FOREST VEGETATION CONDITION ASSESSMENT OF KARKONOSKI NATIONAL PARK BASED ON APEX HYPERSPECTRAL DATA – FROM FOREST TO SPECIES LEVEL

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Knowledge about forested area vegetation condition is important both for monitoring protected areas and estimating potential economic value of forests. One of regions that was endangered by human activities were Karkonosze Mountains. More than 30 years ago rapid expansion of industry and particular landscape caused acid rains that ravaged fragile mountain ecosystem. Given the environmental tragedy that happened in Karkonosze Mountains, detailed information about vegetation recovery is crucial for national park administration and foresters alike. With use of advanced hyperspectral sensors like Airborne Prism Experiment (APEX), more in depth analysis of vegetation can be made. In this work we investigated vegetation condition using range of remote sensing indices. To further understating about forest condition we decided to also preform our analysis at species level. First step of this research was selection of indices that would be most suitable for the task. By calculating correlations between hyperspectral field data from ASD FieldSpec 3 taken in late August 2014 and 2015 and hyperspectral data from APEX sensor taken in early September 2012, we were able to select vegetation indices that didn't deviated from field measurements with statistical significance. This step allowed us to believe that phenological changes happening in plants, due to different months of data acquisition (end of August- field data; September – APEX data), didn't had statistically significant effect on vegetation indices and all change was caused by other factors. Selected indices were: NDVI, EVI, ARVI, mNDVI705, PRI, SIPI, PSRI, NDNI. Additionally we selected a number of vegetation that are sensitive to water content, lignin and carotenoid content (WBI, NDLI, CRI). Mentioned dataset was the used to assess overall condition of forest vegetation in Karkonoski National Park. Furthermore we decided to use tree species classification map to further investigate vegetation condition change on species level. For this analysis same indices were used as in case of forest condition assessment. Tree species map was made with help of APEX data, using field collected data as training and verification data. Mentioned classification achieved overall accuracy of 87% with all classes having producer accuracy of no less than 70%. Results show differences in vegetation indices on species level that might be explained by different phenological cycles, stand specific characteristics, habitat preferability and resistance to negative effects of selected tree species.

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