USING SELF-ORGANIZING MAPS TO PREDICT SOIL TEXTURE AND HYDRAULIC CONDUCTIVITY IN POÇOS DE CALDAS, MINAS GERAIS, BRAZIL

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RESUMO: The self-organizing map (SOM), a type of unsupervised artificial neural network, is well-suited to organizing, visualizing, and classifing noisy, non-gaussian multi-dimensional data. In this study, the self-organizing map (SOM) technique was used to predict soil texture and hydraulic conductivity based on relief morphometric features. The concave-convex nature of hillslopes (from hilltop to bottom of the valley) reflected a steady-state geomorphic condition. The topographic features were extracted from Shuttle Radar Topographic Mission (SRTM) elevation data; whereas soil textural (fractions clay, silt and sand) and hydraulic conductivity data were associated with 30 locations sampled at 75 cm depth. In contrast to traditional principal component analysis the SOM identified relations among relief features, such as, slope, horizontal curvature and vertical curvature. Stochastic cross-validation indicated that the SOM was unbiased and provided a means to quantify the magnitude of prediction uncertainty for all variables. SOM-based cross component plots of the soil texture revealed higher clay proportions at concave areas with convergent hydrological flux and lower proportions for convex areas with divergent flux. The sand ratio had an opposite pattern with higher values near the ridge and lower values near the valley. Silt had a trend similar to sand, although less pronounced. The relation between soil texture and concave-convex hillslope features revealed that subsurface weathering and transport was an important process that changed from loss-to-gain at the rectilinear hillslope point. These results illustrated that the SOM can be used to capture and predict nonlinear hillslope relations among relief, soil texture, and hydraulic conductivity data.

PALAVRAS-CHAVE: SELF-ORGANIZING MAPS; MODELING; HILLSLOPES.