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AREA-BASED SNOW DAMAGE CLASSIFICATION OF FOREST CANOPIES USING BI-TEMPORAL LIDAR DATA

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Abstract. Multitemporal LiDAR data provide means for mapping structural changes in forest canopies. We demonstrate the use of area-based estimation method for snow damage assessment. Change features of bi-temporal LiDAR point height distributions were used as predictors in combination with in situ training data. In the winter 2009 – 2010, snow damages occurred in Hyytiälä (62 ° N, 24 ° E), southern Finland. Snow load resulted in broken, bent and fallen trees changing the canopy structure. The damages were documented at the tree level at permanent field plots and dense LiDAR data from 2007 and 2010 were used in the analyses. A 5 × 5-m grid was established in one pine%ndash;spruce stand and change metrics from the LiDAR point height distribution were extracted for the cells. Cells were classified as damaged (n = 43) or undamaged (n = 42) based on the field data. Stepwise logistic regression detected the damaged cells with an overall accuracy of 78.6% (Kappa = 0.57). The best predictors were differences in *h*-distribution percentage points 5, 35, 40, 50 and 70 of first-or-single return data. The tentative results from the single stand suggest that dense bi-temporal LiDAR data and an area-based approach could be feasible in mapping canopy changes. The accuracy of the point *h*-distribution is dependent on the pulse density per grid cell. Depending on the time span between LiDAR acquisitions, the natural changes of the *h*- distributions due to tree growth need to be accounted for as well as differences in the scanning geometry, which can substantially affect the LiDAR *h*-metrics.

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