Multi-temporal assessment of UAS based crop variables for improved winter wheat monitoring and modelling in the field cropping systems

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Abstract:
The crop model performance can be significantly improved through the assimilation of remote sensing (RS) data for model calibration and also may reduce uncertainties in the model's input parameters (Pei et al., 2014). In the regions like Central Europe, where cloud cover is frequent and the fields are relatively small, data with high temporal and high spatial resolution, required for crop monitoring and modelling, are often missing. With the development of unmanned aircraft systems (UAS), the advances in crop monitoring and modelling at very high spatial and temporal resolution are expected because remote sensing sensors placed on UAS are available at low-costs and meet the critical requirements of spatial, spectral, and temporal resolutions (Bendig et al., 2015). Even though the UAS-based imagery have been increasingly used for different applications in agriculture, currently only very few quantitative studies exist on the use of UAS imagery for crop modelling. Multi-temporal studies aiming at crop parameter derivation based on multiple image acquisitions over several years are also missing. In the intended research project, we aim at assessing the usability of the UAS images for crop growth monitoring and eventually modeling. In particular, we aim to: (i) derive different crop growth (LAI, phonological stages, biomass) and state parameters (water stress, canopy temperature) based on multi-temporal and multi-year optical and thermal imagery from UAS, (ii) assess crop development stages and crop status due to drought effects, and (iii) analyse certain distinctive temporal windows for acquisition of the UAS image that are suitable to accurately describe the crop development stages. The test sites for the study are located on the experimental fields of the University of Bonn in Germany. The derived crop variables will be used for calibration of the crop model embedded in the SIMPLACE crop modelling framework (http://www.simplace.net) for winter wheat. The results will be also used for providing recommendations on the distinctive temporal windows for acquisition of the UAS image that are suitable to accurately describe the crop development and status stages.


Figure 1. Example figure caption.

References:

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