



Suspended sediment transport and sediment fingerprinting in the watershed of the Canche (Nord-Pas-de-Calais, France): a multi-parameter approach

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ABSTRACT

In France, erosion by water run-off is estimated at 1.5 t .ha⁻¹ .yr⁻¹ and can exceed 10 t .ha⁻¹ .yr⁻¹ in large growing areas according to authors. The North is the most affected area in France by the phenomena. In this region, the Canche watershed (1294 km²) sustains heavy losses of arable lands. In 2001, 185,000 tons of suspended sediment transited to the estuary.

As demonstrated in the literature, agricultural soil erosion led to the gradual disappearance and depletion of fertile soil, which constitute a non-renewable resource at the human time scale. Additionally, water erosion can significantly damage the aquatic habitat and can be responsible for the inputs of nutrients, pesticides, heavy metal and radio-nuclides into surface waters.

Suspended sediment in fluvial systems originates from different sources with spatial and temporal varying relative contributions from each source as a consequence of different erosion processes. Sediment fingerprinting methods provide a straight forward approach to quantify the different sources of sediments in the watershed. The potential sediment sources are characterized by their physicochemical properties and compared to the suspended particulate matter characteristics.

In this study, a range of different geochemical tools was deployed on soils and suspended particulate matter samples. The aim was to identify sources of particles. Samples were collected along the Canche River and on the watershed taking into account the seasonal variability. XRF and ICP-AES analyses were performed to determine the elemental composition. Granulometric analyses were carried out to determine the size distribution of the particles. Additionally, magnetic hysteresis measurements on bulk dry sediment have provided information on the ferriferous fraction present in the sediment samples. Most discriminating data were identified, based on statistical tools (clustering, PCA). Finally, the combination of this data allowed sources tracing of the particles and the identification of the transit mode in the watershed.