Quantitative Soil-Landscape Modeling Using Multi-Scale Terrain Analysis. (6152)

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Abstract:

Soil-landscape modeling techniques are widely used as a quantitative method to predict patterns of soil properties from digital elevation models (DEM) and other environmental variable data. The processes that control this soil variability, and consequently the landscape factors that regulate these processes, vary at different spatial scales. Selecting a single DEM resolution to model soil variability is therefore highly dependent on the scale of the process being modeled. Our objectives were to develop quantitative soil-landscape models using multi-scale terrain analysis and to examine terrain attribute scale effects on soil-landscape relationships. We have collected high-resolution DEM for multiple study sites across the Pennyroyal physiographic region of Kentucky, and for each study site used terrain attributes derived from the DEM to collect discrete soil samples for morphological, physical, and chemical characterization using a stratified random sampling design. Each topographically derived terrain attribute has a different optimum resolution for predicting soil variability. We developed quantitative soil-landscape models that predict the spatial patterns of A-horizon depth, surface soil organic carbon content, and surface clay content using terrain attributes calculated at multiple scales.

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Session Information: Tuesday, November 2, 2004, 1:25 PM-4:35 PM

Presentation Start: 2:00 PM

Keywords: soil variability; terrain analysis; spatial modeling; digital elevation models