Post-doctoral position : Functioning of land-sea interface wetlands: carbon balance and food web modeling approach

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Keywords :
Land-sea continuum; wetlands; carbon balance; food web; model

Theme:

Blue carbon is carbon captured and sequestered in coastal wetlands, particularly in vegetated coastal areas. The concept of blue carbon was first described in 2008 by an international team of researchers. It is one of the proposed solutions to reduce/offset the level of CO_2 in the air, which is one of the contributing factors to climate change.

Freshwater and coastal aquatic ecosystems, such as those found within the La Rochelle Agglomeration, serve as critical exchange interfaces in coupling biogeochemical cycles between continents, oceans, and the atmosphere (Bauer et al., 2013). These "critical" zones encompass not only the horizontal transfer of materials (nutrients, carbon) from the terrestrial domain to the oceanic domain but also host significant fluxes and complex metabolic processes at various exchange interfaces (air-water, air-sediment, and sediment-water) (Cole et al., 2007; Aufdenkampe et al., 2011). Carbon dynamics in these areas are controlled by a multitude of biogeochemical factors and processes, including indigenous biological activity (primary production/respiration balance), physical processes (temperature control on CO_2 solubility), benthos-pelagos coupling, CO_2 exchange with the atmosphere, and horizontal advection of CO_2 with tidal rhythms (exchanges with terrestrial and oceanic domains). Given the importance of these systems in biogeochemical cycles and their sensitivity to natural and anthropogenic pressures, carbon dynamics need to be addressed at the scale of coastal meta-ecosystems (Loreau et al., 2003) and integrated across different characteristic temporal scales (diurnal, tidal, seasonal, and interannual) (Cai et al., 2011). Furthermore, understanding these dynamics requires considering the entire biodiversity that plays a major role in the carbon cycle.

Subject;

As part of the LRTZC project (La Rochelle Zero Carbon Territory) in the La Rochelle Agglomeration, in-situ measurements related to carbon dynamics (i.e., partial pressures of CO_2 (pCO_2), dissolved inorganic carbon (DIC), sediment-air, water-air, sediment-water CO_2 fluxes, carbon in various biological compartments, and the study of carbon origin) have been conducted within different wetland areas (e.g., estuaries, salt marshes, intertidal zones, saltwater and freshwater marshes, etc.). These measurements aim to determine whether the wetland habitat acts as a carbon sink or source to the atmosphere.

Through these large-scale in-situ studies, the goal is to gain a better understanding of carbon processes and fluxes at various exchange interfaces within the representative connected ecosystems of the region. The ultimate objective is to establish the first carbon budget for the coastal and marshland areas. Currently, bridging the gap between the

carbon balance of these wetlands and the major physical, chemical, and biological processes remains a challenge.

To account for the mosaic of habitats within wetlands, several typologies have been studied, including the urban fringe salt and brackish marshes of Tasdon, freshwater marshes of Marans, the maritime Aiguillon Bay (salt marshes/mudflats), the salt marshes of L'Houmeau and Fier d'Ars (Ile de Ré), eelgrass beds in Baie d'Yves, as well as the saltwater and freshwater marshes of Brouage. Various physicochemical and biological parameters were assessed in these wetland areas, including CO_2 fluxes at different interfaces and an estimation of carbon stocks in various biological compartments. Planktonic communities in the water column (involved in carbon capture by primary producers and transfer to secondary producers), benthic flora/fauna in the sediment (such as macrofauna), and biotic vectors of horizontal carbon transfer within the ecosystem (e.g., fish in mudflats, primarily mullet) were described. Trophic relationships among these biodiversity components were seasonally analyzed using stable carbon and nitrogen isotope signatures.

The overarching goal of this postdoctoral work will be, based on these data, to construct a carbon flux model in these ecosystems by integrating both biogeochemical processes among physical compartments and material flows within trophic networks.

The postdoctoral researcher's tasks will include: • Compiling all the already acquired datasets from the different study areas. • Establishing carbon balances (mass balances) for the different typologies. • Proposing a dynamic architecture of carbon fluxes in wetlands through a trophic network modeling approach, including seasonal variations.

Skills expected:
We are looking for a candidate for a fixed-term contract, specifically a postdoctoral position, lasting 18 to 24 months (depending on previous experience) and requiring a doctoral degree. We are primarily seeking an ecologist with the following qualifications:

(i) Strong knowledge of the carbon cycle. (ii) Excellent skills in trophic ecology with a holistic perspective on interface ecosystems, including coastal ecosystems and potentially backshore ecosystems (water column, benthos, and benthos-pelagos coupling). (iii) Proficiency in statistical tools and modeling in ecosystem trophic ecology to contribute new expertise to the scientific consortium.

Additional competencies and skills required include: • Proficiency in written and spoken English. • Strong work ethic and excellent computer skills. • Ability to learn quickly and work independently. • Aptitude for a multidisciplinary approach. • Enthusiasm and curiosity. • Excellent communication skills and the ability to work as part of a team.

Application
To apply for this postdoctoral position, please send your CV, a cover letter, letters of recommendation (from previous supervisors or thesis advisors), contact information for scientific references, and your doctoral diploma to Christine Dupuy (christine.dupuy@univ-lr.fr), Thomas Lacoue-Labarthe (thomas.lacoue-labarthe@univ-lr.fr), and Elodie Réveillac

(elodie.reveillac@univ-lr.fr). We will accept applications until October 30, 2023. Please feel free to contact us via email for any inquiries about this postdoc position. The contract will commence in the first semester of 2024.

References :

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