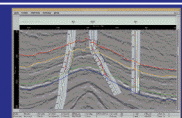# GEOTIGG

TOTALLY INTEGRATED GEOLOGICAL AND GEOPHYSICAL DATA INTERPRETATION SYSTEM
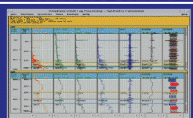
Works on PC-Linux and on Solaris

GEOTIGG is based on ORACLE data base, and all the modules are totally integrated. No need of data duplication.
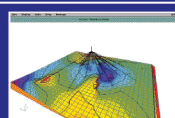
2D/3D SEISMIC INTERPRETATION	SYNTHETIC SEISMOGRAM	LOG ANALYSIS & INTERPRETATION	MAPPING	STATIC RESERVOIR	RESERVOIR SIMULATION
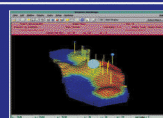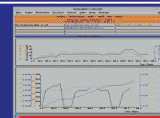
APPLICATIONS   APPLICATIONS

GeoRAPID

DATA   DATA

TOPOGRAPHY	SEISMIC	VELOCITY	LOGS	VSP	GEOLOGY
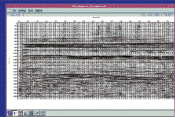
GeoTIGG

Contents

GeoTIGG

Introduction

- GeoTIGG is powerful suite of data management and interpretation software that comprehensively satisfies the demanding requirements of geologists and geophysicists. It includes all the software needed for petroleum exploration and production, from initial seismic and well log interpretation to production analysis and reservoir simulation.

- GeoTIGG is the result of collaboration between three companies:

    - A French company, CGG (Compagnie Générale de Géophysique)

    - A British company, Tigress

    - A Russian company, Geoleader

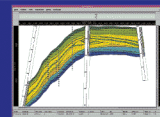- Based on a state-of-art integrated database management system, GeoTIGG avoids the data duplication, reformatting problems, and workflow interruptions that are inherent in conventional non-integrated software collections. Compare your old, piecemeal approach to oil exploration and production with the streamlined workflow of GeoTIGG. Review the features of the GeoTIGG modules described in this brochure, presented in workflow order, and discover the advantage that a truly integrated solution can bring.

- The GeoTIGG menus and comprehensive on-line manuals are available in both English and Russian.

GeoTIGG

GeoRAPID database

The GeoRAPID project database (**R**elational **A**dvance **P**roject **I**ntegrated **D**atabase) is an Exploration and Production logical data model based on the Tigress Project Data Store™. The data model is implemented in the Oracle relational database management system (RDBMS). The combination of a well designed model and the industry's leading RDBMS ensures a high degree of availability, integrity and security of data. GeoRAPID, through continued evolution, represents the most comprehensive data model available today. GeoRAPID includes many thousands of attributes covering all domains from seismic exploration through to production management.
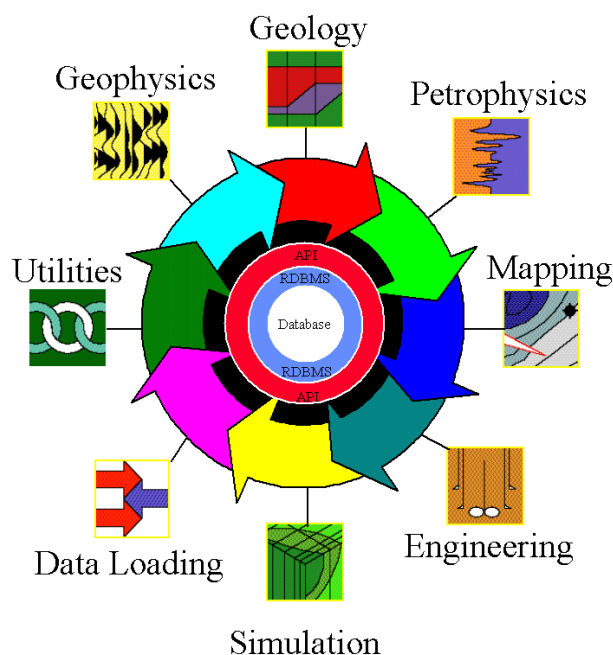
GeoRAPID is a project oriented data store providing real-time data retrieval and storage for an unlimited number of concurrent interpreters. Data versioning, access controls and audit trails ensure the continued quality of the project data stored within GeoRAPID. The GeoTIGG applications are fully integrated with GeoRAPID, allowing interpretation using data from all disciplines to accurately simulate the reservoir. Complete descriptions of the GeoTIGG applications are provided in accompanying sheets.

All applications that access GeoRAPID share the same data, ensuring continuity and minimising data redundancy. An API developer's kit is available to enable connection of 3rd party applications directly to GeoRAPID, along with a GUI kit for writing graphical front ends sharing the same look and feel as the GeoTIGG applications.

The GeoRAPID Database is also supplied with a complete suite of easy to use applications for all data import and export, database management and associated utilities for printer, tape drive and digitizer.

Data Loading

GeoRAPID is also supplied with a complete suite of graphically based, easy to use applications for data loading and unloading, database management and associated utilities. Data can be transferred to and from

the RAPID in a variety of industry standard and 3rd party formats, such as SEGY, LIS, BIT, TIF, LAS, Geoshare, OpenWorks, GeoFrame, CPS-3, Z-Map, Irap, ISM, EarthVision and Eclipse.

Data loading applications include the following:

Seismic Import/Export	Import and export of 2D and 3D seismic and navigation data in a variety of different formats
The Import/Export System	Bulk data import of well dependent and independent data in a variety of industry standard file formats.
OpenSpirit – TIES	A version of TIES supporting the transfer of well data between PBAscii and OpenSpirit-enabled data stores
Log Load	Import and export of log, core and interpreted trace data in a variety of formats
Deviation Survey	Entry of the well trajectory, and correction to true vertical depth
Core Entry	Spreadsheet entry/editing of conventional and special core analyses
RFT Load	Spreadsheet entry/editing of formation test data
ASCII File Converter	Import of well data in unrecognised ASCII file formats
Log Digitisation	Import of paper based log data using a variety of supported digitisers
Mapping Import/Export	Import and export of all map data to and from ASCII and binary files
Well View	Entry of construction and production history for a well
Production Loader	Import of generic production and special test data

Database Management

|	
GeoRAPID Manager	Data Store creation, backup, restoration and deletion
GeoRAPID Data Publisher	Publishing of a users private data for viewing by all project users
GeoRAPID Table Viewer	Display of values in the individual tables comprising the data model
GeoRAPID Navigator	Spreadsheet display of production and special test values stored in the POSC compliant tables
GeoRAPID Reporting Tool	Data Store querying and reporting using interactively built SQL
GeoRAPID Data Delete	Bulk deletion of well dependent data
GeoRAPID Units	Setting of the default data units for a project

Database Utilities

Tape/Printer Administration	Definition of printers and tape drives to be accessed by GeoRAPID
Digitiser Administration	Definition of digitising tables to be accessed by GeoRAPID
Cartographic Reference System	Definition of the mapping projection system used in GeoRAPID
Trace Type Editor	Definition of trace name, type and default scale and minimum and maximum values
Geophysics File Locator	Creation and management of GeoRAPID pointers to Unix directories for storing seismic data and interpretations
Well Symbol Editor	Creation of well symbols for map displays and hardcopy

A comprehensive set of on-line documentation also accompanies GeoRAPID. This documentation covers all aspects of the product from entity relationship diagrams for the data model through to user documentation for the GeoRAPID tools. Navigation through the material is simplified by the inclusion of extensive hypertext links.

GeoRAPID Data Loading

GeoRAPID Data Loading applications enable E&P personnel to transfer data to and from the GeoRAPID database for use in the GeoTIGG applications. Data is loaded from a variety of 3rd party databases and file and tape formats using graphical interfaces and specially developed links. Links to other databases, applications and file formats can be written using the GeoRAPID Developer's Toolkit, transforming GeoRAPID into an open integration platform and data distribution hub.
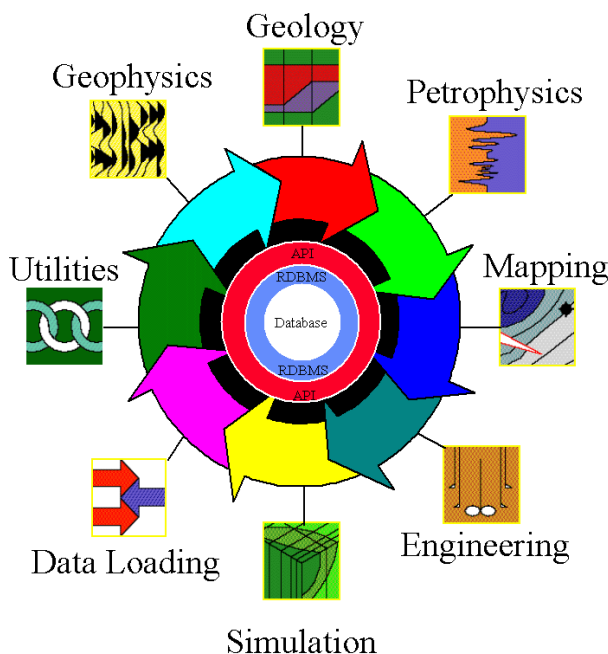
Seismic Import/Export

Import and export of 2D and 3D seismic and navigation data in a variety of different formats

- Import and export of 2D and 3D SEGY data in a variety of formats (SEGY, Charisma and Landmark SEGY in 8, 16 & 32 bit)
- 3D surveys can be specified using a single inline/crossline origin point and rotation, or three corner points
- 2D navigation data is read from UKOOA ASCII files on tape or disc
- Dump facility for EBCDIC, binary SEGY files, binary trace headers and data values to be decoded and viewed
- Elevation, static correction and water depth data can be extracted from the trace header and stored in the database for later display in the Seismic Interpretation application
- Post processing options include polarity reversal, filtering and scaling
- Import of cultural data from ASCII files
- Generation of time slices

Log Load

Import and export of log, core and interpreted trace data in a variety of formats

- Import and export of data in PBAscii, LIS, LAS v2.0, BIT and TIF formats (Schlumberger and Atlas)
- Display and manipulation of trace values using spreadsheet editing tools or simple functions
- Definition of log and mud header, casing and bit-sizes for use in borehole and environmental corrections
- Definition of tool type and pre-processing applied to traces (e.g. temperature corrected)
- Interrogation of LIS tapes and TIF files prior to loading
- Conversion of LIS to TIF and vice versa
- Merging of log runs
- Format conversion from LIS to Tiff and vice versa

Deviation Survey

Entry of the well trajectory and correction to true vertical depth

- Trajectory can be imported in PBAscii format or typed in manually
- Display and manipulation of raw and computed survey values
- Computed deviation table can be generated by four methods:
  - Balanced tangential
  - Radius of curvature
  - Average angle
  - Minimum curvature
- Location of survey origin can be offset from the well header

Core Entry

Spreadsheet entry/editing of conventional and special core analyses

- Fast entry of core data using spreadsheet editors
- Conventional core analyses include:
  - wettability index, grain density, porosity, CEC, permeability, fluid saturation
- Special core analyses include:
  - capilliary pressure, formation resistivity factor, resistivity index, waterflood susceptibility, porosity and permeability compaction factors, relative permeability, gamma ray
- Definition of core and mud header
- Automatic generation of length drilled and core recovery

RFT Load

Spreadsheet entry/editing of formation test data

- RFT data can be imported in PBAscii format or typed in manually
- Display and manipulation of base, header and test data values
- Base data includes initial, final and formation pressure definition
- Header data includes mud, choke and chamber parameters
- Test data includes time and pressure per sample point

Well View

Entry of a well's historical construction and production history events

- ASCII file and spreadsheet entry of all events
- Historical construction events are graphically illustrated as a wellbore schematic diagram
- Schematic can be displayed for any period in the well's history with display of well zonation to ensure correct completion
- Twenty one construction events including drilling, casing, cement, perforation, packers, liners, tubing, pumps etc.
- Five geology and production events including:

- production data, flowmeter, static tests, logging, and coring. Production data includes rates, cumulatives, ratios, cuts, pressures and days
- General and naming events including:
  - well symbol, location, elevation, platform, rig and quadrant names

Log Digitisation

Import of paper based log data using a variety of supported digitisers

- Supported digitisers include:
  - Microgrid; Calcomp 9500/9100; sketchpad; GTCO digipad
- Supports a variety of baud rates from150 to 19200. Supports trace wrapping
- Point or stream digitising modes
- Log normalisation

ASCII File Converter

Import of well dependent data in unrecognised ASCII file formats

- Imports data into GeoRAPID or converts the file into PBAscii format
- Data types include log, core, deviation, zonation and RFT data
- Interactive definition of data location in the file and data type

Mapping Import/Export

Import and export of all map data to and from flat files

- Import and export of map data including:
  - well control points, faults, polygons, grids, simulation grids and seismic control points
- Import in a variety of industry standard ASCII formats including Tigress, CPS-3, IRAP, Landmark, ISM and Z-Map
- Import of generic free format ASCII data
- Import in a variety of industry standard binary files including CPS-3 and other.
- Export in a variety of industry standard ASCII formats including Tigress, CPS-3 and Z-Map
- Export in a variety of industry standard binary formats including CPS-3 and IRAP
- Bulk export of map data
- Association of related imported map data (for example, structure grid with fault set)

Production Loader

Import and export of ASCII files containing production related data into POSC compliant data model (for example, like in PetroVision)

- Data types include, forecast, performance, production, production test, reallocated and reconciled data, special survey
- Data can be stored at any appropriate well hierarchy level – well, wellbore, conduit, reservoir element, perforation interval, completion
- Any ASCII file format can be imported using Generic Data Loader
- Format templates can be defined to import data files, and saved for re-use
- Flexible loader settings for different structure of input files
- Flexible matching of data to the format definition by keyword, number of columns, field count and line position
- User definition of null values, comment markers, number of lines to ignore etc.

Data and 3rd Party Application Links

An API developer's kit is available to enable tight and loose integration of 3rd party applications and databases to GeoRAPID. Tight integration enables data to be transferred directly, while loose integration enables data to be transferred via ASCII or binary file. The currently available links are summarised in the following diagram:
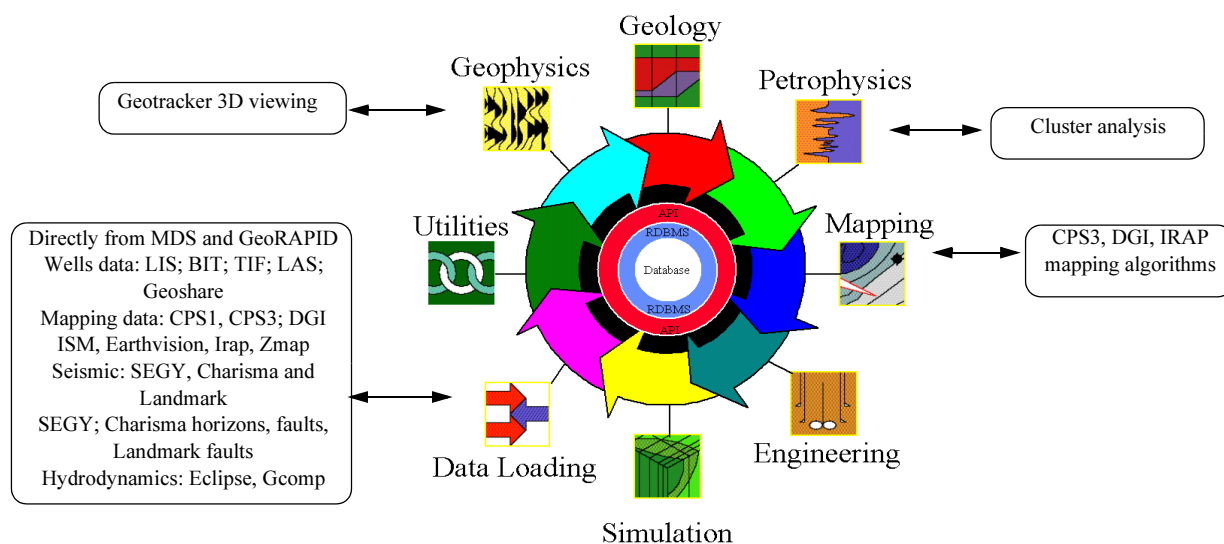
Data and Database Links

The Import/Export System

You can use The Import/Export System (TIES) to transfer data using a large variety of industry standard and third-party file formats and database links, including Geoshare. A complete description of TIES is given in the dedicated section on The Import/Export System.

OpenSpirit – TIES

OpenSpirit – TIES retains the basic features of standard TIES and connects to the OpenSpirit Application Integration Framework to transfer well header, log and deviation data between OpenSpirit enabled data stores and PBAscii data exchange format.

The OpenWorks Link

This is a bi-directional tight link transferring well and map data between the GeoRAPID and OpenWorks databases. The OpenWorks link is described in the documents, GeoRAPID/OpenWorks Link and GeoRAPID/OpenWorks Data Item Transfer.

The Recall Link

This is a bi-directional tight link transferring well data between GeoRAPID and the Z&S Recall database. Contact Z&S Consultants for further information.

PetroVision-GeoRAPID Link

This link transfers bulk seismic and log data stored in the PetroVision Data Store to the GeoRAPID database. Seismic data is exported from PetroVision as 8, 16 or 32 bit formats. The PetroVision-GeoRAPID link is used to select the destination GeoRAPID project data store, define the survey location in GeoRAPID, move the file(s) to a specified Unix directory and then update the data store pointers to the files.

Eclipse Link

The Eclipse link has been developed to import and export Eclipse keyword files. The link imports and exports the controlling RUNDAT file and any include files of grid properties, PVT and saturation tables and well properties.

GeoFrame - GeoRAPID link

This link displays seismic data stored in GeoFrame and interpreted in Charisma in the GeoTIGG Cross Section application. The link also transfers seismic horizon and fault data from GeoFrame to the GeoRAPID database.

3rd Party Application Links

Tight links have been developed with the following 3rd party applications:

- Geotracker from VoluMetrix, for 3D seismic data visualisation. Details are in the GeoTIGG Geophysics section of this brochure.
- Cluster Analysis from Agip, for log facies analysis. Details are given in the Cluster Analysis and Linear Analysis brochure
- Sure from HOT, for simulation
- Chears from Chevron, for simulation

GeoRAPID - The Import/Export System

The Import/Export System (TIES) is a user-configurable graphical application that acts as a hub for both data transfer and file conversion. TIES reads data from a database, a file, a digitiser or a tape, re-formats the data if necessary, then directs the data to the specified destination, which may be a database, a file, a printer or a tape. Data can be transferred, for example, from file to database, database to database, database to file and from file to file.

TIES supports a wide variety of industry standard data formats for import and export of data to and from the GeoRAPID datebase, and for file-to-file conversion. TIES has been specially extended to provide import and export capability for company internal database file formats. You can also add other conversion programs to TIES to convert and transfer non-standard data formats.

TIES imports and exports all the major data types stored in the GeoRAPID database, including:

- Well header
- Log traces
- Core traces
- Deviation surveys
- RFT
- Zonations
- Audit
- Production
- Checkshot surveys
- Mechanical well data
- Hydraulic
- Mapping grids
- Seismic faults
- Seismic horizons
- Seismic Wavelets

Multiple data types for multiple wells can be imported and exported in one operation, either immediately or in batch. The number of wells and data types that can be imported and exported is controlled by the source and destination data formats. Before data export from the GeoRAPID database, the well data range can be constrained by depth or by zone interval. This can be set globally for all wells, or on a well-by-well basis. Data can also be exported in metric or imperial units.

The data formats currently supported by TIES for each source and destination media are shown in the next diagram:

GeoTIGG

GeoRAPID database

Source

Database:
- GeoRAPID
- OpenWorks
- GeoFrame
- Open*Spirit*
- PetroVision

File:
- EarthVision
- Z-Map
- CPS3
- Geoshare
- PBAscii
- Production Analyst
- LAS
- Geolog 6
- EPCD
- Epics
- Epproms
- Geode
- Geologix
- Geosecs
- Logic
- Pagoda
- PTF
- Parasol

Digitiser:
Automatically starts the Log Digitising application

Tape:
Automatically starts the relevant application for loading:
- LIS
- BIT
- TIF
- SEGY

Destination

Database:
- GeoRAPID
- OpenWorks
- Open*Spirit*
- Recall
- PetroVision

File:
- EarthVision
- Z-Map
- CPS3
- Geoshare
- PBAscii
- Irap RMS
- Geolog 6
- Geologix
- Spatial
- Epics
- FIST
- FrontEnd
- Geode
- Geosecs
- ISATIS
- Logic
- Pagoda
- PTF

Printer:
- Tigrep report

Tape:
Automatically starts the relevant application for exporting:
- LIS
- SEGY
- UKOOA

GeoTIGG

GeoINT: 2D/3D Seismic Interpretation

GeoINT provides a complete set of easily accessible applications for the interpretation of 2D and 3D seismic data. These tools, coupled with 3D visualisation, provide an integrated approach for the Geoscientist. Results of the interpretation are saved to the GeoRAPID database for use in the other GeoTIGG applications, for example, GeoCROSS, GeoQC and GeoCART.

Standard seismic interpretation is based on Tigress applications; Advanced 3D seismic interpretation is based on CGG applications.

GeoINT: 2D/3D Seismic Interpretation
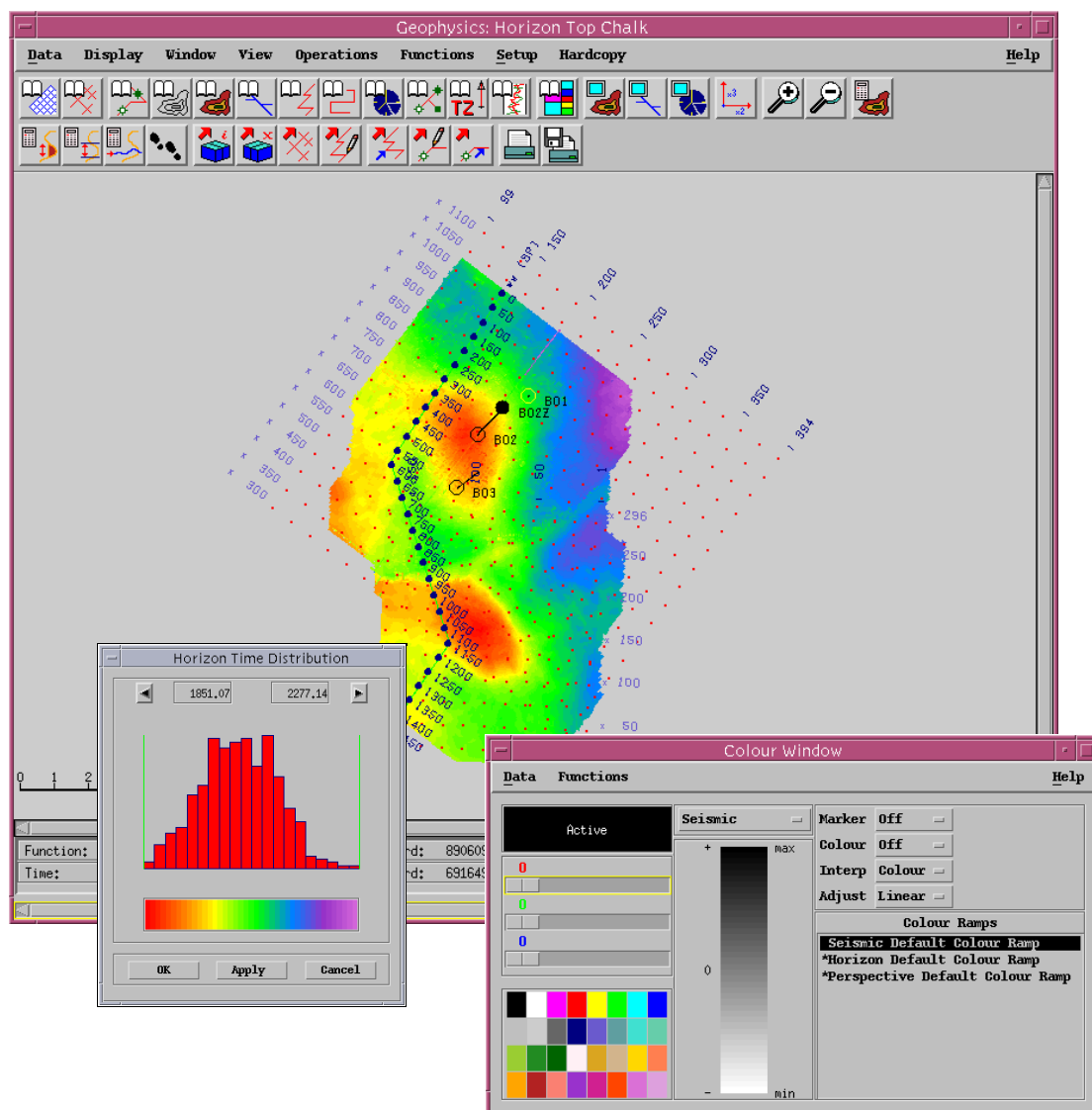
Standard Seismic Interpretation

- Tools for interpreting 2D and 3D seismic data
- Display and interpretation of large volumes (including coherency and velocity) utilising single or multiple overlapping 2D and 3D surveys
- Displays seismic traces in interpolated or repeated variable density, wiggle, or variable area modes, with user-defined colour ramps
- Interpretation of horizons and faults can be performed on inlines, crosslines, timeslices, 2D lines and random and composite lines
- Interactive generation and selection of random and composite 2D/3D lines on the basemap
- Interactive selection of inlines, crosslines, 2D lines and timeslices from the basemap or a seismic window for display in single or multiple seismic windows
- Hot link to Well Correlation for quick loading of well data, including log and core traces, wellbore schematics, zonations and RFT
- Displays wells and associated data in true trajectory, including horizontal wells
- Extracts a 'log' trace along the well path from any volume type to integrate into GeoMOD and GeoTOP
- A Master Grid facility allows multiple 3D volumes to be associated together. For example, seismic and other data for use in reservoir characterisation studies

- Overlay of horizon and fault interpretations on the seismic profile from the same or overlapping surveys
- Creation of correlation windows to match interpretations on either side of faults
- Horizon interpretation techniques include autotracking, autopicking from seed points, drawing, snapping and interpolation
- Horizon and fault interpretations are automatically stored to the GeoRAPID database
- Fault heave calculation line by line, or for a survey, for use in automatic or manual fault polygon delineation
- Generation of sub-volumes and time slices from any loaded data volume
- Application of arithmetical and logical operations on seismic and other volumes, including complex attributes, cosmetic filters and gain control
- Full range of horizon operations including calculation of dip and azimuth maps for fault delineation or isochron mapping
- A wide range of complex trace, loop and window attributes can be extracted from the seismic data based on interpreted horizons
- Advanced horizon intersection mistie calculations for 2D interpretations graphically or by spreadsheet
- Seismic Index Window for improved navigation around large data sets
- Display and interpretation of large volumes (including coherency and velocity) utilising single or multiple overlapping 2D and 3D surveys
- A 'Copy Interpretation' facility allows horizon and fault interpretations to be copied from one 3D seismic data set to another. This is particularly useful in multi-volume reservoir studies
- Multiple configuration states of the application can be stored to the GeoRAPID database for convenient retrieval
- Display of attributes as profiles in seismic interpretation window
- CGM hardcopy output with user-defined plot header
- Hardcopy 'window dumps' showing data as they appear on-screen
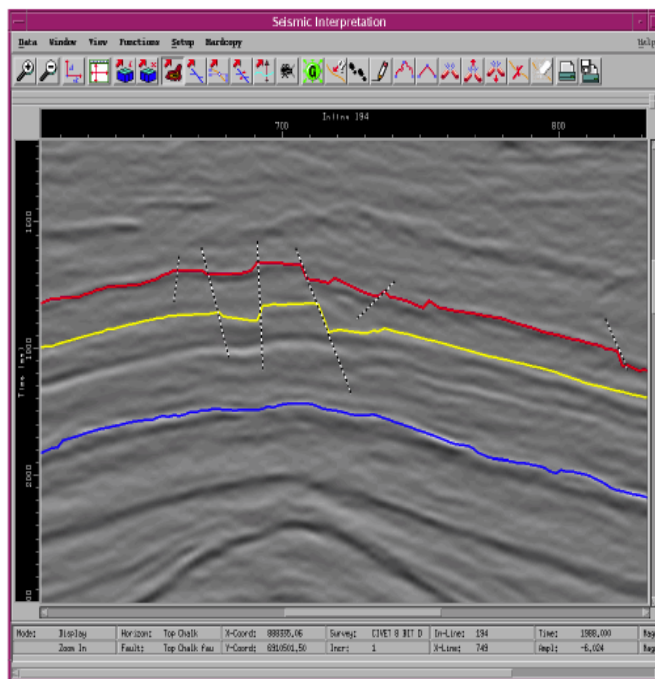
Advanced 3D Seismic Interpretation (based on GeoMig 3D)

Basic features of the module:
- Complete range of seismic interpretation tools, including for several coincident cubes with the option of full automatic horizon and fault correlation
- Automatic storage into the database of any information generated while interpreting
- Well visualization (trajectories, markers, well logs)
- Calculation of attribute parameters according to picked horizons or intervals
- Interactive correction of isochron maps and any attribute maps
- Creation of different velocity cubes
- Creation of "virtual" cubes to increase the productivity on performing an interpretation project
- Different modes of "time-depth" recalculation for picked horizons
- Simultaneous visualization of different overlapped data with colour and opacity adjustment
- Plotting all data or saving into a CGM file for further editing

It is possible to manage all data of the project from GeoINT 3D main window: 3D blocks, velocities, horizons, faults, wells etc.

In the interpretation module of GeoINT 3D package (based on Geomig3D) it is possible to trace horizons and fractures considering well information visualized on sections.
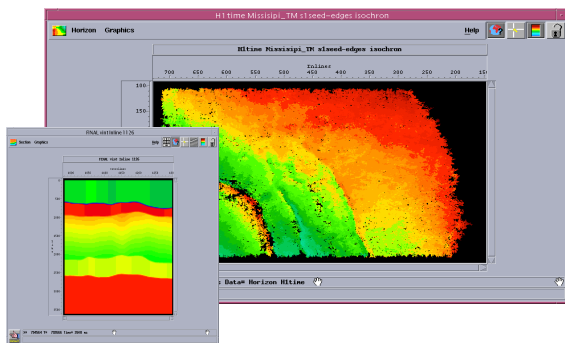
GeoINT 3D allows to perfom time-depth conversions taking into consideration the introduced velocities, to convert Vrms-Vint velocity laws, as well as perform horizons migration-demigration between different sesmic blocks (migrated time - stack time).

All information loaded into the base as well as the information obtained from interpretation result can be presented in the form of different maps, sections, complex views and in different colours.

GeoINT: 2D/3D Seismic Interpretation
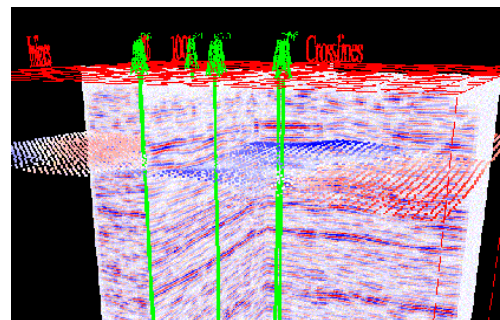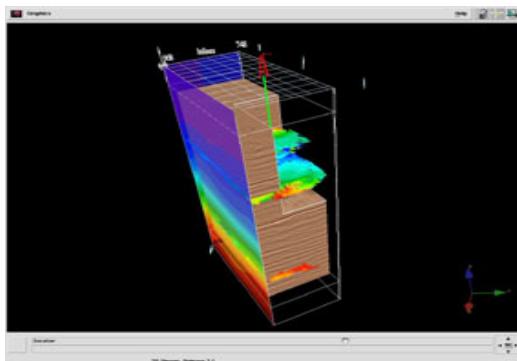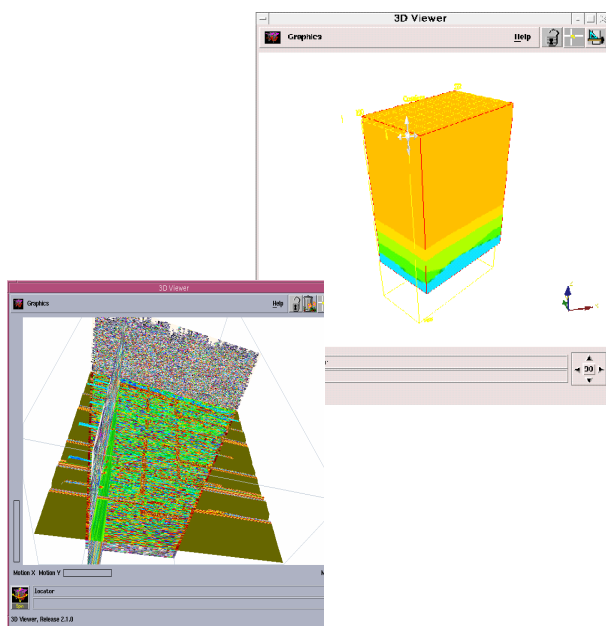
GeoINT 3D provides a three-dimensional view of different types of information: seismic sections (2D and 3D), horizons, wells - by simple dragging of the required object from any window to the 3D window. In GeoINT virtual reality visualization is possible. Using standard stereo glasses you can find yourself inside the created model.

Visualizing on the seismic section of several data types (well logs, markers, horizons, velocities, intervals etc.) allows geologists and geophysicists to have a more exact and logical notion of the relationship between the seismic data and the real geological situation in order to perform more exact and detailed interpretation.
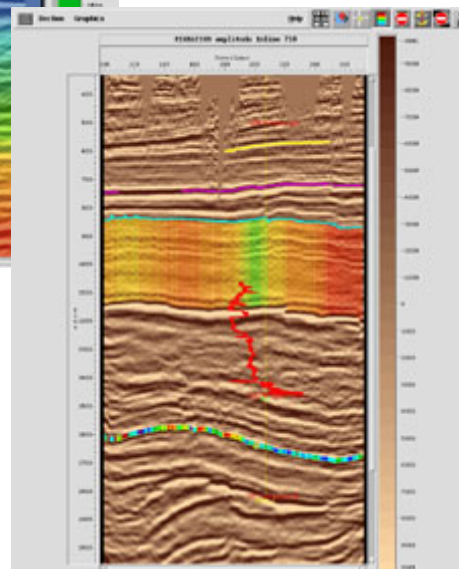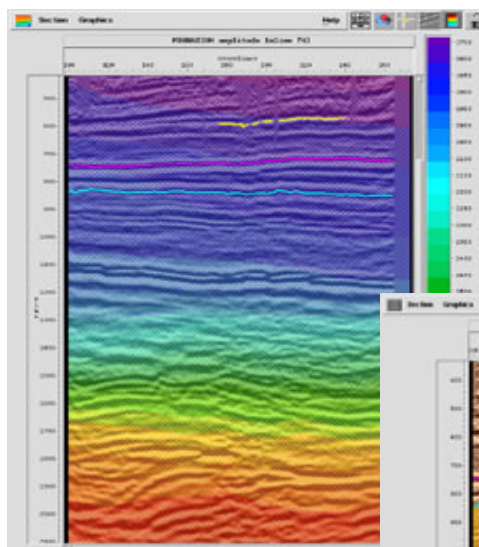
GeoTIGG

GeoCaem: 3D Model Building (time-depth)

GeoCaem is a unique 3D modelling package designed for a wide range of geological and geophysical tasks. It provides complete modelling of an object (Shared Earth Model) starting from seismic acquisition planning to velocity model building and reservoir characteristics calculation.

Main features of the module:
- Direct access to the database together with the possibility to load/record necessary information through external files of different formats
- Different algorithms and options for gridding and triangulation for all data types
- Fast and easy conversion of one data type into another
- Simultaneous work in time and depth domains
- Different methods of time-depth recalculation, including recalculation with a ray model building
- Automatic update of model correction
- Different ways of visualization of all data types with colour and opacity adjustment
- Wide range of tools for variable arithmetic, logical and graphical operations for all data types
- Possibility to analyze the correctness of acquisition planning using the ray model and coverage maps
- Saving views into graphic files for further editing and plotting
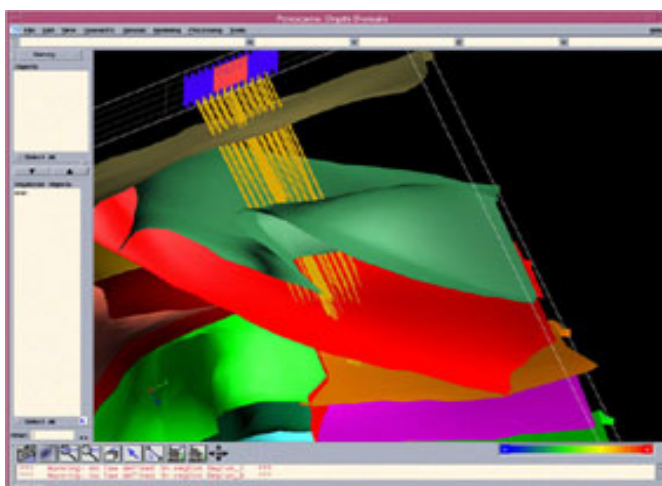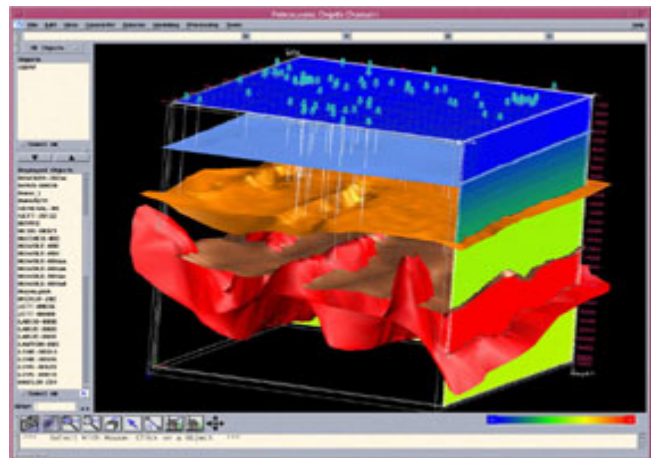
When realizing the Exploration/Production project, geophysicists have to interpret, analyze and model large amount of data and to pass the obtained results from one job into another. Thanks to the Shared Earth Model concep, GeoCaem allows fast and exact data conversion from times to depths and vice versa, using different methods including recalculation through the ray model. It also allows geophysicists, geologists and developers to work with one model. GeoCaem can also be used for performing special functions at different stages of the E&P project workflow, such as velocity modelling, time-depth conversion, ray modelling and reservoir characterisation.
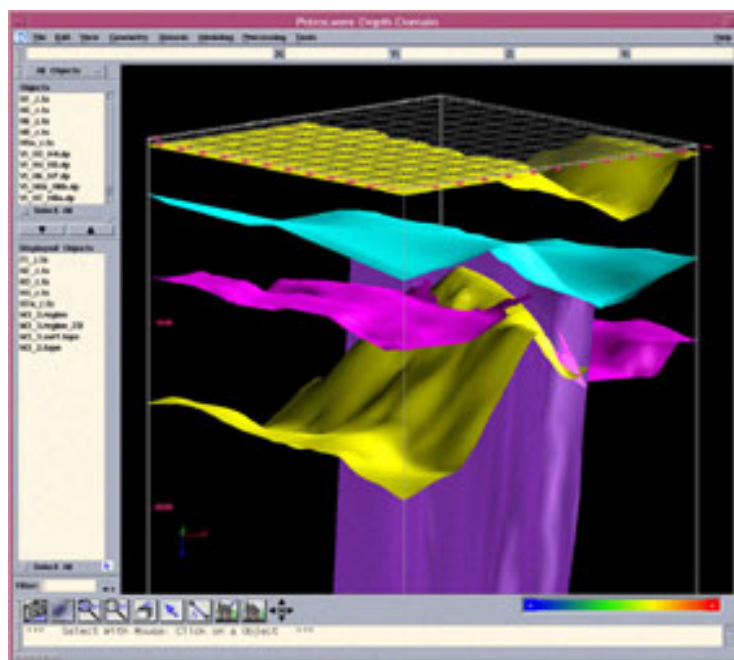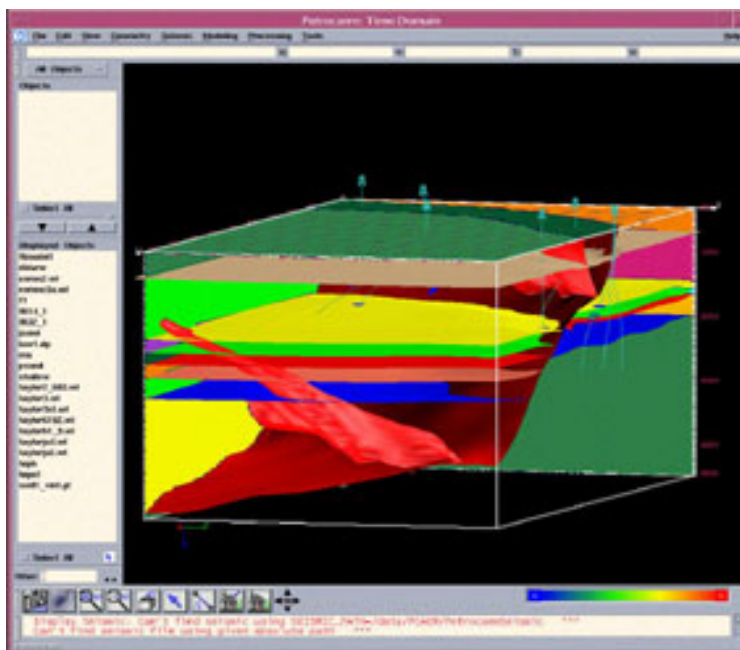
GeoCaem: 3D Model Building (time-depth)

You can also use GeoCaem to create a velocity model (SLT) for pre- and post-stack seismic data migration.

GeoCaem also has the option for virtual reality visualization. Using standard stereo glasses you can find yourself inside the model you have created.

Also in GeoCaem it is possible to plan acquisition with further ray tracing in order to obtain the optimal spread of sources and receivers for field acquisition.
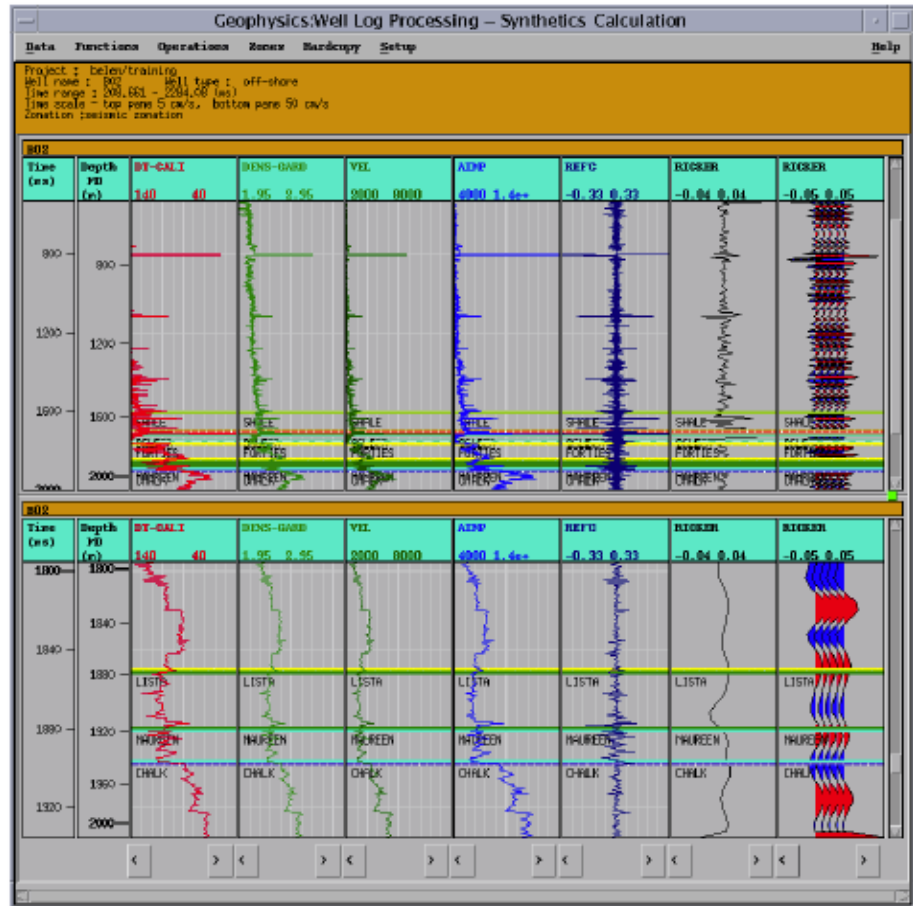
GeoTIGG

GeoSYN: Synthetic Seismic Generation

Generation of synthetic seismograms to tie in geological models

- Simple three step guided process for generation of synthetic seismograms – checkshot correction, sonic/checkshot calibration, and synthetic generation
- Automatic transfer of results from one process to the next
- Import or keyboard entry of raw or corrected checkshot data for land and offshore surveys
- Correction of raw checkshot times to true vertical depth sub-seismic datum times, using offset, shot depth and near surface data
- QC of checkshot data against user-defined sonic log
- Generation of pseudo-density from sonic, and pseudo-sonic from density to fill missing sections prior to calibration
- Interactive editing, de-spiking and merging of sonic and/or density logs prior to integration
- Interactive calibration of the integrated sonic with the corrected checkshot data

- Calibrated sonic and density logs used in batch generation of derived attribute traces, from acoustic impedance to reflection coefficient.
- Batch generation of multiple synthetic trace sets
- Same synthetic generation sequence can be run on multiple wells
- Generation of PP, PS and SS synthetic gathers using Backus Averaging or CREWES blocking algorithms
- Display NMO corrected or uncorrected gathers
- Display stacked traces
- Choice of Reflection Coefficient, Impedance or log (AI) as input to synthetic generation
- Ormsby, Butterworth, Ricker and user-defined filters
- Wavelet phase includes zero, minimum or zero with a constant phase rotation
- Modelling of multiples in the primary synthetic
- Choice of SEG reversed and standard polarities
- Displays synthetic and derived traces in depth and time, with multiple depth tracks/modes including MD, TVD, TVDSS

GeoTIGG

GeoSYN: Synthetic Seismic Generation

- Multiple synthetic display by wiggle, variable area or interpolated density
- Display and interpretation of geophysical zonations in time or depth
- Derived traces and synthetics may be stored in depth for use in GeoMOD and GeoMUL modules
- Export of synthetic and derived traces in time or depth units in ASCII format for use in 3rd party applications
- Hardcopy capabilities

GeoTIGG

GeoTOP: Well Log Analysis

The GeoTOP well log analysis package is designed to process and interpret wellbore geophysics. GeoTOP is adept at both Western and Russian petrophysical interpretation methods, with the ultimate aim of obtaining petrophysical parameters of reservoir layers.

The package is integrated with GeoRAPID database.

General information
- Importing formats are LAS, LIS, ASCII and ZAK.
- Exporting formats are in LAS or ASCII.

Preprocessing modules
- Graphic editing of logs, zones and markers. Log depth matching.
- Environmental corrections: temperature, pressure and mud.
- Alpha PS and GR relative parameters calculation.
- Skin correction of Induction Log.
- Induction Log transformation from Ohm to msim.
- Russian Nuclear log environment correction.
- Sonic calculation using resistivity and density.
- Poisson ratio computation.
- Lithology coefficients calculation.
- Automatic Layering using one method or combination of methods.
- Histogram (mono- and multi-well).
- Cross Plot (mono- and multi-well).

Calculation modules
- Shaliness calculation (SP, GR, DT, NPHI, Rt and log combination).
- Porosity calculation. (DT, Density, NPHI, Neutron, SP, GR, log combination and empirical).
- Water saturation (Archie, Poupon, Simandoux, Hossin, Bardon and Pied, Doll and Laminated shale).
- Permeability coefficient.
- Quality control of electrical logs (Russian logs GZ, BK and IK).
- Layer electrical resistivity (Russian logs).
- Point wise definition of elecrical resistivity (single or jointed).
- Resistivity for Western logs.
- Lithology of clastic formation (continuous or layer wise).

Utilities
- Calculator, Normalization, Smoothing, Control records for QC.
- Well trajectory (Balanced tangential, Linear, weighted linear, curvature and linear-curvature methods).
- Result and report generation.
- Well logs data management.

GeoTIGG
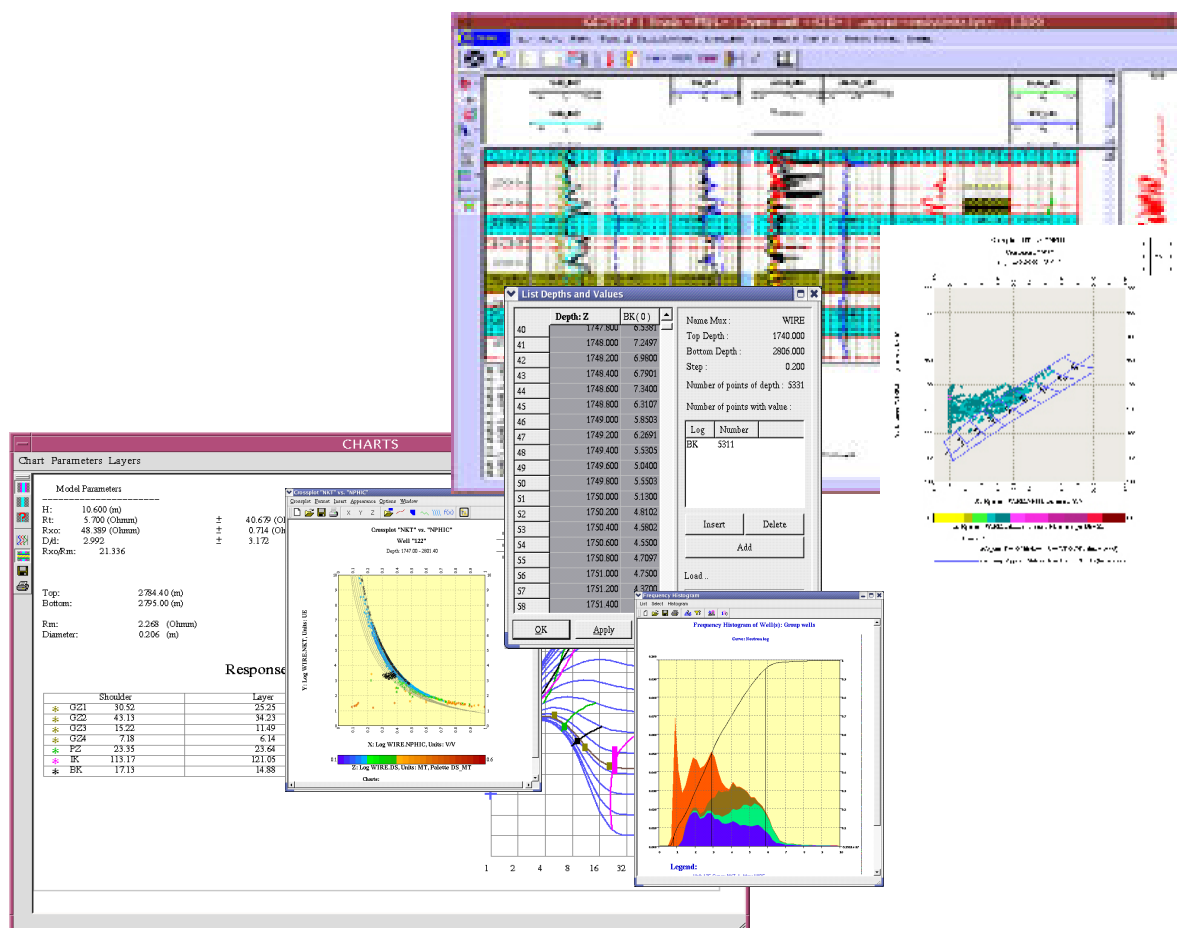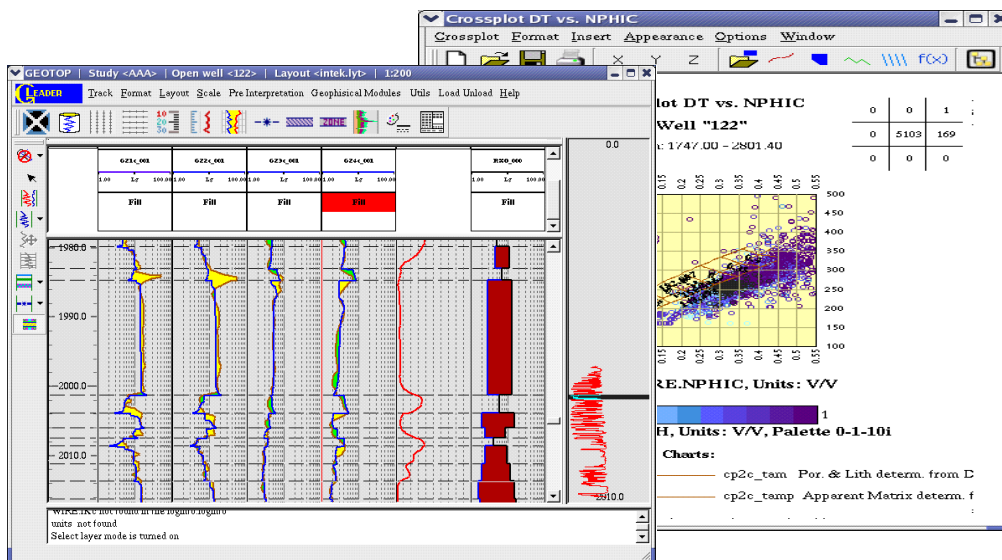
GeoMUL: Multi Well Processing

Trace Edit

Log and core trace manipulation by equation and graphical editing methods

- Trace types may be raw, depth-matched, corrected, interpreted or previously edited
- Automatic editing methods include:
    - smoothing, de-spiking and median functions
    - infilling of gaps
    - normalisation
    - conversion of discrete core data to core traces
- Manual editing methods include:
    - graphical and keyboard point and section editing
    - horizontal shifting
- Equation editing methods include:
    - standard - e.g. $f(x) = a*x + b$
    - user-defined
- Equations can be stored in the GeoRAPID for subsequent re-use
- Simple combining and complex merging of log runs
- Multi-well processing of any number of wells using equations applied to the displayed well
- Creates new versions of traces with an edited status flag thus preserving the original input traces
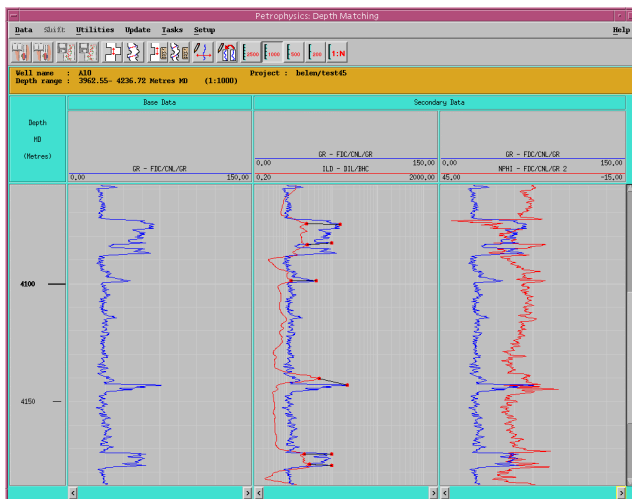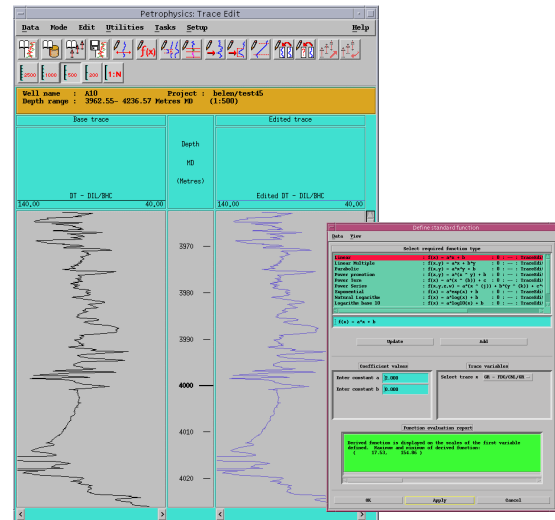
Log Depth Matching

Depth matching of log traces or complete runs

- Depth matching by block shifting of sections or tie-pointing of individual trace peaks/troughs
- Block and tie-point methods can be applied manually or graphically
- Depth shifting can be performed on each trace in a log, or a common shift applied to all traces
- Creates new versions of traces with a depth matched status flag thus preserving the original raw inputs

GeoTIGG

GeoMUL: Multi Well Processing

Corrections

Correction of log traces for borehole and environmental effects

- Correction charts for Schlumberger, Western Atlas, Gearhart and BPB logs
- User-defined correction programs can be written in C, Fortran or the GeoTIGG programming language
- Logging and mud details are automatically read from the log header
- Utilises caliper or bit-size data for borehole corrections
- Accepts a combination of induction log, laterolog, and micro-resistivity log traces for environmental correction
- Gaps in Rt and Rxo can be filled by merging with resistivity traces, by logic or by interpolation
- User-defined trace/chart combinations can be selected for environmental corrections
- Error listing facility to identify why gaps have been produced and traces not corrected
- Multi-well processing of any number of wells
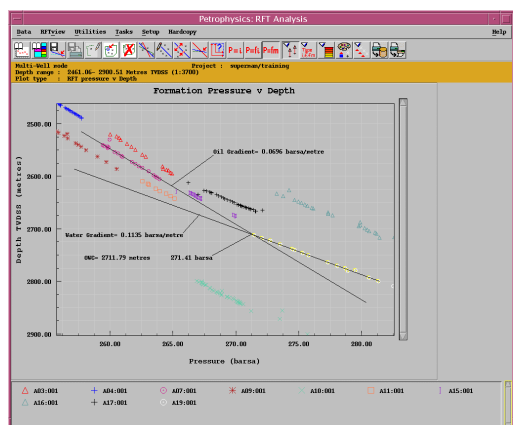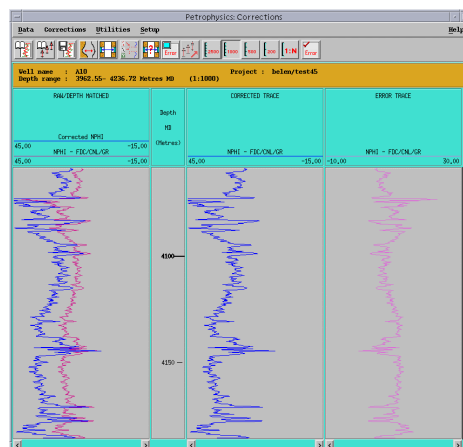
Formation Test Analysis

Multi-well interpretation of RFT data to determine fluid contact type, depth and pressure

- Displays up to 100 RFT runs simultaneously, coded by well, by zone or by pressure type
- Displays pressure/time data for individual RFT measurements
- Simple graphical clustering/selection of points for regression to generate fluid gradients
- Regression methods include X on Y, Y on X, RMA, forced and user-defined
- Gradients and contact type, depth and pressure are saved for use in GeoMOD and GeoSIM
- Complete user control over plot layout, annotation, symbols, colours, scales, grids and hardcopy

Well View

Entry of a well's historical construction and production history events

- ASCII file and spreadsheet entry of all events
- Historical construction events are graphically illustrated as a wellbore schematic diagram
- Schematic can be displayed for any period in the well's history
- Display of well zonation to ensure correct completion
- Twenty one construction events including: drilling, casing, cement, perforation, packers, liners, tubing, pumps etc.
- Five geology and production events: production data, flowmeter, static tests, logging, coring

Crossplot

Display and crossplot analysis of multi-well data, geophysics horizons and mapping surfaces for reservoir characterisation

- Data types for display include log and interpreted traces, conventional and special core data, zone parameters, time/depth data, structure and attribute maps and horizons
- Data on display can be filtered by well, zone, cluster, cut-off, z-plot band prior to analysis
- Hot link to Well Correlation & Zonation, Log Plot, other Crossplots and Cluster Analysis for sample highlighting
- Industry standard pre-defined crossplots (and associated regression techniques) include:
  - Density/Neutron/Sonic
  - D/N/S/Qv./FRF/K v. porosity
  - Hingle/Pickett
  - M/N
  - Pef and NGT
  - Leverett J/RI/height/depth v. Sw
  - Porosity/Rt v. Sigma
  - Grain density/porosity v. K
- User-defined crossplots can be generated using any input data types
- Zonal parameters are generated from standard analyses and cut-offs defined in pre-defined plots
- Normal regression methods include X on Y, Y on X, RMA, forced and user-defined
- Chart overlays for density/neutron/sonic crossplots, M-N plots and NGS plots
- Complete user control over plot layout, annotation, symbols, colours, scales, grids and hardcopy

Histogram

Display and histogram analysis of multi-well trace and core data

- Data display by well and/or by zone
- Overlay of different data or similar data from different wells/ zones
- Full statistical summary including mean, mode, median, averages
- Determination of GR min and max for clay volume interpretation
- Determination of matrix density for porosity interpretation
- Complete user control over plot layout, annotation, symbols, colours, scales, grids and hardcopy

GeoMUL: Multi Well Processing

Parameter Table

Spreadsheet display, manipulation and export of input and output zonal parameters

- Displays input zonal parameters required for log and core interpretation and output parameters generated from averaging and thickness calculations
- Pre-defined parameter table views (crossplot; output; open-hole etc.) and user-defined table views
- Parameter population using default values for quick look interpretation
- Automatic copying of parameters between wells and zones
- Table editor functions for copying and pasting parameter values
- Fast re-read of parameters when updated in another application
- Output file formats include ASCII, spreadsheet and Irap with full control over the file format

Petrophysics Interpretation

Determination of lithology volume, porosity and saturation from log, core and zonal data using standard and user-defined equations

- Input data includes pre-corrected and corrected open hole logs, cased hole logs, core data and zonal parameters generated in the Crossplot and Histogram applications
- Generation and display of porosity, saturation, sand, lime, dolomite, clay, shale, silt ,calcite, coal, salt and anhydrite
- Interpreted trace value can be user-defined where mineral flags are set
- Identifies bad hole using rugosity and caliper cut-offs resulting in automatic use of DT method
- Application of hydrocarbon corrections on porosity using a selected saturation method
- Comprehensive set of pre-defined industry standard equations:
- Clay volume - single trace (e.g. GR, SP); crossplot; shaley sand; NGT and ratio; minimum; no correction
- Porosity - single trace; crossplot; secondary; shaley sand; core
- Saturation - Archie; Indonesia; Simandoux + Modified; Laminated Clay; Waxman-Smits; Dual water; EPT
- Composite and user-defined methods per zone
- Sensitivity analysis per zone or for all zones for up to 10 variations with graphical and numerical comparison
- User-definable programs written in C, Fortran or the GeoTIGG programming language
- Error checking facility to identify problems with applied methods
- Multi-well processing of any number of wells using methods applied to the displayed well
- Interpretation process is automatically written to the Audit Trail
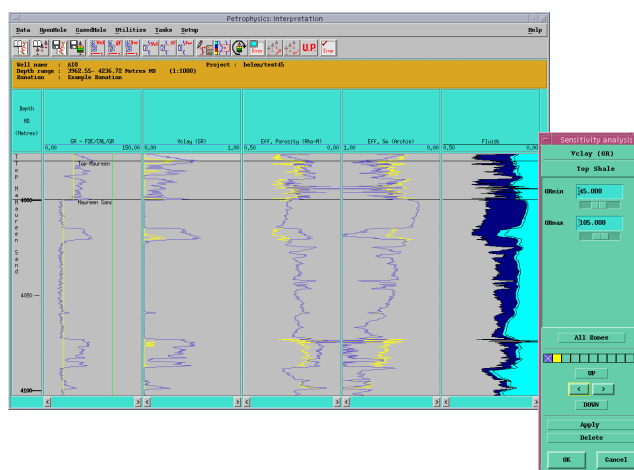
Audit Trail

Keep historical records of all editing and interpretation methods that have been performed during the course of the study

- All data manipulation and interpretation applications write to the Audit Trail
- Records show user, date, time and details of change
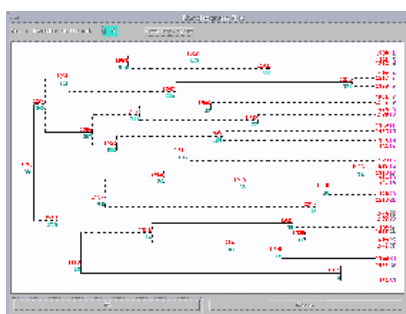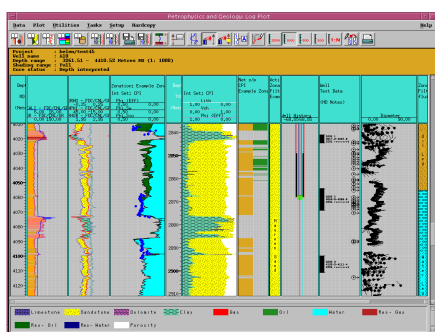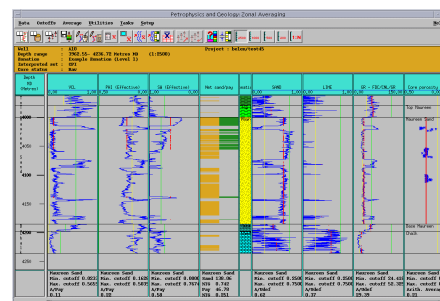
Cluster Analysis

Automatic statistical log facies analysis based upon a clustering algorithm

- Generates a hierarchical cluster succession based upon similarities in selected log response
- Analysis is initially performed on key well intervals and additional wells/intervals are then aggregated using the statistics derived from the key wells
- Number of facies is determined by graphical selection of dendrogram cuts
- Hot links to Well Correlation & Zonation and Crossplot for data loading and to highlight and review clusters and aggregation
- Generates cluster traces, reservoir flags, synthetic average property traces and facies zonation for input into 3D reservoir modelling

Zonal Averaging

Calculation of zonal averages and net sand/pay from log, interpreted trace and core data

- Averaging of log, interpreted trace and conventional core data, based upon cut-offs defined graphically or manually
- Definition of new averaged parameters
- Cut-offs can also be defined in the Crossplot and Parameter Table applications
- Calculates arithmetic, geometric and harmonic averages over net sand, net pay and user-defined areas
- Any other trace or core data can be used as discriminator for net sand/pay identification and data averaging
- Option to exclude thin layers of pay or sand from the averaging process
- Multi-well processing of any number of wells
- Averaging process is automatically written to the audit trail

Log Plot

Generation of single well plot of raw and interpreted data for visualisation and hardcopy

- Two types of automatic plot generation:
  - Quick look standard plots (API format) of density/neutron log, induction log and laterolog log data
  - Results plot of fluid saturation, lithology, matrix density and net sand/pay
- Comprehensive composite plot for flexible user-defined plotting of all raw and interpreted trace data as well as RFT, dipmeter, zones, core (raw and depth matched) and wellbore schematic
- All plot types share an extensive range of display features include trace shading and shading by value, depth markers, cut-off markers
- Composite plot has complete user control over plot layout, line styles and colours, scales, grids, annotation and hardcopy

## GeoTIGG

GeoMUL: Multi Well Processing

Facies Analysis

The standard GeoMOD and GeoMUL modules have enhanced features that allow the display and interpretation of facies traces. These square traces can be displayed, edited and interpreted to calculate facies distribution.

Well Correlation & Zonation

- Display of facies traces
- Conversion of zonations into traces
- All standard shading and scaling options available
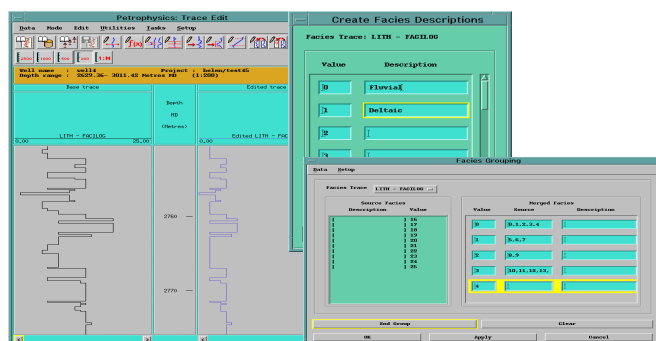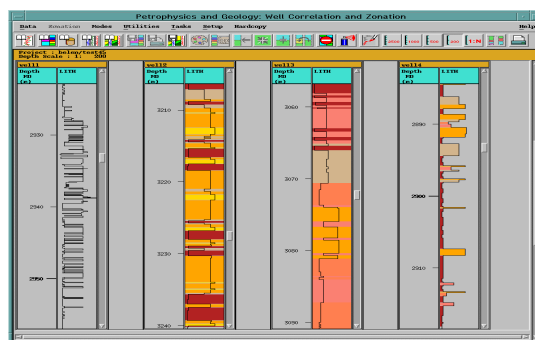
Trace Edit

- Editing of facies traces
- Combining of facies groups to a smaller number of sets
- Inputting of individual descriptions for each facies

Zonal Averaging

- Calculation of facies distribution percentage for each zone
- Summary output of percentages and dominant facies per zone
- Results are saved to the database and stored in the Parameter Table

Parameter Table

- Facies percentage distribution for each zone stored in the GeoRAPID database
- Indication of dominant facies for each zone

Log Plot

- Display facies traces
- Facies summary and description in the plot header

Log Load

- Resampling of log data to one of three options; point, linear or squared
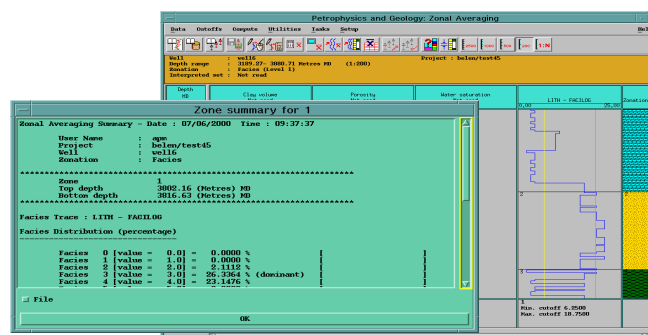
GeoTIGG

GeoCROSS: Integrated Interpretation of Well and Seismic Data

The GeoCROSS application is a true depth domain cross sectional tool merging the GeoINT application with the multi-well capability of the GeoMUL application. The GeoCROSS window is used to display and interpret a cross section line and any data lying along the line or within a specified search radius (well data, seismic trace data, seismic horizons, seismic faults, mapping surfaces) in either time or depth.

Application Highlights

- Cross sectional display of seismic data and well data
- Conversion from time to depth
- Horizon and fault interpretation
- Seismic backdrop direct from Charisma if required
- Depth only display if no seismic data is present
- Display of the correlation panel between wells
- Shape the correlation panel using seismic horizons and map surfaces
- Add new control points to be used for gridding
- Shading between map surfaces and horizons
- Editing of the correlation panel
- Communication with the Well Correlation application
- Display of mapping surfaces
- Full hardcopy capability
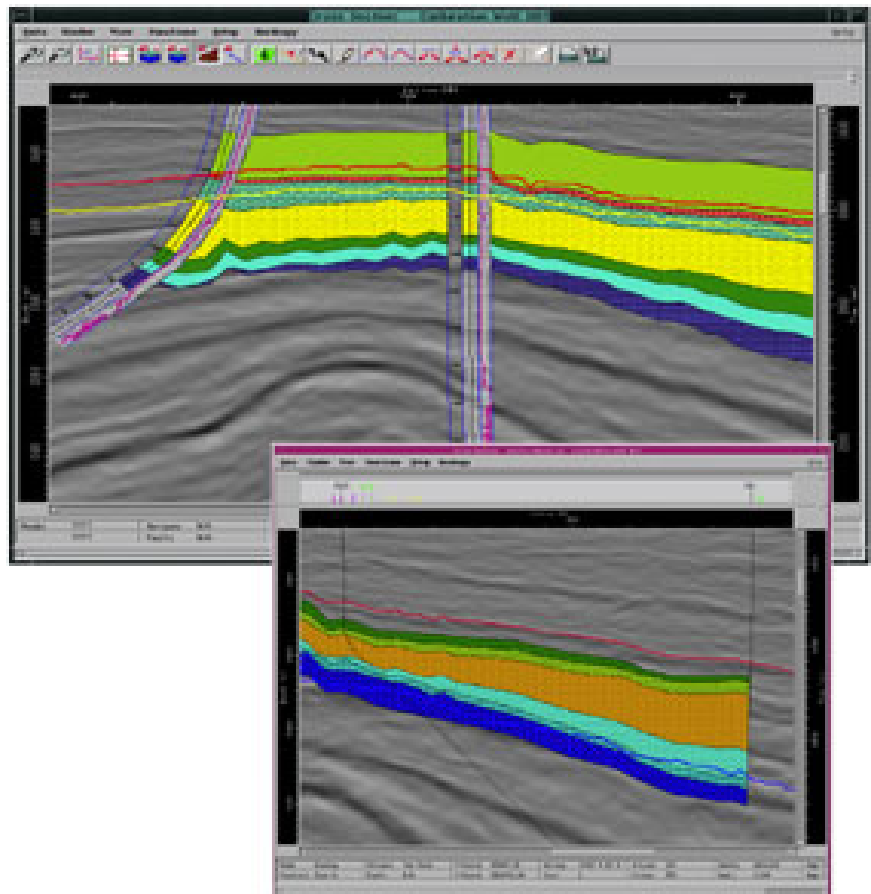
A more detailed description of GeoCROSS functionality is given in the GeoMOD section.

GeoTIGG

GeoMOD: Geology

The GeoMOD/Geology module of GeoTIGG allows the Geoscientist to model the chrono, litho and fluid stratigraphy of the reservoir, using multi-well zonation, correlation and cross-section interpretation. GeoINT, GeoMUL and GeoCART data can be integrated to accurately model the well and inter-well areas. Application hot links with the GeoMUL applications, Cross Plot, Histogram and Cluster Analysis can be used to define finer facies and lithology zonations using core and log data. Zone thicknesses can be generated from the finished zonation and then passed to GeoCART along with zone top and bottom depths for gridding as part of the structural modelling process. Results of the interpretation are saved to the GeoRAPID database for use in the other GeoTIGG modules.

Well Correlation and Zonation

Creation of well stratigraphy and correlation for use in GeoTIGG Geophysics, Petrophysics and Mapping.
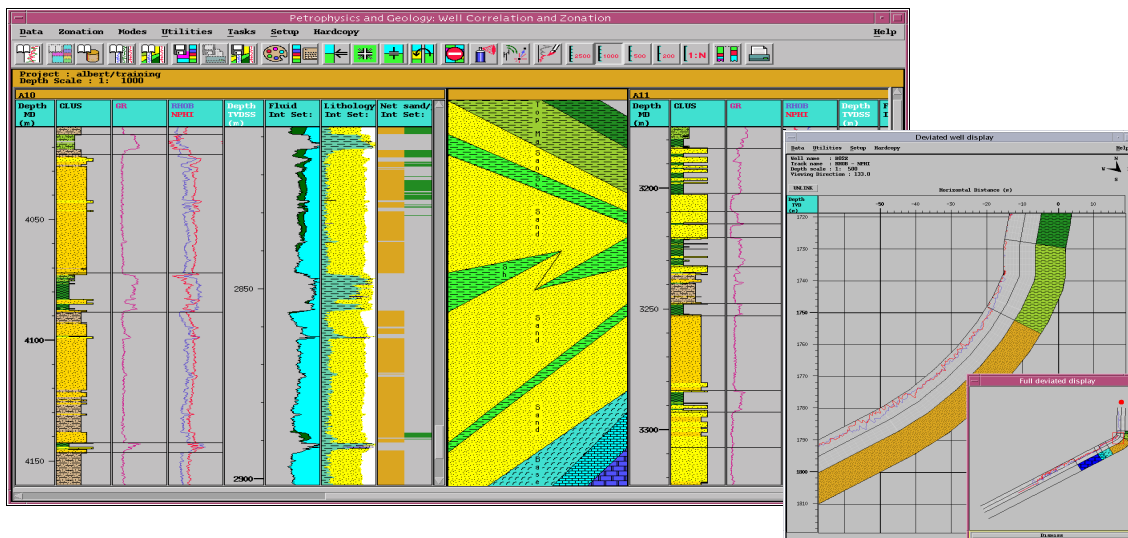
- Graphical and spreadsheet creation and editing of zone tops and bottoms for multiple vertical, deviated and horizontal wells
- Single level and hierarchical zonation schemes which can contain repeat zones and gaps
- Semi-automatic option of correlation by matching trace responses in wells
- Hot link to GeoCART to select wells for the display
- User-defined templates to quickly load data
- Data display includes log, core, RFT, dipmeter, wellbore schematic, tests, multiple reference zonations and interpreted sets
- Overlay of a second zonation between wells and option to display markers instead of zones
- Entire display can be saved as a picture for quick restoration
- Data display can be in depth and time, with multiple depth tracks/modes including MD,TVD, TVDSS, TVT, TST, HD
- Highly deviated and horizontal wells can be zoned in true trajectory
- Hot link to GeoCROSS to show effects of zone editing between wells
- Hot link to GeoCROSS, Histogram and Cluster Analysis to help create lithological and facies related stratigraphy
- Full user control over data display - colours, scales, track and well positions, track widths, grids, data wrapping and depth increments

- Depth marker, cut-off marker, shading, shading by value and annotation modes
- Well alignment on zone top, base, or depth, and spacing by proportional or user-defined distance
- CGM hardcopy output with user-defined plot header and inclusion of zonation legend, location map and company logo

GeoCROSS

Allows the geoscientist to define the inter-well region using seismic data and interpretations if available

- Integrates the structural and stratigraphic models built in GeoINT and GeoMOD to accurately define the inter-well region
- Can be licensed with Seismic Interpretation to allow display and interpretation of the inter-well region using seismic data
- Entire seismic display can be converted from time to depth with simultaneous time and depth tracks
- Lines of section between wells and along well paths are generated interactively on the basemap
- Displays multi-wells and data in true trajectory, including horizontal wells
- Displays log and core traces, wellbore schematics, zonations, RFT, dipmeter data
- Displays the correlation panel between wells which can be shaped using horizons and mapping surfaces and interactively edited
- Displays mapping surfaces with fault intersection markers
- Allows new surfaces and faults to be picked in depth (with or without a seismic backdrop)
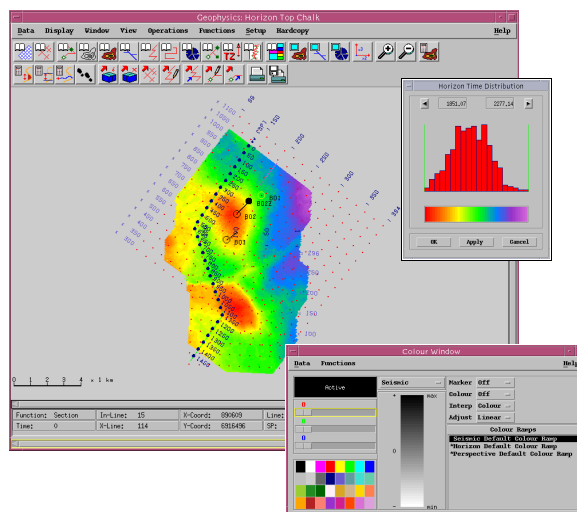
- Digitise new control points and save them as a mapping set
- Overlay of a second zonation between wells and option to display markers instead of zones
- Hot link with Well Correlation & Zonation for quick data loading and automatic updating of zone edits
- Full user control over the display - seismic, colours, scales, track positions, track widths, grids
- Opaque and transparent well displays to view the seismic backdrop
- CGM hardcopy output with user-defined plot header and inclusion of zonation legend
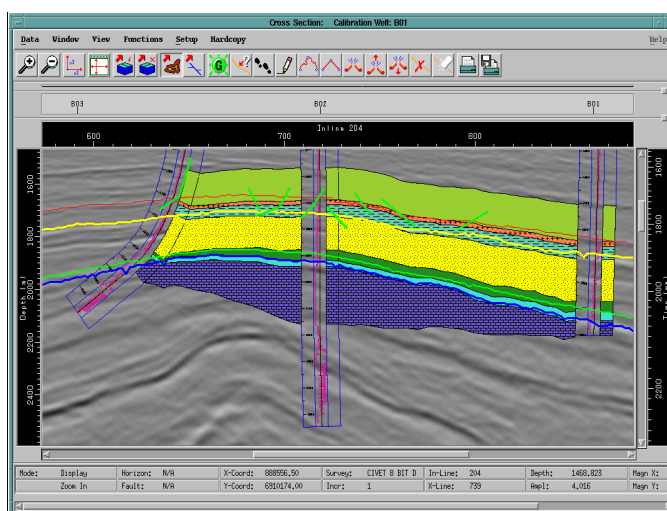
Isochore/Isopach

Calculates isochore (TVT) and isopach (TST) zonal thicknesses for a well

- Handles vertical and highly deviated wells
- Calculation is based on deviation survey and dip and azimuth of each zone top and bottom
- Zone dip and azimuth can be manually entered or calculated from a mapping surface
- Calculation can be applied simultaneously to multiple wells
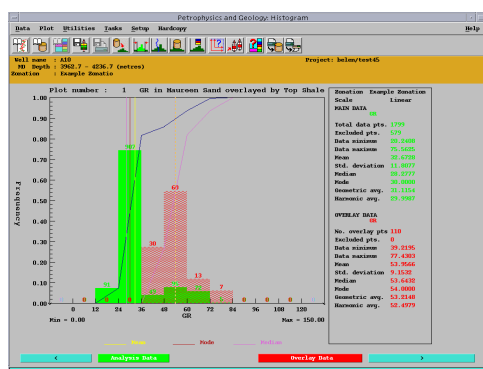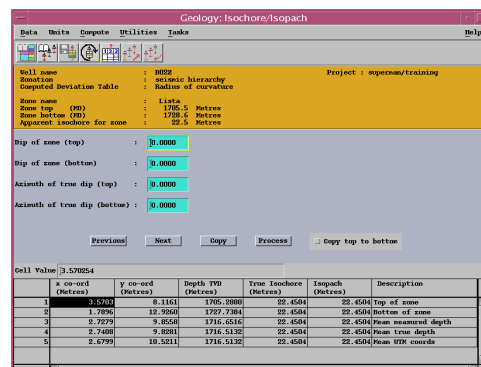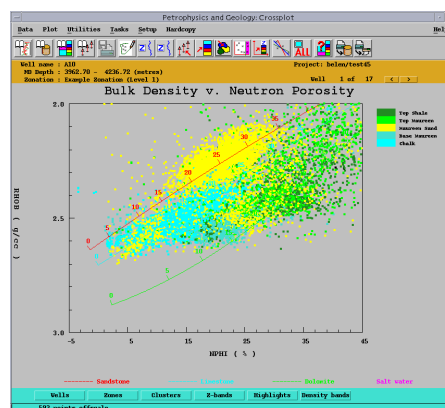

Histogram

Display and histogram analysis of multi-well trace and core data

- Data display by well and/or by zone
- Overlay of different data or similar data from different wells/zones
- Full statistical summary including mean, mode, median, averages
- Determination of GR min and max for clay volume interpretation
- Determination of matrix density for porosity interpretation
- Complete user control over plot layout, annotation, symbols, colours, scales, grids and hardcopy

Crossplot

Display and crossplot analysis of multi-well data, geophysics horizons and mapping surfaces for reservoir characterisation

- Data types for display include log and interpreted traces, conventional and special core data, zone parameters, time/depth data, structure and attribute maps and horizons
- Data on display can be filtered by well, zone, cluster, cut-off, z-plot band prior to analysis
- Hot link to Well Correlation & Zonation, Log Plot, other Crossplots and Cluster Analysis for sample highlighting
- Industry standard pre-defined crossplots (and associated regression techniques) include:
  - Density/Neutron/Sonic
  - D/N/S/Qv./FRF/K v. porosity
  - Hingle/Pickett
  - M/N
  - Pef and NGT
  - Leverett J/RI/height/depth v. Sw
  - Porosity/Rt v. Sigma
  - Grain density/porosity v. K

- User-defined crossplots can be generated using any input data types
- Zonal parameters are generated from standard analyses and cut-offs defined in pre-defined plots
- Normal regression methods include X on Y, Y on X, RMA, forced and user-defined
- Chart overlays for density/neutron/sonic crossplots, M-N plots and NGS plots
- Complete user control over plot layout, annotation, symbols, colours, scales, grids and hardcopy

Core Depth Matching

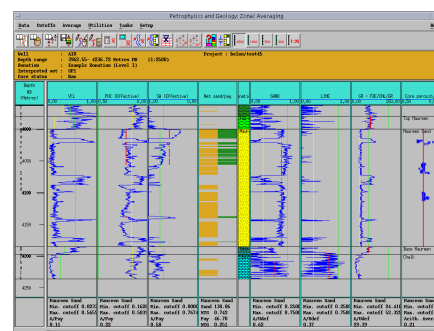### Depth matching core data to log data

- Raw and depth matched core can be aligned with raw or depth matched log traces
- Core runs are shifted, stretched, split and flipped interactively
- Core porosity compaction corrections can be applied
- Original core depths are preserved, new depths are saved separately
- Core top and bottom markers
- Display null analysis values as markers on the side of the track
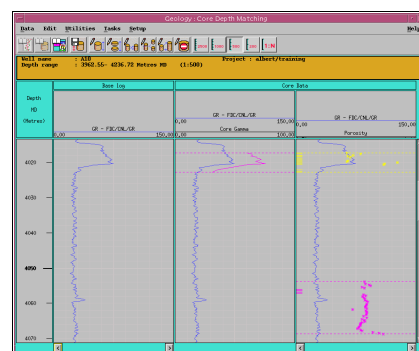
Zonal Averaging

Calculation of zonal averages and net sand/pay from log, interpreted trace and core data

- Averaging of log, interpreted trace and conventional core data, based upon cut-offs defined graphically or manually
- Cut-offs can also be defined in the Crossplot and Parameter Table applications
- Calculates arithmetic, geometric and harmonic averages over net sand, net pay and user-defined areas
- Any other trace or core data can be used as discriminator for net sand/pay identification and data averaging
- Option to exclude thin layers of pay or sand from the averaging process
- Definition of new averaged parameters
- Multi-well processing of any number of wells
- Averaging process is automatically written to the audit trail

Log Plot

Generation of single well plot of raw and interpreted data for visualisation and hardcopy

- Two types of automatic plot generation:
  - Quick look standard plots (API format) of density/ neutron log, induction log and laterolog log data
  - Results plot of fluid saturation, lithology, matrix density and net sand/pay
- Comprehensive composite plot for flexible user-defined plotting of all raw and interpreted trace data as well as RFT, dipmeter, zones, core (raw and depth matched) and wellbore schematic
- All plot types share an extensive range of display features include trace shading and shading by value, depth markers, cut-off markers
- Composite plot has complete user control over plot layout, line styles and colours, scales, grids, annotation and hardcopy
- Improved Template functionality to load data based on trace type, trace name, status, logging tool name, interpreted set name.
- Alternative trace function for missing data.
- Common Template function between Log Plot and Well Correlation & Zonation.
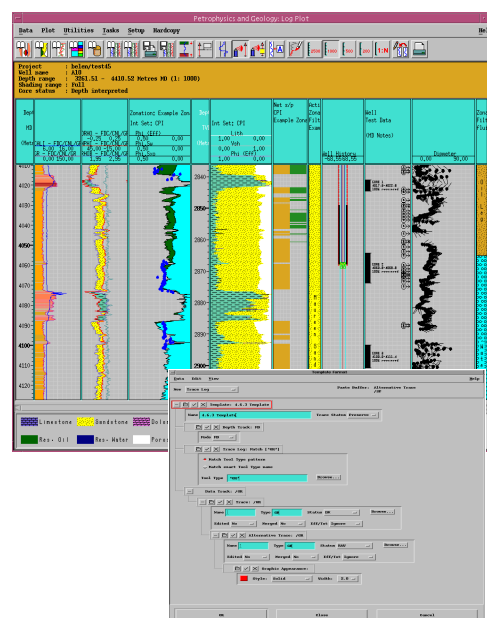
GeoTIGG

GeoCART: Mapping

The GeoCART module of GeoTIGG is designed for creating, editing and visualising different maps. The module uses data stored in the GeoRAPID database, originally created in GeoMOD, GeoINT and GeoSIM. GeoCart consists of several interrelated applications that complement each other, forming a simple tool for solving complex geological tasks. GeoCart allows the Geoscientist to model the structural and lithological properties of the reservoir, to create a static model of the deposit, and calculate the oil and gas reserves. The static model can be passed to GeoSIM as the basis for the fluid flow simulation model.

Map Editor

Generation of mapping grids based on fault data and a variety of control point data

- Integrates GeoMOD and GeoMUL well data with GeoINT horizons and fault interpretations to accurately model structure and properties spatially
- Choice of industry standard gridding and contouring algorithms including CPS-3, DGI and Irap
- Variety of grid operations including smoothing, snapping and re-gridding and refining
- Graphical editing of all mapping data including grids, contours, faults and control points
- Comprehensive set of geographical projections and projection transforms
- Digitisation of paper based map data
- Generation and display of dip and azimuth data based on structural grids
- Full user control over the basemap display – contour increments, line styles, fills, colours etc.
- Inclusion of title boxes, scale bars, latitude / longitude graticules, free text, simulation grids, 2D and 3D seismic grids

- User defined basemaps for fast generation of report quality output and quick regeneration
- Link to GeoSIM for fluid flow model grid generation and property population
- Hot link to GeoMOD for selection of wells for well correlation display
- Cursor tracking gives instant spatial positioning links with geological, petrophysical and geophysical displays
- CGM hardcopy output
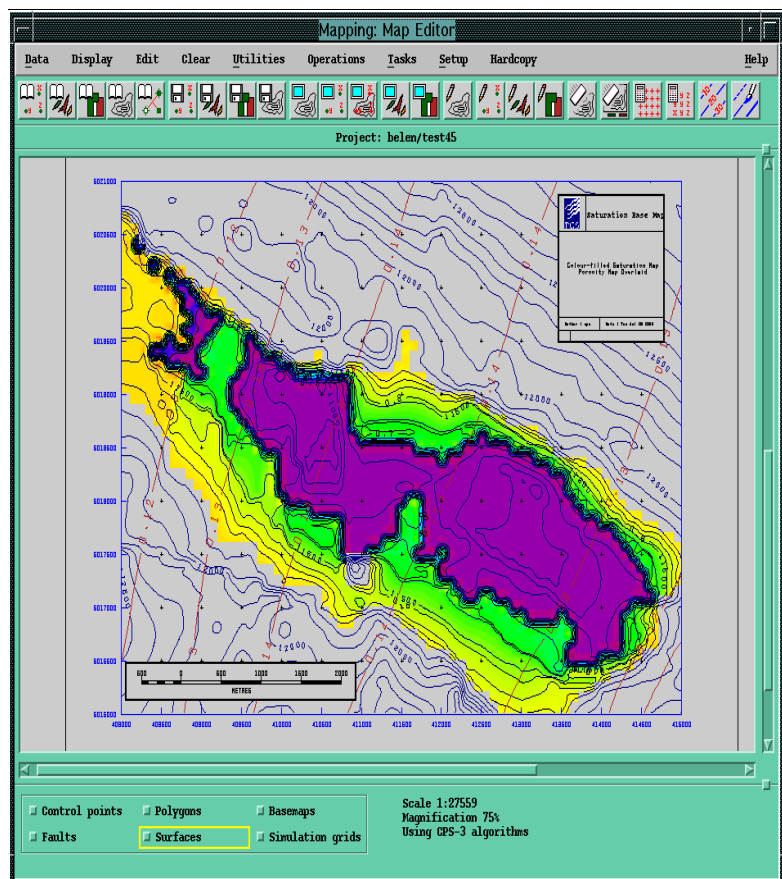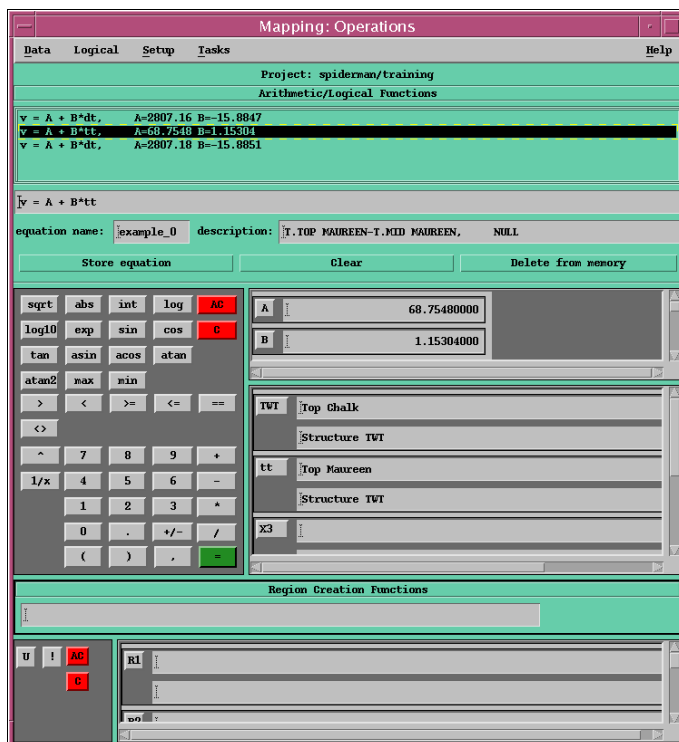
Mapping Operations

Arithmetic / logical manipulation of mapping grids and control points

- Graphical calculator style creation of equations

- Equations generated in other applications such as Saturation Mapping and Crossplot can be accessed

- Complex arithmetical equations of up to 255 characters can be stored for future use

- Logical application of equations to relevant mapping data

- Calculations can be performed on an area by area basis defined by polygons

Perspective Display

Perspective (3D) view of mapping grid data

- Three dimensional view of multiple structure grids

- Choice of display styles including wire frame, light shaded and band shaded

- Display of contour lines, grid lines, projected 2D surface, etc.

- Display of a choice of parameters as a fourth dimension

- Projection of well paths through the 3D model

- Display of fence diagrams through the 3D model based on any line of section

- Horizontal sectioning of model to indicate gas leg, oil leg and water leg
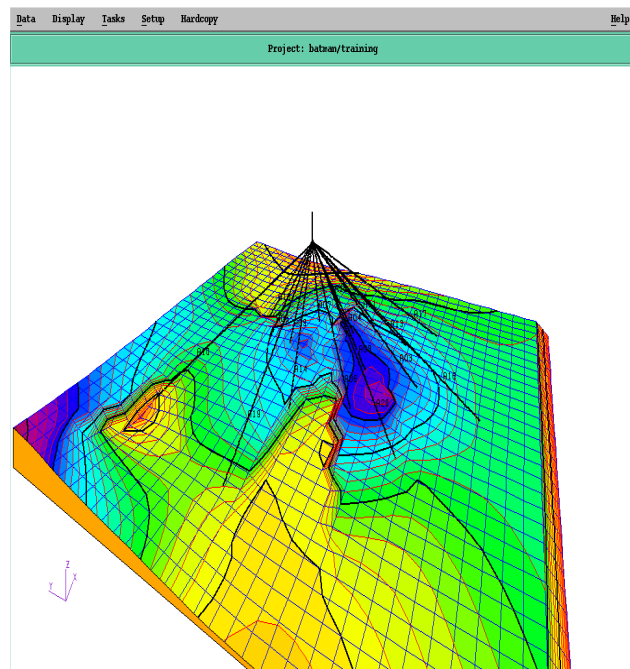
Saturation Mapping

Constructs a water saturation grid of the hydrocarbon / water transition zone within the reservoir

- Graphical specification of model input data
- Models based on a variety of information including structural, fluid, permeability and other parameter data
- Graphical calculator style specification of regression equations
- Storage and retrieval of equations and models from the GeoRAPID database
- Construction of porosity banded models with a separate equation for each band
- Hot link to GeoCROSS for transfer of user defined Saturation vs. Height regressions

Volumetrics

Generation of volumetric results based on mapped grid input data or constant values

- Logical specification of volumetric input data
- Input grid data can be read from the GeoRAPID database or user specified constant values can be entered
- Generation of a various volumetric calculations including gross rock, net rock, net pore and net hydrocarbon pore volumes
- Creation of volumetric macros for re-running calculations with the same or new input data
- Generation of volumetric "in place" results, areas and volume thickness grids
- Volumetric reporting on a polygon by polygon basis
- Volumetric and area reporting in a choice of units
- Saved audit trail of input data and output results

GeoTIGG

GeoQC: Quality Control and Fast Mapping

GeoQC is an independent program used both for the quality control of initial and interpreted data (scatterings and grids) and fast mapping. Also, GeoQC allows performing mathematical operations on data as well as geostatic analysis (crossplots).
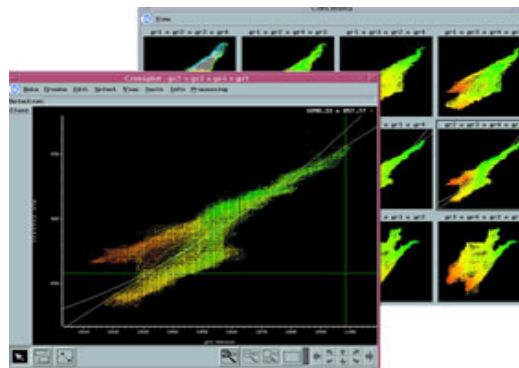

Main options in GeoQC:
- Direct access to the database combined with the possibility to load/write needed information through external files of different formats
- Simultaneous work with different data types (scatters, grids, isoline maps etc.)
- Editing all data types graphically and manually in the table
- Full access to information on all kinds of data in different modes: tables, histogram, crossplots etc.
- Interactive grid creation combined with the option to load existing templates
- Grids and maps calculation with faults
- Back gridding - grid recomputing after map editing
- Fitting - linking the seismic interpretation data to wells
- Crossplotting and dependencies calculation with the possibility to save these dependencies for further mathematical operations
- All types of arithmetic and logical operations on data
- Saving all obtained results into the database
- Plotting all data or saving into a CGM file for further editing
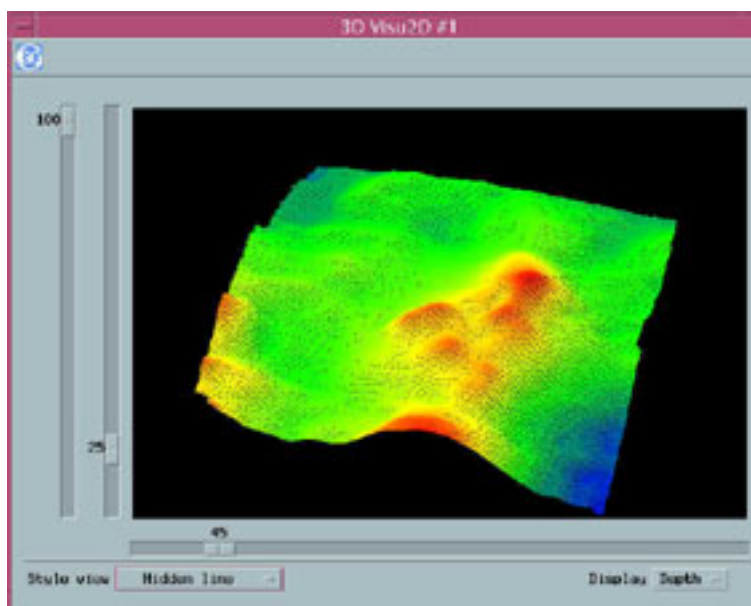
GeoTIGG

GeoQC: Quality Control and Fast Mapping
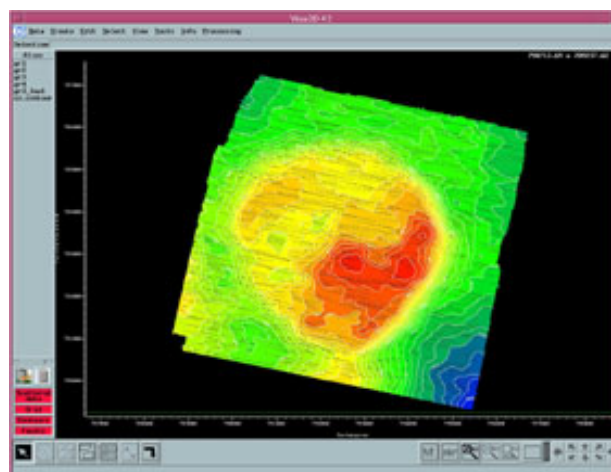
GeoQC gives the opportunity of simultaneous processing and visualisation of large sets of data. GeoQC is a simple, user-friendly package providing a choice of gridding methods allowing fast, high-quality grid calculation. Grids can be corrected to follow seismic structure (including faults) and to tie with well data.
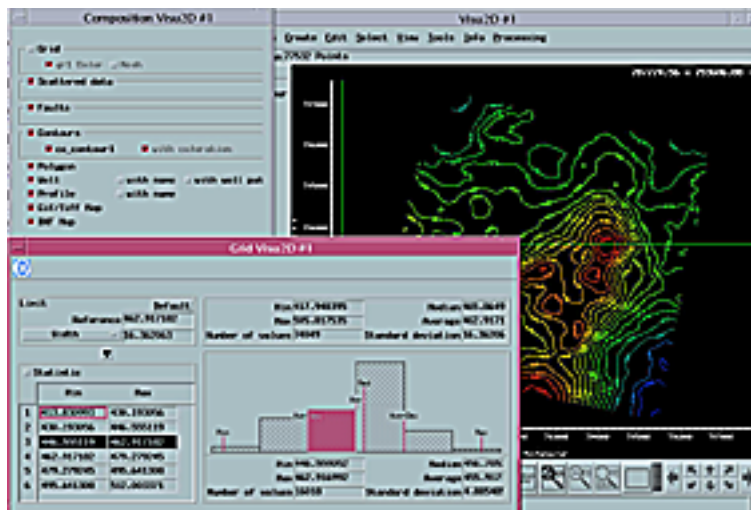
The easy-to-use tools for processing of different parameters (crossplots, histograms and other) and the possibility of data visualisation both in single and multiple windows allow fast, high-grade interpretation of geological and geophysical information.

GeoTIGG

GeoRES & GeoSIM: Reservoir Simulation

The GeoSIM module of GeoTIGG provides a wide range of analysis techniques for black oil, compositional, and EOR simulation including thermal modelling, with gas condensate and dual porosity options. Both IMPES and fully implicit time stepping methods are supported for 1D, 2D and 3D models. A unique strength is the use of the integrated project database as the focal point for the compilation and management of the sequence of models required in a simulation study. No keyword files are necessary as all data is stored in the database. The architecture of the GeoSIM module facilitates the use of third party simulators. Tigress Ingeoservice has experience in working both with E&P companies to link in-house simulators and in the use of other industry standard products such as Eclipse, Chears, SURE and the Falcon MPP simulator.

A comprehensive set of linked numerical and graphical editors enable the user to display and operate on the data.

Data Assembly

Construction and management of the simulation study

- Graphical display of the data types required for any particular model and run, through a set of colour coded push buttons
- Access to all simulation tasks and validation of the data type values
- Automatic display of run build status and data entry requirements
- Spreadsheet editors for each data type
- Data completeness and consistency checking
- Computation of layer thickness from depths and vice versa
- Computation of initial fluids in place and average reports by region
- Full restart capability
- Extraction of PVT tables from the database for the run
- Extraction of data from other models and runs

GeoRES & GeoSIM: Reservoir Simulation
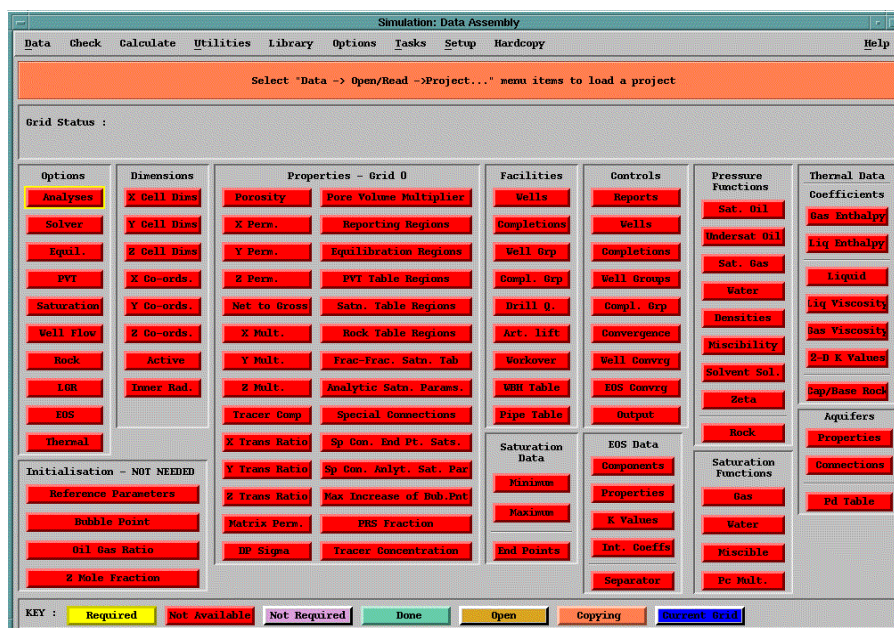
Scalar Editor

- Display and entry of run reference parameters – depth, pressure, contacts etc.
- Specification of run options for analysis, solver, equilibration, wells, PVT, saturation, rock, LGR, thermal and polymer
- IMPES and fully implicit solvers, PCCG, LSOR and MPP solver types

Grid Editor

- Manipulates grid data including property and dimensional data
- Displays grid data one cell layer at a time, depending on the axes selected
- Displays the time series for simulator output available in the database
- Displays output grid block data (pressures, saturations and concentrations)
- Application of arithmetic and logical operations to grid cell values
- Copying and combining of grid sets
- Highlights cell completion locations

Table Editor

- Designed to manipulate tabular data varying with pressure or saturation
- Operates on saturated oil properties which are a function of pressure (e.g. oil formation volume factor, GOR etc.)
- Display and modification of saturation functions including relative permeability and capillary pressure
- Arithmetic operations and transforms can be performed on any column of data

Matrix Editor

- Recurrent data manipulation including well, completion and location definitions, well and group controls, completion and solver controls
- Averaging of field production and injection histories to suit required reporting times
- Ability to control well behaviour at any schedule time
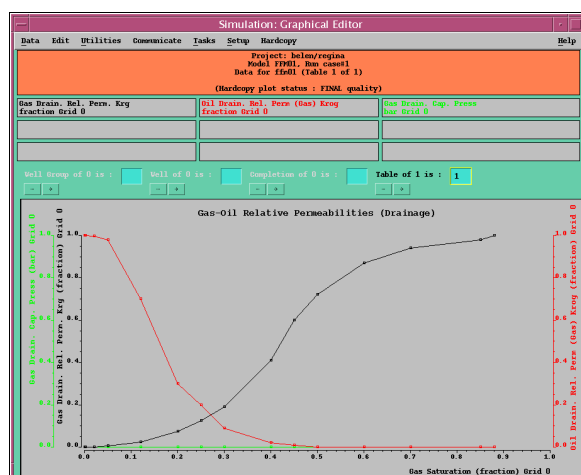

Graphical Editor

- Graphical alternative to the Table Editor.
- Displays plots of fluid property, saturation functions and well performance
- Plots all available simulator or historical well and group performance data against time
- Hot link with the table and matrix editors

Grid Preparation

Cartesian or cornerpoint grid generation tool

- Graphical grid definition using maps in the database
- Graphical layer by layer definition of inactive grid blocks, locating aquifers, barriers and faults
- Grid block averaging of map data to define grid block properties
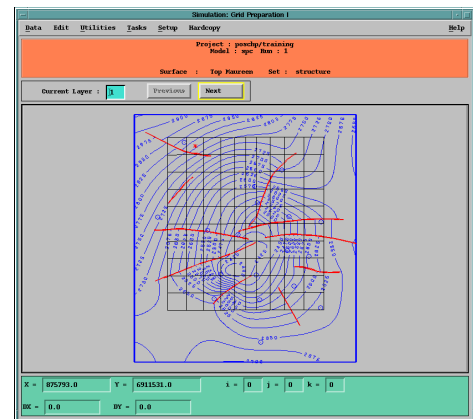
Grid Display

Simple 2D or 3D grid data graphical visualisation tool

- Display of any grid data (e.g. porosity, permeability, pressures, saturations)
- Ability to scroll or animate through time, across sections and down through layers
- Allows grid cell colour fill selection from a variety of colour palettes
- Ability to select any location on the screen and see the co-ordinate location and parameter value
- Grid display types include contour lines, contour bands and colour fill

Equilibration

The calculation of initial fluids in place using reference pressure and depth information

- Six methods depending upon model type
- Includes fine scale options in which each grid block is sectioned by depth for the saturation calculation, and end point initialisation
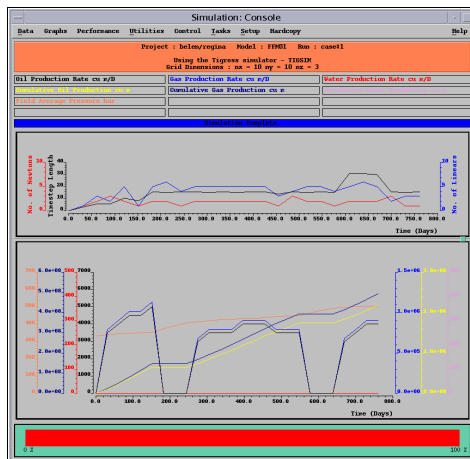
Console

**Initiating and monitoring the progress of simulation runs**

- Run simulation can be launched to run on local or remote workstations
- Graphical and digital displays of simulation results to monitor progress
- Choice of 3rd party simulation engines

3D Viewer

Powerful and easy to use 3D visualisation system

- Displays the model structure and grid cell properties in 3D, including locally refined grids
- Displays values in grid block shading, contour bands or lines
- Used for both pre and post processing
- Allows the user to move and rotate the simulation grid in 3D
- Animation of fluid flow for each report time
- Standard display features include:
  - Cross sectioning
  - Grid cell transparency
  - Isosurface
  - Bubble plots
  - Well production graphs for history matching
  - Tertiary plots
  - Probing for value in any grid block
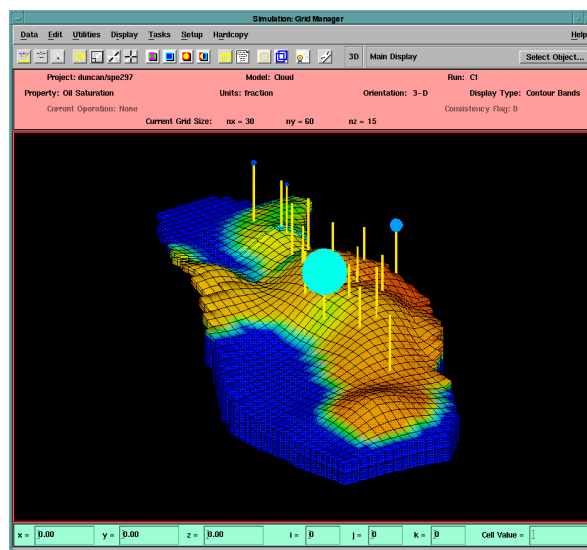
Reporting

Tabular view and report quality output of all results and derived quantities

- Interactive construction of customised tabular hardcopy reports
- User-selectable viewing of the report for preview and hardcopy
- Output data selectable on a report time by report time basis

GeoTIGG Simulator - GeoSIM

Built in simulator for running black oil, compositional, thermal and miscible flood models

- Runs cartesian, corner point and radial geometries
- IMPES and fully implicit solvers
- Stones 1D and 2D relative permeabilities
- Novice and experienced modes
- Local grid refinement
- Horizontal and deviated wells

GeoTIGG

GeoPROD: Production Analysis

GeoPROD is designed to be the E&P Industry's most advanced Field and Well Management IT Tool and was developed as a joint project between the Tigress team and Shell International. GeoPROD is used by the exploration and production industry for the analysis, manipulation and easy visualisation of recent and historical production data. It performs all of the typical objectives of reservoir performance analysis and forecasting, including estimation of original hydrocarbons in place, analysis of past and present performance, prediction of future performance under current conditions, estimation of reserves and recovery rates under various conditions and updating of analysis with new data during life of field. GeoPROD is a client server solution for both UNIX and NT servers and is fully integrated with the GeoRAPID database and other GeoTIGG applications.

GeoPROD helps with short-term production gains, for example identification of under producing wells and identification of candidate wells for stimulation treatment and workovers. It is also used for long-term reserves gains through early identification of inappropriate reservoir management studies including inadequate areal drainage and over/under injection. GeoPROD benefits are: increased efficiency and time savings, easy management of large data volumes, quicker identification of production problems, increased production potential

Data Loading

- By PBAscii or a generic data loader, utilising user-defined formats
- All data are stored to POSC Epicentre compliant tables
- Data can be loaded into any well hierarchy level (well, conduit, completion etc.)

Data Selection

- Map-based object selection and data display
- Well hierarchy selection
- List based object selection
- Sorting And Grouping
  - By physical items (wells, wellbores, wellbore conduits, wellbore completion intervals, reservoir elements, etc.)
  - By logical items (patterns, operators, concessions, etc.)
  - By groups of the above
- Queries / Filtering
  - Multi- level production/completion queries
  - Queries at any physical/logical hierarchy level

GeoPROD: Production Analysis
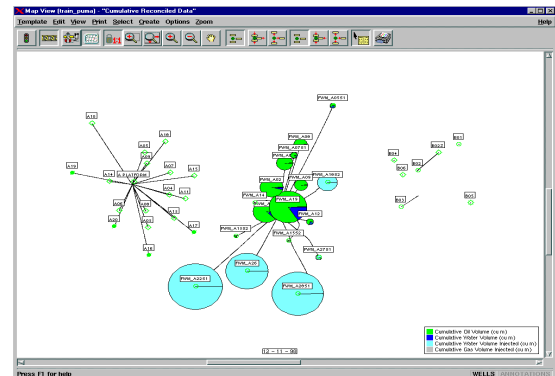
Data Visualisation

- XY Plots with multiple X and Y axes can display anything against anything
- Full control over crossplot design and the entire set-up can be saved to a template
- Up to 18 curves on a single plot
- Multiple plots (up to 16) per plot window
- Easy to create object comparison plots and normalised time plots
- Curve fitting (polynomial, linear, exponential)
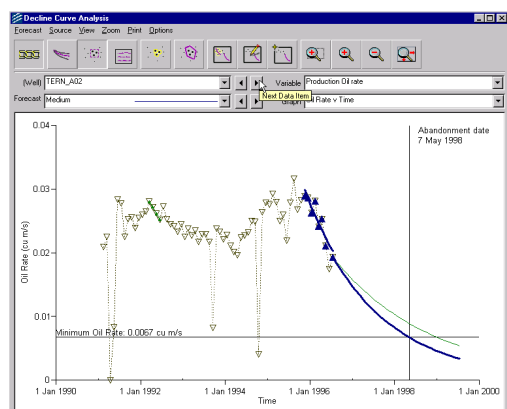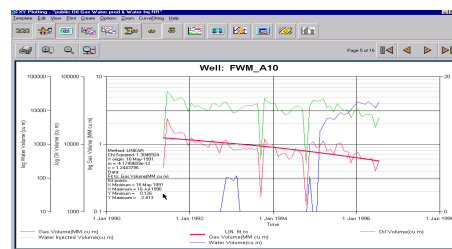
Decline Curve Analysis

- Decline curve analysis for oil, gas and water rate curves
- Designed to produce oil, gas and water rates, gross rates, oil
  water ratio and water cut forecasts
- The forecasts can be manually edited or projected to any start date in the future
- The decline curve can be forced through a specified technical reserve
- Calculates the technical reserves (or ultimate reserves) and the abandonment date for the curve
- Analysis can be performed on any level in the hierarchy
- Multiple forecasts can be created for each data item

Performance Indicators

- Pre-defined indicators:
  - Lift Performance Indicator (LPI)
  - Well Inflow Quality Index (WIQI)
  - Gas Utilisation Factor (GUF)
- User-defined indicators can be generated and stored
- Batch calculation of Well Performance indicators
- Link to other applications facilitate generation of IPR and VLP data

Reporting

- Design to report anything against anything
- Full control over report designs features (columns positions, fonts, types)
- Report designs saveable to templates
- Spreadsheet like background grid controls
- Easy to create object comparison reports

Macro Language

- Stores an entire analysis sequence including data selection, crossplot and report templates, and well performance indictors that were applied
- Record and replay stored procedures

Auto-sequenced Printing/Plotting

- Applying a selected plot / report template to a sequence of selected objects (wells, conduits, reservoir etc.)