

# Petrel Geology and Modeling

From 1D petroleum systems through structural modeling, to reservoir characterization across the E&P lifecycle

## APPLICATIONS

- Exploration uncertainty evaluation
- Play assessment
- Chance-of-success estimation

## BENEFITS

- Streamline everyday workflows using flexible, dynamically linked 3D, section, and map canvases
- Enhance collaboration within your team
- Gain a better understanding of trends and correlations
- Incorporate new data using local model update, without disturbing the history-matched model
- Confidently estimate reserves while assessing uncertainty from all perspectives

## FEATURES

- Extensive property modeling algorithms
- Enhanced characterization of depositional features identified in seismic attributes
- Stratigraphic interpretation, contouring, map editing, and structural complexity evaluation—prior to modeling
- Structural framework and volume-based modeling tools, bridging the gap between seismic interpretation and modeling
- High-quality maps rapidly updated when new data is available

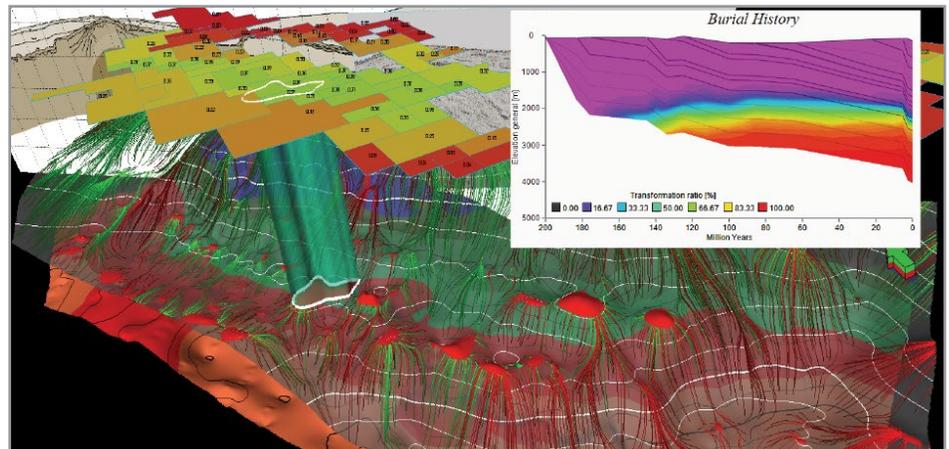
The Petrel\* E&P software platform offers a unique user experience, placing the focus on user productivity. The logically laid out, workflow-driven interface allows you to interact with the data directly from the 3D window and focus on your project's geological workflow. The new geology and geophysics perspective lets you move through the key geological work steps, such as stratigraphic and seismic interpretation, fracture, facies, and geocellular property modeling—right through to production simulation and well design.



*The geology and geophysics perspective within the Petrel platform.*

## Exploration geology

Acquiring the right acreage and drilling the best prospects are the central investments impacting exploration success. The Petrel platform's Exploration Geology module provides workflows to improve these decisions, from early phase exploration through to appraisal. The geoscientist can evaluate the key components of exploration uncertainty, assess plays with results connected directly to interpretations, generate prospects incorporating play level assessments and perform chance-of-success estimates.



*Play and prospect evaluation using hydrocarbon generation and charge and burial history analysis combined into a play chance map.*

Since results are linked to data and interpretations, you can easily reference the input geology and interpretations, get rapid updates when new data is added, and have consistent evaluations across your organization.

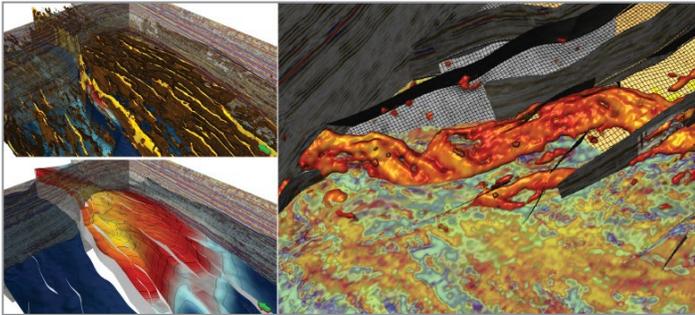
## Mapping and well correlation

The Petrel platform enables you to generate high-quality maps at regional, or prospect scale. Vitality, if any data is modified in the project, maps are updated with minimal effort—keeping your maps live.



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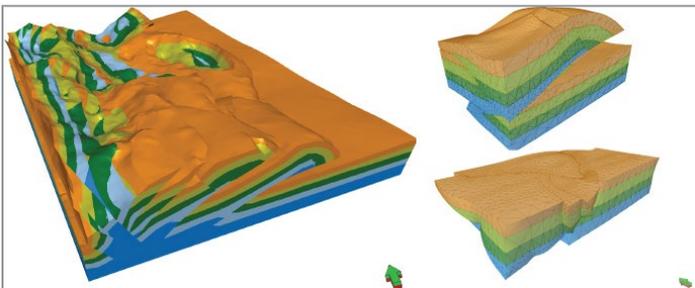
The correlation window enables stratigraphic interpretation, seismic well tie, 4D workflows, reservoir modeling QC, and production history matching. Customized well section displays are easily shared between projects, without the need to save the window, while log estimation using neural networks and interactive log conditioning enhance your stratigraphic interpretations.



Seismic attribute blending used to delineate structural features and isolate a channel feature, which is extracted as a geobody and instantly used in property distribution across the grid.

## Structural and stratigraphic interpretation

In addition to enabling the construction of consistent, watertight structural frameworks, any seismic attribute volume can be used directly in a 3D grid. Using geobodies, you are able to identify and isolate stratigraphic and depositional features in seismic data and extract and sample them directly into your model. This unique, seamless workflow improves productivity and characterization of subsurface features.



Volume-based modeling of a structurally complex region, and the area of interest flattened for DepoSpace property population.

## Structural modeling

A fundamental modeling requirement is the construction of sound geocellular frameworks, with the goal of populating them with properties for volumetrics and, ultimately, reservoir production and engineering workflows. Watertight frameworks of structurally or stratigraphically complex regions are quickly built using the new volume-based modeling functionality. Using the DepoSpace tool, property population parameters are distributed in flattened, non-deformed space that honors variogram and distance inputs.

## Enhanced geostatistical data analysis

Representing the subsurface according to analogs and your geological concepts, while honoring data trends and distributions, is essential for volume estimations and fluid-flow simulations.

The new geostatistical tools combine interactive and powerful data analysis between histogram, function, and stereonet windows, providing a better understanding of distributions, trends, and relationships.

## Fracture modeling

Complex fracture networks are modeled using a combination of discrete and implicit fractures, driven by either stochastic, geomechanical, or tectonic drivers. Estimating fracture density across mechanical zonations along the wellbore is enabled. Analysis and visualization is enhanced through a combined stereonet and rose diagram window.

## Fault seal evaluation

Rapid definition of critical flowing or sealing windows along faults enables better evaluation of prospects, and their appraisal when integrating fault data into the dynamic flow simulator. Using horizon-fault relationships and juxtaposition, you can ensure that transmissibility across fault blocks is not neglected in dynamic simulations. Early 1D seal analysis of a faulted reservoir during exploration can be supported with the well juxtaposition mapping prior to building a 3D grid.

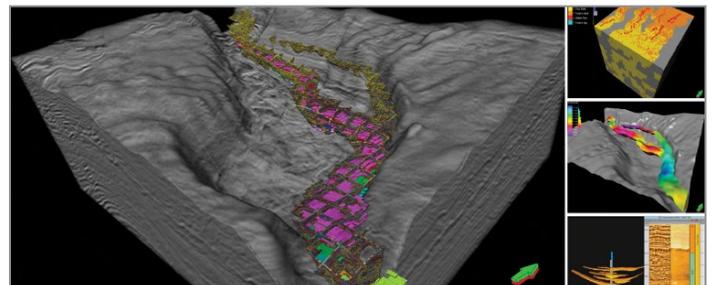
## Integrated reservoir modeling

Conceptual depositional environments are modeled using a variety of distribution algorithms that honor all available data and its trends. In areas with sparse well control, you can gain a better understanding of regional trends by correlating well information with seismic attributes, creating probability volumes to guide the spatial distribution of rock properties.

You can now maintain continuity with the surrounding model and ensure your history match is maintained away from newly acquired data by updating locally, inside a polygon or segment, without changing previously distributed properties.

## Uncertainty and optimization

The uncertainty and optimization process provides powerful analysis tools to analyze sensitivities, or multiple alternative scenarios throughout the entire E&P cycle.



Combining high-resolution facies interpretation from image logs with a training grid and geometrical trends in multipoint facies modeling to generate stratigraphically consistent models.<sup>†</sup>



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<sup>\*</sup>Mark of Schlumberger.  
<sup>†</sup>Data courtesy of Geoscience Australia.  
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