

Modelling soil microbial carbon dynamics in Germany

Master's thesis project

Background

Soil microbial communities are important drivers of numerous ecosystem functions, like nutrient cycling, carbon sequestration, and decomposition. Changes in climate and land cover affect the size of soil microbial communities, measured and microbial biomass carbon. To better understand and protect soil communities and functions, it is important to develop methods to model and assess microbial carbon's response to global changes. Recent advances provide a framework to assess spatial-temporal microbial dynamics (Patoine et al., 2022), on which additional work can be built to improve and adapt these results in the context of decision-making and management.

Project

This master's thesis aims to improve our understanding of how global change drivers, including climate and land-cover change, affect soil microbial carbon patterns, which will in turn be used to generate spatial-temporal predictions for Germany. Working with collected datasets, the student will perform data processing and computational modelling to calculate estimates of soil microbial carbon over past decades, and possibly extending to future decades. Multiple independent datasets and modelling approaches (ensemble modelling) will be used to assess the confidence and robustness of model results. This approach will provide valuable information to support decision-making for the sustainable management of soil biodiversity in Germany (<https://www.feda.bio/de/faktencheck-artenvielfalt/>).

Qualifications and Benefits

Applicants should have an interest in soil ecological processes and be willing to learn and use advanced statistical and computational methods to address ecological questions. Experience with statistics and programming (especially with R) are assets. The student will benefit from working in a dynamic group of ecological research, within a leading biodiversity research center (iDiv). Scientific training will take place through courses and mentoring.

Supervision

The project will be supervised by M.Sc. Guillaume Patoine (iDiv / UL) and Prof. Dr. Nico Eisenhauer (iDiv / UL). For questions and applications, please contact Guillaume Patoine (guillaume.patoine@idiv.de).

References:

Patoine, G., Eisenhauer, N., Cesarz, S. et al. Drivers and trends of global soil microbial carbon over two decades. *Nat Commun* 13, 4195 (2022). <https://doi.org/10.1038/s41467-022-31833-z>

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