International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

Forest-Observation-System.net – a global in-situ forest biomass data repository

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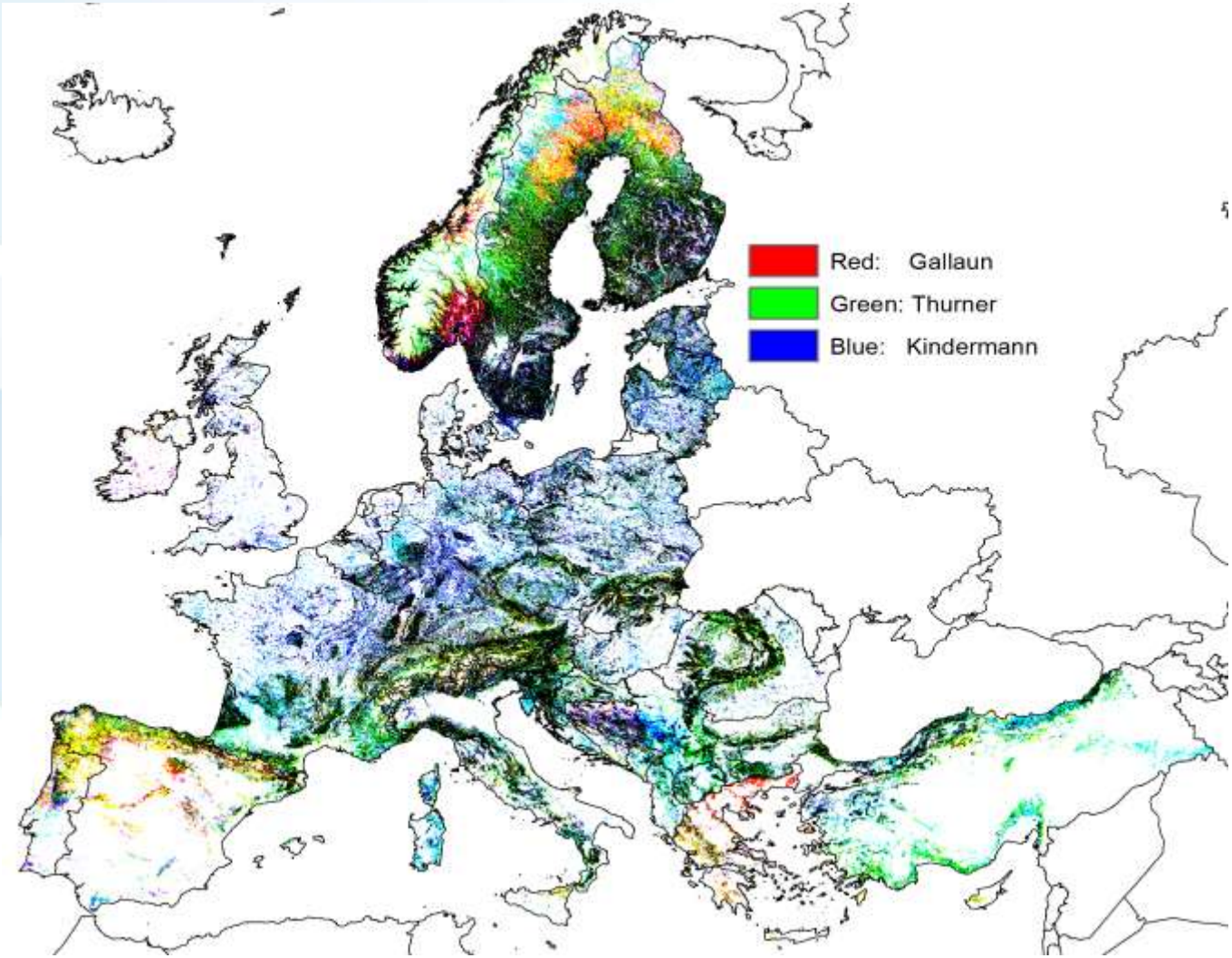
Spatial Focus

UNIVERSITY OF LEEDS

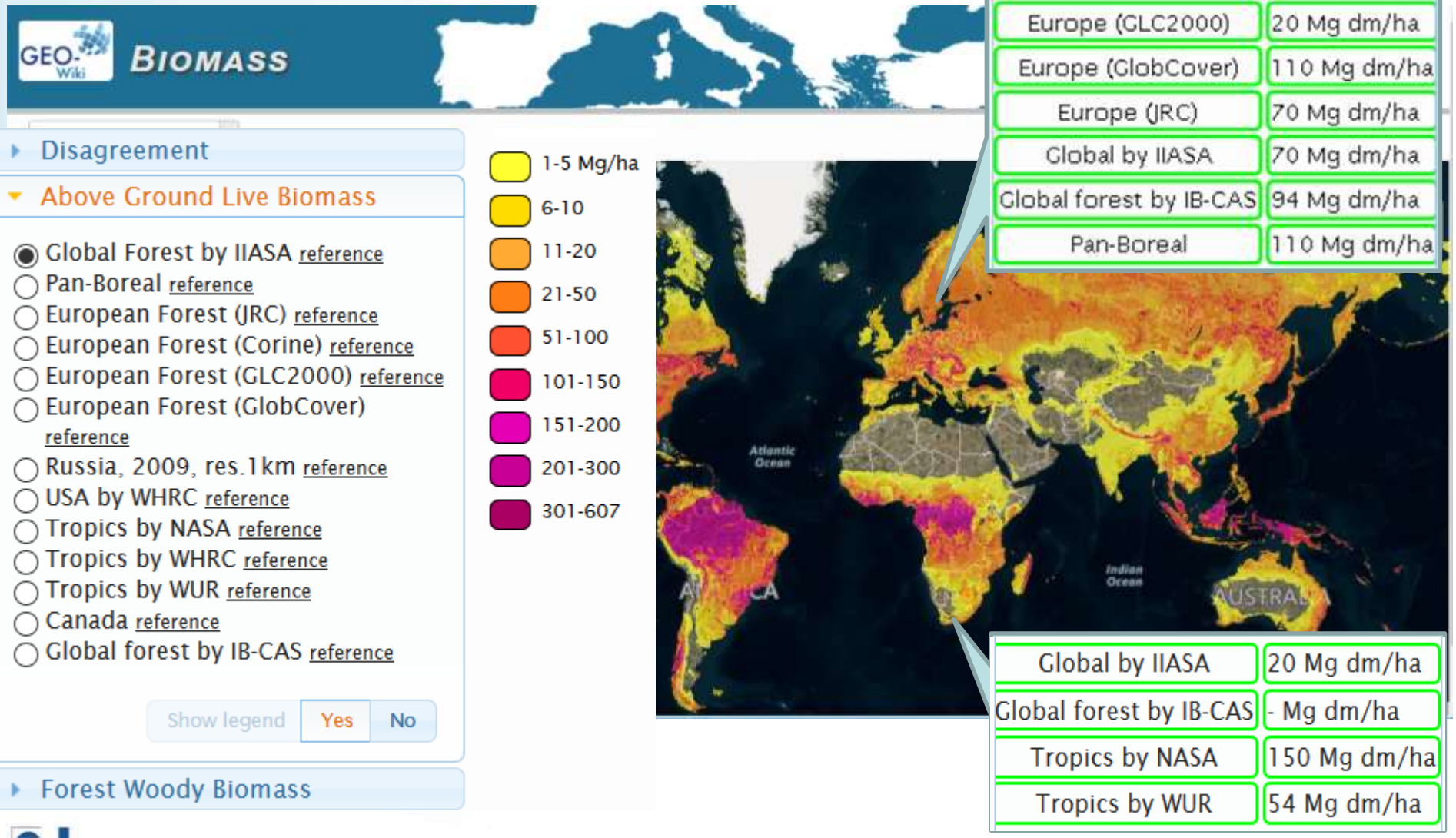
UCL

Smithsonian Tropical Research Institute

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?

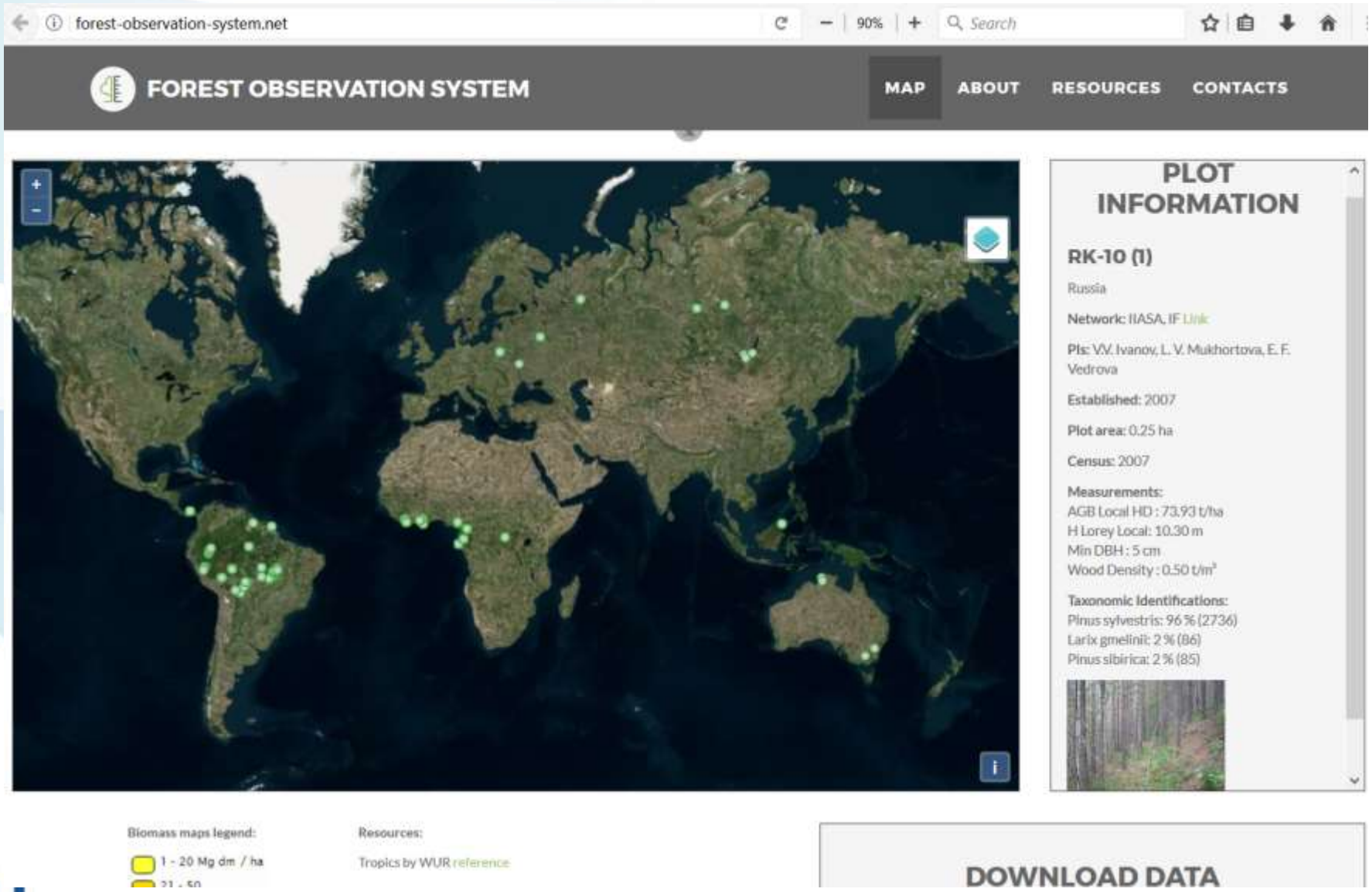
- forest height
- forest biomass
- biomass change

The remote sensing challenge

- **Algorithm development**: To derive AGB we need algorithms that are trained/calibrated with reference data of known quality.

- **Product Validation**: Assessing uncertainty in the data products requires validation with reference data of known quality.

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



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

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

RAINFOR Partners

Museo de Historia Natural
NOEL KEMPFF MERCADO U.A.G.R.M.

Instituto Smithsonian de Investigaciones Tropicales

UNIVERSIDAD DE LOS ANDES VENEZUELA

Instituto de Pesquisa Ambiental da Amazônia IPAM

INPA INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA

UNIVERSITY OF LEEDS

Jardín Botánico de Medellín Joaquín Antonio Uribe

IDEA-PUCP INSTITUTO DE ESTUDIOS AMBIENTALES
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ

BAU

UNEMAT

IVIC INSTITUTO VENEZOLANO DE INVESTIGACIONES CIENTÍFICAS

COLERE CUPIO HOMINEM ET AGRUM

CIFOR

UNIVERSITY OF OXFORD

Global Forest Coalition Quality Sustainable Forestry

INSTITUTO HUMBOLDT

MUSEU PARAENSE EMÍLIO GOELDI

UNIVERSIDAD NACIONAL DE COLOMBIA SEDE AMAZONIA

THE UNIVERSITY OF EDINBURGH

SMITHSONIAN INSTITUTION WASHINGTON DC

IWOKRAMA THE GREEN HEART OF GUYANA

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UNIVERSIDAD NACIONAL DE COLOMBIA SEDE BOGOTÁ FACULTAD DE CIENCIAS INSTITUTO DE CIENCIAS NATURALES

AMAZON CONSERVATION ASSOCIATION

UFAC

Embrapa AMAZÔNIA ORIENTAL

UFPA Universidade Federal do Pará

Universiteit Utrecht

LBA

CONSERVATION INTERNATIONAL

Evolution & Diversité Biologique EDB

MISSOURI BOTANICAL GARDEN

CEH Centre for Ecology & Hydrology NATURAL ENVIRONMENT RESEARCH COUNCIL

IIASA

The Background of FOS

1. Forest-Observation-System.net (FOS) is a “Cyberinfastructure” to collect and disseminate ground data.
2. FOS is tailored to the needs of the EO community. FOS shall not compete against existing initiatives such as ForestPlots, CTFS-ForestGeo, etc.
3. The Guiding Principles of FOS
   a. FOS aims at building an interface between well established, existing ecological networks and the EO community.
   b. FOS has an inclusive approach: FOS data should not be Mission or Network specific
   c. 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.
   d. FOS data is available free & open in a unified format.
   e. FOS collects, but does not distribute tree level data. FOS only distributes aggregated data (following a standardized and transparent process to go from tree to plot level)

FOS schedule

1. Phase 1 (2016-2017) – Demonstration
    a. Set up the infrastructure & web portal
    b. Establish a collaboration with RAINFOR, AfriTRON and CTFS-ForestGEO
    c. Run the web portal in a Demo mode including first data

2. Phase 2 (2017 - 2020) – Implementation
    a. Open the web portal to the general public
    b. Identify and establish collaboration opportunities with research teams and networks collecting high quality data
    c. Identify gaps and encourage investment in field-based observations
    d. Expand to host airborne LiDAR 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

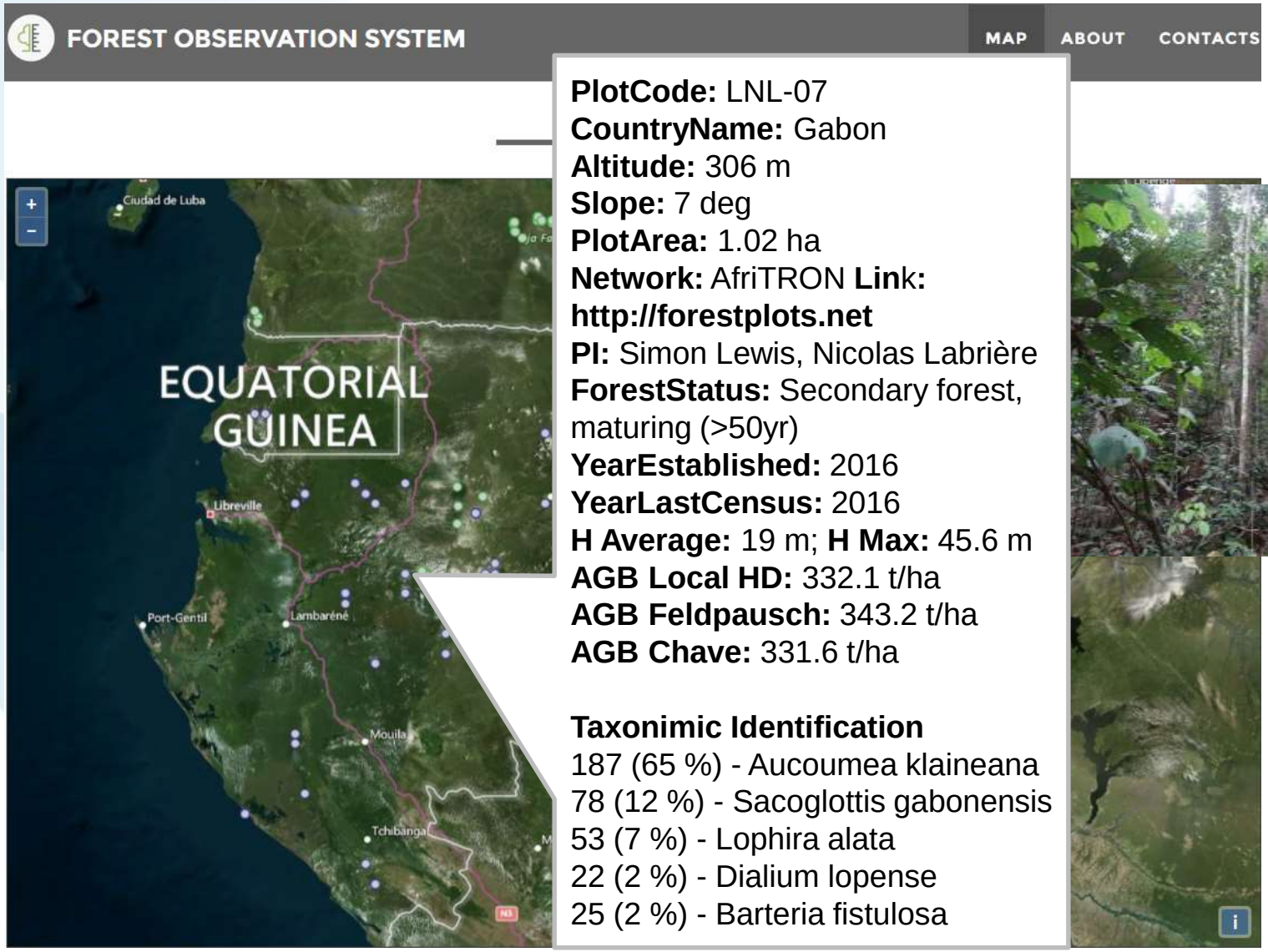
- Output data at plot level:
  - General characteristics (relief, forest type, disturbances, tree species)
  - Canopy height (top, Lorey's)
  - Above ground live biomass (estimated by allometric model AGB=f(ρ,D,H)

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

CTFS-ForestGEO

ArfiSAR ESA field complain 2016, Gabon

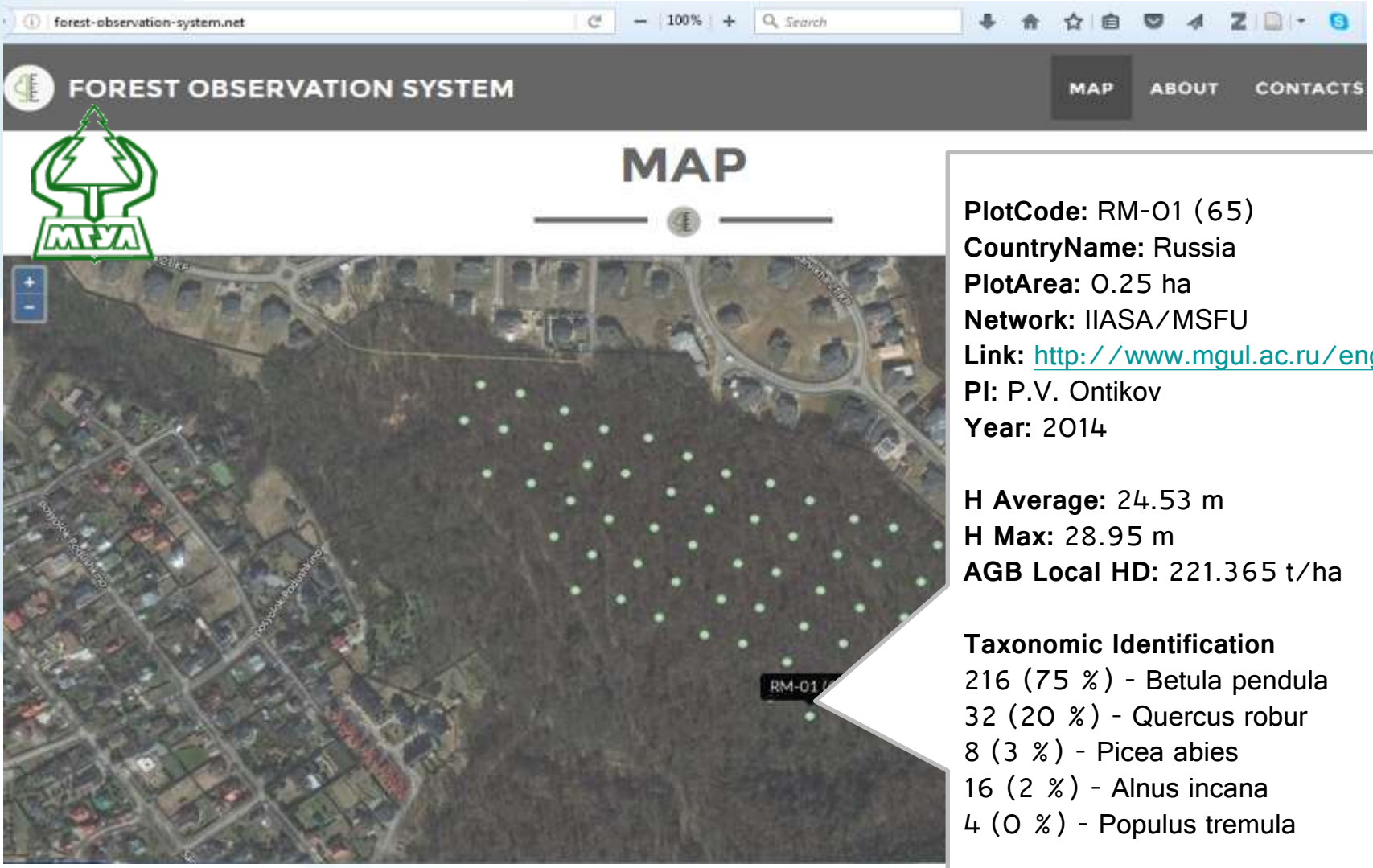


PlotCode: LNL-07
CountryName: Gabon
Altitude: 306 m
Slope: 7 deg
PlotArea: 1.02 ha
Network: AfriTRON **Link: http://forestplots.net**
PI: Simon Lewis, Nicolas Labrière
ForestStatus: Secondary forest, maturing (>50yr)
YearEstablished: 2016
YearLastCensus: 2016
H Average: 19 m; **H Max:** 45.6 m
AGB Local HD: 332.1 t/ha
AGB Feldpausch: 343.2 t/ha
AGB Chave: 331.6 t/ha

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

City park inventory near Moscow

(17 ha divided by 0.25 ha sub-plots)

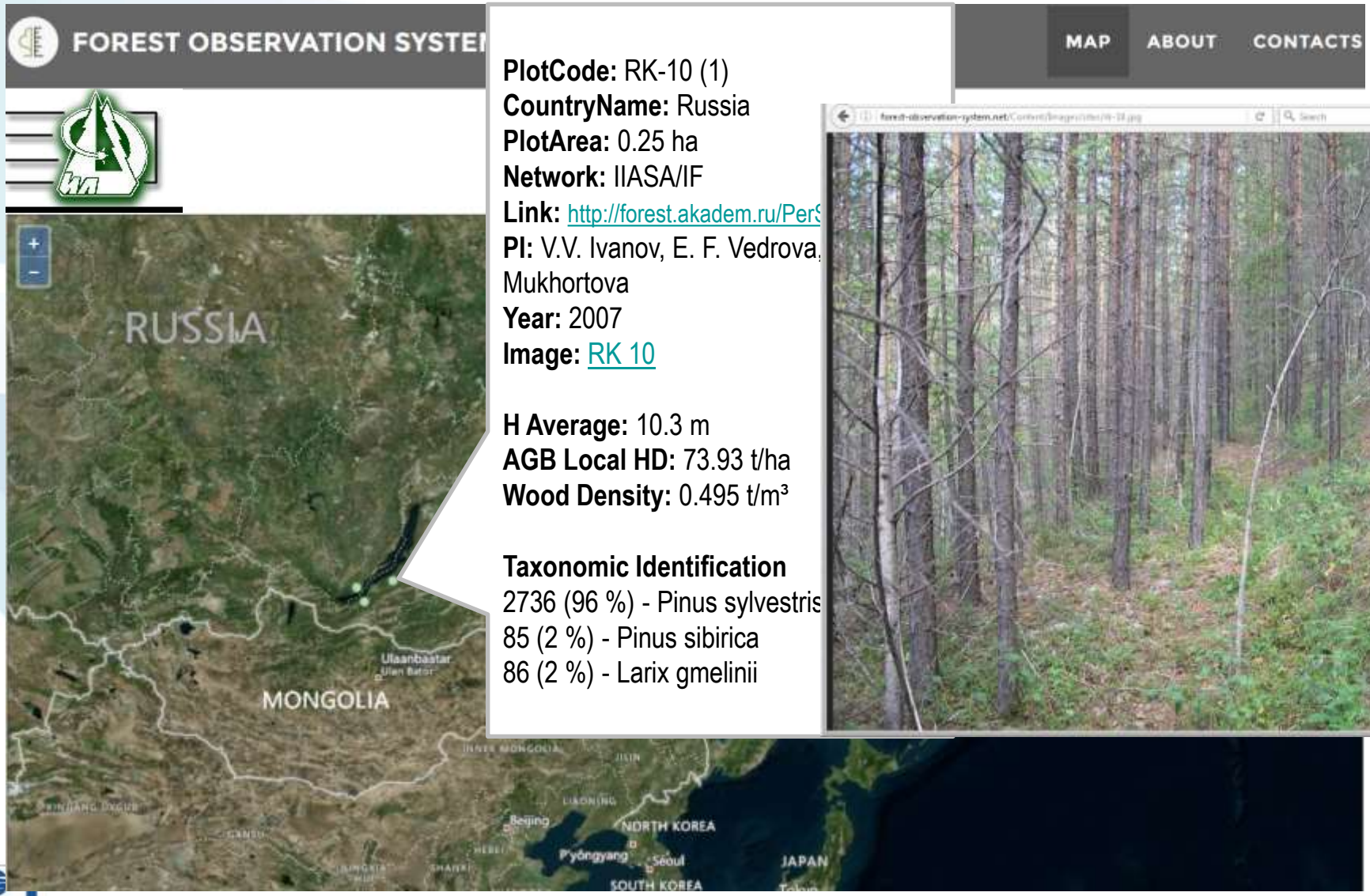


PlotCode: RM-01 (65)
CountryName: Russia
PlotArea: 0.25 ha
Network: IIASA/MSFU
Link: http://www.mgul.ac.ru/eng/
PI: P.V. Ontikov
Year: 2014

H Average: 24.53 m
H Max: 28.95 m
AGB Local HD: 221.365 t/ha

Taxonomic Identification
216 (75 %) - Betula pendula
32 (20 %) - Quercus robur
8 (3 %) - Picea abies
16 (2 %) - Alnus incana
4 (0 %) - Populus tremula

Post-fire forest dynamics and coarse woody debris decomposition investigation

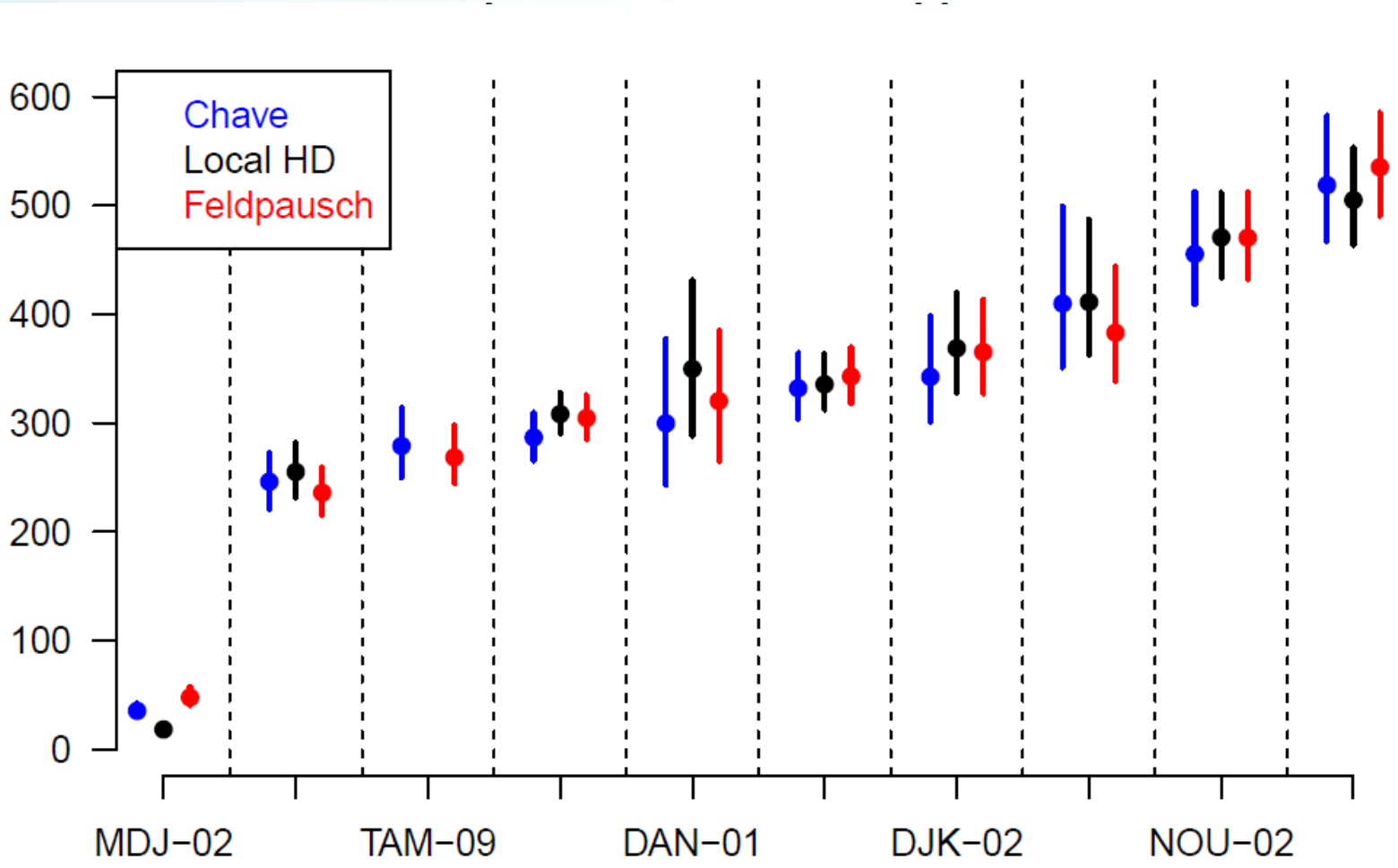


PlotCode: RK-10 (1)
CountryName: Russia
PlotArea: 0.25 ha
Network: IIASA/IF
Link: http://forest.akadem.ru/PerS
PI: V.V. Ivanov, E. F. Vedrova, Mukhortova
Year: 2007
Image: RK 10

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

From individual tree measurements to plot-level biomass



Distribution of sample plots by participation networks

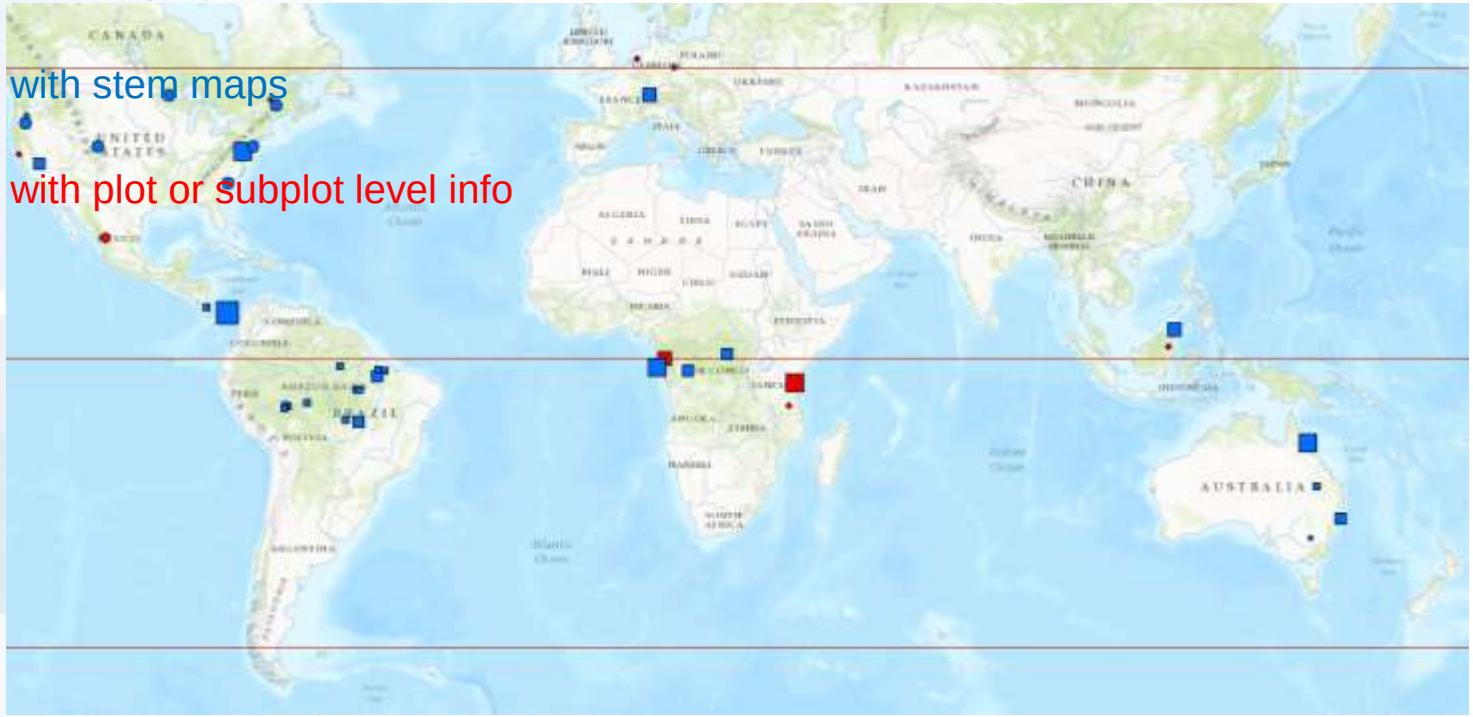
Network	Sites	Plots
AfriTRON	46	174
AusCover	4	4
CTFS-ForestGEO	2	300
IIASA	38	112
RAINFOR	51	204
TForces	3	12
TmFO		
Total	144	806

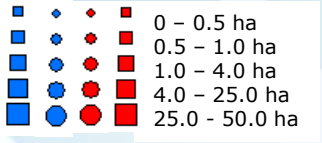
Distribution of sample plots by continents

Continent	Sites	Plots
Africa	47	272
Asia	18	43
Australia	4	4
Europe	23	83
South America	52	404
Total	144	806

GEDI Biomass Calibration Database (Oct 2016)

- 2357 plots from 42 projects
- 28 projects with stem maps
- 14 projects with plot or subplot level info





GEDI
ECOSYSTEM LIDAR

John David Armston
AfriSAR Science Team Meeting
October 26-28 2016

Thank you for your attention

Forest-Observation-System.net

rainfor

FORESTPLOTS.NET

AusCover
Remote Sensing Data Facility

TFO

CTFS-ForestGEO

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