# Tracing phosphate sources through oxygen isotopic signatures

*M. TCACI[1], F. BARBECOT[1], J.F.HÉLIE[1], D. GOODDY[2]*

[1]GEOTOP-Université du Québec à Montréal, Canada
tcaci.marina@courrier.uqam.ca
[1]GEOTOP-Université du Québec à Montréal, Canada
barbecot.florent@uqam.ca
[1]GEOTOP-Université du Québec à Montréal, Canada
helie.jean-francois@uqam.ca

[2]British Geological Survey, England
dcg@bgs.ac.uk

Phosphorus (P) is a vital element for all life but P is also the subject of an environmental paradox. World food security relies on enhanced P inputs to ecosystems and widespread P-enrichment of aquatic ecosystems has occurred in many parts of the globe leading to eutrophication. Isotopic tools offer a potentially powerful way to understand the origin and fate of phosphorus in hydrological reservoirs. This study focuses on the isotopic composition of phosphate oxygen ($\delta^{18}O_P$). Our main aim is to use oxygen stable isotopes in dissolved inorganic phosphates (DIP) to identify phosphate sources. The first objective is to optimise sampling methods and the analytical protocol of silver phosphate precipitation for waters with a low concentration of phosphate (<<0.03 mg P/L). The second objective is to find and discriminate different sources of phosphorus along the Saint Lawrence River (Quebec, Canada) and follow the phosphate pollutant migration in the River.

One challenge is to avoid the oxygen isotopic fractionation induced by phosphate losses as well as contamination by the co-precipitation of oxygen bearing organic matter. Another very big challenge is processing enough dissolved inorganic phosphate at the very low concentrations that can be found in natural samples.

In this important work, we developed a sampling system that facilitates this process and enables extraction of large volumes of water more rapidly than existing methods. Optimization of the analytical and sampling methods for watersheds with low concentrations of phosphate allows for tracing and the characterization of phosphate sources.