Applying an algorithm for slope segmentation as an auxiliary variable to digital soil mapping in the Ceveiro Watershed, Piracicaba, SP.

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Abstract

The spatial variation of soils is due to the action of pedogenetic factors and processes. Among those factors, the relief determines the dynamic of superficial water (infiltration vs runoff), which in turn affects the intensity of hydrolysis and the development of soils. In Pedometry, and particularly in digital soil mapping (DSM), the use of spatial disaggregation techniques can improve the accuracy and precision of the predictions about the geographic distribution of soil classes. This work employed and validated an algorithm for segmenting the slopes as an auxiliary technique for spatial disaggregation of compound soil mapping units occurring in the Ceveiro Stream Watershed, Piracicaba, SP.

Key words:

Soil-relief relationship, Terrain morphometric algorithms, Digital soil mapping.

Introduction

In the context of Pedometry and digital soil mapping (DSM), Silveira et al. (2012) emphasizes the possibility of predicting soil units employing morphometric parameters extracted from relief, or particularly from the slopes. Computational algorithms are capable to automatize the process of morphometric characterization of the slopes. Their integration to a geographical information system (GIS) generates quantitative information, digital and georeferenced, which can be validated, corrected, exhibited, and updated. This is the case of the TOPOSHAPE algorithm (Pellegrini, 1995), available in GIS IDRISI®.

The main objective of this work was to apply the TOPOSHAPE algorithm for slope segmentation and morphometric characterization as a tool for automatic disaggregation of compound soil mapping units occurring in the Ceveiro watershed (1990 ha).

Results and Discussion

Exemplifying for the compound soil mapping unit referred to LI1+Li2+PV11 (31 ha), TOPOSHAPE recognized seven among twelve possible segments of the slope as illustrated in Figure 1.

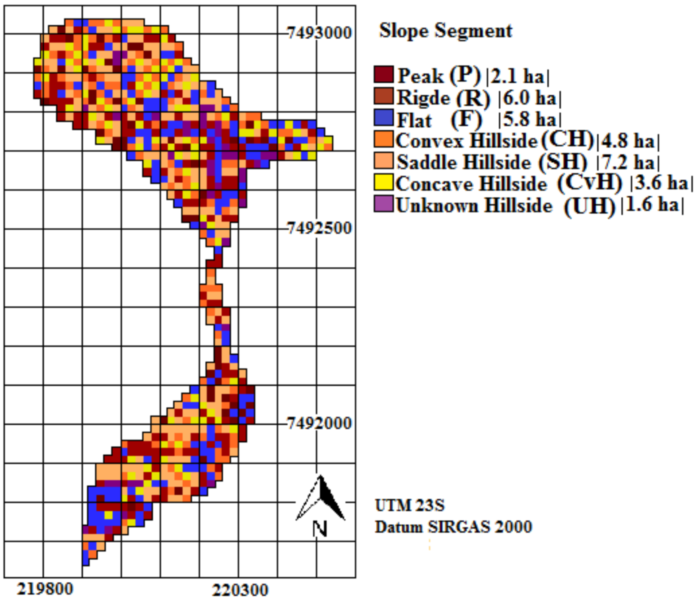

Figure 1. Slope segmentation of the compound soil mapping unit (Li1+L12+PV11) employing TOPOSHAPE.

Applying TOPOSHAPE to the digital elevation model of the entire watershed, the three segments *ridge* (higher region relating to the neighbors), *convex hillside*, and *saddle hillside* (slope with positive curvature in one direction and negative in its orthogonal) had the greatest areas. In the topographic profile studied within the area of the soil mapping unit Li1+Li2+PV11 (Figure 2), the Flat (F) segments refers to areas with very low or zero inclination.

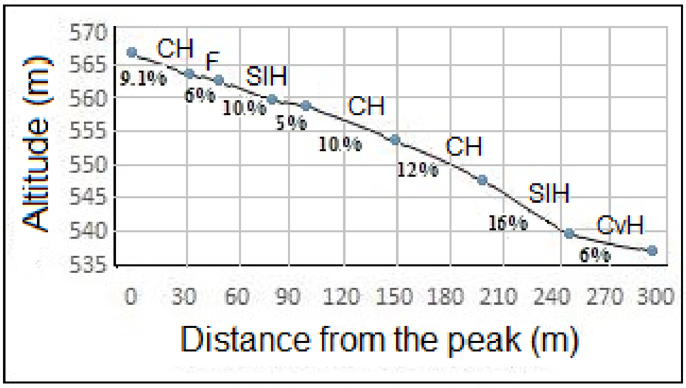

Figure 2. Topographic profile of a soil sequence within the area of the soil mapping unit Li1+Li2+PV11 in Ceveiro watershed. (F, flat; CH, convex hillside; SIH, slope hillside; CvH, concave hillside).

Conclusions

The segments of the slopes defined by the TOPOSHAPE algorithm had correspondence with those identified by the field work. Established the relationship between soil and relief as they occur in soil sequences, the use of that algorithm will be useful as an auxiliary tool for soil mapping units disaggregation and digital soil mapping.

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PELLEGRINI. G.J. (1995) Terrain Shape Classification of Digital Elevation Models using Eigenvectors and Fourier Transforms, PhD theses, UMI, USA, 1995.

SILVEIRA, T. C; OKA-FIORI, C; SANTOS, C. J. L; SIRTOLI, E. A; SILVA, R. C. Pedometria apoiada em atributos topográficos com operações de tabulação cruzada por álgebra de mapas. Rev. Brasileira de Geomorfologia v. 13, nº 2, 2012.