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New Insights into Pb Isotope Fingerprinting of U-Mine Material Dissemination in the Environment: Pb Isotopes as a Memory Dissemination Tracer

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1 **New insights into Pb isotope fingerprinting of U-mine**
2 **material dissemination in the environment: Pb isotopes as a**
3 **memory dissemination tracer.**

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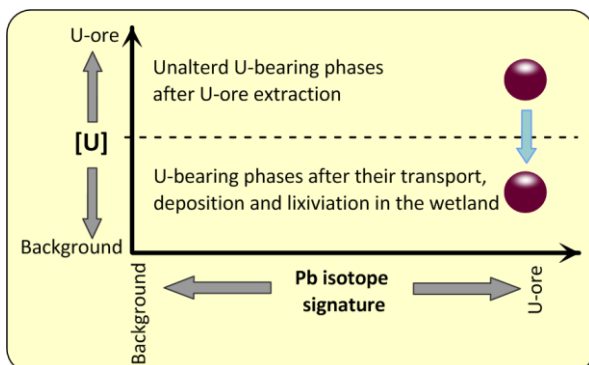
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Abstract

Stable Pb isotope ratios were measured and compared to U distributions in three soil cores located in a wetland highly impacted by water discharge of a former U-mine. Pb isotope ratios showed notable alignments in binary mixing plots demonstrating the dissemination of radioactive-enriched material from the U-mine. Thanks to these alignments and to the measurement of ^{204}Pb isotope, a precise characterization of the Pb isotope composition of the U-ore was performed without the use of U-ore samples. The well-defined end-members with the help of a reevaluated isotope mixing model allowed the accurate determination of the radiogenic Pb percentages in the cores that were overall found to be >50%. Non-correlated distributions of radiogenic ^{206}Pb and U are observed in several of the wetland soil samples studied. They reveal post-depositional U redistribution explained by major U speciation changes due to redox cycling in the wetland. On the contrary, the radiogenic ^{206}Pb showed no or small post-depositional mobility and thus can be considered to be a memory tracer of the dissemination of U-rich radioactive material: even after an important U loss, the radiogenic ^{206}Pb is able to reveal past contamination by U-rich materials.