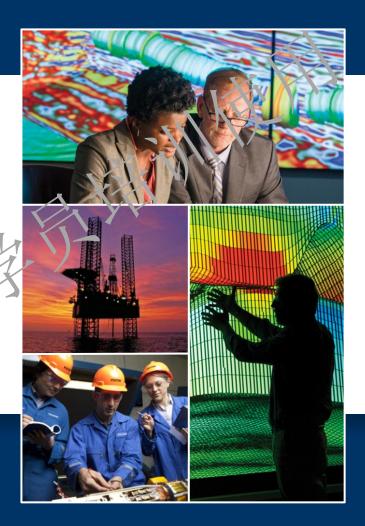


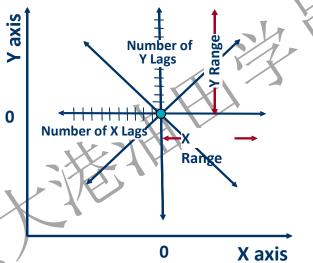
Petrel 2017 Property Modeling Module 7: Variogram modeling in the horizontal direction



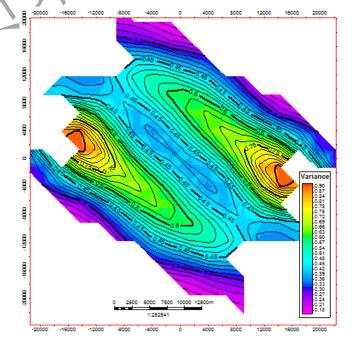
Variogram map: Theory

A *Variogram map* is a way to present variograms that have been computed in several directions over a dataset. (In **Petrel**, this is a point dataset, surface, or 3D property.) It produces a contour of the 2D variance surface (direction and extent

of anisotropy).



Note: The center of the variogram map is coordinates (0,0). It can be displayed only in a **Map** window in **Petrel**.

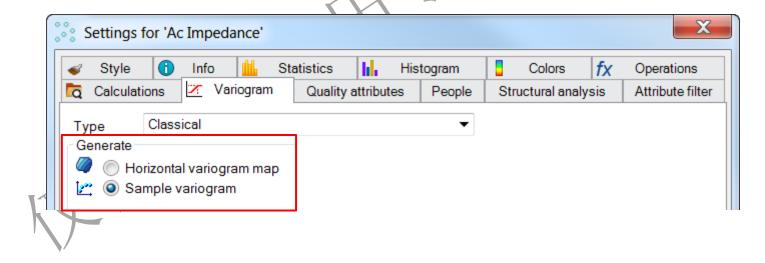




Variogram maps and sample variograms in Petrel

In the object **Settings** window of the **Variogram** tab, you find:

- Variogram map: Good for visualizing anisotropy and its direction.
- Sample variogram: Good for finding major and minor range horizontally.





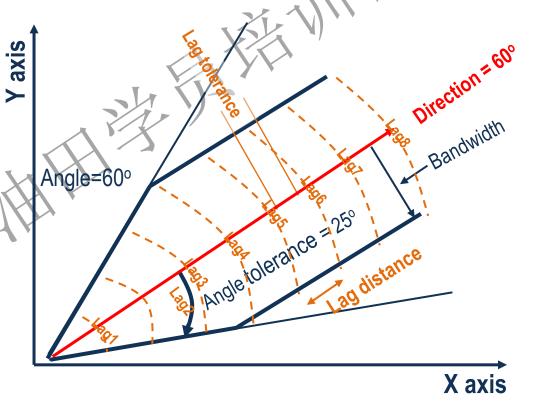
Directional variogram analysis: Search cone

Because of irregular spacing of input points, you need a search cone to

search for points that lay within the distance range given by the Lag.

Suggested lag distance:

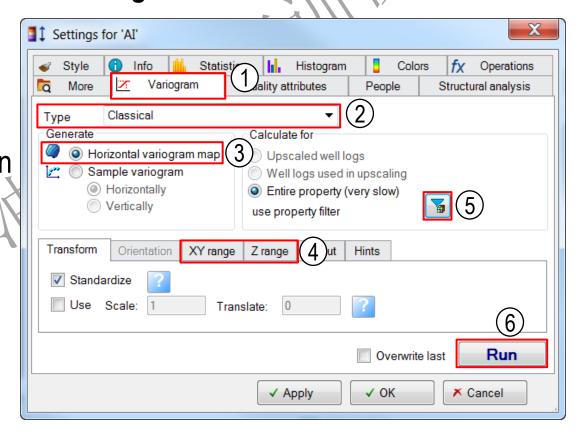
Lateral = well spacing
Vertical = cell thickness





Variogram map: Computation in Petrel

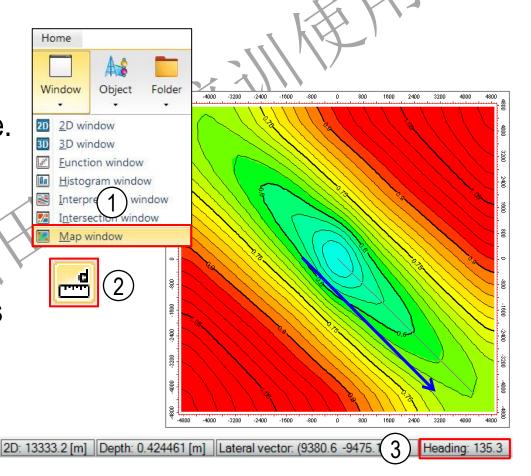
- 1. Go to **Settings** window of the **Variogram** tab.
- 2. Choose the model Type.
- 3. Select Horizontal variogram map.
- Define the parameters on the XY/Z range tab: Number of lags and Search distance.
- 5. Use a filter if necessary.
- 6. Click Run.





Variogram map: Visualization in Petrel

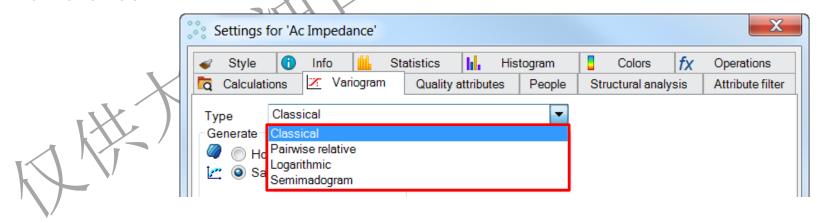
- Open a Map window and display the new variogram map stored in the Input pane.
- 2. Click the **Measure distance** button to measure the anisotropy orientation.
- 3. Read the values in the status bar.





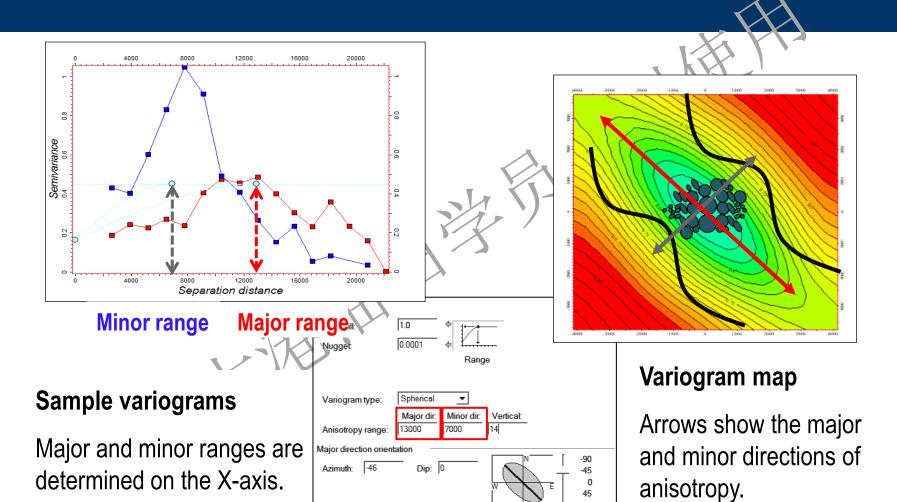
Variogram types

- Classical variogram: Used as the default
- Pariwise Relative: Each pair is normalized by the square average
- Logarithmic: Logarithmic values are used instead of the original values
- Semimadogram: Uses the absolute difference instead of the squared difference.





Anisotropy





Sample variogram: Theory (1)



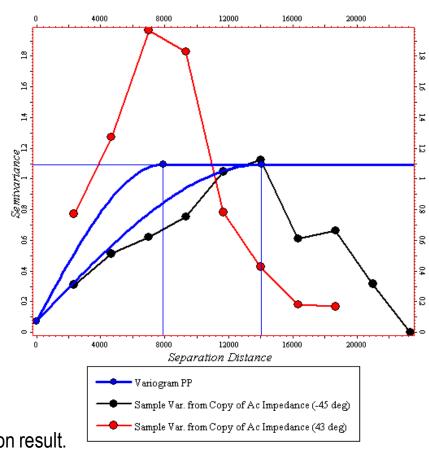
Important model parameters:

- Model type
- Nugget
- Range
- Anisotropy (azimuth given from the variogram map)

These parameters must be the same for the experimental variograms:

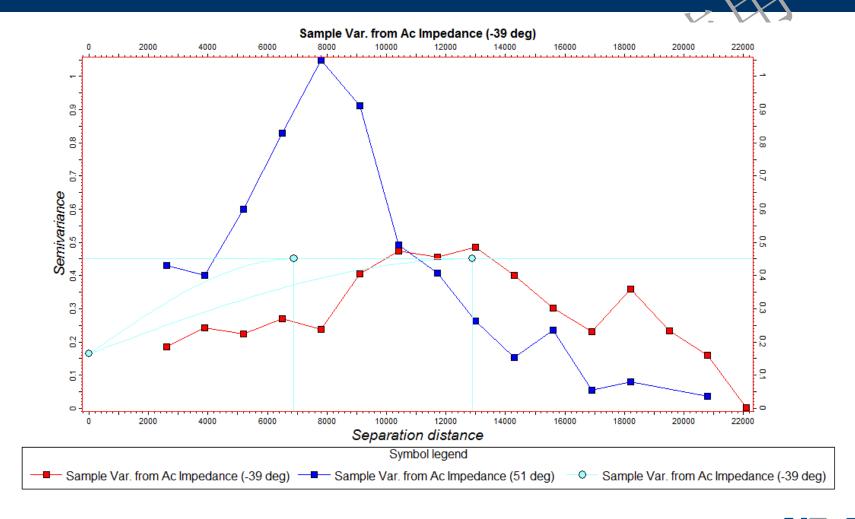
- Nugget
- Sill
- Variogram model type

Note: Sill has no influence on the kriging/simulation estimation result.





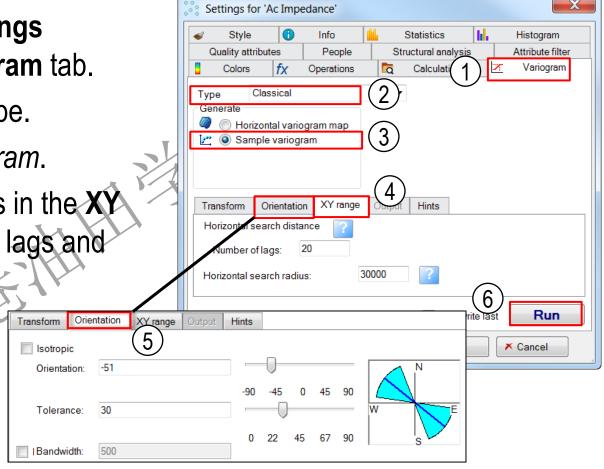
Sample variogram: Theory (2)





Sample variogram: Computation in Petrel (1)

- 1. Go to the object **Settings** window of the **Variogram** tab.
- 2. Choose the model Type.
- 3. Select Sample variogram.
- 4. Define the parameters in the XY range tab: Number of lags and Search radius.
- 5. Set the Orientation.
- 6. Click Run.





Sample variogram: Computation in Petrel (2)

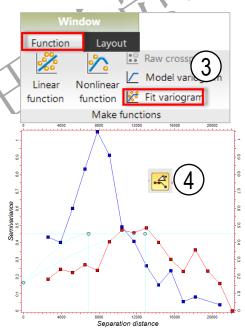
1. Open a **Function window**: display the sample variogram.

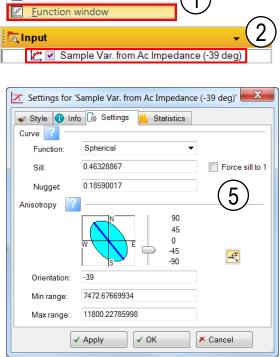
2. Display one of the two orientations.

3. Click Fit Variogram.

4. Click *Edit function point* to split into both major and minor variogram ranges.

5. Open **Variogram Settings** to see the model parameters.





Window

2D window 3D window



Exercises

Calculate a Variogram map

Calculate a Sample variogram map

