



Changes in forest ecology and foliage functional traits in beechwoods from a central European latitudinal and altitudinal gradient

Research context and objectives:

With mean annual temperature increases of 1.9-5.4°C and up to 25% reduction of summer precipitations, the ongoing climate change will severely challenge the tolerance and resilience of forest ecosystems of Central Europe in the future and affect the essential services they provide. Beechwoods form a main forest type in Central Europe of particular concern, given their mesic site conditions requirements. Improved understanding about adaptation/adjustments to contrasted environmental conditions in the beech distribution range is needed for predicting forest sensitivity and tolerance to ongoing climate change. Completing a previous research performed in Southeastern France, the principal objective in this master thesis is to understand the changes in beech forest ecology and functional adaptations within trees along a latitudinal and altitudinal gradient from the Mediterranean coast to Northern Switzerland and from the sea to montane vegetation level.

Research program:

The research program will be realized at intensive research sites from two long-term forest research networks, one being located in Switzerland (6 sites spread over the Swiss Midland and Jura region) and established in the 1990s (<https://www.wsl.ch/fr/foret/evolution-et-suivi-de-la-foret/recherches-a-long-terme-sur-les-ecosystemes-forestiers-lwf.html>) and the other one located in Southeastern France (5 sites, from Marseille to the swiss border) and created in 2012. In this master thesis, changes in the forest ecology along the latitudinal and altitudinal gradient will be assessed by means of vegetation surveys and measurement of key soil properties. Functional adaptations to environmental drivers in dominant beech trees will be analyzed on the basis of functional morpho-anatomical, nutrient and isotope data measured in foliage sampled in the top crown branches (by a tree climber). Environmental data will either be provided by local meteo stations or interpolated, on the basis of regional monitoring at larger scale. The proposed master thesis will thus include field work and laboratory analyses, with vegetation surveys being performed in the two countries and functional traits being assessed in Switzerland. The sample collections and data from these latter assessments will then be completed with material from previous (2019, 2021) investigations in the two countries, to analyze responses along the whole climatic gradient. The detailed program and research plan will be determined in close collaboration with the thesis candidate. This master thesis is especially suited for students interested in interdisciplinary research on plant, soil and climate interactions, in the framework of forest dynamics and climate change science.

Keywords: climate change, biodiversity, forest ecosystem, forest ecology, functional traits

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