Important variables of RapidEye time series for modelling biophysical parameters of winter wheat

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Abstract (Poster)

High-resolution agricultural monitoring, e.g. the robust derivation of biophysical parameters throughout the cropping season and at subfield level, is increasingly gaining importance for agricultural management (precision agriculture) and relays on high resolution remote sensing data (e.g. RapidEye or Sentinel-2). This data can then be utilized for regular mapping of biophysical parameters such as the fraction of absorbed photosynthetic active radiation (FPAR), the leaf area index (LAI) and the chlorophyll content. Currently the development of methods for robust mapping of these biophysical parameters is matter of subject in research. At the same time, enormous data amounts will challenge possessing capacities and a wise selection and reduction of data will improve the applicability of remote sensing in agriculture.

Biophysical parameters were modeled with RapidEye data on winter wheat in Mecklenburg-Western Pomerania, Germany using random forest based on conditional inference trees. The study aims at the selection of the most important information out of spectral bands and indices for parameter prediction on winter wheat. In-situ and remote sensing observations were grouped into phenological phases in order to examine the importance of single spectral bands or indices for modelling biophysical reality in the several growing stages of winter wheat. Model accuracies for FPAR ranged between 0.19 and 0.83 (R^2), showing, that the model accuracy is linked with the phenological phase. The results showed that for each biophysical parameter, different spectral variables become important for modeling and the number of important variables depends on the phenological time span. The prediction of biophysical parameters for short phenological groups, often depends only on one to three variables. The results also showed, that in the phenological phase of fruit development, the model accuracy is the lowest and the determination of the importance is vaguer.