

Hydro-sedimentary dynamics of a drained agricultural plot by tracing water and suspended solids

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Since the 1960's, agricultural productivity of humid plains increased thanks to the widespread implementation of subsurface drainage, which is now present in more than 11 % of the arable lands in the world. Studies have shown drainage increases water and sediment connectivity. Research efforts are still needed to investigate its impact on the erosion dynamics from the soil profile to the field scale, as it is a key to set efficient conservation measures to reduce erosion. Therefore, we propose to trace water and suspended solids to determine their sources and pathways. The study site is a 5 ha cereal field located at the south of Tours (37, France) with surface and subsurface drainage. Suspended solids and water fluxes are monitored at high temporal resolution since January 2019. Since November 2019, physical, geochemical and isotopic tracers are used to identify water and sediment sources and transfer modality (subsurface flow or overland flow). Subsurface and surface water fluxes were equivalent but less than 11 % of suspended sediments were transferred by subsurface drainage. Water tracing shows two different transfer processes depending on the season and soil moisture. During winter, soil is saturated and subsurface runoff seems to result from a piston-like effect under the input of rainfall. During summer, a shorter subsurface lag of reaction is observed and can be explained by a direct transfer to the subsurface drainage through the soil macroporosity.

Mots-Clés : drainage, suspended sediment, geochemical tracer, water tracing, erosion