

Assessment of spatial variability of soil thermal properties in cultivated field

Boguslaw Usowicz and Jerzy Lipiec

Institute of Agrophysics, Polish Academy of Sciences, Lublin, Poland (b.usowicz@ipan.lublin.pl)

Most of soil physical properties are spatially variable both in regional and field scale. Spatial heterogeneity of soil properties in the field is related to the nature of the soil itself, but some of the variation is caused by tillage and other management practices. The aim of this work was to determine spatial variability of thermal properties on the cultivated field (40 x 350 m) using geostatistical method. The present work used data obtained from the measurements of topsoil soil texture (sand, silt and clay content), organic carbon, water content, bulk density, particle density, thermal conductivity, heat capacity and thermal diffusivity after harvest of triticale. The measurements were done in 45 points using TDR and KD2Pro for soil water content and thermal properties, respectively. Moreover, measurements of the thermal properties were performed in the laboratory at dry and saturated soil.

The coefficient of variations (CV) varied from 1.6% for the particle density to 67% for the clay content. Among the thermal properties the most variable was thermal diffusivity at saturation (24%) and the least variable thermal conductivity in dry state (8.4%). The exponential semivariogram models matched well with empirical semivariogram. The range of the thermal properties measured in the field varied from 10 m for the thermal diffusivity to 23 m for the thermal conductivity. The ranges in dry and saturated soil were greater than at field water content. Among the remaining properties the largest range of the semivariograms was for soil textural fractions (100-250 m) and bulk density (145 m) and the lowest water content (14 m). This indicates that the thermal properties were resultant of both soil water content and bulk density. Most of the soil properties exhibited strong and moderate spatial dependency. Heterogeneity and variation of soil physical and thermal parameters in a field due to soil cultivation should be taken into consideration for a successful agricultural management.

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