



Introduction to geostatistics and its applications in hydrogeology

J. Jaime Gómez-Hernández, Eduardo Cassiraga
Universitat Politècnica de València

This course will be an introduction to geostatistics aimed to understand the foundations of this discipline that allows it to treat spatial data. The types of parameters dealt in geosciences show spatial patterns that cannot be captured with deterministic expressions; geostatistics provides tools to infer those patterns in a statistical way so that they can be used to interpolate/extrapolate sparse data observations. The geostatistical tools can be classified in two groups: estimation tools and simulation tools. Geostatistics started in the mining industry with the development of the first estimation tools, kriging and its variants, but you will learn that in hydrogeology kriging is of seldom interest when dealing with complex problems such the prediction of the fate and transport of contaminants in the subsurface. In these cases, it is necessary to resort to stochastic simulation, to generate numerous alternatives of the spatial distribution of conductivities to be fed to the flow and transport numerical codes so as to get an appropriate model of uncertainty about solute concentration predictions.

This short course can only give you a glimpse of what geostatistics can achieve and it will be structured in the following modules:

1. Introduction to geostatistics, spatial data, continuity characterization, variograms (first half of first day).
2. Introduction to the open software SGeMS and demonstration of its use for exploratory data analysis, continuity characterization, variogram calculations (second half of first day).
3. Introduction to estimation and demonstration with SGeMS (first half of second half day).
4. Introduction to simulation and demonstration with SGeMS (second half of second day).
5. Brief introduction of the new geostatistical tools for heterogeneity characterization: multiple point geostatistics (course ending).

The SGeMS examples will be hydrogeology oriented.