Offre de Stage IPSL 2020

(soutenu par le programme EUR IPSL-*Climate Graduate School)*

Titre du sujet de stage :

Composition and origin of Dissolved Organic Matter in thermokarst lakes of Yakutia

Description du sujet (1 page maximum) :

In Boreal and Arctic areas, permafrost soils and peatlands (remaining below 0°C for 2 consecutive years) store 1035 ± 150 Pg of organic carbon, representing 50% of the global soil organic carbon stock. If this long-term sequestered organic carbon stock is released into the active carbon cycle, it could induce a positive feedback to climate change (Schuur et al., 2015). In Yakutia (Eastern Siberia), a region of continuous ice-rich permafrost, permafrost thaw induces ground subsidence and the formation of thermokarst lakes, which cover 20% of the surface in Central Yakutia. The quality and fate of the organic matter released from permafrost to thermokarst lakes is thus determinant to constrain its potential feedback to climate change (Vonk and Gustafsson, 2013).

This subject is part of a larger project that involves GEOPS, LSCE, EcoLab and METIS laboratories (ROASTY, IPSL), investigating the carbon dynamics in thermokarst lakes formed after permafrost thaw that occurred recently, 5kyr or 8kyr ago. Lake water has been sampled during several field campaigns (2018 and 2019). The student work will focus on the chemical composition of dissolved organic matter (DOM) of these different lakes. The main objectives are the following:

- To determine the molecular composition of lake DOM, through Curie point Pyrolysis coupled to gas chromatography and mass spectrometry (Py-GC-MS),
- To compare the DOM from lakes with different ages, as well as DOM sampled at different seasons (winter, spring and summer),
- To link DOM molecular composition to other DOM characteristics previously analyzed (optical properties, stable isotope signature),
- To select samples for radiocarbon dating, and potentially relate DOM molecular composition to radiocarbon content.

The student will be hosted at the METIS laboratory. Meetings with the partner laboratories and visits in LSCE and GEOPS will be organized during the internship.

Résumé en anglais (5 lignes) :

Under climate change, the thaw of Siberian permafrost induces thermokarst lake development and activates biogeochemical cycles. At the interface between soils and lakes, the dissolved organic matter (DOM) is a key component for carbon dynamics and potential feedback to climate change. The

characterization of DOM from lakes in Central Yakutia (different ages, different seasons) at the molecular scale will allow better understanding its origin and fate.

Responsable du stage (Nom/prénom/statut) :
Marie ALEXIS, MCF (marie. alexis@upmc.fr)
Christine HATTE, CR
Antoine SEJOURNE, MCF
Laure GANDOIS, CR

Laboratoires concernés :

- METIS UMR 7619, Sorbonne Université
- LSCE, UMR CEA-CNRS-UVSQ 8212
- GEOPS, UMR 8148, Univ Paris-Saclay
- EcoLab, UMR 5245, UPS Toulouse III

Equipe de recherche concernée (si pertinent) :

- Département « Biogéochimie » du laboratoire METIS
- Thème « Archives et traceurs » du LSCE
- Equipe « hydrologie, hydrogéologie et géophysique » de GEOPS
- Equipe « Biogéochimie intégrative de la zone critique » d'EcoLab

Niveau du stage (Licence, M1, M2, internship) : M2

Licence ou Master(s) où sera proposé le sujet : M2 *Hydrologie, Hydrogéologie, Géochimie environnementale* (HHGE) du portail SDUEE à Sorbonne Université ; M2 *Hydrologie, Hydrogéologie et Sols* (HHS) à Université Paris Sud ; *ENSChimie – Environnement* à Rennes.

Thème scientifique de l'IPSL concerné : Biogéochimie terrestre, écosystèmes, agriculture

Durée du stage : 5-6 mois

Période : ~01/02/2020 → ~31/07/2020

Est-il prévu une thèse dans le prolongement du stage ? non