Classification of selected agricultural crops from time series of Sentinel-2 and PlanetScope imagery in Kutnohorsko model area

Abstract

The thesis is focused on the analysis of spectral characteristics of selected agricultural crops druring agriculutural season from time series of Sentinel -2 (A and B) and PlanetScope sensors in the model area situated around the settlements of Kolín and Kutná Hora. It is based on the assumption that the use of multiple dates of image data acquired crops in different phenological phases of the crops allows better identification of crop species (Lu et al., 2004). The aim of the thesis was to analyse the characteristics of the seasonal course of spectral features of selected agricultural crops (sugar beet, spring barley, winter barley, maize, spring wheat, winter wheat, winter rape) and to determine the period of the year suitable for the differentiation of individual crops. Another aim of the thesis was to classify these crops in the model area from time series of two above-mentioned sensors and to compare the accuracy of the pixel and object-oriented classification approach for multitemporal composites and the accuracy for monotemporal image from the term when the individual crops are clearly distinguishable. The training and validation datasets and the classification mask were created using LPIS database provided by the State Agricultural Intervention Fund. The time of satellite data of the both sensors from 2017 were used for the classification. Data from 2015 and 2016 from LPIS database were also used for the detection of the spectral features of crops, that were determined from the NDVI and the from spectral values in the individual bands. The highest overall accuracy (88,4 %) was achieved by the pixel classification (maximum likelihood classifier) of the 1st multitemporal composite created from Sentinel-2A and 2B data (consisting of six ten-band scenes). The best object based classification (from Sentinel-2A and 2B 2nd multitemporal composite: 6 scenes, 24 bands - RGB, NIR) achieved a total accuracy of 87,29 %. The highest overall accuracy within the monotemporal approach classification (76,19 %) was obtained from the Sentinel-2 image acquired in 20 June 2017. Therefore, the assumption that the use of the multitemporal composite yields significantly more accurate results for the classification of the agricultural crops has been confirmed. The significance of the RED EDGE and SWIR bands of Sentinel-2 for the accuracy improvement of the pixel classification was documented. Higher spatial resolution of PlanetScope data did not bring better classification results compared to Sentinel-2 data, that has better spectral resolution.

Keywords: time series of satellite imagery, agricultural crops, classification, spectral feature, Sentinel-2, PlanetScope