Agroscope gutes Essen, gesunde Umwelt

BSc / MSc Thesis Opportunity:

The Role of Climate Change in Carbon and Nitrogen Dynamics in Swiss Alpine Soils

Background

Alpine soils are among the largest terrestrial carbon (C) reservoirs in Switzerland and play a crucial role in regulating climate, water quality, and ecosystem functioning. However, these ecosystems are particularly vulnerable to climate change. Rising temperatures, changing precipitation patterns, and more frequent climate extremes may alter the storage and cycling of C and nitrogen (N) in soils, with important consequences for greenhouse gas balances and ecosystem resilience.

Switzerland has a unique network of long-term soil monitoring sites in alpine grassland and forest ecosystems, with repeated soil sampling since 1985. Combined with high-resolution climate data, these datasets provide an exceptional opportunity to investigate the role of climate change for soil C and N stocks over the past four decades.

Objectives and Methodology

The aim of this Bachelor's or Master's thesis is to assess long-term changes in soil C and N stocks and their relationship with climate.

The project will include:

- Calculating soil C and N stocks from repeated soil measurements (1985–present; every five years).
- Deriving climate indices from MeteoSwiss data.
- Analysing long-term trends using time-series methods.
- Applying linear and nonlinear statistical models to identify relationships between climate variables and changes in soil C and N stocks.
- Identifying climate-sensitive periods, elevations, or ecosystem types.

This project offers hands-on experience with unique long-term environmental datasets and statistical modelling in R while contributing to our understanding of climate change impacts on Swiss alpine ecosystems.

Start: Immediately or upon agreement
Duration: 3 – 6 months

Requirements:

- interest in environmental data analysis and statistical modelling
- experience with R (or willingness to learn)

What we offer:

- close supervision in a collaborative and supportive working environment
- an opportunity to gain first-hand experience in applied research and environmental monitoring

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Soil monitoring

Schweizerische Eidgenossenschaft
Confédération suisse
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