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Sedimentary response of land use change and agricultural intensification during the Anthropocene

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The definition of the Anthropocene boundary is being discussed across various disciplines. In this study, we have focused our research on the sedimentary responses of landscape to human activity, as a response to agricultural changes over the 20th century in Europe.

In the absence of long-term records of sediment transported by river systems, sediment deposited in lakes may represent a powerful archive for reconstructing the evolution of sediment yields in response to global changes.

Accordingly, sedimentary fluxes were reconstructed in 10 ponds located at the outlet of small agricultural headwater catchments distributed across the Loire Basin, in Western France. These study sites were selected in order to represent a large variety of land cover/land use changes, landscape morphologies and agriculture dynamics. The objective was to investigate whether a common evolution of sediment yields was observed.

The results obtained show the occurrence of a general transition in the sediment production during the second half of the 20th century (between 1945 and 1960), with two contrasting trajectories. On the one hand, sediment delivery decreased in catchments witnessing a decline of agriculture, with a 70% decrease of sediment delivery. On the other hand, in lowland areas affected by intensification of land management after WWII (land consolidation, stream redesign, edge removal or agricultural drainage implementation), sediment deposits record a sharp acceleration, by one order of magnitude.

The recent sediment dynamics therefore emphasizes a significant change associated to the post-1950 period, with a sharp positive or negative trend. These local observations are in agreement with data compiled from other countries across the Northern Hemisphere (Europe, USA, Japan). In contrast, there is a lack of similar data from catchments located in the Southern Hemisphere (e.g. in South America, developing countries).