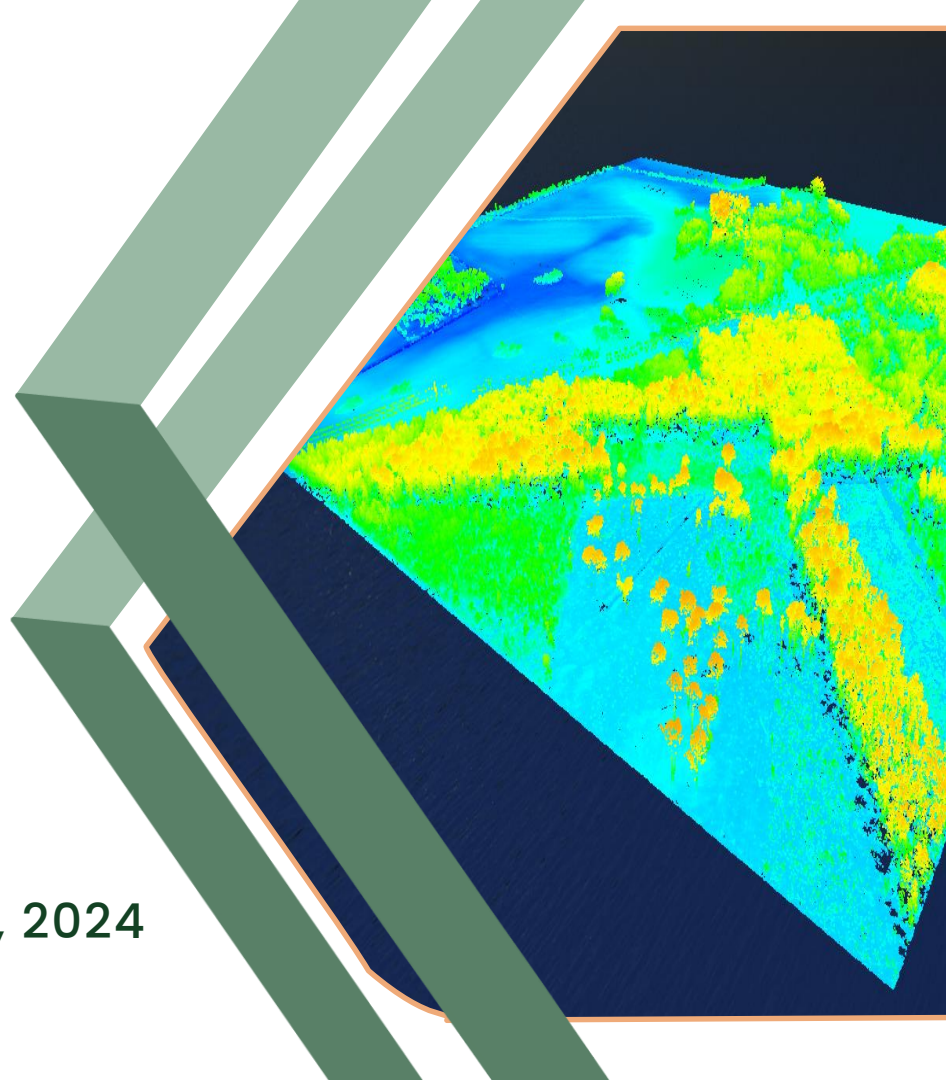




The influence of forest tree species composition on the forest height predicted from airborne laser scanning data

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EnviLink conference
Sękocin Stary, Poland, May 15 – 17, 2024





Introduction

ALS data can be used to predict various forest inventory parameters, however, the ALS point cloud properties depends on various environmental parameters

We used ALS data in combination with NFI field data to construct forest stand height models for forest stands dominated by 6 most common tree species in Latvia in mixed forest stand conditions

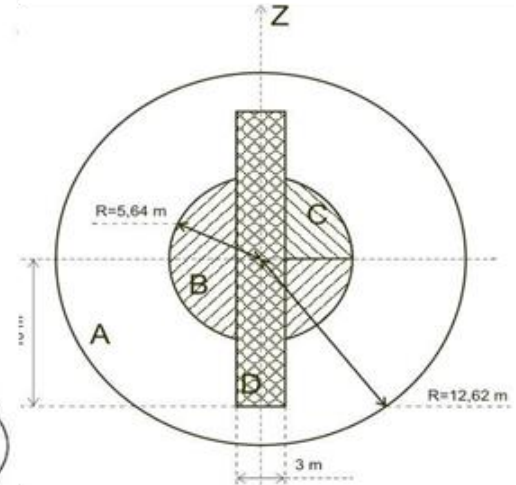
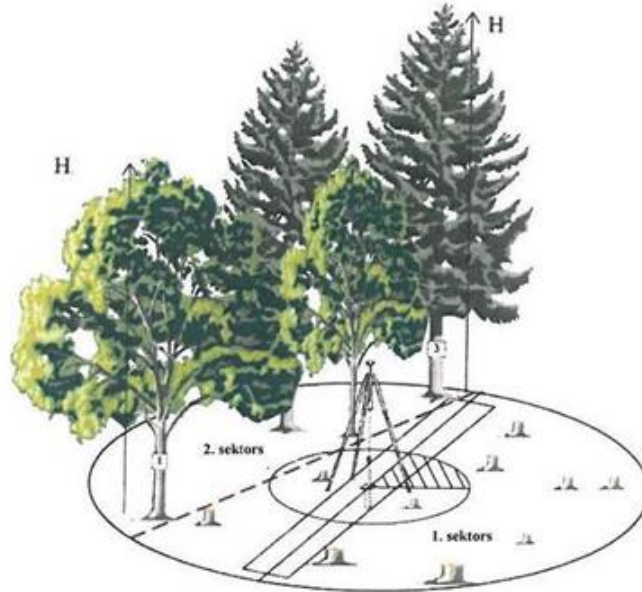
Latvian NFI

Since 2004

More than 16 000
permanent sample
plots

5 year cycle

Accurate statistical
data, without
spatial coverage





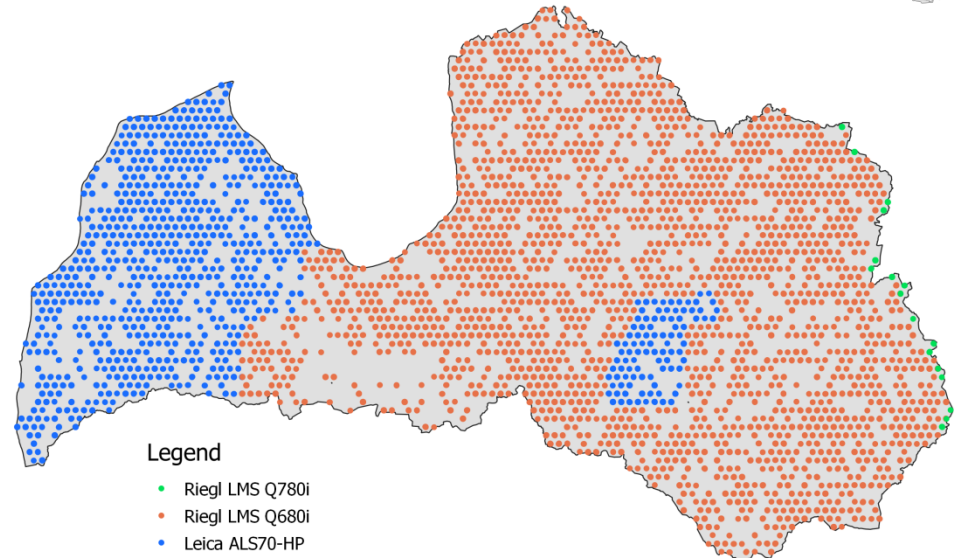
ALS data

Collected from 2013 –
2019

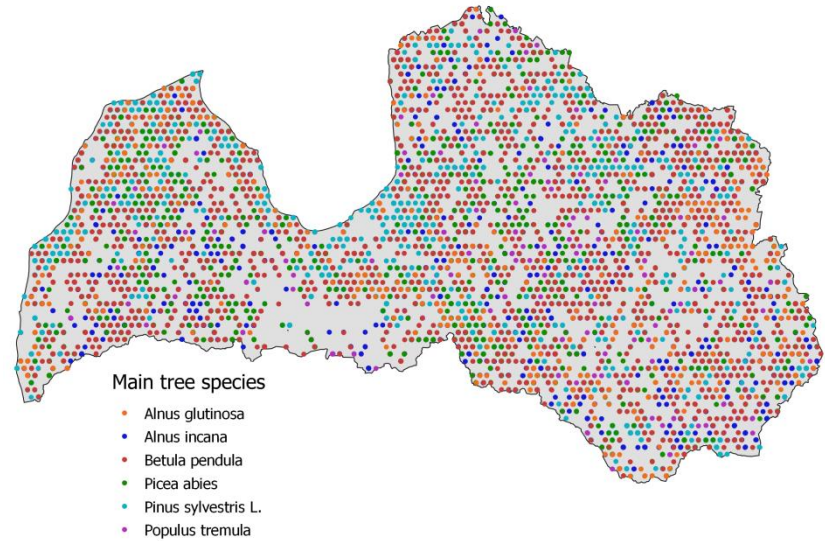
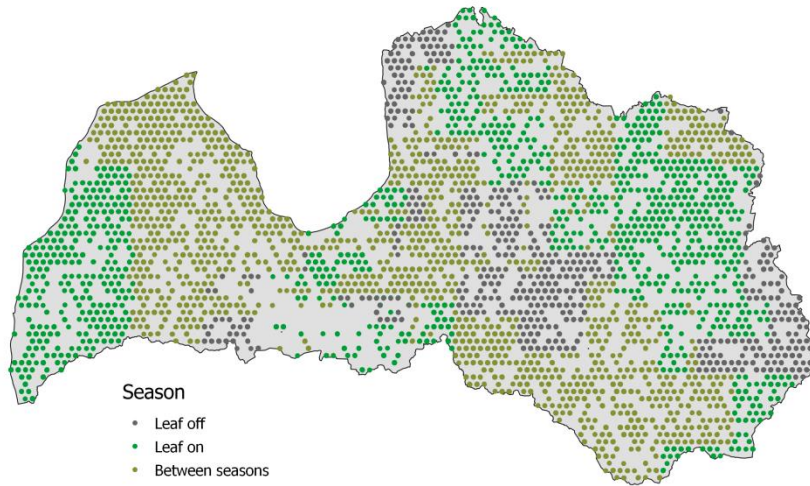
Multiple companies

3 different scanners

Data collected from
early spring to late
autumn



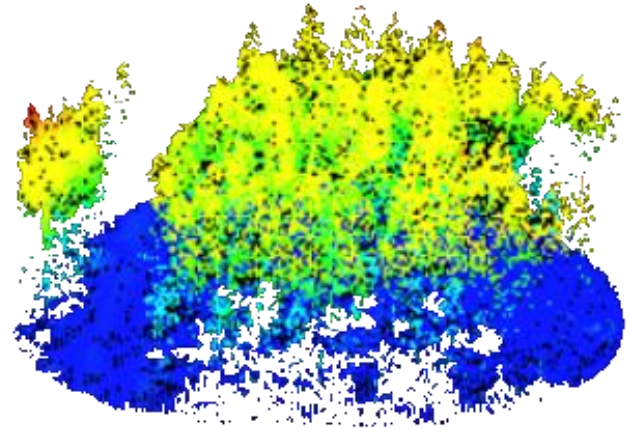
ALS data



Methods

ALS point clouds
normalized and
clipped by NFI sample
plot borders (R=12,62
m)

Obtained statistics on
the vertical distribution
of ALS points

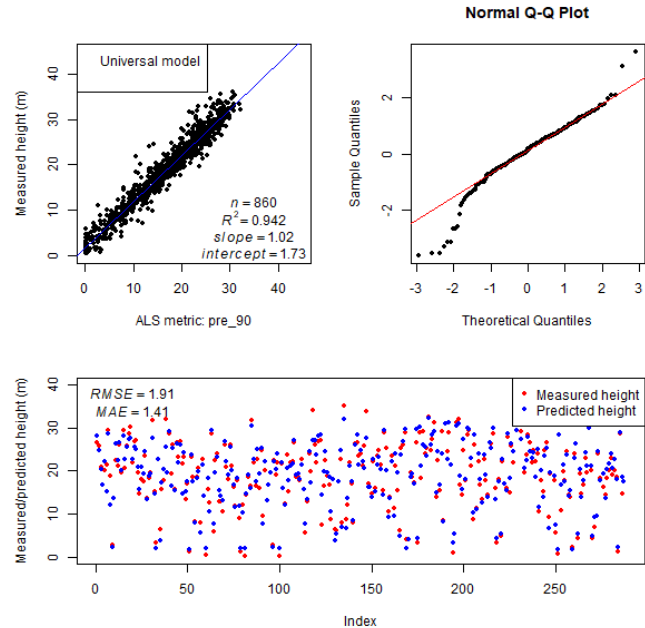


Methods

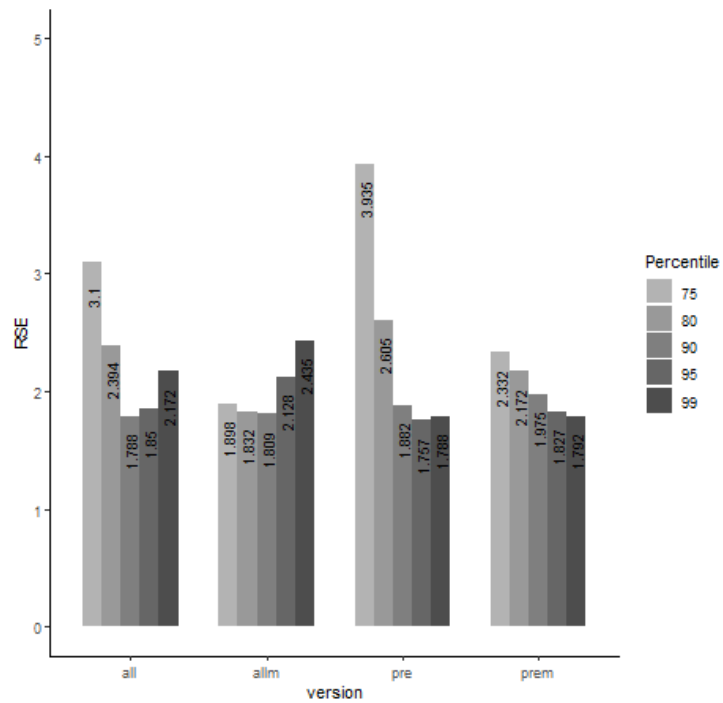
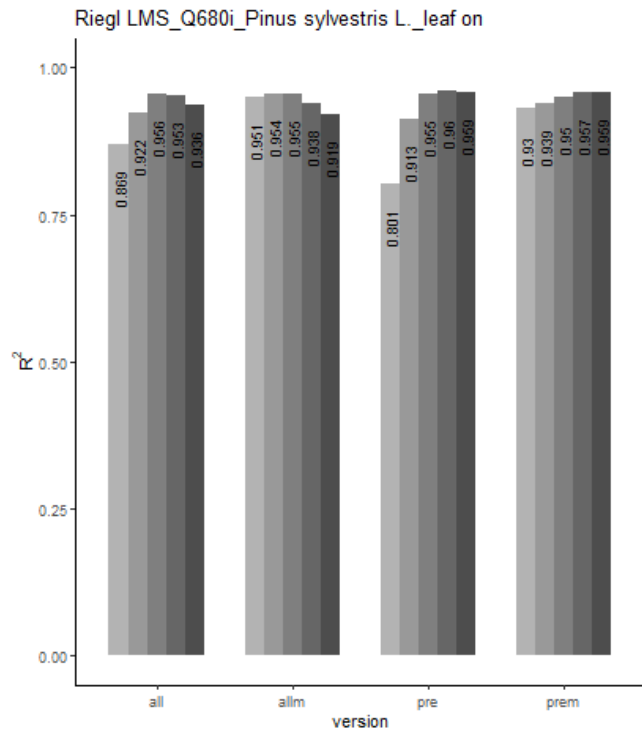
Data split by different scanners, tree species and seasons

Linear models built on 75% of data, 25% for validation

RMSE and MAE used for model selection

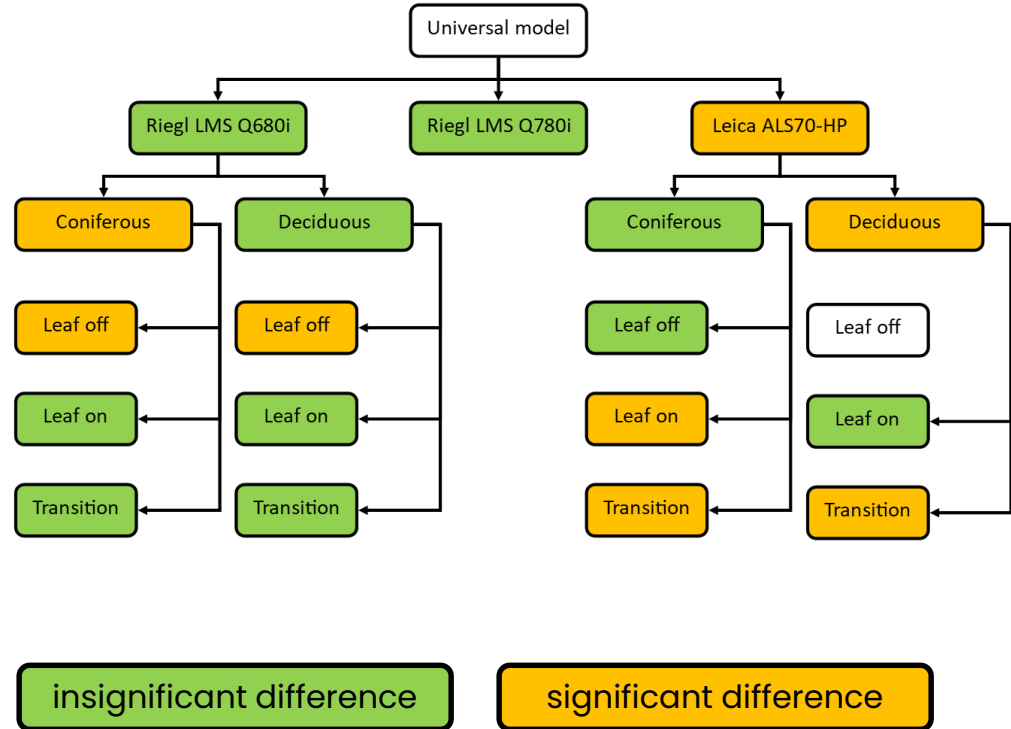


Methods

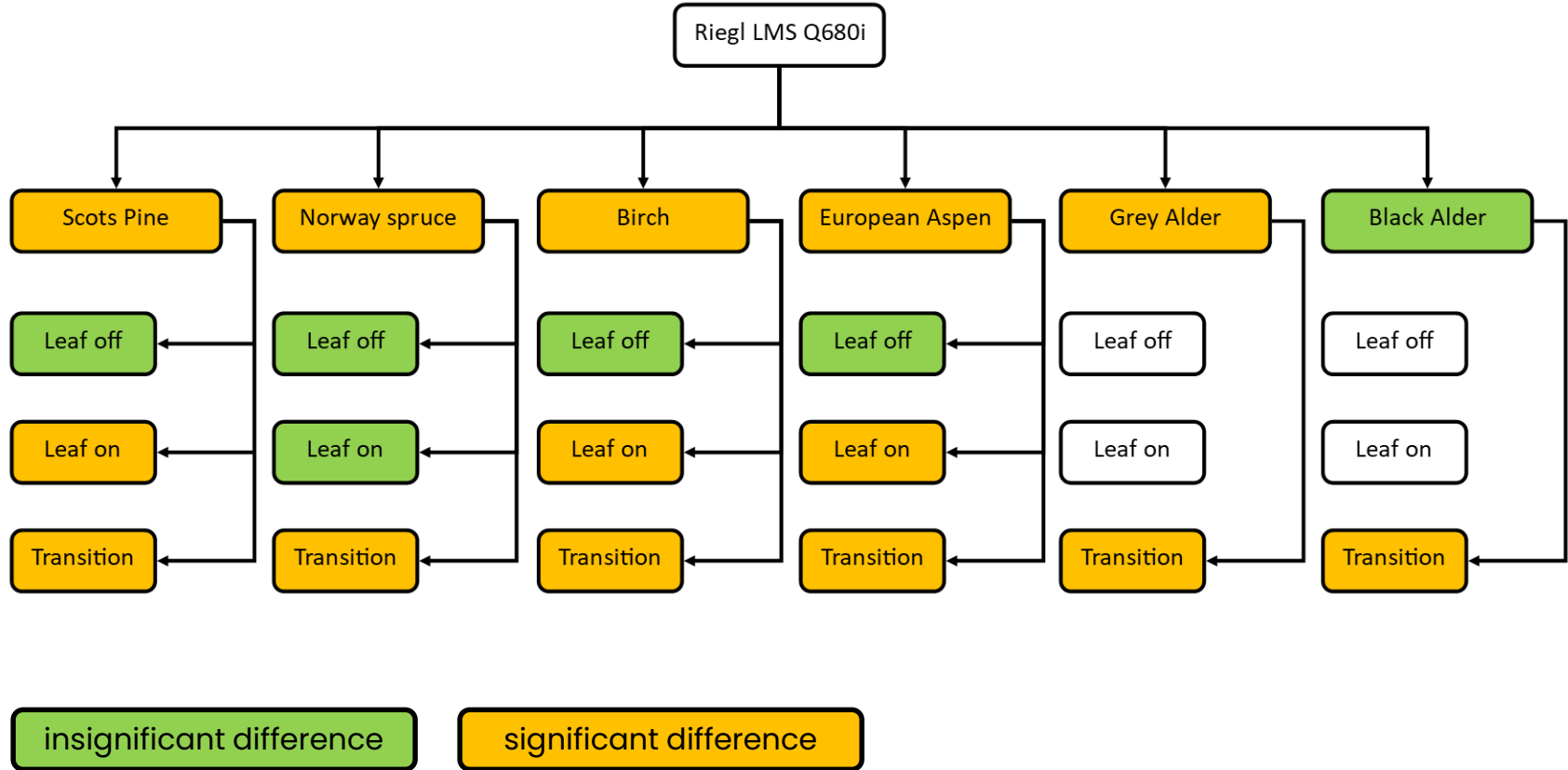


Results

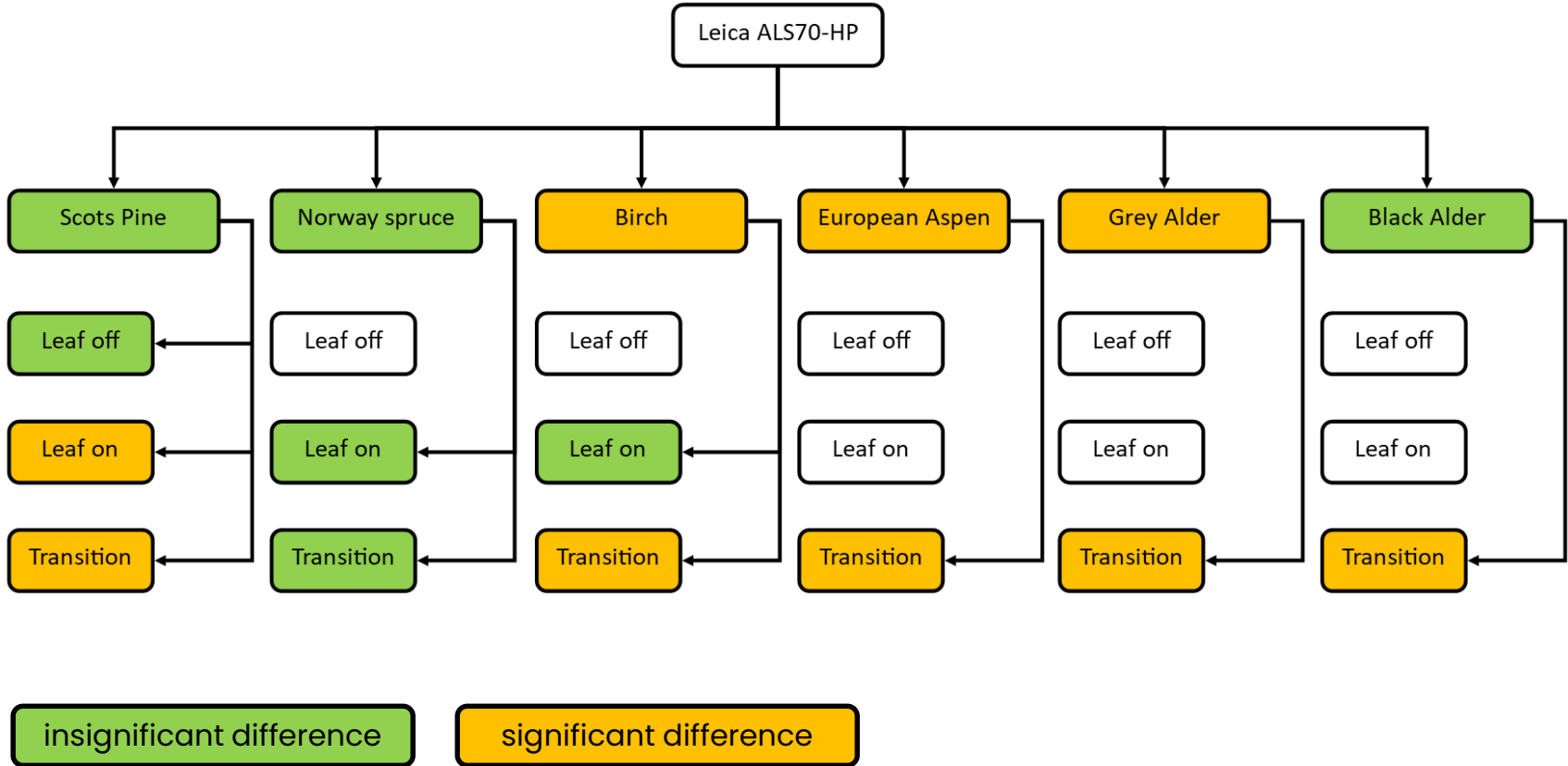
Models compared with paired t-test



Results



Results



Forest land delineation

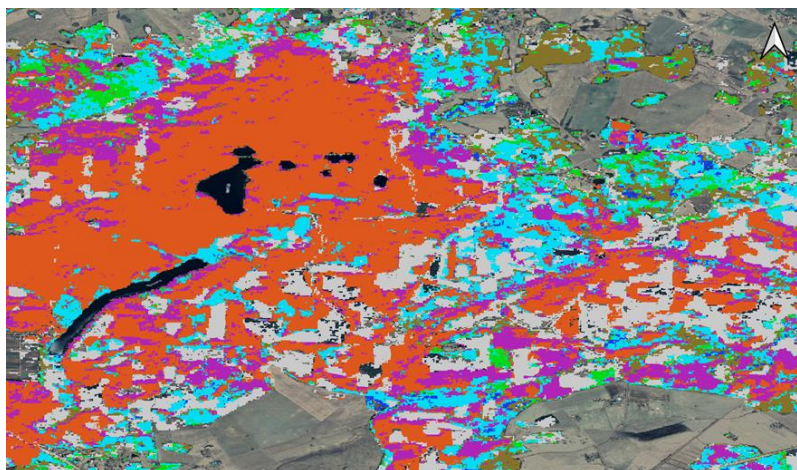
Multiple remote sensing data sources used for forest land delineation:

- Cloud free Sentinel-2 mosaics for spring, summer and winter;
- Depth-to-water maps;
- Wet area maps;
- Normalized height map;
- Slope;
- Elevation;
- Etc;

Class	Sensitivity
Forest	0.96
Agriculture land	0.98
Water	0.91
Wetland	0.57

Kappa score – 0.92

Forest tree species classification



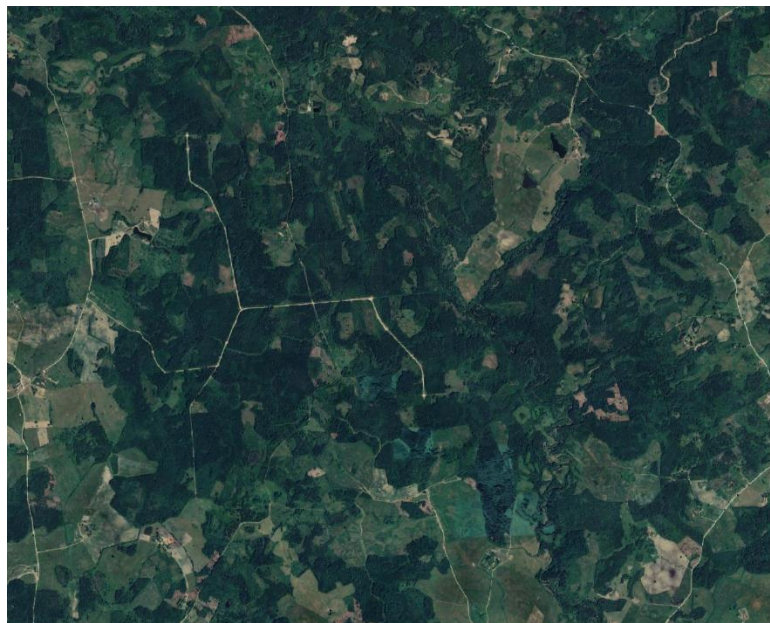
Legend

Tree species			
	Norway Spruce	Black Alder	Grey Alder
	Scots Pine	Birch	European Aspen
			Young growth forest

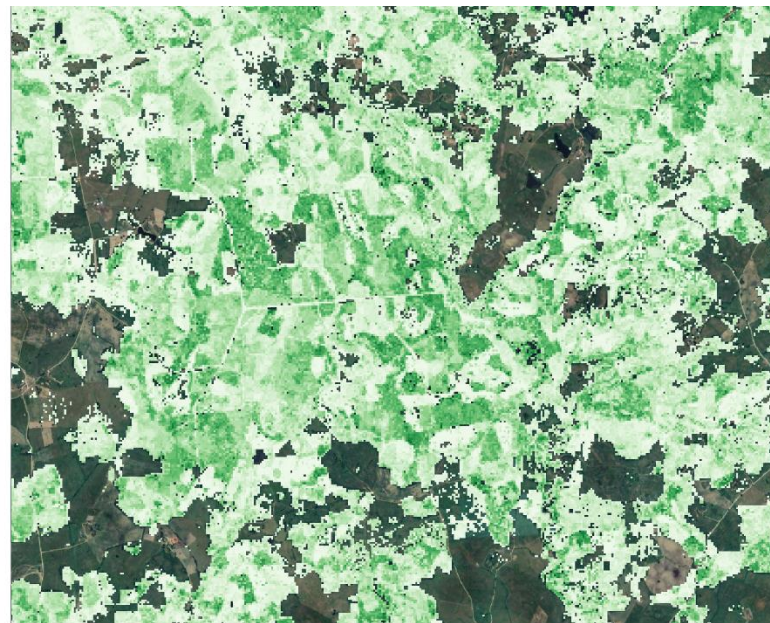
Tree species	Sensitivity
Young growth	0.88
Scots Pine	0.92
Norway Spruce	0.84
Birch	0.79
Black Alder	0.79
European Aspen	0.80
Grey Alder	0.69

Kappa score – 0.81

Forest height map



0 1 2 km

A horizontal scale bar with three segments. The first segment is labeled '0', the second '1', and the third '2 km'.

Forest height (m)

0 40

A vertical color scale bar. It starts with a light green color at the bottom, labeled '0', and transitions to a dark green color at the top, labeled '40'.



Conclusions

Tree species composition, vegetation season and surveying technology have an impact on the parameters of forest stand height models

The use of ALS and NFI data is useful in creating forest stand height models, however, regular updating of ALS data coverage is a prerequisite for accurate and up-to-date information



Thank you! Questions?



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