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Potential impact of former Zn ore extraction activities on uranium distribution in the Riou-Mort watershed (France)

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The industrial basin of Decazeville (Riou-Mort watershed, South-West France) is well known for its heavy metal pollution and its subsequent environmental effects on the Lot-Garonne River system. The source of this pollution is the Riou-Mort River, which drains smelting waste areas. A first survey after remediation works has revealed elevated dissolved uranium (U^D) concentrations in the outlet of the Riou-Mort River. The objective of this research is to identify the origin of U^D in the Riou-Mort watershed and to evaluate the impact of industrial activities on this element.

Uranium was measured at 10 sites, located upstream and downstream the industrial basin, and in smelting waste deposits. Uranium concentrations in the smelting waste deposits reach up to 14.4 mg kg^{-1} and ($^{234}U/^{238}U$) activity ratios (AR) are near unit. Dissolved U concentrations in the Riou-Mort River and its main tributaries ranges over an order of magnitude from nearly 0 to 6.1 μg L^{-1}. The highest levels were measured in a non-polluted site, upstream from the industrial area. This observation suggests that U^D is mainly linked to weathering: the elevated U^D concentrations originate from the naturally occurring radioactive materials (NORM) located in the Permian bedrock and no significant U pollution exists, at present, in the Riou-Mort watershed.

This work demonstrates, that long time-series is an essential prerequisite to assess spatiotemporal variations of U^D or of other dissolved species, prior pollution diagnostic in small watershed.