Impact of tile-drainage on the hydro-sedimentary responses of hydromorphic agricultural soils by tracing water and suspended solids from the field to the catchment scale.

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Since the 1960's, large landscape modifications were carried out to improve agriculture productivity. One of these changes was the ploughing of humid plains together with the installation of subsurface drainage, which currently represents 10\% of arable lands in the world. Studies have shown the impact of subsurface drainage on the water regime, and especially decreases in flow peaks. Drainage increases water and sediment connectivity. Less effort was devoted to investigate the impact on the erosion dynamics and very few studies were designed at the catchment scale. However, the understanding of water and suspended solids dynamics from field to catchment outlet is a key to set efficient conservation measures to reduce erosion up. Here we focus on water and suspended solids dynamics from the soil profile scale to the field scale. We propose to trace both water and suspended solids to determine the relative contributions between surface and subsurface sources. Water tracing gives indication on pathways while suspended solids trace sources (i.e. soil surface vs. deeper soil). The study site is composed of a 5ha field within a 2500 ha agricultural catchment representative of the French agricultural intensive openfield catchments. The studied field is representative of the catchment. It is a cereal crops openfield. Two drainage methods exist in the field: subsurface drainage with drains 120 cm-deep and surface drainage with artificial channels created after the winter seeding. The soil in this field is a loamy clay soil with clay floor at 45 cm of depth. Quantification of suspended solids and water fluxes (surface and subsurface) are monitored at high temporal resolution both at the field (since January 2019) and catchment (since September 2013) scale. Since November 2019, we trace water flows (rain, soil water subsurface flow and overland flow) using water ions and stable isotopes. Suspended solids are analysed through their mineralogy and primary particle size. At the field scale, the first results show a rapid response of surface drainage to rain inputs - confirmed by ions tracing - and suspended solids are mainly coming from surface drainage. Subsurface drainage reacts with a significant delay. Ions tracing shows that subsurface runoff seems to result from a replacement of older soil water by rain inputs.