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Using semivariogram scaled to the sample design of heavy metals

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The "sampling intensity" issue is of important application to precision agriculture. About 80%-85 % of the total error in precision in agriculture results from the field sampling preceding the application of fertilizers and corrective practices. The spatial sampling design used to characterize the spatial variability of soil attributes is crucial to science studies. The sample planning for interpolation of a regionalized variable may use several criteria, which could be best selected from the estimated semivariogram from a previously established grid. The objective of this study was to evaluate the use of the semivariogram scaled to improve the sample design of heavy metals in an experimental plot. The study area surface is 6 ha and is located at Castro Ribeiras de Lea, Lugo, Spain. The geographical coordinates of the study area are: latitude 43º 09 '49"N and longitude 7º 29' 47"W, with average elevation of 410 m and average slope of 2 %. The mean annual temperature is 11.2 ºC and mean annual rainfall is 930 mm (data 1961-1990). The soil is classified with Cambisol and the parent material are sediments from tertiary and quaternary. Heavy metals were initially sampled at 40 points randomly distributed in the study area. The heavy metals analyzed in this study were: Pb, Cd, Cu and Ni. Data were initially analyzed using descriptive statistics and geostatistical tools. The scaled semivariogram was built with the aim of setting a single theoretical semivariogram all elements studied. Subsequently, the software SANOS was used to determine the sampling optimization of new sampling points of the heavy metals. The spatial variability analysis of the studied elements using the scaled semivariogram showed the existence of a relationship between the spatial variability of these elements. The gaussian model was adjusted for Pb, Cd and Ni, and spherical models for the Cu element. The semivariogram scaled theoretical adjusted to elements in four study was Gaussian, with a value range of 70 m, and this value range intermediate values found for the individual semivariograms. The scaled semivariogram and programs of simulation of sampling points based on the parameters of the semivariogram can be used to assist soil management.