Soil nutrient and landscape interactions in a tropical dry forest: exploring alternatives to derive soil information in a region with limited data in Brazil

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The adoption of new pedometrical techniques for soil assessments often depends on a relatively large number of soil and ancillary environmental observations, hindering their application in areas where such data are limited. This study investigates the relationship among soil and environmental variables in the Mata Seca (Dry Forest) State Park, in Brazil, exploring alternatives to derive soil information based on an existing soil/environmental dataset. Soils in this tropical dry forest vary from those with incipient development (Entisols and Inceptisols) to deep gibbsitic soils (Oxisols). Contrary to moist forests, in dry forests the limited water supply delays plant succession and nutrient cycling, ultimately affecting soil formation, and possibly imprinting different physical, chemical and morphological signatures to these soils. Based on these premises, we aimed to characterize soil-soil and soil-landscape correlations in this unique environment, expecting to find some interesting and distinctive patterns relative to other tropical environments. Soil samples were collected (from boreholes or pits) at 272 locations along topographic and vegetation (i.e. succession) gradients. Pedotransfer functions were derived for soil nutrients (e.g. Ca, Mg, K), and were complemented by quantitative (e.g. linear), and discriminant (e.g. decision tree) models to characterize relationships among soil and landscape variables. Soil-soil and soil-landscape correlations varied depending on the variables and type of relationship (e.g. parametric vs. non-parametric) considered. Identified patterns generally corresponded to field expertise expectations, offering alternatives to derive soil information to support digital soil mapping and assessment in a data-scarce region. This study advances the understating of soils in tropical dry forests, which to this date have still received very little attention.