Modeling the horizontal distribution of tree crown biomass (HBD) from terrestrial laser scanning data

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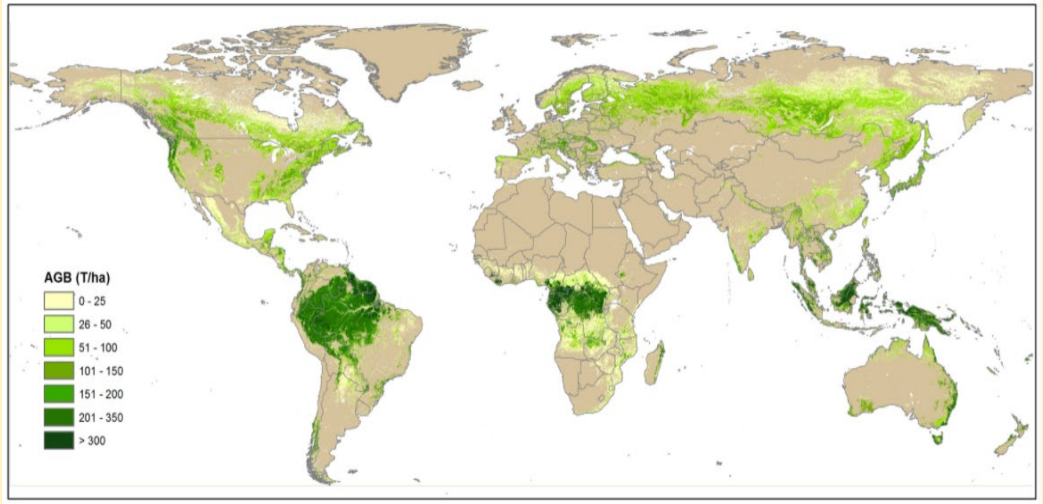
SLU, Umeå, Sweden (16-20.06.2024)

Motivation of the study

Researches addressing forest biomass estimation uncertainties:

- Researches on accounting various source of uncertainties (allometric model, measurement error, spatial scale, integration of EO products and geo-location error)



Avitabile et al. (2016)

Motivation of the study

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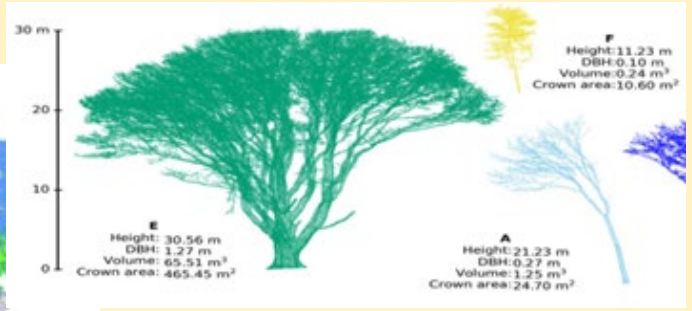
FAO (2024)

Motivation of the study

Researches addressing forest biomass estimation uncertainties:

- The growing laser technologies and mature algorithms for characterizing 3D of individual trees, and biomass proxies



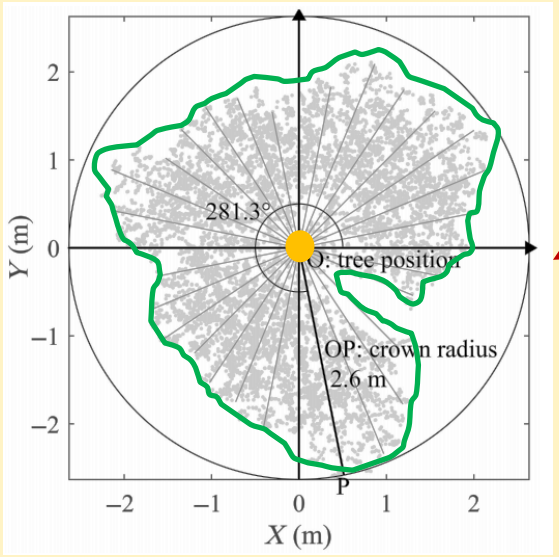
Calders et al. (2022)

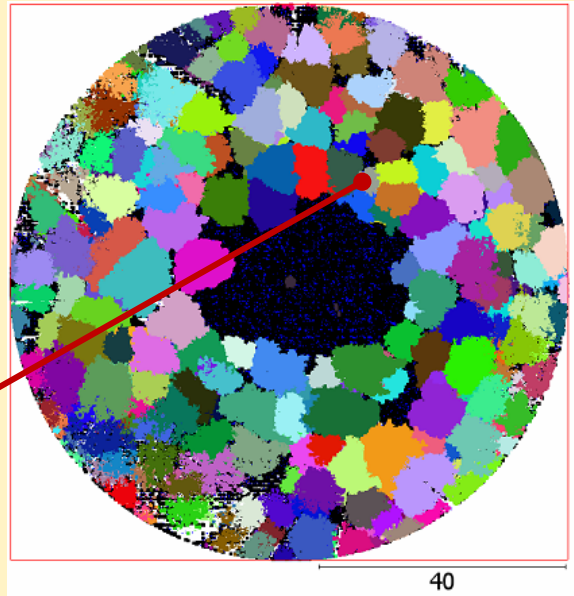
Motivation of the study

Researches addressing forest biomass estimation uncertainties:

- The predicted total tree biomass is assigned exclusively to the stem geolocation.

- Need of more complete biomass estimation while forest inventory approach is still incomplete!

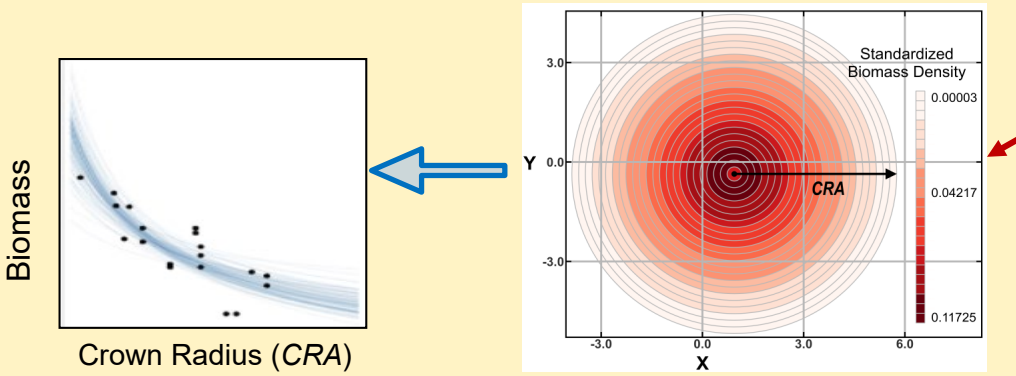




Motivation of the study

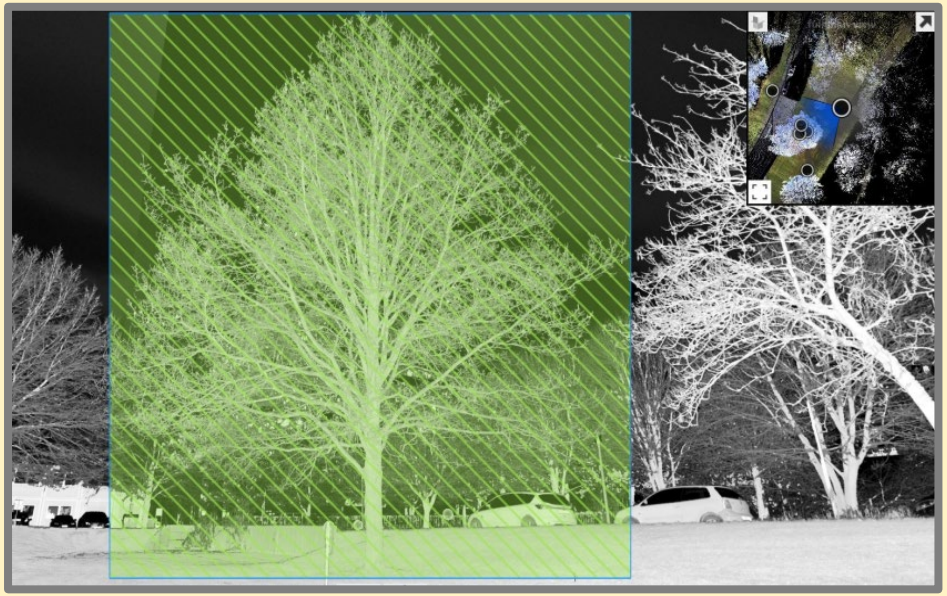
Researches addressing forest biomass estimation uncertainties:

- However, biomass is spatially distributed across the crown projection area: Continuous distribution of crown biomass horizontally along the crown radius; HBD.



Motivation of the study

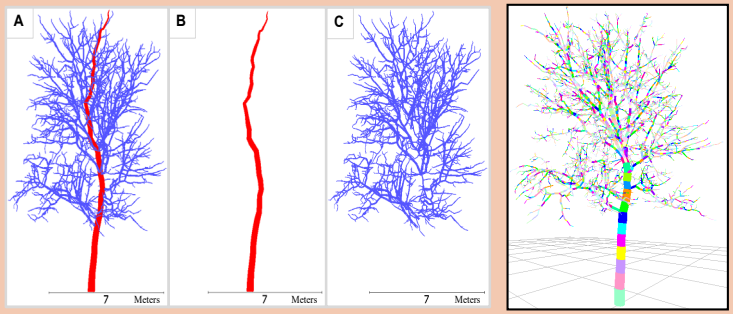
- Develop a methodology for describing the horizontal distribution of tree crown biomass from terrestrial laser scanning data (Trimble TX5 Scanner)



Methods

Step ONE

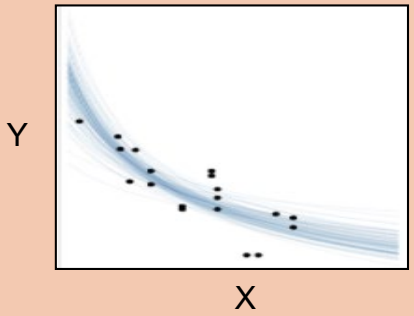
Crown biomass extraction



Step TWO

Empirical Models

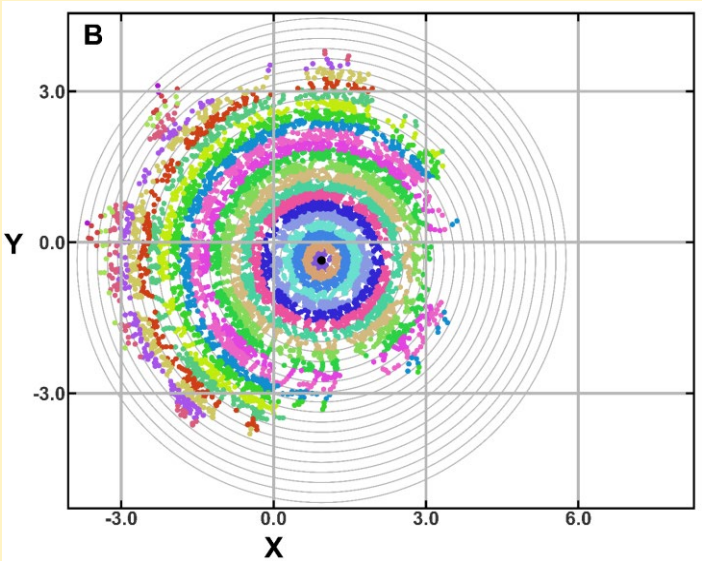
. SPRM
. WDM



Methods

Step ONE

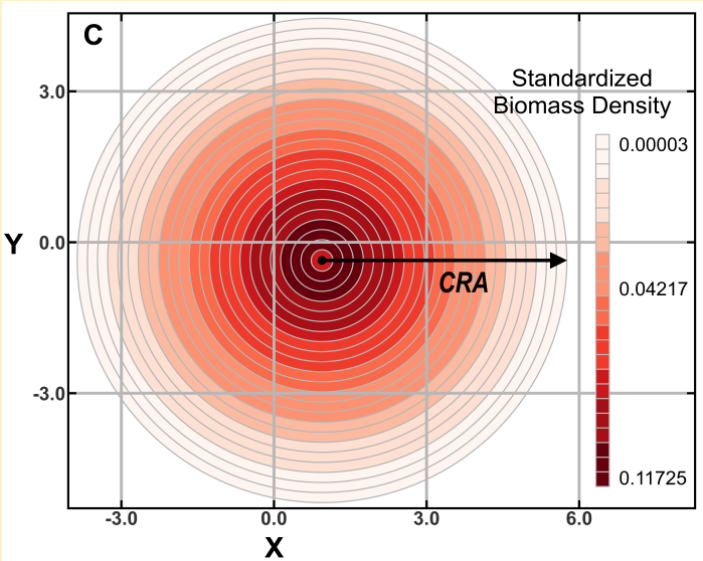
Step TWO



Methods

Step ONE

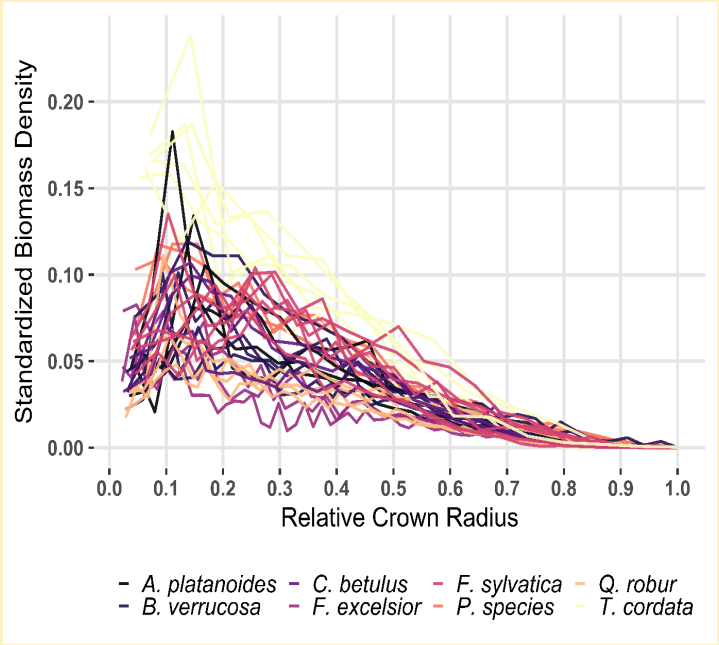
Step TWO



Methods

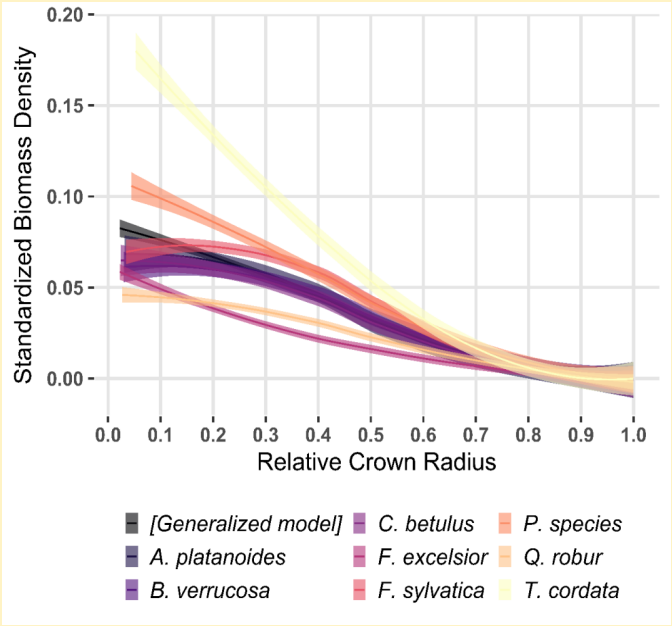
Step ONE

Step TWO

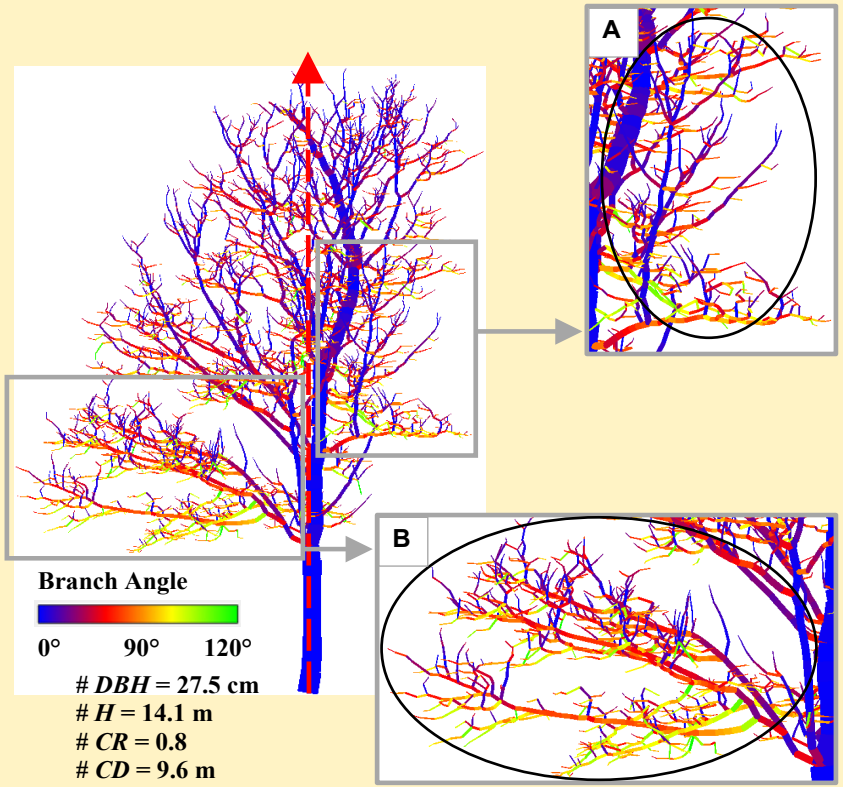


Results

Step ONE | Step TWO | Results



Outlooks and applications of the study

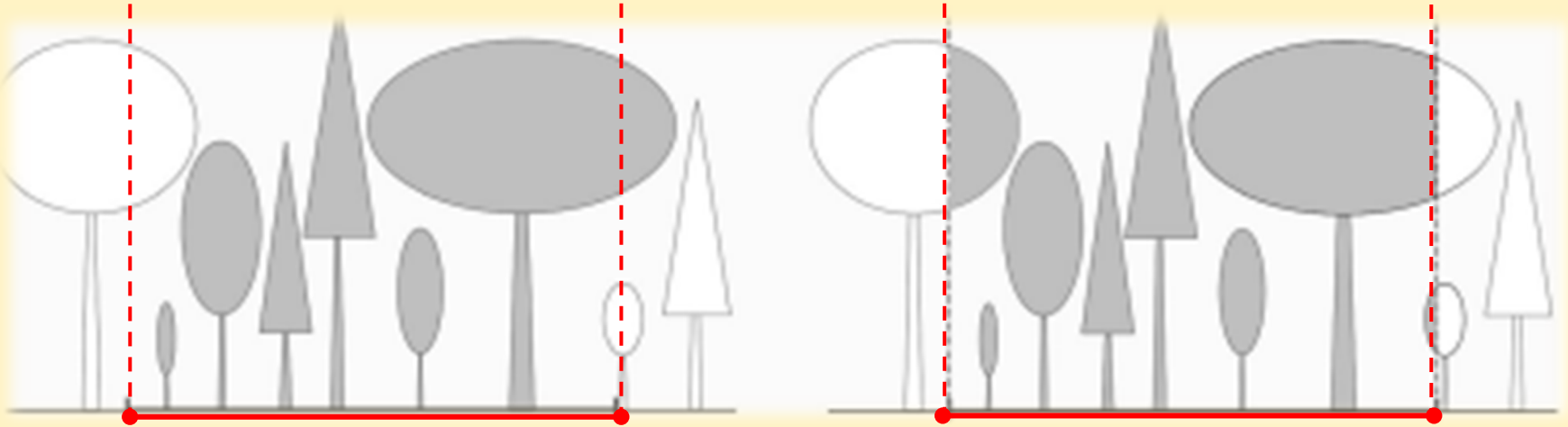


- Field or direct measurements is not convenient for describing HBD!

- Laser points could probably be the best alternative way for HBD descriptions!

Outlooks and applications of the study

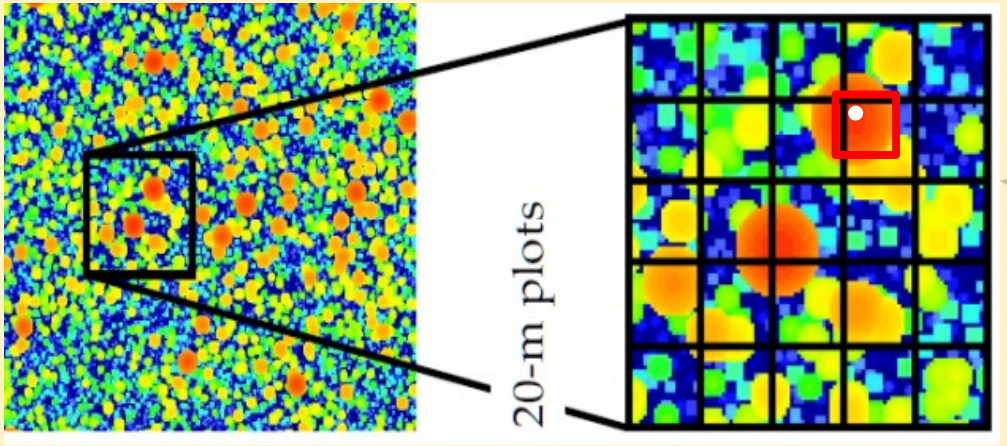
- What is the optimum plot size in fixed area forest biomass inventory? Optimum plot size?

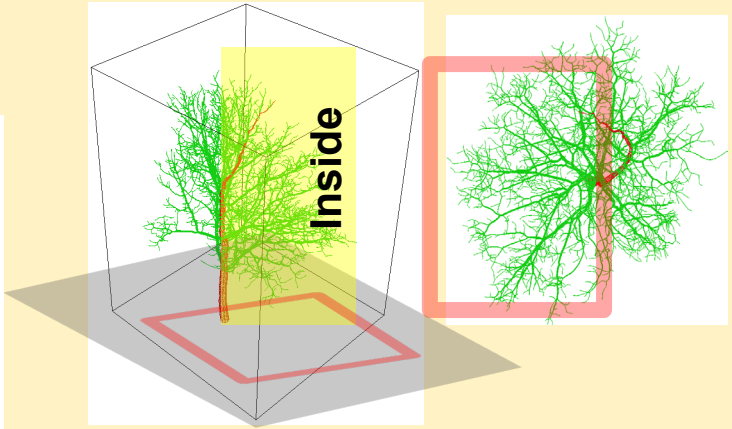


Kleinn (2020)

Outlooks and applications of the study

- How to match field inventory biomass with remotely sensed information?





Outlooks and applications of the study

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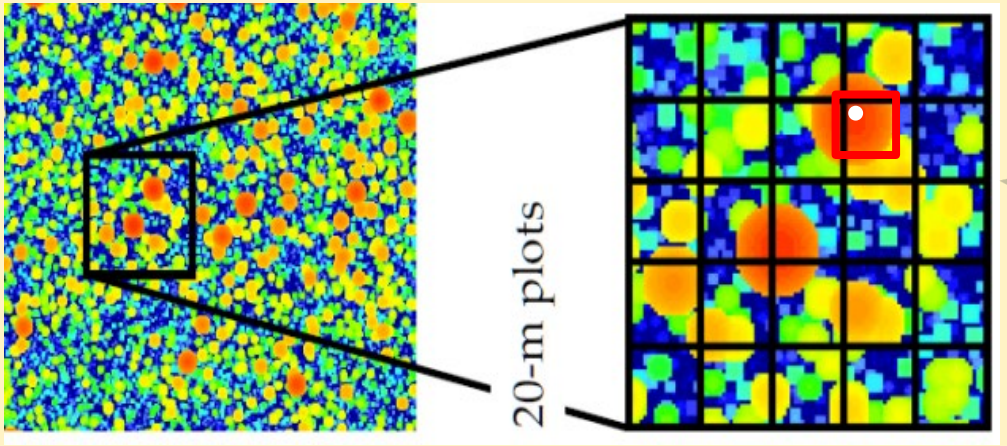
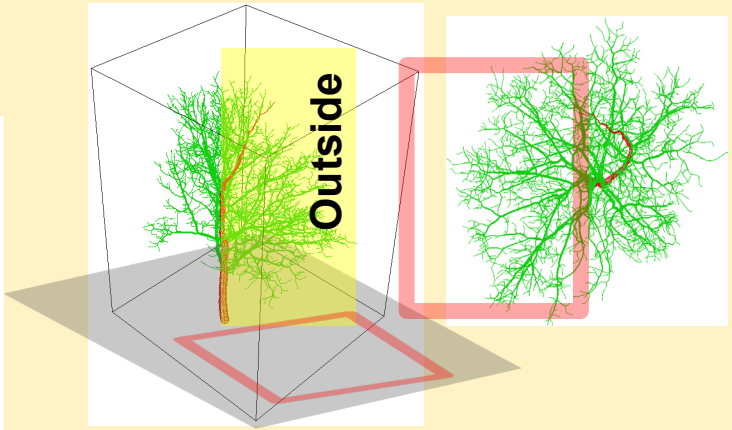
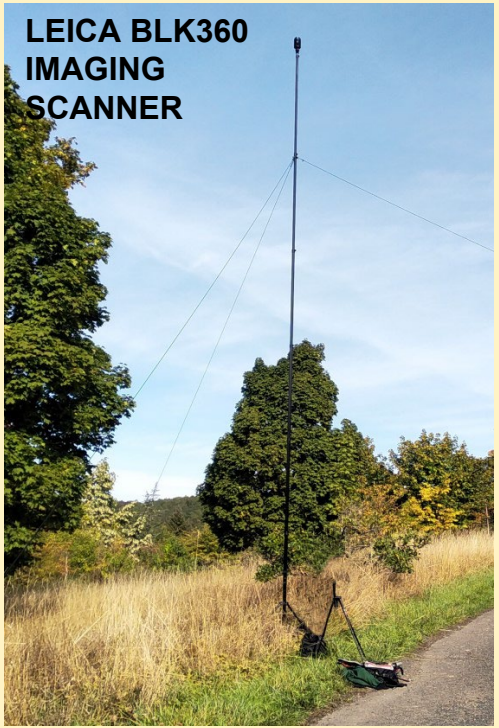




Our current project

- HBD in large forest dataset; combining data from different laser tools



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Tack så mycket!

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Table 1. Sample trees

Tree Species	Family	n
Acer platanoides	Sapindaceae	4
Betula verrucosa	Betulaceae	4
Carpinus betulus	Betulaceae	3
Fagus sylvatica	Fagaceae	6
Fraxinus excelsior	Oleaceae	3
Platanus species	Platanaceae	3
Quercus robur	Fagaceae	4
Tilia cordata	Malvaceae	6