Influence of Different Stratified Sampling Methods on the Accuracy of Multi-Temporal Object-Based Crop Mapping

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ABSTRACT:

One major goal of the PhenoS project ("Phenological structuring to determine optimal acquisition dates for Sentinel-2 data for field crop classification") is the detection of optimal phenological time windows for land cover classification purposes. Since many crop species are spectrally highly similar, accurate classification requires the right selection of satellite images for a certain classification task. One particular focus is set on the separation of spectrally similar cereal crops like winter wheat, barley, and rye. Study region is the TERENO test-site "The Harz/Central German Lowland".

The aim of this MSc study is to evaluate the influence of different stratified sampling methods on the classification accuracy. For the stratified sampling various combination of strata were tested in order to select field objects, which act as input data for an object based classification algorithm. In context of the PhenoS project an object based classification tool called MELanGe ("Multi-functional tool for the Evaluation of Land use classification and Geometric accuracy") was developed. MELanGe uses, random forest (RF) classification to investigate the impact of image acquisition frequency and timing on crop classification accuracy. The required zonal information to train the RF classifier originates from the tool itself. It performs an automatic calculation of spectral metrics based on the selected objects. Using information from different strata, like field-size, soil type, aspect and heterogeneity in height, for a stratified sampling, leads to a better representation of all different features in the training objects. The Combination of those strata was assumed to increase the robustness of the classification results.

The accuracy assessment of the object selection methods demonstrates that stratified sampling methods can lead to better or more robust classification results compared to random object selection. For each RF run, 700 out of 2000 available objects were sampled. Each sampling strategy was repeated 10 times (10 RF runs). Despite achieving overall accuracies similar to random sampling, the stratified sampling reduced the standard deviation in the overall accuracy by 20%. Class-wise assessments showed that stratified sampling can increase the accuracy of some specific classes by up to 10%.

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