Geophysical Research Abstracts
Vol. 20, EGU2018-996, 2018
EGU General Assembly 2018

Multispectral ALS data for tree species classification

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The objective of this study was to investigate what type of features from multispectral ALS data (wavelengths of 532 nm, 1064 nm and 1550 nm) that are best suited for tree species classification. Two new methods for feature extraction were tested and compared to features of height and intensity distributions. The best classification model had a cross-validated correctness rate of 76.5 % for 179 individual trees from nine genera. This model used height and intensity distribution features. Nevertheless the results show that the upper and outer parts of the crown contained more information on species than other parts. ALS data were collected from hemi-boreal forest in southern Sweden using the Optech Titan X.

Accurate tree species classification would be useful in forestry, conservation and urban planning. Single wavelength ALS data have made it possible to create accurate maps of forest attributes, such as tree height and wood volume, but have not provided a good basis for tree species classification. Spectral properties of vegetation, usually recorded from airplane or satellite, provide a basis for tree species classification but these data have some drawbacks. Solar and observation angle causes shadows and different view of shadows in the same image. As a result parts of the crown are not contributing much to the measurement and individuals of one species can differ greatly in spectral attributes. Furthermore, ground and canopy reflectance are mixed within a pixel. Multispectral ALS data solves some of these problems. It is an active sensor, and thus not affected by solar angle. The return intensity has a three dimensional coordinate, meaning that data originating from ground returns can be omitted. If these new data are efficiently used, they may provide a better classification accuracy than passive optical sensors have done.