

Petrel 2009—What's New

Realize the power of Petrel 2009 seismic to simulation software

NEW CAPABILITIES IN

- **Innovation**
- **Usability**
- **Workflow**
- **Data management**

Innovation

- Fully integrated genetic inversion
- Multiple resolution 2D visualization
- Multipoint geostatistics
- New fast Fourier transform algorithm
- Multidimensional properties visualization
- Completions modeling
- 64-bit version

Usability

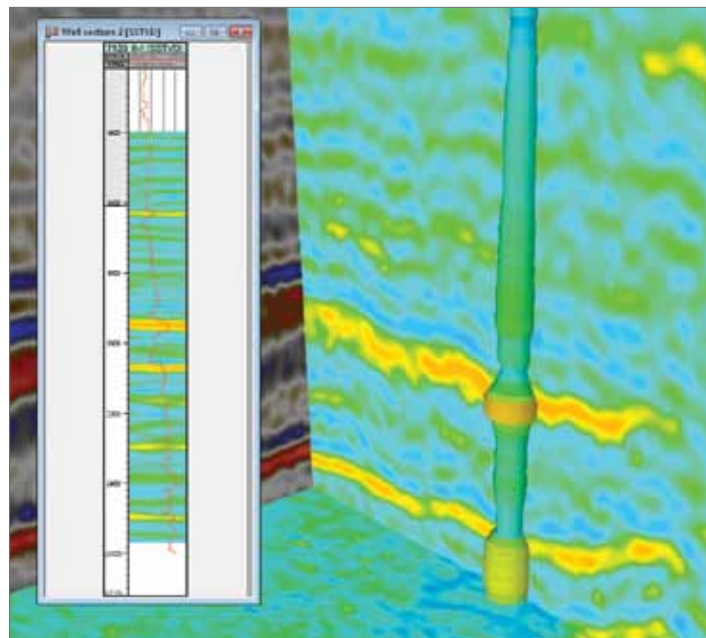
- Seismic interpretation manager
- Support for new color bar handling
- 2D seismic selection from 3D
- Direct Computer Graphics Metafile (CGM) and PDF output
- Improved license querying

The 2009 release of Petrel* software is our most comprehensive release to date, delivering best-in-class workflows and innovative technology in geophysics, geology, geological modeling, and reservoir engineering. Petrel 2009 software is now available for the first time in a 64-bit version for unrivaled scalability and performance.

GEOPHYSICS

Seismic scalability

The Petrel 2009 solution provides a new paradigm in geophysical interpretation. With a unique combination of 64-bit processing with smart disk roaming technology and the latest multicore compute technology, Petrel software offers unrivaled performance and scalability for exploration projects. Additional developments allow users to work with multiple regional 2D and 3D datasets in the same canvas, generate seismic well ties, and automatically grid and map basins, fields, and prospects. Performance enhancements include 64-bit, multiple-resolution 2D visualization and preloading of 3D seismic into RAM. Workflow advancements include new color handling, an interpretation manager, and automated structural framework generation—enabling you to rapidly identify and qualify prospects at a basin scale.



The Petrel Inversion module is not restricted to a pure acoustic impedance inversion. It can be extended to any property with some inherent link to the input seismic cube.

Interpretation

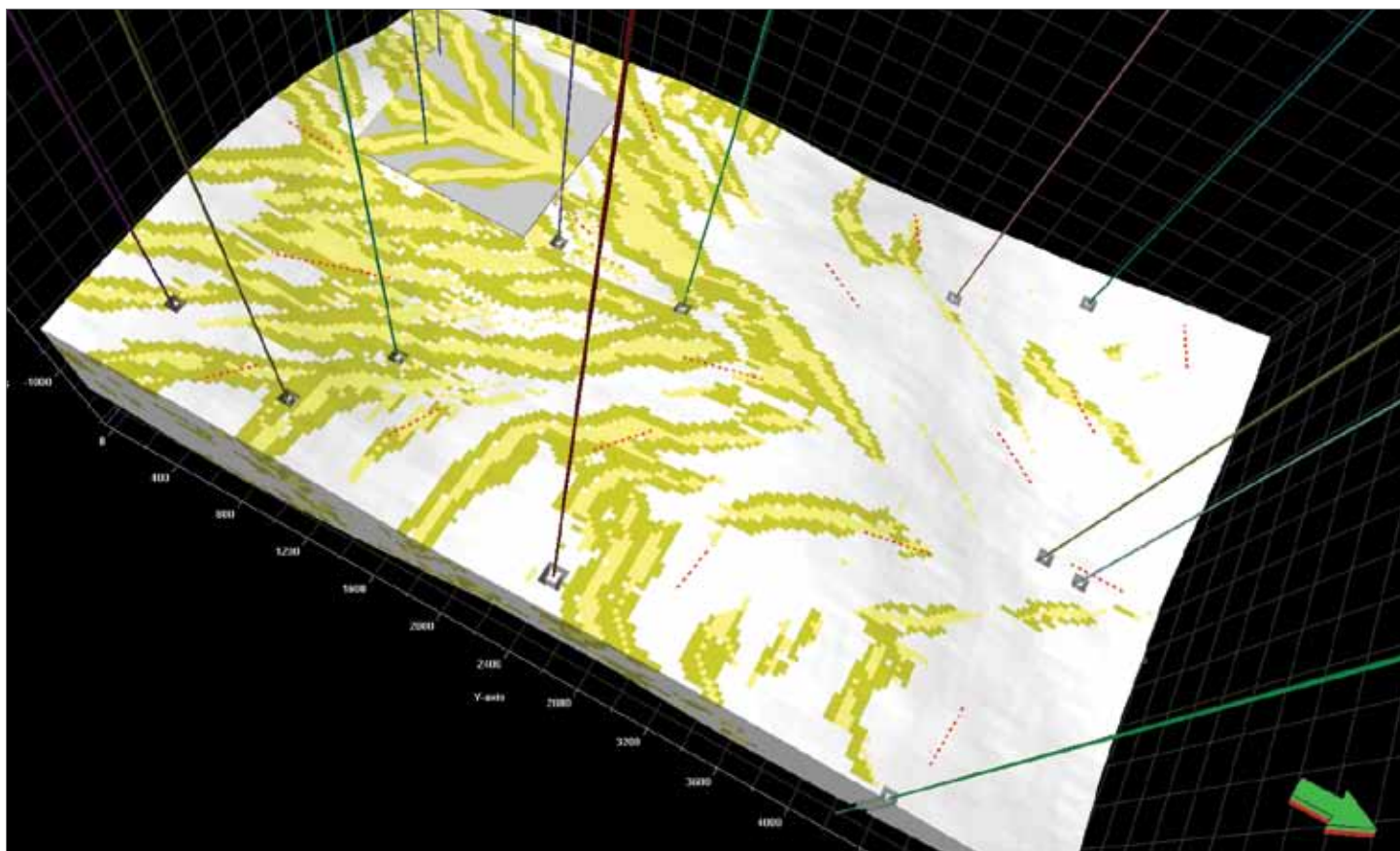
Accurate interpretation of faults, horizons, and geobodies is a critical part of the geophysical workflow. Petrel software continues to deliver advances to these core workflows including multiple volume tracking, a doublet tracking selection option, interactive 3D tracking from within a probe, nonzero-centric data tracking, improved fault projections, and the addition of a third volume into the geobody extraction process for advanced RGB volume blending.

Synthetics and time-to-depth conversion

An accurate link between seismic and well information is critical for exploration and reservoir characterization. The new seismic well tie module in Petrel software includes interactive sonic calibration, deterministic wavelet extraction, wavelet building, and multiwavelet functionality for improved confidence in your seismic well ties. With a strong seismic well tie, a dependable velocity model is critical to producing an accurate image



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Multipoint geostatistics (MPS) uses training images to model facies, providing the user with a new method to model complex geological features.

of the subsurface. The new velocity modeling process in Petrel 2009 software streamlines the stacking velocity workflow and enables greater data quality control and editing for improved accuracy and reliability in the domain-conversion process.

Seismic inversion

For the exploitation of hydrocarbon resources, seismic data is the primary input for resolving structural and stratigraphic variations between points of well control in most of the world's sedimentary basins. The Petrel 2009 release brings step-change improvements with the fully integrated genetic inversion algorithm, which allows geophysicists and geologists to directly generate impedance volumes inside the Petrel application. New horizon autotracking

options allow picking directly on the impedance volume and can be used as an input in the enhanced geobody isolation and extraction process for improved reservoir characterization.

GEOLOGY AND MODELING

Mapping support for exploration workflows

The new Additional Inputs tab is a major enhancement to the make/edit surface process. This tab allows the user to make surfaces using combinations of data, including multiple 3D and 2D seismic interpretations, isochore points, zero lines, and dummy wells.

Fault polygons and maps

When creating structural models early in the exploration stage, performance is critical. The new

set of Petrel 2009 tools allows the geoscientist to create fault polygons and maps as well as an initial structural model base in the horizons and faults interpretation with just two clicks.

Multipoint geostatistics (MPS)

Traditional reservoir modeling techniques use simplified, two-point statistics to represent geological phenomena that have complex geometrical configurations.

The use of multipoint statistics has improved in recent years, reducing the limitations. The Petrel 2009 release reintroduces multipoint geostatistics, providing users with new methods to model complex geological features and connectivity. These workflows function efficiently in multimillion cell models and honor well, seismic,

and probability data. The workflows are much faster than before and use less than 5 percent of the memory needed to run MPS in the model, improving performance when using training images.

Parallel Gaussian simulation

When the correlation between soft data and hard data is zero, the simulation depends on well data only and is completely independent of soft data such as seismic. As the correlation increases, so does the dependence of the final result on the seismic data. Petrel software calculates the optimal correlation between seismic

and porosity and uses this as the default for colocated cosimulation. However, this correlation is one of the sensitivities that should be examined within an uncertainty study. The Petrel 2009 release gives users a quick visual appreciation of the correlation without having to restart the simulation every time. The correlation can be changed quickly enough for a slider bar to be used, because the algorithm is able to run in parallel using all the CPUs available in your machine. These parallel capabilities are also available in kriging and cokriging, making these algorithms extremely fast.

RESERVOIR ENGINEERING Completions Manager

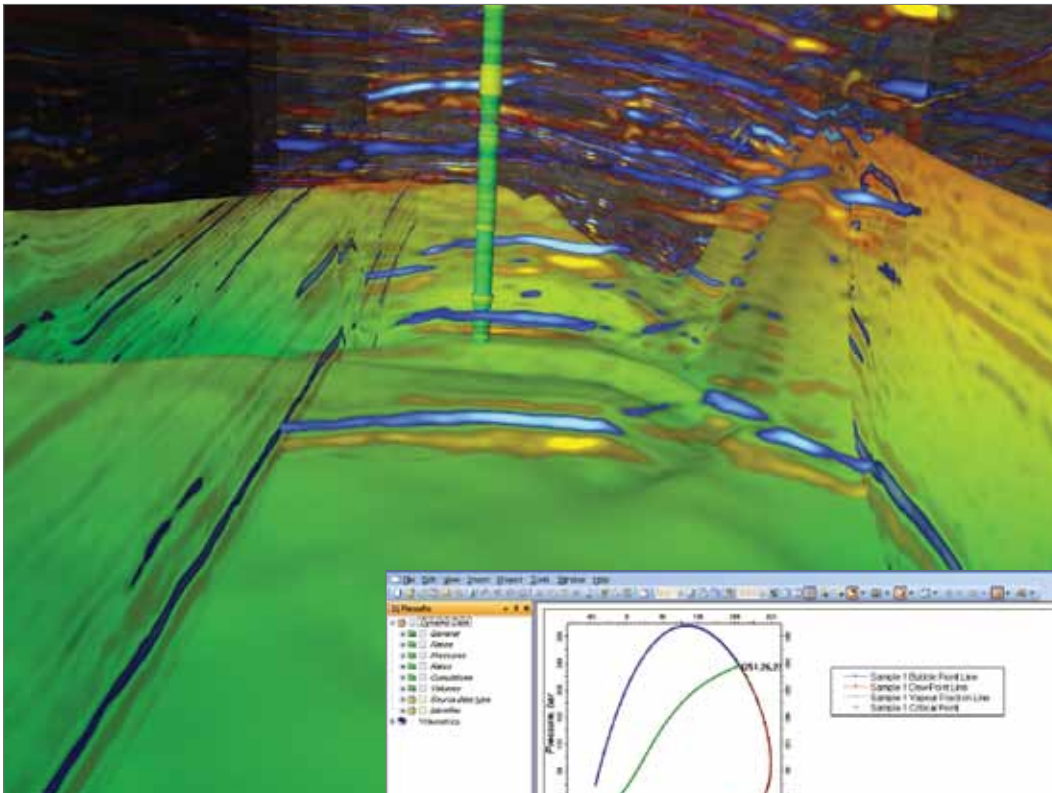
Well completions are becoming increasingly complicated as drilling and completions technology improves. It is now common to have wells with many branches, valves, and packers. Accurately simulating wells using the ECLIPSE* multisegmented well model requires correct data setup in the Petrel application. With the Completions Manager, a tabular interface allows a user to organize data to suit the task at hand.

NEW CAPABILITIES, cont'd Workflow

- New synthetics module
- Horizon autotracking improvements
- Fault interpretation improvements
- Enhanced geobody extraction process
- Batch processing of surface attributes
- Automated fault polygon generation
- Enhanced domain conversion workflow
- Adaptive channels algorithm enhancements
- Combined continuous and discrete fracture modeling
- New tools for building structural models and generating fault boundaries

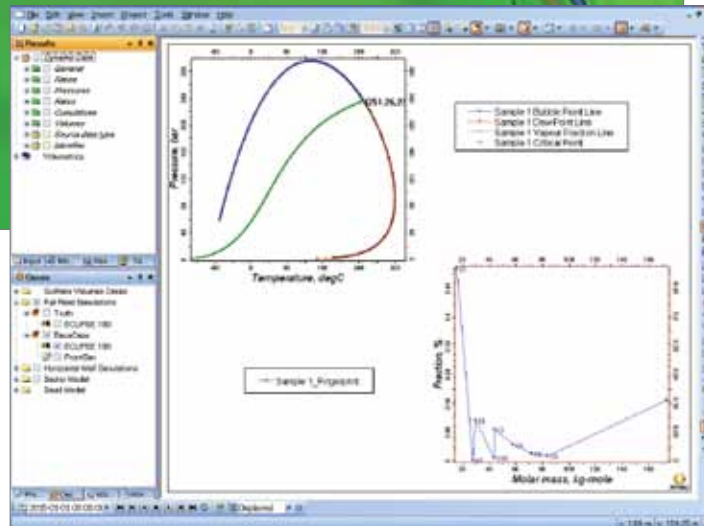
NEW CAPABILITIES, cont'd Data management

- Improved reference project workflows
- Transition of OpenSpirit® to Ocean* API



Opacity applied to 2D seismic lines allows the interpreter to see beyond the lines.

Phase envelope displayed in Petrel 2009. You can now create an equation of state in Petrel software by simply selecting library components, defining the molecular weight of user components, and typing in the composition.





Whether displaying the details of single well completion, or every valve or perforation in all the wells, the complete data can be filed in an identifiable folder.

The completions process offers operations on all completions so that attributes such as skin and heat capacity can be modified. Creating completions from logs has been consolidated into a single operation and extended to support the conversion of a discrete log into a completion string, making it much easier to calculate the placement of valves and packers based on logs.

Compositional fluid modeling

The Petrel 2009 release now supports compositional (equation of state) fluid models. You can now create an equation of state by simply selecting library components and defining the molecular weight of user components through the addition of the composition. While Petrel software will provide all the component properties necessary, it does not yet match equation of state properties to laboratory observations. For a full workflow, you should continue to use pressure-volume-temperature analysis software (PVTi) and import the matched equation of state into the Petrel application.

UNCERTAINTY AND OPTIMIZATION

The Petrel Uncertainty Editor has been updated with innovative features and capabilities. A new workflow editing tool in the uncertainty analysis and optimization process allows you to modify a workflow without leaving the uncertainty process. This means that alternative samplers (e.g., experimental design), proxy models (e.g., response surface models), and optimizers can now be added to the Petrel application via the Ocean API. Schlumberger plans to release these algorithm plug-ins in the future, but companies that currently have in-house technology can refactor their algorithms today as Ocean plug-ins.

If your uncertainty analysis generates multiple cases, they now can be organized as a “case collection” instead of a case folder. Case collections plot statistical measures such as P90, P50, and P10, or mean +/- 2 standard deviations, and the user can control these measures. Case collections also allow you to rank the cases by an attribute such as reserves and select a particular realization such as the P50 for further analysis.

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