Measurement of uncertainty in geostatistics: estimation or simulation?

Yamamoto, J.K.[1], Rocha, M.M.[2] - [1] Department of Environmental and Sedimentary Geology, Institute of Geosciences, University of São Paulo, Brazil, [2] Ph.D. Candidate at Institute of Geosciences, University of São Paulo, Brazil.

This paper presents a comparative study between estimation and simulation both concerned to uncertainty measurements. It has been proved that depending on the simulation algorithm used, the E-type estimates from a set of simulated realizations is equivalent to the OK estimates. Ordinary kriging estimation provides an uncertainty measurement which is traditionally based on the kriging variance. Recently an alternative approach based on interpolation variance has been proposed. Conditional stochastic simulation has been preferred in relation to OK estimation because a field of uncertainty at unsampled points can be derived. The GSLIB's cluster.dat was chosen as a test data set. For this data set both ordinary kriging and E-type estimates, derived from sequential gaussian simulation, are very similar. The kriging variance and the conditional variance around the E-type estimates show also a similar behavior, i.e. both do not present any correlation with OK and E-type estimates, respectively. This result proves that the conditional variance around the E-type estimate indeed does not measure the conditional local data dispersion as should be expected. In this sense both kriging variance and conditional variance are homoscedastics. On the other hand, the interpolation variance shows a good correlation with OK estimates, recognizing in this way the proportional effect presented by the cluster.dat asymmetrical distribution. Therefore, the results reconfirm the usefulness of the interpolation variance but on the other hand discourages the use of the conditional variance derived from conditional stochastic simulation as a reliable measurement of uncertainty.