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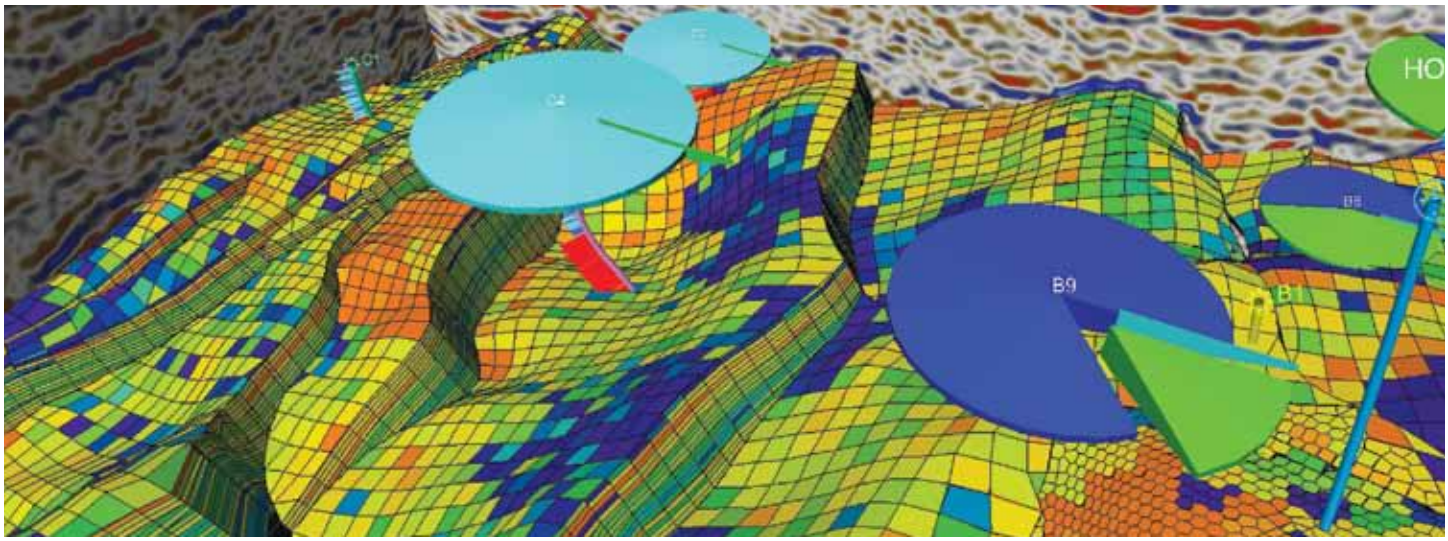
Petrel Reservoir Engineering 2011

More confident decisions



Covisualization of seismic, geology, logs, and production allocation.

The Petrel* E&P software platform enables experts to combine the richness of their domain-specific information and knowledge into a single, model-centric* subsurface representation, while also delivering a fully featured reservoir simulation preprocessing and postprocessing environment. Changes in the seismic interpretation or the geological model now easily cascade through to the reservoir simulation model and back. You can evaluate the impact of the changes on production rates or reserves—in a fraction of the time previously required. Compatible with the entire family of ECLIPSE* and INTERSECT* reservoir simulation software applications, the Petrel Reservoir Engineering (RE) workflows enable dynamic analysis to meet your business or operational needs.

Petrel 2011 enhancements

Faster history matching through manipulation of all facets of the model from seismic to simulation is provided, including the definition and analysis of history matching objective functions, uncertainty tools to evaluate and understand parameter sensitivity, and local model updates. This allows you to work directly on problem areas or incorporate new data, and run new scenarios to better match production history data.

Rapid simulation results analysis help you get your day-to-day analysis of simulations done more efficiently. Petrel 2011 offers one-click access to standard plots and one-click updates of these plots to incorporate new wells for rapid screening and comparison of your results, as well as a new faster-loading summary format.

Petrel 2011 provides enhanced capabilities for reading and converting existing ECLIPSE data decks into Petrel projects, thus enabling the full suite of Petrel workflows and reservoir model updates.

Petrel 2011 supports the INTERSECT next-generation reservoir simulation software. INTERSECT software is designed to handle large and complex models, with excellent performance and scalability on multiprocessor and multicore hardware, and novel numerical techniques for nonuniform and unstructured grids.

Using the new Studio* E&P knowledge environment in Petrel 2011, you get a new level of productivity. The Studio Favorites function lets you personalize your workspace to include only the data and processes you need to support your current workflow tasks, while the Find tool provides smart search, access, and scalability across your Petrel data world. Using the Studio Annotate function, it is possible to enrich Petrel projects with contextual information (for example, text notes, documents, images, and analogs), allowing you to share knowledge, raise questions, or explain thought processes—with current or future team members. Session sharing across the office or across the world is supported by the Studio Share tool, while the Database and Transfer function provides effortless access, publish, and store capabilities to enrich your company's knowledge base.

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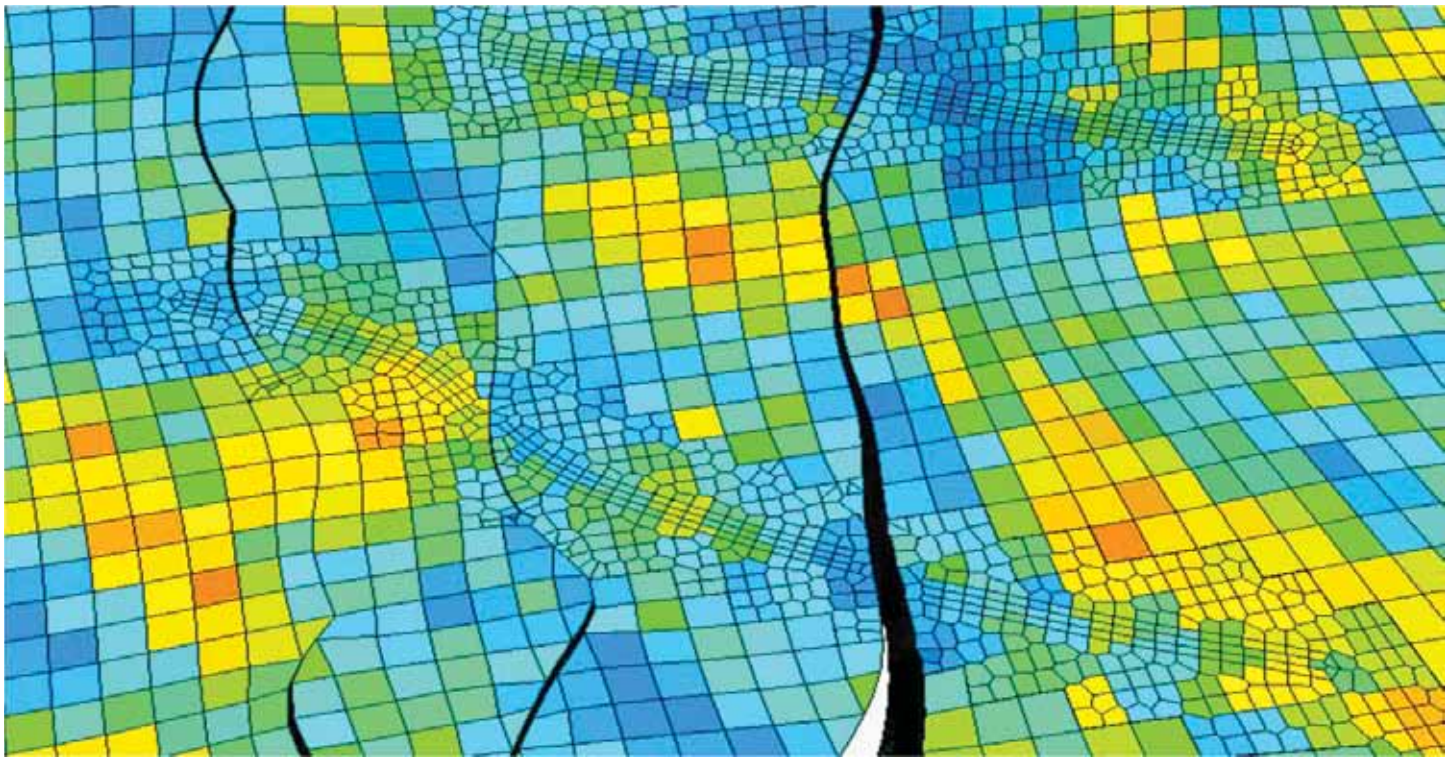


Unstructured local grid refinements around horizontal wells.

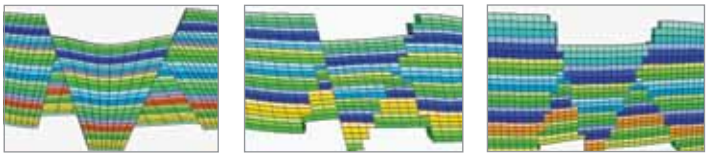
Detailed reservoir simulation

Combine and apply Petrel modular workflows to your varied reservoir engineering needs. The Petrel RE core module is your entry point for detailed reservoir simulation and pre- and postprocessing. Simulation models are built directly from your geological models. Then you can add fluid properties, well completions, production history, and event scheduling, as well as organize your geological realizations and development scenarios into simulation cases. Finally, select and launch the appropriate reservoir simulator, then analyze your results—all within the intuitive Petrel interface.

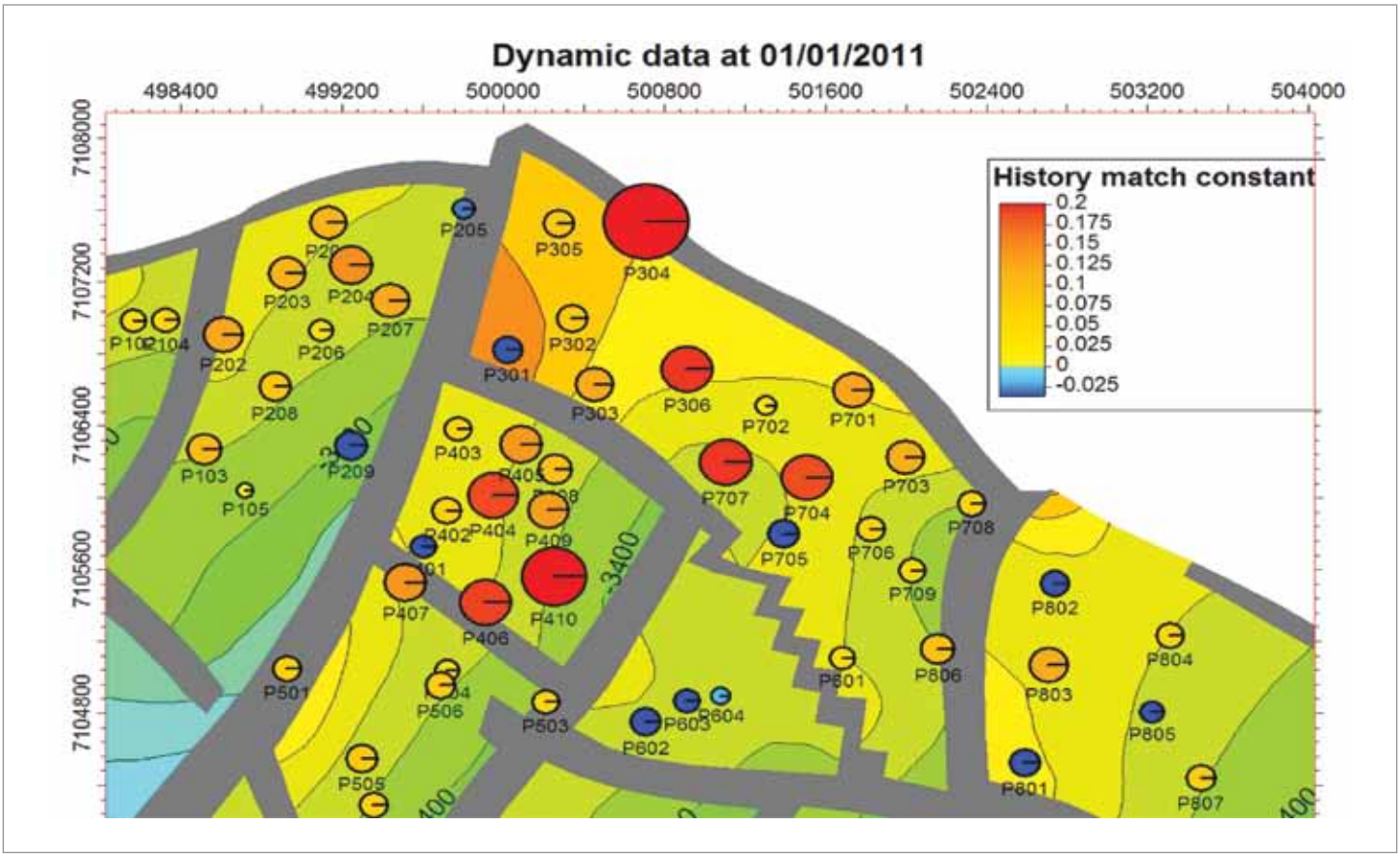
Accurate modeling of multisegmented wells

Conventional reservoir simulator well models treat the entire wellbore as a single entity, with constant or averaged fluid properties throughout the well. These models do not address pressure drops resulting from friction, interphase slip, and acceleration. The multisegmented well model in Petrel and ECLIPSE software overcomes this by dividing the entire wellbore into segments, much as a reservoir is divided into cells when a grid is made. Petrel software gives each well segment the physical properties of the casing or tubing that contains it, allowing ECLIPSE software to accurately model the fluid physics throughout the wellbore.

Well completions are becoming increasingly complicated. It is now common to have wells with numerous branches, valves, and packers. With the Completions Manager module in Petrel software, the complex task of setting up completions data is greatly simplified. A tabular interface helps you organize data to suit the task at hand. Whether displaying all the detail associated with the completion of a single well, or every valve or perforation in all your wells, you can find the associated completion data to support your needs.



Depending on complexity, you can choose the most appropriate type of grid (pillar, partial stair step, or stair step).



History match bubble plots.

Enhanced handling of complex wells

Petrel software provides complex well-handling capabilities with automated placement and completion optimization. Easily design complex wells, such as fish-bone and fork wells, and place wells inside geological bodies with precision—in seismic data or in your model. The enhanced Completions Design module enables you to set completions criteria for multiple wells, improving the efficiency of field planning studies. Petrel 2011 includes extended support for inflow control device (ICD) and flow control valve (FCV) completions. Using these new tools and the improved uncertainty and optimization workflows, you can evaluate and optimize well placement and spacing, as well as the type and number of laterals.

Uncertainty analysis and optimization

Improve your understanding of uncertainty and optimize recovery using the Petrel uncertainty and optimization process—create, submit, and analyze a large number of simulation runs. These workflows include sensitivity and uncertainty analysis, optimization, and proxy-model workflows—for both simulation cases and static volumetric cases. Flexible crossplotting and tornado charts support additional analysis capabilities. Optimization of objective functions helps you find the best design or control parameters.

Comprehensive thermal simulation

Petrel 2011 supports workflows for live oil thermal fluids to set up, run, and analyze thermal recovery processes. These tools provide a comprehensive thermal workflow—from creating fluid models to evaluating live oil thermal fluids and boundary conditions.

ECLIPSE software integration

The development-strategy process includes a set of rules that allow you to take advantage of more ECLIPSE software functionality within Petrel 2011. These rules assist with compositional simulation, gas lift optimization, thermal simulation, and keyword use.

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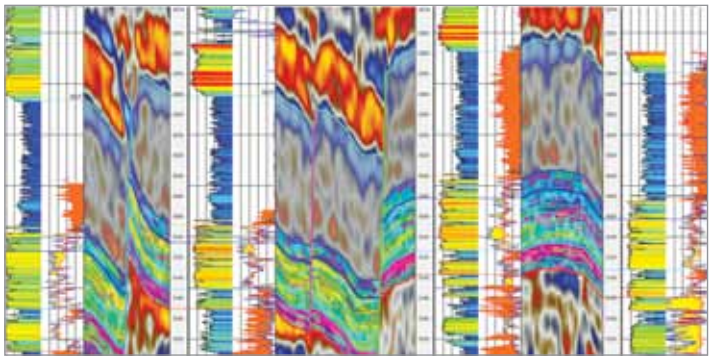
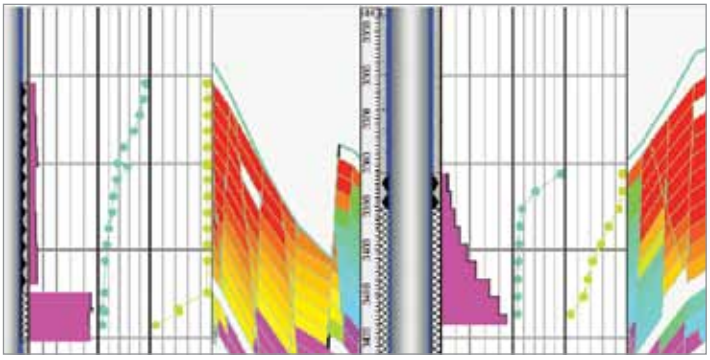


The well section window shows well log data against a backdrop of seismic data and a porosity model.



Use the time player and well section to animate well events, simulated inflow logs, and oil saturation through time.

Advanced gridding and Upscaling module

Petrel software offers a variety of gridding and upscaling techniques for resampling fine-scale geological models to coarse-scale simulation models. Gridding techniques include corner point grids for full fields, structured and unstructured local grid refinements (LGRs) for solving problems associated with coning and horizontal and multilaterals wells, and stair-step (IJK) gridding for handling complex faults such as highly inclined or Y faults. Upscaling supports an assortment of averaging methods, including a flexible tensor-upscaling function to determine effective permeability in each simulation cell.

Quickly analyze hundreds of reservoir simulations

The process of history-matching can be time-consuming and difficult when you have many simulation runs, many wells, and many properties to consider. With the Petrel History Match Analysis module, you can quickly and easily analyze hundreds of ECLIPSE reservoir simulations by using the history matching objective function with the uncertainty and history match analysis processes. This allows you to isolate the most likely realization and arrive at the best history match sooner.

Enhanced user experience

Petrel 2011 offers significant enhancements to the user experience, including upgrades to deck management, results analysis, development strategies, gridding, and aquifer and thermal modeling. Improvements to the simulation data deck management increase the capacity to perform more runs when you are faced with limited disk space. The Results and Case tree has enhanced performance and usability. New, automated line-plotting capabilities dramatically reduce the effort needed to recreate plots. You can now display well-production data in the 3D window with summary data displayed as sphere, bar, stack, or pie graphs.

Intuitive integrated workflows

Historically, the difficulty in preparing input for and analyzing the results from reservoir simulation has been a lack of integration between the pre- and postprocessing tools and the need for many manual, time-consuming data transfers and data-formatting steps. Traditionally, only specialists used reservoir simulation, and only after a long, steep learning curve. As a result, reservoir simulation has not been used for many business decisions in which it would have added tremendous value. The solution is to integrate the necessary workflows surrounding simulation, make the data flows transparent, and make the interface easy to learn. Petrel software provides the ideal simulation workflow integration solution.

Schlumberger Information Solutions

Schlumberger Information Solutions (SIS) is an operating unit of Schlumberger that provides software, information management, IT, and related services. SIS collaborates closely with oil and gas companies to solve today's tough reservoir challenges with an open business approach and comprehensive solution deployment. Through our technologies and services, oil and gas companies empower their people to improve business performance by reducing exploration and development risk and optimizing operational efficiencies.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.

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