

M.Sc. Vorlesung (Summer Semester)

# Soil- Plant- Atmosphere continuum

**Lecturer**

Dr. Yiannis Moustakis

**Target group**

B.Sc.  M.Sc.  LA

**Examination method**

Exam

**Course details**

Time: Tue, 14-16

Place: Luisenstr. 37

Room: C024

ECTS: 3

**Goal.** The course focuses on understanding the exchange of water, energy and carbon through the soil-plant-atmosphere continuum in terrestrial ecosystems, which is mediated by plant physiological and metabolic processes. Key topics include soil hydraulic properties, water movement in the soil, plant-mediated water transfer to the atmosphere, radiation and energy balance at the land surface, turbulent heat exchange, and vegetation functioning, such as photosynthesis (C3, C4, CAM), stomatal regulation, respiration, phenology, and carbon allocation. Students will gain a deep understanding of ecosystem fluxes and how land surface processes are effectively modeled. The course aims to help the students understand how terrestrial ecosystems respond to climate change, and be able to assess the reliability of current models in predicting future changes. Finally, students will understand how ecosystem responses can further affect the climate, and how plants can serve as a tool to mitigate climate change.

Lecture No.	Topic
01	Introduction
02	Water in the soil (1)
03	Water in the soil (2) / Introduction to terrestrial plants
04	Plant metabolic processes
05	Gaseous diffusion and photosynthesis
06	Stomatal regulation / Water in Plants
07	Modelling the soil-plant-atmosphere continuum
08	Ecosystem water and carbon dynamics
09	Land surface energy balance
10	Land surface energy balance (2) / Turbulent fluxes
11	Ecosystems under climate change
12	Exam

**Indicative literature:**

Bonan, G. (2015). Ecological Climatology: Concepts and Applications. Cambridge: Cambridge University Press.  
 Bonan, G. (2019). Climate Change and Terrestrial Ecosystem Modeling. Cambridge: Cambridge University Press.  
 Schulze, Ernst-Detlef, Erwin Beck, Nina Buchmann, Stephan Clemens, Klaus Müller-Hohenstein, and Michael Scherer-Lorenzen (2019). Plant Ecology. Berlin, Heidelberg: Springer