

Influence of variogram and geostatistics models on 3D reservoir simulation results>

ZHONGQI WANG, LESLEY A. JAMES, AND THORMOD E. JOHANSENN

*Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland and
Labrador A1B 3X5, Canada*

From basin exploration to reservoir simulation, models play a very important role in understanding and predicting a reservoir's geological and geophysical information and production performance. A detailed and reliable geological model which integrated stratigraphy information and rock properties collected by seismic or logging tools can be used to guide the drilling path and make a more scientific field development plan. Since field data are usually limited, probabilistic models may be used to represent the formation and rock properties in locations where seismic survey and logging data are not available. Geostatistics is a branch of statistics focusing on spatial or spatiotemporal datasets and was developed originally to predict probability distributions of ore grades for mining operations. The data generated in geostatistics is correlated spatially or temporally. The key objective of geostatistics is to manage the spatial relationship and balance the weight between local mean and global mean. Common models include stratigraphy modeling, geophysics modeling, structural framework modeling, property modeling and geostatistic modeling, upscaling, and reservoir modeling.

This paper shows a case study that indicates the influence of variograms and geostatistic models on 3D reservoir simulation results. Based on the same porosity data used as constraints, different geostatistics realizations will yield different reservoir production performance. Numerical simulation is used in this paper to demonstrate this and to compare results using parameters like lag distance, separation, search ellipsoid, etc., to create geostatistic realizations and compare production performance indices like oil flow rate, gas to oil ratio and water cut. The potential updating of geo-models with real-time data is also discussed.