

Postdoctoral researcher position - Consequences of radioactive contamination on forest soil biodiversity and functioning at Fukushima (Japan)

Duration: 18 months - **Start:** October 2023

Net Salary before tax: 2.5-3.0 k€/month



Context

This postdoctoral position is part of a research project aimed at understanding and quantifying the effects of radioactive contamination on soil biodiversity (biological communities, food webs, etc.) and on two key soil functions: surface organic matter decomposition and bioturbation.

Soils harbour a large and rich biodiversity that is essential for their functioning and the provision of ecosystem services. Among the vital functions of soil biodiversity is that (i) bioturbation plays an important role in the physical, chemical, and biological properties of soils and, in particular, in the burial of organic matter; (ii) organic matter decomposition, in turn, enables the cycling of key biogeochemical cycles. These two functions contribute to the fertility of the soil, i.e., to its ability to support adequate crop production. While bioturbation is mainly controlled by macrofauna (earthworms, etc.), organic matter decomposition is the result of the activity of numerous organisms (bacteria, fungi, detritivorous invertebrates).



Various stress factors (chemical and radioactive substances, household waste, compaction, etc.) may or effectively affect soils. For example, major nuclear accidents (e.g., Chernobyl, Fukushima) have led to the radioactive contamination of large areas of soil, particularly forest soils. Indeed, in the case of the accident at Japan's Fukushima Daiichi nuclear power plant in March 2011, 70% of the total surface area of contaminated land was forest cover.

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While much information is available on the effects of radioactive substances (i.e., ionizing radiation) at the individual or even community level, there are very few studies on the effects of this type of pollution on ecosystem functioning, and none that consider both biodiversity and soil functioning.

Job duties

In 2022, a first laboratory experiment has already been carried out in semi-natural conditions (mesocosms; IRSN, Cadarache, France) in order to study the combined effects of ionizing radiation and water stress were leaf litter decomposition and bioturbation. The postdoctoral researcher will contribute to the analysis of the obtained samples and results. In 2023 (Nov-Dec) and 2024 (Spring and Fall), are now planned experiments in Fukushima Prefecture (Japan) to study in situ soil biodiversity, bioturbation (movement of matter, etc.) and degradation of surface organic matter along gradients of radioactive contamination in forest soils. The postdoctoral researcher will play an active role in this work:

- Field work: litter bags survey; determination of macrofauna by manual sorting of soil blocks; study of soil biodiversity (eDNA; bacteria, eukaryotes); characterization of soil properties; measurement of bioturbation using tracers (luminophores, barium sulfate);
- Analysis of macrofauna using a "traits" approach to test relationships between shared characteristics (e.g. presence of a cuticle...) and abundances along radio-contamination gradients;

- Reconstruction and analysis of food webs and investigation on relationships between food webs, functional processes and levels of radioactive contamination.
- Calculation of the total dose absorbed by soil organisms;
- Linking of all the actions carried out by the various partners involved in this project;
- Publishing and communication of results at conferences.

Who are we looking for?

The candidate must hold a PhD in ecology, with proven experience in soil ecology (biodiversity, functional ecology...). He/she must be highly motivated by the subject, have field and laboratory experience, and strong biostatistical skills (R software...). Skills in the construction and analysis of food webs will be appreciated. In addition, he/she must be prepared to carry out field missions in Fukushima prefecture (Japan), and to travel to other French partner laboratories (see below).

Location/Supervision/Collaboration

The position will be located at the Institut de Radioprotection et de Sûreté Nucléaire (IRSN), Cadarache site (France), at the Laboratoire de recherche sur les effets des radionucléides sur les écosystèmes (LECO). The day-to-day supervision of the postdoctoral researcher will be carried out by LECO, but this work will be conducted in strong synergy with:

- F. Gilbert, CNRS, Lab. Ecologie Fonctionnelle et Environnement, Toulouse.
- Y. Capowiez, INRAE, Envi. Méditerranéen et Modéli. des Agro-Hydrosystèmes, Avignon.
- S. Hättenschwiler, CNRS, Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier.
- A-S. Benoiston, IRD, et A. Iribar-Pelozuelo, CNRS, Lab. Evol. & Diversité Bio., Toulouse.
- O. Armant, IRSN, LECO.
- M. Hedde, INRAE, UMR Eco&Sols, Montpellier.
- N. Kaneko, Faculty of Food and Agricultural Sciences, Fukushima Uni., Japan.
- K. Nanba, V. Yoschenko, Insti. of Environment and Radioactivity, Fukushima Uni., Japan.

Regular interaction between laboratories will take place remotely and face-to-face as required (participation in field and measurement campaigns, training, etc.).

Who to contact?

In order to apply or ask any questions, please contact us by email before **15th July 2023**:

- Dr. J-M. Bonzom: jean-marc.bonzom@irsn.fr
- Dr. F. Gilbert: franck.gilbert@univ-tlse3.fr
- Dr. Y. Capowiez: yvan.capowiez@inrae.fr

Always include these 3 persons as message recipients.

Send a short covering letter describing your relevant experience, a CV and the names and emails of 2 or 3 referral persons.