ASSESSMENT OF HYPERSPECTRAL VEGETATION INDICES FOR HEAVY METAL CONTAMINATIONS OF LEAVES IN KARKONOSZE

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Hyperspectral remote sensing techniques allow to detect physiological and chemical properties of plants. Narrow-band techniques register detailed biophysical properties, which have direct impact on spectral responses of plants in different wavelengths (350-2500 nm). The proposed researches were conducted along the Polish part of the Karkonosze National Park. It is characterized by beech-fir forest intermixed with Norway spruce. Field campaigns were undertaken in May, June and September 2014 at 24 sites along an environmental gradient dominated by spruce (*Picea abies*) and beech (*Fagus sylvatica*). The following data were acquired from these two species:

- hyperspectral leaf characteristics (using ASD FieldSpec 3 hyperspectral spectrometer with a direct contact ASD PlantProbe + ASD LeafClip),
- bioradiometric data: surface and air temperatures (IRtec MiniRay pyrometer); content of chlorophyll, protective pigments (anthocyanins), flavonoids and nitrogencontent (Dualex Scientific+™) and chlorophyll fluorescence values (OS1p OptiSciences),
- leaves samples for measurements of heavy metals (Mn, Ni, Cu, Zn, Cd and Pb). The collected samples were cleaned and dried in laboratory conditions, then homogenized and mineralized in a microwave mineralizer.

Spectral characteristics were used to analyze spectral response curves and to calculate selected vegetation indices ($mNDVI_{705}$, VOG1, SIPI, NDLI, ARI1, NDWI, NDII). Bioradiometric data and content of heavy metal were used as a reference data. In case of both species significant differences were observed in spectral characteristics of the near-infrared spectral region and in the short-wave infrared region, which is due to differences in coniferous and deciduous cell structures and water content. Overall, the measurements clearly suggest that both species were in a good condition at all sites, and there were no indications of water stress. The applied hyperspectral remote sensing tools and methods proved to be appropriate for analysis of forest tree conditions at a detailed level; the acquired data precisely depicted vegetation phenology. Detailed results will be presented during the conference.

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