HYPERSPECTRAL IMAGE DATA FOR MAPPING MOUNTAIN VEGETATION

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Mountain vegetation have specific adaptations to survive the harsh conditions of life in variable habitats. These adaptations can be observed as different relationships between leaf characteristics, such as pigment content, plant tissue structure, waxes etc. All of them have a direct impact on reflectance which can be measured and quantified using hyperspectral sensors. The application of remote sensing, especially hyperspectral remote sensing techniques, allows for vegetation mapping.

The aim of the study was to show the potential of hyperspectral image data for mapping subalpine and alpine mountain vegetation. The research area covered the eastern part of Karkonosze National Park above tree line in Poland. Two types of data were used to this research: aerial and simulated satellite images. The 288-bands aerial APEX (Airborne Prism EXperiment) data operating in the wavelength range 0.4-2.5 µm were acquired on 10th September 2012 by DLR in the framework of the EUFAR HyMountEcos project. APEX data were corrected radiometrically, geometrically and atmospherically at VITO's, Centre for Remote Sensing and Earth Observation Processes in Mol (Belgium). EnMAP (Environmental Mapping and Analysis Program) is a future German hyperspectral satellite mission that enables a characterization of the Earth's surface, due to be launched in 2018. Based on acquired APEX data the simulation of 242-bands satellite EnMAP data over the study area was performed in GFZ in Potsdam (Germany). The spectrally similar APEX characteristics were resampled from 3.12 m to a 30 m pixel size of EnMAP and based on both datasets the subalpine and alpine vegetation classification was performed.

As reference of vegetation the vector map of its distribution provided by Wojtuń and Żołnierz (2002) was chosen. The terrain recognition was based on field walks conducted in 2013 and 2014 with a Trimble GeoXT GPS receiver. It allowed to create training and

validation samples of vegetation type classes as follows: grasslands, heathlands, subalpine tall-forbs, deciduous shrubs vegetation, bog-springs, fens and bogs, subalpine dwarf pine scrubs, rock and scree vegetation, ruderal vegetation and forests, which were used in the Support Vector Machine (SVM) classification method. The overall accuracy of classification for the APEX and EnMAP data reached about 90% and 80%, respectively. Generally, the individual class accuracies were about 80-90%, for both datasets the best classified were subalpine dwarf pine scrubs (about 90% of producer accuracy) and grasslands (for APEX about 98% and for EnMAP about 84%), the worst classified on both datasets were heathlands (about 62% for APEX and about 45% for EnMAP).

The results show the potential use of both types of hyperspectral imagery in mapping subalpine and alpine vegetation. Spectral resolution of images allows to identify most of classes succesfully. Even though satellite data provide a lower spatial resolution than aerial images but enables a higher temporal resolution which is needed in monitoring of protected areas.

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