



# Challenges and opportunities for ground observations

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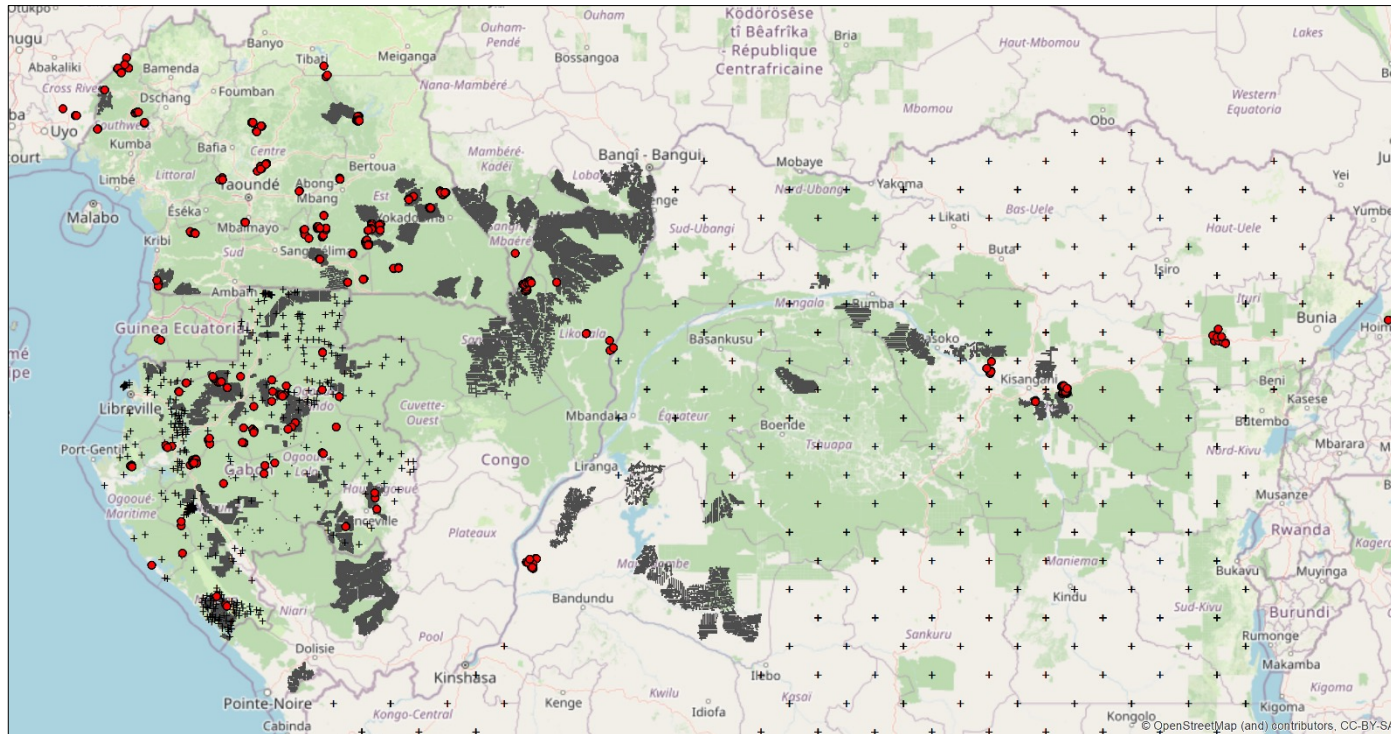




# 1/ Untapped ground data

... and Caveat on map validation

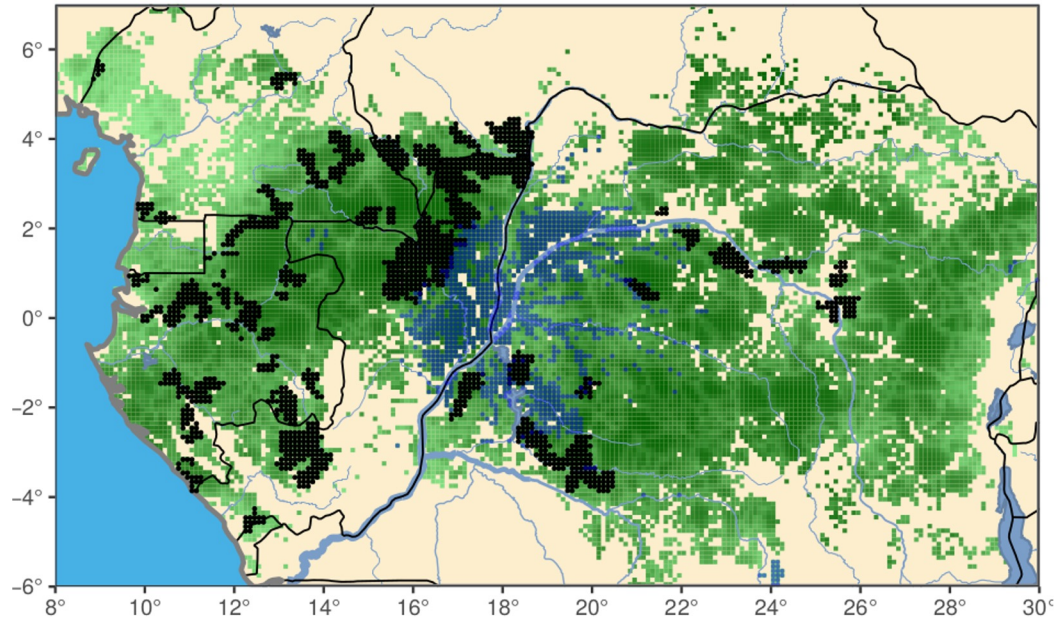
# Forest inventories in central Africa : several data types with their own merits & limits



- Scientific plot networks { Afritrion (c. 260 plots)  
**IRD-ENS (c. 200 plots)**  
... }
- + National forest inventories (DRC, Gabon...)
- ▨ Management forest inventories

- Scientific plot networks : high quality data | Urgent need for support & expansion
- Despite lower quality (taxonomic identification, geositionnal accuracy) other data types are useful too

# The Congo basin FORest (COFOR) forest management inventory database



*Estimated time for a single (wo)man to collect COFOR data in the field : 1000 years.*

## A tremendous undertaking led by the late S. Gourlet-Fleury

- ... > 15 years of collaboration with forest companies
- ... Development of cleaning & assembling procedures



## A unique database

- ... > 185,000 plots (ca. 90,000 ha)
- ... > 12 M trees measured and identified

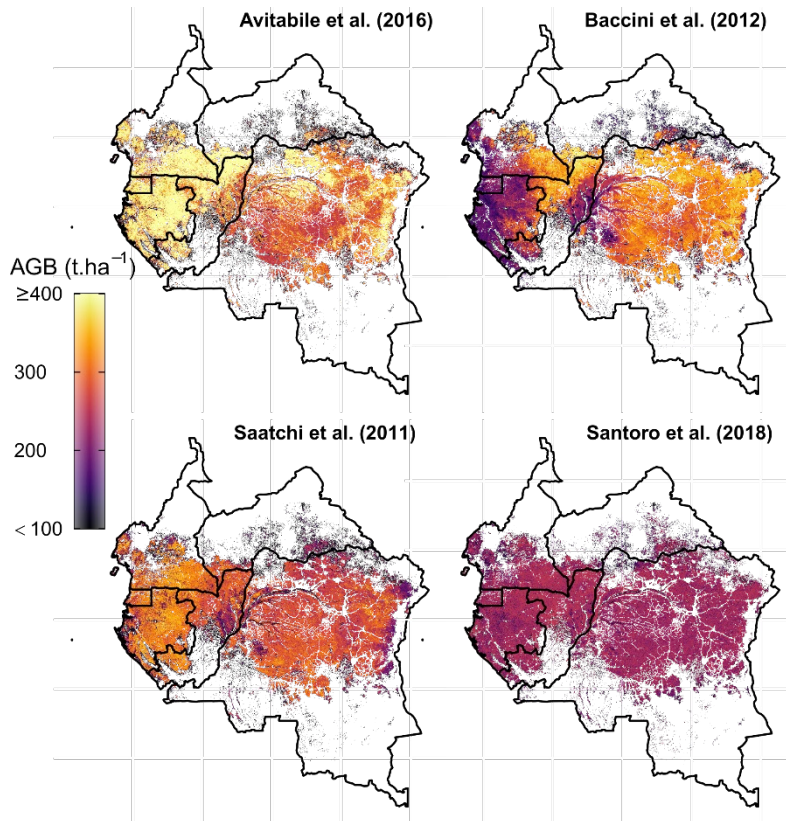


➡ **Unprecedented spatial representativity !**



# Existing AGB maps over-estimate validation statistics

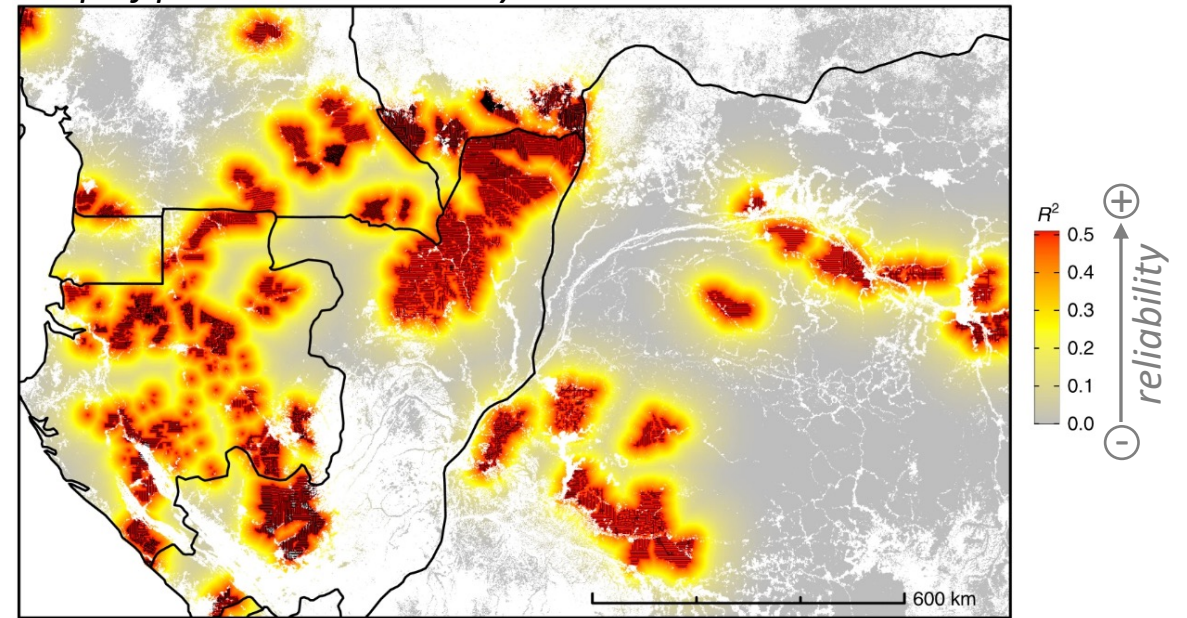
## Broad-scale biomass maps



## Similar mapping methodology based on COFOR data

P. Ploton et al., 2020, Nat. Com.

### Map of predictions reliability



=> Need to penalize spatial correlation in validation sets!



2/ Using LiDAR for improving  
'ground data'



# Potential super-sites in Central Africa

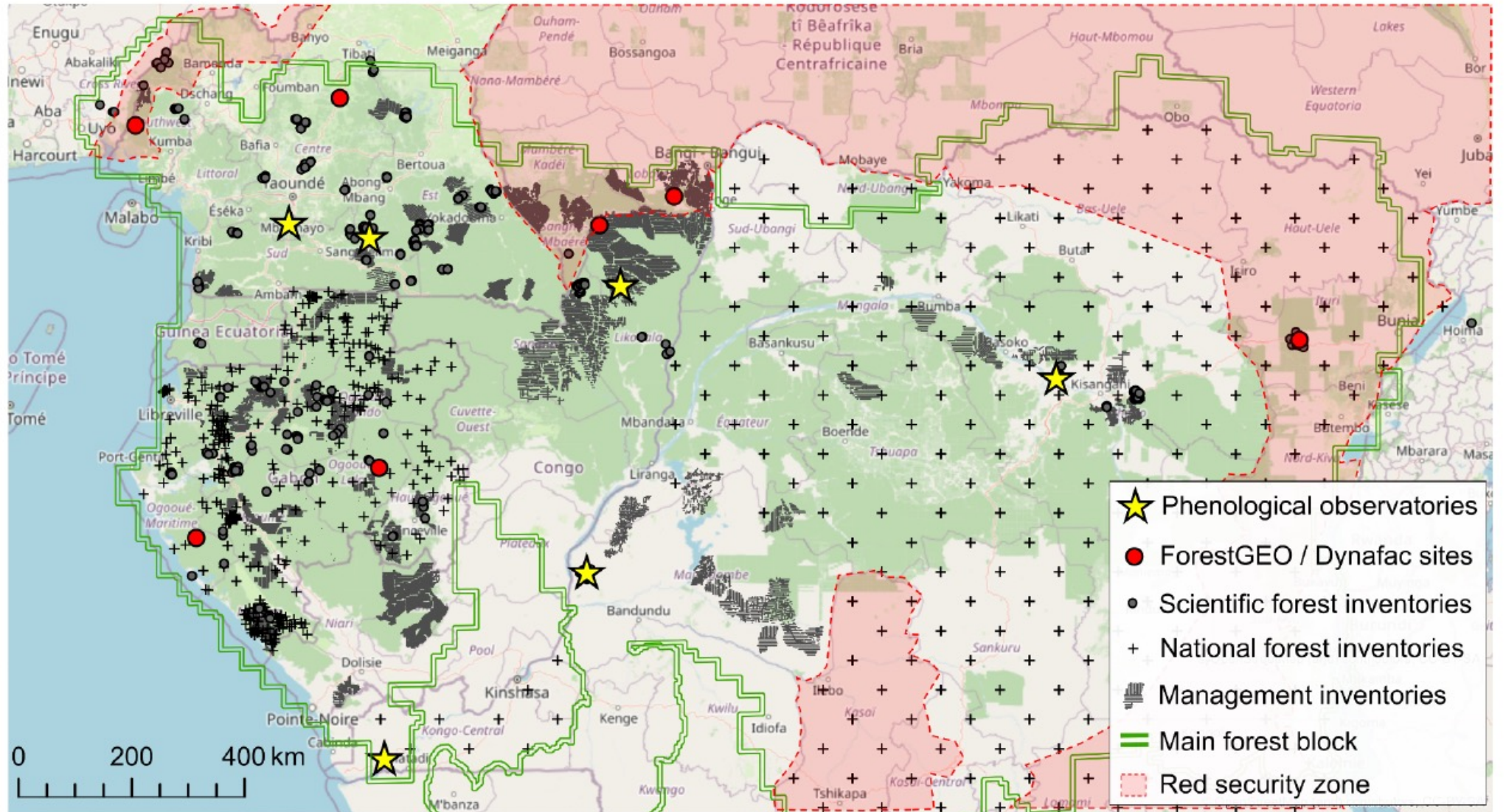
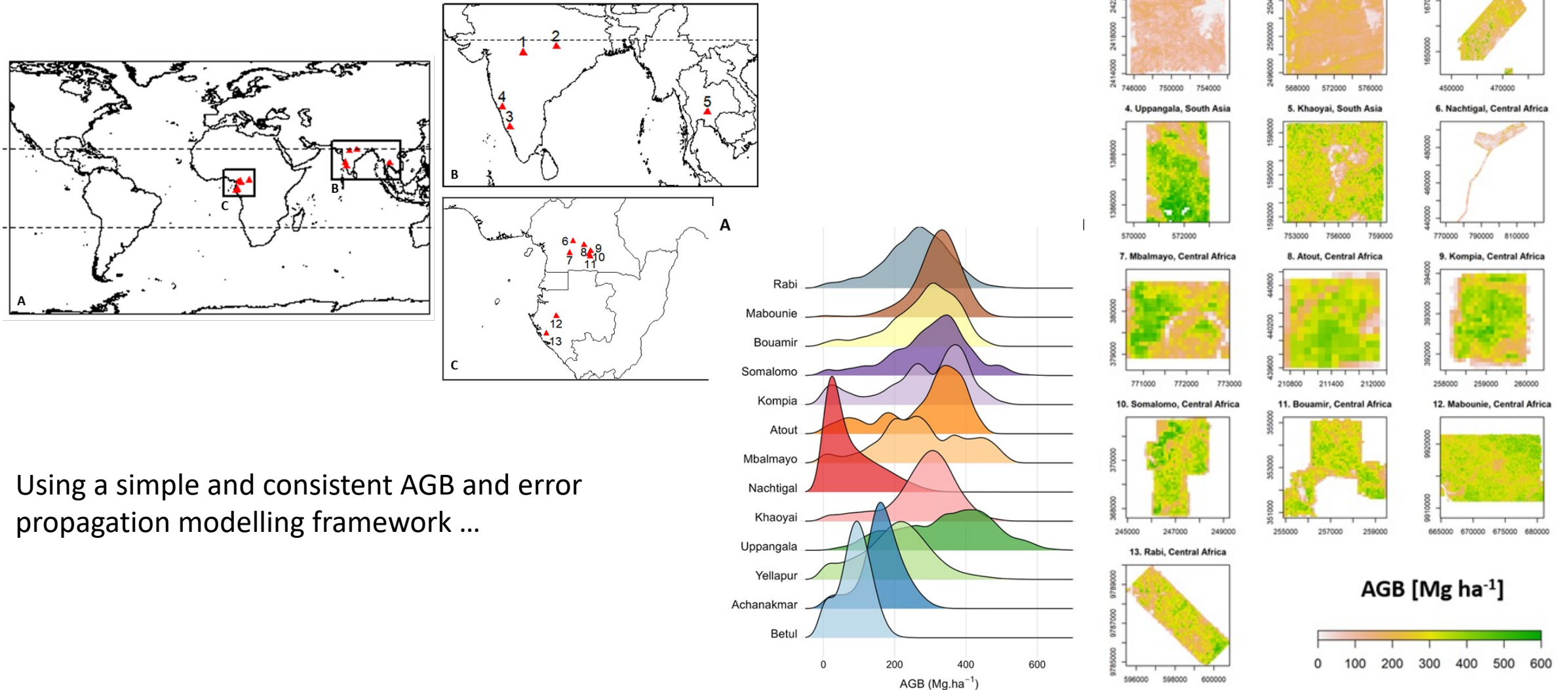


Figure 2. Location of targeted phenological observatories and complementary field datasets accessible for the project across the Congo Basin Forests (CBF).



# LiDAR-based reference aboveground biomass maps for tropical forests of South Asia and Central Africa

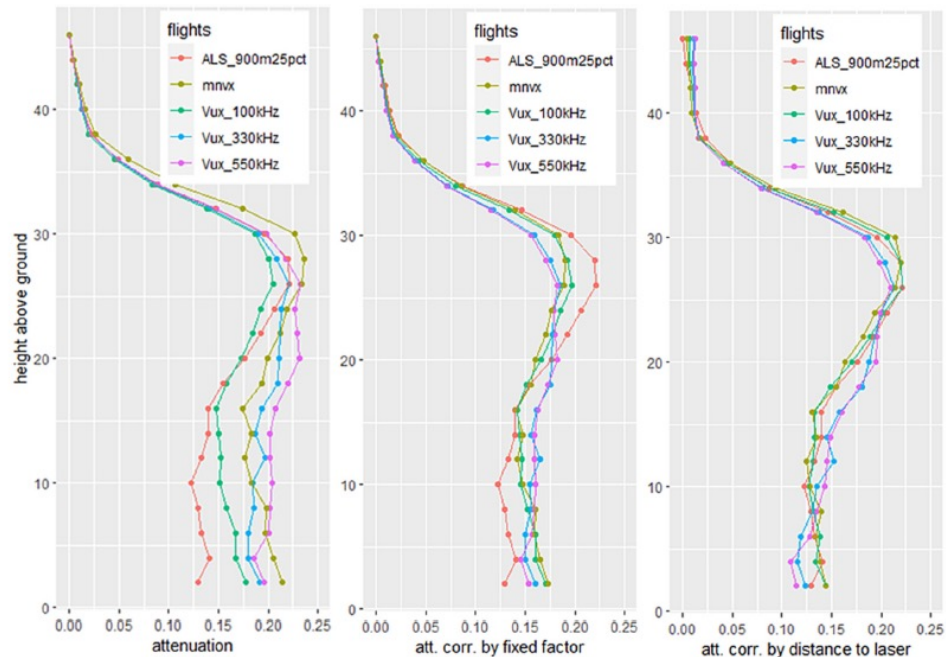
Suraj Reddy Rodda et al., Submitted to Scientific Data



Using a simple and consistent AGB and error propagation modelling framework ...

# Going beyond the CHM...

- As more complete descriptions or other variables are targeted, **intercal will become crucial...**



- Extinction depends on target detectability
  - influenced by laser characteristics (power, sensitivity, wavelength).
- 3 ALS were flown over Paracou (FG).
  - Different sensors, flight heights and transmitted power levels were compared.
- Light attenuation was retrieved with AMAPVox
  - => Marked differences (up-to 25% difference in profile-averaged light attenuation rate and 50% difference at particular heights) that could only be explained by differences in scanner characteristics.
  - => Bias can generally be mitigated by a sensor intercalibration



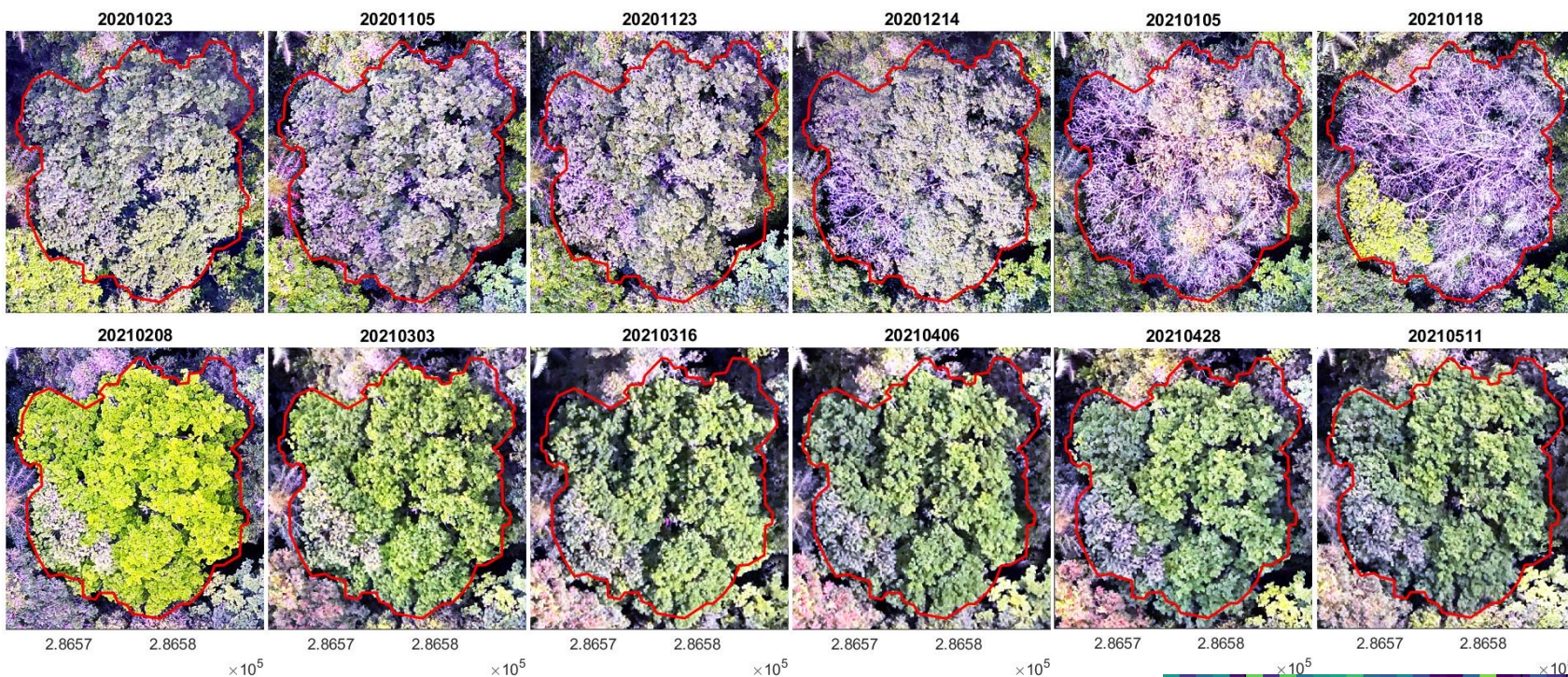
Contents lists available at ScienceDirect

Remote Sensing of Environment

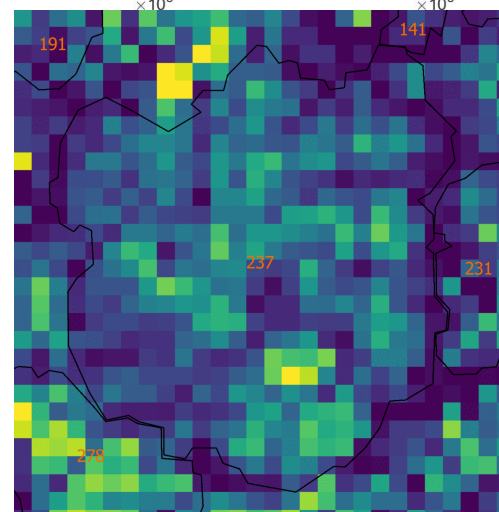
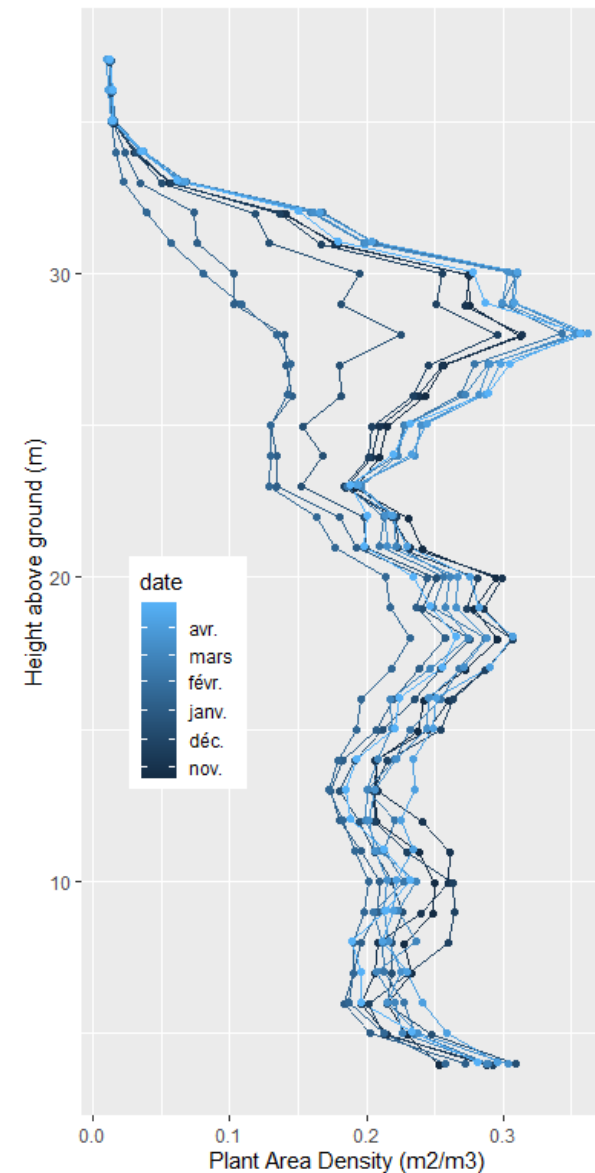
journal homepage: [www.elsevier.com/locate/rse](http://www.elsevier.com/locate/rse)



# PHENOBS: UAV-based phenological observatory in French Guiana



Paracou, *Parkia nitida*, MiniVux\_corrected



PAD in 3 top meters

- Tree- and landscape-level phenology (and LAI) monitoring
- => Towards assessing photosynthetic capacity and productivity



## Evaluation of automated pipelines for tree and plot metric estimation from TLS data in tropical forest areas

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Bonaventure Sonké<sup>2</sup>, Nicolas Barbier<sup>1</sup>, Pierre Couteron<sup>1</sup> and Raphaël Pélissier<sup>1</sup>

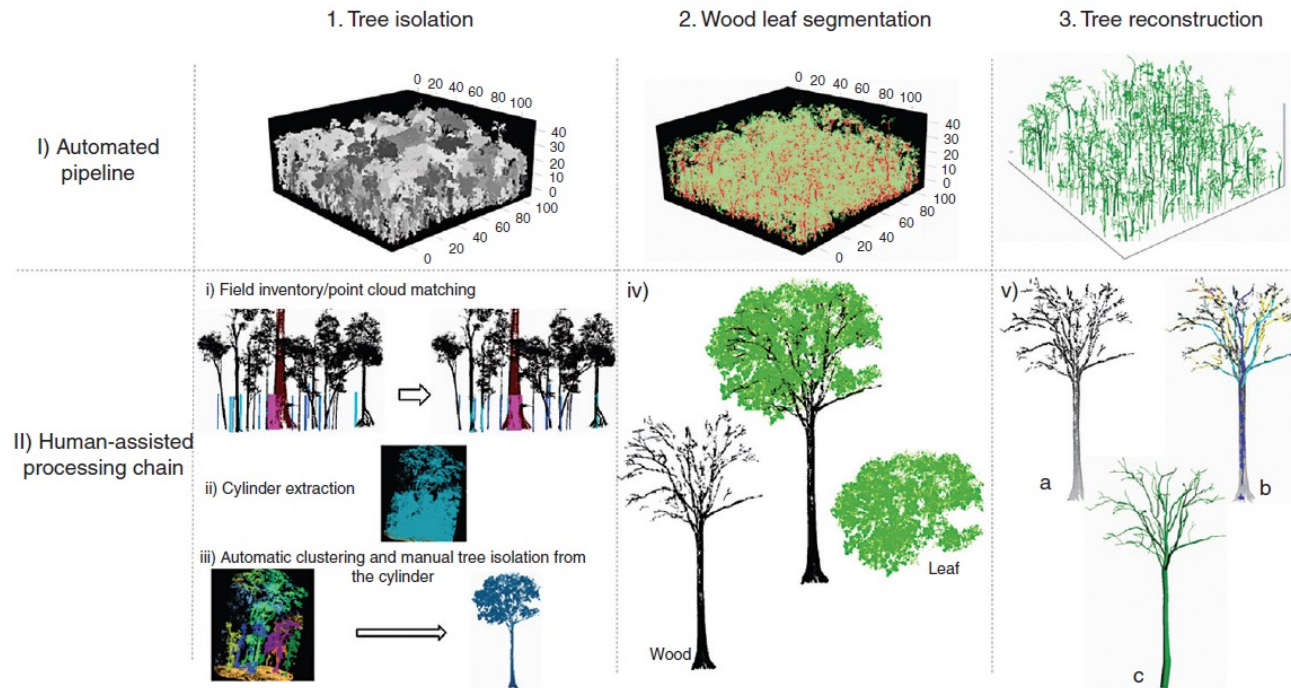


FIG. 2. Summary scheme representing the automated and human-assisted processing pipelines. The three columns represent the main steps of the pipelines: (1) tree isolation; (2) wood/leaf segmentation; and (3) tree reconstruction. The two rows represent (I) an automated pipeline and (II) the fully human-assisted pipeline. The tree isolation step in the human-assisted processing chain (II-1) is split into three steps (i, ii and iii).

- In complex tropical forests, fully automated pipelines may provide relatively unreliable metrics
- Human assistance with automated pipelines can help reduce error QSM volume.
- Tree scale: isolating trees using human assistance reduced the error by a factor 10.
- 1-ha plot scale: locating trees with human assistance reduced the error by a factor 3.



# ForestScan: new technology for characterising forest structure and biomass at 'Super Sites' for EO cal/val across the tropics

Planning meeting 2019-10-08





# AIMS & OUTCOMES

- Demonstration of the use of TLS and UAV-LS to provide integrated AGB assessment in tropical environment
- Quantifying and assessing the performance of TLS and UAV-LS to derive AGB + H at EO-scales (500 m)
  - compared to traditional ground-based mensuration estimates + ALS (H)
- Propose a framework for combining census, TLS, UAV-LS to provide AGB + H
- Summarise pros/cons of TLS, UAV-LS to improve / extend EO cal/val + protocol for optimal acquisition and use
- Sites: Paracou, FG; Lopé, Gabon; Sepilok, Malaysia

Data paper in preparation...



