



# Experimental Variograms & Variogram Modelling

## 1 Day Professional Development Course

**Course Leader: Mike Stewart**

### Objectives of the Course

The variogram lies at the heart of geostatistics. All commonly used geostatistical methods require a “model” to describe the spatial variability of grade – this model is the variogram. Many of the decisions we must make during resource estimation, from defining the search neighbourhood (using quantitative kriging neighbourhood analysis) through to determination of the kriging weights required for block grade estimation, are underpinned by the variogram model. Consequently a strong understanding of how experimental variograms are calculated from sample data, and how robust, coherent variogram models are fitted to these, is an essential skill for the mining and resource geologist.

This one day professional development program gives participants applied, hands-on tuition in all aspects of variography. The course explains the definition and potential uses of variograms, clearly explains the difference between experimental variograms and variogram models, demonstrates techniques for selecting the parameters used to calculate experimental variograms and addresses the issues associated with difficult data. Participants will learn the importance of understanding their data and the connections between the variogram and geological processes involved in ore deposit formation.

Participants will use free, public domain software to calculate experimental variograms and create models on a number of data sets ranging from well behaved to complex. Practical examples of techniques and approaches will be demonstrated and participants will be encouraged to complete training exercises designed to demonstrate key aspects of variography.

### Who Should Attend?

This professional development program is designed for professionals working in resource estimation, exploration or mining geology including grade control. It is particularly aimed at people with responsibility for working with estimates and models or those seeking further understanding and insight into spatial variability. The course is strongly focused on giving users a set of practical tools to ensure that their awareness of the benefits of variography is enhanced. Non-geologists involved in resource-reserve evaluation will also benefit from the program as they will be introduced to key concepts underlying resource estimation.

As this program includes hands-on demonstrations participants will need to supply their own computer and have sufficient authority to install public domain software.

## Program

Day 1	<p>Introduction to Variograms; Domaining and stationarity: implications for variography; Experimental variograms: terminology and calculations; Understanding your data: why is this essential? Tricks and tips for analysing difficult data; Alternative 'variogram' calculations: uses and limitations; Variogram models : definition and theory; Fitting variogram models: practice; Is my variogram model 'sensible?': the link to geology.</p>
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A full set of PowerPoint slides will be provided to each participant. Additional reference materials including examples and test cases will be provided electronically at the completion of the program.



### Course Leader: Mike Stewart

Mike Stewart is a geologist and geostatistician with over 18 years experience of nickel, gold and copper projects, for a variety of deposit types. He has run a number of courses in geostatistics and sampling in Australia and Africa. Mike has particular strengths in mining geology and the application of geostatistics to mining operations. He has been consulting in all aspects of resource estimation and applied mining geostatistics since 2004, particularly focusing on skill transfer (“co-pilot training”) with mine geology and resource teams.

Mike is Principal Consultant with QG and holds both B.Sc and M.Sc (first class honours) degrees in geology from the University of Canterbury, NZ. In addition he holds the CFSG post-graduate Diploma in Geostatistics from the Paris School of Mines (Fontainebleau). He is a member of the AIG and the AusIMM.

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