Internship 2020-2021 **Master 2**

Title of the internship : Does microbial diversity matter? Impact of carbon on denitrification and microbial diversity in intertidal mud flats

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Summary:

Coastal sediments, especially intertidal mud flats and saltmarshes, may either be a sink or source of nutrients. Numerous crucial microbial processes (photosynthesis, mineralization, nitrification, denitrification) occur in sediments and determine the fluxes of nutrients and carbon at the water-sediment interface. These processes and fluxes are both influenced by abiotic factors (temperature, hydrodynamics, light), linked to local environmental conditions, and biotic factors, such as the biomass and the diversity of benthic microbial communities. A better characterizing of these processes will allow stakeholders in the management and rehabilitation of coastal and estuarine ecosystems improving the associated ecological functions.

In "macroecology", the concept that species diversity is a major determinant of productivity, stability, and resource dynamics of ecosystems is widely accepted. On the other hand, microbial diversity in relation to ecosystem functioning remains less studied. The goal of this internship will be to test the hypothesis of a diversity-function relationship at the microbial scale.

The environmental variable tested in this project will be organic carbon quality, an important variable impacting nitrogen cycling. Organic carbon is the main driver for denitrification and its quantity and quality impact denitrification rates (Laverman et al 2006). In salt marshes different organic carbon sources may be either of marine (algal) or terrestrial (plant) origin and difference in quality may impact denitrifying activity and diversity. It is hypothesized that carbon quality impacts microbial – denitrifying – diversity and the associated nitrate reduction rates. Denitrification will be determined using flow through reactors, allowing the application of different carbon sources (easy degradable versus more complex, plant derived carbon). Microbial communities (denitrifiers) will be analysed *via* amplification and high throughput sequencing of taxonomic and functional markers.

Other informations :

Insertion within an ongoing research project : project FEREE
see website : https://www.seine-aval.fr/projet/feree/

Publications on the field of research (up to 3) :

Laverman, A. M., P. Van Cappellen, D. van Rotterdam-Los, C. Pallud & J. Abell (2006) Potential rates and pathways of microbial nitrate reduction in coastal sediments. *Fems Microbiology Ecology,* 58**,** 179-192.

Bulseco, A. N., A. E. Giblin, J. Tucker, A. E. Murphy, J. Sanderman, K. Hiller-Bittrolff & J. L. Bowen (2019) Nitrate addition stimulates microbial decomposition of organic matter in salt marsh sediments. *Global Change Biology,* 25**,** 3224-3241.