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Oxygen isotopic composition of single detrital quartz grains: a new frontier in the source-to-sink study of the Bengal Fan record.

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The aim of the study is to implement a new protocol to analyze the oxygen isotopic signatures of single detrital grains of quartz, with primary application in source-to-sink studies, and to assess their role as a provenance fingerprint of different magmatic, metamorphic and sedimentary source rocks. While single grain approach is standard in detrital thermochronology [1,2], it has not been applied on major minerals using classic isotopic tracers.

This new protocol is tested on modern sediments of Ganga-Brahmaputra rivers and turbiditic sediments from the Bengal Fan (IODP Expedition 354). Single grain isotopic fingerprint allows us to define oxygen isotopic signature of magmatic and metamorphic source rocks of different Himalayan tectonic domains (Higher Himalaya Crystallines, Lesser Himalaya, Tethys Himalaya and Trans-Himalayan Batholiths) and to detect and quantify their relative contribution in Bengal turbidites and to highlight sediment mixing from specific sources thus enhancing provenance resolution with respect to bulk approaches.

Quartz is the most stable and abundant mineral in sedimentary rocks and its $\delta^{18}O$ signature depends primarily on the maturity of its source [3]. Moreover, quartz remains stable during weathering and diagenetic processes [4], thus being a good provenance tracer.

Around 150 quartz grains in each sample from rivers draining different Himalayan tectonic units have been analyzed by ion microprobe LG-SIMS to better characterize their oxygen isotopic variability, thus providing a good fingerprint of the source rocks in the detrital record. Around 150 quartz grains from each Bengal Fan turbiditic sample have been analyzed to quantify the contribution of different Himalayan tectonic domains in Bengal Fan turbidites through time. Also, grain-size of turbiditic sediments is taken into account to detect possible links between oxygen isotopic composition and grain-size.

New data allow us to better reconstruct the evolution of erosion processes (their distribution and style) in the Himalayan belt during the last 18 Ma, as recorded in the sedimentary record.

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