

Soil moisture dynamics and stoichiometry controls on soil nutrient cycling

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Abstract. The coupled nonlinear dynamics of biotic and abiotic processes in ecohydrological systems give rise to complex system with several nonlinearities and feedbacks whose understanding will help us to sustainably use soil and water resources and maintain valuable ecosystem services. With this background, we discuss how soil moisture dynamics controls the cycling of soil nutrients (nitrogen and phosphorous in particular) at different time scales, driving the competition for mineral nutrients between microbial biomass and plants. We also show how the role of stoichiometry on soil organic matter decomposition and mineralization may be disentangled from the one of soil moisture and climate and formalized into universal curves governing the decomposition of soil organic matter. We discuss open problems related to the spatial soil moisture control of soil organic matter from the pore to topographic scales and show the above approaches and results may be relevant for the sustainable management of soil and water resources, optimal stochastic irrigation and in general to prevent soil and ecosystem degradation.

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