The Role of Geomodeling in the Multi-disciplinary Team

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Summary

Geomodeling today is integral to a successful business strategy in most hydrocarbon reservoirs. The subsurface team uses the Geomodel to render the geologic interpretation into a digital format suitable for input to reservoir simulation software, for resource evaluations, for well planning, as part of uncertainty analysis, and in a variety of decision making processes. It is a technology driven discipline using digital and spatial information combined with geological concepts. A key goal in the Geomodeling practice is to provide images of reservoir heterogeneities critical to better understanding the physical hydrocarbon extraction processes (Figure 1). Geomodels help reveal the impact of the various reservoir multi-scale features on dynamic behaviour. Challenges exist to adapt workflows and build efficiencies for subsurface modeling needs.

The talk will provide a discussion of geomodeling processes and topics in their integrated context related to general forecasting workflows and will include a discussion on improving the effectiveness of geomodeling within teams. Geomodeling is an advanced platform to integrate and bridge the technical disciplines. There are three core competencies underpinning the geomodeling discipline for proper execution. These are 1) *grounding in geostatistical theory* for fundamental understanding of the engines behind multi-scale data integration; 2) *capability in geomodeling software applications*, largely through vendor training on algorithms, implementations, and application connectivity; and 3) *geomodeling best practices*, the thought process, rules, experience and trade craft. These capabilities are the basis for appropriate workflow designs based on geoscience, engineering and business needs.

Building strength in the combination of all three core competencies provides practitioners with sophistication, ability to adapt and customize as those individuals grow their career experiences. Attributes for success are open team communication, healthy collaboration, and workflows that are transparent, well documented and auditable. Subsurface teams engaged in growing bench strength in these core areas can improve the overall quality of deliverables. Organizationally, a strong team commitment when incorporating geomodeling competencies can positively impact results. This includes the ability to reframe subsurface practices, mitigate bottlenecks and improve subsurface cycle time. Geomodeling can be an enabler.

Geomodels are built in a hierarchical manner. Reservoir architecture is described by the sequence of model facies or lithologies within a structural framework. Heterogeneities are essentially the combination of simulating facies first, followed by the variability of properties within the facies. Geostatistical algorithms are regularly applied as the main engines. The subsurface data and interpretations used as model inputs are from multi-disciplinary sources and as such are multi-scale, i.e. the information represents different sample volume scales. Geomodeling has various rules and flexible guidance for rescaling diverse data for integration within models. Many data types have properties which cannot be directly averaged into grids

and either follow physical laws or are treated as probabilities. Examples of common data types are seismic surfaces, faults, seismic inversions or attributes, well markers, discrete facies logs, petrophysical curves, core analyses and deterministic maps. Models are built in discrete grids to ensure critical reservoir features are captured appropriately for the development goals. Each data type must be considered in the context of ensuring model fidelity and representativity from inception through to final deliveries. A healthy feedback loop within the subsurface team can get the most out of the modeling process for each modeling cycle and for planning for new data, model updates and rebuilds.

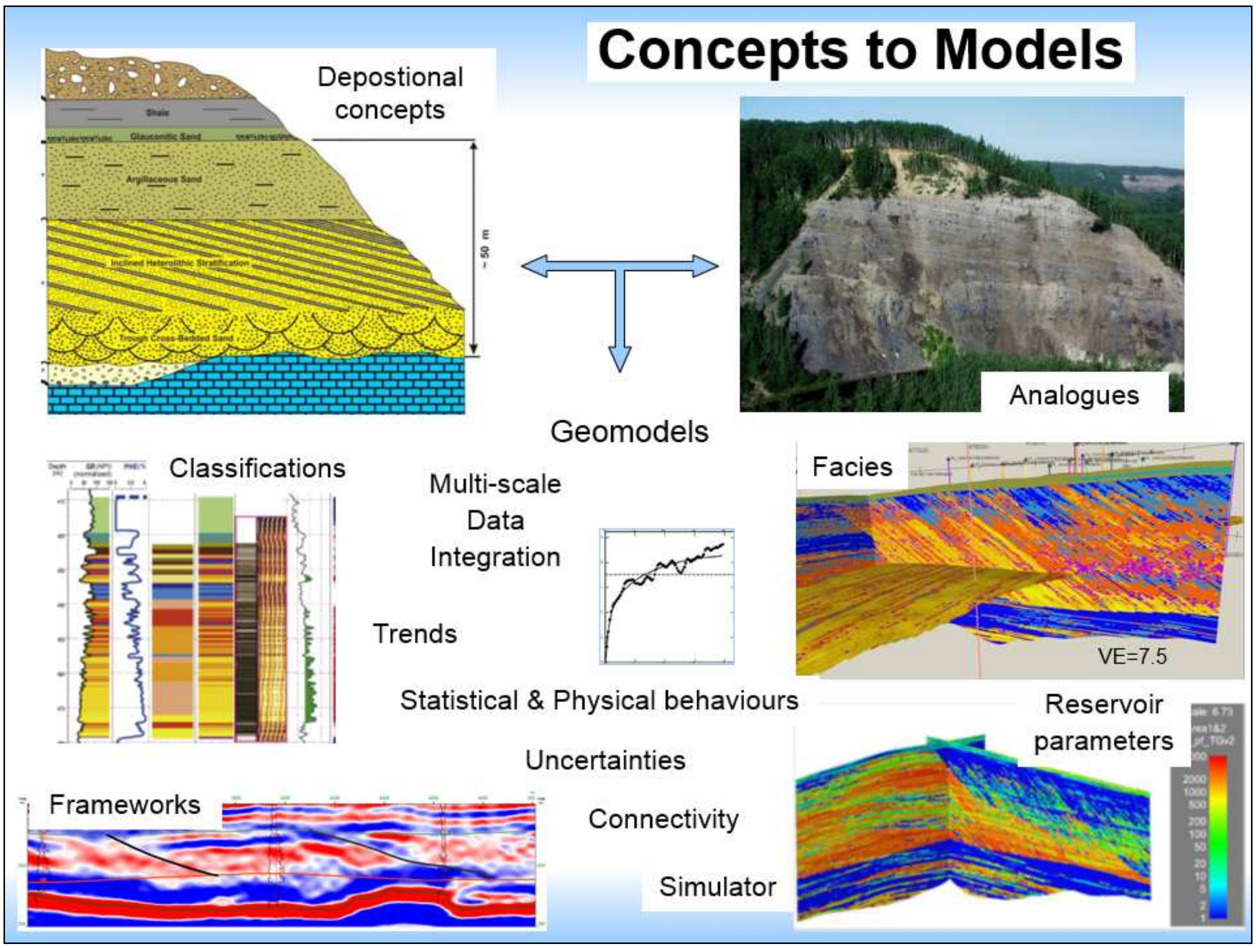

Figure 1. *Gemodeling is a distinct subsurface discipline drawing expertise from multiple and diverse subjects in geosciences and engineering. The concepts to models, related workflows and practices embody technical themes that influence strategies for integrated subsurface teams and their economic decision making.*