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Spatial hazard assessment using simplicial indicator kriging

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Geochemical sampling campaigns provide concentration of several chemical elements, including major and trace elements, at sampling points covering large areas. These geochemical data can be interpolated to a grid regularly distributed on the region of interest. Geochemical data are typically compositional and the interpolation of all chemical elements leads to a cokriging of considerable dimension, e.g. 10 or even up to 40, with the subsequent difficulties in modelling variography or in dimension reduction [1]. In many situations, interest is centred in classes of hazardous events that can be assessed from the geochemical analyses. For instance, levels of health hazard due to presence of dissolved As, or other elements, in ground water. Whenever it is possible to assess the probability of each hazard category from the geochemical analysis at a sampling point, the geochemical cokriging can be substituted by a cokriging of the categorical probabilities. Probabilities are also compositional quantities which can also be cokriged [2]. This is the core of simplicial indicator kriging [3][4]. This strategy [5] has the advantage that the dimensionality of the probabilities is commonly less than that of the geochemical data. Moreover, the assessment of the category at each sampling point can be performed on the base of the whole geochemical analysis, despite of the categories being defined only on the basis of the concentration of one, e.g. As, or a few elements.

A Bangladesh ground water data base [6][7] is used to illustrate these simplicial indicator kriging techniques. Depending on the As concentration dissolved in the ground water, levels of health hazard are defined. The probabilistic assessment of these levels is then interpolated by using simplicial indicator kriging.

References:

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