Bridging dendrochemistry and soil science

1-year postdoctoral contract at Université de Lorraine & INRAE

Background

This post-doctoral position is funded by the interdisciplinary Artemis program, run by a scientific community of excellence including the Université de Lorraine, INRAE, AgroParisTech and CNRS. The *SoilWood* project, which brings together experts from UMR SILVA (Stéphane Ponton, PI), UMR LIEC (Anne Poszwa), UR BEF (Gregory von der Heijden) and the SILVATECH platform (Nicolas Angeli), is entitled 'Deciphering soil fertility signals in the elemental composition of tree rings'.

This project aims to improve our knowledge of the plant-soil relationship in order to better diagnose changes in soil fertility and better understand the responses of forest trees to these changes. Its main objective is to assess whether elemental concentrations in tree rings can be used as a proxy to bio-indicate the chemical fertility of soils.

To achieve this objective, we will use a set of innovative, rapid and non-destructive techniques (µXRF, LA-ICP-MS, HSI) on a large soil and wood dataset centered on a model species, the sessile oak (*Quercus petraea*), chosen for its importance in the French forest and for the prospects it offers in terms of archival wood. High-spatial-resolution measurements carried out on wood cores will enable to establish elemental concentration profiles along the radial axis for a range of chemical elements of interest for the mineral nutrition of trees. Most of the data is already available or will be acquired in the coming months before the arrival of the post-doc. From the inter-site variations of these profiles on the one hand, and from the intra-profile variations of wood concentrations on the other, we will determine which chemical elements and which tree rings may provide reliable proxies for soil chemical fertility by comparing these wood analyses to the physical and chemical properties of the soil.

The data and knowledge acquired during this project will enable to better define the tree nutritional thresholds or tipping points, improve our understanding of nutrient bio-availability and better characterize the vulnerability of oak forests to the degradation of soil chemical fertility. This project is also an essential step towards providing an *a posteriori* diagnostic tool for reconstructing changes in soil fertility over the long term.

Tasks

In close collaboration with the PI and other members of the project, the candidate will be responsible for analyzing the data in order to 1. realize comparative analyses of the measurement methods, 2. determine an ideal multi-technique analysis trajectory, 3. identify the elements in the wood that have a proxy value for soil fertility, 4. propose a selection of elements needed to characterize fertility as comprehensively as possible. The candidate will also take the lead in drafting publications. Besides scientific aspects, this position will allow the candidate to learn about techniques implemented in the project and to participate in the supervision of an MSc student if desired.

Requirements

We are looking for an enthusiastic and motivated candidate with a PhD degree in Forestry/ /Ecology/Life sciences/Environmental Sciences or a related discipline and with expertise in tree-ring sciences and/or with experience in studies about soil/plant interactions. Strong analytical (proficient

use of R, Python or equivalent) and writing skills, demonstrated by previously published scientific articles, are desirable.

Good knowledge of the English language (written and spoken) is required. The candidate must also have good organizational skills, be able to work independently and have interest in working in an interdisciplinary and collaborative environment as part of a diverse team.

Offer

We propose a one-year contract with a gross monthly starting salary between € 2,343 and € 3,242 (depending on relevant experience), for a workweeks between 36.7 and 38.1 hours, and corresponding annual holidays between 45 and 53 days. **The starting date is 5 January 2026,** but could be brought forward slightly if necessary. The main workplace will be in Champenoux, 15 km from Nancy city center, but regular visits will be made to the Université de Lorraine site in Vandoeuvre-les-Nancy. The INRAE Nancy - Grand Est Research Centre in Champenoux offers a stimulating working atmosphere, bringing together several research units and a wide range of forestry disciplines, as well as a culture of effective supervision of our doctoral and post-doctoral students. The Champenoux center also houses the SILVATECH technical platform, which boasts a wide range of equipment (on which much of the project data will have been acquired): https://silvatech.isc.inrae.fr/. In addition, the Université de Lorraine offers access to social action benefits (contribution to transport costs, sustainable mobility package, childcare assistance, etc.), access to the University's physical and sports activities (https://sport.univ-lorraine.fr), access to multidisciplinary cultural activities throughout Lorraine, and a contribution towards the cost of supplementary health insurance of €15/month.

How to apply

Feel free to contact stephane.ponton@inrae.fr with questions about the position. Candidates are invited to submit their applications by 27 August 2025 at the latest to the same e-mail address, including:

1. a covering letter in which you describe your motivation for joining the project, what your experience and skills will bring to the project and how you work as part of a team,
2. a CV,
3. names and email addresses of two referees that may be contacted to provide references.
4. a publication that you consider most representative of the research work to which you have contributed.

Interviews are foreseen to take place in September 2025.