Vadose Zone Journal

Special Section: Dynamic Soil Properties for Understanding Flow and Transport at Landscape Scales

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It has frequently been reported that soils and soil properties are changing in time. Quantitative understanding of these dynamic effects on the description and prediction of flow and transport phenomena or water and element budgets of soil ecosystems is, however, relatively limited. Temporal changes of soil properties occurring at a wide range of time scales (i.e., minutes, days, years, decades) are intrinsically tied to land use and particular soil spatial (pore, pedon, slope, field, landscape) distribution patterns in the landscape (c.f., soil landscape and hydropedology concepts).

The idea of this special issue specifically arose from the 2013 EGU session entitled "Dynamic soil properties for understanding flow and transport at landscape scales." The main outcome of that session was a discussion of numerous different approaches for understanding the role of soils on flow at the landscape scale, with diverging schools of thought. This special issue will provide a collection of the most recent advancements in this important scientific area. The issue will become one of the special events being presented by VZJ (along with SSSA) for the "International Year of Soil," which the United Nations established for 2015. These events emphasize the substantial value of soil properties and processes to addressing compelling questions of the day.

The dynamics of soil properties can be:

a) “Rapid,” due to soil cultivation or individual erosion/accumulation events, fire and other catastrophic events; and cyclic, due to wetting and drying, freezing and thawing, vegetation development, crop rotations. The dynamics can be biologically mediated due to bioactivity (burrowing, plant root growth, microbial and fungi), structure formation, aggregation, and swelling and shrinking can create or destroy pathways for preferential flow and transport.

b) “Intermediate,” due to gradual changes in content of fine particles by wind and water erosion or changes in soil carbon contents and organic matter composition leading to structural changes and development of water repellency, among other processes.

c) “Slow,” due to pedogenic developments leading to changes in soil horizons at longer time scales and geomorphological changes or changes in water regimes (flooding and drainage), salt leaching, accumulation, acidification, surface crust development, and hydraulic property modifications induced by irrigation with saline water or wastewater.

In spatially structured landscapes, a variety of the above-mentioned changes can occur at different landscape positions at the same time, such that changes in soil properties in one region affect soil properties in the other region (e.g., erosion/accumulation). With these premises, this special issue will focus on dynamics of soil properties as an interpretative key for better understanding flow and transport in soil landscapes and feedbacks between soil changes and fluxes. The challenge is how we can and should account for changing hydraulic behaviors when attempting to quantify fluxes such as, for instance, infiltration, storage, run-off, groundwater recharge, salt and particle movement or transport of contaminants. The special issue will include contributions on individual and on interconnected soil dynamics, observations, conceptual modeling, and experimental and field studies that include regional observations of specific cases of dynamic soil properties within and outside of Europe.

Manuscript submission (http://mc.manuscriptcentral.com/vzj) deadline: January 15, 2015.