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OpendTect



dGB Earth Sciences has decided to go the open source route with d-Tect, our successful seismic attribute processing, filtering and pattern recognition software system. Under the new license agreement, OpendTect source code and compiled versions can be used free of charge for R&D purposes. Commercial application of the software and derived products will be subject to

a modest end-user maintenance fee. Universities, software vendors, private consultants, and E&P companies can build commercial and free seismic interpretation application modules via an easy-to-use plug-in design.

Commercial plug-ins

The first commercial plug-ins are dip-steering, neural-networks and SeisWorks / GeoFrame-IESX data access, which can be purchased from us to obtain the full functionality of what has so far been marketed as the d-Tect system. Apart from maintaining and extending the OpendTect environment we will continue to develop and market additional commercial plug-ins. Current plans include a seismic interpretation module that will simultaneously track multiple faults and horizons and moving GDI, our quantitative software suite, into the new environment.

more info on

www.opendtect.org

Download

OpendTect will be released via the internet (<http://www.opendtect.org>) without license managing restrictions as of November 3, 2003.

SEG annual meeting 2003
Dallas October 26-31

dGB will be exhibiting in booth # 804

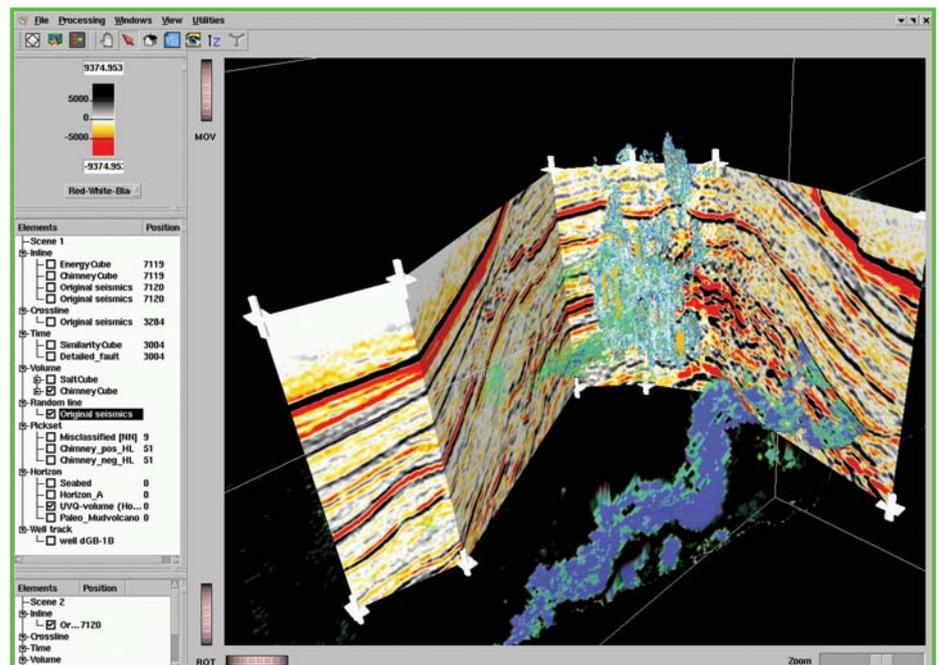
You are hereby kindly invited to the

OpendTect launch party

October 27, 2003
Hyatt Regency, ballroom E, 6 pm

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Company news

New company style

dGB has adopted a new company style, following the design of the new website (see below). In addition we have chosen to introduce a fresh new logo:



Website

End of September, dGB released a new website lay-out. The information on dGB and its activities are now better accessible. Both GD1 and d-Tect can be downloaded directly from our website. So, you can always work with the latest upgrade. On our website you can also find the full list of all dGB publications as well as our brochures in pdf format.



With the introduction of the new website, the email addresses have changed to firstname.lastname@dgb-group.com, e.g. paul.degroot@dgb-group.com. The old addresses will be valid for a while.

dGB USA

A few months ago, dGB USA moved offices to a larger office space in Sugar Land. dGB USA can now be reached at the following address:

1 Sugar Creek Center Blvd.
Suite 935
Sugar Land, TX 77478 USA
Phone: +1 281 2403939
Fax: +1 281 24039

Friso Brouwer has moved office to dGB USA. His responsibilities include execution of seismic inversion and reservoir characterization projects, as well as object detection studies for our clients in the Americas.

Fluid flow behaviour along faults

A new view on fault leakage

The central question at the EAGE Fault and Top Seal conference in Montpellier (8 - 11 September 2003) was "What do we know and where do we go?". It is difficult to say whether this question was fully answered at the conference, but presentations of the latest research discoveries and analysis methods, as well as fruitful discussions on various fault seal and top seal matters led to renewed insight and new ideas. One important

conclusion from the conference regarding fault seal analysis was that much (perhaps too much?) attention was paid to the analysis of shale gouge ratio. From various talks it became clear that a high degree of uncertainty still exists in this type of fault seal analysis. The question rises if a different type of approach is required for fault seal analysis that can contribute to a higher degree of confidence of fault seal quality evaluation.

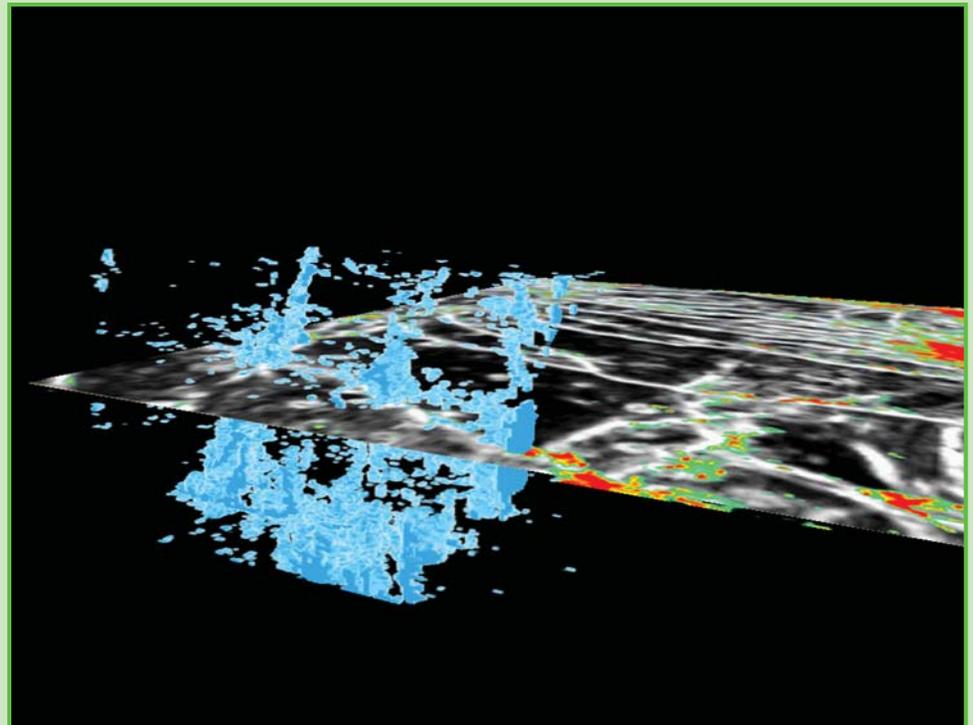
dGB was represented by Herald Ligtenberg, who presented a paper entitled "Sealing quality analysis of faults and formations using seismic attributes and

neural networks". In this paper Herald presented new ideas about fluid flow behaviour along faults. Based on many observations in chimney and fault cubes Herald believes that weak locations along the fault planes are the dominant transport

ways for fluids. He recommends to focus future research on finding the weakest points in the faults and fault zones. For example, very few

publications exist on the analysis of fault intersections and fluid flow. Numerical modelling of the mechanical behaviour of faults, carried out at CSIRO (Australia), illustrated that at fault intersections a high dilation zone is formed, with many open fractures and reduced fault gouge production. These branch lines are important pathways for fluids to escape to shallower levels. In addition, faults are not ideal, straight planes, but contain many irregularities that can initiate fluid flow. Better insight in fluid flow behaviour of faults will provide better insight in the sealing quality of fault planes along its

Focus on finding the weakest locations in the faults



Columnar, diapirism-like fluid flow behaviour along fault planes, lining up with pockmarks at the seabed. Timeslice displays faults (grey-scale) and fluid migration path detection (red-green).

entire length. Instead of assuming the fault to be either completely sealing or leaking, it is more realistic to focus on analysing the sealing quality of fault segments and detecting the weak points in the faults.

More intense fluid flow activity at fault intersections has already been observed in several fluid migration path case studies performed by dGB, confirming observations

Small-scale fluid flow features enhanced on fault planes

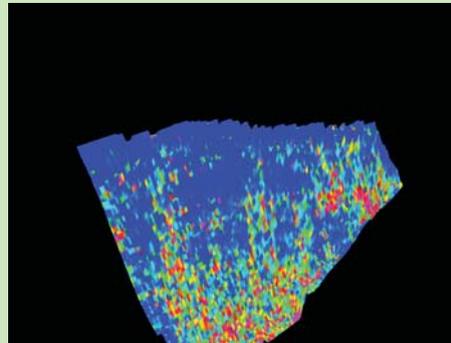
from CSIRO.

Recent

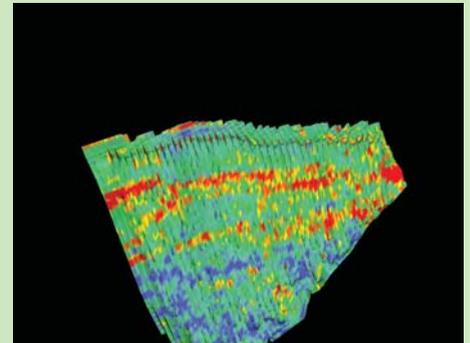
research at dGB has shown that fluid migration path detection in seismic data can also highlight minor fluid migration features on fault planes, providing new insight in the fluid flow behaviour along faults. Columnar, diapirism-like fluid flow has been observed on many fault planes (Figure below, left). These columnar features, when followed all the way to the seabed, line up with pockmarks, confirming that they are indeed related to fluid flow and are not mere seismic artifacts. This new type of fluid flow mechanism along faults will be described in Basin Research magazine next year.

Interesting to note is that these small scale migration patterns along faults are not visible on seismic data, neither are they picked up by single seismic attributes, such as coherency-type of attributes. Only d-Tect's meta-attribute approach, in which an assembly of seismic attributes and a-priori interpreter's knowledge are fed to a neural network, has been able to enhance these important fluid migration paths that otherwise would have been missed. This message is illustrated in the top right figure. The fault plane shows different types of seismic attributes as well as the fluid migration path detection result by means of neural network technology.

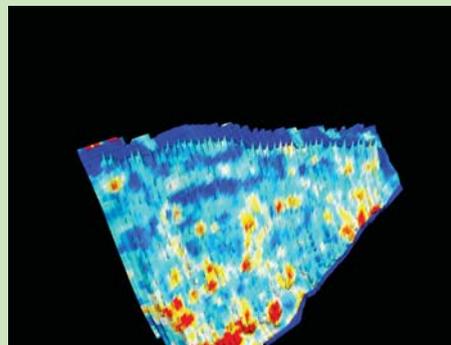
The columnar, flame-like patterns are only picked up by the neural network technology. For more information on fault seal analysis studies, please contact us at info@dgb-group.com



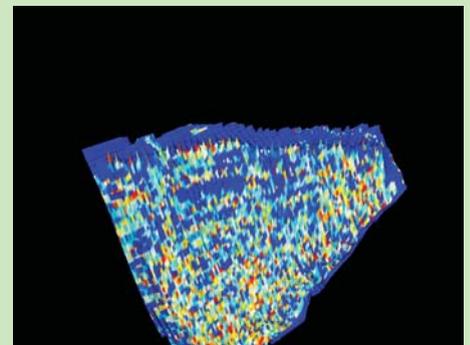
Neural network fluid migration path detection



Energy-attribute on fault plane



Dip Variance attribute on fault plane



Similarity attribute on fault plane

What is in OpendTect?

OpendTect is an open source environment that is equivalent to the commercial d-Tect system except for "dip-steering" capability, neural networks and data access modules.



An OpendTect end-user can use the software a/o to:

- o Load seismic data via SEG Y, and horizons and well data via ASCII.
- o Calculate numerous seismic attributes and filters, several of which are unique (e.g. trace-to-trace similarity and absorption quality factor).
- o Perform logical and mathematical manipulations on multiple seismic volumes or attributes, and thus create your own attributes. All common operators and functions are available.
- o In general, use the d-Tect environment to interactively analyse data, inspect parameters and create output volumes using distributed computing over the network.
- o interpret data using volume rendering and stereo viewing capabilities.

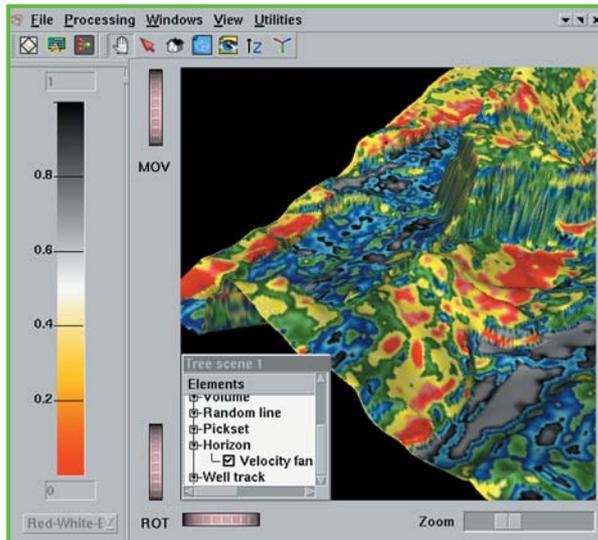
An OpendTect software developer can use the software to:

- o Create (commercial or free) plug-in modules.
- o Create "dip-steered" attributes and filters and neural networks, provided the developer has a license for the commercial plug-ins, which will be released in binary form with an API. (Universities can get free R&D licenses).
- o Extend the OpendTect environment.

Third party developers, who change the environment, have the option to keep such changes proprietary, or to release these to the community. As custodians of the open source environment dGB will consider on a case by case basis whether third party extensions to the environment shall, or shall not be included in the release version. Copyright and title of extensions that make it into the release version are transferred to dGB.

d-Tect version 1.6

A new d-Tect version will be released during the coming SEG. The release coincides with the release of OpendTect. This sixth major upgrade features new visualisation capabilities, improved general functionalities, and an extension of the data access module. The module is based on the IdealLink software from UK-based software providers Ark-cl. Apart from seismic data, the module also supports read and write access of horizon data to and from Landmark's OpenWorks or GeoQuest's GeoFrame/IESX data store. Well data access will follow in a subsequent release.



Application of colour attribute

Other highlights are:

- o Enhanced visualisation of well data, including markers and logs.
- o Improved horizon display, supporting multiple patches.
- o Save and restore functionality for calculated attributes on horizons.
- o New colour-attribute which provides an attribute-based modification of the color table (e.g. to combine classification and confidence results in one display)

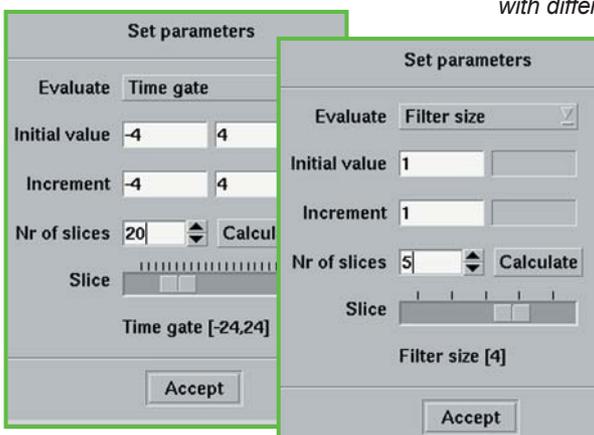
d-Tect v1.6 can be downloaded at <http://www.dgb-group.com>. For licenses, please contact us: info@dgb-group.com

The last minor update of d-Tect (v1.5.3) featured:

- o Data access module on PC-linux
- o A GDI / d-Tect connection. It is now possible to apply trained GDI neural networks in d-Tect. The trained network will substitute GDI input attributes with the equivalent d-Tect attributes.
 - o Fast parameter testing to quickly scan for optimal time-gate, trace step-out, filter size, etc of your attribute. The settings are examined in movie-style and the preferred parameter is accepted in the attribute set. For example, one could generate 20 Energy attributes with varying time-gates or calculate Similarity with different step-outs or steered by different user-specified directions, see examples left.

Looking ahead

In the mean time, our software developers are working hard at implementing a module for fault and horizon tracking. The process of transferring the quantitative interpretation functionalities of GDI to the d-Tect environment is ongoing.



Fast parameter testing for choosing optimal time-gate and filter size.

Publications

The following is a selection of recent publications and forthcoming talks by dGB staff.

Articles

Ligtenberg, H., 2003, **Sealing quality analysis of faults and formations by means of seismic attributes and neural networks**, O21, EAGE Fault and Top Seals - Montpellier

Aminzadeh, F., de Groot, P., 2003, **Qualitative and Quantitative seismic object and reservoir property prediction**, 8th International Congress of the Brazilian Geophysical Society, Rio de Janeiro.

Ligtenberg, H., 2003, **Unravelling the petroleum system by enhancing fluid migration paths in seismic data using a neural network based pattern recognition technique**, Geofluids, November 2003

Talks

At the SEG, the following papers are presented
"Fault detection with meta-attributes" by Matthijs de Rooij (CHI 2.2 - Tuesday 1:55 p.m., room C1)

"Estimating fault-attribute orientation with gradient analysis, principal component analysis, and the localized Hough-transform" by Kristofer Tingdahl (CHI 2.3 - Tuesday 2:20 pm, room C1).

"Meta-attributes within time-lapse seismic" by Paul de Groot at the "Seismic determination of pressure, saturation, and porosity" workshop (Thursday afternoon).

Mailing list

If you are not on our mailing list yet please contact us via
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