

The ANR QUARTZ project: A multi-method approach for quartz characterisation in alluvial sediments for source-to-sink tracing and dosimetry

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The Critical Zone is exposed to a multitude of external forcings (including climate) that condition its environmental evolution and available resources. Understanding the geological processes behind these changes is a challenging task.

Alluvial systems are the response to intertwined climatic, tectonic, (palaeo-)geographic and anthropic drivers over the last millennia, being in consequence very suitable proxies for the Critical zone. The characterization of alluvial sediments, which provide valuable information about the environmental conditions at the time of their deposition. allows indirect assessments of these drivers.

Against this background, quartz mineral is an ideal tracer of the alluvial system's evolution because of its ubiquity and absence of strong weathering. Quartz are also characterised by some differences in their composition and behaviour in response to various stimuli (light, irradiation, ...) related to its initial conditions of formation, and perhaps also to its sedimentary history.

In the ANR QUARTZ project, we aim to develop a multi-technique methodology that uses quartz grains as markers of sedimentary dynamics. The ANR QUARTZ project explores (i) how each quartz grain holds a source-specific signature, and (ii) how this signature evolves over time across sediment routing systems. This 3-year project started in December 2021 and focuses on three French river catchments draining the Vosges, the Alps and the Massif Central: the Strengbach, Séveraise and Creuse, respectively. Modern river borne sediments from the main trunk and tributaries, along with bedrock sources, were extensively sampled in the two first catchments. River terraces of the third catchment will be sampled in 2023.

In this project, the luminescence and paramagnetic properties of the river sediments will be studied along with their elemental composition. The variations in quartz grain characteristics will help to estimate evolution over time of their origin(s) and mode of transport as well as the response of the system to external changes, including volumes of sediments transported from a source-to-sink perspective.