

PhD thesis in soil science and statistical data processing

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Work environment, missions and activities

The increase in soil organic carbon content in agricultural soils has been presented as an interesting lever for mitigating climate change. However, the response of changing systems, which are very heterogeneous in terms of climate, soil type, land use and agricultural practices across the national territory, is poorly understood. There is therefore a strong challenge in achieving a better understanding of the past trajectories of changes in soil organic carbon content, by qualifying the type of change and its temporality for a diversity of pedoclimatic contexts across France. Linking these trajectories to changes in agricultural practices or land use would improve recommendations for better soil management. Thus, the objective of this thesis is to quantify, spatialize and understand the dynamics of changes in soil organic carbon content in agricultural soils in metropolitan France since the 1990s. France has a particularly powerful tool for observing temporal changes in the physicochemical properties of agricultural soils, the soil test database (BDAT). This database, managed by INRAE Info&Sols and containing more than 3.5 million of soil organic carbon determinations, will be used and coupled with a soil map covering the French territory (RRP). This spatial support will allow an interpretation of the factors of the evolution of soil organic carbon contents with regard to the different pedological contexts. The quantification of temporal variations and the associated uncertainty and their cartographic representation on a national scale will be carried out using statistical and geostatistical methods. For example, a spatio-temporal Bayesian inference model (INLA-SPDE) could be used. Temporal variations will be interpreted by considering local specificities, with regard to agronomic indicators that will have to be constructed, climate, soil properties or soil type.

The successful candidate will work within the INRAE Info&Sols research unit in Orléans (France), specialized in soil and statistical and spatial data processing, under the direction of Antonio Bispo, Hocine Bourennane, Eva Rabot and Nicolas Saby.

Special conditions of activity: A 3-month stay must be carried out abroad.

Selection process: Funding has been secured. The thesis directors and supervisors will select three candidates after studying their application and after an interview. The selected candidates will be interviewed in person, between May 5 and 8 2025, by a jury from the EMSTU doctoral school which will establish the final ranking.

Training and skills sought

Recommended training: Master 2 in the field of soil science, agronomy, environmental sciences, mathematics or computer science.

Desired knowledge: Depending on the candidate's specialty, disciplinary knowledge in soil science (soil classification, pedology), agronomy and/or skills in the use of digital tools on large data sets (databases, statistics, geostatistics, geomatics, programming).

Skills: Initiative, creativity, rigor, writing and speaking skills, interest for digital approaches.

INRAE's life quality

By joining our teams, you benefit from (depending on the type of contract and its duration):

- up to 30 days of annual leave + 15 days "Reduction of Working Time" (for a full time);
- parenting support: CESU childcare, leisure services;
- skills development systems: training, career advise;
- social support: advice and listening, social assistance and loans;
- holiday and leisure services: holiday vouchers, accommodation at preferential rates;
- sports and cultural activities;
- collective catering.

Contract details

- Hosting unit name: Info&Sols
- Postal code and city workplace: 45000 Orléans
- Type of contract: Thesis
- Duration: 3 years
- Starting date: October 1st, 2025
- Remuneration: From 2200 € (gross)

How to apply

Please apply on the doctoral school website:

https://collegedoctoral-cvl.fr/as/ed/voirproposition.pl?site=CDCVL&matricule_prop=62581

✖ Deadline to apply: **April 13th, 2025**

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