Optimized Processing of Airborne Hyperspectral Data for Forest Studies

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Overview

From 2013 onwards, regular airborne data acquisitions have been carried out within the "Data Pool Initiative for the Bavarian Forest Ecosystem". The hyperspectral imagery is used for different forest studies, e.g., tree species mapping. In order to produce accurate and meaningful results from airborne hyperspectral data analysis, it is essential to have exact knowledge about the quality of the image data itself. Also, the application of a method to multipurpose data is dependent on the comparability of the data. In the following, the effort to generate standardized data products is being presented.

Processing Chain

The Earth Observation Center (EOC) of the German Aerospace Center (DLR) has developed a processing chain which generates standardized data products automatically, allowing the data to be reproduced easily at any time.

Tree Species Classification

Amongst others, spectral information of the corrected hyperspectral imagery as well as vegetation indices are used as input for a tree species classification. The reliability of the input data directly influences the reliability of the classification result.

The analysis of the input features is realized using HySpex data of three different years (2013, 2015, and 2016), all acquired during the same phenological season but with different ground resolution (2.4m, 4m, 2m pixel size).

Concerning the vegetation index, the red edge NDVI (RENDVI) – an indicator for the general vegetation health – is regarded exemplarily.

Accuracy Assessment of Two Overlapping Scenes (Same Date)

The differences in spectra of the same tree in two different scenes (object based comparison) are due to BRDF effects within the crowns. To correct for these effects is almost impossible due to the complexity of the forest structure.

Without the correction of TOV effects, the differences due to different viewing and illumination geometry can be depicted e.g. by looking at the RENDVI.

Due to the apparent differences within the overlapping area, it is essential to carefully select and filter the training data for a tree species classification.

Accuracy Assessment of Multitemporal Scenes (Same Season)

The RDI based comparison of the spectral index RENDVI calculated of corrected HySpex scenes of three different years shows a shift of the histograms. This shift is different for different tree stands (continuous a–> discontinuous). The difference in frequency is due to the different pixel size.

References


