



Three-dimensional analysis of magnetic susceptibility in areas with different type of land use

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The knowledge of the type of semivariance and its parameters such as nugget-effect, range of correlation and sill, that quantitatively characterize spatial variability of a studied environmental phenomenon, can be essential for both measurements planning and analysis of results. In particular this is the truth in the case of magnetometric measurements of soil pollution. Field magnetometry is internationally recognized as valuable, convenient and affordable tool for soil pollution screening and assessment. However, this geophysical method usually requires support of detailed statistical and geostatistical analyses.

The goal of this study was to evaluate the parameters of spatial variability of soil magnetic susceptibility depending on the terrain usage. To do so, several types of study area were specially selected: forest, arable field and urban park. Some of the study areas were neighboring to each other, in order to ensure that the anthropogenic pressure was the same at each site.

In order to analyze soil magnetic susceptibility in 3-dimensional space, measurements were performed on the soil surface and in soil profile, using the MS2D and MS2C Bartington instruments, respectively. MS2D measurements were performed using quasi-regular grids, and at each sample point 10 single MS2D readings were carried out in the circle with the diameter of about 2 meters. MS2C measurements were performed using soil cores collected in the field, down to the depth of about 30cm. Such approach combines the advantages of both types of measurements and allows to get deeper insight into the distribution of soil pollution.

As the first step of the analysis, the semivariances of magnetic susceptibility were calculated and thoroughly modeled for all different forms of land use, on the basis of only the MS2D measurements. Then, the MS2D and MS2C measurements were jointed into one three-dimensional data set, and were used together to calculate and model the semivariances. Finally, the obtained differences in semivariances calculated using these approaches, were compared and discussed from the viewpoint of the use of the field magnetometry method for a screening of soil pollution.

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