



Nonlinear phenomena in soil nitrogen and carbon dynamics: the effect of stochastic soil moisture fluctuations

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Nitrogen and carbon cycles in arid and semiarid terrestrial ecosystems are strongly affected by the soil water content, which, in turn, depends on soil properties, plant transpiration, and rainfall input. Soil moisture dynamics affect the rates of decomposition, nitrification, root uptake and leaching, with an overall impact on the pace of the nitrogen and carbon cycles. A mechanistic model was developed to assess the impact of soil moisture pulses on the short- and long-term soil nitrogen budget in water-limited ecosystems. The model is used to investigate the nonlinear properties of nitrogen and carbon dynamics forced by stochastic hydrologic fluctuations. In particular, it is studied how the intensification of rainfall extremes would affect the daily, seasonal, and interannual dynamics of soil nitrogen in two seasonally-dry, temperate ecosystems of North America.