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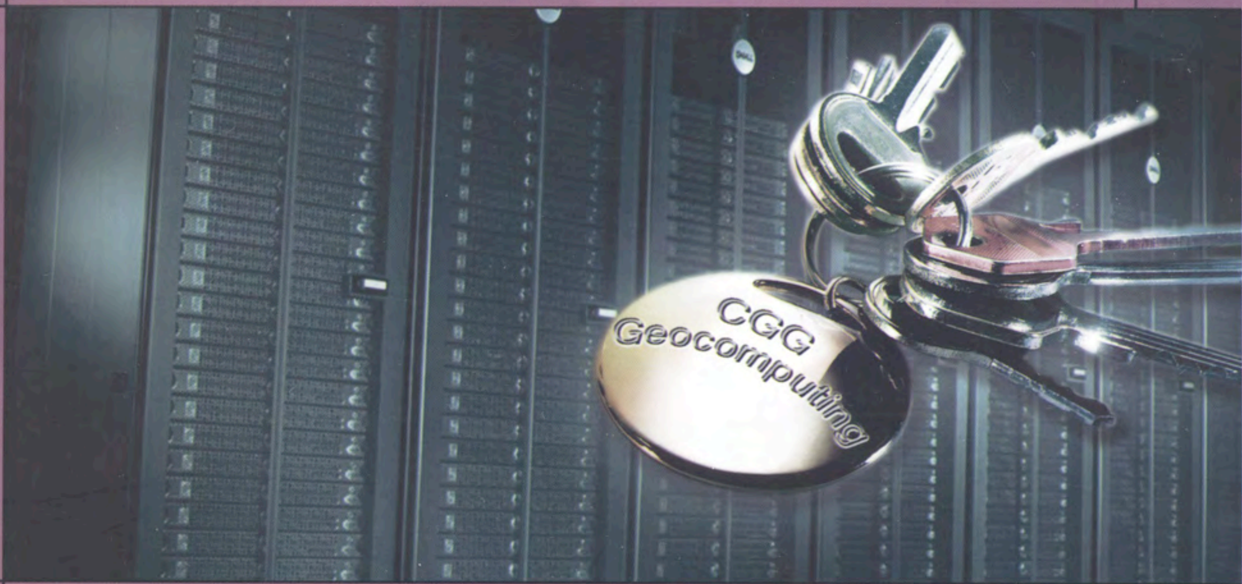

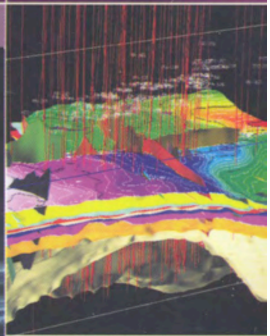

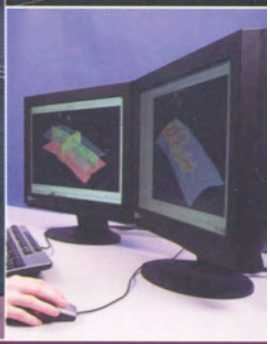

Processing & Reservoir

Processing Software, Data Management & IT Solutions

IT Services
Innovative Linux Systems
Multi-vendor Integration

Geoscience Software
Geocluster

Data Management
PetroVision

Training

CGG Geocomputing *experts & technology provide the Keys to unlock the full potential of your* ***E&P performance.*** *From IT and data processing services to reservoir geophysics and data management,* ***CGG*** *delivers* ***integrated and powerful solutions focused on reducing your E&P cycle time.***

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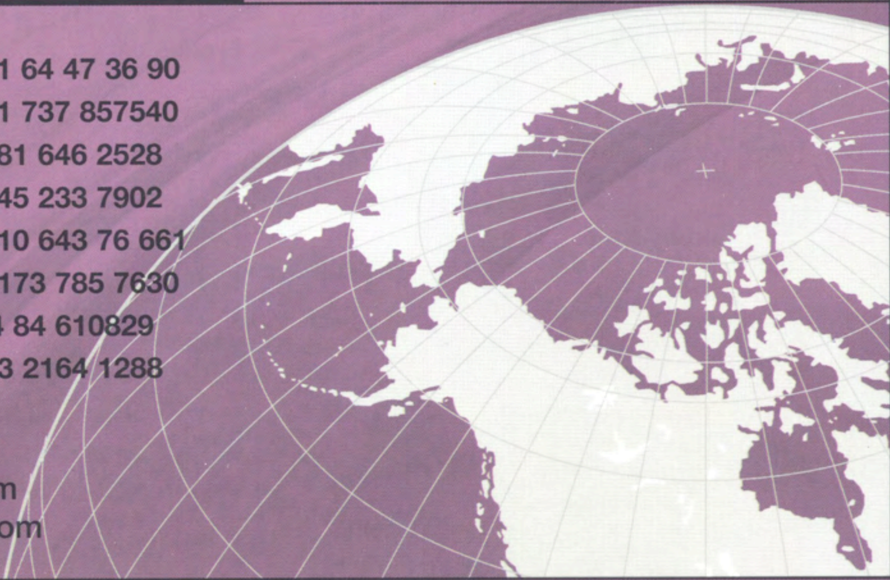

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GeoVista™2

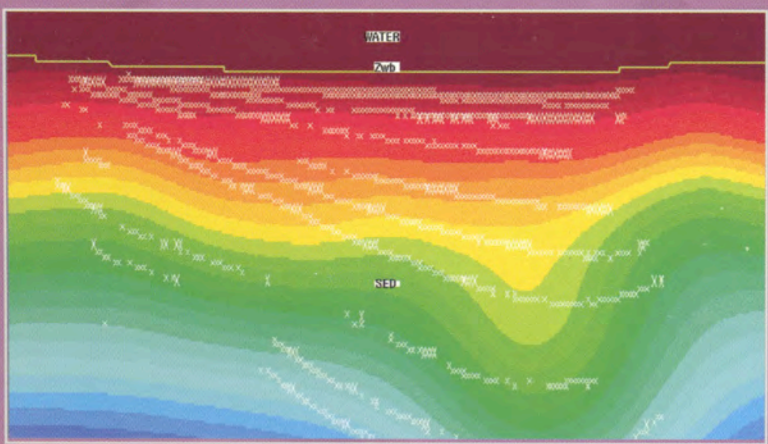
Advanced Kirchhoff Depth Imaging and Model Building

Improved imaging, improved accuracy - improved E&P cycle time

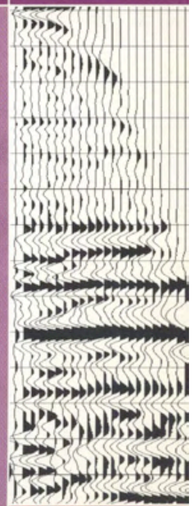
- **GeoVista™2 brings Fast-Cycle PreSDM to reality with 50% reduction in model building turnaround**
- **High-Density, event-guided residual moveout analysis improves velocity model resolution particularly for small-scale structures e.g. faults and shallow channels**
- **VelTracer™, CGG's 3D finite-offset depth tomography, exploits these features for both smooth (gridded) and layered velocity-depth models**

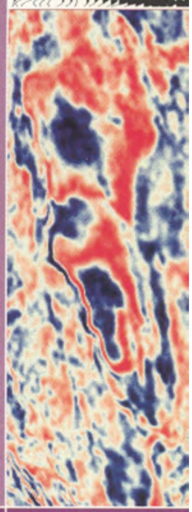
The introduction of new picking and inversion applications is CGG's direct response to market requirements for improved image quality with even faster project turnaround.

Initial inversion velocity model showing RMO analysis locations (white crosses)



Updated smooth velocity model from 3D finite-offset depth tomography.





Processing & Reservoir

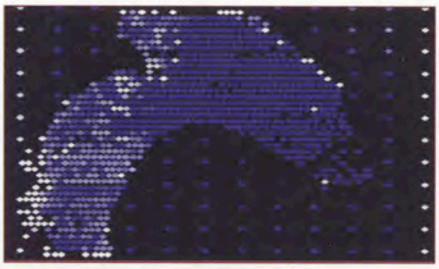
GeoVista™2

Grid-based depth tomography in the Gulf of Mexico

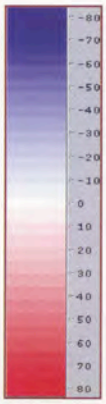
CGG's proprietary picking station allows event-guided automatic picking of residual moveout. Unlike other approaches, CGG's VelTracer™ depth tomography takes the full range of offset picks from the RMO analysis into the tomographic inversion engine to update the model. A full range of parameterization and QC tools for the 3D inversion are incorporated in the latest GeoVista™ release.

The combination of optimized velocity analysis with turning wave migration and amplitude-compensating anti-aliasing filtering guarantees optimal image quality in environments like the Gulf of Mexico.

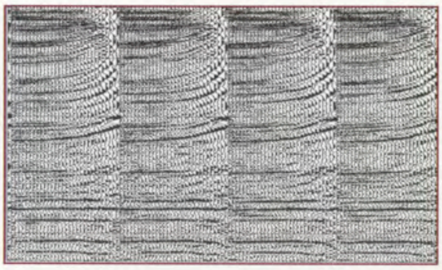
Results of the 3D finite-offset depth tomography update.



Map view of initial RMO picks

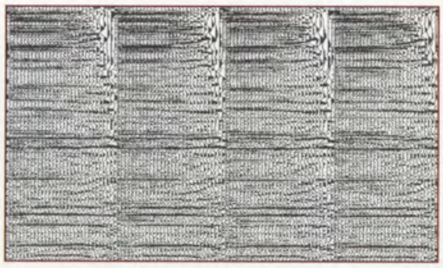


Depth error
Scale +/- 90m



CIP gathers from initial model

Map view of updated RMO picks



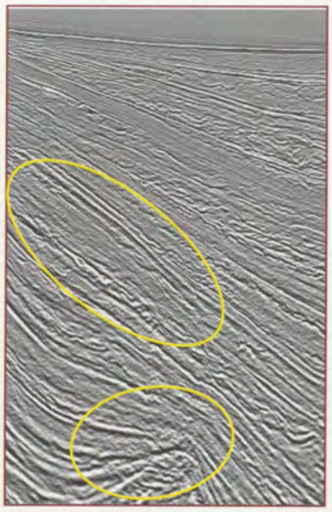
CIP gathers from updated model

Comparison of final migration results using the initial model, the model after 1D update and the final model after 3D depth tomography.

Initial model

1D update

3D tomography

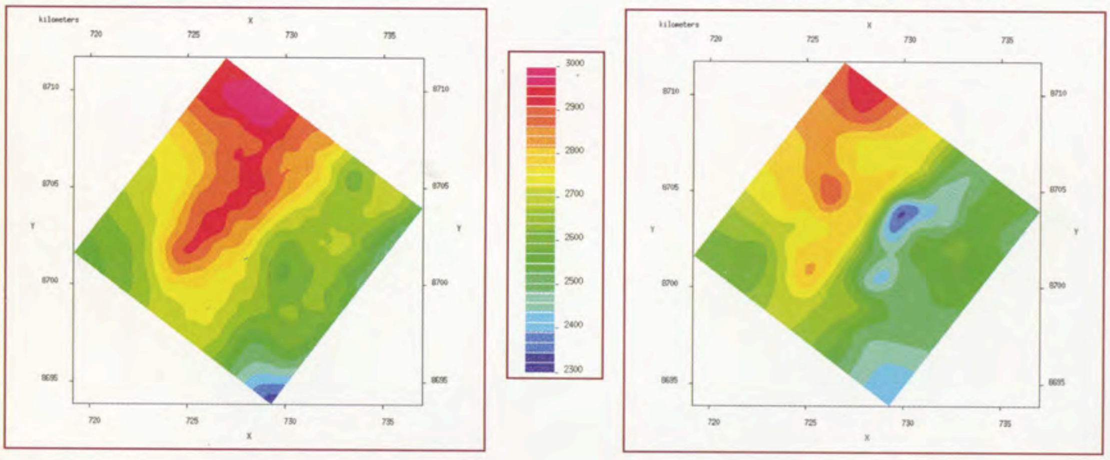


Improved structural imaging through high-density velocity analysis using CGG's Fast-Cycle PreSDM workflow

The combination of 3D automatic, event-based RMO picking and 3D depth tomography enables very accurate velocity models to be built in a very short period of time. In contrast to migration scan techniques, which are traditionally performed on coarse grids, CGG's new high-density picking facilities allow resolution of velocity variation in the subsurface to a previously unachievable level of detail. This improvement in resolution of the velocity variations has helped to improve images in areas of small-scale structural complexity such as complex faults and shallow channel systems.

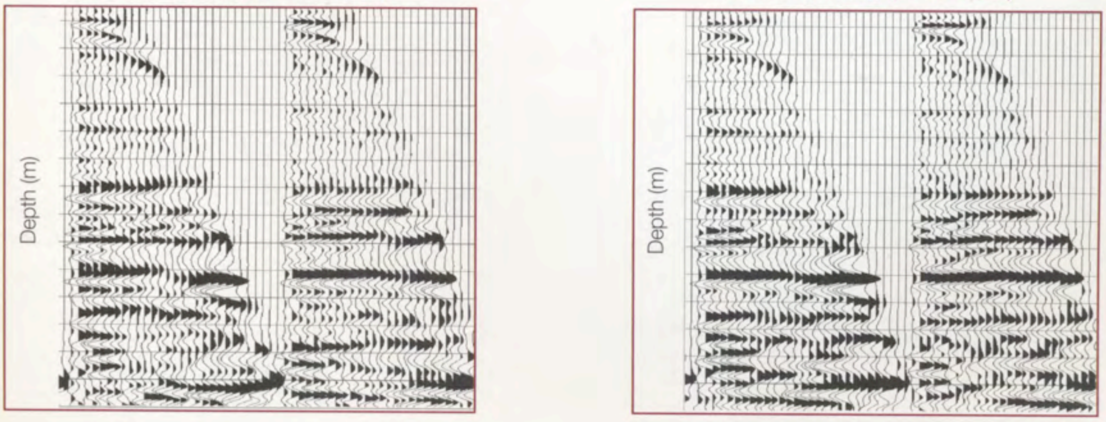
The example illustrated below compares the velocity model and the resulting depth images achieved with traditional image scan methods with those from CGG's new Fast-Cycle PreSDM workflow. Whereas the image scans were performed on a 500x500 meter grid, the RMO analysis was carried out on a much smaller 100x100 meter grid. Although much more data was used for the velocity analysis the overall project turnaround was reduced by 50% for the identical project survey size.

Coarse picking (500x500m) | **Dense picking (100x100m)**



Depth slice through the final model cube after coarse and dense velocity analysis.

Coarse picking (500x500m) | **Dense picking (500x500m)**



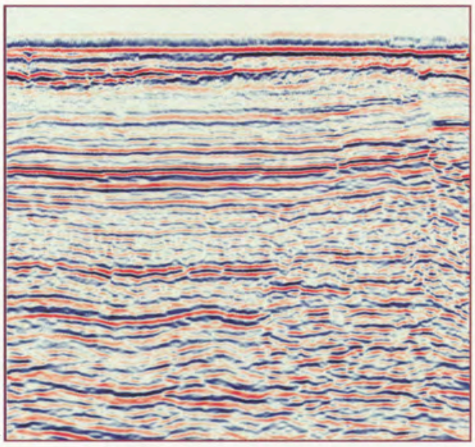
Common image point gathers (CIP) after coarse and dense grid velocity analysis.

GeoVista™2

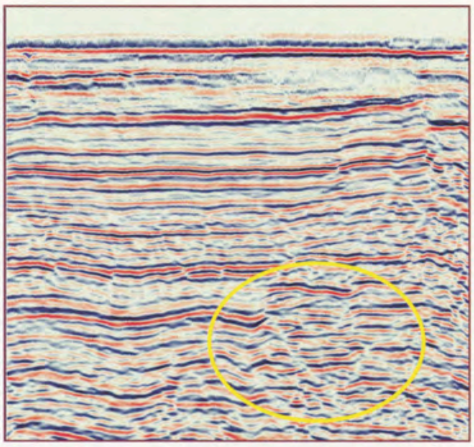
Improved structural imaging through high-density velocity analysis using CGG's Fast-Cycle PreSDM workflow

In-line section through final PreSDM image. The sole difference between the two images is the migration velocity model. Dense velocity analysis results in much improved fault imaging.

Coarse picking

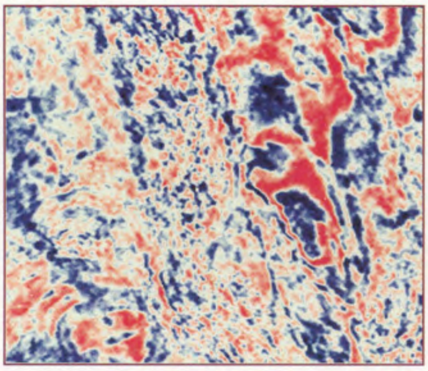


Dense picking

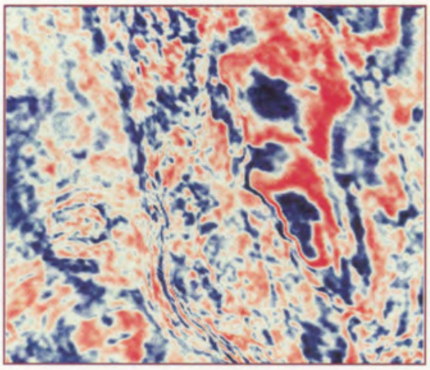


Depth slice through final PreSDM image. The sole difference between the two images is the migration velocity model. Structural resolution of the image has significantly improved.

Coarse picking



Dense picking



GeoVista™2 features

- *Geomig - unique application for structural picking and QC, including map and normal-ray migration for time-depth transfer.*
- *Event-guided residual move-out picking with optional geostatistical filtering.*
- *VelTracer™ - unique depth tomography using all offset information for 3D inversion. Patented approach offers fast and accurate model update.*

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WaveVista

Wave Equation Depth Imaging

Shot-record migration to resolve complex structural issues

Wave Equation migration (WE Pre-SDM) represents the way forward in imaging techniques, providing the interpreter with a more accurate image of complex geology.

Wave equation migration is better able to preserve shorter-wavelength, higher-resolution seismic signal than its Kirchhoff counterpart. This is achieved through its independence from high-frequency travel time calculations and its ability to deal with irregular spatial sampling.

Figures 1 and 2 show the clear advantage that can be expected with WaveVista™ for sub-salt imaging: the bottom horizontal reflector is well imaged and there are no artifacts at the left edge of the salt body.

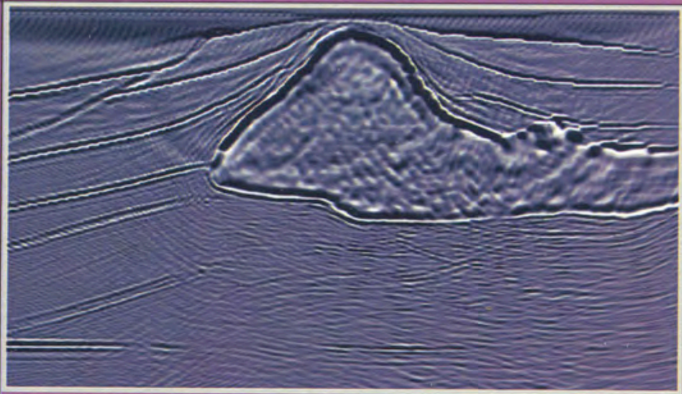

Figure 1: Kirchhoff migration of the 3D SEG/EAGE C3-NA salt model

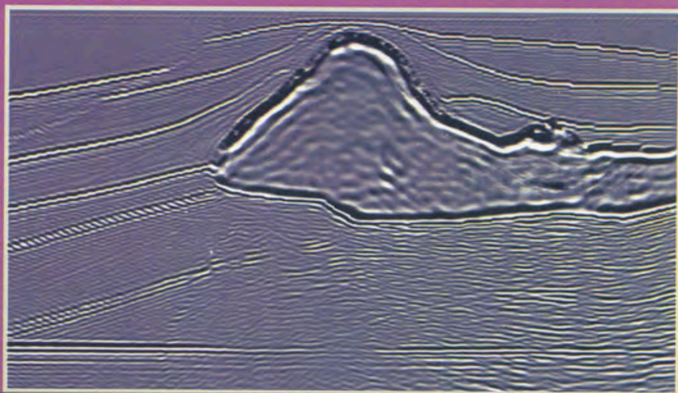

Figure 2: Wave equation shot-record migration of the 3D SEG/EAGE C3-NA salt model

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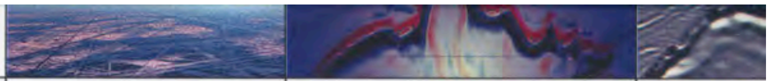

WaveVista

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The new wave in PSDM

Pre-stack wave equation depth migration in Geocluster™

- **Accurate imaging of steeply dipping events with arbitrary large lateral velocity variations**
- **Includes propagation in VTI anisotropic media**
- **Fully operational under Geocluster™**

WaveVista™ implements WE migration in the **Geocluster™** module SRMIP, which runs a shot-record migration based on an explicit extrapolation scheme. The shot-record migration computes one image for each shot and stacks the results with illumination compensation included. No simplifying assumptions are made about the media and the data. The proprietary explicit extrapolation used by CGG, based on an efficient L-∞ optimization of a polynomial Laplacian operator, is the most accurate existing method. Its advantages include:

- user-defined dip limit (typically 70 degrees),
- no numerical dispersion up to a user-defined limit (typically 70% spatial Nyquist),
- accurate propagation in media with arbitrary lateral velocity variations and VTI anisotropy.

Another key feature of **WaveVista™** is the regridding of the receivers from their actual location to a regular grid by using the same 70% spatial Nyquist frequency preservation principle as is used in the extrapolation step of the WE migration. This ensures consistent signal processing, yielding the best possible lateral resolution.

WaveVista™ allows the output of angle gathers via a unique proprietary development for use by tomographic inversion and model update tools in addition to post-migration processing.

WaveVista™ WE shot-record migration is available for application on all 3D datasets: streamer, land and OBC. Figures 3 and 4 show a comparison between Kirchhoff and wave equation migration for a North Sea dataset. The benefit to image quality and resolution is clearly demonstrated on both section and depth slice.

Figure 3: Kirchhoff migration of North Sea dataset displaying section and depth slice.

Figure 4: Wave Equation migration of North Sea dataset displaying section and depth slice.

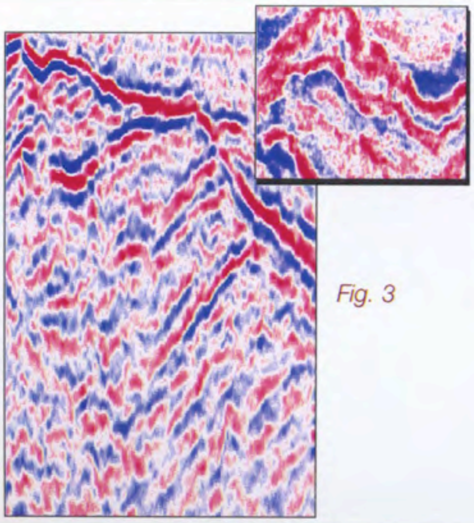

Fig. 3

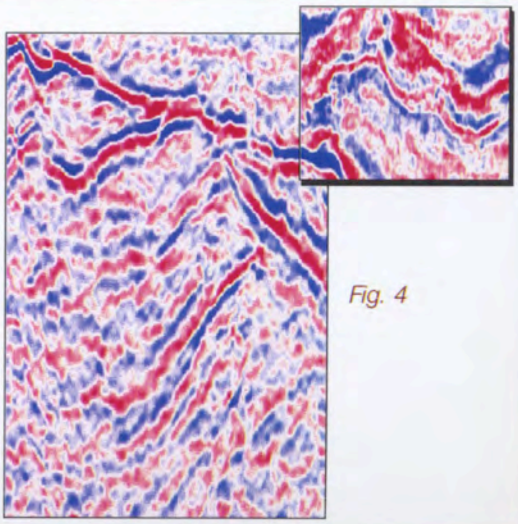

Fig. 4

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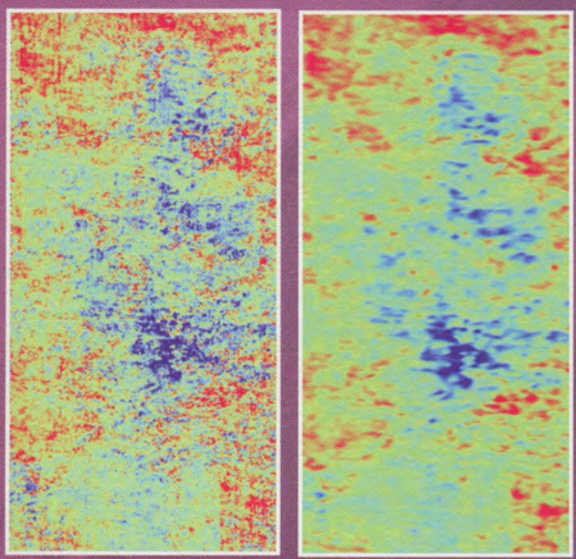
Geostatistical Filtering

GSFIL

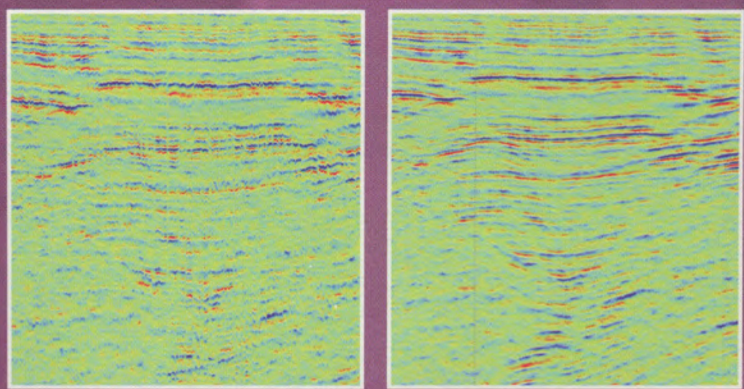
Robust quality enhancement

Geostatistics involves the analysis and prediction of spatial or temporal phenomena. Usually seismic attributes such as velocities contain many spatially correlated features acting on different scales.



The use of geostatistics can remove the non-geological features that corrupt a raw dense velocity field such as localised outliers and acquisition footprint effects.

The figures demonstrate the benefits of application of GSFIL to the velocity field (time slices on the left) and the resulting final stack image (sections below). In both cases the result from the geostatistical filtering is on the right.



Geostatistical Filtering

Factorial kriging - a well known method but a unique approach on seismic data

- *Most people intuitively know that two values in space that are close together tend to be more similar than two values that are farther apart (Figure 1). This correlation decay with distance and direction is measured with experimental variograms similar to multi-dimensional auto-correlation.*

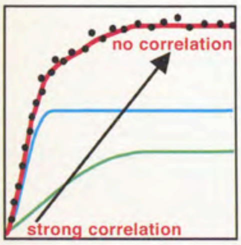


Figure 1: Black dots form the experimental variogram as a function of distance. The red curve corresponds to the modeled variogram which is the sum of two components; the blue curve (artifacts) and the green curve (geological features).

- *3D data-dependent matching filters are built, based on spatial analysis (modeling of experimental variograms). Each variogram component is used in a so-called "Factorial Kriging system" which is related to Wiener-Levinson filters. An automatic factorial kriging is implemented for 3D velocity cube filtering (GSFIL).*

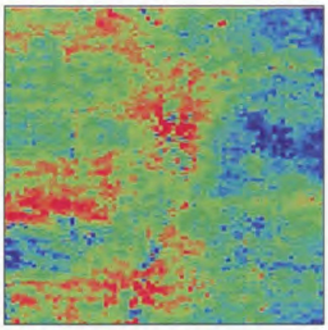


Figure 2: Raw dense velocity field (time slice)

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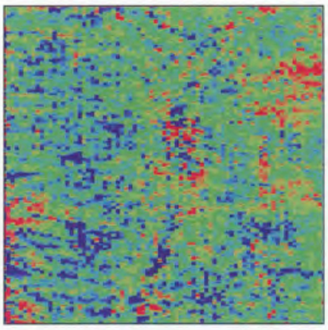

Figure 3: Rejected part of the initial velocity field (time slice)

+

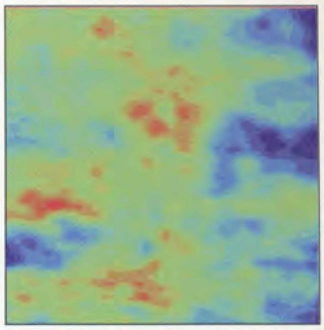

Figure 4: GSFIL-filtered velocity field (time slice)

The random and spatially organised artifacts which contaminate the velocities can be recognised on a time slice extracted from the raw dense velocity field *(Figure 2)*. Geostatistical filtering enables these to be identified and separated *(Figure 3)* from the spatially consistent geological features *(Figure 4)*.

The results of filtering the velocities are best seen on the stack volume

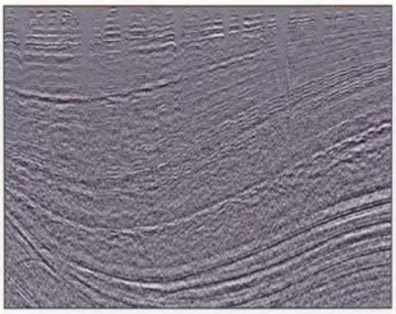

Figure 5: Stack using hand-picked velocities

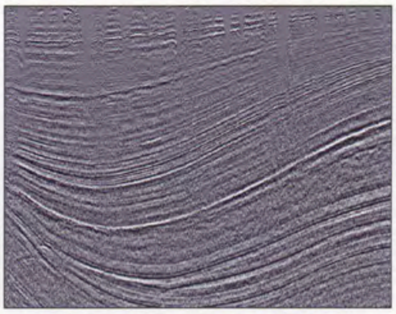

Figure 6: Stack using GSFIL-filtered velocities

Figure 5 shows a stack processed with the standard route (hand-picked velocities 200 x 200 m). The stack in *Figure 6* used the GSFIL-filtered dense velocity field (20 x 20 m). Note the quality improvement on both main and intermediary reflections compared to the standard processing.

Figure 7 shows a time slice through the volume. Note that, if the raw dense velocity field is used for stacking (centre), then artifacts damage the amplitude and the phase continuity of the signal. The full benefit of GSFIL is revealed in the right-hand panel with the improved quality of the lateral resolution and the geological structure compared to the standard processing seen in the left-hand panel.

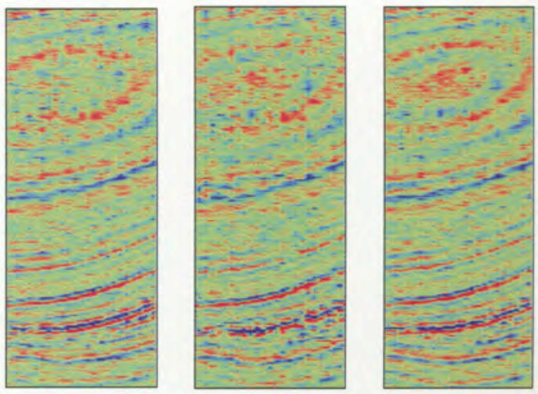

Figure 7: Time slice through the stack volume resulting from the use of (left to right) hand-picked velocities; the raw dense velocity field; and the dense field after geostatistical filtering with GSFIL

Data courtesy of bp, TOTAL and Gaz de France

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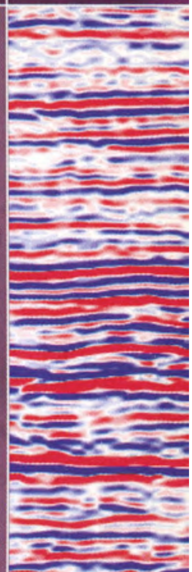
BOOST+

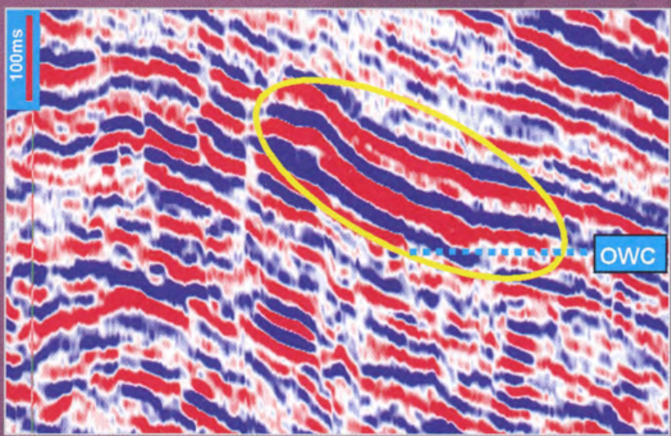
Controlled Spectral Broadening

Maximise the resolution of your seismic

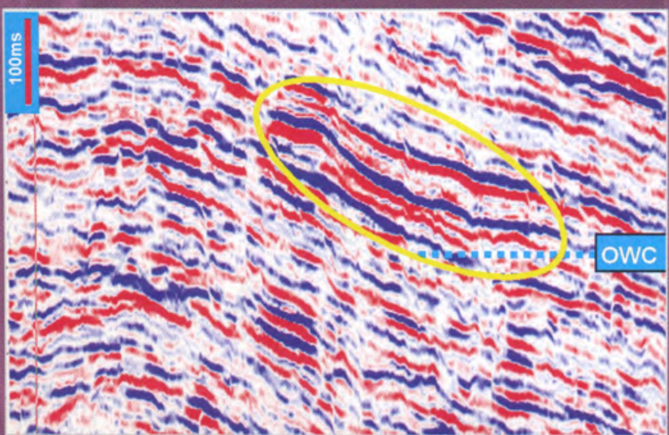
Innovative use of our Reservoir Characterisation technology enables CGG to offer greater levels of high-frequency enhancement than previously achieved on seismic data.



Before BOOST+



After BOOST+



Data courtesy of bp

CGG has developed the BOOST+ technology to allow identification of the underlying reflectivity and thus control of the high-frequency operator required for maximum improvement in the seismic resolution and bandwidth.

Bandwidth enhancement of 20-30Hz can be achieved, accompanied by an improved signal-to-noise ratio compared to the initial data.

The impact is such that reservoir resolution can be significantly improved. After application of BOOST+, the example on the left gained 25dB at 75Hz, enabling individual reservoir sand units to be resolved (2100-2200 ms) and accurately mapped.

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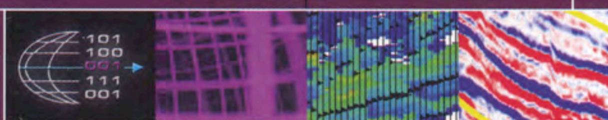


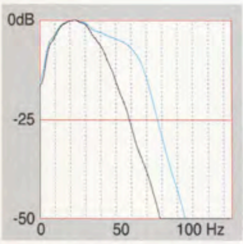
BOOST+

Controlled Spectral Broadening

Maximise the resolution of your seismic

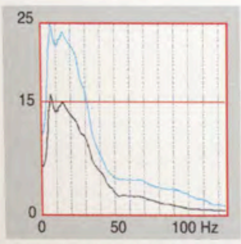
Optimum broadening is achieved in a controlled manner through the use of proprietary tools for identification of reflectivity and for operator design.

The figure below shows the signal spectrum increase of 20-25Hz resulting from BOOST+.

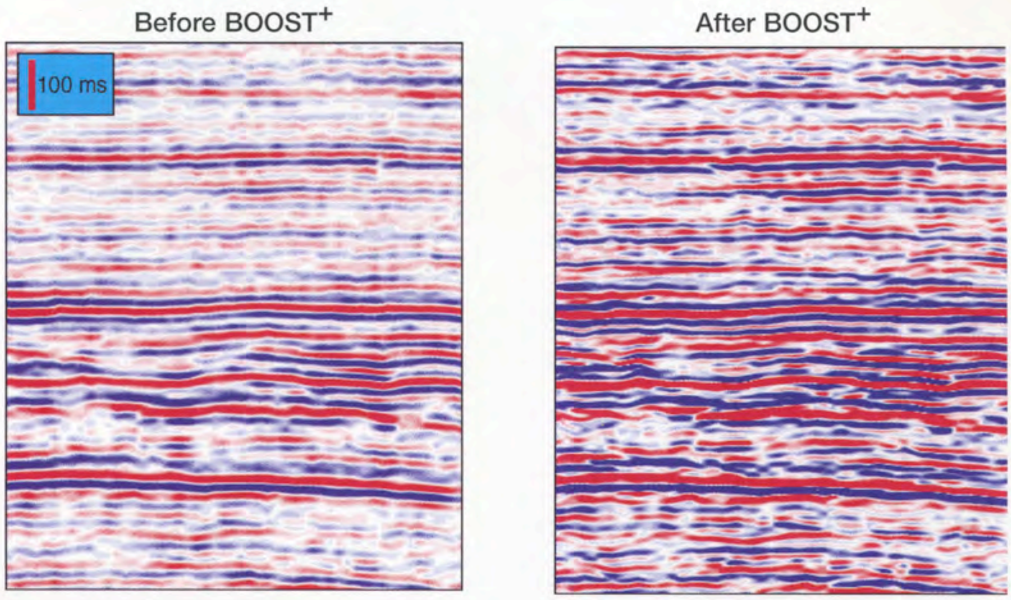


Signal spectrum
– before BOOST+
– after BOOST+

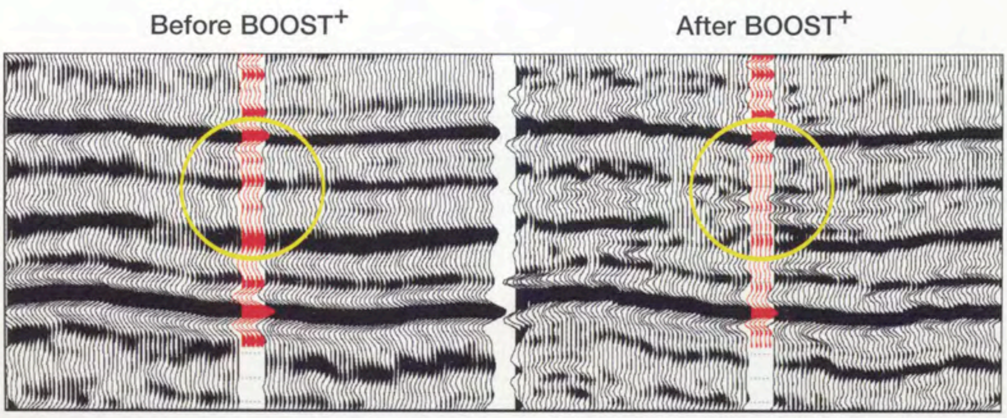
The impact of this broadening on the signal/noise spectrum is monitored and also shows improvement after BOOST+.



Signal/Noise spectrum
– before BOOST+
– after BOOST+



The comparison above illustrates a recent case study where typically an additional 25Hz bandwidth improvement was documented. The extended bandwidth improved the interpretability of the dataset and the resolution of the faults. A number of wells were available for this study and improved matching of the seismic and wells at higher frequencies resulted from the use of BOOST+. The well data is only used for QC of the BOOST+ results. Shown below is a further comparison of the application of BOOST+, this time with a synthetic inserted at the well location and generated with the wavelet for the corresponding seismic panels. Application of BOOST+ improves high-frequency matching, particularly in the highlighted intermediary zone.



Data courtesy of Waha Oil Company

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HDPIC*

High-Density Anisotropic Velocity Analysis

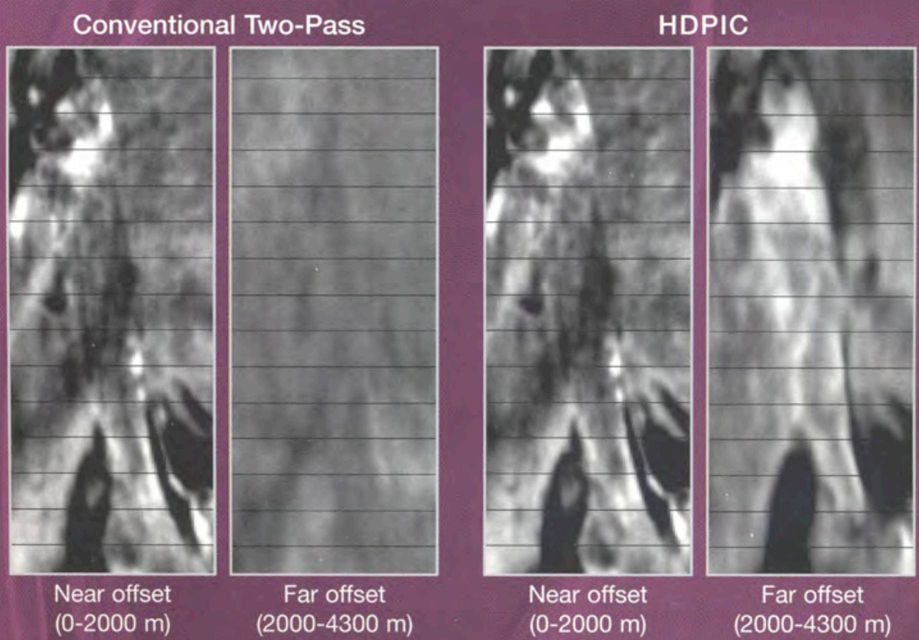
Who says geologists can't pick velocities?

For the past four decades geologists and geophysicists have been at odds over seismic velocities. Velocities are critical for both disciplines but they do not necessarily mean the same thing to each. Today CGG has come up with a new approach to picking seismic velocities that reconciles geologists and geophysicists by delivering geologically meaningful attributes that flatten prestack gathers.

■ Four decades of controversy

Ever since the inception of multiple coverage, some forty years ago, geophysicists have stacked redundant information to improve signal-to-noise ratio. To properly stack seismic records belonging to the same common-mid-point (cmp) gather, it is necessary to apply dynamic corrections (called nmo for normal moveout). It did not take keen minds a long time to realize that these dynamic corrections are closely linked to subsurface velocities. Hence, it is possible to estimate these velocities as a by-product of the flattening of cmp gathers.

Velocities are critical for geologic interpretation; not only can they help distinguish between different types of rocks (e.g. salt and shale) but, combined with the arrival time of seismic echoes, they also help estimate depth of burial. The only missing link is to establish a relationship between geophysically picked velocities and interval velocities, which geologists can interpret.



▲ *Time-slices of near- and far-offset stacks for the standard two-pass method of anisotropic velocity analysis (left) and HDPIC (right). HDPIC clearly improves the far-offset stacks, but the near-offset stack also benefits from more accurate velocities.*

*Patent pending

High-Density Anisotropic Velocity Analysis

Who says geologists can't pick velocities?

Geophysicists pick what are called stacking velocities, because they are meant to flatten cmp gathers and optimize the stack. Under some simplifying assumptions, it can be shown that stacking velocities are close to rms (root-mean-square) velocities. Using Dix's equation, it is possible to transform rms velocities into interval velocities. This simple procedure gives an almost immediate relationship between stacking and interval velocities *(Figure 1)*.

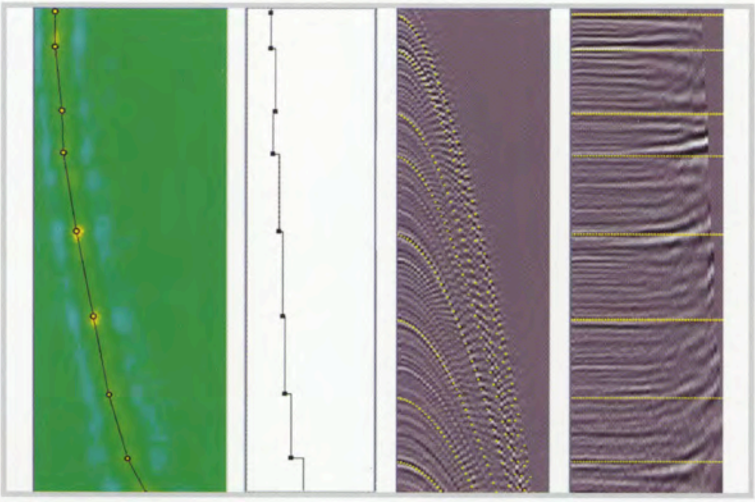


Figure 1: Standard panels for velocity picking. From left to right: the semblance spectrum to pick stacking velocities, the corresponding interval velocities, the corresponding hyperbolas overlain on the uncorrected gather, the nmo-corrected gather. The last panel shows that the hyperbolic assumption only applies to small incidence angles.

It is here that the problem started. Far from closing the gap between geologists and geophysicists, this simple relationship generated years of controversy. Geophysicists insisted on picking velocities that made no geological sense, whereas geologists preferred velocities that did not flatten gathers and yielded a degraded stack. Both had valid arguments; the culprit in this case was the "simplifying assumptions" mentioned above, because they are almost never met.

The not-so simplifying assumptions

Stacking velocities can be equated to rms velocities only when two conditions are met:

- the subsurface is made of flat layers
- kinematics have hyperbolic behavior with offset.

The hyperbolic assumption is known to only be valid at small incidence angles. At larger incidence angles, layering effects and/or anisotropy make the kinematics depart from hyperbolas. Conventional wisdom assumes that the cut-off angle is around 30 degrees, but this is highly debatable: in some circumstances it can be much smaller.

The first assumption breaks down as soon as a structure is present in the subsurface, which occurs more often than not. An early attempt at circumventing this problem was dmo (dip-moveout), which removed the effects of dip for velocity analysis. Now that Kirchhoff prestack time migration has become standard, the effects of structure on velocity estimation are almost totally eliminated. The next step of course is the generalization of prestack depth migration where all kinds of structures and velocity fields are properly taken into account.

Structural velocity picking

The advent of prestack migration (time or depth) offers a new opportunity for velocity analysis: structural velocity picking. The idea is to image the data with a series of velocity functions and locally select the field that yields the best structural image *(Figure 2)*. With this approach, it is natural to involve geologists because it is their structural interpretation that drives the velocity picking.

Yet this new concept still fails to reconcile geological and geophysical velocity fields. The field that yields the best structural image does not necessarily guarantee flattened gathers *(Figure 3)*. The residual moveout features degrade the quality of the migrated stack, and prevent prestack studies such as AVO (amplitude-versus-offset) analysis. The culprit this time is anisotropy (or VTI, vertical transverse isotropy). In VTI media, interval velocities are faster in the horizontal direction than in the vertical direction. This means, in turn, that stacking velocities are faster than migration velocities.

Which velocity should geologists believe then?

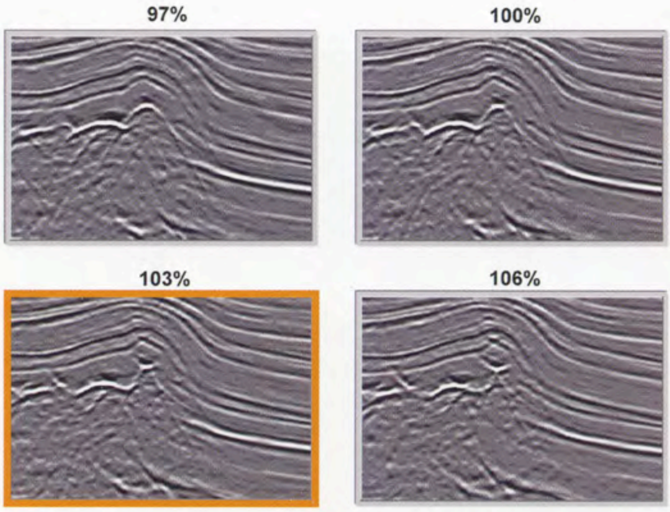


Figure 2:
Structural velocity picking. The data are prestack-migrated with percentage variations of a reference velocity field.
The percentage that yields the most focused image (here 103%) is chosen for this location.
The final velocity field is the combination of the picked percentages with the reference field.

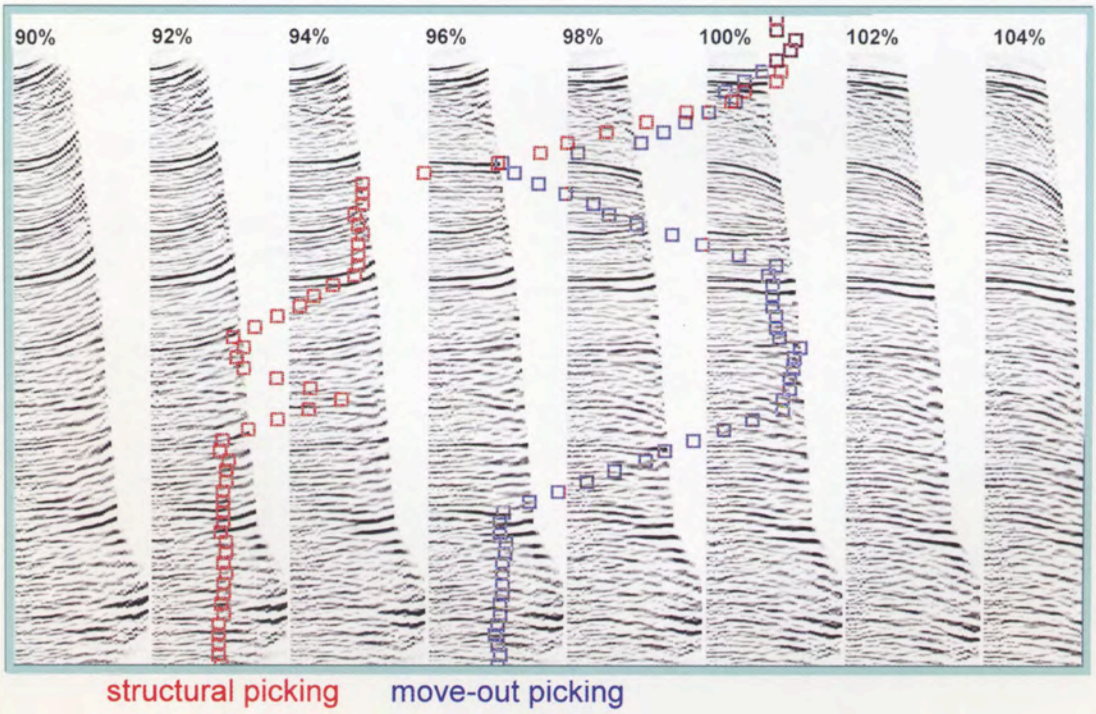


Figure 3:
A prestack-migrated gather is output for various percentage variations of the reference velocity field.
The red squares correspond to the percentages picked by the structural velocity analysis.
The blue squares correspond to the percentages that best flatten the gathers.
The mismatch is a consequence of anisotropy (VTI) where the horizontal velocity is faster than the vertical velocity. In such a medium, it is often observed that nmo velocities are faster than migration (or structural) velocities.

High-Density Anisotropic Velocity Analysis

Who says geologists can't pick velocities?

Anisotropy cannot be ignored

Prestack migration schemes successfully remove the effects of structure on velocity estimation, but leave the anisotropy issue unresolved. Anisotropy has to be handled properly for velocities to become geologically meaningful. In the time domain, the preferred parameter is η, a dimensionless variable related to anisotropy percentage. There are many ways to extract η from residual moveout curves. The standard approach involves a first pass of regular velocity analysis limited to short incidence angles, followed by a second pass aimed at specifically flattening the large incidence angles using a higher-order nmo equation (to go beyond the hyperbolic assumption).

This standard approach however is flawed, because it implicitly assumes that anisotropy effects are only present at large offsets. Although this is valid for a flat layered subsurface, it does not hold in the presence of dips (*Figure 4*). Moreover, the positioning of dipping events in the migration process is affected by anisotropy. Therefore, any method that assumes isotropy in a first pass prior to anisotropy estimation inevitably misplaces dipping events.

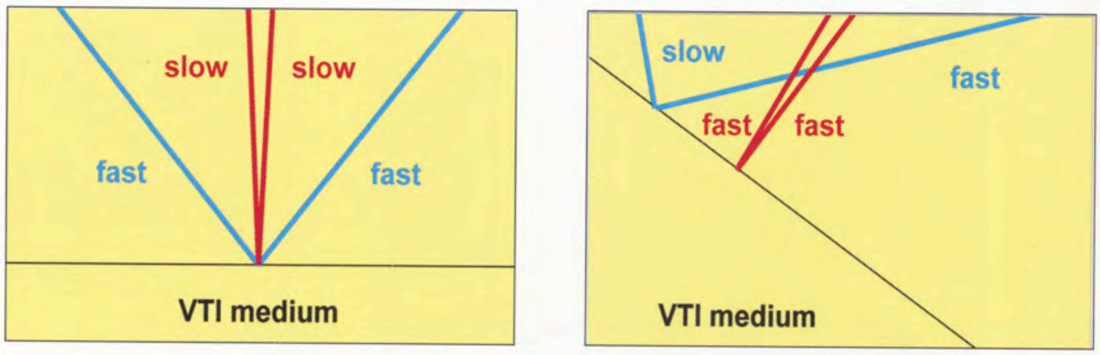


Figure 4:
A far-offset and a near-offset ray for a cmp in a VTI medium.
For a flat event, the far-offset ray samples a faster velocity than the near-offset ray.
For a dipping event, the far-offset ray can sample a slower velocity than the near-offset ray.

One way to circumvent the problem would be to scan both velocity and anisotropy fields in a structural picking scheme. However, sampling 10 fields for each attribute would require a geologist to browse through 100 images – and to run as many prestack migrations. Besides, velocity and anisotropy are so tightly intertwined that many of the 100 images would look the same.

The close relationship between velocity and anisotropy is actually the source of many problems for nmo corrections. An estimation error on one of these two attributes immediately propagates to the other. Similarly, within the scopes of dense automatic picking schemes, any editing or filtering of one of the fields affects the other one. Editing and filtering have to take place in a complex combined way to ensure that the final fields will actually flatten the gathers. So far, all attempts at proper handling of anisotropy have failed in delivering consistent products that satisfy both geologists and geophysicists.

HDPIC to the rescue

To solve all these problems, CGG has developed a new concept called HDPIC. The basic principle is to pick two orthogonal attributes instead of the usual second and fourth order velocities. Orthogonal means that the two attributes are perfectly decoupled and that any action on one does not affect the other. Coming back to the earlier example of simultaneously scanning two fields at 10 samples each, orthogonal attributes only require 20 runs (instead of 100) and the geologist will only have to browse through 20 images, all of them looking different. This approach is particularly effective for dense automatic picking schemes because the two attributes can safely be estimated in one pass, and the editing/filtering process can be applied to the two fields separately.

In the time domain *(Figure 5)*, the two parameters of choice are dtn (the time delay between near and far offsets) and τo (the intercept of the shifted hyperbola). They are indeed ***orthogonal*** *(Figure 6)*. Once these two parameters have been picked, it is a matter of simple algebra to compute the associated velocity and η fields. The key to this process is to pick ***geophysical*** attributes with little physical meaning but that are conveniently orthogonal, and then to transform them into attributes that make ***geological*** sense.

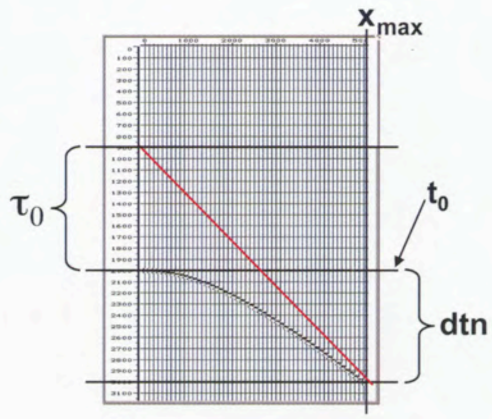


Figure 5:
New parameters for flattening the kinematics. Prestack events are described as shifted hyperbolas. The zero offset arrival time is called t_0, the time delay between t_0 and the intercept of the shifted hyperbola is called τ_0, and the time delay between t_0 and the maximum offset arrival time is called dtn.

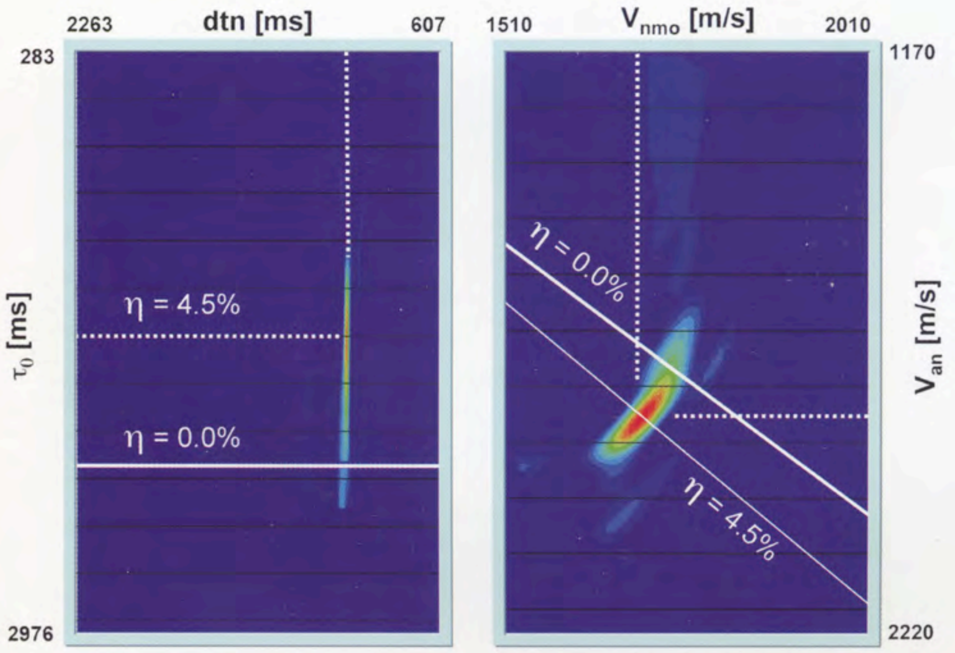


Figure 6:
The two panels represent a time-slice through real-data bispectral semblance spectra for two sets of parameters.
The spectrum on the left scans the two proposed parameters of τ_0 and dtn. They are clearly orthogonal.
The spectrum on the right scans the usual 2nd and 4th order terms of the nmo equation. Their correlation makes picking, editing and filtering more complicated.

High-Density Anisotropic Velocity Analysis

Who says geologists can't pick velocities?

Indeed with this process the effects of anisotropy are effectively separated from velocity estimation and the resulting fields make more geological sense. Experience shows that in sedimentary sections the velocity field resulting from this process closely follows the depth of burial (as it should) and not the layering – the effect of which is confined to the η field *(Figure 7)*. Furthermore, the gathers are almost perfectly flat *(Figure 8)*, which optimizes the stack and makes AVO analysis possible *(front cover)*. After 40 years, HDPIC finally achieves the original goal of getting geologists and geophysicists to agree on velocities!

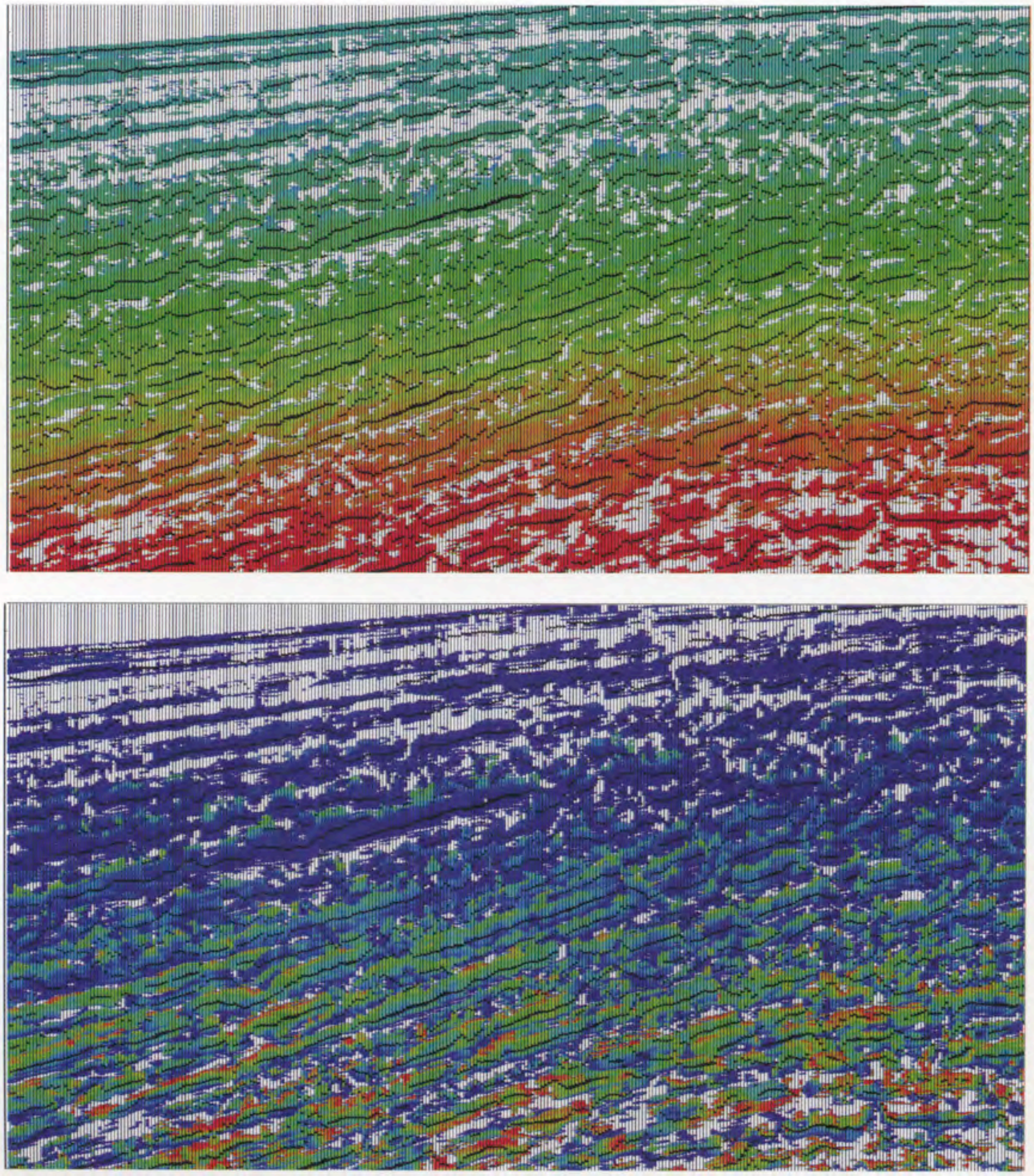


Figure 7: Results of HDPIC. Seismic events have been picked automatically following maximum semblance (the picked "skeleton" is shown as black spikes). The two parameters τ_0 and dtn are picked simultaneously at every skeleton location, and outliers are automatically edited. No filtering is used in this case. Rms velocities (top) and η (bottom) are then reconstructed at every location using simple algebra. Even though no constraints were imposed on the attributes, it is befitting to see that the velocity field goes across layering and roughly follows the water bottom, while the η field closely follows the layering skeleton.

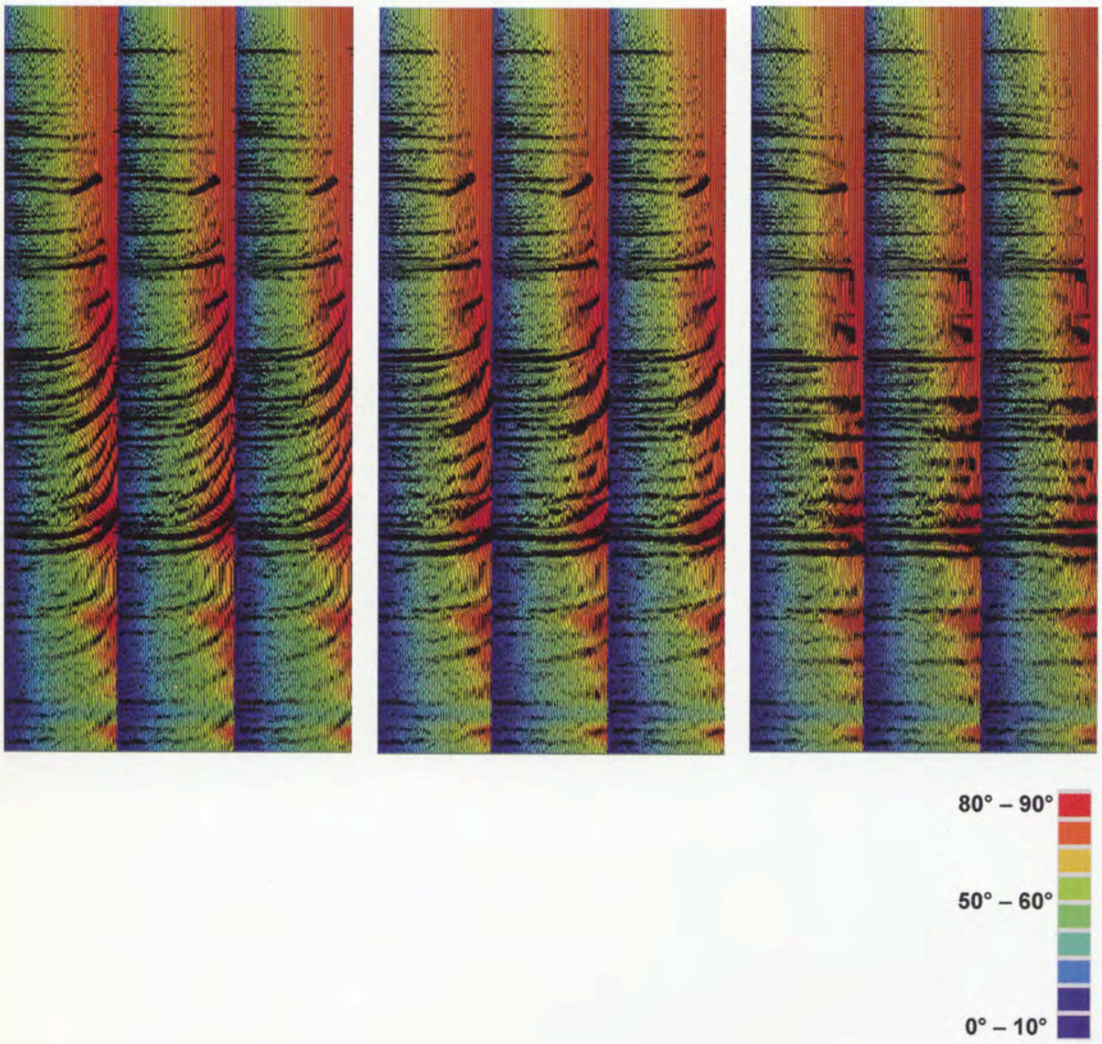
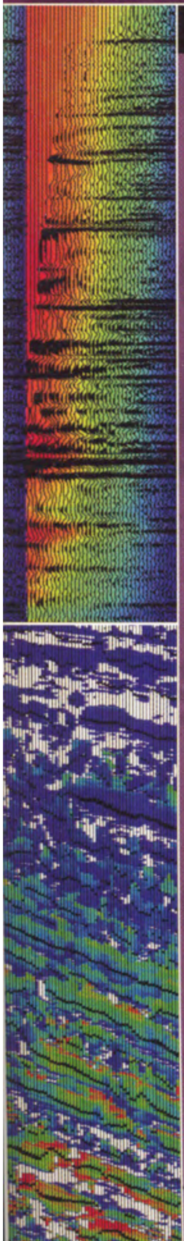


Figure 8:
Gathers after various nmo-correction methods.
The left panel shows a standard 2nd order nmo-correction with velocities derived from restricted incidence angle data (below 30 degrees).
The middle panel shows the same data after a 4th order residual correction designed on wide aperture data (30 degrees and above).
Although the gathers are flatter, the second pass fails to properly overcome the inaccuracies inherent with the first pass.
The right panel shows the same data after a one-pass HDPIC analysis. The gathers are flat throughout the angle range (overlain in color).

HDPIC Highlights

- *After 40 years geologists and geophysicists can now agree and pick the same velocities*
- *One-pass orthogonal velocity analysis replaces conventional two-pass anisotropic method*
- *Improved, accurate determination of velocity v and anisotropy η*
- *Removes contradiction of structural picking vs. gather flattening*
- *High-density automatic picking afforded by high-accuracy HDPIC approach*
- *High-quality velocity field yields significantly improved gathers for AVO and impedance studies.*



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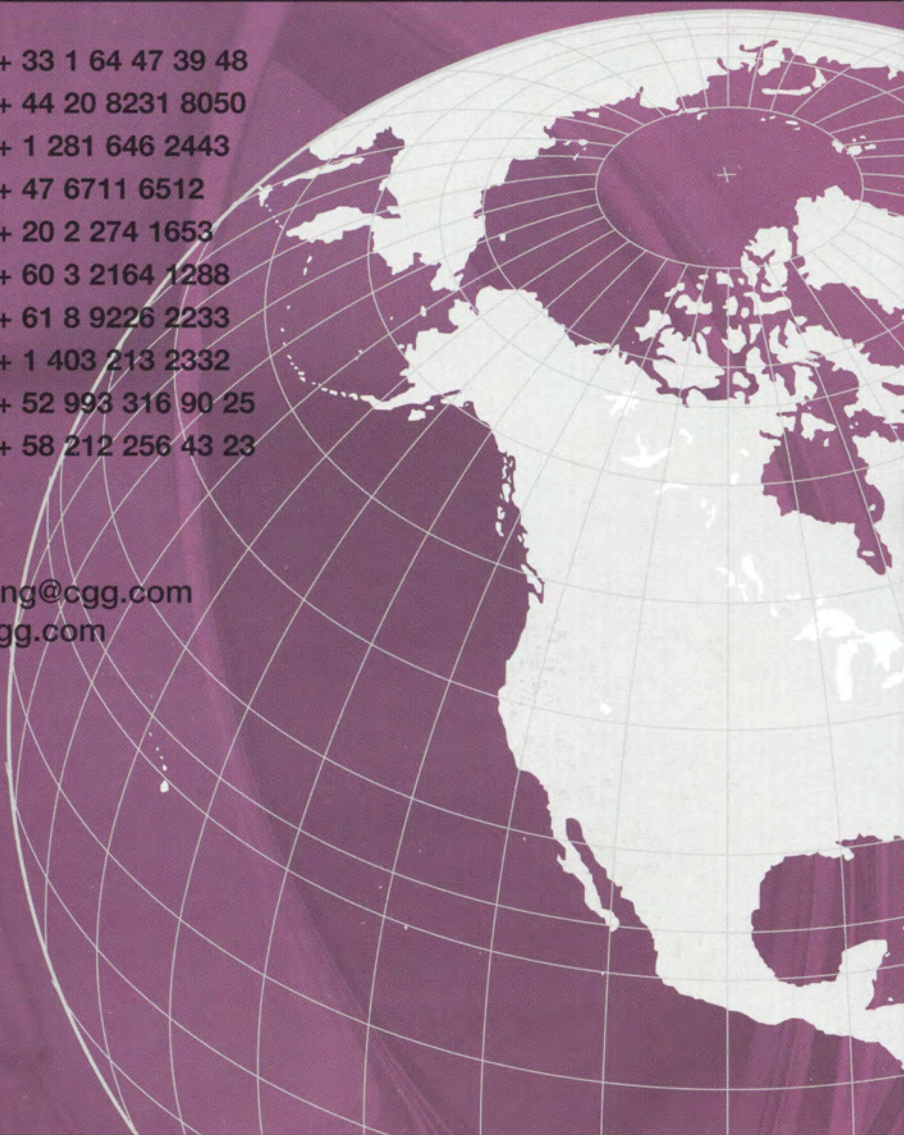

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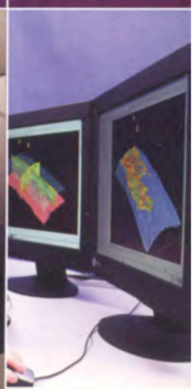

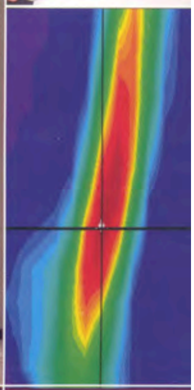

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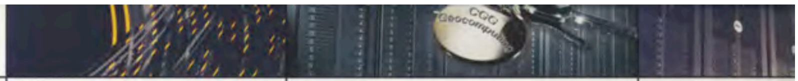

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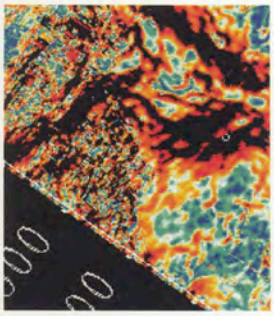

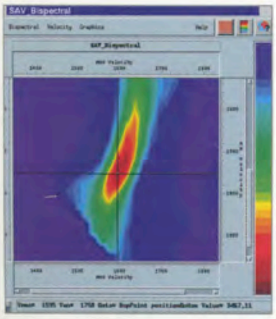

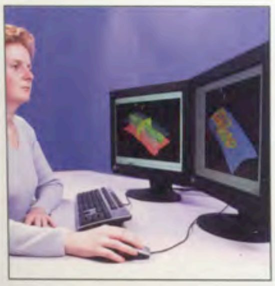

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Exploration ▶▶▶▶▶ Development ▶▶▶▶▶ Production

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These tools have been optimised in CGG's high-volume data processing centers.

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CGG's distributed computing expertise delivers scaleable data processing solutions from single-user configurations to the largest "mega" processing centers utilising SAN technology. In the context of IT, Geocluster is proven in supercompute environments supporting huge Petabyte storage capacity and teraflop computing power.

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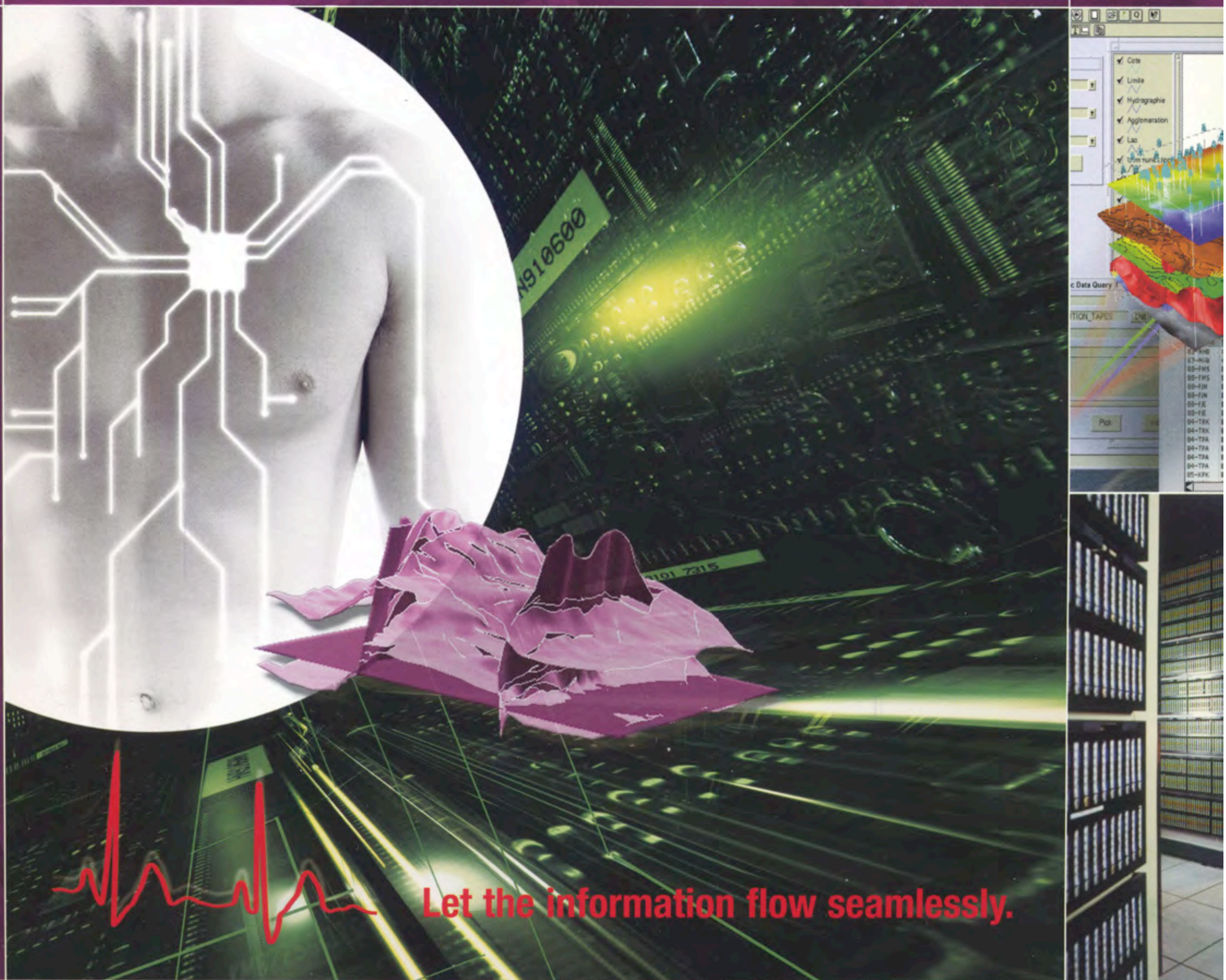

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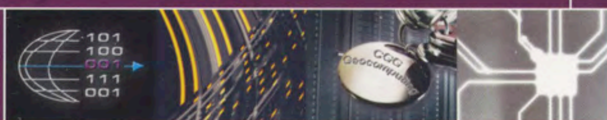

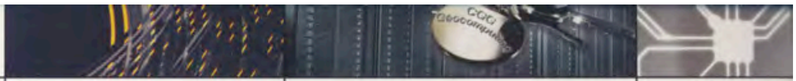

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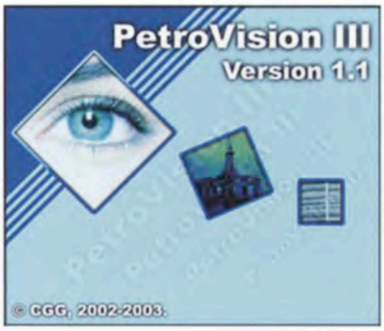

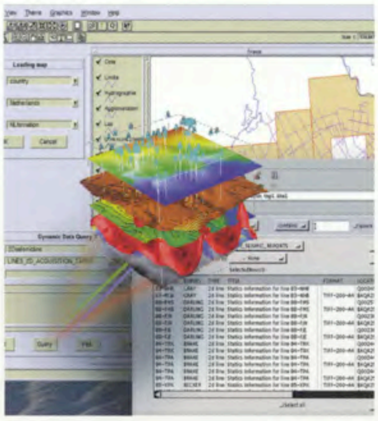

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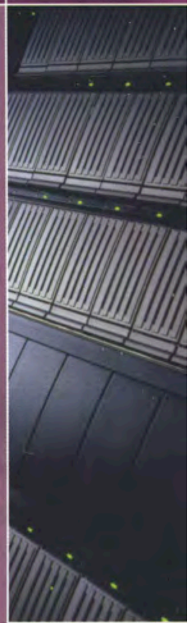

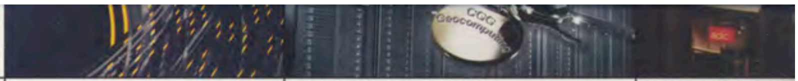

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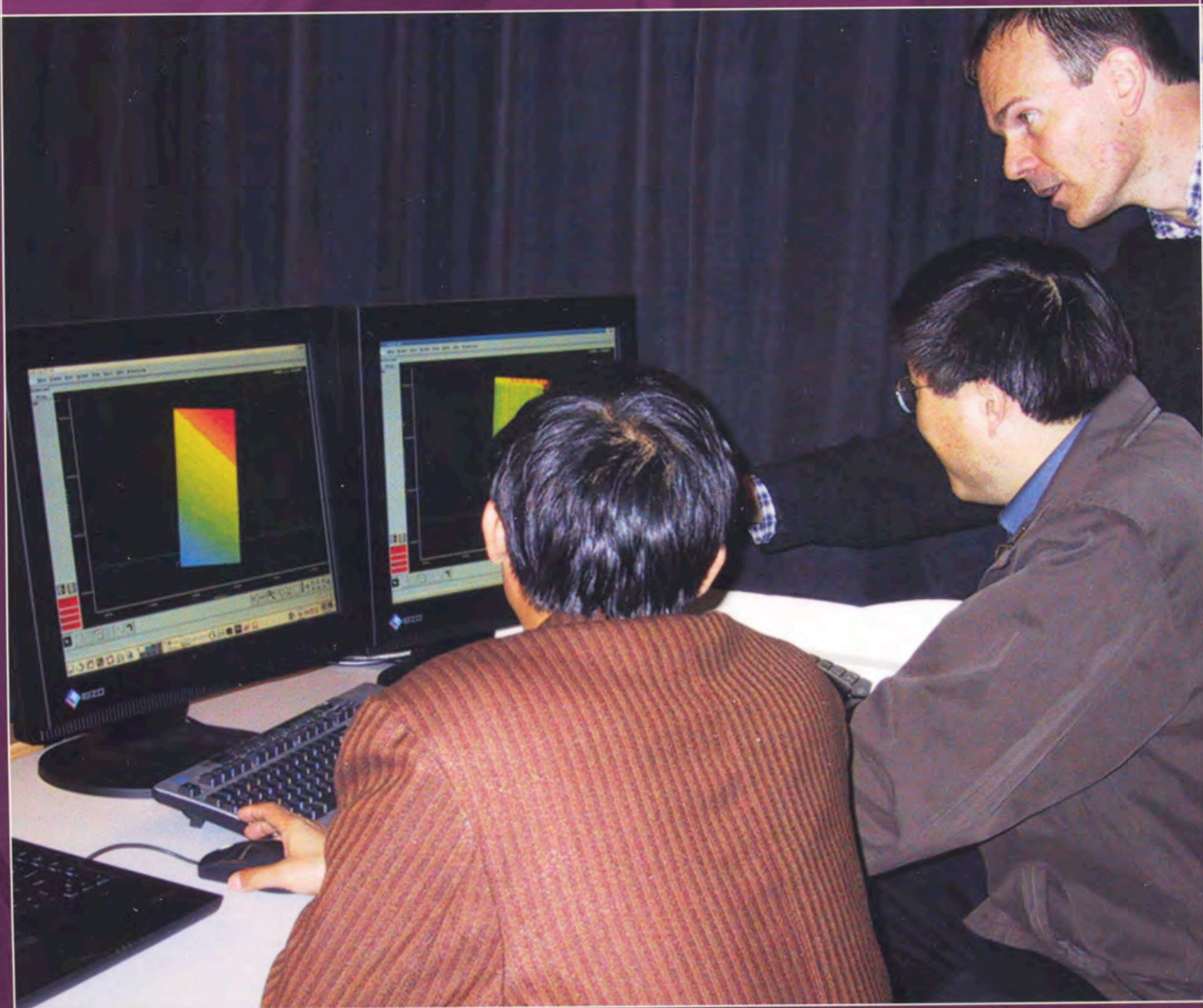

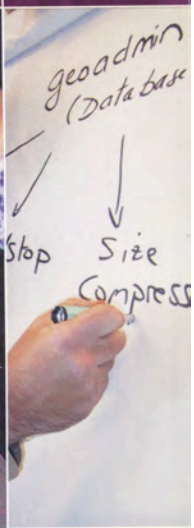

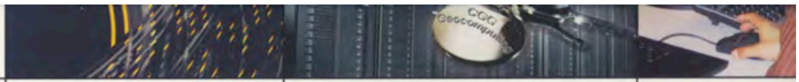

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Cefoga

Experience

- *Since its creation in 1976, CEFOGA has trained over 15,000 people, including CGG employees and external trainees from oil companies, contractors, and universities.*

Flexibility

- *Courses are delivered at CGG's primary training centers located in Paris, London, Houston and Villahermosa (Mexico). Alternatively CGG will deliver the training at a venue of your choice.*

  Specific training courses can also be tailored to fit client specifications and match the geophysical experience of trainees.

  Training courses can be delivered in English, French, Spanish, Chinese and Russian. Other languages may be catered for upon request.

Courses

Training courses cover a broad range of activities from project concept through execution to ongoing support. A full suite of standard courses lasting from 2-30 days is available. Alternatively courses can be tailored to meet your specific requirements. Each training course includes both theoretical and practical content, all of which has been validated by CGG's geophysical experts.

IT administration

- Installation and maintenance on LINUX and UNIX platforms such as SUN, SGI, IBM, Dell, HP, etc.
- Operation and Production - tools to optimize the use of networked hardware configurations and allow efficient access to seismic and auxiliary datasets.
- Systems Administration (LINUX, UNIX, etc.)

Geocluster software

- Acquisition-related QC
- Full 2D, 3D land & marine time and depth processing sequences
- Use of interactive processing and production tools
- Specific topics such as
  - Signal processing
  - Phase processing
  - Demultiple processing
  - Amplitude processing (AVO)

Geoland software

- Design of acquisition surveys
- Monitoring of operations
- Processing of acquisition geometries

Expertise

A key aspect of our training is the quality of the knowledge transfer and expertise development. To facilitate this:

- All our trainers have extensive practical experience of working in a production environment and are at the forefront of CGG's technology deployment.
- CEFOGA's knowledge base includes access to the geophysical experts of CGG's Research, Technical and Operations departments
- State-of-the-art training facilities are used to deliver personalised training. Trainees receive hands-on, real-life exposure to a seismic production environment.

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Call our Sales Teams now for further information

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