AEGS-3: Procesamiento de la Información geocientífica

Change of support using non-additive variables with Gibbs Sampler: application to metallurgical recovery of sulphide ores

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The creation of an integrated database allows the application of geostatistical tools, such as exploratory data analysis, search for correlations, studies of spatial variability and generation of predictive models. The process of generating a consolidated database presents difficulties when the samples are not georeferenced in the same position, do not have the same sampling support, or are non-additive variables. This research we study the change of sampling support for variables of a geometallurgical nature associated with the mining process of copper extraction in sulphide minerals. Flotation tests at laboratory scale describe the metallurgical behavior of the minerals that will be processed in the operational plant. This material is generally composed of ore and gangue minerals. These tests are usually scarce, expensive and sampled in large supports. This research proposes a methodology for the geostatistical modelling of metallurgical recovery, covering the change of support problems through additive pivot variables. The methodology consists of simulating these pivot variables using a Gibbs Sampler in order to infer the behaviour of samples with smaller supports. This allows downscaling a large sample measurement into smaller ones, reproducing the variability at different scales considering the physical restrictions of additivity. As a consequence, it is possible to apply conventional multivariate geostatistical tools to data at different supports, such as multivariable exploratory analysis, calculation of cross-variograms, multivariate estimations, among others. The methodology was tested using a drillhole database from an ore deposit, modelling recovery at a smaller support than that of the metallurgical tests. The support allowed for the use of the geochemical database, to consistently model the metal content in the feed and in the concentrate, in order to obtain a valid recovery model. Results show that downscaling the composite size reduces smoothing in the final model.