Using Digital Cameras and high-resolution Satellite Image for Sub-pixel Classification of Landsat data in Mountainous areas

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Vegetation in Scandinavian mountain areas are highly diverse and very heterogeneous. Such conditions make it hard to do a proper vegetation classification with satellite data, especially in those areas where the vegetation elements are of the same scale as the pixel resolution. Landsat data is convinient to use for such classification, but in the heterogeneous areas a mixture of vegetation type often occur at 30 meter pixel level. Capturing point based reference data from field visits will under such condition be insufficientOur aim in this study has been to look for methods to get reference data more suitable for vegetation classification under conditions described above. We have compare the accuracy of a two step vegetation classification of Landsat data based on field visits for capturing reference data, with a three step approach. In the latter we have taken vertical pictures with digital cameras lifted up with monopods on field visits, and used that information to classify vegetation with highly spatial details on high-resolution aerial photos and high-resolution satellite data. This classified product is used as reference data in both a decision tree and regression tree analysis on Landsat images.The study has been done at the Hardangervidda, a 9 000 kmI mountain plateau in southern Norway. 35 areas of 2 x 3 km have been sampled at 15 cm ground resolution with a digital aerial camera (Vexcel) and two larger areas have been sampled with IKONOS images. Parts of these high resolution images have been classified using a detailed area segmentation with the eCognition software. The segmentation has been done in two steps, first a segmentation for capturing segments in size comparable to vegetation units, and a sub-level which inherited features from the mother segments and with segments of the size of objects like single shrubs, trees, rocks, etc. Preliminary results shows that the three steps approach increase classification accuracy, and opens for doing additional products like a sub-pixel analysis for abundance estimations of lichen, willow, rocks and grass.