Airborne laser scanning-based stem volume imputation in a managed, boreal forest area: a comparison of estimation units

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In typical airborne laser scanning (ALS)-based inventories, the forest is aggregated from initial estimation units, for which the attributes are produced using variable imputation techniques. The initial units vary in size and shape, being usually either regular grid cells or segments derived from the ALS data. This study compared small grid cells and segments of trees or tree groups as initial estimation units in an ALS-based estimation of species-specific, plot-level volume. The experiments were carried out in a managed, boreal forest area in Eastern Finland, where pine was the dominant species, and spruce and deciduous trees formed the other species groups. The field data consisted of 79 sample plots (400–900 m^2 in area) and the ALS data had a density of about 12 pulses/m^2.

The estimation was overall very accurate, resulting in best-case root mean squared errors of 13% for the total volume, 23% for pine, 49% for spruce and 90% for the deciduous trees at the plot-level. The total volume was estimated most accurately using a method in which 0 to *n* trees were imputed per segment [1]. However, the differences between the estimation units were minor. Despite the significant biases in the estimates, the species-specific estimation was most accurate using a single-tree approach [2], i.e. by considering only the largest trees per segments in the imputation. The species-specific biases were of the same magnitude than the volume not detected by the tree detection algorithm, indicating that the proportion of the detected trees was estimated very accurately.

References

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