

**Title:** Estimation and prediction of biophysical crop parameters and water-deficit stresses, using multi-sensor satellite data and AI

**Team:** ATB: Michael Schirrmann  
UOS: Björn Waske

**Abstract:** Water is essential to all internal processes of plants including photosynthesis, nutrient transport and temperature regulation. Water-deficit stresses limit crop growth and increases yield losses. According to projections, droughts in Germany are expected to become more frequent and severe with a greater need for efficient water use in agriculture. This requires more comprehensive planning tools that help farmers adapt to climate-smart agricultural practices. The main objective of the PhD-project is the development of adequate methods for estimating biophysical parameters and crop water stress from field to landscape-scales. In addition to assessing current crop conditions, the project aims to forecast crop water stress by utilizing time-series constructed from a variety of Earth-Observation data (such as multispectral, SAR, thermal, and soil moisture data) and different shared socioeconomic pathway (SSP) climate change scenarios. This will be achieved through advanced machine learning techniques, including state-of-the-art physics-based deep learning models. Finally, XAI methods should be used to improve the understanding and transparency of the foundation of these models. Better predictive drought models will be highly relevant for the EU common agricultural policy and local planning, adapting agriculture to climate change and to support agricultural management.

**Desired skills of the applicant:**

- An above-average university degree (MSc or equivalent) in Geoinformatics, Computer Science or related discipline, ideally focusing on remote sensing
- Sound background in remote sensing
- Programming skills (preferably Python)
- Knowledge in time series analysis and machine learning, ideally including deep-learning