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Soil-born mobile organic matter (MOM) may significantly contribute to subsurface ecosystem development and functioning

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MOM encompass dissolved and colloidal, but also particulate matter and biota. It is suggested to impact the architecture and functioning of subsurface compartments in various ways, for instance as key components in biogeochemical cycling, as substrate and microbial actor. Yet, the understanding of conditions and relevance under which MOM is released in topsoil and translocated to downstream compartments is still in its infancy, as long-term and high-resolution field studies are essentially lacking. To overcome this knowledge gap, we operate, in addition to a groundwater monitoring well transect, 22 tension-supported lysimeters in topsoil and subsoil, covering different land use in the topographic recharge area of the Hainich Critical Zone Exploratory (NW-Thuringia, central Germany). Besides the collection and physico-/chemical and spectroscopic analysis of soil seepage, we furthermore analyze precipitation and groundwater on a regular and event-scale cycle. Generally, our results suggest that the composition of soil-born MOM is largely controlled by the "formation environment" (soil group, parent rock, land use). However, both, episodic infiltration events (rainstorms, snow melts) and seasonal moisture fluctuations are major factors of MOM release. Especially, episodic events cause mobilization of significant amounts of the particulate OM fraction. Mobile particulate substances, present in all seepage and groundwater samples, were mainly comprised of dispersed mineral particles (e.g. carbonate particles, clay minerals), mineral-organic particulates, but also diverse bioparticles and biotic detritus make up as considerable fraction. Our long-term field study, allowing to track mobile substances within the Critical Zone, demonstrates the importance of the particulate fraction of soil-born MOM, released under natural transient conditions, that may significantly contribute to subsurface ecosystem development, supply, and functioning.