



First mission – towards a global harmonised in-situ data repository for forest biomass datasets validation

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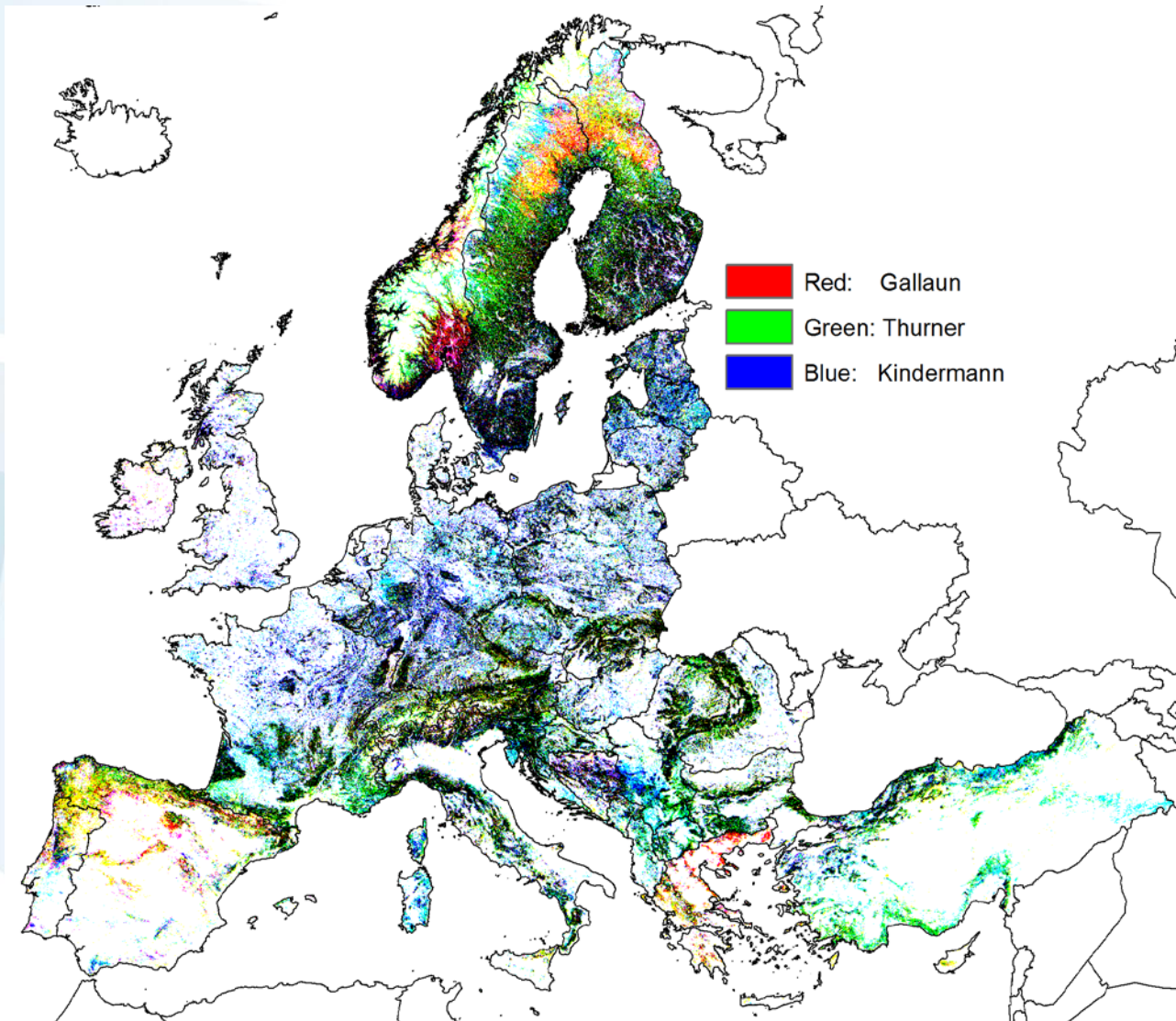
Maxime Réjou-Méchain (AMAP);

Klaus Scipal (ESA)

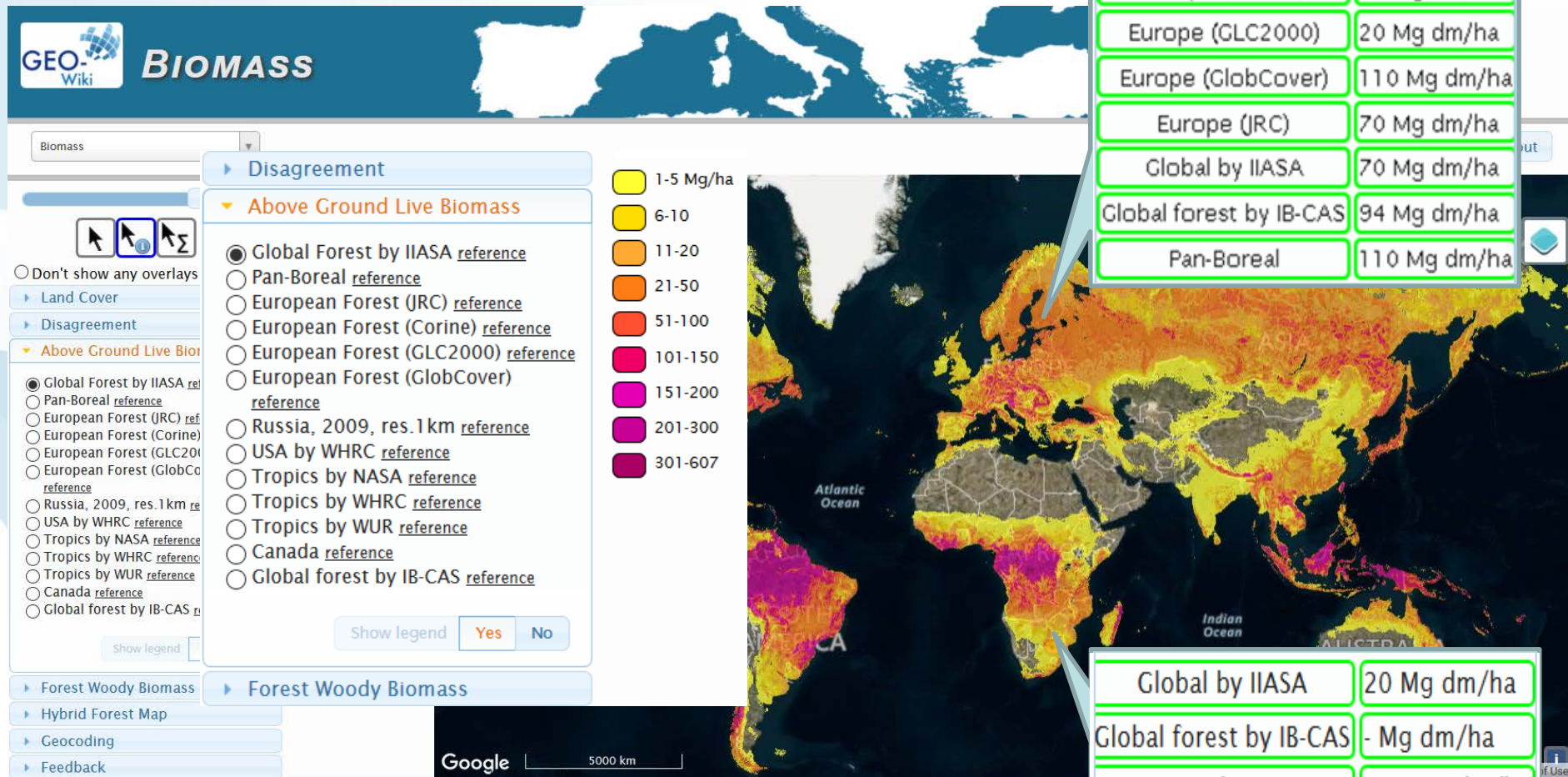


Comparison of three biomass maps for Europe:

White color – all map agree on low biomass,
black – all agree on high biomass



Biomass.Geo-Wiki.org



3 Spaceborne Missions to measure forest structure



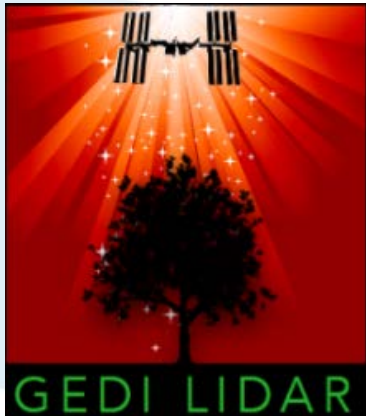
Question:

1. Are we able to make best use of these missions?
2. Will users trust remote sensing products?

These missions will deliver measurements of

- forest height
- forest biomass
- biomass change

The 1st Mission? Global Reference Data



BIOMASS

The good news: We don't need to start from scratch



RAINFOR (Red Amazonica de Inventarios Forestales)
500 biomass & dynamics plots

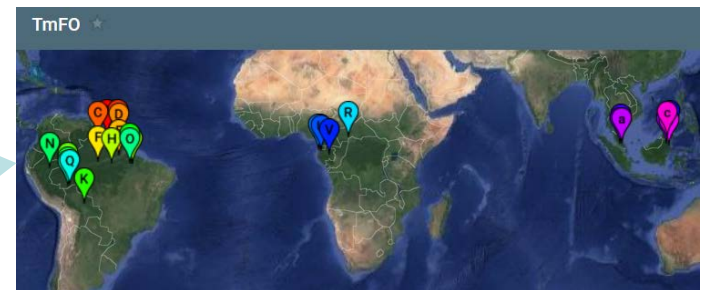


AfriTRON (African Tropical Forest Observation Network)
> 250 biomass plots



CTFS-ForestGEO
61 large dynamic plots,
ca. 30 tropical

TmFO (Tropical managed Forest Observatory)
ca. 490 biomass plots



These networks have a long history and experience building on a network of cooperating partners and mutual trust



IIASA network: Forest Observatories Partnership



The Background of FOS

(Forest-Observation-System.net)

- Forest-Observation-System.net (FOS) is a “Cyberinfrastructure” to collect and disseminate ground data.
- FOS aims at building an interface between well established, existing ecological networks and the EO community.
- FOS focus is on high quality datasets that are fit for the EO purpose (e.g. geocoded data, plots with a history, etc.) based on traceable and documented requirements.
- FOS collects, but does not distribute tree level data. FOS only distributes aggregated plot level data
- FOS data is available free & open in a unified format.

FOS schedule

Phase 1 (2016-2017) – Demonstration

- Set up the infrastructure & web portal
- Establish a collaboration with RAINFOR, AfriTRON and CTFS-ForestGEO
- Run the web portal in a Demo mode including first data

Phase 2 (2018 - 2021) – Implementation

- Identify and establish collaboration with other networks (TmFO, AusCover and others).
- Interface upgrade (search, download, etc.)
- Expand to host airborne LiDAR-based biomass maps
- Journal articles – contributor recognition and acknowledgement

FOS: <http://forest-observation-system.net>

The screenshot shows the Forest Observation System (FOS) website interface. At the top, there is a navigation bar with the FOS logo and the text "FOREST OBSERVATION SYSTEM". To the right of the logo are menu items: "MAP", "ABOUT", "RESOURCES", and "CONTACTS". Below the navigation bar is a world map with red dots indicating the locations of forest observation plots. The map is labeled with various countries and oceans. To the right of the map is a "PLOT INFORMATION" panel for plot "RK-10 (1)". The panel contains the following information:

- PLOT INFORMATION**
- RK-10 (1)**
- Russia
- Network: IIASA, IF Link
- PIs: V.V. Ivanov, L. V. Mukhortova, E. F. Vedrova
- Established: 2007
- Plot area: 0.25 ha
- Census: 2007
- Measurements:
 - AGB Local HD : 73.93 t/ha
 - H Lorey Local: 10.30 m
 - Min DBH : 5 cm
 - Wood Density : 0.50 t/m³
- Taxonomic Identifications:
 - Pinus sylvestris: 96 % (2736)
 - Larix gmelinii: 2 % (86)
 - Pinus sibirica: 2 % (85)

Below the map, there is a "Biomass maps legend" with two color-coded boxes: a yellow box for "1 - 20 Mg dm / ha" and a red box for "21 - 50". To the right of the legend is a "Resources" section with the text "Tropics by WUR reference". At the bottom right of the page, there is a large button labeled "DOWNLOAD DATA".

Biomass maps legend:

- 1 - 20 Mg dm / ha
- 21 - 50

Resources:

Tropics by WUR reference

[DOWNLOAD DATA](#)

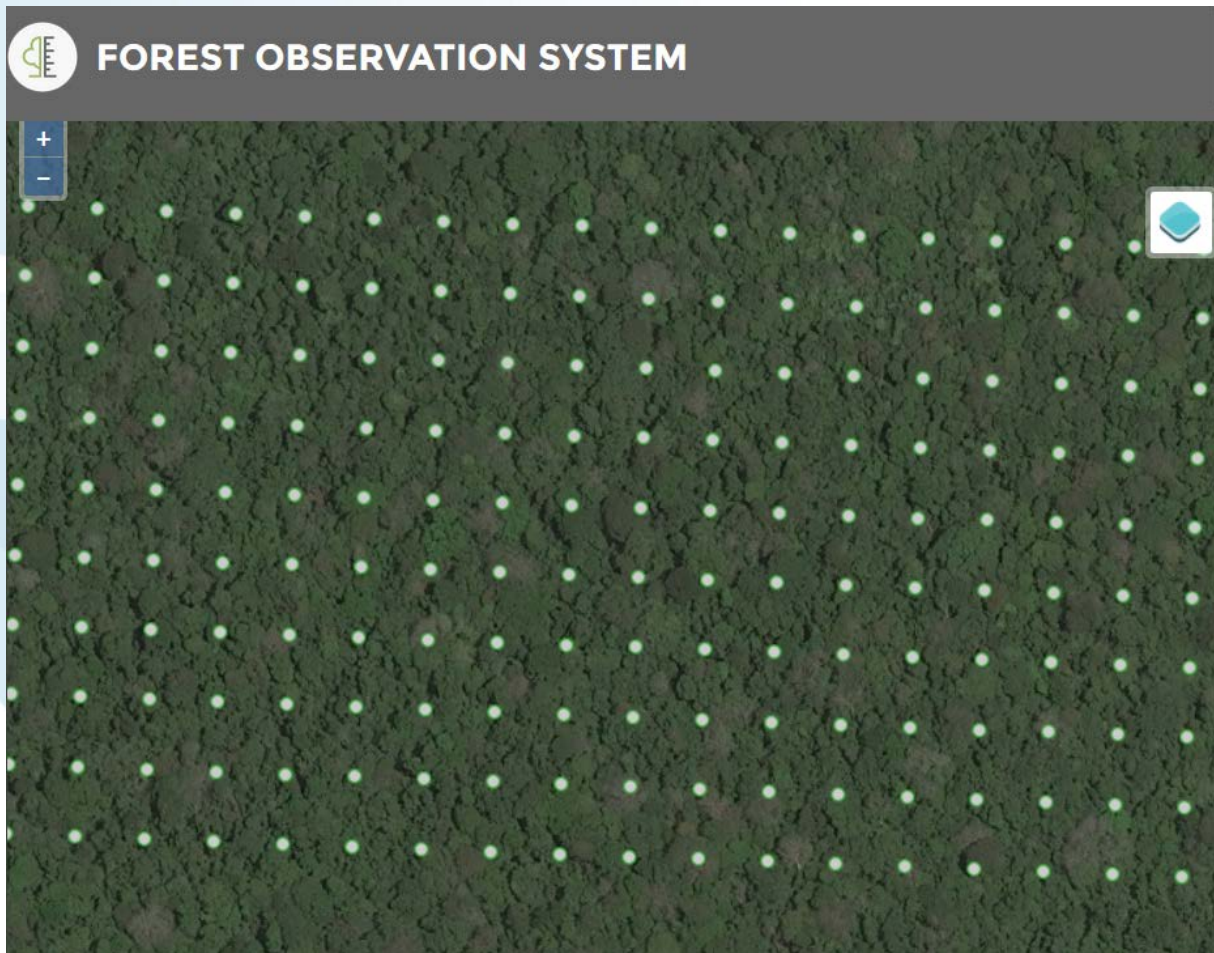
FOS *in situ* data

- What are we looking for:
 - Data from permanent plots with the min size of 0.25 ha (preferably 1 ha or large)
 - Every tree (over 10 cm dbh) got species identification and DBH is measured
- Output data at plot level:
 - General characteristics (relief, forest type, disturbances, tree species)
 - Canopy height (top, Lorey's)
 - Above ground live biomass (estimated by allometric model $AGB=f(\rho,D,H)$)

Distribution of sample plots by participation networks

Network	Number of plots	Number of sub-plots	Area, ha
AfriTRON	46	178	45
AusCover	4	4	3
CTFS-ForestGEO	2	300	75
IIASA	126	258	78
RAINFOR	52	288	72
T-Forces	3	12	3
TmFO	17	500	125
unaffiliated	24	105	27
Total	274	1645	428

Smithsonian STFS-ForestGEO site in Panama divided by 0.25 ha plots



H max: 35–56 m

H mean: 22–35 m

AGB: 119–415 t/ha



ArfiSAR field complain 2016, Gabon

 FOREST OBSERVATION SYSTEM



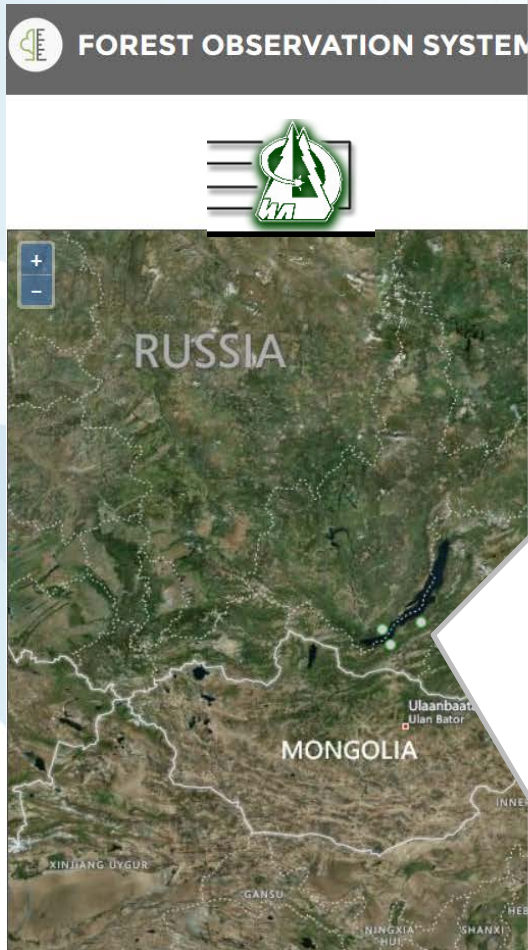
PlotCode: LNL-07
CountryName: Gabon
Altitude: 306 m
Slope: 7 deg
PlotArea: 1.02 ha
Network: AfriTRON **Link:**
<http://forestplots.net>
PI: Simon Lewis, Nicolas Lab
ForestStatus: Secondary forest
maturing (>50yr)
YearEstablished: 2016
YearLastCensus: 2016
H Average: 19 m; **H Max:** 45 m
AGB Local HD: 332.1 t/ha
AGB Feldpausch: 343.2 t/ha
AGB Chave: 331.6 t/ha



Taxonomic Identification

187 (65 %) - *Aucoumea klaineana*
78 (12 %) - *Sacoglottis gabonensis*
53 (7 %) - *Lophira alata*
22 (2 %) - *Dialium lopense*
25 (2 %) - *Barteria fistulosa*

Post-fire forest dynamics and coarse woody debris decomposition investigation

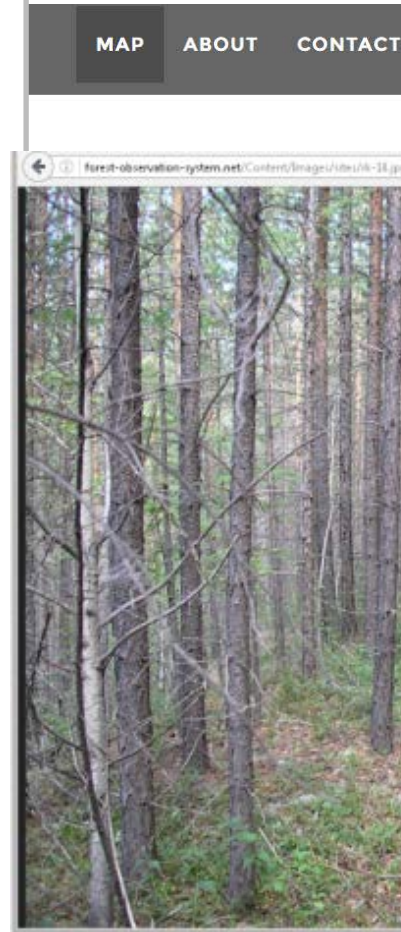


PlotCode: RK-10 (1)
CountryName: Russia
PlotArea: 0.25 ha
Network: IIASA/IF
Link:

<http://forest.akadem.ru/PerSyst/>
PI: V.V. Ivanov, E. F. Vedrova, L. V. Mukhortova
Year: 2007
Image: [RK 10](#)

H Average: 10.3 m
AGB Local HD: 73.93 t/ha
Wood Density: 0.495 t/m³

Taxonomic Identification
2736 (96 %) - *Pinus sylvestris*
85 (2 %) - *Pinus sibirica*
86 (2 %) - *Larix gmelinii*

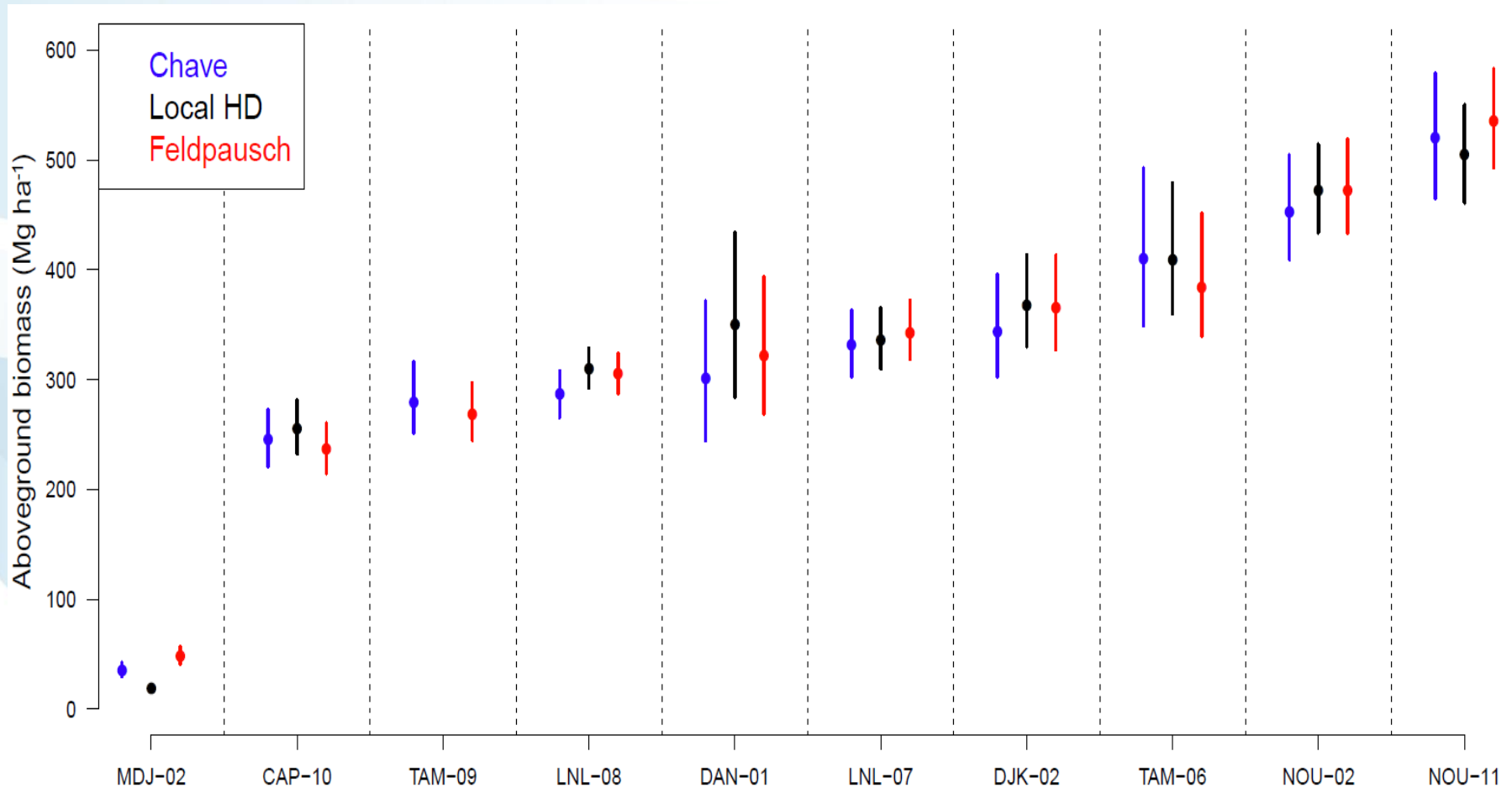


Three 0.25 ha plots in the Caucasus Fir-Beech forest

H mean = 22-29m
H max = 48-57m
AGB = 500-700 t/ha



From individual tree measurements to plot-level biomass



Airborne Lidar-based biomass maps

https://forest-observation-system.net



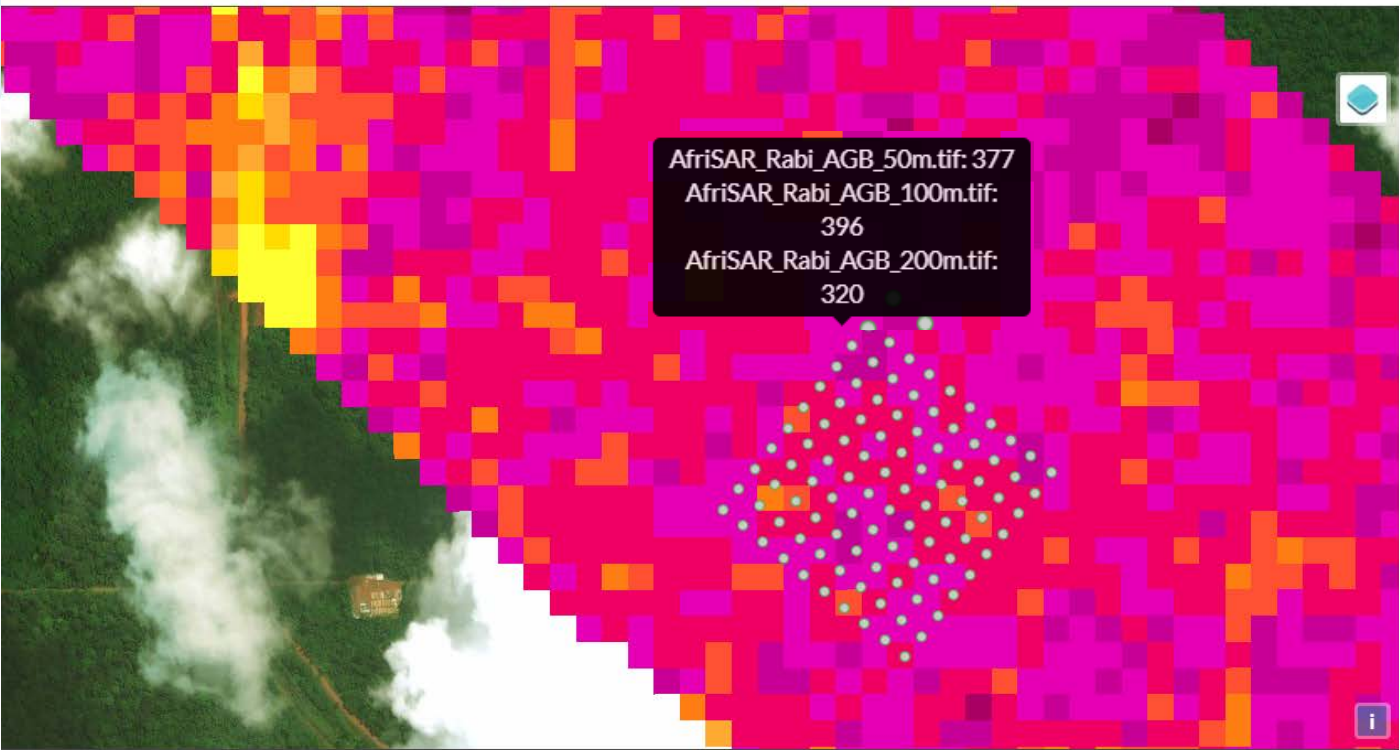
FOREST OBSERVATION SYSTEM

MAP

ABOUT

RESOURCES

CONTACTS



PLOT INFORMATION

RABI (8_8)

Gabon

Network: CTFS-ForestGEO [Link](#)

PIs: Dr. Alfonso Alonso, Dr. Lisa Korte, Mr. Hervé Memiaghe

Established: 2009

Plot area: 0.25 ha

Census: 2011

Measurements:

AGB Chave : 322.80 t/ha ⓘ

AGB Feldpausch : 355.20 t/ha ⓘ

H Lorey Feldpausch: 34.80 m

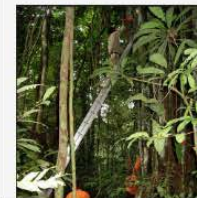
H Lorey Chave: 32.00 m

H Max Feldpausch: 46.60 m

H Max Chave: 46.10 m

Min DBH: 1 cm

Wood Density : 0.68 t/m³



Biomass maps legend:

- 1 - 20 Mg dm / ha
- 21 - 50
- 51 - 100
- 101 - 500

Resources:

Tropics by WUR [reference](#)

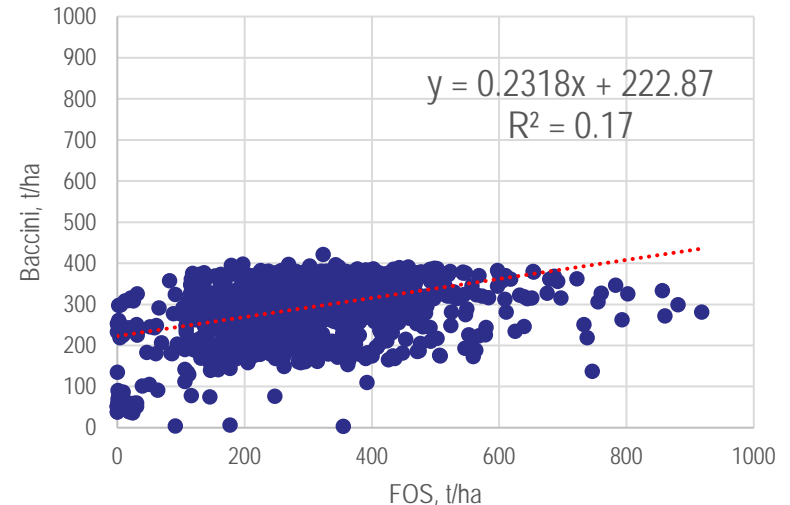
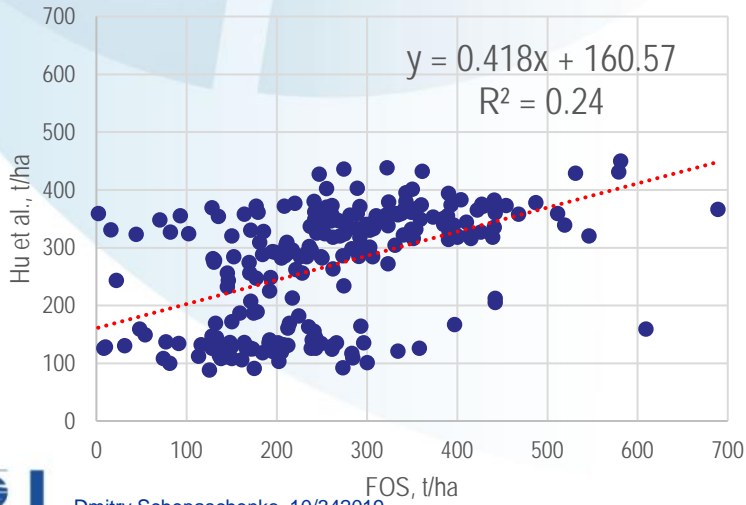
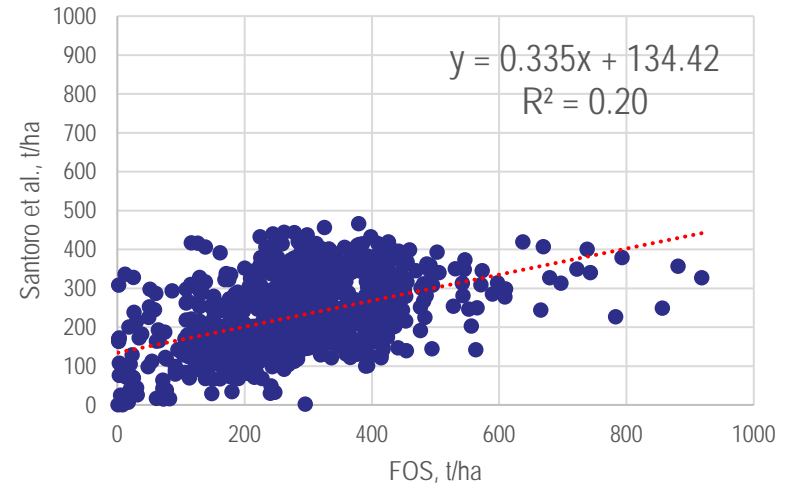
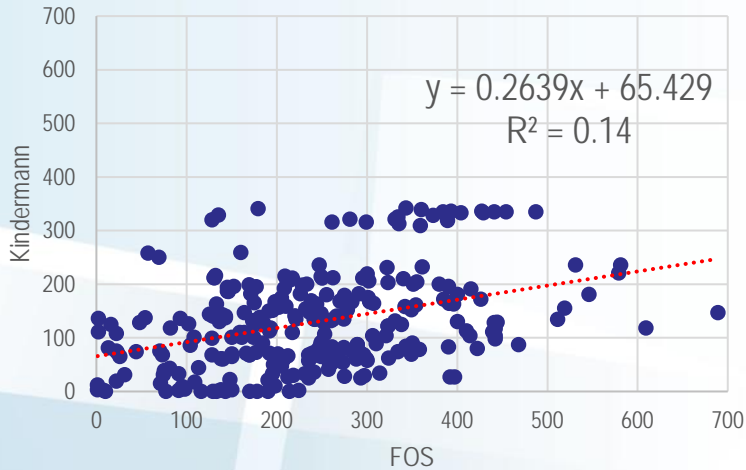
Pan Boreal [reference](#)

IIASA hybrid biomass [reference](#)

DOWNLOAD DATA

Only logged in users are allowed to download.

Comparison FOS plot data with global maps (Kindermann et al., 2008; Santoro et al., 2018; Hu et al., 2016; GFW, 2018)



Thank you for your attention

Forest-Observation-System.net

