Abstract for American Geophysical Union Fall Meeting in New Orleans, LA, December 2017

Title
The Vertical Structure of Urban Soils and Their Convergence Across Cities

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ABSTRACT

The theoretical patterns for vertical soil structure (e.g., A-B-C ordering of horizons) are a basis for research methods and our understanding of ecosystem structure and function in general. A general understanding of how urban soils differ from non-urban soils vertically is needed to inform urban research methods and advance our knowledge of urban ecosystems. We performed a soil taxonomic assessment of 391 deep soil cores (up to 5-m) collected in 11 cities across the U.S. and Puerto Rico. The likely soil series in the absence of urbanization was identified for each soil core and comparison soil taxonomy data for agricultural and wildlands land uses soils of the same soil series was gathered from the NASIS database. We hypothesized that urbanization has modified the vertical arrangement of soil horizons and decreased their vertical complexity (e.g., degree of horizonation). In addition, we hypothesized that soils in each city are becoming more like each other and less like their pre-urbanization soils. Urban soils had fewer soil horizons than their non-urban references; specifically, urban soils had two fewer distinct genetic horizons in the top meter of soil. B horizons were commonly lost or reduced in extent as A horizons deepened and C horizons shallowed in urban relative to reference soils. The order of horizons was also different from reference and theoretical soil structure. Namely A-C transitions with an absence of B horizons was more common in urban than non-urban soils. If these patterns hold across more cities, our results indicate a need to revisit the conventional predictions of vertical soil structure for understanding urban ecosystems. Finally, we found that several attributes for urban soils with evidence of significant disturbance associated with urbanization were converging across cities. Similar findings have been found for surface soils; here we show the structure of urban soil convergence at greater soil depths than previously reported.