Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.31504

Chemical potamology: from initial promise to the future directions

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The term POTAMOLOGY (from the ancient Greek “science of rivers”) was not new, at least in the French school of geography, when Claude Allègre proposed, in the late 80s, to call “chemical -or isotopic- potamology” a branch of chemical geodynamics, which earned him the Crafoord Prize [1]. The idea was very simple: apply the isotopic tools used for the mantle to the Earth's continental crust and, instead of using volcanoes as messengers of mantle geochemistry, use large rivers as messengers of continental crust composition and evolution. This marked the start of ambitious sampling campaigns on the Amazon and Congo rivers, in collaboration with a number of southern countries and ORSTOM (which later became IRD: Institut de Recherche et Développement), as well as the systematic use of radiogenic isotope systems that had proved very useful for exploring the mantle (Sr, Nd, Pb). Claude Allègre placed great emphasis on the idea that these heavy isotopes, because they are not fractionated by water-rock interaction processes, should provide average information on the composition of the upper crust. With time, and as usual in our sciences, the simple initial hypothesis complexified. Unexpected and exciting new perspectives appeared, that led to researchers extending the geochemical toolbox to major, trace elements and stable non-traditional isotopes.

We will review the main results and directions taken by chemical potamology over the last 30 years: importance of particular lithologies at the global scale for producing sediments and delivering ions to the ocean (e.g. basalts), importance of sedimentary cannibalism, the role of chemical weathering on geological climate evolution, the vivid temperature-physical erosion controversy on the controls of river chemistry. Because rivers integrate a wide range of tectonic, climatic and land-use processes, chemical potamology has become an important, even major, component of critical science. This is where the future of chemical potamology probably lies, with the promise of also integrating the social and human sciences.

[1] Allègre, C. J. (1987). Isotope geodynamics. *Earth and Planetary Science Letters*, *86*(2-4), 175-203.