



## Proposition de stage

### Parcours Master 2 « Microbiologie, Environnement, Santé »

#### 1. Laboratoire / Entreprise d'accueil :

Intitulé : Laboratoire d'Océanographie Microbienne UMR7621  
Adresse : Observatoire Océanologique, 66650 Banyuls sur Mer  
Responsable du Laboratoire / Entreprise : Fabien Joux  
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#### 2. Titre, description du sujet, approches utilisées, références (2 pages maximum) :

#### **Linkage between DOM composition and prokaryotic diversity across temporal scales in the NorthWestern Mediterranean Sea**

At present, the amount of atmospheric CO<sub>2</sub> approximately equals the carbon content in the form of marine dissolved organic matter (DOM; 660 Gt). Microorganisms are key mediators in the formation, transformation, and storage of ocean DOM, while DOM provides the energetic foundation for their growth, their community structure and their metabolic potential. Therefore, knowledge of two-way interactions between DOM and microbes is critical not only to understand the evolution and succession of microbial communities in the ocean, but also to draw the routes of DOM cycling, with an ultimate impact on CO<sub>2</sub> sequestration.

In the Mediterranean Sea, there is a temporal mismatch between with the maxima of phytoplankton (early spring), the main DOM source through photosynthesis, and DOM itself that its shows maxima in late summer. This suggests that DOM accumulation is driven by the activity heterotrophic prokaryotes (HP): These organisms would consume labile DOM compounds and release refractory compounds that persist in the water, in a process known as the microbial carbon pump. However, how the different DOM compounds are cycled by the different members of the HP community, and how this is modulated by the environment through the year, remains unresolved.

The main scientific questions to tackle during the master internship will be,

- 1. Does DOM lability change over the year in the NW Mediterranean Sea?** According to our hypothesis, DOM from spring would be enriched in labile compounds, while DOM from late summer would be mostly refractory
- 2. Which are the main prokaryotic players driving seasonal changes in DOM composition in the Mediterranean Sea?** In the Mediterranean Sea, many microbial taxa show recurrent seasonal patterns, thus we hypothesize that DOM dynamics are driven by seasonal variations in the HP community composition, and thus, their metabolic potential.

To answer these questions, the student will work with a 3-year series of both DOM and microbial composition in a Mediterranean Sea station (MOLA), currently being sampled on a monthly basis (<https://www.moose-network.fr>). The in situ data will be combined with data from biodegradation

experiments conducted in 2020 and 2021, where HP communities are exposed to different DOM sources to unravel which are the main taxa degrading/producing the different DOM compounds in each season.

The specific tasks of the M2 student will be: (1) To analyze dissolved amino acids and (2) To process 16s rRNA sequences (OTU/ASV Tables, diversity indexes, etc) in both the timeseries and the experiments. The generated datasets of prokaryotic composition and amino acids will be combined with other DOM descriptors, microbial activity measures, and environmental variables (datasets available) to infer co-occurrences between the different DOM compounds, microbes, and the environment.

Experience in 16s sequence analysis and in data analysis using R will be valued, as well as good written English (the master report will be preferentially prepared in English). We look for a motivated student willing to learn all aspects of scientific work (including participation in lab seminars and journal club). The master 2 work will involve laboratory analyses and (mostly) data analysis, however the student will have the possibility to punctually join some ongoing projects for 1-day field sampling campaigns.