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Object-Based Classification of Vegetation at Stordalen Mire near Abisko by using High-Resolution Aerial Imagery

The focus of this work is to investigate and apply the remote sensing method of object-based image analysis (OBIA) for vegetation classification of a permafrost underlain peatland in sub-arctic Sweden, by using aerial imagery of high resolution. Since the northern landscapes are an important source of naturally stored CH_4 and CO_2, their contribution to the global carbon cycle is a focus in research about climate change and the global methane exchange. Climate change affects permafrost soils by future increases in the mean temperature and precipitation. It further influences the depth of the frozen layer, and the thickness of the active layer above permafrost increases. This complex relationship results into a changing future landscape distribution of the vegetation at permafrost peatlands. The change has an effect on the exchange of CH_4 in particular permafrost areas. For that reason, knowledge about the vegetation distribution of plant communities is interesting for ecological studies. In this work, the observed area is Stordalen mire, which is situated in Swedish Lapland. At this peatland, a landscape change is currently visible as it occurs as variations in the vegetation pattern above the permafrost and by an obvious permafrost thaw. A number of studies focus on the mire and the place has a long history of research in climate change. So far, there is no detailed vegetation map of Stordalen available, indicating the relative spatial distribution of vegetation. Therefore, the main aim is to use a suitable technique to derive a detailed vegetation map by supervised classification. To carry out the information needed, digital aerial photography of high spatial resolution was used. The extraction of thematic information from that data was done by a combination of OBIA methods. Remote sensing has the capability to explore distant regions, and the usage of digital aerial imagery of high resolution allowed to captures the small size of structures of vegetation. It was possible to identify single plant communities from the data, and this information was taken out as vegetation classes. The presented work includes the preprocessing of the data, the segmentation of image objects, establishment of classification controls, set up of training areas, and the image classification to the vegetation map, finally with an evaluation of the results. The resulted map is a contribution to apply OBIA as a method for landscape analysis in future research about northern peatlands.

Key words: Physical Geography and Ecosystem Analysis, Object-Based Image Analysis, OBIA, Vegetation Classification, Permafrost, Arctic Peatland, Remote Sensing, Aerial Photography, Environmental Monitoring, Landscape Analysis

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