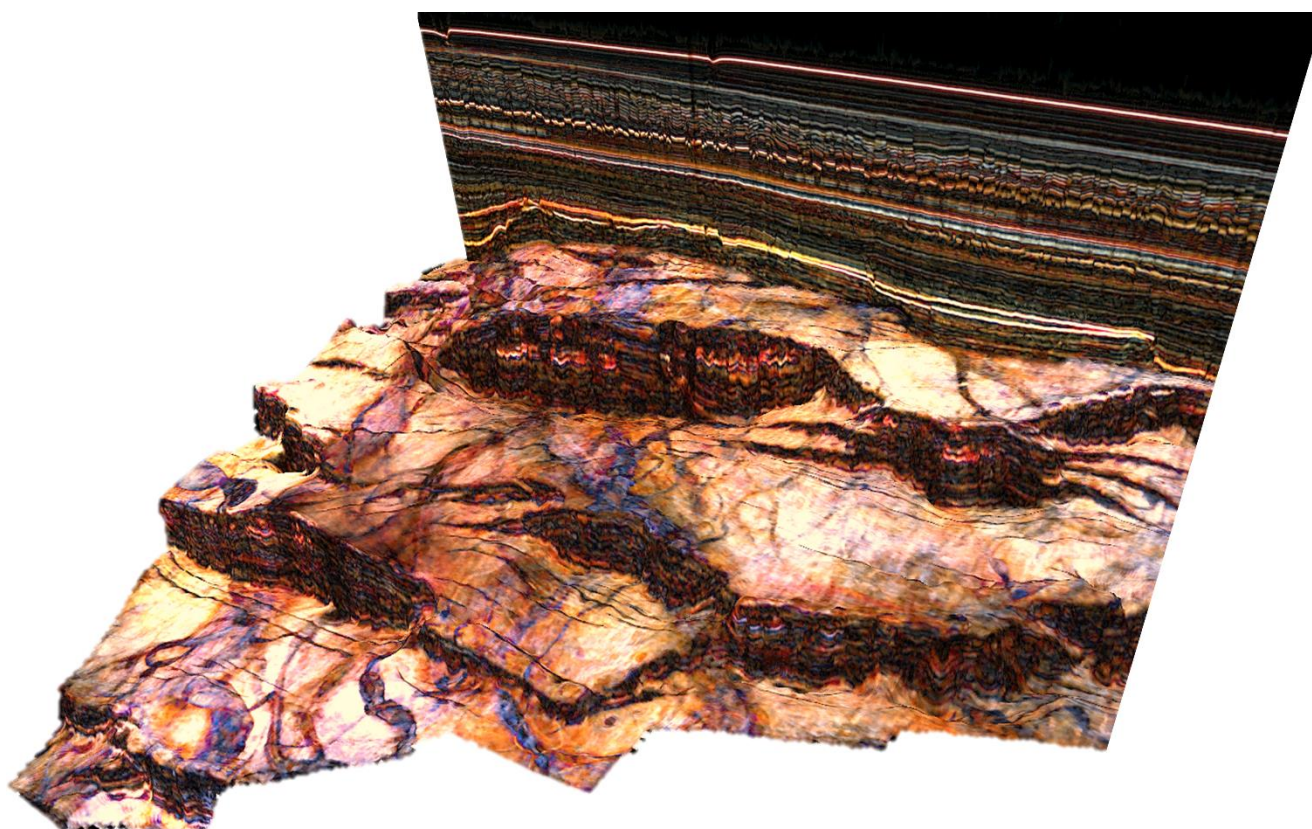
Our **Streamlined** Frequency Decomposition and RGB Blending workflow enables **optimal parameter picking** to deliver the **best geological images possible**.

"The RGB Blends really bring out the subtle details and facilitate a better understanding of the subsurface"

Dana Petroleum



GeoTeric delivered the first Frequency Decomposition and RGB Colour Blending workflow to the market over 15 years ago and has been the Industry leader ever since.



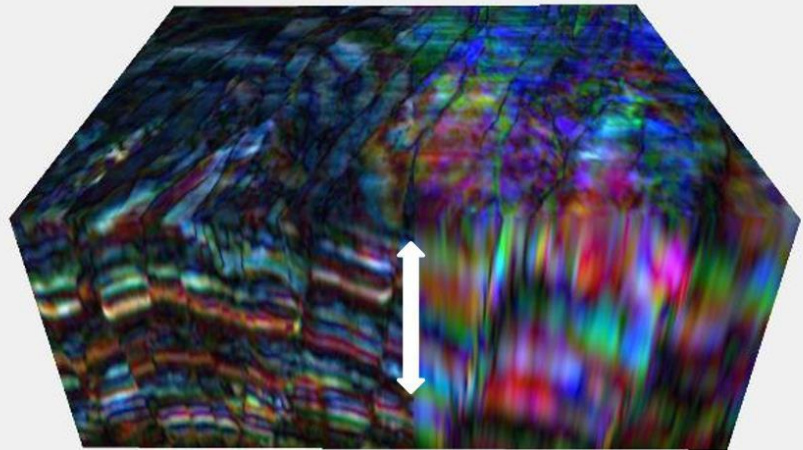
Frequency RGB blends reveal geological features in seismic data much more clearly than with a single attribute. They help to highlight subtle variations / heterogeneity within a given geological entity and allow differentiation of features with similar amplitude characteristics.

Increased Vertical Resolution with HDFD

Need to Image your Reservoir Geology at a Greater Resolution?

GeoTeric's HD Frequency Decomposition workflow delivers a much **greater vertical resolution** than standard techniques allowing you to **see your Geology in High Definition** and extract more accurate 3D Geomorphologies.

"I have exposed geology with your HDFD tool, which simply could not be seen with any other frequency decomposition program"
US Independent



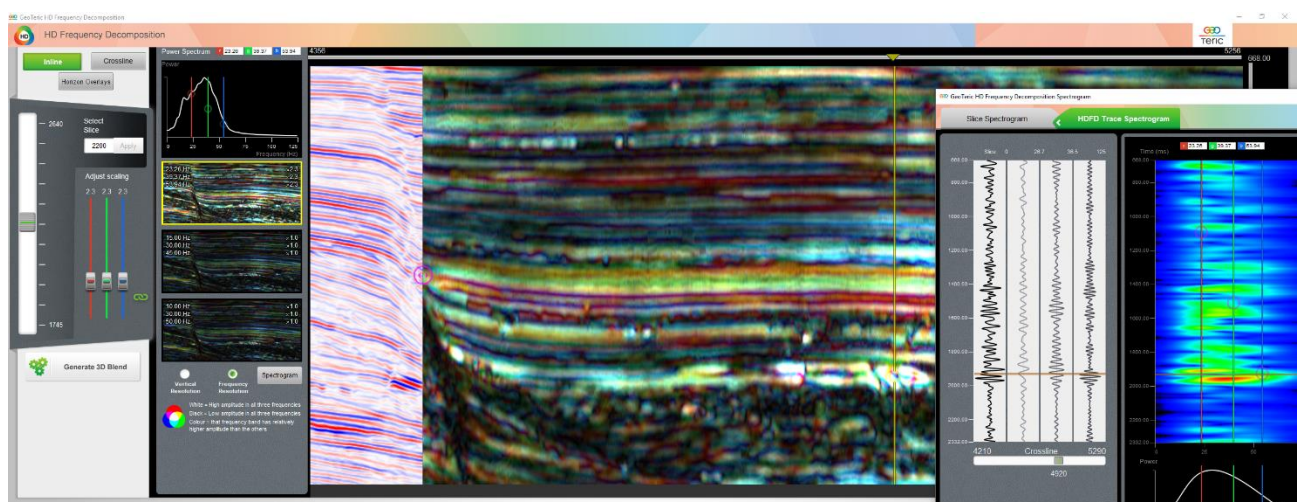
HD
Frequency Decomposition

Standard
Frequency decomposition

In addition to standard Frequency Decomposition (Constant Bandwidth & Constant Q) GeoTeric has the only commercially available High Definition Frequency Decomposition Algorithm on the Market (Matching Pursuit).

This technology allows the Geoscientist to image the subsurface at a much greater vertical resolution when compared to standard approaches.

- Frequency splits in the HDFD provide good results in both lateral and vertical resolution.
- HDFD delineates features at seismic resolution so there is minimal vertical blurring, this means you have high confidence in the vertical positioning of the features you see.
- Works for broadband and standard seismic
- Optimise quickly and interactively with the example driven framework



Multi Attribute Edge Detection

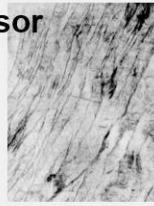
Need to understand your structural framework in more detail?

GeoTeric's 3 Attribute CMY Blending enables you to image a more complete fault network by combining Fault Flexure, Fracture, and Amplitude changes into one image.

"I have been using this software since 2008. It provides really powerful tools for stratigraphic and structural interpretation of the seismic data"

Statoil Brazil

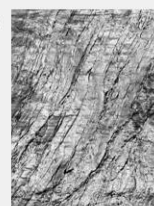
Tensor



SO Semblance



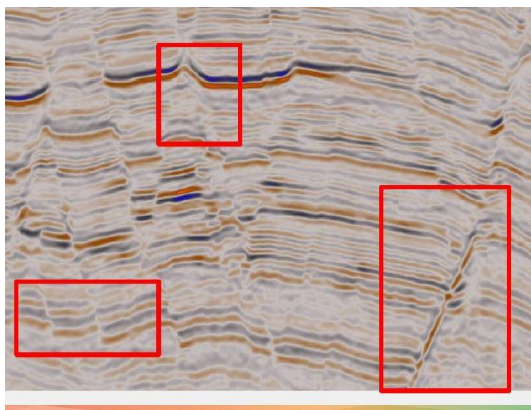
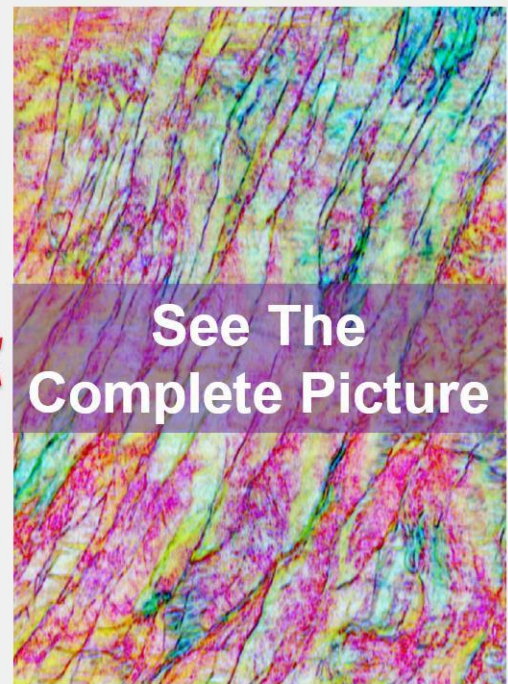
Dip



C

M

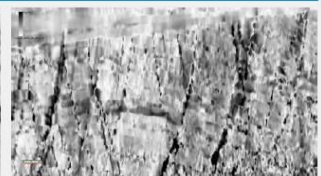
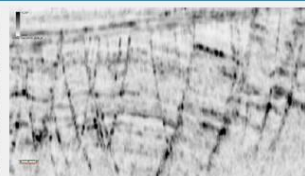
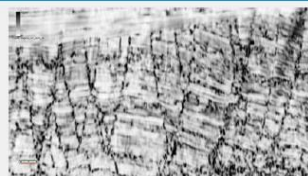
Y



Structural breaks can be represented in a number of ways in seismic data; Phase Breaks, Amplitude Changes and Reflections. This means that a single attribute will not show the full picture. GeoTeric's CMY Blending allows you to bring together all types a fault representation into one image and get a more complete understanding of the structural framework.

Automatic fault extraction can then be carried out on the combined volume and embedded into the reflectivity volume aiding your structural interpretation.

Fault Type \ Attribute	SO Semblance	Tensor	Instantaneous Dip
Phase Breaks	Good	Reasonable	Reasonable
Amplitude / Orientation change	Poor	Good	Good
Reflecting fault	Poor	Reasonable	Good

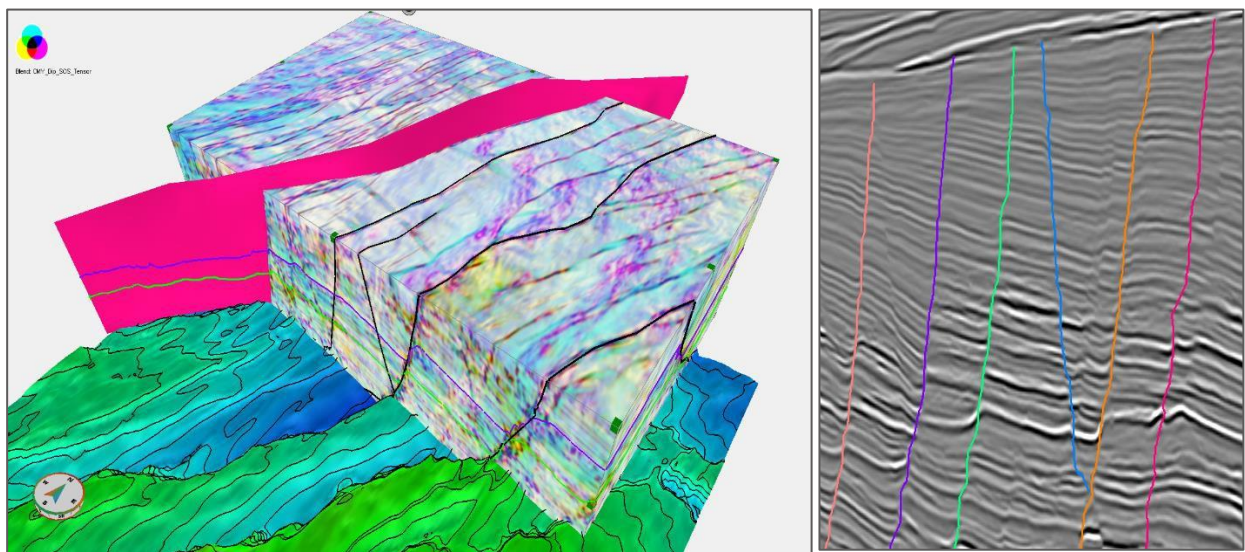


Adaptive Interpretation

The new Adaptive Interpretation system being implemented in GeoTeric is based on 3 years of research with Lundin Petroleum in Norway, which has resulted in the creation of a unique technology, which is described in GeoTeric's Adaptive Horizons and Adaptive Faults patents (see attached).

The Adaptive Interpretation system uses graph theory to understand all the potential paths a horizon or fault can take through a dataset. The use of graph theory and the simultaneous detection of all possible paths gives GeoTeric a Regional Structural Awareness, which in turn allows the interpreter to preview interpretation paths and update interpreted surfaces in 3D.

With GeoTeric's new Adaptive Interpretation system, Fault and Horizon tracking can be carried out simultaneously within an integrated system using a common interface, which again increases interpretation efficiency and helps capture detailed insights on the imaged geology.



Adaptive Faults and Horizons can be generated on reflection seismic, attribute volumes and, crucially for the Fault Expression Workflow, on attribute blends. Now you can use CMY blends to create a structural framework by quickly and accurately interpreting the fault network through the blended edge detection volumes.

GeoTeric's Adaptive Fault Interpretation follows the data at every point so fault sticks and surfaces are highly detailed but take only seconds to pick. The fault surfaces track the data between the fault sticks ensuring accurate positioning with minimal numbers of fault sticks. But don't take it from us, here is what our clients are say:

"GeoTeric has built out from a solid base of multi attribute generation tools to provide a rapidly developing interpretation system. At DNO Norge, we are using the software for fast and efficient screening of large data volumes, moving our evaluations rapidly through to prospect generation and quantification. This is not just about doing the same things faster – it is about digging deeper and understanding more from our datasets."

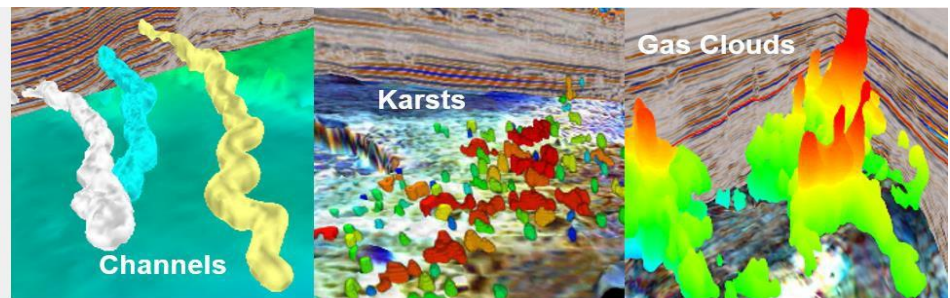
DNO Norge

"The detail captured by the Adaptive Faults is incredible; being able to pick quickly and accurately in a few clicks is a game changer. This looks like the future of seismic interpretation."

Lundin Norway

Automated Geobody Extraction

Need to isolate key Geological units such as channels, salt bodies, gas chimneys and Karst structures?



GeoTeric's patented **data driven – interpreter guided Geobody extraction** tool works simultaneously with colour blends and multiple attribute volumes, allowing you to **extract more accurate 3D Geomorphologies**.

Integrated manual manipulation ensures the Geobody matches the data and your interpretation.

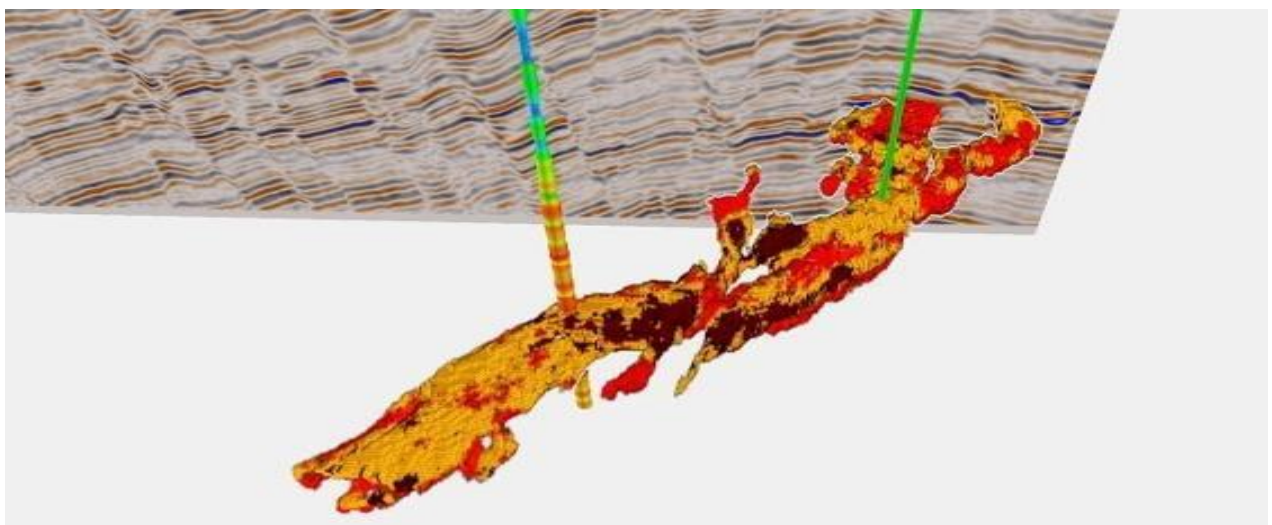
Adaptive Geobodies allows you to extract the geology you have revealed using colour blending techniques. Unlike other solutions, which use opacity or threshold as limits, Adaptive Geobodies uses a Probability Density Function (PDF) which describes the value range that could/must be included within the geobodies neighbourhood and/or from clusters (seeds) used to begin the data inclusion.

This can be used to extract features using any attributes or colour blend volumes, individually or simultaneously. When combined with HDFD you can extract even more accurate 3D Geomorphologies when compared to other approaches.

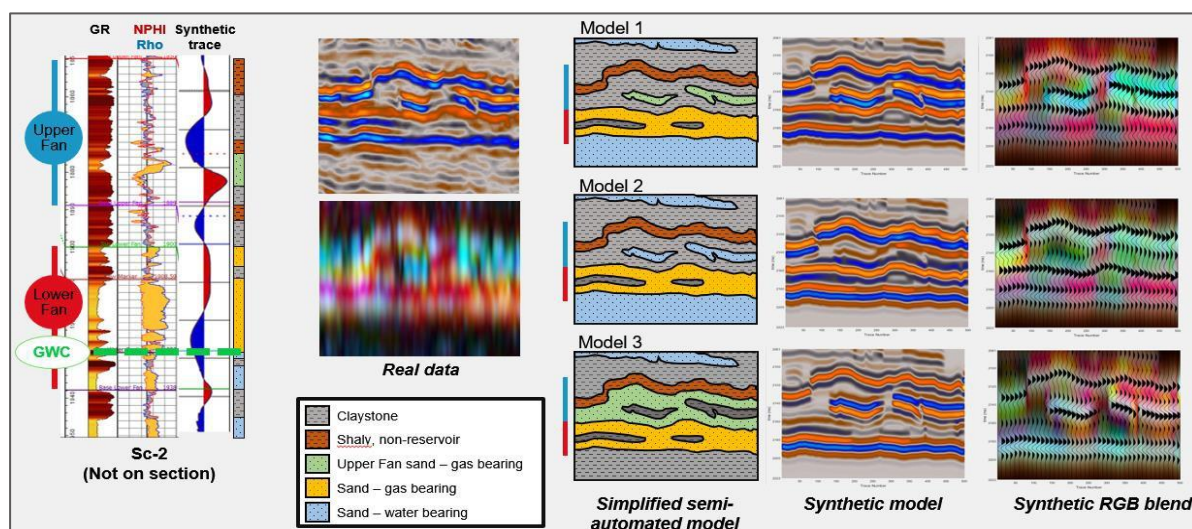
Interactive Facies Classification +

Interrogate the geophysical response within your target area or volume with intuitive data-driven and semi-supervised tools, while maintaining the geological context.

IFC+ allows you to correlate your well-data with the seismic and attribute response, to build your remarkably accurate reservoir model. Any classified volume honours all your available data, while incorporating your own expert understanding of what is geologically feasible.

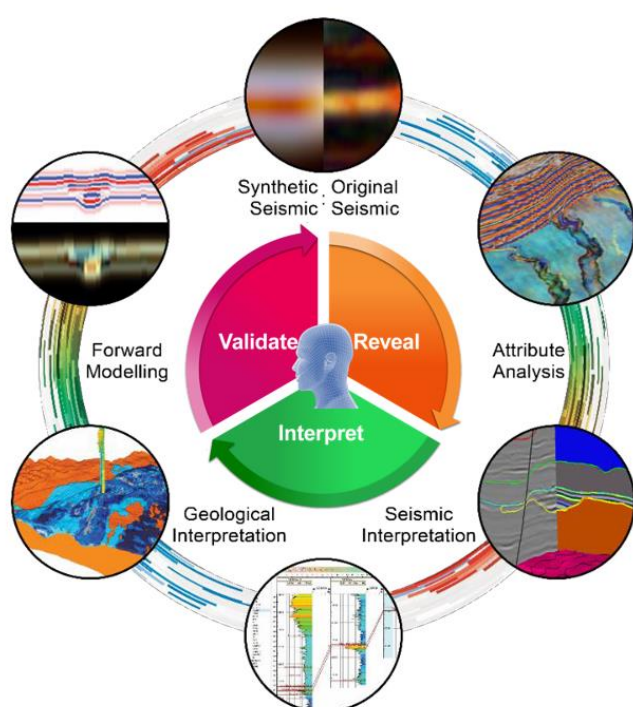


Validate your Geological Hypothesis



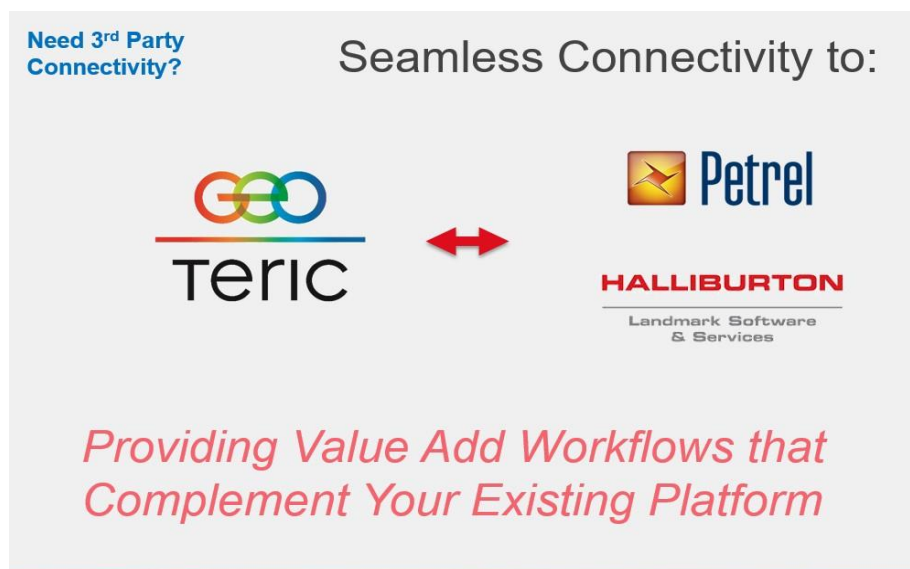
Ever since GeoTeric started captivating geoscientists with our geologically revealing attribute workflows and visualization, there has been one consistent question; what do the colours in RGB blends mean? With Validate, by forward modelling the seismic response, GeoTeric will empower the geoscientist to quantitatively describe geological changes in the subsurface that can lead to the variations in colour within the blends.

GeoTeric users will be able to quickly build and edit geological models, testing hypothesis and ruling out inconsistent models. GeoTeric's Validate will allow the geoscientist to **Close the Loop** between their geological understanding of the subsurface and the responses they see in the original seismic, leading to a more accurate understanding and a reduced risk in interpretation.



GeoTeric allows you to validate your interpretation to ensure an accurate representation of the underlying geology, without the need to construct a geo-cellular grid.

Multi-Platform with Seamless Connectivity



GeoTeric is multi-platform (Windows or Linux) and seamlessly connects to both Petrel and DSG platforms. Enabling easy integration into any existing configuration.

Market Leading Innovation

GeoTeric has a long and distinguished track record of innovation that spans more than 25 years. Cognitive Interpretation empowers the interpreter. It ensures that sophisticated analysis algorithms are harnessed so that the information they provide can be used much more effectively to generate and share the knowledge and understanding necessary to make the best economic decisions. By doing this, Cognitive Interpretation has the potential to transform how we use seismic data and the value it brings to the E&P workflow.

GeoTeric has a long history of bringing new technology to the market:

<ul style="list-style-type: none">First general 3D post stack seismic image processing toolkit (C_Images 3D)First 3D geobody delineation technology (Body Labelling)	}	1995 - 1999
<ul style="list-style-type: none">First volumetric Dip, Azimuth and DipAzi attributesFirst edge-preserving, adaptive noise cancellation techniques (TDiffusion and FMH)First volumetric fault lineation detection (FaultDetect and FaultIn)	}	2000 - 2004
<ul style="list-style-type: none">First volumetric frequency decompositionFirst volumetric RGB blendingFirst volumetric CMY blending	}	2005 - 2009
<ul style="list-style-type: none">First RGB surface tracking technology (Adaptive Horizons)First RGB and true multi-attribute geobody delineation technology (Adaptive Geobodies)First 3D geobody mesh editing technology (Adaptive Geobodies)First High Definition frequency decomposition technology (HDFD)First multi-attribute fault detection (CMY FaultDetect)First example driven workflows (Noise Expression, Fault Expression)	}	2010 - 2014
<ul style="list-style-type: none">First frequency decomposition technology adapted for broadband seismic (HDFD)First Example Driven spectral enhancement technology (Spectral Expression)	}	2015 - 2020

Validated by a Growing User Community

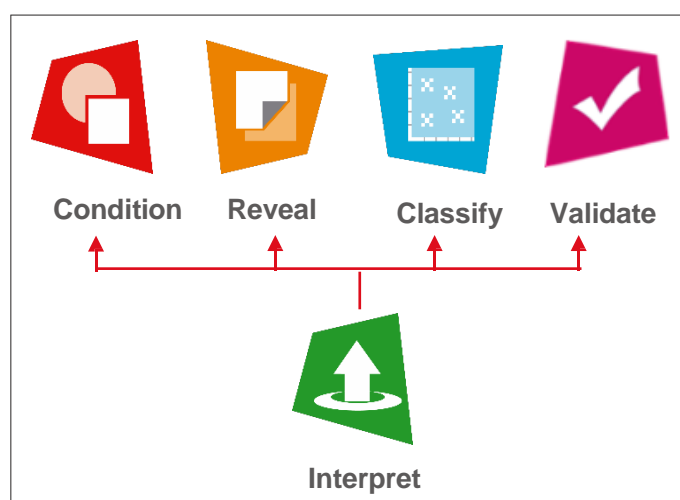


The GeoTeric user community has been rapidly growing and is now deployed to over 150 customers worldwide. In addition we have carried out over 300 service projects covering all the major geological settings around the world.

Flexible Economic Licensing

GeoTeric's software suite is licensed per module allowing clients to build the portfolio they need in an efficient and economic manner. The Interpret module is the base module required to open the software, on to this 4 add-on modules can be added to the suite and float between the base modules on the network.

This model allows Interpreters to take advantage of the attribute blends, visualisation and Adaptive Technologies without having to check out more advanced modules. Please contact your account manager for more details of the functionality that lies within each module.



Customer Testimonials

"GeoTeric extracted more information from our project area in a matter of days than I've seen in the last six years"

Lekoil

"GeoTeric is a powerful exploration tool and has helped me to identify and validate prospects. Its visualization potential has also enabled PGNiG to cross the communication gap between different disciplines in exploration and make sure that everyone understands the nature of the prospects."

PGNiG Upstream International AS, Norway

"GeoTeric is a great exploration tool. The example-driven interface for noise cancellation can help you from seeing nothing to bring out the geology very quickly. This together with the very intuitive RGB blending, both for stacks and AVO, makes GeoTeric an important software in my daily workflow."

VNG Norge AS, Norway

"GeoTeric is one of the best Seismic Attributes tools for structural studies, allowing to identify faults with different seismic attributes combinations. The inclusion of ready to go batch processing routines facilitates using the program to generate attributes and filters in seismic data."

Petrobras, Pre-salt, Brazil

"The structurally-oriented de-noise tools exceed the capabilities of anything I have seen anywhere else from any software or services company. Additionally, I have exposed geology with your HDFD tool, which simply could not be seen with any other frequency decomposition program."

– I want this software"

US Independent

"GeoTeric is now routinely used in the Carigali Hess geosciences project maturation process. The work flows and deliverables fundamentally underpin our Static Model build in respect to "facies distribution". The enhanced imaging functionality is now mandatory in our well optimisation process."

Carigali Hess, Malaysia

"I am considered new user of GeoTeric and previous work exposure dealing with attributes extraction. GeoTeric volume attribute /geobody mapping and 3D visualization enable us to investigate and help us better understanding the Geology of an area. In a carbonate reservoir, mapping of internal layer help better understand how the reef develop through time. A part from that GeoTeric is useful for DHI/shallow hazard mapping."

Mubadala Petroleum Malaysia

"GeoTeric enable us to better integrate QI Geophysics with Project Geologist. Through this integration, our decision for well placement is faster. We can reveal clear seismic geomorphology using this software. "

Petronas Carigali, Malaysia

"I use GeoTeric for Noise filtering of Pre-Salt type Seismic data in Brazilian basins. Excellent results were achieved and the resulting filtered data was used for Seismic attributes generation with less noise associated and for generate an improved Acoustic inversion. We are testing of noise filtering in partial stacks (Near, Mid, Far and Ultra-Far) in order to get an improved Elastic Inversion."

Petrobras, Pre-Salt, Brazil

Why GeoTeric?

Cognitive By Design

- By integrating cognitive cybernetics into our approach to seismic interpretation we enable the user to work in a way that is in tune with their natural methods of thinking and understanding. Software interactivity/design and example-driven frameworks allow the user to:
 - Rapidly visualise multiple processing scenarios,
 - Parameterise according to your geological needs,
 - Make informed decisions.
- This is the ethos behind Cognitive Interpretation and the foundation of GeoTeric which enables the geoscientist to analyse vast amounts of data in a fast and effective manner.

Unique Value Add Workflows

- Superior post stack noise removal for optimal data conditioning for input to Interpretation workflows.
- Streamlined workflow to calculate & choose the optimum frequencies for colour blends.
- High Definition Frequency Decomposition is the only tool available to work with the complex waveforms found in Broadband data, delivering images with a far greater vertical resolution compared to standard approaches.
- Patented workflows to pick Faults, Horizons & Geobodies from blended attributes delivering geologically accurate interpretations.
- Integrated Facies Classification for Quantitative mapping of Reservoir heterogeneity.
- The only interactive forward modelling tool to help understand the impact of changes in lithology, thickness and fluid content of your reservoir on frequency decomposition blends.

The Value of Cognitive Interpretation

- Enables a more thorough examination of the information contained within the available seismic data.
- More effectively utilises the skills of your Geoscientists.
- Increases the likelihood that a seismic interpretation is an accurate reflection of the imaged geology.
- Allows a deterministic assessment of reservoir heterogeneity (Geobodies, Facies, AVO, & 4D).
- Enables more informed decision making.

