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How the origin of organic compounds affects vegetation patchiness and regime shifts in ecosystems

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Soil water repellency (SWR) is a common property of soils and has been reported from all inhabited continents. It can have negative consequences for plant growth due to stagnation of water infiltration. Recently, the understanding of SWR has increased, mainly for the soil physical mechanisms. Although it is known that SWR-causing compounds, so-called SWR-biomarkers, stem from organic matter, the types and their origin (leaf, root, microbial decomposed organic matter, algae), are largely unknown. At the ecosystem scale, positive feedbacks between vegetation and increased soil water due to increased infiltration lead to self-organization of vegetation patchiness and abrupt shifts in ecosystem for semi-arid regions (Rietkerk et al. 2004, Dekker et al. 2007). Organic matter can enhance infiltration capacity but can also interrupt water infiltration through SWR. In this research we hypothesize that biomarkers at the molecular level can explain spatial patterns of water infiltration while the origin of biomarkers determines whether they can trigger or halt regime shifts in patchy vegetation. Therefore, we analyze SWR-biomarkers found in soil and relate them to their origin and the extent of SWR for patchy vegetated sites. Vegetation-hydrology interactions at the ecosystem scale are unraveled by combining molecular level mechanisms of SWR with soil physical mechanisms at macro-level in spatial ecohydrological models. Our aim is to understand the effects of SWR at the molecular level and emerging consequences at ecosystem level.

References

Dekker, S.C., Rietkerk, M., Bierkens, M.F.P., 2007, Coupling microscale vegetation-soil water and macroscale vegetation-precipitation feedbacks in semiarid ecosystems. Global Change Biology, 13, 671-678.
Rietkerk, M., Dekker, S.C., De Ruiter, P.C., and Van de Koppel, J., 2004. Self-organized patchiness and catastrophic shifts in ecosystems. Science 305, 1926-1929.