



## Stochastic Methods for Reservoir Simulation

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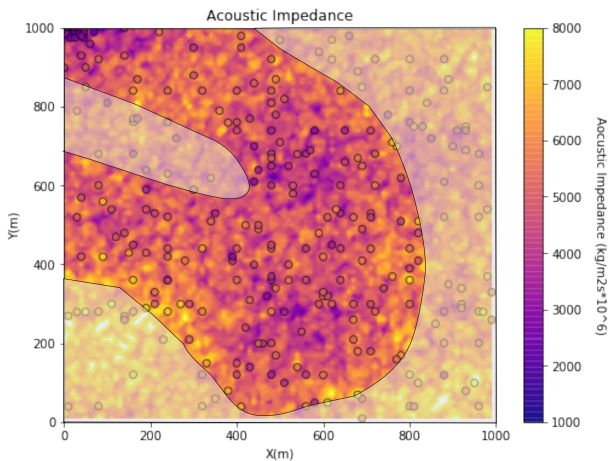
### **Project Update 3**

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Preston Durham, Ningjie Hu, Jayaram Hariharan, Jorge Navas  
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## Initial Interpretation



**Figure:** Geologic interpretation overlaid on acoustic impedance data



## Workflow

The following steps comprised our computational workflow:

1. Outliers in well data were removed via the Tukey method
2. Porosity and permeability data were transformed to standard Gaussian distribution
3. Variogram map was constructed
4. Experimental variograms of facies, porosity and permeability were constructed to establish azimuthal directions for major and minor axes of continuity in the reservoir
5. Model variograms were fit to the experimental variograms and interpreted

## Variogram Map

The variogram map for sand facies has shown a primary direction SW to NE with an azimuth in the major direction of 22.5 degrees and 112.5 degrees in the minor direction.

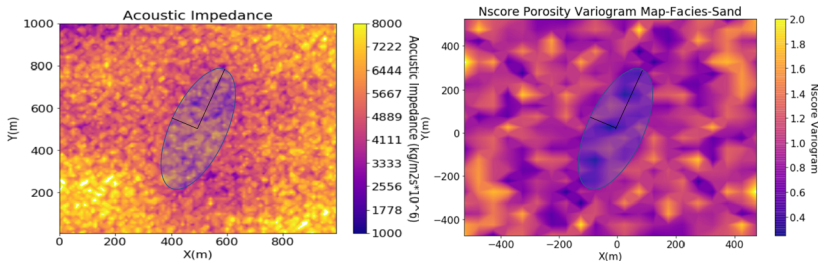
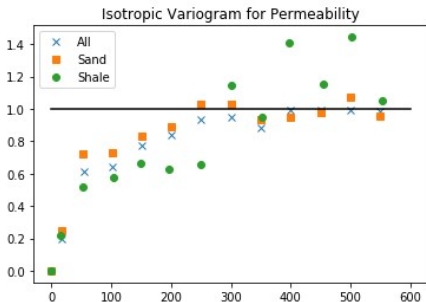


Figure: AI map and Variogram map for porosity sand facies



## Isotropic Variogram

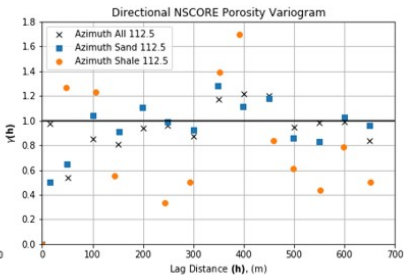
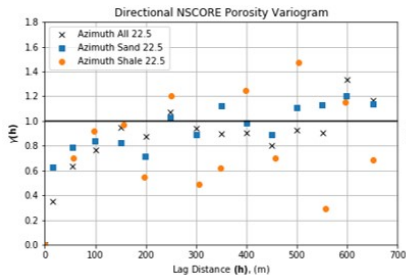
- ▶ The range of the correlation for sandstone facies is 250 m
- ▶ The width of the channel belt is 250m, agreed with the visual estimation based on the acoustic impedance map





## Directional Variograms

- ▶ Major direction: 22.5 degrees
- ▶ Minor direction: 115.5 degrees





## Facies Variogram

- Presence of some cyclicity as expected from sinuous channel interpretation

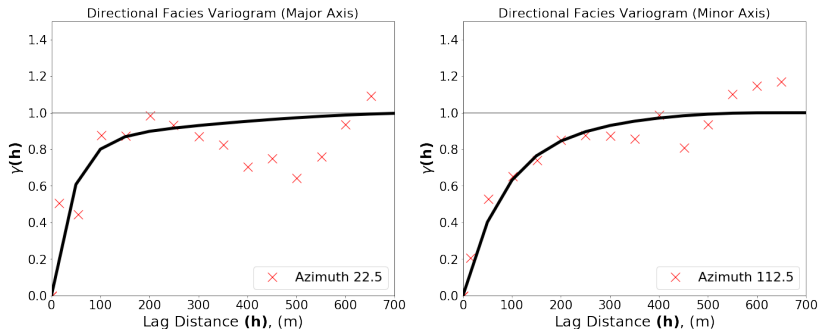


Figure: Modeled variogram for facies continuity



## Sandstone Porosity Variogram

- Have a significant nugget effect in sandstone porosity accounting for  $\sim 50\%$  of the variance

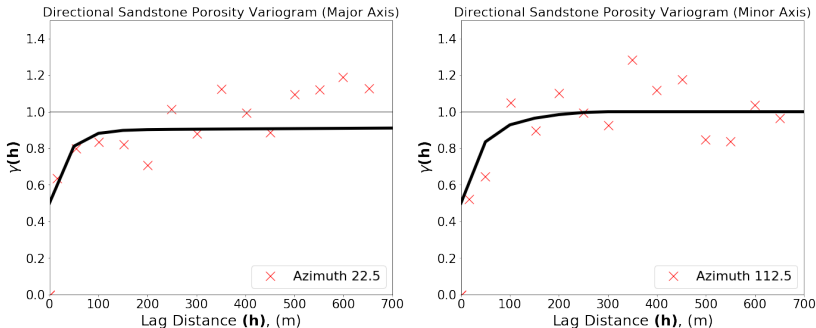


Figure: Modeled variogram for sandstone porosity





## Sandstone Permeability Variogram

- ▶ Smaller nugget effect
- ▶ Similar ranges in major and minor axes

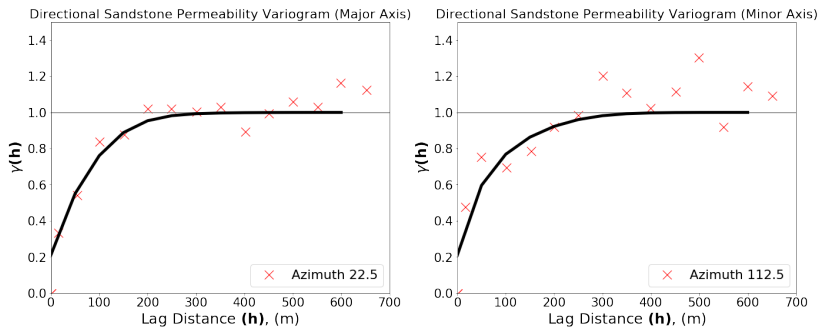


Figure: Modeled variogram for sandstone permeability



## Conclusions

- ▶ Variogram map and directional variograms suggest weak directional spatial continuity in the 022/112 azimuthal directions
- ▶ Long range spatial continuity in the 112 direction
- ▶ Cyclicity in variogram validates initial geologic interpretation of a 200-250m wide channel feature