Hierarchical Truncated Plurigaussian Simulation in Aspen RMS®

Building a facies model that can incorporate complex facies and environments is always a challenge. The unique Hierarchical Truncated Plurigaussian Simulation in Aspen RMS helps create stochastic facies models that simplify complex geological variables while delivering optimal performance. This module can also be integrated into an ensemble-based workflow to keep the facies model evergreen as new production data arrives.

Key Benefits

Enhance geological integrity

- No compromises are needed when modeling highly complex geologies. Complexities are handled in both well data and depositional environments.
- Facies and facies association relationships can be handled together, ensuring consistent stochastic models that preserve geological integrity.

Generate models quickly

- Quickly experiment and generate a model using an algorithm focused on optimal performance with any data set.
- An intuitive UI focuses on the user experience and how users can quickly incorporate their geological understanding into the model.
- API enables the automation of experimentation, validation and scenario iterations using Python.

Keep models evergreen

- Fully integrated with uncertainty/sensitivity analysis tools; can be controlled by an external orchestrator when run in an Aspen Big Loop® context.
- Keep the model up-to-date with automated workflow management.

Build robust ensemble-based models

- Update the facies model using production data through an ensemble smoother.
- Increase prediction confidence when planning new wells by using a model that incorporates historical data when propagating uncertainties.

Key Capabilities

- Modern UX with previewers (Figure 1)
- Combine any number of facies associations
- QC provided by both input and simulation previewers
- Define relationships using the facies hierarchy tree
- Use polygons and/or 3D probabilities to define facies
- 3D probabilities can be global or local volume fractions
- Digitized facies boundaries using polygons directly on the model
- Uncertainties can be defined on all input
- Define boundaries qualitatively
- Define variograms with locally varying azimuths
- Capture outliers with nested variograms
- Export Gaussian random fields to be used in ES-MDA
- Use externally updated Gaussian fields to update the facies model
- Automate and control with Python using RMS Jobs API
- Fully integrated with RMS Workflow Manager and Uncertainty Setup

Use Case: Adaptive Facies Modeling for Accurate, Evergreen Reservoir Predictions

CHALLENGE: Facies modeling impacts volume estimations and connectivity, directly affecting the production forecast. Effective models must integrate diverse data sources with conceptual models to capture subsurface complexities.

An additional challenge is ensuring the model remains "evergreen", continuously and automatically updated with the latest well and production data to maintain prediction accuracy throughout the asset's lifecycle.

SOLUTION: The Hierarchical Truncated Plurigaussian Simulation algorithm facilitates the construction of simple-to-complex facies models in clastic (Figure 2) or carbonate (Figure 3) deposition environments. The hierarchical approach organizes subsurface features into facies associations and captures erosion rules, enabling multi-level facies architecture. This ensures models are fit for purpose.

Additionally, the algorithm integrates with Aspen Big Loop ensemble-based workflows. This integration keeps the model up to date as new production data becomes available, and ensures efficient assisted history matching while maintaining the geological integrity of the subsurface model.

RESULT: More informed and agile decision-making throughout the asset lifecycle, based on an efficient, accurate and user-friendly approach to building dynamic, high-quality facies models that evolve with new production data.

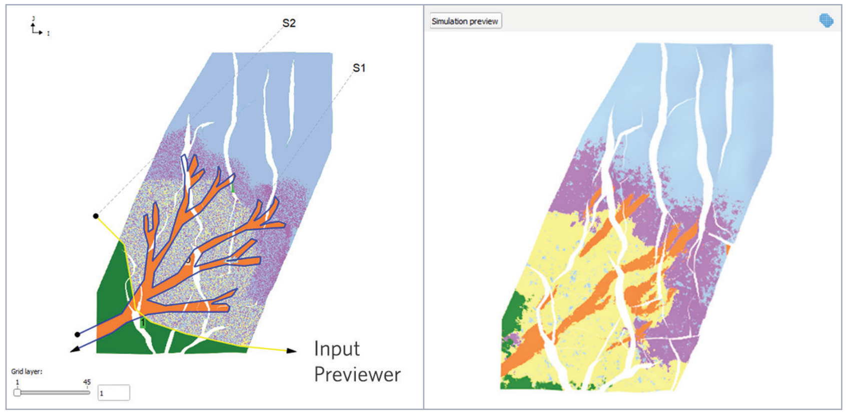

Figure 1. Built-in previews facilitating quality control with real-time feedback, ensuring continuous validation throughout the process.

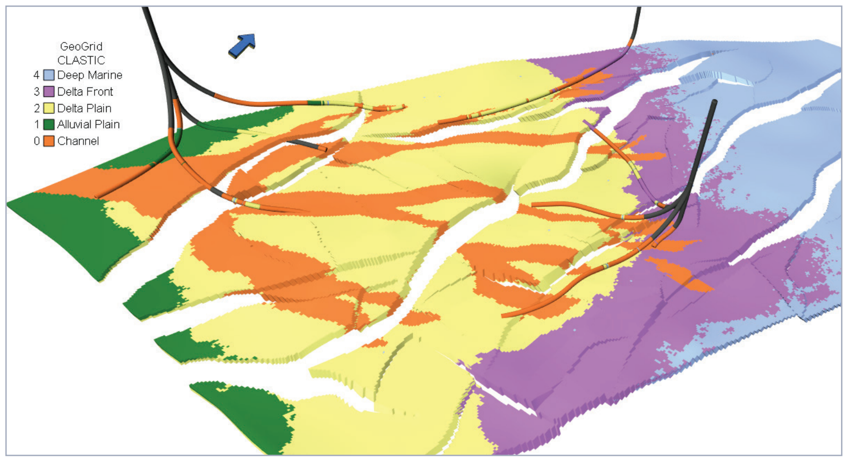

Figure 2. A prograding clastic environment capturing erosion rules and a multi-level facies architecture.

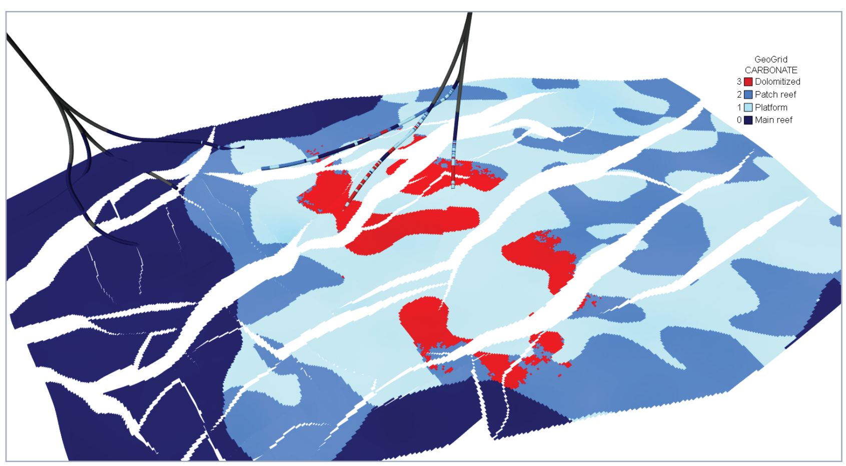

Figure 3. Carbonate environment capturing dolomitization using both digitized boundaries and probabilities as input.

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