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Variability of earthworm-induced biopores and their hydrological effectiveness in space and time

Anne-Kathrin Schneider^{1*}, Tobias L. Hohenbrink^{1,2}, Arne Reck², Anne Zangerlé³, Boris Schröder^{1,4}, Erwin Zehe⁵, Loes van Schaik²

- 1) Technische Universität Braunschweig, Landscape Ecology and Environmental Systems Analysis, Institute of Geocology, Langer Kamp 19c, 38106 Braunschweig, Germany
- 2) Technische Universität Berlin, Ecohydrology and Landscape Evaluation, Ernst-Reuter-Platz 1, 10587 Berlin, Germany
- 3) Ministère de l'Agriculture, de la Viticulture et de la Protection des consommateurs, Luxembourg
- 4) Berlin-Brandenburg Institute of Advanced Biodiversity Research (BBIB), 14195 Berlin, Germany
- 5) Karlsruhe Institute of Technology (KIT), Institute of Water and River Basin Management, Karlsruhe, Germany

* Corresponding author: Anne-Kathrin Schneider, anne-kathrin.schneider@tu-bs.de

Highlights

- (1) We investigated earthworm-biopore relationships *in situ* repeatedly over one year.
- (2) Earthworms, biopore densities and hydrological effectiveness varied over time.
- (3) Earthworm and biopore dynamics differed between grassland and arable land.
- (4) SEMs indicate effects of earthworms on biopores and on hydrological effectiveness.
- (5) Juvenile earthworms affected biopore dynamics.

Abstract

Earthworms create biopores and thereby increase the susceptibility of soils to preferential flow which, on the one hand, reduces surface runoff and soil erosion, but, on the other hand, enhances vertical water and solute transport. Spatial and temporal variability in earthworm abundances might lead to spatial and temporal variability in biopore densities and even in the hydrological effectiveness of these pores. In this paper, we present a reproducible sampling design for simultaneous earthworm-biopore observations and analyze the temporal variability in earthworm abundances, biopore densities and hydrological effectiveness of biopores and its differences between grassland and arable land. During one year we performed six field campaigns where we sampled earthworms and performed dye tracer experiments in the small Luxembourgian Wollefsbach catchment (4.4 km²) on three arable land sites and three

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