

**AAP China Scholarship Council - CSC 2023
PROJET DE RECHERCHE DOCTORALE (PRD)**

Titre du PRD : Spatiotemporal characterization of the organic matter in wetlands of the Seine Estuary

DIRECTION de THESE

Porteuse ou porteur du projet (*doit être titulaire de l'HDR*) :

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Ecole doctorale de rattachement : ED398 - GRNE

Nombre de doctorants actuellement encadrés : 3

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Ecole doctorale de rattachement : Sélectionner

Nombre de doctorants actuellement encadrés : 1

CO-TUTELLE INTERNATIONALE envisagée : OUI NON

DESCRIPTIF du PRD :

Ce texte sera affiché en ligne à destination des candidates et candidats chinois : il ne doit pas excéder 2 pages doit être rédigé en ANGLAIS

1) Details of the proposal

Wetlands perform key ecological functions and play an essential role in the biogeochemical functioning of estuaries, especially regarding organic matter (OM) dynamics and cycling of elements. The OM and nutrients feeding wetlands originate from multiple sources, i.e. water streams, grasslands, wooded, agricultural areas and the coastal zone. Wetlands are thus a place of exchange, where (i) part of the OM is deposited, representing a source of energy for the organisms living in situ, (ii) another part of the OM is released into the water, feeding rivers and other humid zones and (iii) biogeochemical transformations take place via the release or elimination of nutrients. The quality of the estuarine waters largely depends on these fluxes of materials, which play an essential role in maintaining an appropriate habitat for living organisms.

The Seine Estuary is one of the major estuaries in France. The Seine watershed is characterized by (i) a unique concentration of population in France, especially related to the presence of the Paris megalopolis, (ii) a strong agricultural and industrial activity (30% and 40% of the total activities in France, respectively) and (iii) an intense fluvio-maritime traffic (50% of the French one). The Seine estuary presents a large diversity of wetlands structured according to salinity, anthropisation and humidity gradients, and subject to different agricultural and hydraulic managements. The biogeochemical functioning of most types of wetlands present in the Seine Estuary remain poorly understood. The characterization of the types of wetlands in the Seine Estuary and spatiotemporal dynamics of the biogeochemical processes taking place in the latter are still to be investigated. The sources and fate of the organic matter in estuarine wetlands remain especially poorly constrained, whereas they are linked to those occurring in the water column.

The aim of this PhD will be to assess the origin and fate of the OM in wetlands in relation to (i) land cover and natural or anthropogenic practices of these areas, (ii) nutrient fluxes and carbon sequestration potential and (iii) the OM characteristics in the estuarine network.

This work will focus on the Seine Estuary where teledetection data are available and will be used to select representative and contrasting wetland zones in terms of vegetation, land use, humidity and connectivity to the estuary. Several sampling campaigns are already scheduled in 2023 and envisioned in 2024 to take into account the seasonal variability of the OM dynamics. Surficial soil/sediment samples, pore water and leaves will be collected along 4 to 5 lateral transects located from upstream to downstream.

Complementary techniques will be used to characterize the OM (in its particulate and dissolved forms), in order to qualitatively and quantitatively discriminate the different lateral wetlands and the resulting lateral inputs to the Seine estuary.

The organic carbon (C_{org}) and nitrogen (N) contents as well as the carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotopic compositions of the different samples will first be measured. In addition to quantitative data, these analyses will provide qualitative information on the sources of OM (terrestrial or aquatic plants in C₃ or C₄, microphytobenthos, plankton) in the different wetlands, via the combined use of elementary ratios (C/N) and isotopic (^{13}C and ^{15}N) of C and N. In addition, analyses at the molecular level will be performed using specific lipid biomarkers (e.g. n-alkanes, sterols/stanols, glycerol dialkyl glycerol tetraethers). This refined OM characterization will allow distinguishing the samples on the basis of their molecular fingerprint.

In addition to sedimentary OM, it will be essential to also characterize dissolved OM (DOM) contained in soil/sediment water, since the quantities and qualities of sedimentary OM and DOM are closely linked. The analysis of the optical properties (UV-Visible absorbance and 3D fluorescence) of the DOM will provide semi-quantitative information on its properties and will allow evaluating the relative proportions of its different sources in the investigated areas.

This PhD work will provide key information on the OM characteristics in the wetlands of the Seine Estuary, taking into account their spatiotemporal variations, and will be related to those of the estuarine water column.

2) Supervision

The PhD student to be hired will benefit from the complementary expertise of the two co-PIs in organic geochemistry and will benefit from the interdisciplinary dynamics of the consortium working on the Seine Estuary. The analytical equipments required to make the project successful are available in the laboratories of the co-PIs.

3) Profile of the Applicant (skills/diploma...)

The candidate will have a MSc degree in geosciences, analytical chemistry or environmental chemistry. Skills in organic geochemistry would be a plus. The candidate should be motivated by laboratory experiments and field campaigns. He/she should have good skills in English.

AVIS de l'École Doctorale : Avis favorable

**Merci d'enregistrer votre fichier au format PDF sous la forme :
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**Fichier à envoyer par mail simultanément
à l'école doctorale de rattachement et à csc-su@listes.upmc.fr**