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Scale dependency for assessment of biodiversity indicators from different remote sensing data sets

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Knowledge of tree species distribution and forest structures is important for biodiversity studies. The accuracy and information content of species maps and structural indicators produced by using remote sensing images vary with scale, sensor, classification algorithm, verification design and natural conditions like tree age, forest structure type or density. Imaging spectroscopy reduces the inaccuracies due to detailed spectral response on species identification while LiDAR, stereo optical data and TerraSAR-X as well as TanDEM-X data have been used to provide information on 3-D structural elements. The quality of information for biodiversity studies from multi-sensoral data sets is very much dependent on the scale effects respectively on point cloud density generated from different remote sensing data sets. The presented study aims to bridge the knowledge gap in understanding the scale effect and point cloud density for tree species and structural mapping.

For the tree species investigations airborne (HyMAP) and one spaceborne (Hyperion) imaging spectroscopy dataset with pixel sizes of 4 m, 8 m and 30 m respectively were selected to examine the effect of scale. Normalized digital surface model (nDSM) derived from LiDAR, digital airborne stereo photographs, high resolution stereo satellite data and TanDEM-X data point clouds was used as additional information to examine the effect of multi-sensor information. Six different sets of predictor variables (reflectance value of all bands, selected

components of a minimum noise fraction, vegetation indices and each of these sets combined with height) were explored at different scales. Supervised kernel based (Support Vector Machine) and ensemble based (Random Forest) machine learning algorithms were applied on the dataset to investigate the effect of different classifiers.