



Enhancement of MS2D Bartington point measurement of soil magnetic susceptibility

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Field magnetometry is fast method used to assess the potential soil pollution. The most popular device used to measure the soil magnetic susceptibility on the soil surface is a MS2D Bartington. Single reading using MS2D device of soil magnetic susceptibility is low time-consuming but often characterized by considerable errors related to the instrument or environmental and lithogenic factors. Typically, in order to calculate the reliable average value of soil magnetic susceptibility, a series of MS2D readings is performed in the sample point. As it was analyzed previously, such methodology makes it possible to significantly reduce the nugget effect of the variograms of soil magnetic susceptibility that is related to the micro-scale variance and measurement errors.

The goal of this study was to optimize the process of taking a series of MS2D readings, whose average value constitutes a single measurement, in order to take into account micro-scale variations of soil magnetic susceptibility in proper determination of this parameter. This was done using statistical and geostatistical analyses.

The analyses were performed using field MS2D measurements that were carried out in the study area located in the direct vicinity of the Katowice agglomeration. At 150 sample points 10 MS2D readings of soil magnetic susceptibility were taken. Using this data set, series of experimental variograms were calculated and modeled. Firstly, using single random MS2D reading for each sample point, and next using the data set increased by adding one more MS2D reading, until their number reached 10.

The parameters of variogram: nugget effect, sill and range of correlation were used to determine the most suitable number of MS2D readings at sample point. The distributions of soil magnetic susceptibility at sample point were also analyzed in order to determine adequate number of readings enabling to calculate reliable average soil magnetic susceptibility.

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References:

- Zawadzki J., Magiera T., Fabijańczyk P., 2007. The influence of forest stand and organic horizon development on soil surface measurement of magnetic susceptibility. *Polish Journal of Soil Science*, XL(2), 113-124
- Zawadzki J., Fabijańczyk P., Magiera T., Strzyszczyk Z., 2010. Study of litter influence on magnetic susceptibility measurements of urban forest topsoils using the MS2D sensor. *Environmental Earth Sciences*, 61(2), 223-230.