



ÉCOLE DOCTORALE
SCIENCES DE LA TERRE ET DE L'ENVIRONNEMENT
ET PHYSIQUE DE L'UNIVERS, PARIS

USPC
Université Sorbonne
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Subject offered for a contract starting October 2019

SUBJECT TITLE: *CZ-TOP: Isotopic tracer constraints on concentration-discharge relations in the Critical Zone*

Advisor: Louis Derry

Second Advisor/ Supervisor: Jerome Gaillardet

Host lab/ Team: Equipe des Envelopes Externes, IPGP

Financing: USPC

For more information go to <http://ed560.ipgp.fr>, section: Offres de these (PhD offer), You must apply on the Doctoral School website

Presentation of the subject: (1 or 2 pages)

The research project *CZ-TOP* seeks to integrate isotope tracers with reactive transport and non-steady state hydrologic modeling to gain an improved understanding of the processes that control concentration-discharge relationships in watersheds. In many watersheds variations in the concentration of weathering-derived solutes are less pronounced than variations in discharge, sometimes much less. This leads to large discharge-mediated variations in elemental fluxes on short time scales. The variations in flux can arise from activation of new water pathways under variable hydrologic forcing. Yet solute concentration data alone often cannot resolve how water transport paths and reaction paths change. The addition of reactive tracer information, such as isotopes of Si, Ca, Mg, Sr and others can provide insight into how water has moved through and reacted with the landscape prior to emergence in the stream. Weathering can result in mineralogical, chemical and isotopic differentiation in the Critical Zone. The differences in isotopic tracers may then be imparted to water moving through different parts of the CZ, providing constraints on water pathways and reaction time scales.

The project will include development of techniques to generate high frequency time series of tracer data associated with hydrologic events. Study sites will include Critical Zone Observatories such as the OZCAR and US CZO networks. Interpretation of the data will involve reactive transport modeling as well as hydrologic transit time distribution modeling. The student will be part of an interdisciplinary team of geochemists and hydrologists.

We seek individuals with interests in developing new approaches in non-traditional isotope geochemistry and reactive transport modeling. Qualifications include background in geochemistry, hydrology or related fields.

More information is available at:

<http://www.geo.cornell.edu/eas/PeoplePlaces/Faculty/derry-new/index.html>

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