Small Scale Spatial Variability of Soil Properties and Nutrients in a Ferralsol under Corn

M. C. Alves (1), E. Vidal Vázquez (2), V. Pereira de Almeida (1), and J. Paz-Ferreiro (3)

(1) Dpto. Fitossanidade, Engenharia Rural e Solos, UNESP, Campus Ilha Solteira, SP, Brazil, (2) Facultad de Ciencias, Universidade da Coruña, A Zapateira, 15071, Coruña, Spain, (3) Dpto. de Edafología, Universidad Politécnica de Madrid, Ciudad Universitaria, Madrid, Spain

Spatial variability of soil attributes, both in natural and agricultural landscapes can be rather large. This heterogeneity results from interactions between pedogenetic processes and soil formation factors. In cultivated soils much variability can also occur as a result of land use and management effect, i.e. agricultural systems and practices. Therefore, the main objectives of this work were to investigate the statistical and geostatistical variability of selected properties in a soil cultivated with corn. The experimental work was carried out in Ilha Solteira, São Paulostate, Brazil and the soil was classified as an Oxisol (SSA), i.e. "Latossolo Vermelho" according to the Brazilian Soil Classification System. Eighty-four soil samples were collected at each of two different depths (0–10 and 10–20 cm) from the one-hectare plot studied. Sampling included a combination of grid and nesting schemes in order to allow description of the spatial variability at different scales. Soil texture fractions (sand, silt clay), organic matter content and pH ($CaCl_2$) were determined using standard methods. Moreover, exchangeable bases (Ca, Mg, K), cation exchange capacity (CEC) and P were determined after exchange resin extraction. In the two depths studied, extractable P, K and Mg contents were found to be highly variable (C.V. > 30%), organic matter content and CEC showed a medium variability (C.V. ≈ 15-30%) and base percent saturation and pH exhibited a low variation (< 15%). Experimental semivariograms were computed and modeled and used to map the spatial variability of the study properties. Semivariograms provided a description of the pattern of spatial variability and some insight into possible process affecting the spatial distribution of the assessed soil properties. Sensitivity of nutrient spatial requirements to between field variability was discussed on the basis of the results obtained. In addition, the usefulness of kriging maps to improve and optimize productivity of this soil under intensive agricultural land use was considered.