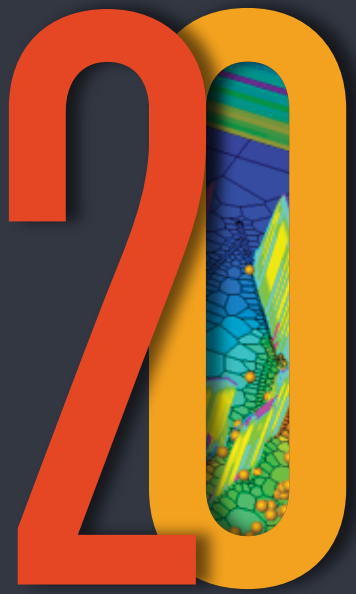

Petrel

Since 1998

Schlumberger

Acknowledgements

For help in preparation of this publication, we thank Gavin Rennick, Lyndsey Lomas, Trond Skjerven, Trygve Randen, Jon Bulman, Clark Chahine, Jorn Letnes, Audun Bremer, Ivar Skauge, Morten Brun, Phil Hodgson, Emer Caslin, Surender Manral, Carlo Caso, Caroline Le Turdu, Maria Popp, Eleanor Steele, Laetitia Mace, Simon Harris, Sofie Nollet, Daniel Palmowski, Cassie Warren, Jan Derks, Fredrik Stabell, Sami Sheyh Husein, Martyn Beardsell, Tormod Slettemeas, Kathryn Fletche, Per Salomonsen, Barbara Claussmann, Sergio Courtade, Tino Grossmann, Marianne Lenormand, Rob Messenger, Kathryn Fletcher, David Rowan, Jose Pina, Shripad Biniwale, Saad Kisra, Adrian Rodrigue, Karsten Fischer, Aaron Scollard, Steve Warner, Artem Khramtsov, Adrian Newton, Pierre Bonningue, Tim Hollis, Patrick Dineen, Stephanie Lee, Keith Tushingham, Keith Burkhart, Edo Hoekstra, Larry Velasco, Hallgeir Fure, Tom Remi Ellingsen, Per Eivind Solum, Mark Douglas, Jonathan Gulliksen, Kim Demail, Laura Gardner, Seth Growney, Lucas Salles, Christine Gardner, Carlos Oscar Bonifax Ancheyta, Annie Thompson, Julie Berg Bringsdal, Kahina Abdeli-Galinier & Raphael Guerithault

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Foreword

Gavin Rennick
President, Software Integrated Solutions

Sometimes it's only when we look back that we realize just how far we've come.

In 2018, it will be 20 years since the birth of the Petrel* E&P software platform—that is, without a doubt, one of the oil and gas industry's defining technologies.

In creating this special anniversary book, we want to take a moment to reflect on that history and to celebrate the many achievements we have made together with you, our clients, and our partners.

In the chapters that follow, you will discover how the Petrel platform developed from a disruptive software concept into an industry-leading ecosystem that has transformed how we analyze geoscience and petrophysical data.

You will hear from the developers who created the first versions of the Petrel platform under Technoguide (including the importance of waffles to software design!) and find out how everyone who has been part of the journey since then has brought so many tools together into one incredible package.

Innovation is the theme that sings from every page. Throughout its life, constant innovation has kept the Petrel platform right at the leading edge.

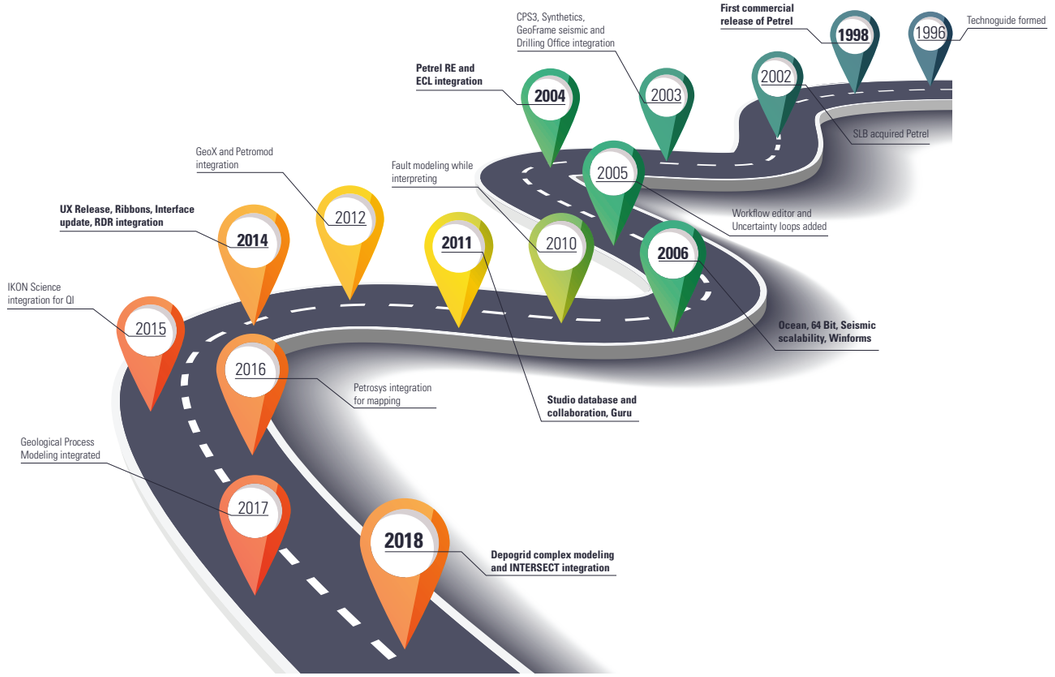
That meant Windows PCs rather than Unix in the early days, which has evolved towards today's rich platform, from data management in the Studio* E&P knowledge environment to unconventional reservoir modeling with Kinetix* stimulation software suite.

The passion and creativity of our user and developer community has been the driving force behind this innovation.

From Technoguide's embryonic beginnings, Schlumberger now coordinates hundreds of developers across ten global locations. There are more than 45,000 users worldwide. All are deeply committed to the platform and we are truly grateful.

But the story doesn't end here. It was not by chance that the Petrel platform was one of the first products we made available in the DELFI* cognitive E&P environment —a Software as a Service model running in the cloud—paving the way for the next wave of technology evolution. And I can say with confidence that the best is still to come.

But for now, please enjoy the book, and thank you for being part of our story.



The Petrel Platform History Overview

Lyndsey Lomas,Trond Skjerven & Trygve Randen

In the early-90s the subsurface software market was comprised of niche products. The first-generation 3D reservoir modeling products had just been commercialized and were competing with in-house proprietary tools in the E&P super majors. While these niche products were all scientifically strong, they were complex to learn and had limited capability to integrate across disciplines.

Technoguide started developing the Petrel platform in 1997. They built it on the Windows platform—a bold decision at a time when UNIX/Linux was the industry standard. Their ambition was to build a true shared-earth modeling program designed to make complex reservoir modeling intuitive, fun, and easy, and which enabled collaboration across the traditional subsurface disciplines.

The first commercial release was in December 1998 and just one year later the first major started global investment in the Petrel platform. By 2002, Technoguide had established a global presence with 125 employees in 10 countries supporting more than 300 E&P clients globally.

The Petrel platform was initially a geological modeling tool but its unique visualization capabilities made it stand out from its competitors.

Petrel

PETREL™

PETREL™
a Schlumberger product group

Petrel

Petrel

For the first time it was possible to view all subsurface data in 3D. The Petrel platform became a natural collaboration tool, enabling asset teams to align on a common understanding of the subsurface. It set a standard for integration that is today taken for granted in our industry.

In 2002, Technoguide was purchased by Schlumberger, bringing product critical domain knowledge to rapidly expand the workflow into geophysics and reservoir engineering. The development team quickly grew from the initial eight developers to over 300. In parallel, the Ocean* software development framework program was refocused on the Petrel platform. This enabled over 700 industry Ocean developers to further enhance the capabilities of the Petrel platform. By the mid-2010s, the Petrel platform had clearly established itself as the undisputed industry leader.

So, what is the secret to the success of the Petrel platform? While the technology and its capabilities played a major part, the key was really the people. Right from the outset, the team has always been passionate about the product and the change it drove in the industry, and this enthusiasm is also evident in our user community. Today, the Petrel platform has an active global community of over 45,000 users who continue to push the boundaries of subsurface understanding.

Petrel Engineering and Portfolio

Jon Bulman, Clark Chahine, Jorn Letnes, Audun Bremer, Ivar Skauge & Morten Brun

Office Life in Technoguide

Back in the really early days, prior to the Schlumberger acquisition, things looked and functioned a bit differently around the office. Nobody had titles, only first names were in use. We didn't have a switchboard, so everyone answered the phone. Roles were flexible. Responsibilities were shared. It was fun. It was exhausting. It was scary. We learned a lot.

The physical surroundings were a bit scruffy-looking, completely unlike the glass-and-steel corporate office building that houses the Petrel platform today. I distinctly remember Nils Fremming storing his spare car winter tires in his office, making it look like he lived in a garage. The office was littered with toys and games, and had semi-matching furniture hastily procured whenever the need arose. One spring, all our meetings had to be conducted in hushed voices whenever Nils Fremming's newest baby decided to sleep for a bit (naturally Nils spent his paternity leave coming to the office every day, baby in tow). During school breaks, the office was full of happy children making the noises that happy children make. The office was part storage, part nursery, part playground, and, most importantly, the place we spent more than 10 hours a day working on the Petrel platform.

All five developers had a complete overview of what the other four were doing. There was no need for a project manager to coordinate things. There was a lot of yelling across the hallway. Our bug reports were hand-written on pieces of paper, which were hand-carried and personally delivered every morning by the QA department.

We had never heard of three-letter acronyms for anything before. We had no process. Everyone just—pitched in. Do we need to squeeze out a new batch of CDs for the release installers? Fine, you do that after work today, and play computer games in the lab while waiting. We need a bunch of new desks? Fine, we'll organize a traditional Norwegian "dugnad" next weekend (i.e., we all work for free, but get beer and have a BBQ after) and get those pesky desks installed.

If you have ever worked in a Norwegian office, you know that waffles are a big deal. We all sat around one table, and we only had one waffle maker, so naturally we took turns making waffles for each other. In time, we learned each other's waffle preferences. Nothing soothes quite like having your CEO fry up and serve you a perfect waffle, with your custom choice of topping, without you needing to say a thing.

> "If you have ever worked in a Norwegian office, you know that waffles are a big deal."

One day I was told to wear a tie by CEO Jan Grimnes, because "some French guys are coming tomorrow, and we don't want to scare them". Turns out it was a scouting party from Schlumberger. And work life, as we knew it, was about to change forever…

Developing the Petrel Portfolio: Talent, Passion, and Innovation

Since the acquisition, the team that develops the Petrel platform is composed of three distinct groups: Portfolio, Engineering, and Commercialization. The first representing the business, the second the technology, and the third the quality. These groups always attracted the best people within the organization, very often driven by the passion for the domain, the taste for technology, and the love of challenges.

The Petrel portfolio is a great example of these characteristics, and this group has attracted a variety of talented and passionate individuals. These individuals have, and still are, interacting with customers around the world to build the most relevant software platform in the industry. They master the translation of users' problems into technology needs that engineers can understand and innovate on. Over the years, working with the engineering and commercialization group, the portfolio has designed over 2,800 functionalities (14 million lines of code equivalent), used daily by over 45,000 users worldwide.

The development of the platform follows a technology pattern. Every 4 years or so, a brand-new technology or approach enables the platform to grow. In 2005, it was Windows 64 bit; in 2009, it was the implementation of CRS and spatial capabilities; in 2014, it was the new UX with the ribbon; in 2018, it is Depogrid and the expansion into the brand new world of the DELFI environment, which takes the capabilities of the Petrel platform to the next level. We expect the cloud enablement to take the Petrel workflows way beyond what users can do today.

We understand that it takes commitment and innovation to design the best products that are tailored to our customers' needs. We are constantly seeking new input to our group and our team is eager to bring new skills to the table.

1

Geophysical Interpretation

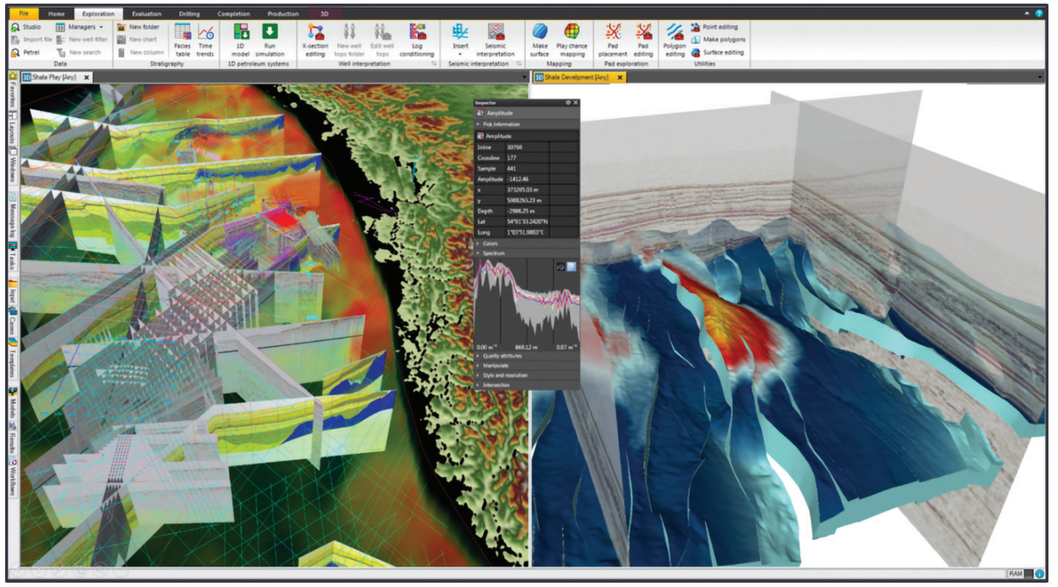
Phil Hodgson, Emer Caslin, Surender Manral & Carlo Caso

The integration of the geophysical interpretation technologies within the Petrel E&P software platform has been one of the first fundamental developments to enable the end-to-end—"from seismic to simulation"—approach in Subsurface Characterization, which is the key signature of the Petrel platform. The developments in geophysical interpretation have not only involved the domain science, but also the integration with the other disciplines, and the need for scalability and usability. In the domain science, one of the key milestones has been the launch of the ant-tracking patented algorithm, which is still one of the most powerful tools available in the Petrel platform to highlight and interpret structural elements (like faults and fractures) from a seismic cube. The Petrel platform now has more than 40 seismic attributes to perform advanced seismic reconnaissance and seismic facies classification. The seismic rendering capabilities, first launched in 2008, have continuously improved, up to the seismic mesh probes launched with the latest 2018 release. Even the subtlest stratigraphic and structural elements can be extracted from the seismic and converted in geobodies for geological characterization (property distribution) and hydrocarbon volume calculations.

In terms of scalability, the Petrel platform introduced a big change in the visualization, manipulation, and interpretation of large volumes of seismic in 2007, when the new format ZGY was created. Now it represents the standard to perform geophysical interpretation workflows within the Petrel platform. Over the years, many other developments have been made, including the support for 64 bit, multi-synthetic workflow, multi-thread depth conversion, and the management of multiple seismic reference datums, for instance.

The continuous development in usability is represented by the improvements in the autotracking algorithms made in each release: automated fault extraction tools, seismic reconstruction, and more recent tools like fault contacts and horizon prediction. This represents an advanced suite of functionalities to enable fast interpretation and accurate QC, improving confidence in interpretation.

In addition, pre-stack interpretation and quantitative interpretation tools make the geophysical interpretation workflow in the Petrel platform very comprehensive. They provide intuitive capabilities to solve the most complex structural and stratigraphic challenges and to empower multidisciplinary teams to collaborate across the asset for rapid qualitative and detailed quantitative workflows in an integrated workspace.



2

Quantitative Interpretation

Caroline Le Turdu & Surender Manral

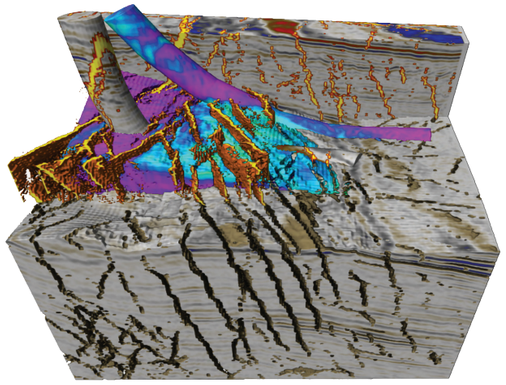
The acquisition of Odegaard A/S by WesternGeco in May 2006, brought leading-edge simultaneous inversion techniques and new seismic-driven reservoir characterization into the Amplitude Versus Offset (AVO) and inversion arena. These techniques were then integrated in mature standalone applications in Schlumberger WesternGeco (Log Conditioning, Multi-Measurement Reservoir Definition [MMRD] functionalities) but they were tools still "disconnected" from the rest of the reservoir characterization process.

In 2012, operators were seeking to increase their subsurface knowledge and integrate attributes from well log and seismic data in new ways to better understand rock properties. Integrating data sets such as well logs, seismic data, and other data sources to perform rock property analysis was frequently cited as the most challenging task in performing reservoir characterization. More than 50% of the operators surveyed (Worldwide Survey of the Market for Reservoir Characterization-2012 Edition) expected heavy use of rock physics, property analysis, seismic attributes, AVO elastic inversion and well log conditioning for quantitative interpretation over the 2 to 3 years to come.

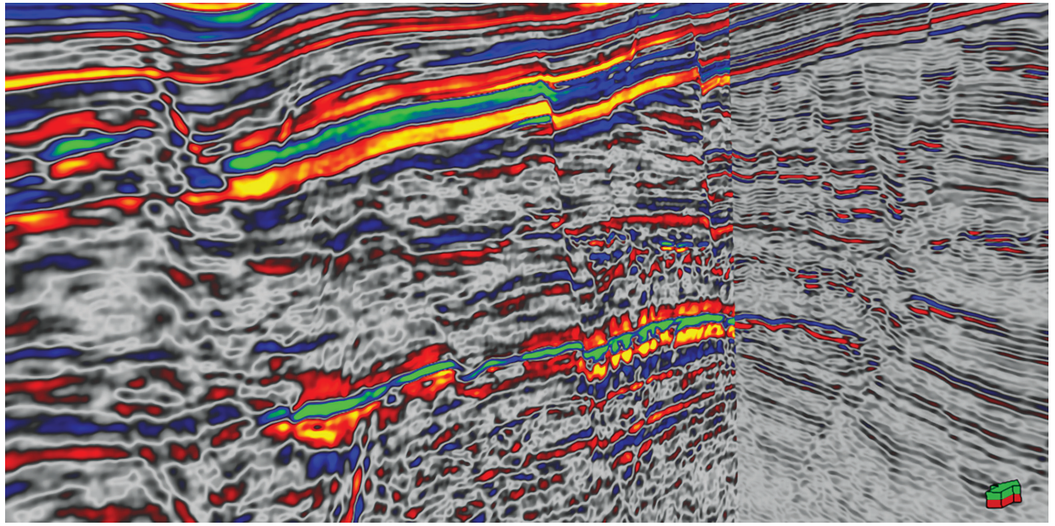
A test campaign started in Brazil at the BRGC Schlumberger Research Center to test the first integration of Quantitative Interpretation tools from WesternGeco into the Petrel platform. Schlumberger, but also some external clients, were selected to test the first Quantitative Interpretation (QI) AVO and Rock Physics tools integrated into the Petrel platform. In 2013, we introduced the first plug-in of Petrel Quantitative Interpretation which enabled basic AVO and rock physics, as well as simultaneous seismic inversion.

In November 2015, Schlumberger and Ikon Science signed a Joint Development Agreement to further develop the existing quantitative seismic interpretation capability in the Petrel E&P software platform. By bringing capabilities of the RokDoc® software into the Petrel platform, this collaboration contributed to the creation of high-value seismic workflows fully available to clients and allowed easy access to advanced reservoir characterization tools.

Now Petrel Quantitative Interpretation enables true integration of multidisciplinary seismic with well and geological data. This ensures complete description of reservoir properties and extends conventional qualitative interpretation to a quantitative interpretation workflow in the same canvas.



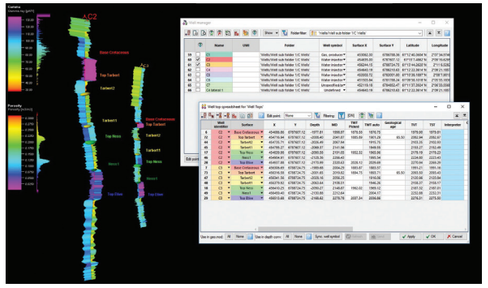
Without leaving the Petrel platform, Petrel Quantitative Interpretation provides seamless seismic data conditioning, rock physics, fluid substitution, AVO/AVA analysis, and seismic inversion (pre-stack, post-stack, deterministic, stochastic) to predict lithologies, pore fluid content, and seismic pore pressure.



3

Geological Interpretation

Maria Popp, Eleanor Steele & Laetitia Mace

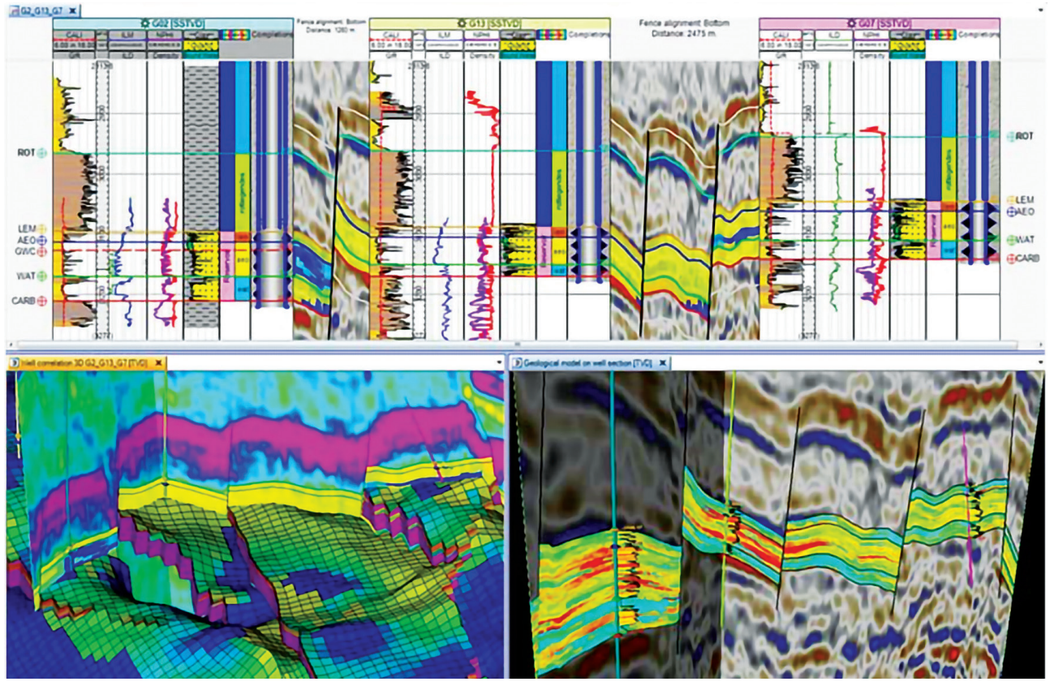


Wells, logs, and well tops are naturally part of the Petrel platform – key objects that are used in many workflows. Over the years, the usability of well-related data in Petrel platform has continuously been improved by the Well Manager, the Well Tops spreadsheet, and the ability to filter wells using the Saved Search functionality, just to mention a few of the available tools. In the 2014 release, the Wells surveys folder was introduced. This provided the user with the functionality to have multiple surveys and plans in one main well. In the 2015 release, the old well type was retired and completely upgraded to the enhanced new well model. The surveys and plans can be generated manually or imported in several different formats. The new well model also allows for lateral wells to be more tightly linked to the main borehole.

The Well Section Window is the optimal tool for correlation of well logs and other well-related data. The well section window was thoroughly reworked and the new version, with a focus on user experience, was released in 2010. All the well section windows settings and all the well section template settings were moved into one dialog, each with the ability to define preferences and set up user-defined defaults to be reused and shared

between projects. Since then, the well correlation window has improved to support more data types and include new functionality in every release.

Creating geological maps has also always been at the heart of the Petrel platform. It is possible to use any type of input to create robust geological interpretation that can be visualized in 3D and in map views as well. Performances are continuously improved through multiresolution mapping of large surfaces (>10 million nodes). User experience is enriched by live collaboration, i.e., real-time sharing of objects (such as well tops, surfaces, and point sets) among multiple users while interpreting. In 2016, a Petrel platform mapping module by Petrosys® was integrated and offers the full functionality of this industry-leading mapping package.



4

Fault Seal Analysis

Simon Harris, Russel Davies & Steve Freeman

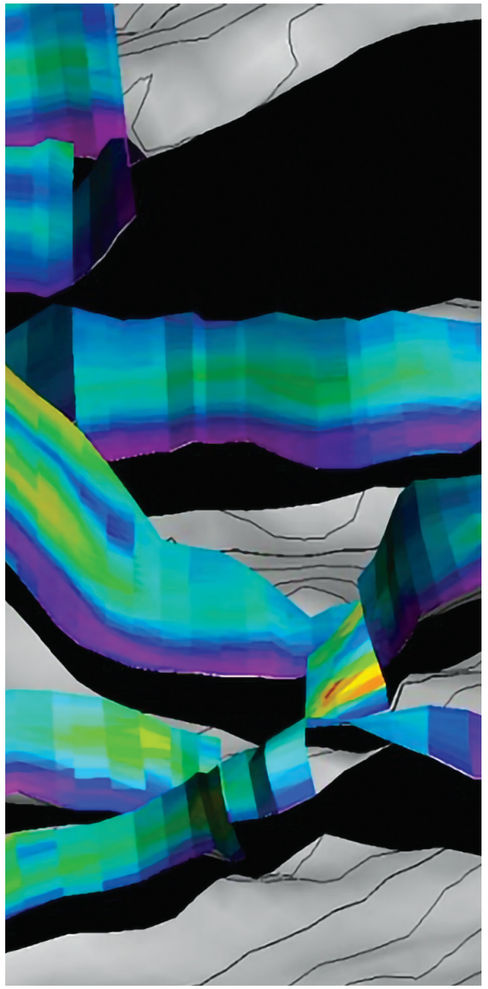
The first approach to fault seal analysis in the Petrel platform came in the Petrel 2003SE release and was driven by the Petrel RE need to implicitly model geological fault seal properties in the ECLIPSE* industry-reference simulator. As such, the ultimate aim of fault seal in the Petrel platform at this time was the generation of fault transmissibility multipliers.

In 2007, Rock Deformation Research (RDR) began discussions with Schlumberger to embed their in-house fault seal and structural analysis technologies into the Petrel platform, mainly prompted by a long list of customer requests for updated fault seal algorithms for both exploration and development. RDR was a small structural geology consulting company based in Leeds, UK, that had a global reputation in the application of fault seal analysis for oil and gas industry customers. Over the following 2 years, RDR developed an extensive set of structural analysis tools using the Ocean framework and launched the first version of the Structural and Fault Analysis (SFA) module in the Petrel platform 2010 for structural trap validation and fault seal analysis. The module aimed to contain ‘favorite’ tools for all Petrel platform users, from explorationists to geomodelers to reservoir engineers. The relationship between RDR and Schlumberger was unique in that the SFA tools were embedded as a Petrel module and not as a separate plug-in. The SFA module saw the re-focusing of the fault seal calculations in the Petrel platform towards the geomodeler and provided tools for the user

to really understand the potential for fault seal in their prospect or field. Geoscientists were now able to model all the major uncertainties associated with fault-related fluid flow in petroleum reservoirs in a single platform and thereby reduce the risks associated with drilling new exploration and production wells. In addition to workflows on fault seal analysis, the module includes rapid data clean-up tools, attributes for the identification and analysis of structure and interpretations, fault throw uncertainty, fault property predictions, and many more.

The RDR–Schlumberger collaboration on the SFA module was extremely successful, and RDR was subsequently acquired by Schlumberger in March 2014. The SFA module continues to grow and offers exciting future developments focused on fault seal tools in exploration prospect appraisal and the SFA workflows applied to the VBM Volume Base Modeling–depogrid–INTERSECT* high-resolution reservoir simulator end-to-end modeling.

> Geoscientists were now able to model all the major uncertainties associated with fault-related fluid flow in petroleum reservoirs in a single platform.



5

Petroleum Systems Modeling

Sofie Nollet, Daniel Palmowski, Cassie Warren,
Bjorn Wygrala & Jan Derks

PetroMod* petroleum systems modeling software has been on the market since 1991. Developed by Integrated Exploration Systems (IES), it evolved to become the leading basin and petroleum systems modeling software product developed by Integrated Exploration Systems (IES). In 2008, IES was acquired by Schlumberger and the PetroMod product was transferred in 2010. Shortly after, a basic data exchange plug-in was developed. With the release of Petrel 2010.1, first steps were taken to better integrate PetroMod functionality with the Petrel platform via the Petroleum Systems Quick Look (PSQL) plug-in. In 2011.1 The exploration Toolkit combined PSQL and Play Chance Mapping into one exploration solution.

Petroleum Systems Quick-Look (PSQL) enables basic petroleum systems modeling functions to be performed directly in the Petrel platform on data such as mapped surfaces and fault polygons. This enables quick-look drainage area and regional flow direction modeling to be performed using proven PetroMod functions. It is especially useful in combination with automated workflows in the Petrel platform, for example for depth-conversion uncertainty analysis on both prospect/field and basin scales.

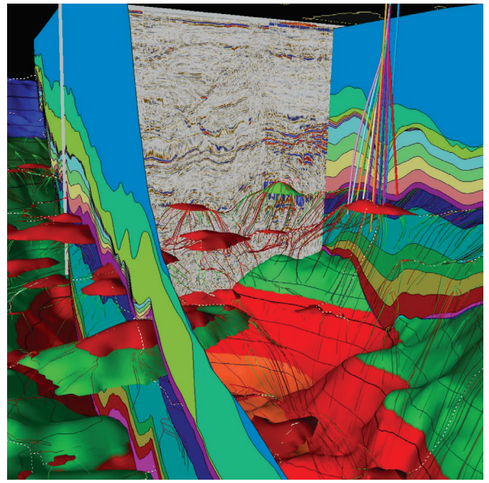
With the Petrel 2012.1 release, the plug-in evolved to a full Petrel module called Exploration Geology combining PSQL, Play Chance Mapping, and the new Prospect Assessment tool with a direct connection between the Petrel and PetroMod projects available for all geoscience core users. Play Chance Mapping and Prospect Assessment (which later became Play to Prospect Assessment) will be addressed in more detail in the next chapter.

Shortly after that, in 2012.2 the first Petroleum Systems 1D modeling solution, running fully independently of the PetroMod software, was introduced in the Petrel platform as part of Exploration Geology. It added the Geotime Window, extending the Petrel platform with the concept of geologic timescales. This new module now made it possible to combine the power of the Petrel platform with the PetroMod petroleum systems

simulation technology. The PetroMod Lithologies containing the thermal, mechanical, and migration-related properties of more than 180 lithologies, were fully integrated in Petrel 2014.1 and marked the time when more and more petroleum systems specific modeling capabilities were added to the Petrel platform.

From 2014 onwards, significant efforts were made to maximize the Petrel platform's structural modeling capabilities to build better and higher resolution petroleum systems models by enabling the consumption of fault geometries and fault properties directly in PetroMod models.

In Petrel 2015, the PetroMod simulator was fully connected to the Petrel platform, allowing



users to build petroleum systems simulation cases, including kinetics for defining source rock maturation, simulator settings, and boundary conditions to directly start simulation jobs from within the Petrel platform.

Between 2016 and 2018, further improvements and workflow integrations were made to fully leverage the Petrel platform's capabilities for petroleum systems modeling workflows. The 1D workflow has evolved to read facies and/or Total Organic Carbon (TOC) directly from well logs, run multiple scenarios with the workflow editor, and view the 1D results either in the well section window or in the interactive Geotime window. Users are able to build high-resolution 3D petroleum systems models with Petrel facies modeling tools and integration of seismic lithofacies. Models can be viewed through geological time with the simulation preview. Geometrical adjustments allow for eroded sections or changing paleowater depth, and transfer of complex structural models make it possible to simulate complex basin evolutions including thrust geometries. After simulation, results can be visualized together with contextual data such as wells, logs, culture data, seismic, and other modeling results allowing a fully integrated exploration workflow in combination with Play and Prospect Assessment.

Finally, with Petrel 2018, a data exchange from seismic objects to the PetroMod 2D Builder has been established, extending the petroleum systems capabilities of the Petrel platform towards 2D models.

6

Play to Prospect Assessment

Fredrik Stabell & Sami Sheyh Husein

GeoX* exploration risk, resource, and value assessment software entered the market in 1994 with a play assessment solution and was developed by GeoKnowledge. It evolved to be the leading decision support solution to evaluate risk, resources, and economic value for assessment of play and prospect uncertainties in exploration. GeoX* software works over a corporate database allowing efficient management and reporting of an exploration portfolio. In 2013, GeoKnowledge was acquired by Schlumberger and the GeoX product was transferred in 2014.

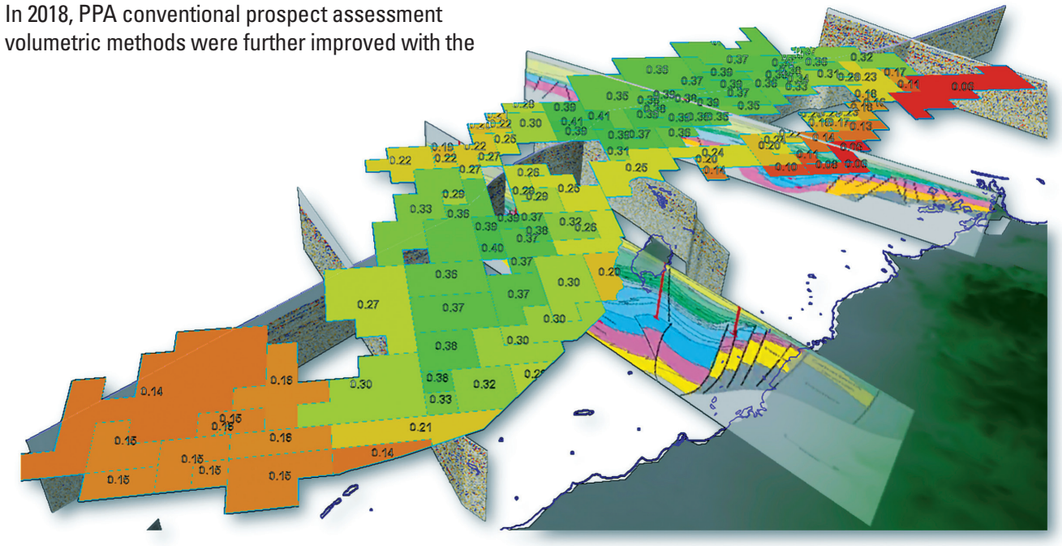
Play and Prospect Assessment (PPA) is the tool where we first saw the basic building blocks of GeoX software being integrated into Petrel 2015.3. The tool is designed to bring the resource assessment closer to the subsurface data in the Petrel platform. Assessment workflows in 2015.3 only focused on continuous resource play assessments for shale oil and gas. The process brought in new objects to the Petrel platform: the Geopolygon, a Petrel object with a behavior of shape-files. The Geopolygon was a prerequisite for industry standard map-stacking approaches, where the risk element polygon-maps are stacked together to create assessment units. Assessment units are spatially discrete areas that share risks within them. Assessment units are further attributed with ranges of volumetric, local risk, and fluid parameters to enable a stochastic Monte Carlo calculation that produces results in the Petrel platform and which are also saved in the GeoX database.

Conventional assessments were first introduced in Petrel 2016.1, where simple single-segment prospects can be assessed using the modified slab volumetric method: area, thickness, and geometry factor. A Geopolygon set representing multiple single-segment prospects from one play can be used alongside a stacked composite play risk map to quickly populate the play risks to all the prospects consistently from the maps. This feature enhanced the link and consistency of prospects to the underlying play risk maps.

With the Petrel 2017.1 release, the map-based assessment workflow was further enhanced by integrating results produced by the Play Chance Mapping tool (PCM). PCM uses geologically-based proxy property maps to create continuous risk grid maps, and in 2017.1 it also produced a secondary result: Geopolygon objects. The Geopolygons represent the play and conditional risk elements of the play to be assessed. The risk Geopolygons were directly usable in the PPA tool, where the risk values from each map would be automatically populated in the assessment units. This method proved very useful for continuous resource plays such as unconventional assessments, where the stacking of the play and conditional risk elements could produce hundreds of assessment units.
In 2018, PPA conventional prospect assessment volumetric methods were further improved with the introduction of the first depth-area pair method. The method uses function objects extracted from top reservoir depth surfaces in the Petrel platform to calculate gross rock volume.

Spatial assessment reporting methods were introduced, with workflows facilitated by spatial reporting and analytics tools in the Petrel platform where the Geopolygon outlines for nations, licenses, basins, plays and segments can be saved directly into the GeoX database from the Petrel platform. Saved outlines logged important historical information and metadata of the assessments.

GeoX Exploration Risk, Resource, and Value Assessment Software



7

Pillar Gridding

Caroline Le Turdu & Martyn Beardsell

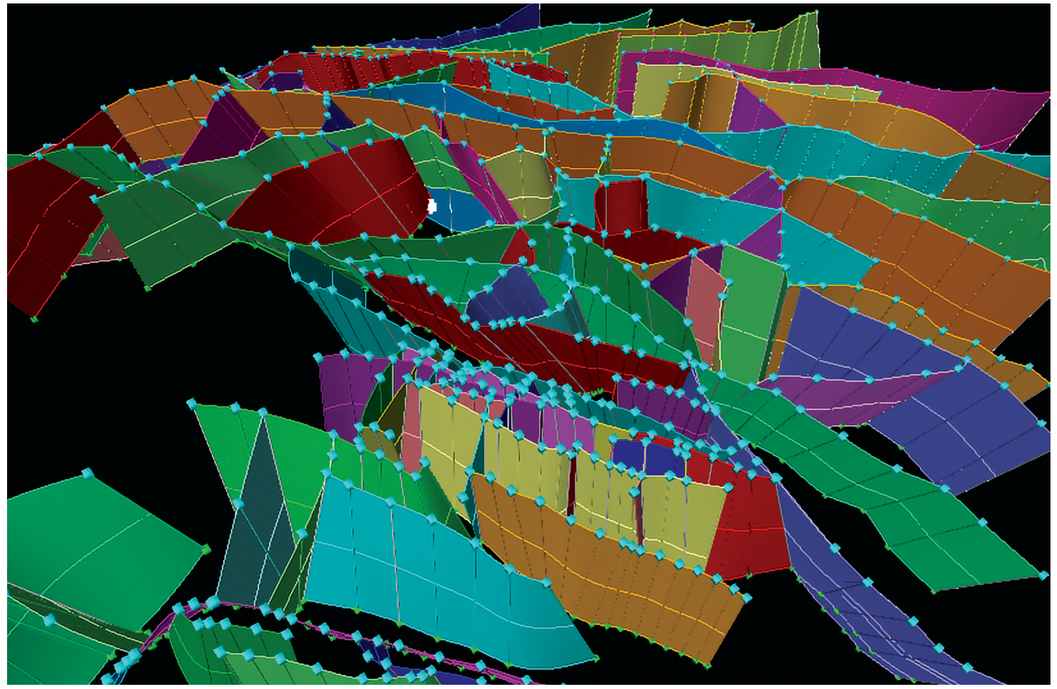
Firstly, why is a grid so important? Well, probably the two most important results from a subsurface study are the evaluation of the volumes of hydrocarbons in place and the results of reservoir dynamic simulation, both of which usually require a grid which represents the reservoir rock geometry and its properties.

The Petrel platform was first released in late 1998. At that time, it had little functionality except for a very innovative way to build a corner point grid which they called Pillar gridding. It was faster, more robust, and, above all, easier to use than anything else on the market, even in quite complex cases. This gave the Petrel platform its entrance to the market.

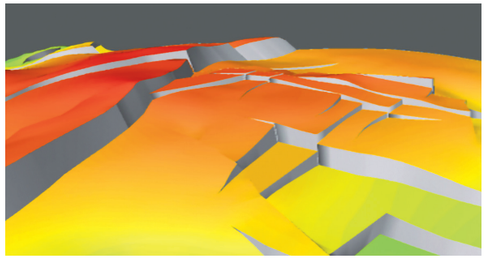
The process is very logical:

- Define the faults by pillars which are splines passing through two, three, or five points.
- Set up boundaries and trends to create a 2D mesh in the middle of the fault pillars.
- Extrude the 2D mesh following the key pillars to create a skeleton.
- So what you have at this point is a discretization of the space into a set of pillars (coordinate lines).
- The horizon data can then be gridded and intersected with these pillars to create major horizons.
- More horizons can then be added using well tops and isochores (Make zones).
- Finally, the zones can be divided into cells using the Make Layers process.

As a result, this new method makes the Petrel platform a unique technology able to create very robust 3D models including a lot of complex faults, even connecting and truncated faults. Back in 2000, during trials, we used to deliver 3D grids sometimes in less than a day which was very convincing and would usually trigger a more serious trial and training.



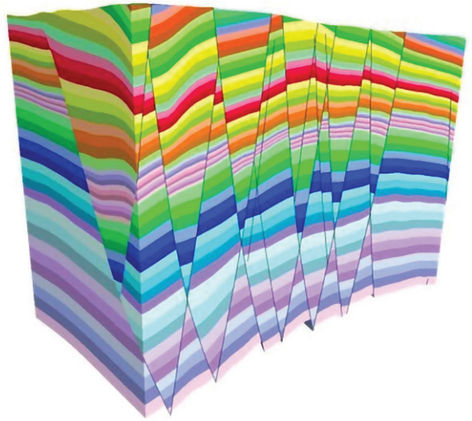
In the last few years, the Petrel platform has further advanced gridding by producing a structural framework that can handle more complex geometries and then turn them into stairstep grids or depogrids. However, there are still many reservoirs around the world that can be modeled very effectively using the Pillar grid methodology so it remains a key functionality of the Petrel platform today.



8

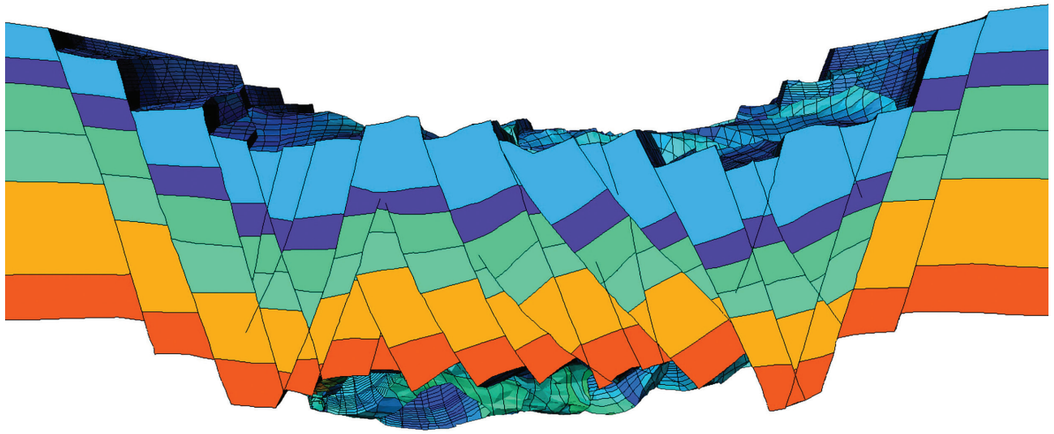
Structural Frameworks and VBM

Tormod Slettemeas, Kathryn Fletcher & Leigh Truelove



2010 saw the first introduction in the Petrel platform of an alternative to the pillar fault model. Petrel structural modeling surface-based technology from WesternGeco was then tested to target complex reservoirs which could not be modeled with pillar gridding method. The 2011 release introduced the structural gridding process that directly constructed stair-stepped corner point grids from this structural framework, with associated structural and fault analysis operations.

The Petrel 2014 release is best known as the “UX” release, and the structural modeling took full advantage of the user interaction improvement opportunities. It also introduced the integrated dual-scale reservoir modeling with aligned resolution between geological and simulation grids and fast accurate upscaling.



The acquisition of IGeoss in 2010 brought an exciting new volume-based modeling (VBM) technology to Schlumberger with its concepts of mechanical up-faulting, the stratigraphic function and Depospace. A VBM algorithm for structural model construction was first released in 2013.2 alongside the surface-based algorithms, before becoming the sole algorithm from the 2014 release onward. Depospace has been used to improve the accuracy of geostatistical property modeling since this release.

The 2015 release saw the launch of two major multi-year projects, each of which had extensive client testing programs throughout the development. The first project rearchitected the structural modeling code and user interfaces from the Fault Framework to Depospace to improve robustness, sparse data handling, performance, and usability. The second introduced the unstructured Depogrid to the Petrel platform to meet the increasing challenges of modeling and field development planning in complex structural environments. Property modeling, reservoir engineering, and visualization in the Petrel platform were all upgraded to support the new grid to provide an end-to-end workflow with accurate and efficient INTERSECT flow simulation.

The speed with which a grid is generated from the initial fault framework is really a step-change in the modeling world, the same way the pillar gridding was twenty years ago!

Modeling and Simulation with Depogrid

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Geological Process Modeling

Per Salomonsen, Barbara Claussmann & Sergio Courtade

GPM geological process modeling software was first developed as part of a WesternGeco research project in the early 2000s; and was then picked up and expanded by both the Schlumberger-Doll Research Center and the Schlumberger SIS Norway Technology Center. The initiative came as a result of the oil and gas industry continuously pushing to improve conceptual geological models, and, therefore, make better predictions of where to drill.

In 2015, a Collaboration Joint Industry Project (JIP) emerged to steer the development of the GPM software technology and address the industry needs for advancements in subsurface modeling and analysis tools. Further developments and enhancements were made, and the GPM software was finally launched as a foundation technology for the Petrel E&P software platform in June 2017.

The GPM software is a simulator for forward modeling of stratigraphic and sedimentary processes that offers a methodology to model siliciclastic and carbonate reservoirs based on the principle of mass and energy conservation.

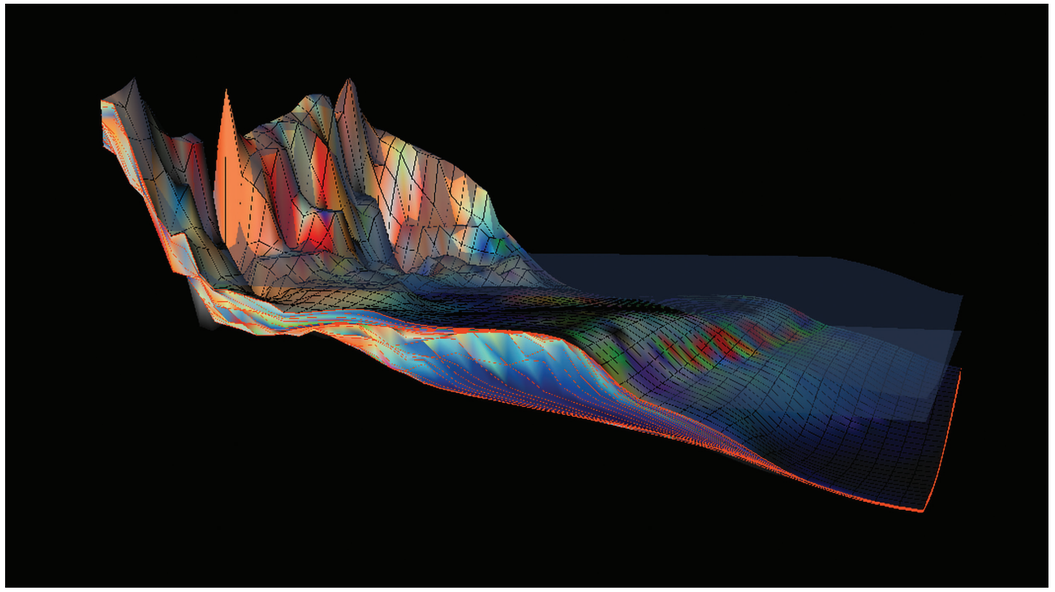
The GPM software works as a digital sedimentary laboratory and generates geological models by numerical simulation of the physical processes and principles of sedimentation in combination with well-documented empirical rules. More specifically, the GPM software models the erosion, transport, and deposition of clastic sediments as well as carbonate growth and redistribution—either independently or concurrently—in different geological settings.

The resulting geological models allow the users to explore different physically defensible scenarios, and to gain insights into the depositional architecture and composition of the sedimentary sequences resulting from the interaction of sea level changes, paleogeography, paleoclimate, tectonics, and variation in sediment supply.

Tightly integrated with the Petrel platform, the GPM software provides advanced subsurface modeling and analysis tools within the same canvas. Realistic, deterministic models of clastic and carbonate sediments away from the wells are created, leading to enhanced reservoir simulation models, and better drilling predictions.

Relevant throughout the entire E&P lifecycle, the GPM software addresses challenges at different scales, from basin to reservoir, improving the mainstream modeling workflow. This technology offers a unique opportunity to test, validate, and redefine the existing geological interpretations and concepts, thereby revealing potential new exploration and development prospects, and reshaping the geological modeling workflows.

Geological Process Modeling



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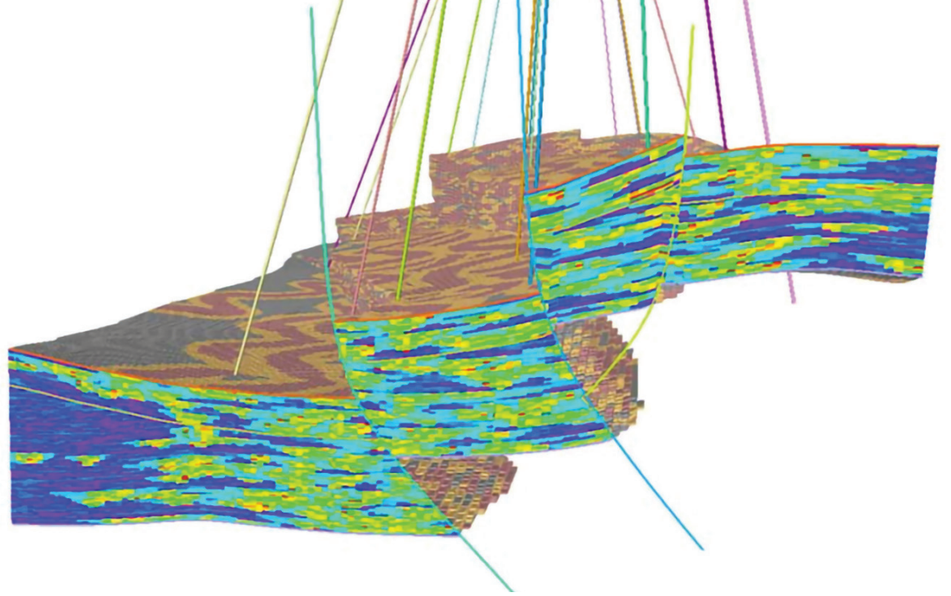
Property Modeling

Tino Grossmann & Marianne Lenormand



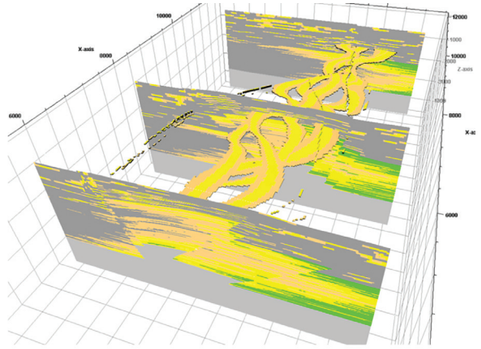
In Property Modeling, the worlds of Geoscience and Mathematics meet. Hard data information from wells, converted seismic attributes, and even ideas like conceptual depositional models as soft data are possible inputs to the many algorithms.

Already, in the early days of the Petrel platform, property modeling was in place, helping bring these different inputs together for deterministic and stochastic estimation of reservoir properties and volumes of hydrocarbons in place. Different scenarios can be tested, and stochastic approaches ensure the range of uncertainty is properly considered within field development plans, helping to assure the most reliable decision making. In addition, for the past 20 years, Property Modeling in the Petrel platform has been continuously enriched with new functionalities and geostatistical engines. All these enhancements have increased the understanding of reservoir characteristics but also facilitated the combination of geological conceptual knowledge with known data.

Over the years, the Petrel platform allowed the integration of more geology supporting algorithms and modules to characterize the subsurface. It resulted in a better representation of reservoir characteristics and a more accurate evaluation of volumes in place.

This steady progression of Property Modeling in the Petrel platform has been highlighted in the first decade by key enhancements of existing algorithms but also by the implementation of new developments like Classification and Estimation in Petrel 2004, Fracture Modeling in Petrel 2007, or MPS with pattern object algorithm in Petrel 2009.

More recent developments like Trend Modeling in Petrel 2012, quality assurance maps in Petrel 2014, new MPS in Petrel 2015, or the latest adaptation of the property algorithms to Depogrid in Petrel 2018 are other examples illustrating our teams' dedication to continuously improve modeling methods and features to magnify the Property Modeling experience in the Petrel platform.



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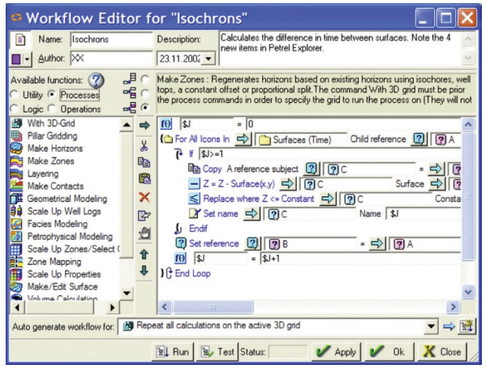
Uncertainty and Workflow Editor

Martyn Beardsell & Rob Messenger

The workflow manager made a big splash when it was first released in Petrel 2002. It was a revolutionary concept: in other systems, workflows were captured as scripts which often had to be recorded and hand edited to produce a usable workflow. In the Petrel platform, the objects themselves contained all that was needed to recreate them—inputs and algorithms. People soon appreciated its power and ease of use in constructing macros and repeat tasks.

At the outset, one of the workflow manager's key features was its ability to generate a workflow from the processes and settings that went into the construction of a model. Not only did this allow the complete modeling process to be captured, but it also made the reconstruction or update of a model—historically a difficult procedure—to be performed very simply. It became much easier to realize the ideal of the living model. So, for example, if a new well was drilled, everything from velocity modeling, model creation, volumes, and, eventually, simulation could be rerun automatically.

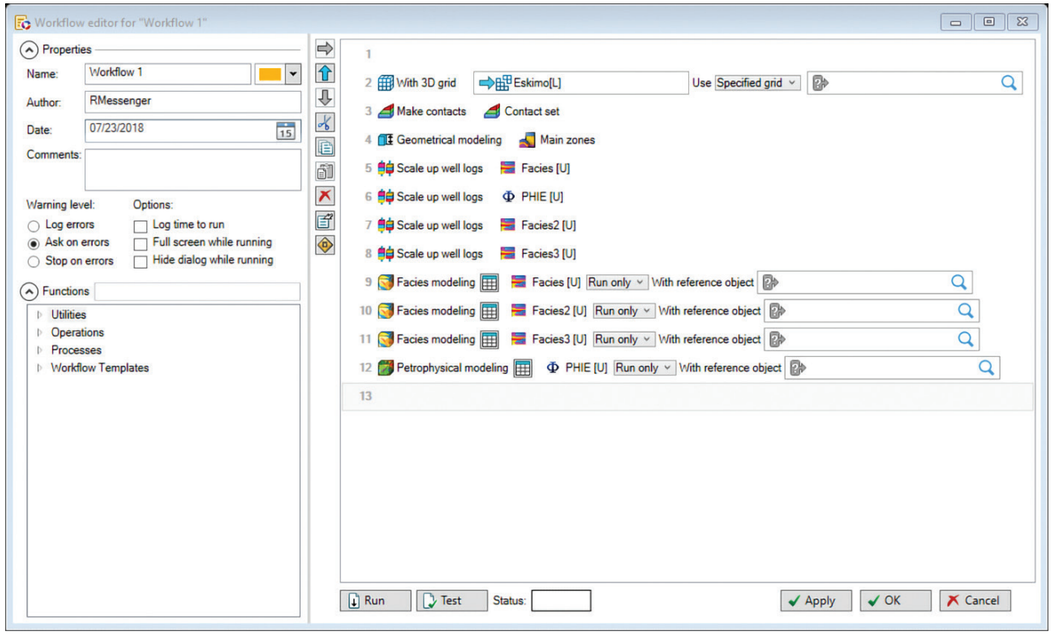
With the introduction of variable substitution in processes, it became possible to script multiple realizations of models and thus, in Petrel 2005, the uncertainty workflow editor was born. Since that time, the options for uncertainty and optimization have grown hugely in sophistication in the front end, but the workflow editor is still the engine behind the scenes.



Workflow editor, Petrel 2002SE

One reason for the success of the workflow editor was the user experience it offered. Not only were the scripts built up out of friendly graphical objects, but a whole workflow could be built out of the processes pane. Carrying this familiar component over into the workflow editor made the barrier to entry very low. Petrel 2018 makes another step in the journey, giving the dialog a facelift and introducing features such as search.

To this day, the workflow editor remains a key part of our customers' operations, whether it is in conducting advanced uncertainty and optimization (U&O) studies or in disseminating expert knowledge and best practice. No less important is the value it has for Petrel development in automating test scripts. Power users and testers rejoice!



Workflow editor, Petrel 2018

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Simulators

Kathryn Fletcher, David Rowan, Jose Pina & Shripad Biniwale

Shortly after the acquisition of Technoguide by Schlumberger, we began the rapid expansion of the Petrel platform into the geophysics and reservoir engineering (RE) domains. The original RE visionaries saw the value of an integrated modeling and simulation environment on a single platform—a user workflow-driven combination of the Petrel platform, Flogrid, and ECLIPSE Office.

Throughout the history of Petrel RE, the Ocean framework software has accelerated the growth of reservoir engineering workflows on the Petrel platform. Third-party companies and Schlumberger have developed plug-ins such as the Hydraulic Fracture Modeler and EOR screening, to name just two of the 35 RE plug-ins in the Ocean store. Several clients have linked their in-house environments and simulators with Petrel RE to improve their internal workflows, and other Schlumberger product lines build RE plug-ins to support our petroleum engineering services, for example Geotesting by Well Services and ICD Advisor by Completions.

The first RE technologies added to the Petrel platform were the Frontsim streamline simulator and the Fault Analysis module from Flogrid, in the 2003SE release. In those days, Nils Fremming himself quality checked the code to ensure you did not break the strict Petrel platform coding standards. By the 2005 release, a concerted team effort had delivered a graphical simulation pre- and post-processing environment.

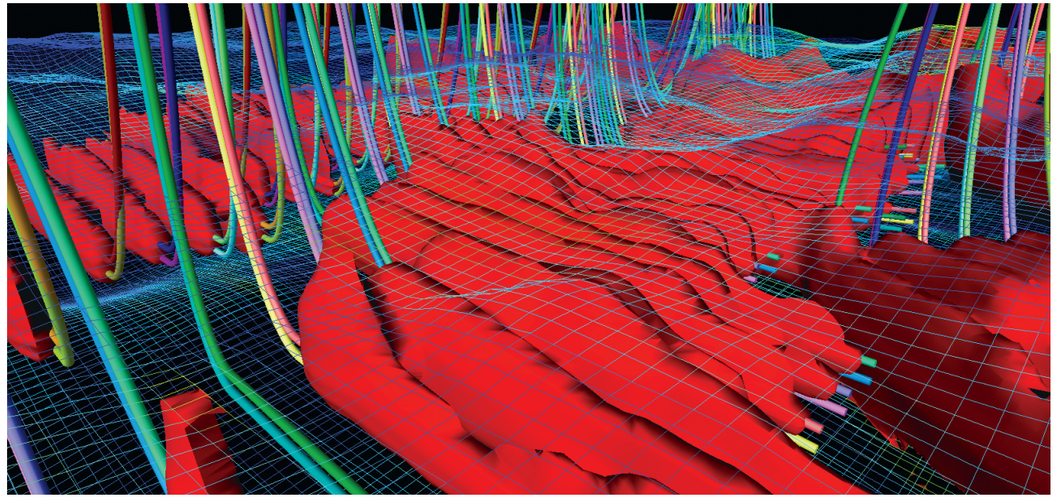
Roll forward 5 years and by 2010, high-value workflows such as history match analysis and the complex well and completion design had been delivered in collaboration with clients. The introduction of Petrel U&O automated the creation of Petrel workflows to quantify uncertainty and added optimization algorithms for history matching and field development planning. Over the next 4 years, there was a focus on usability, automation, and performance, culminating in the ground-up redesign of the RE user experience for Petrel 2014. Six months working on a field development plan gave the user insight to design the results charting and analysis process for rapid automatic, customizable summary plots. Petrel RE introduced the tools for common reservoir and production engineering tasks such as nodal analysis, rate transient analysis and decline curve analysis.

Dual-scaling reservoir modeling put the simulation grid at the heart of the modeling workflow. Dual porosity, compositional, and thermal simulation support grew. We integrated the INTERSECT simulator into the Petrel RE workflow.

We have focused the recent releases of Petrel RE on our core mission to provide an enjoyable and efficient simulation environment for the INTERSECT and ECLIPSE simulators. History matching in the Petrel platform is easier than ever with increased automation, INTERSECT simulator user edits, and the grid property modifiers. There have been major reverse engineering developments to convert ECLIPSE input decks into the Petrel platform models in support of migration from the ECLIPSE simulator to the INTERSECT simulator. We have made numerous usability enhancements over the past two years to the Field Management (FM) dialog used to design INTERSECT FM strategies, including long-planned templates to autogenerate elements of common strategies.

Looking forward, integrated Petrel RE-INTERSECT support for the Depogrid workflow reduces the need to compromise simulation model resolution, and the Petrotechnical Suite in the DELFI environment gives the advantages of the Petrel RE workflows linked to the elastic simulation compute resources of the cloud.

Petrel Reservoir Engineering



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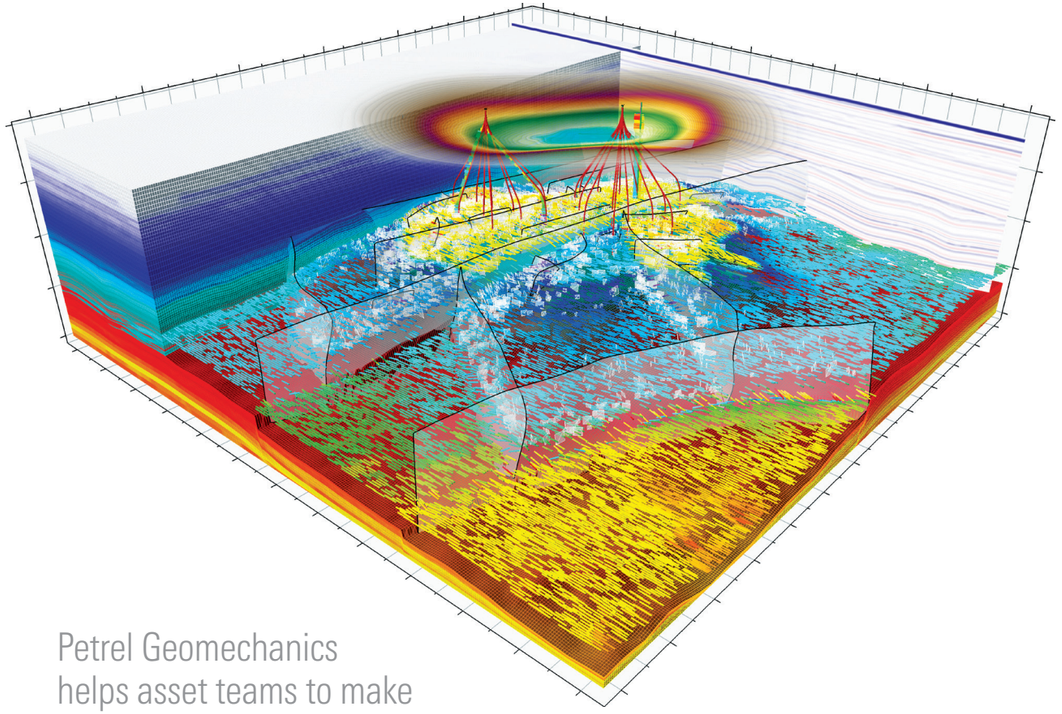
Geomechanics

Karsten Fischer, Saad Kisra & Adrian Rodriguez

Since the introduction of the Petrel Reservoir Geomechanics plug-in for Petrel 2012, the ambition has always been to provide an end-to-end workflow for non-expert and expert users to extract maximum value from geomechanics insights for different applications ranging from exploration and field development to abandonment. Over the years, the Petrel Geomechanics workflow was continuously improved in terms of functionality and usability, and became a critical part of the Petrel platform integration from 'seismic to simulation' story in 2015. Today, the Petrel Geomechanics workflow is widely considered the most complete of its kind in the industry allowing the users to: easily embed reservoir simulation grids in geomechanical models; run VISAGE simulations using the Petrel interface; leverage seismic inversion data to build complex property models; and, in combination with coupling to state-of-the-art reservoir simulators, provide the most predictive insights into subsurface behavior.

Petrel Geomechanics helps asset teams to make optimal decisions and accurately assess risks throughout the life of the field. The insights gained can be used to evaluate wellbore stability, fault and fracture criticality, cap rock integrity, compaction, and subsidence.

Petrel Geomechanics



Petrel Geomechanics helps asset teams to make optimal decisions and accurately assess risks throughout the life of the field.

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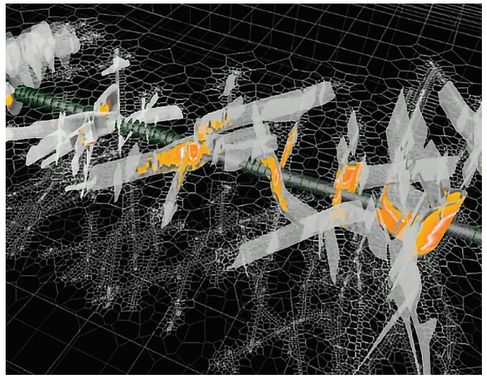
Shale

Aaron Scollard & Steve Warner

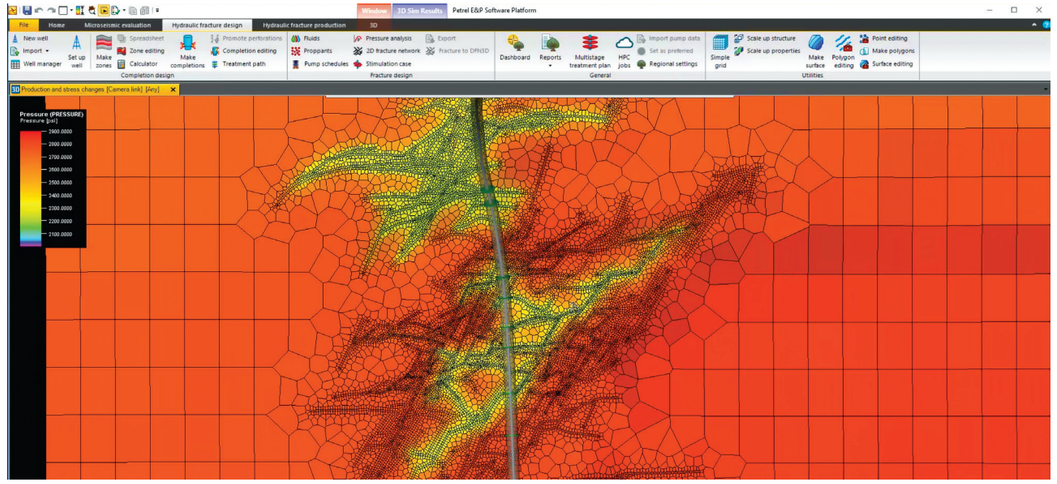


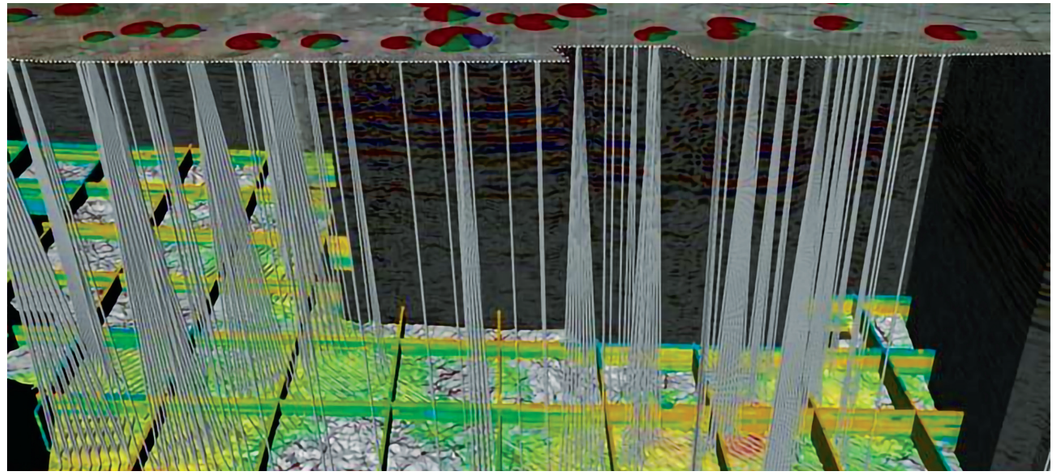
In the late 2000s unconventional reservoirs were starting to play an increasingly significant role in the E&P industry. It was clear that this type of play added new challenges, which required new technology, especially around data, drilling multipad wells, and completion optimization. Leveraging the Ocean framework, Schlumberger was able to rapidly develop unconventional reservoir-focused solutions in the Petrel platform around pad placement, well design, geosteering, and microseismic integration, enabling our customers to gain advantage in this type of play.

In 2014, shale core was released bringing these plug-ins together into the core. This enabled customers that focused on unconventional reservoirs to access all the technology needed in one solution. The new Petrel platform user interface was used to bring together the key workflows of exploration, evaluation, drilling, completion, and production into one integrated workflow.

The release of the Kinetix* stimulation software suite inside of the Petrel platform further enhanced the value to our customers, enabling them to model and fully simulate hydraulic fractures in single or multiple wells for the first time. Integrating geology, geomechanics, and reservoir simulation helps optimize completion design as well and gain insight into the best well spacing. Today, the Petrel platform continues to offer innovative solutions in a fast-moving world of unconventional reservoirs with cloud-based sensitivity analysis for multi-scenario testing to optimize field development plans.

Kinetix Shale





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Well Design

Adrian Newton, Artem Khramtsov & Pierre Bonningue

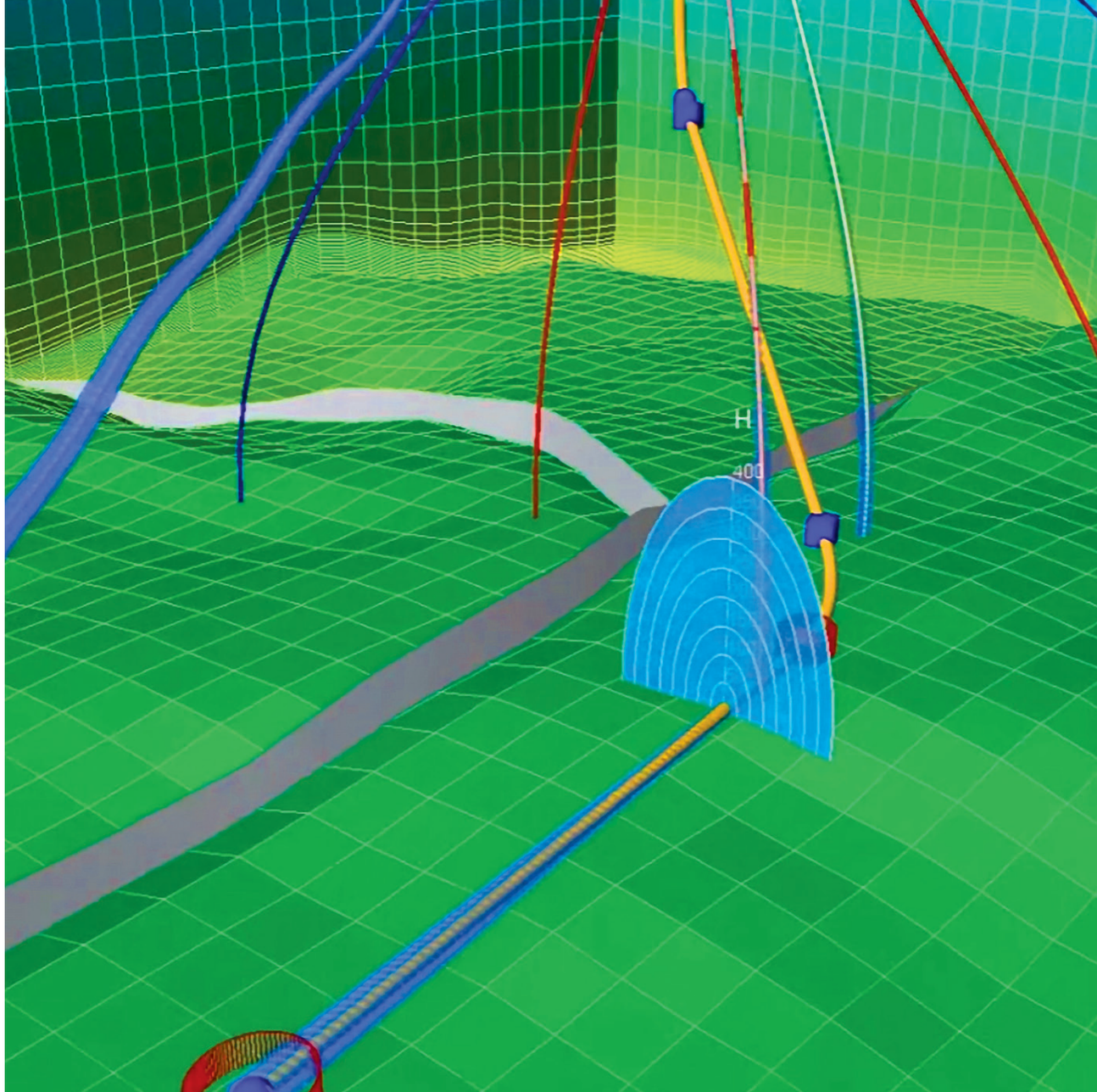
In early 2000, the Petrel platform developed a Well Design module. This innovative approach allowed the design of well trajectories in a three-dimensional space within the geological context. In the following Petrel platform releases, new Drilling modules were released for well engineering and drilling analysis allowing geoscientists and drilling engineers to work efficiently to deliver a drillable trajectory through collaborative workflows. With teams reviewing targets and wells inside a shared-earth model, the trajectory planning inside the Petrel platform allowed customers to deliver trajectories within days and not weeks.

Dedicated to identifying and mitigating risks, Petrel 2016 Trajectory Planning workflows enabled anti-collision analysis while planning or while drilling the well. In addition, with wells becoming more and more challenging to drill, drilling workflows integrated geomechanical modeling and the computation of the safe mud weight window for each well and redesign.

Designed trajectories are engineered and visualized in 3D and 2D in the context of all offset events to make sure challenges are understood and relief well planning regulations met through simulation. Offset drilling performance analysis allows optimal drilling parameters to be identified for new wells in given formation or by section, predicting rates of penetration on the proposed trajectory.

The ultimate objective is to reach geological targets safely and accurately in real-time and run the completion successfully. To achieve this, depth-indexed data can be streamed while drilling and in Petrel 2017, the Reservoir Steering module was released providing a complete workflow to steer horizontal wells through the geological model to ensure optimal well placement.

Petrel Trajectory Planning



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Data and Collaboration

Tim Hollis & Patrick Dineen

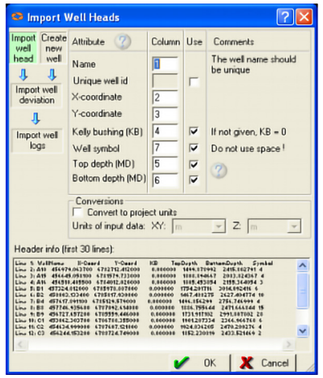
From its earliest releases the Petrel platform has always focused on empowering end users to complete the workflows and deliver smarter and more intuitive insights and results. In the early to mid-2000s, the Petrel platform focused on data loading by the end user, delivering a rich set of native file format importers for domain entities and supporting industry formats for all data types required to complete the end-to-end workflows.

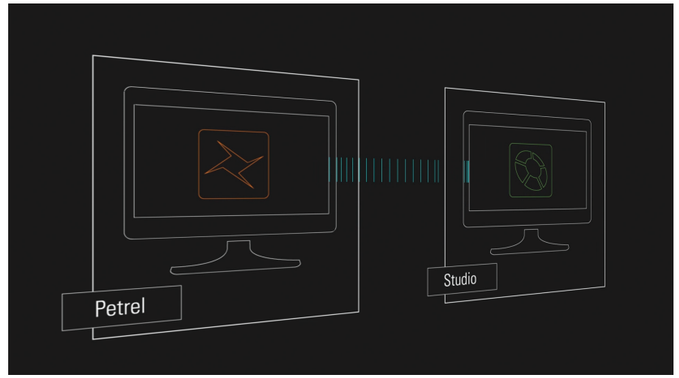
By 2005, the Petrel platform had grown into a seismic-to-simulation platform and required much greater collaboration between end users across a multitude of disciplines. The secondary project workflows enabled users to share, but the breadth of collaboration required was growing.

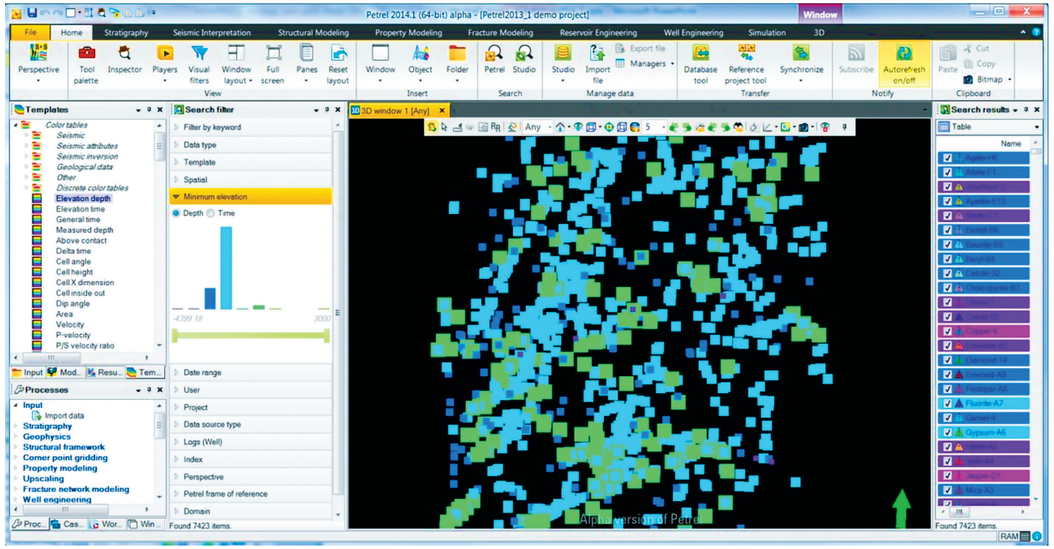
By 2007, the Petrel platform introduced the concept of Reference projects to empower complete asset teams and improve collaboration and data sharing. The introduction of the Ocean framework in 2005 also enabled third-party vendors such as OpenSpirit to add their own solutions to enhance collaboration and data integration. This also expanded the support for data workflows into new and growing domains such as real-time.

As we moved towards 2010, Petrel had grown significantly, enabling access to all the best science that both Schlumberger and other vendors provided through the Ocean framework. However, the feedback we received was that the Petrel platform was great for end users but that proven data management practices in many companies were suffering and having an adverse effect on productivity. Many companies wanted full database integration, project level data access and control, full metadata access and a robust API, e.g., for project clean-up, updates and data reconciliation. We listened to the industry and Studio E&P knowledge platform was born with the first major release in 2012. The Studio platform provided the robust database collaboration space and workflows that many companies needed to solve integration workflows, completely integrated into the Petrel platform. The additional workflows from Studio Find and Studio WorldMap empowered users in understanding what data was available to support their analyses and interpretations. The journey continues today.

Studio E&P Knowledge Platform







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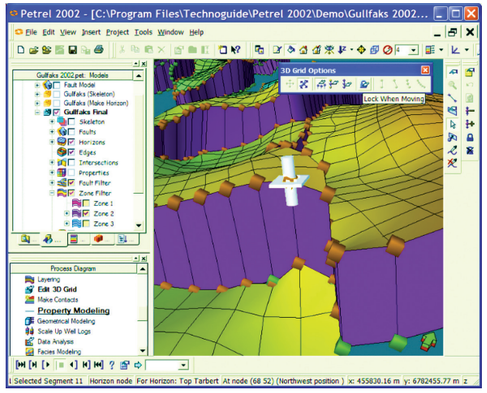
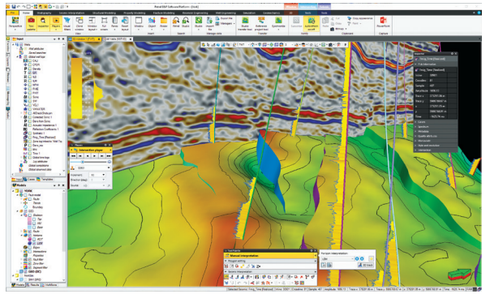
UX and Guru

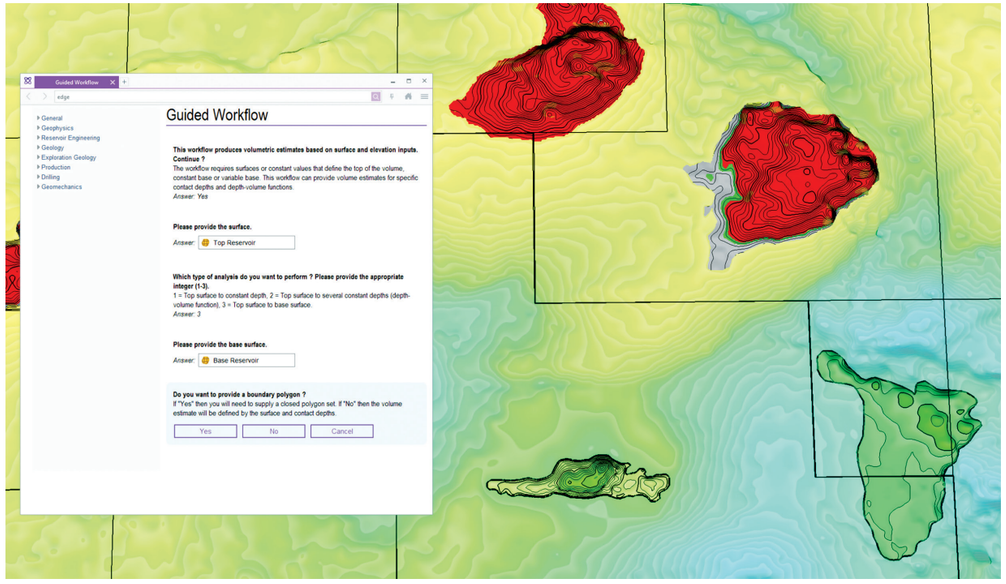
Robert Messenger & Stephanie Lee





User Experience
The user experience has been a big part of the Petrel platform since its first days. The Petrel platform was the first application to bring reservoir modeling into the Windows world, but perhaps more importantly it presented the workflow in an accessible way. Soon, everybody was building models where only an elite group had done so before.

Over time, more and more domains have introduced functionality to the Petrel platform. So when we redesigned the user interface around a Ribbon in Petrel 2014, we also reorganized the processes into the categories of work that most people do. An even bigger change was made from a single, exclusive process to multiple concurrent processes, so that, for the first time, you could interpret seismic, draw polygons, and make surfaces all together.



Guru
Petrel Guru started its life as the Studio Advisor plug-in in 2012, before becoming the Petrel Guru module in 2015. It aims to provide the next level of user assistance, giving Petrel users access to in-context guidance and knowledge about Petrel functionalities and workflows. Integrated video tutorials, practical exercises, detailed theory pages, and comprehensive workflows allow users to easily navigate through the Petrel platform and increase the efficiency of their work. Users can even create their own Petrel Guru content to federate best practice guidance throughout their organization.

In 2015 the Quality Reporting functionality was added to Petrel Guru, enabling users to generate image-rich reports about the status of their Petrel data objects. This utilizes the power of the Petrel Workflow Editor and can be used to communicate statistical and qualitative aspects of a project. The 2018 Petrel release saw the Guru module become an integrated part of the core licenses, expanding the accessibility to all Petrel users and promoting the ethos of high quality user assistance.

Petrel Guru

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Ocean Openness

Keith Tushingham, Keith Burkhart,
Edo Hoekstra & Larry Velasco

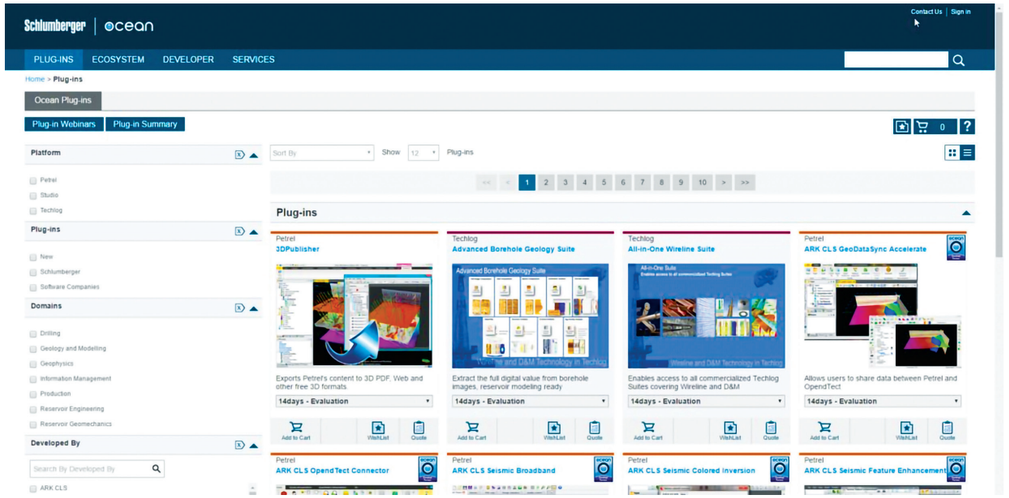
The Ocean framework as a commercial development kit was released back in 2006 when we hosted the first user group meeting in Houston, talking about the promise of Openness.

One major operator had spearheaded the very first incarnation of the Ocean framework a few years earlier when it was in its infancy and was focused on providing an environment to build applications and integrate cross-domain objects. Collectively, the industry quickly saw that in fact what organizations were trying to achieve was addressed around 80% by the Petrel platform. The extra workflows and ideas that companies had to differentiate themselves could be added

to the growing strength of the Petrel platform and so the Ocean framework was fully embraced.

The main task at hand was to ensure that the Ocean framework provided a modern, supported, and easy-to-deploy development kit that would allow oil companies, vendors, and universities to add their own intellectual property into the Ocean ecosystem.

The Ocean store was created to house all the plug-ins created by the industry that could be purchased, much like the Apple store we see so successfully running today. To date, we have over 150 plug-ins in the store, covering domains such as Geophysics, Geology and Modeling, Information Management, Drilling, Production, Reservoir Engineering, and Geomechanics, and over 325 companies and organizations use the Ocean framework daily to integrate their technology.



This has allowed the ecosystem to grow and become successful in the market. Companies are able to compete and differentiate themselves while at the same time embellish and strengthen the Petrel platform as the subsurface characterization and reservoir simulation standard.

In 2015 and 2016, the Ocean framework was extended to support both the Studio platform and the Techlog* wellbore software platform. This provided the extensibility and integration capacity for data and wellbore-related workflows.

New domain objects have been added over the years which has allowed the industry to quickly integrate and evolve into new markets. Integration of microseismic data for the shale stimulation market; direct implementation of quantitative interpretation from IKON science; and integration of Petrosys® mapping functionality directly into the Petrel platform are all key initiatives that have brought technology to market in a sustainable and professional manner.

The experience obtained over a decade with the Ocean framework provides us with a solid foundation as we develop the DELFI environment based on the core values of openness, extensibility and composability.

Ocean Software Development Framework

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Training and Services

Per Eivind Solum, Hallgeir Fure & Tom Remi Ellingsen

Petrel Training
The main goal of the Petrel training group is to facilitate the adoption of our technology, communicate new functionality, and suggest workflows to speed up the daily workloads of our users. Petrel training focuses on standardizing workflows through well documented practices and procedures. At the core of our design we strive to support and help Petrel users in their decision making.

Training has been a core service of the Petrel platform since its origin. Already by the time it became part of the Schlumberger family in 2002, there was a dedicated training manager. At that time, 6 our of 48 employees at the Røa office in Oslo, were working on training-related tasks. The first Petrel course—the Petrel introduction—was released in 2002. It was the result of a collaboration with a major operator. Since the acquisition, the group expanded both its portfolio of offerings and the number of members. More than twenty different courses have been developed, covering the geology, geophysics, and reservoir engineering domains.

Today, Petrel software training courses are delivered by certified instructors at our training centers around the world through the Schlumberger training umbrella of NExT. We also offer tailormade courses and workshops to individual customers and universities.

Petrel training has embarked on a transformational path, opening up new delivery techniques and contents, to reach beyond the traditional classroom environment. From self-learning microlearning modules to further virtual instructor led training, and video-enabled eBooks, we want to leverage best practices and unify workflows with the user and the technology at the center of deeper learning experiences.

Petrel Support
Support for the Petrel platform was, in the beginning, handled by a small support team in the Technoguide office in Oslo. In addition, we had personnel in offices around the world that handled local support.

After the Schlumberger acquisition, the Oslo team, including a branch in Stavanger, started to function as second-line support for Petrel Geology, Geophysics, and Core functionality for our customers, in addition to supporting our field personnel in the local Geomarkets. Second-line support teams for Petrel RE and Petrel Exploration are located in Abingdon and Aachen, respectively. Worldwide we benefited from the large support organization of Schlumberger to ensure satisfactory support for our customers. The customer support is now organized in a three-tier support structure, where customers are in contact with local first-line support through our Customer Care Center and www.software.slb.com. In addition, the second-line support is located with the engineering teams in the different technology centers. The third-line support is the engineering and quality assurance teams together with our Portfolio and selected subject matter experts worldwide. With a constant focus on collaboration, team effort, and customer satisfaction, the Petrel organization is continuously trying to provide the best possible support for our users.

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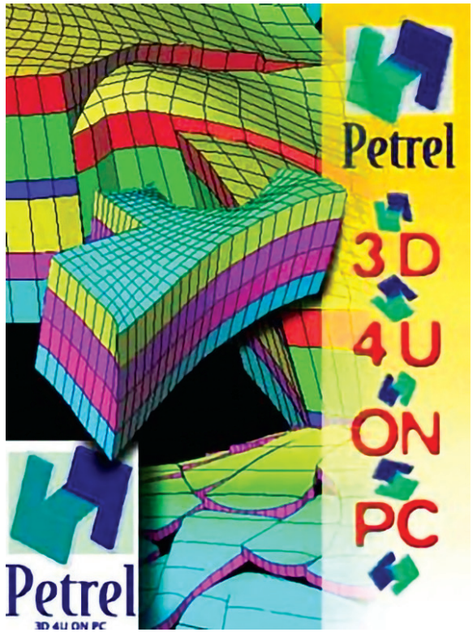
Sales and Customers

Jonathan Gulliksen, Mark Douglas & Carlo Caso

We want to sincerely thank you for taking part in this 20-year journey, and hopefully in the many more years to come. Through our first user group meetings in Norway, to growing across the world, participating in breakfasts, lunches, dinners and pub demos, we have always valued your help and dedication to make the Petrel platform a better product. Whether it is through webinars, social media groups, or at our SIS Global Forums, the drive for improvement and keeping our customers and partners happy has always been our primary motivation. Together, we have made the Petrel platform what it is today, and we are extremely appreciative for all your contributions.



At the outset, your patience in helping us with trialing, and improving new versions of the Petrel platform and then over the years in collaborating, sharing, and developing functionalities, which have transformed and made it into the platform it now has become. Our focus remains on you, our valued customers and partners, achieving your objectives.

We are all excited as we transition to the cloud and to the DELFI environment, bringing together advances in technical disciplines such as artificial

intelligence, data analytics, and automation. Yet again, working in close collaboration with all our customers and partners to be to more efficient, effective, and to extract the most value out of our data.

Thank you for the first 20 years. We are ready for the next 20 and we hope you are too.

Into the Future

Kahina Abdeli-Galinier & Raphael Guerithault

Evolution has been the one constant in the 20-year life of the Petrel E&P software platform.

Every chapter in this book details the immense efforts made to extend and improve the platform. From core geophysics enhancements, to Petrel Guru's knowledge management, to the latest Depogrid workflows, every development helps E&P experts better interpret their subsurface data and make the best possible decisions.

But we're not stopping here. The future for the Petrel platform will see more innovation happening even more quickly. Our DELFI environment will supercharge the Petrel platform's existing capabilities through the liberation of geoscience and petrophysical data and engines in one environment, while still preserving domain knowledge and science. By extracting the best of the data available, it will be possible to take full advantage of digital technologies that will elevate the Petrel platform to places that the founders at Technoguide could barely have dreamt of.

Cross-domain collaboration and data integration have always been strengths of the Petrel platform and having it in the DELFI environment promises truly transformational change.

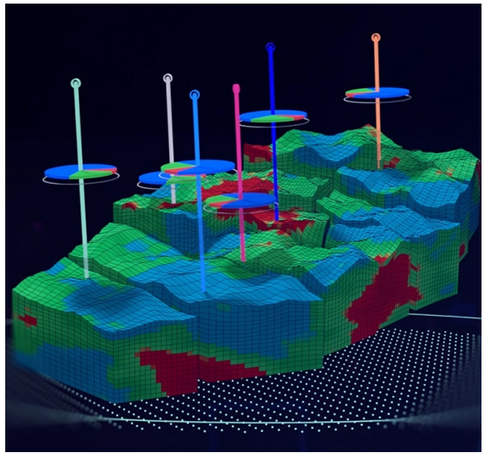
It offers the independent consumption of every numerical engine, intuitive real-time analysis of enormous data volumes, evergreen shared workflows with personal workspaces for data, models and interpretations, shared globally—all made possible and cost-effective by the cloud's massive processing power and endless storage.

It also takes our commitment to openness to another level as it will be even easier to integrate external data and software with the Petrel platform, as well as customizing and adding your own ideas and intellectual property to make it yours.

The Petrel platform today is the best it has ever been. It's the global standard for subsurface characterization and reservoir simulation, without question.

But we know that as users, developers, and partners we can make it better by working together.

With your help, our exhilarating journey will never end.



The Petrel E&P software platform started 20 years ago when Technoguide, a Norwegian startup based in Oslo, released the first version of Petrel 1.0 in December 1998.

The Petrel platform has become an industry standard and has revolutionized the way we work in all domains. Today, the active global community of users continue to push the boundaries of subsurface understanding using the Petrel platform.

In creating this special anniversary book, we want to take a moment to reflect on that history and to celebrate the many achievements we have made together with you—our customers and partners.