



Source tracing of fluvial suspended sediments by magnetic and geochemical particle characterization: example of the Canche watershed (Nord-Pas-de-Calais, France)

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In France, erosion by water run-off is estimated to $1.5 \text{ t ha}^{-1}\text{yr}^{-1}$ and can exceed $10 \text{ t ha}^{-1}\text{yr}^{-1}$ in large growing areas, such as the North of France (Nord-Pas-de-Calais). In this region, the Canche watershed (1294 km^2) sustains heavy loss of fertile soils. The land use is mainly dominated by arable lands (80%) and in 2013, 104 kt of suspended sediment transited to the estuary. As demonstrated in literature, agricultural soil erosion leads to the gradual disappearance and depletion of fertile soil, which constitute a non-renewable resource at human time scale. Additionally, water erosion can significantly damage the aquatic habitat and can be responsible for the input of nutrients, bacteria, pesticides, heavy metals and radionuclides into surface waters. Conscious of these effects, many programs have emerged in the Nord-Pas-de-Calais to reduce erosion. This study presents a combination of environmental magnetic proxy parameters and geochemical analyses on sediments and suspended particulate matter. The aim is to develop effective tools to trace erosion by water run-off and quantify this process. In order to identify the respective sediment sources in the Canche watershed, sediment trap samples of suspended particulate matter were recovered at key positions along the Canche watershed. The preliminary results show that magnetic concentration (Mrs) shows typical values for the agricultural soils in the region, but these variations in magnetic concentrations and total irons concentrations are not always correlated, which may be explained by the iron speciation. In calculating the so-called S-ratio for each sample we can distinguish changes in magneto-mineralogy (and thus iron speciation) from magnetite-dominated assemblages in the mainstream Canche (naturel background signal) to high-coercivity-dominated assemblages in the tributaries, typical for soil erosion material rich in hematite/goethite. In combination with the element concentrations from ICP analyses, this proxy parameter may give valuable insight into the tracing of the suspended sediment sources. In perspective, the seasonal variability and the discharge in the Canche watershed have to be taken into account.