

Chemical potamology of river sediments: where do we stand?

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The critical zone - between the rocks and the sky - is a conveyor belt that continuously shapes the Earth's continental surface, provides the nutrients necessary for life, regulates climate on a geological scale and controls water quality. Formed by chemical weathering processes, the critical zone is destroyed by erosion processes, both chemical and physical, which prevent weathered and nutrient-depleted materials from accumulating on our planet's surface. Rivers export the products of erosion to the ocean, making it possible to integrate them over large surface areas. Compared with soil studies, which are local by definition, chemical "potamology" - the science of rivers - integrates information over very large areas.

In this presentation, we'll review what we've learned over the last few decades by sampling, analyzing and interpreting the chemical and isotopic composition of solids transported in rivers, either as suspended sediments or bedload. It is particularly interesting to compare the approaches to chemical weathering that have been taken on a local scale using soil profiles with those using rivers as integrators. Problems of scale are rapidly arising and have not yet attracted sufficient attention.

We will attempt to summarize and critically analyze the main discoveries made in exploiting river sediments as an indicator of chemical weathering, using their chemical composition and the isotopic composition of a number of critical elements: radioactive and radiogenic isotopes, stable isotopes of lithium, boron and barium.

All in all, river sediments are an exemplary scientific object requiring a multidisciplinary approach and therefore a totem of critical zone science.