Modeling of Soil Organic Carbon in Dependence of Ancillary Environmental Factors

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The SCORPAN (i.e., the spatially explicit soil forming factor) model has been widely applied in digital soil mapping studies at different levels of complexities incorporating all or few of the factors to estimate a soil property of interest. However, we lack clarity which of the SCORPAN factors has the most predictive capabilities for soil carbon in subtropical, sand-rich landscapes interspersed with wetlands, which is represented by our large study area (about 16,588 km^2) – the Lake Okeechobee Basin (LOB), Florida. This study is aimed to: 1) identify the SCORPAN factors with the most predictive power for soil organic carbon (SOC) by testing various SCORPAN factors, such as land cover / land use, remote sensing vegetation indices (e.g., Enhanced Vegetation Index - EVI), biomass, climate, hydrology and topography, in the LOB; 2) establish a reliable predictive model and assess the spatial distribution of SOC in the LOB. We collected soil samples (0-20 cm) at 198 sites and analyzed and derived SOC stocks (kg m^{-2}). A wide array of SCORPAN factors (more than 100 variables) were compiled using ArcGIS. A tree-based regression kriging technique was applied to model SOC and validation used to assess prediction performance. Results show that SOC from SSURGO (Soil Survey Geographic Data Base), remote sensing products (MODIS EVI) and biological properties (forest canopy cover and biophysical settings) have the most predictive power among all the SCORPAN factors. Findings from this study advance our understanding of the underlying processes and dynamics that form SOC pattern and shed light on predictive modeling of SOC at regional scale.