

## Quantifying sediment sources in an agricultural catchment using fallout radionuclides and radiogenic $^{87}\text{Sr}/^{86}\text{Sr}$ ratios (Loire River basin, France)

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Soil erosion is one of the main processes degrading water and land in agricultural areas. In this study, sources of sediment were investigated in the Louroux catchment (24km<sup>2</sup>, Loire River basin, France), representative of lowland cultivated environments of Northwestern Europe. There is a pond at the catchment outlet undergoing significant siltation.

To investigate spatial and temporal variations in sediment source contributions, <sup>137</sup>Cs concentrations and  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios were measured in surface (n=41) and core (n=20) sediment samples collected in the Louroux pond. <sup>137</sup>Cs concentrations were used to discriminate between surface and subsurface (channel bank) sources, while variations in  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios reflected contributions from tributaries draining subcatchments characterised by different lithologies (calcareous vs. siliceous). A modelling approach incorporating distributions throughout the entire modelling framework was used to determine the relative contribution of these sources to sediment.

Results indicated that surface sources provided the main contribution to pond sediment ( $\mu$  81%,  $\sigma$  1%) while the contributions of both lithological sources were similar (calcareous contribution,  $\mu$  48%,  $\sigma$  1%).

These results improve our knowledge of sediment transfer processes in drained lowland catchment and will help improve the implementation of management measures. Furthermore, they demonstrate the novel utility of coupling fallout radionuclides and  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios to trace sediment source dynamics.