

# Assess Uncertainty and Risk in Hydrocarbon Reservoirs Using 3D Models



## Geoscience Insights in 30 Days

Paradigm® is committed to providing oil and gas companies with high-quality geoscience services, to help them gain deeper insight into the subsurface and maximize the value of their assets. As part of our offering, we are happy to announce the availability of "Quick Turn" services, for specialized projects where qualified, on-time delivery is critical.

Most hydrocarbon development strategies are based on predictions of future production revenues, which in turn are derived from simulating reservoir performance under different operating and depletion conditions. But reservoirs cannot be seen with the naked eye or even measured with 100% accuracy. These models are often highly inaccurate as they may incorporate measurement errors and are built from sparse and biased interpretations of the subsurface. An invalid picture of the reservoir can lead to erroneous forecasts and decisions.

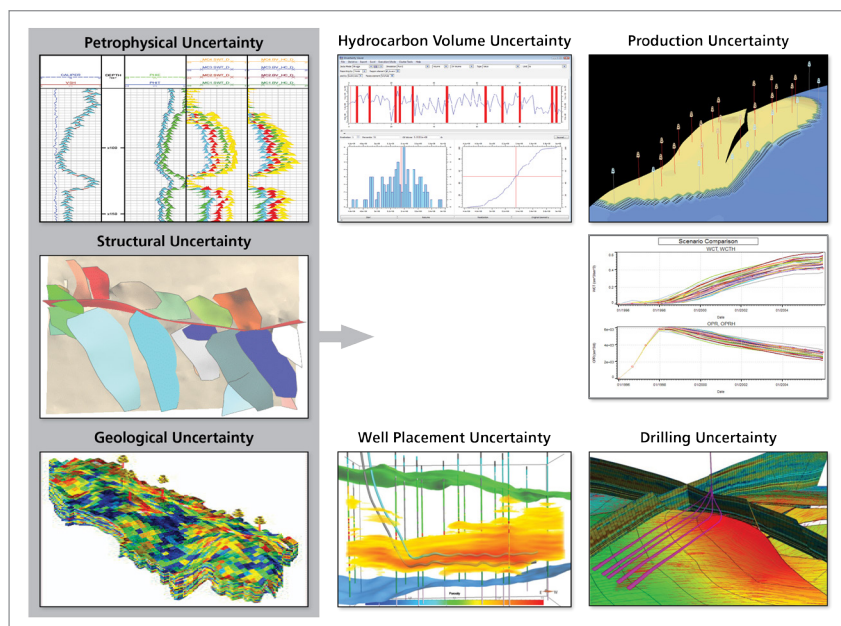
Uncertainty can have a major impact on hydrocarbon in-place volume assessments, drilling plans, field development strategies, production forecasts, and hence reserves estimates. Quantifying uncertainty in the position and volume of hydrocarbon plays is critical.

For example, accurately determining the position and shape of subsurface structures is crucial in the characterization of oil and gas reservoirs, as they often determine the extent of the reservoir and its internal compartmentalization. It is recognized that there is tremendous uncertainty associated with fault interpretation, yet little is done to quantify that uncertainty and even less to propagate it through to 3D modeling and flow simulation. Fault uncertainty affects, among other things, hydrocarbon in-place volumes, well positioning, fault seal calculations, and of course reserves.

Paradigm Geoscience Services integrate and model uncertainty from all sources and all stages of constructing full 3D reservoir models. The results are multiple valid alternatives that can be ranked and exported to commercial flow simulators, summarized for optimal appraisal or infill target identifications, or used to reliably inform traditional Monte Carlo-based economic assessment applications.

## Reservoir Uncertainty benefits:

- Integrate all subsurface uncertainties and understand how they impact reservoir management decisions.
- Capture uncertainty on all faults and horizons of the earth model and propagate its influence to rock and hydrocarbon volumes, fault seal calculations and production profiles.

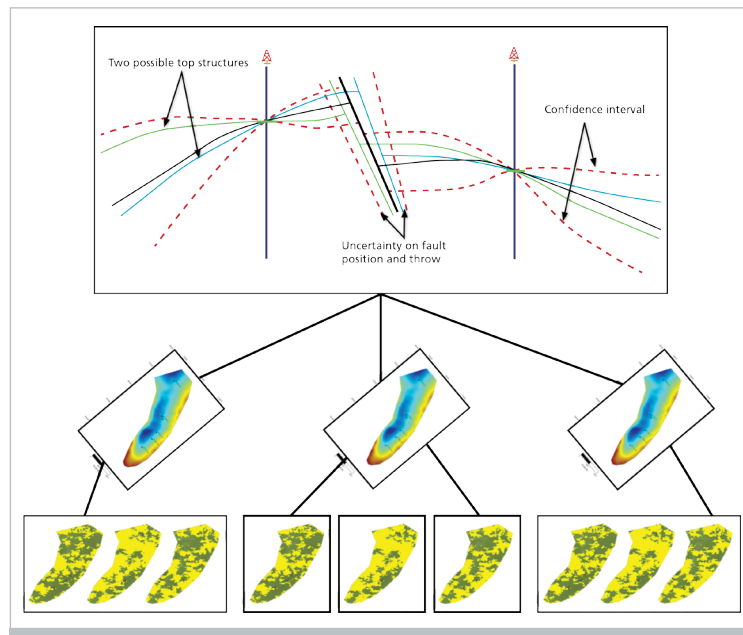


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- Identify the most important reservoir parameters so you can focus resources on relevant issues and maintain the right level of technical detail, saving time and money.
- Understand the effects of uncertainty on the position of your reservoir structure due to time-to-depth conversion uncertainty, seismic resolution and interpretation bias.
- Consider uncertainty in well data used to constrain the reservoir model, their interpretation and the parameters derived from them, because they are often the largest contributors to overall uncertainty.
- Quantify uncertainty in not only in-place volumes but also in recoverable volumes.
- Enhance confidence in your resource estimates through a systematic workflow that ensures that all elements contributing to the estimates have been analyzed and integrated.
- Efficiently investigate many alternatives through a combination of scenarios and stochastic simulations.

## This “Quick Turn” Service provides added value to:

- Resource assessment teams looking to book reserves and estimate P10, P50, and P90 hydrocarbon volumetrics, both in place and recoverable
- Interpreters wishing to account for biases in seismic interpretation and/or improve accuracy in velocity models
- Geologists needing to account for error ranges in subsurface models for both structure and reservoir properties
- Reservoir engineers interested in narrowing down best scenarios to run for history matching
- Operational decision makers aiming to refine development strategies such as optimal appraisal and infill target identifications, or deciding on future investments



▲ Propagating structural and petrophysical uncertainty in a 3D model

## About Paradigm Geoscience Services

For over thirty years, Paradigm has been recognized for its industry-leading integrated technology and exceptional people. Our products have played a major role in finding and developing some of the largest oilfields in the world.

Combining our R&D strength and software interoperability with expert implementation, the Paradigm Geoscience Services team collaborates with our clients to provide complete solutions, from seismic and wellbore field data, to prospects, and drilling targets. Whether using proven and field-tested methodologies or new, innovative solutions, our best and brightest geoscientists deliver a highly collaborative, interactive and quality service offering. The advanced technologies offered by our Services group deliver more insights into the subsurface, enabling you to make better informed, timelier and more accurate decisions.

For more information about Paradigm Geoscience Services, please visit our Website: [pdgm.com/gs-services](http://pdgm.com/gs-services).