



FICHE NAVETTE: DOCTORANTS IDEX

SECTOR : Higher Education Institution

LOCATION: France, Grenoble

RESEARCH FIELD: Ecology

RESEARCHER PROFILE:

First stage researcher,

INSTITUTION: Univ. Grenoble Alpes, University of Innovation

One of the major research-intensive French universities, Univ. Grenoble Alpes**1 enjoys an international reputation in many scientific fields, as confirmed by international rankings. It benefits from the implementation of major European instruments (ESRF, ILL, EMBL, IRAM, EMFL*2). The vibrant ecosystem, grounded on a close interaction between research, education and companies, has earned Grenoble to be ranked as the 5th most innovative city in the world. Surrounded by mountains, the campus benefits from a natural environment and a high quality of life and work environment. With 7000 foreign students and the annual visit of more than 8000 researchers from all over the world, Univ. Grenoble Alps is an internationally engaged university.

A personalized Welcome Center for international students, PhDs and researchers facilitates your arrival and installation.

In 2016, Univ. Grenoble Alpes was labeled «Initiative of Excellence ». This label aims at the emergence of around ten French world class research universities. By joining Univ. Grenoble Alpes, you have the opportunity to conduct world-class research, and to contribute to the social and economic challenges of the 21st century ("sustainable planet and society", "health, well-being and technology", "understanding and supporting innovation: culture, technology, organizations" "Digital technology").

* ESRF (European Synchrotron Radiation Facility), ILL (Institut Laue-Langevin), IRAM (International Institute for Radio Astronomy), EMBL (European Molecular Biology Laboratory), EMFL (European Magnetic Field Laboratory)

Key figures:

- + 50,000 students including 7,000 international students
- 3,700 PhD students, 45% international
- 5,500 faculty members
- 180 different nationalities
- 1st city in France where it feels good to study and 5th city where it feels good to work
- ISSO: International Students & Scholars Office affiliated to EURAXESS

¹ Univ. Grenoble Alpes

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MANDATORY REFERENCES:

CDP TITLE: Trajectories

SUBJECT TITLE : Crossing pollen and lake sediment DNA, to develop innovative reconstructions of past mountain social-ecological trajectories (land-use, ecosystem functioning)

Scientific department (laboratory's name): EDYTEM & LECA

Doctoral School's: SISEO (Sciences et Ingénierie des Systèmes de l'Environnement et des Organisations)

Supporter's name: *C. Giguët-Covex (EDYTEM)*, *E. Messenger (EDYTEM)* and *F. Ficetola (LECA)*

SUBJECT DESCRIPTION:

Pollen preserved in lake sediments is traditionally used as the basic tool to reconstruct palaeoenvironmental dynamics. On the basis of taxa proportions recorded in pollen assemblages, the composition of a regional vegetation cover (i.e. % of meadow/ forest/ cultivated area...) can be estimated. Pollen data also permit to reconstruct the past farming activities (such as cereal growing or, indirectly, pastoral activities) and their impacts on vegetation dynamics. However, the low taxonomic resolution for many herbaceous families limits the precision of palaeo-community reconstructions and their possibility to measure biodiversity. Such information is of high importance to determine past dynamics of socio-ecosystems and is a key to provide palaeoecosystem services reconstructions.

Extracellular DNA preserved in lake sediments is an emerging and a promising tool to overpass the limits described above. Today, the biodiversity of an ancient environmental sample like lake sediments can be analyzed using the metabarcoding technique. This improves reconstructions of past plant cover provided by pollen, not only in terms of taxonomic resolution but also in terms of spatial distribution, as DNA better represents the plant cover within the lake catchment area. However, obtaining quantifications of plant cover by this technique remains challenging and needs developments like "calibration tests" on modern systems.

The design of this PhD thesis is based on the application of both methods (pollen and DNA analyses using the metabarcoding technique, as well as other emerging techniques that are being developed at LECA), on modern systems (referential) to assess 1) the accuracy of each method regarding their capacity to reflect the current landscape and 2) how they are complementary. For instance, they have different origins in terms of spatial distribution. Pollen can have a regional origin (transported by wind), while the extracellular DNA is expected to be of local origin like the plant biomass archived in lake sediments. As a result, pollen will provide a mixture of regional and local information whereas DNA provides a local picture.

Both methods will be applied to lake sediment archives spanning several millennia. The final objective is to provide more accurate reconstitutions of past plant cover dynamics, in particular regarding their ecological functions. This point is crucial in order to move toward the modeling of palaeoecosystem services over time.

We propose to initiate such a double analysis on lakes presenting different characteristics (lake and catchment size, geology,...) and located in different ecological zones from mountainous forested areas to alpine pastures, within the TRAJECTORIES project workshop area. Such a large range of lake-catchment systems is necessary to investigate how pollen and DNA methods complete one another depending on the context and thus draw generic conclusion.

Deliverables

- Understand the optimal operating conditions for lake sediment DNA and pollen markers and improve our knowledge of the limits and power of lake sediment DNA in different lake-catchment systems.

- Provide the more detailed and accurate reconstructions of past plant biodiversity than ever, over the 3 alpine regions targeted by the project.
- Provide a palaeoecological data set precise and robust enough to evaluate changes in ecosystem services along time.

5 references to support the work

- Ficetola, G. F., Pansu, J., Bonin, A., Coissac, E., Giguët-Covex, C., De Barba, M., Gielly, L., Lopes, C. M., Boyer, F., Pompanon, F., Rayé, G., Taberlet, P., 2015. Replication levels, false presences and the estimation of the presence/absence from eDNA metabarcoding data. *Molecular Ecology Resources* 15, 543-556.
- Giguët-Covex, C., Pansu, J., Arnaud, F., Rey, P.-J., Griggo, C., Gielly, L., Domaizon, I., Coissac, E., David, F., Choler, P., 2014. Long livestock farming history and human landscape shaping revealed by lake sediment DNA. *Nature communications* 5.
- Messenger, E., Belmecheri, S., von Grafenstein, U., Nomade, S., Ollivier, V., Voinchet, P., Puaud, S., Courtin-Nomade, A., Guillou, H., Mgeladze, A., Dumoulin, J.P., Mazuy, A., Lordkipanidze, D., 2013. Late Quaternary record of the vegetation and catchment-related changes from Lake Paravani (Javakheti, South Caucasus). *Quaternary Science Reviews* 77, 125-140.
- Pansu, J., Giguët-Covex, C., Ficetola, G.F., Gielly, L., Boyer, F., Zinger, L., Arnaud, F., Poulenard, J., Taberlet, P., Choler, P., 2015. Reconstructing long-term human impacts on plant communities: an ecological approach based on lake sediment DNA. *Molecular Ecology* 24, 1485-1498.
- Taberlet, P., Coissac, E., Pompanon, F., Brochmann, C., Willerslev, E., 2012. Towards next-generation biodiversity assessment using DNA metabarcoding. *Molecular Ecology* 21, 2045-2050.

ELIGIBILITY CRITERIA

Applicants:

- must hold a Master's degree (or be about to earn one) or have a university degree equivalent to a European Master's (5-year duration),

Applicants will have to complete online an application form and send their cv, last diploma, and a short presentation of their scientific project (2 to 3 pages max) via a dedicated application Platform prior to the deadline. Letters of recommendation are welcome.

Selection process

Application deadline: **20/05/2017** at 17:00 (CET)

Applications will be evaluated through a three-step process:

1. Eligibility check of applications in 20/05/2017
2. 1st round of selection: the applications will be evaluated by a Review Board in end of Mai 2017. Results will be given in 31/05/2017.
3. 2nd round of selection: shortlisted candidates will be invited for an interview session in Le Bourget du Lac, on 15-20th of June 2017.

TYPE of CONTRACT: temporary-3 years of doctoral contract

JOB STATUS (Full time or part time): Full time

Hours per week: 35

Offer starting date: 15/09/2017

Application deadline: 20/05/2017

Salary: between 1769 € and 1989.80€ bruts per month (depending on complementary activity or not)