TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Umweltwissenschaften, Fachrichtung Forstwissenschaften

Professur für Standortslehre und Pflanzenernährung

Professur für Meteorologie

Technische Universität Dresden, 01062 Dresden

MSc. thesis topic

Unravelling the relationship between atmospheric and soil moisture dryness on forest's water status

German forests are suffering more and more from extreme droughts (soil moisture and atmospheric) but little is known about how droughts affect the functioning of trees and forests. Elevated vapor pressure deficit (VPD), or evaporative water demand, lead to elevated transpiration rates from trees and evaporation from soils. This can put trees under stress if their water supply is restricted, for example, because of low soil moisture contents.
This master thesis aims at quantifying and assessing the impact of extreme soil dryness and air dryness on the functioning of trees. For this, long-term stand-specific measurements of a spruce-dominated stand from the ICOS site in Tharandt of carbon dioxide, water vapor fluxes, soil moisture as well as tree growth data will be analyzed. The unique datasets from the ICOS site enable a detailed analysis of the relationship between atmospheric and soil moisture dryness.

Requirements

- Able to handle big datasets
- Interest in statistical data analysis
- Programming skills (nice-to-have)

Tasks

- Literature study on the topic of forest water status under varying environmental conditions
- Analysis of eddy-covariance data, VPD, tree growth and soil moisture data with regard to forest's response to dryness
- Discussion and interpretation of the results in order to investigate climatic anomalies and responses of the forest ecosystem

Supervision

Cover Prof. Dr. Natalie Orlowski (Standortslehre)
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Literature

Shekhar, A., Hörtnagl, L., Paul-Limoges, E., Etzold, S., Zweifel, R., Buchmann, N., and Gharun, M.: Contrasting impact of extreme soil and atmospheric dryness on the functioning of trees and forests, Science of The Total Environment, 916, 169931, https://doi.org/10.1016/j.scitotenv.2024.169931, 2024.

Further overview literature will be provided.