

# A comparison of spatialisation methods for the aggregation of LiDAR forest estimates at the compartment level

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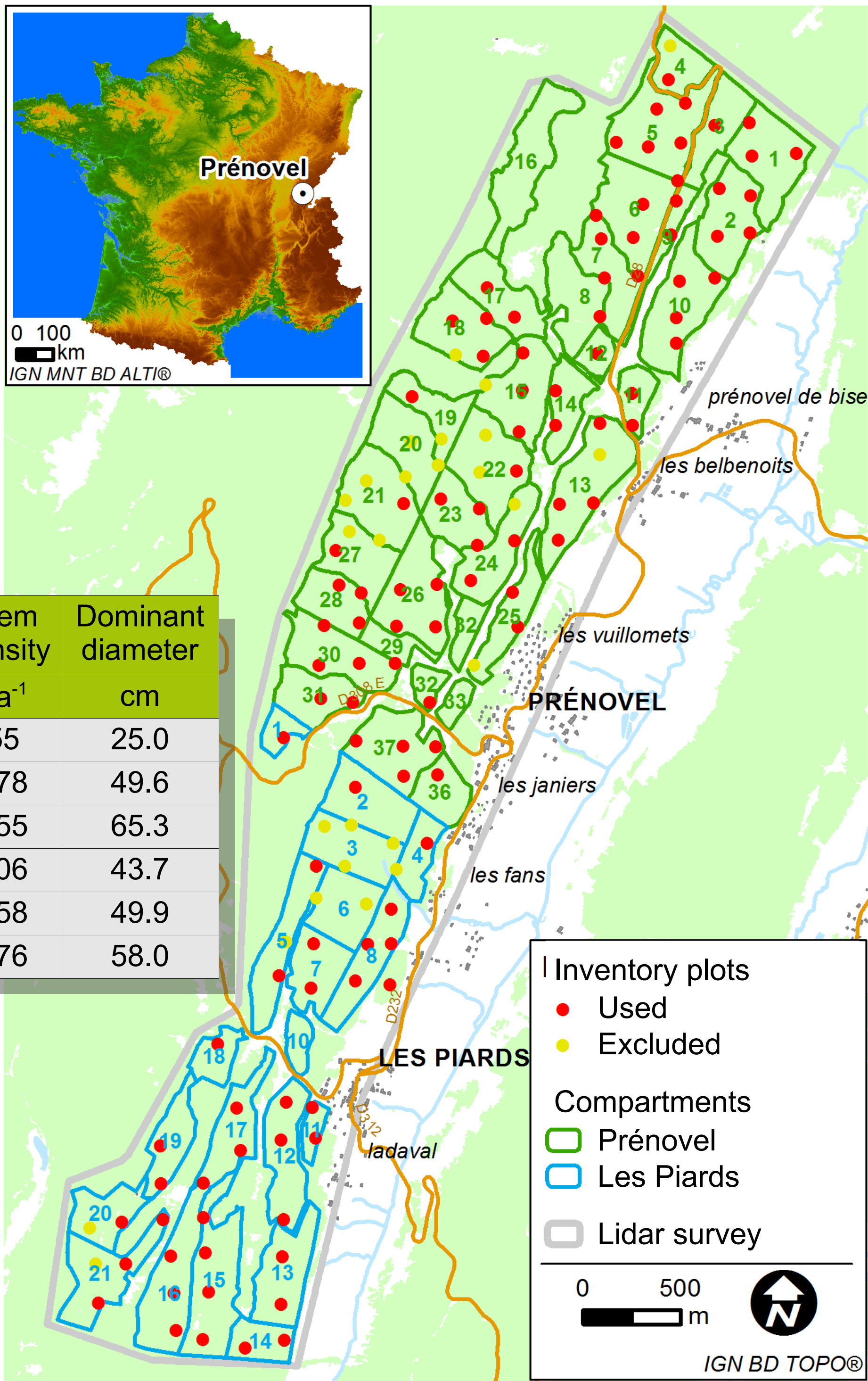
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Regarding the area-based approach, the modelling step has been widely investigated, whereas there is little documentation on the mapping step. Different options for cell size and border exclusion are investigated based on a full-census dataset.

## Material

The study area is located in the Jura mountains. The forest is uneven-aged, dominated by fir, spruce and beech.



Location of forest plots and compartments

- 139 nested plots of 17 m radius
- 35 compartments with full census (380 ha)

## Results

- Case with 17 m disks, 20 m spacing and 10 m buffer.

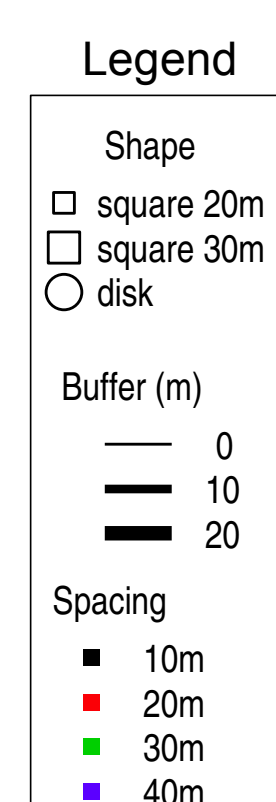
Comparison of plot-level and compartment-level accuracy

		Basal area m <sup>2</sup> .ha <sup>-1</sup>	Stem density ha <sup>-1</sup>	Dominant diameter cm
Plot level	R <sup>2</sup>	0.76	0.57	0.88
	rmse	4.5	75.0	3.3
Compart- ment level	SRE	R <sup>2</sup>	0.85	0.76
		Bias	-0.4	-7.4
		RMSE	1.9	19.8
	GREG	R <sup>2</sup>	0.66	0.46
		Bias	0.0	-0.9
		RMSE	3.8	47.0

> Scatter plot of field measures vs LiDAR aggregation for the 35 compartments

- Influence of mapping parameters

> RMSE vs bias at the compartment level, depending on the mapping parameters

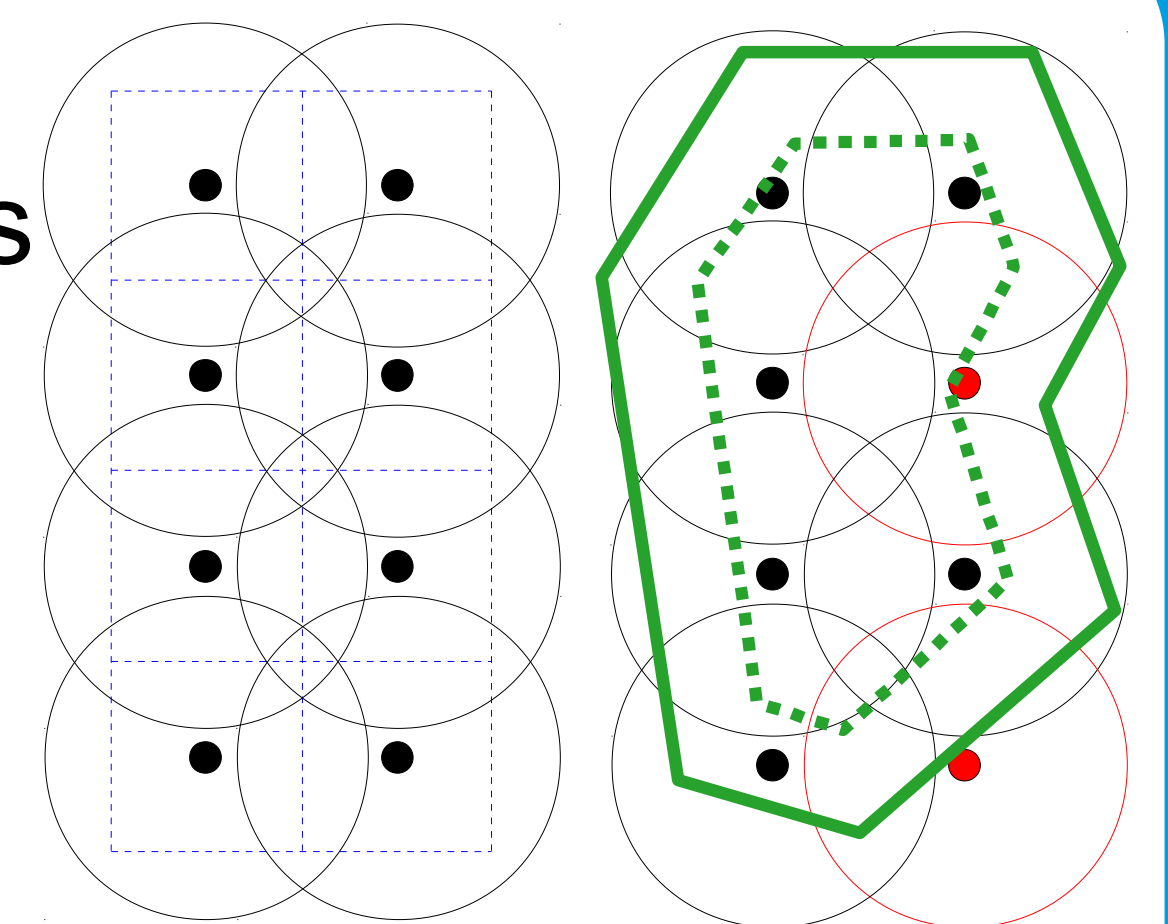


## Methods

- Calibration of prediction models for basal area, stem density and dominant diameter with the area-based method.
- Mapping with different spatial supports (surface / shape / spacing)
- Aggregation into compartments with border exclusion
- Validation at compartment level

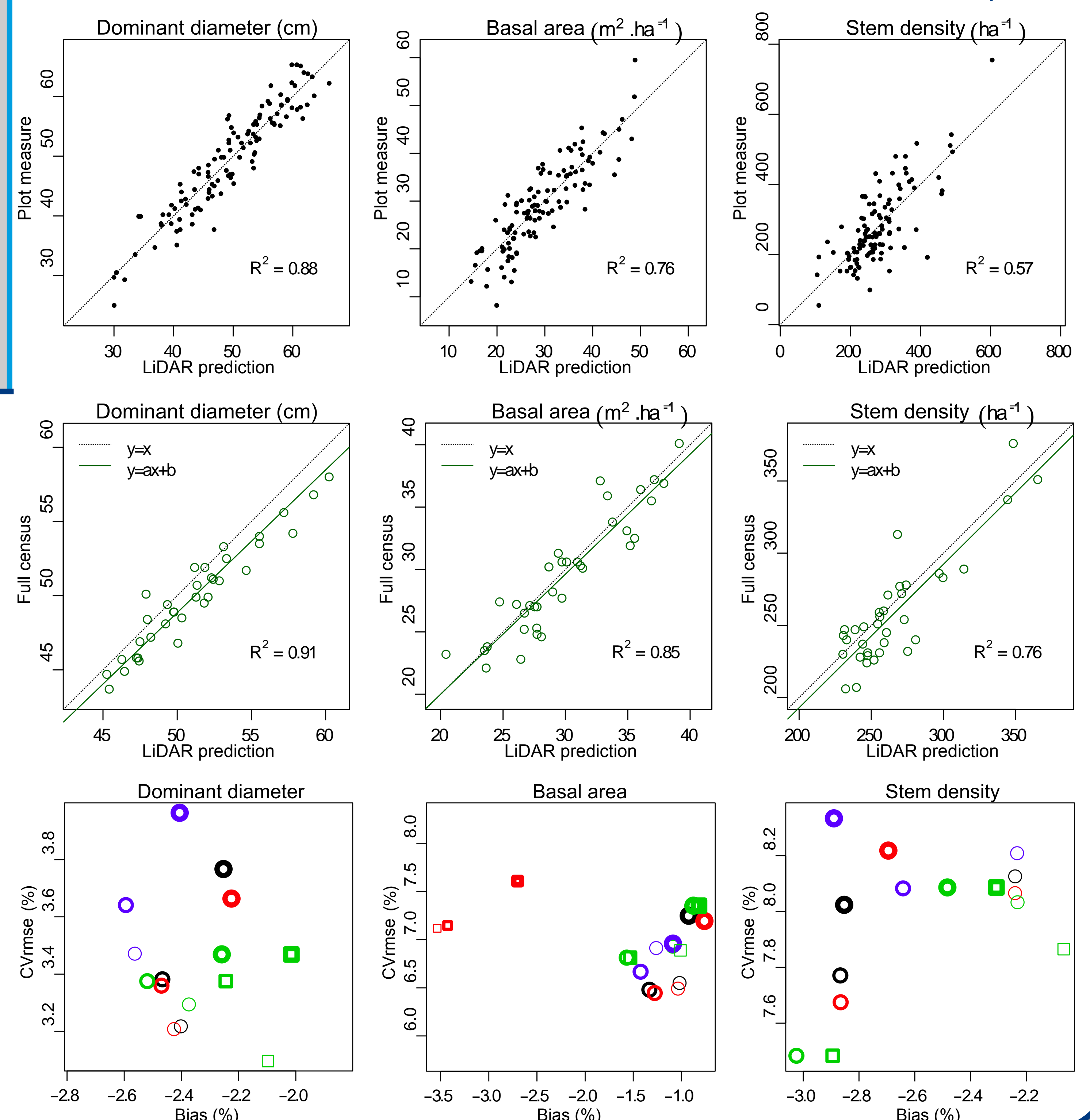
- SRE:  $\hat{Y}_{S,j} = \frac{1}{\text{card}(V_j)} \sum_{i \in V_j} \hat{y}_i$
- GREG:  $\hat{Y}_{G,j} = \hat{Y}_{S,j} + \frac{1}{n_k} \sum_{k \in V_j} (y_k - \hat{y}_k)$

Breidenbach & Astrup 2012. doi 10.1007/s10342-012-0596-7



Left: mapping when disks are used for computation and pixels for storage. Right: border exclusion threshold

Scatter plot of field measures vs LiDAR predictions for 113 field plots.



From the plot to compartment level, prediction error decreases from 15 to 6.4% for basal area, 26 to 7.7% for stem density and 6.5 to 3.4% for dominant diameter. The major criterion for mapping is to respect the calibration plot size, whereas for aggregation the issue of compartment borders depends on the forest parameter.