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Soil erosion is recognized as one of the main processes of land degradation in agricultural areas. It accelerates the supply of sediment to the rivers and degrades water quality. To limit those impacts and optimize management programs in such areas, sources of sediment need to be identified and sediment transport to be controlled.

Here, we determined the sources of suspended sediment in the Louroux (24 km^2, French Loire River basin), a small catchment representative of lowland cultivated environments of Northwestern Europe. In this catchment, channels have been reshaped and 220 tile drain outlets have been installed over the last several decades. As a result, soil erosion and sediment fluxes have increased drastically.

The variation of 87Sr/86Sr ratios, driven by the weathering of rocks with different ages and chemical composition, may reflect the mixing of different sediment sources. Strontium isotopic ratios (87Sr/86Sr) were therefore determined in potential soil sources, suspended particulate matter (SPM) and a sediment core sampled in the Louroux Pond at the catchment outlet.

Soil, SPM and core samples displayed significantly different isotopic signatures. 87Sr/86Sr ratios in soil samples varied from 0.712763 to 0.724631 $\pm$ 0.000017 (2σ, n=20). Highest values were observed in silicic parts of the catchment whereas the lower values were identified in a calcareous area close to the Louroux Pond. 87Sr/86Sr ratios in SPM (0.713660 to 0.725749 $\pm$ 0.000017, 2σ, n=20) plotted between the soil and sediment core (0.712255 to 0.716415 $\pm$ 0.000017, 2σ, n=12), suggesting the presence of particles originating from at least two different lithological sources, i.e. silicic rocks and carbonate material. Variations in 87Sr/86Sr ratios in the outlet core sample were used to reconstruct the sedimentary dynamics in the catchment during the last decades.

These results will guide the future implementation of appropriate management practices aiming to reduce erosion in upstream catchments and the subsequent transport of sediment degrading the stream systems and the filling of reservoirs.

Keywords: soil erosion; 87Sr/86Sr isotopic ratio; end-members; mixing models