

PhD scholarship

Title: Carbon cycle and biodiversity in Mediterranean oak forest: impact of climate change

Brief description of the research project

This project aims at linking predicted climate change scenarios to changes in biodiversity across multiple trophic levels, and to quantify their feedback on ecosystem functioning using mainly experimental approaches.

The specific objective is to measure the consequence of an increased drought period on leaf litter decomposition, a process linking structure and functioning. We will follow mesofauna and microorganisms-like decomposers. As decomposition is a key process of ecosystem functioning is directly involved in carbon cycle, the project will contribute to develop predictive tools for climate change effects on ecosystem carbon sequestration, one of the main ecosystem services. Modelling will be the last part of this work.

We will evaluate if a change in rainfall pattern will affect i) **directly litter production and decomposition**, ii) **indirectly litter decomposition through changes in litter biochemical composition, particularly the quantity and diversity of plant secondary metabolites**.

Finally, we will study if the mixture of plant species with different chemical traits can give insight on iii) **the effect of plant community changes on litter decomposition in response to climate change**.

The innovative nature of this project is that it connects biodiversity and functioning by an interdisciplinary approach: molecular biology (microbial diversity), chemical ecology (plant chemical leaf traits), stable isotope tracing (by following the decomposition of labelled ^{13}C leaves) and modelling (by using LPJ GUESS model), by using a long-term field observatory allowing experimental ecological research and experiments under laboratory controlled conditions.

The chosen model is a Pubescent Oak forest (*Quercus pubescens* Willd.), one of the dominant local forest ecosystems (more than 300000 ha) structuring Mediterranean landscapes. Often occurring in the transition of several climatic factors, this forest is especially responsive to climate change, which are already affecting the Mediterranean region and will occur with greater intensity in the coming decades. We will apply an experimental approach to simulate reduced rainfall under otherwise natural conditions at the O₃HP field site (Oak Observatory at the OHP) platform (<https://o3hp.obs-hp.fr/index.php/en/>).



In others words, **will the climate change alter biodiversity and functioning of the Mediterranean oak forest ecosystem?**

Qualification:

You should have the MSc degree, and should be born after 15 March 1984.

Concerning skills, you should have a strong background in ecology, particularly functional ecology. You should be interested in different compartments of the ecosystem (plant, soil mesofauna, soil microorganisms) and in different methodological approaches (experimental studies - *in situ* and under laboratories conditions - chemical analyses, mesofauna identification, molecular biology for determination of microbial diversity).

Moreover, as there is a great part of modelling in the project, you should have skills in modelling or, at least, should have a background in data analysis.

Finally, you should show strictness and interest with great autonomy and enthusiasm and should become quickly part of the team. This PhD project is based on several collaborations, partly already established through various research programs. You will benefit and should be active in collaborations with the project SecPriMe² (<http://secprime.imbe.fr/>).

The PhD will be funded to equal parts by the Laboratory of Excellence OT-Med of the Aix-Marseille University and by the *Provence-Alpes-Côte d'Azur* region for a period of 36 months (<http://www.otmed.fr>).

The PhD will be integrated at the DFME Research Group at the Mediterranean Institute of Biodiversity and Ecology (IMBE) of the Aix-Marseille University, France (<http://www.imbe.fr/eq-5-1-diversite-et-fonctionnement.html?lang=en>) and will work with three other groups in France (J. Balesdent, GSE – INRA UR1119 Géochimie des Sols et des Eaux, A. Bondeau, IMBE) and in US (W. Oechel, Global change Research group - San Diego State University). The student's principal place of work will be in Marseille (Aix-Marseille University - campus St Charles).

Net Salary: about 1400€/month

Contract duration: limited to three years

Starting date: September or October 2014

Application: CV and motivation letter including two supervisor references should be sent by e-mail directly to Virginie Baldy (supervisor of the PhD, virginie.baldy@imbe.fr) and Catherine Fernandez (co-supervisor of the PhD, catherine.fernandez@imbe.fr) before the 10th of July.

Contact person: Virginie Baldy, Equipe DFME IMBE, Case 4 - Aix-Marseille Université - Campus Saint-Charles - 3 place Victor Hugo - 13331 Marseille Cedex 3-France - Tel: + 33 (0)4 13 55 12 18 - Fax: + 33 (0)4 13 55 11 51- email virginie.baldy@imbe.fr