GEOSTATISTICS FOR RADIOLOGICAL CHARACTERIZATION:
EXPERIENCE GAINED AND PERSPECTIVES

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Abstract

The objective of radiological characterization is to find a suitable balance between gathering data (constrained by cost, deadlines, accessibility or radiation) and managing the issues (waste volumes, levels of activity or exposure). It is necessary to have enough information to have confidence in the results without multiplying useless data.

Geostatistics processing of data considers all available pieces of information: historical data, non-destructive measurements and laboratory analyses of samples. The spatial structure modelling is then used to produce maps and to estimate the extent of radioactive contamination (surface and depth). Quantifications of local and global uncertainties are powerful decision-making tools for better management of remediation projects at contaminated sites, and for decontamination and dismantling projects at nuclear facilities. They can be used to identify hot spots, estimate contamination of surfaces and volumes, classify radioactive waste according to thresholds, estimate source terms, and so on.

The spatial structure of radioactive contamination makes the optimization of sampling (number and position of data points) particularly important. Geostatistics methodology can help determine the initial mesh size and reduce estimation uncertainties.

Several show cases are presented to illustrate why and how geostatistics can be applied to a range of radiological characterization where investigated units can represent very small areas (a few m2 or a few m3) or very large sites (at a country scale). The focus is then put on experience gained over years in the use of geostatistics and sampling optimisation.

Keywords: Geostatistics, radiological characterization, sampling strategy, data analysis