Aims of the project

1) To develop a software library for the generation of consistent time series of optical satellite data at so far unique spatial and temporal resolution (Sentinel-2 scale): The focus will be set on the optimization of the computation time and the improvement of currently used methods. The library is also foreseen as a basis for tests in other application fields.

2) Implementation and demonstration of the developed library using the example of a robust and large-scale calculation of the biophysical parameters LAI and FAPAR by Sentinel-2 and Sentinel-3 (alternatively RapidEye, Landsat, and MODIS) data sets: An optimization is done by a systematic comparison of several approaches.

3) Implementation of an application service for estimating crops yields.

Data Fusion

The generation of high-resolution time series is usually hampered by reduced temporal coverage and atmospheric disturbance (clouds). The resulting variability in observation times (Fig. 2) significantly reduces the consistency of large area observations and can negatively impact on subsequent applications. In order to solve the problem, the project will develop generic algorithms for multi-sensor (S2/3) data fusion. Figure 3 shows first tests of the fusion algorithm STARFM [1] for predicting daily Landsat data from MODIS observations.

Biophysical Parameters

FAPAR and LAI maps will be derived using statistical methods (empirical regressions and the percentile approach after [2], and radiative transfer modelling. The focus is set on the minimization of computation efforts for mapping extensive areas. For validation, two field campaigns are envisaged.

Three wheat and three maize fields were selected, on which LAI, FAPAR, vegetation height and chlorophyll were measured with three repetitions every week 2014 (Fig. 4).

Destructive sampling served for the calibration of the LAI-2000 and AccuPAR LP-80 devices. Further campaigns in 2015 will optimize data collection. Figure 5 shows first results of a regression model based on field LAI and RapidEye spectral data.

References