

NExT

A Schlumberger Company

Petrel 2017 Property Modeling Module 12: Facies modeling using secondary data



Schlumberger-Private

Petrel 2017 Property modeling

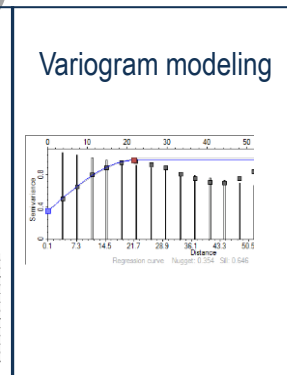
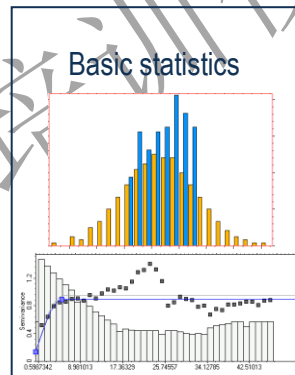
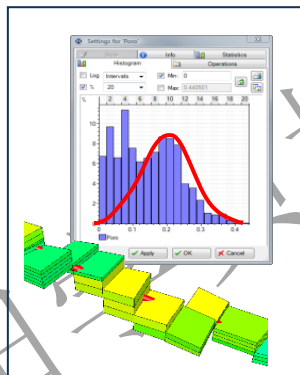
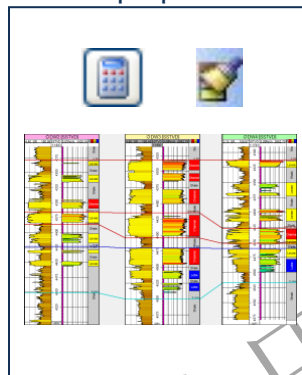
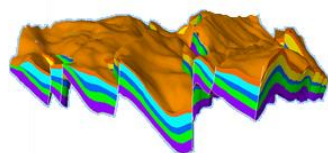
Intro

Property modeling
data preparation

Scale up well logs

Univariate and bivariate geostatistics

Petrel Property Modeling
objective and workflow



Facies modeling

Petrophysical modeling

Volume calculation and
Uncertainty analysis

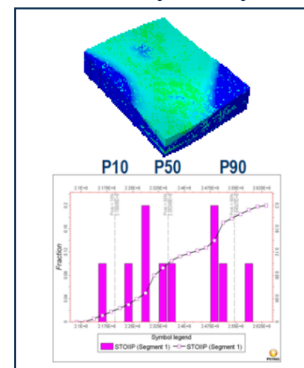
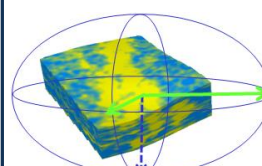
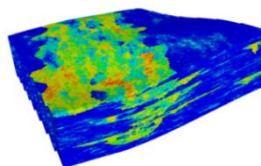
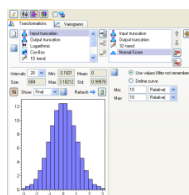
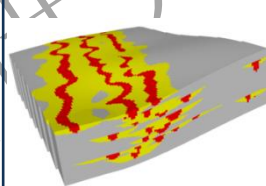
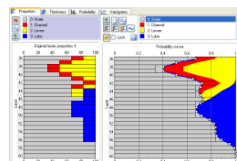
Discrete
data analysis

Stochastic facies
modeling

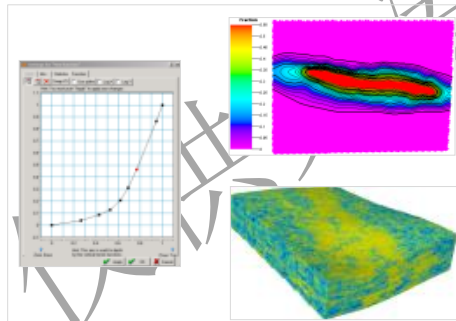
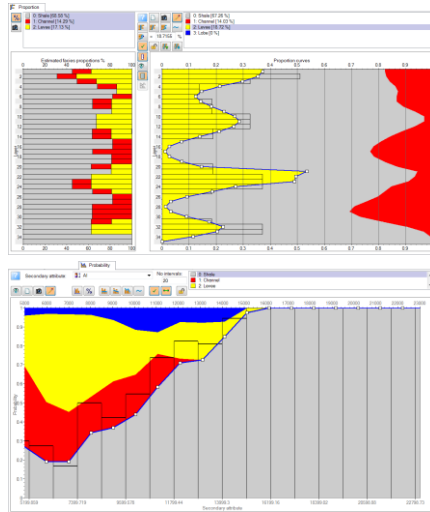
Continuous
data analysis

Stochastic and
deterministic
petrophysical modeling

Use of secondary
information for
property modeling



Global facies distribution control



Zones: ZoneA (Main_pay)

Facies: No conditioning to facies. The zone is modeled in one single operation.

Method for zone/facies: Sequential indicator simulation

Facies | Settings | Expert | Hints

3: Lobe [0 %]

0: Shale [68.58 -> 68.58]
1: Channel [14.29 % ->]
2: Levee [17.13 -> 17.1]

☒ Same variogram for all facies

Variogram | Fraction/Trends

☒ Trust fraction/trends

Global fraction

- ☐ Upscaled cells 14.29 % # Cells: 28
- ☐ Well data 14.85 % # Samples: 715
- ☐ Manual 14.29 %
- ☒ Trend

Trends

☒ Vertical: ChannelV
☒ Inverse X axis

☒ Horizontal: Channel_ind_trend

☐ Volume:

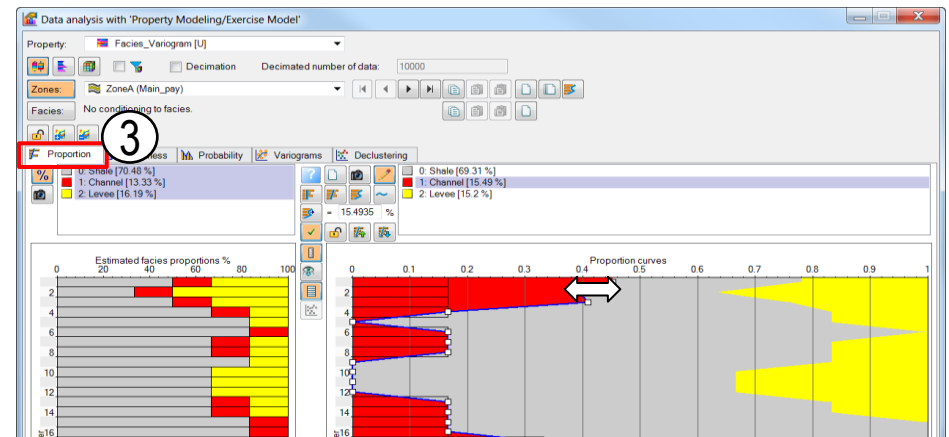
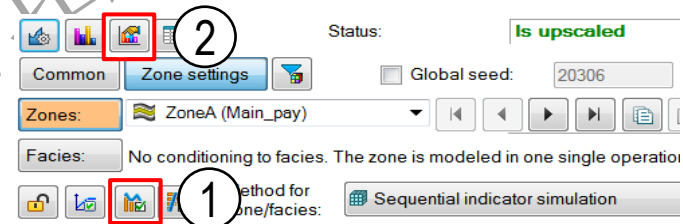
Attribute probability curves

Control the proportion of each facies vertically in a stratigraphic zone.

1. In the Zone settings of the *Facies modeling* process, select *Use the vertical proportion curves from Data analysis*.

2. Launch the Data analysis process.

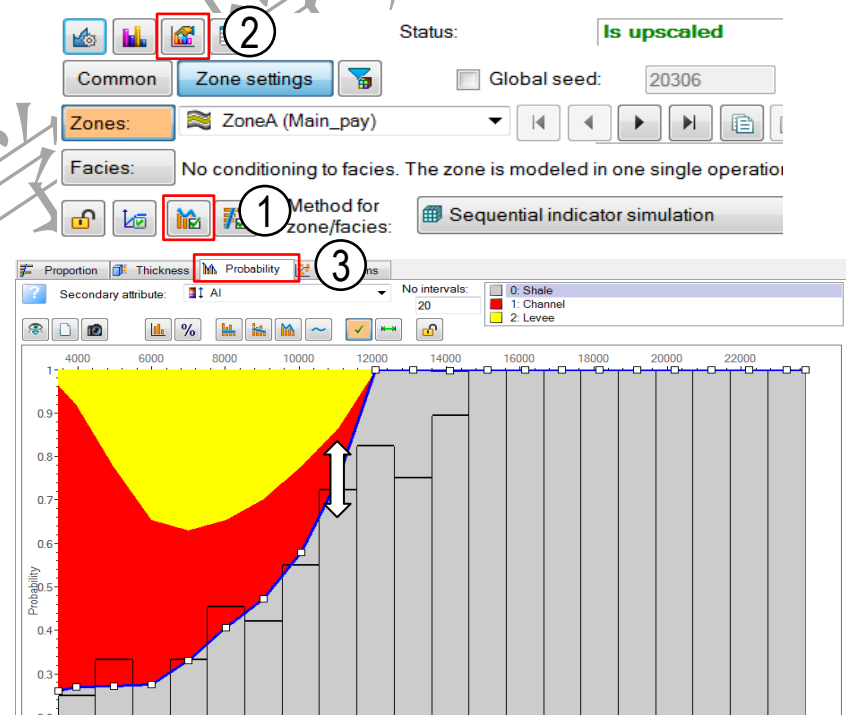
3. On the **Proportions** tab, check the original facies proportions.



Vertical proportion curves

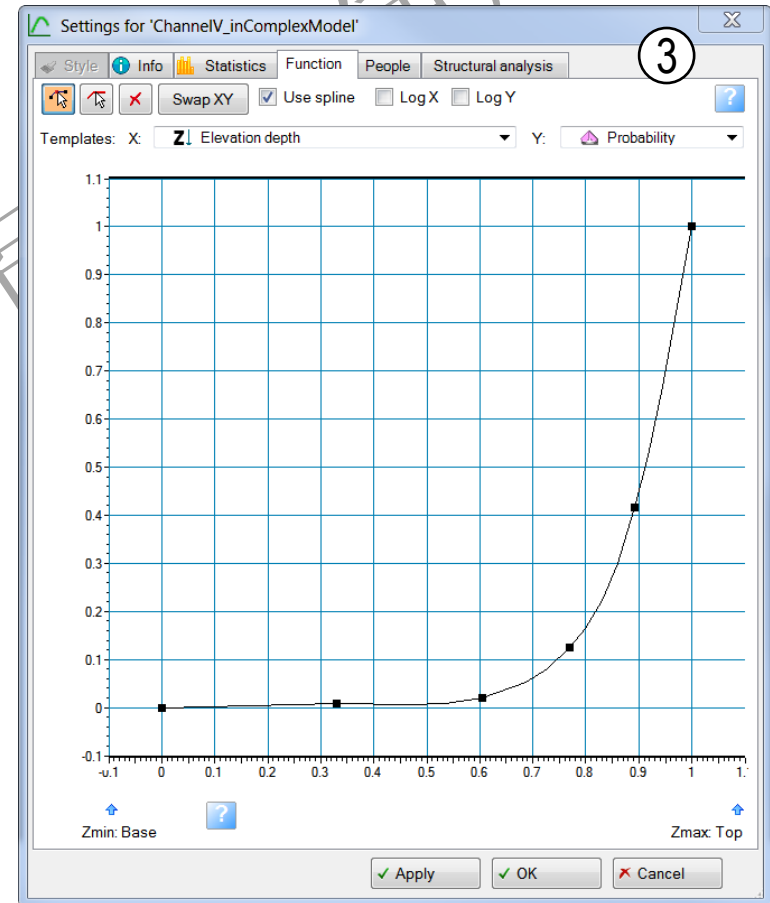
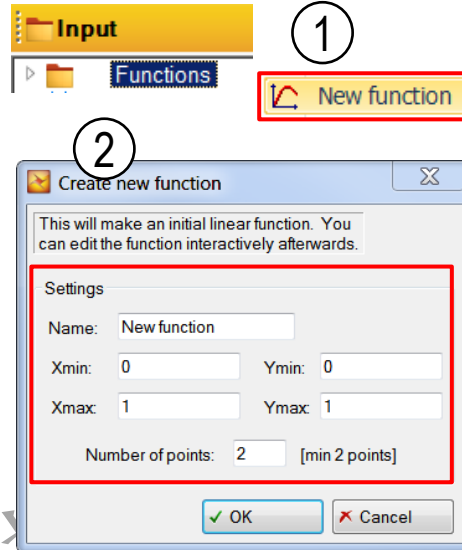
Relate the probability of a specific discrete parameter, calibrated with its correlation, to a secondary continuous attribute.

1. In the Zone settings of the *Facies modeling* process, select *Use the vertical proportion curves from Data analysis*.
2. Launch the Data analysis process.
3. On the **Probability** tab, check the original facies proportions.



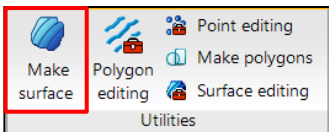
Generate a vertical function trend

1. Create a new folder in the **Input** pane, right-click it, and click *New function*.
2. Assign a name to the new function and specify the ranges for the X and Y axes. Click *OK*.
3. On the **Function** tab in the **Settings** for the new function, create the required probability curve for the facies by clicking the line and moving the points to edit the vertical function.

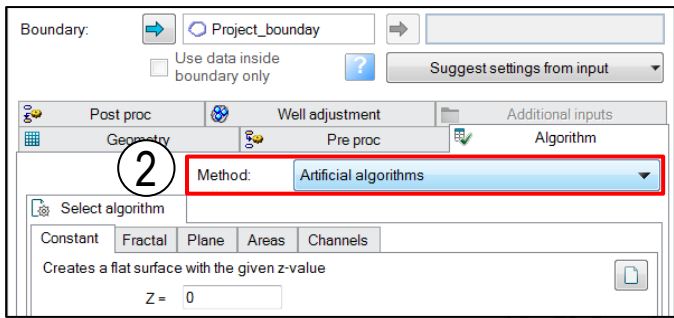


Generate a probability map trend

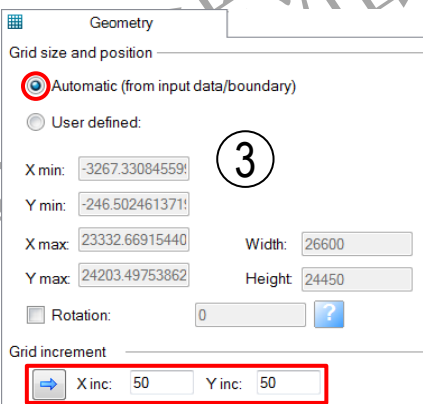
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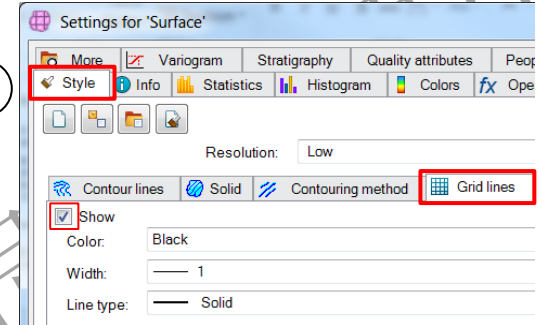
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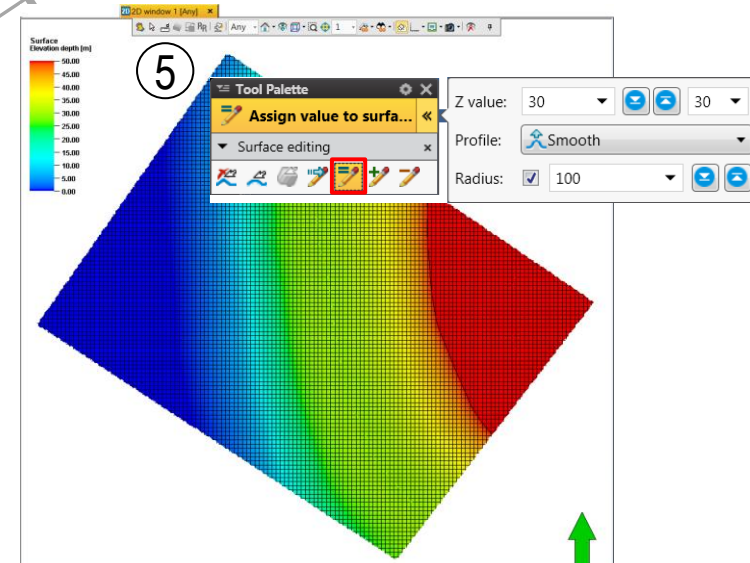
3



4



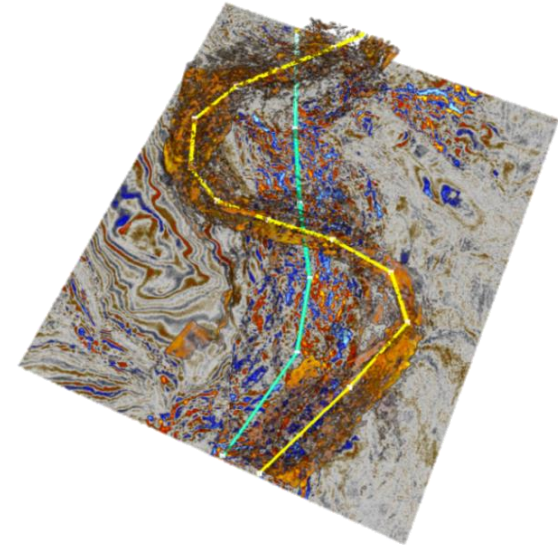
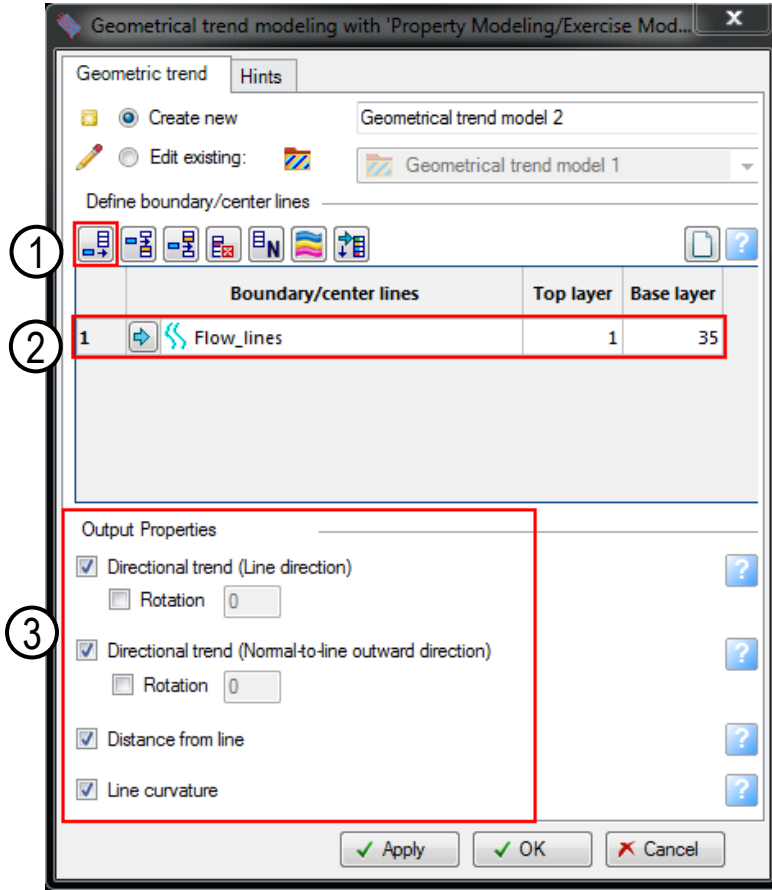
5



The figure illustrates the steps to generate a probability map trend using a software interface. It shows the selection of the 'Make surface' tool, setting the method to 'Artificial algorithms', configuring the geometry (Automatic, X min: -3267.33084559, Y min: -246.502461371, X max: 23332.66915440, Y max: 24203.49753862, Width: 26600, Height: 24450, X inc: 50, Y inc: 50), and setting the style (Grid lines, Show, Color: Black, Width: 1, Line type: Solid). The final output is a 3D surface plot showing the generated trend, with a 'Tool Palette' overlay for further editing.

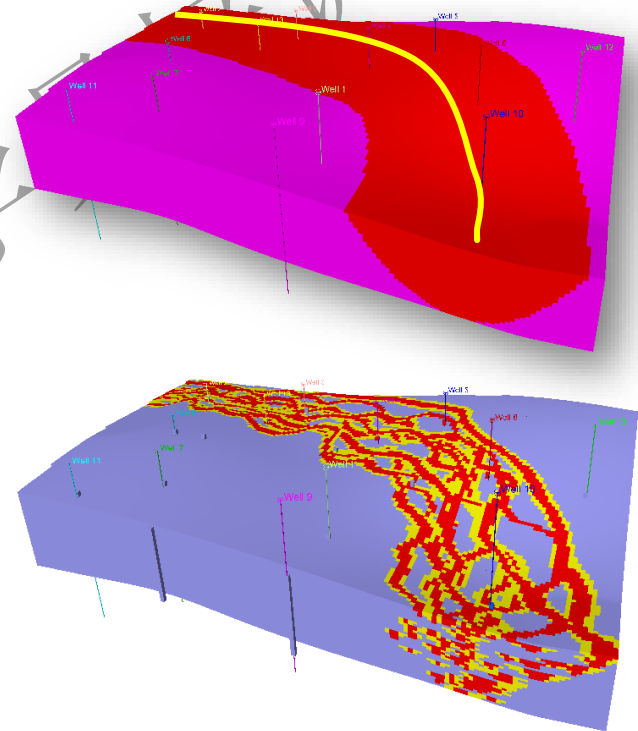
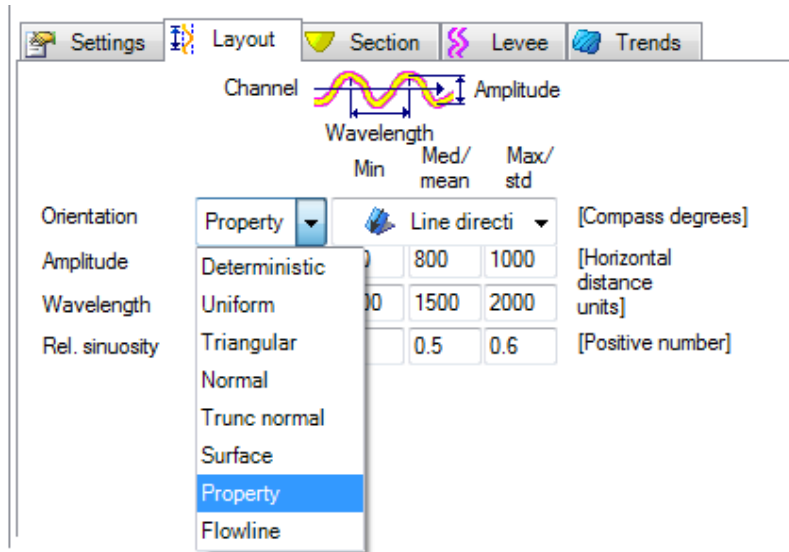
Geometrical trend modeling

1. Append item in the table.
2. Drop the polylines and define the layer range.
3. Select the properties to generate.

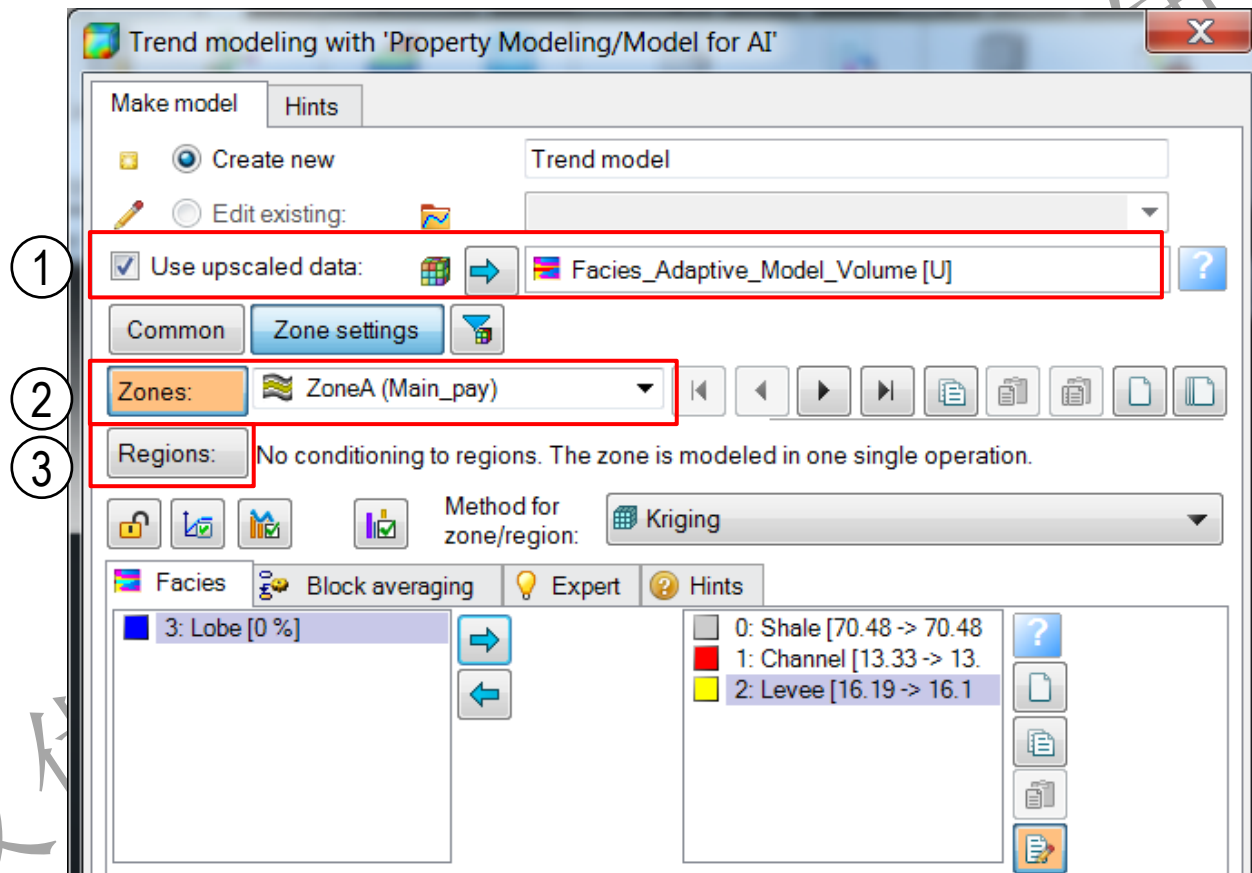


Geometrical trend applied

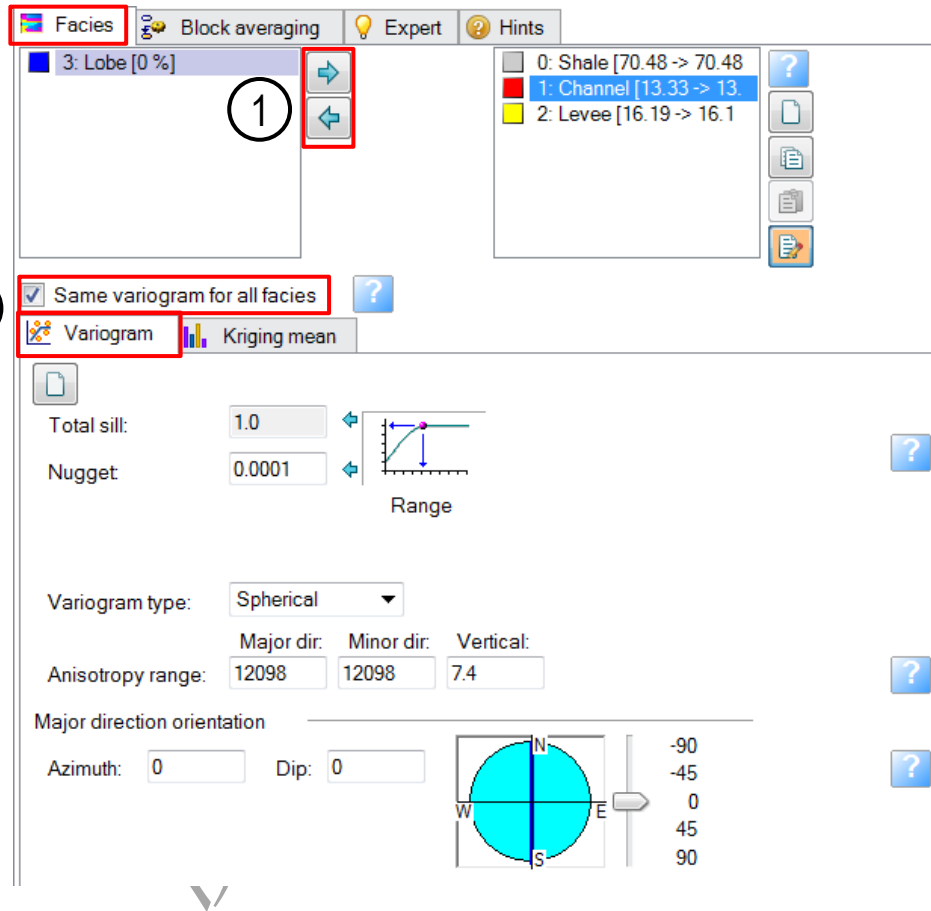
Flow line combined with intersection probability property



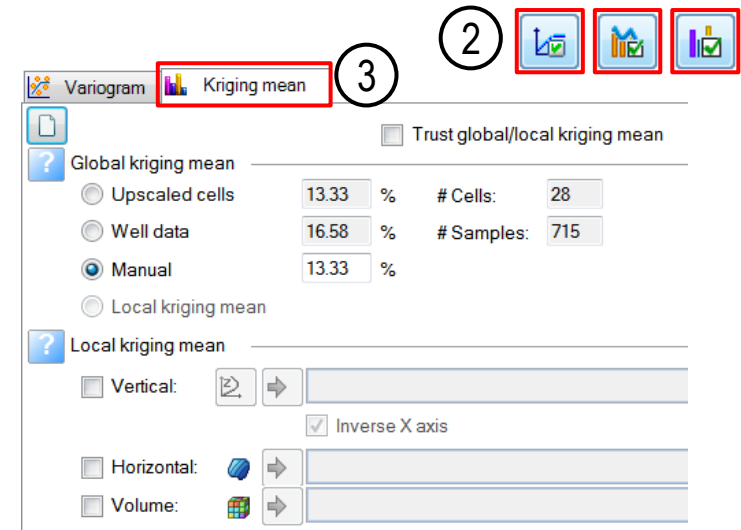
Discrete trend modeling



Perform discrete trend modeling

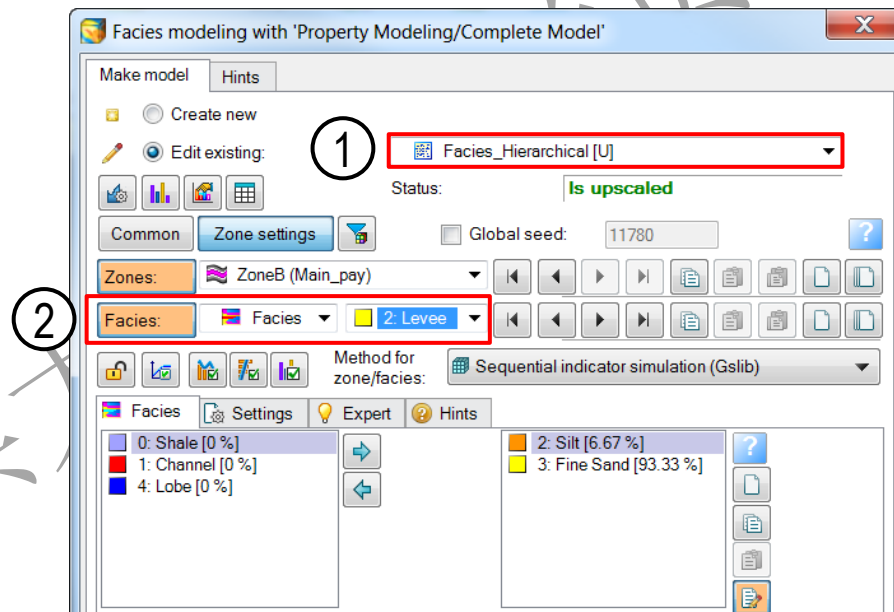
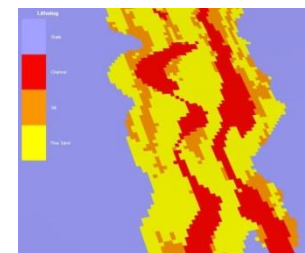
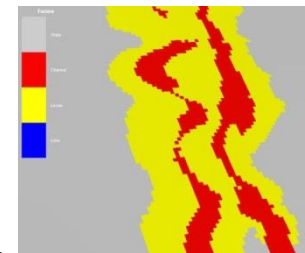


1. Choose the facies to be included.
2. Define the variogram settings for each facies.
3. Select the mean value to the kriging algorithm.



Hierarchical facies modeling

First level facies models can constrain second level facies models when two independent levels of facies models are used.



Exercises

- Use variogram and trends for facies modeling
- Crosscheck the results by making average facies maps
- Apply Sequential Indicator Simulation with seismic attributes
- Use SIS with geobody and the probability for local model update
- Apply hierarchical facies modeling using SIS in an existing object model
- Use geometrical trend modeling properties