International Institute for Applied Systems Analysis
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science for global insight

GlobBiomass Validation in Russia, Forest-Observation-System.net and Biomass.Geo-Wiki.org

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GLOBBIOMASS

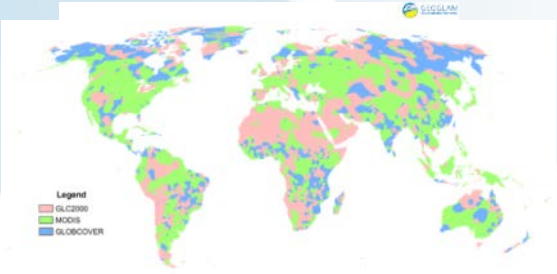
GEO-Wiki

Geo-Wiki

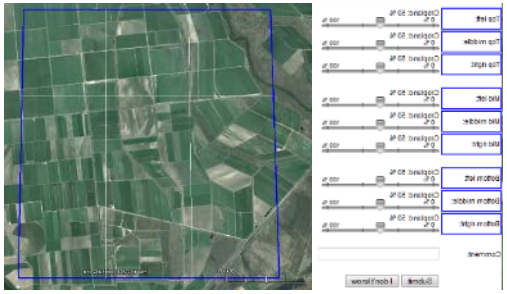
Visualization of Global Land Cover, Biomass, Photos, etc.

Crowdsourcing of Land Cover (Google Earth, Bing Maps)

Creation of Hybrid Land Cover Maps



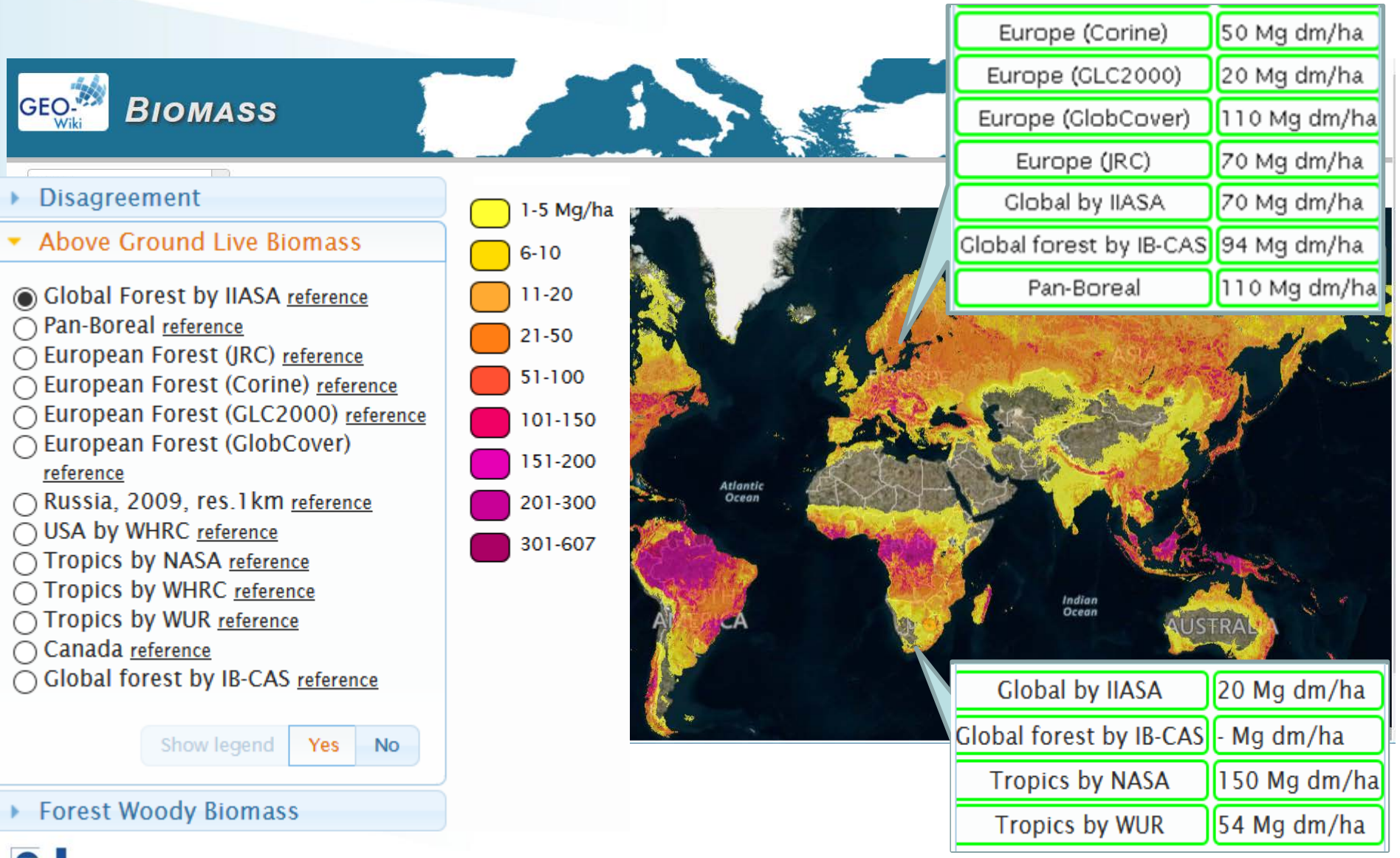
Validation of Land Cover Maps



In-situ Data via Geo-Wiki Pictures, FotoQuest Go app

Serious Games (Cropland Capture, Picture Pile)

Biomass.Geo-Wiki.org



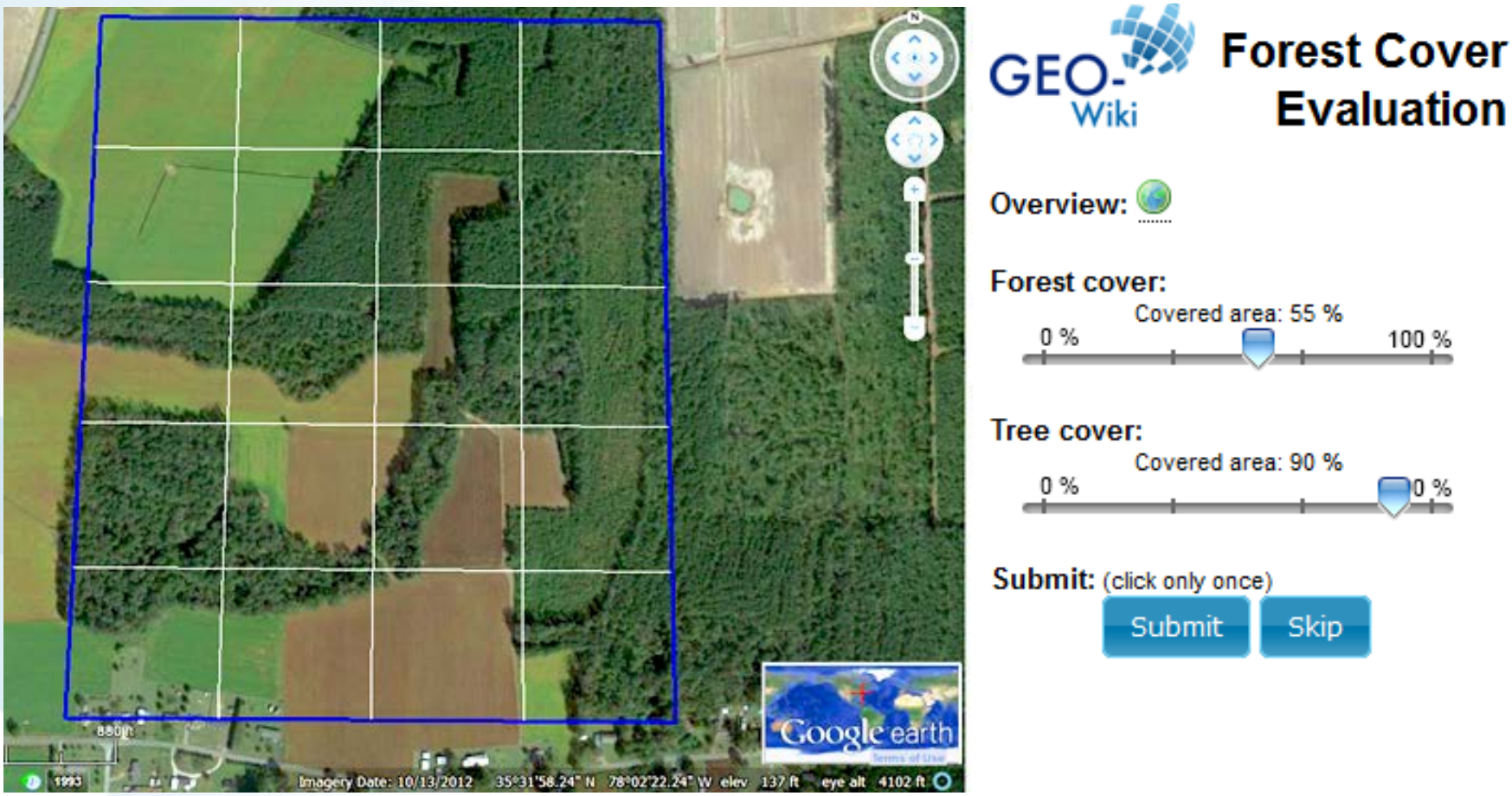
What can we do with Geo-Wiki for biomass validation

Use VHR res. imagery and georeferenced photo to check:

- Land cover type, forest / non-forest
- Homogenous / heterogeneous pixel
- Disturbances / changes (time series of VHR images)
- Low / medium / high biomass
- Young / old forest
- Plantation / natural
- Evergreen / deciduous

Statistically proved sample, focus to problematic areas

Estimation of forest cover using Geo-Wiki and high resolution Google Earth imagery



where 55% of 1km pixel area is estimated to be forest cover with tree cover of 90% stocking in this example.

Serious Game: Picture Pile

1371
Players

5,141,981+
Classifications

517,331
Unique images

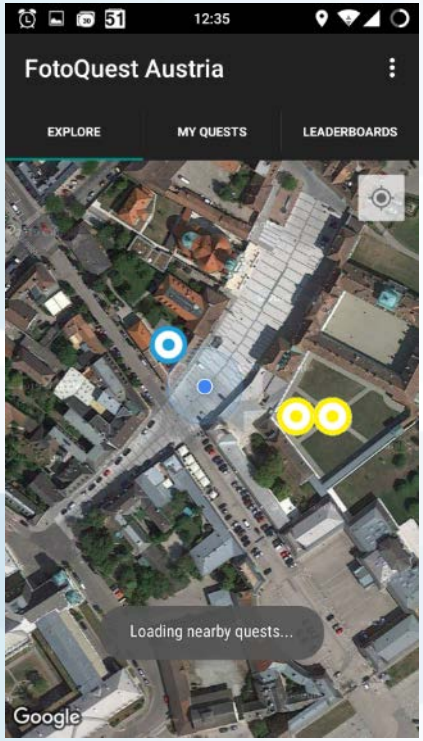
90%
< 5 seconds

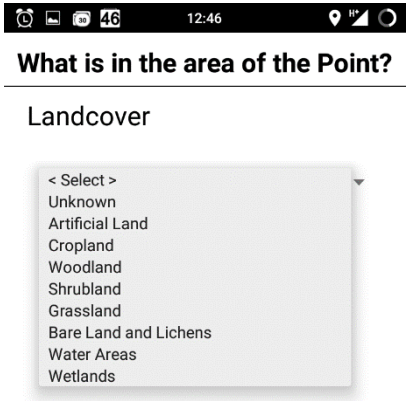
Available on the App Store

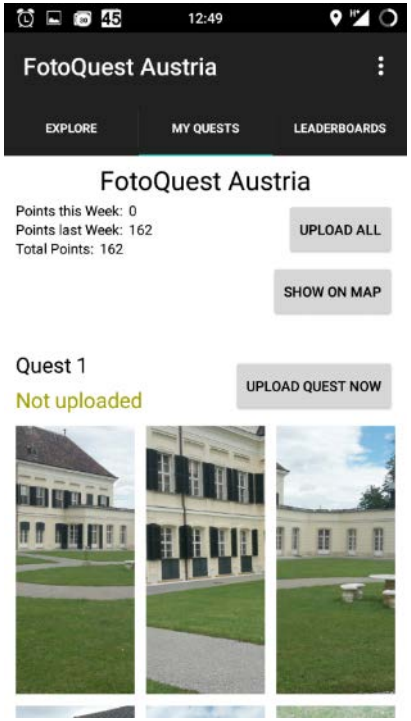
Get it on Google play

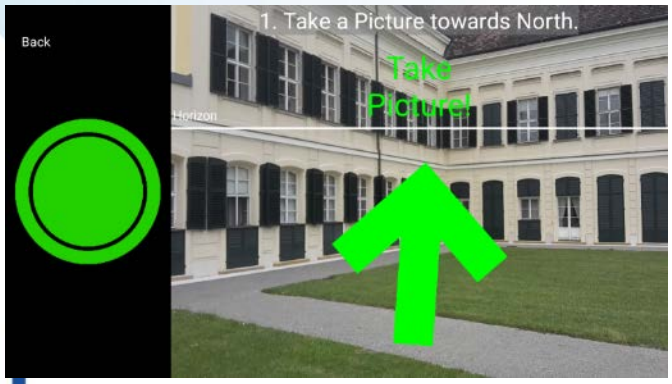
Mobile App: Geo-Wiki Pictures

FotoQuest Austria / FotoQuest Go

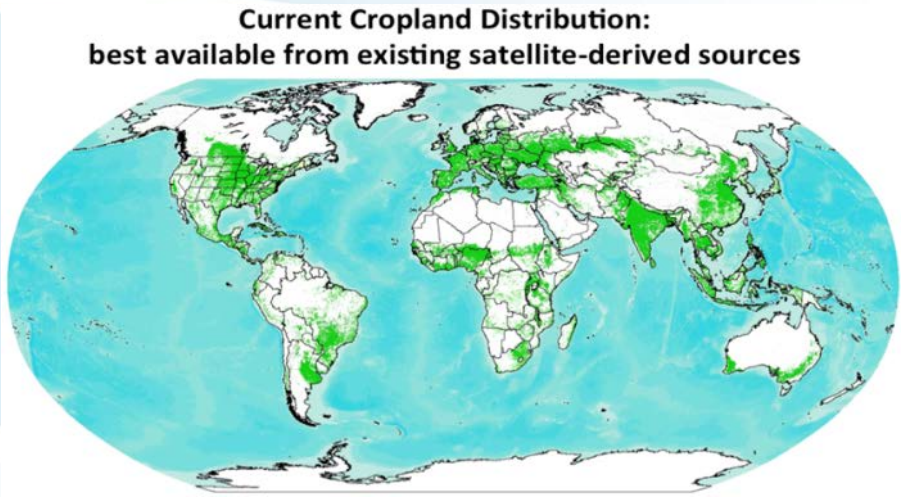






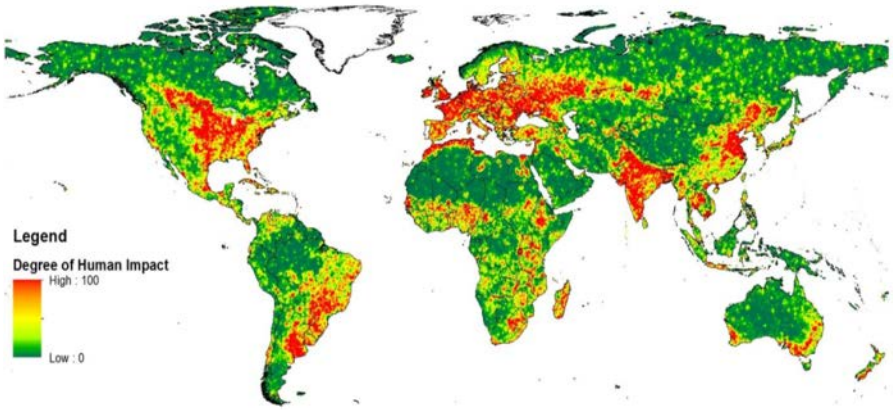


Geo-Wiki Outputs



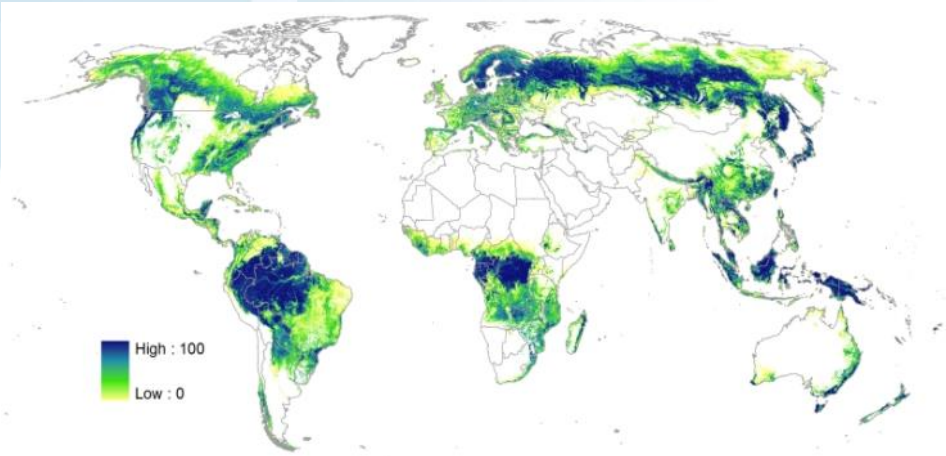
Fritz et al. (2015) in Global Change Biology

Wilderness



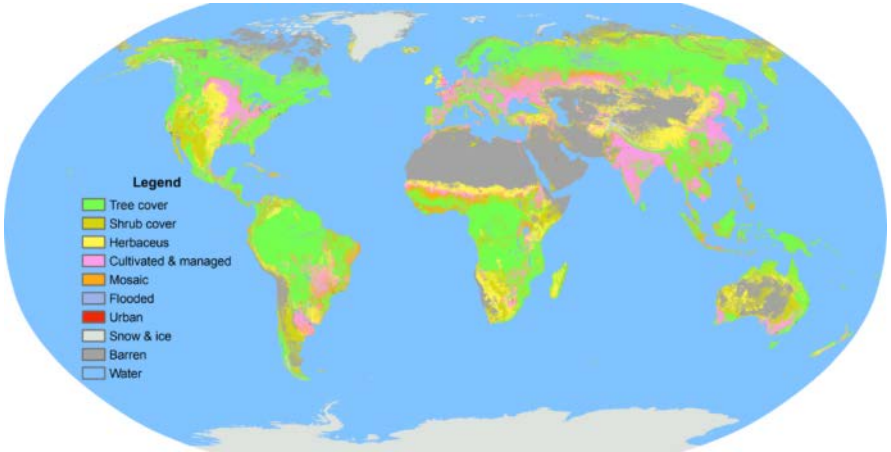
See et al. (2015) in Technological Forecasting and Social Change

Forest Cover



Schepaschenko et al. (2015) in Remote Sensing of Environment

Hybrid Land Cover



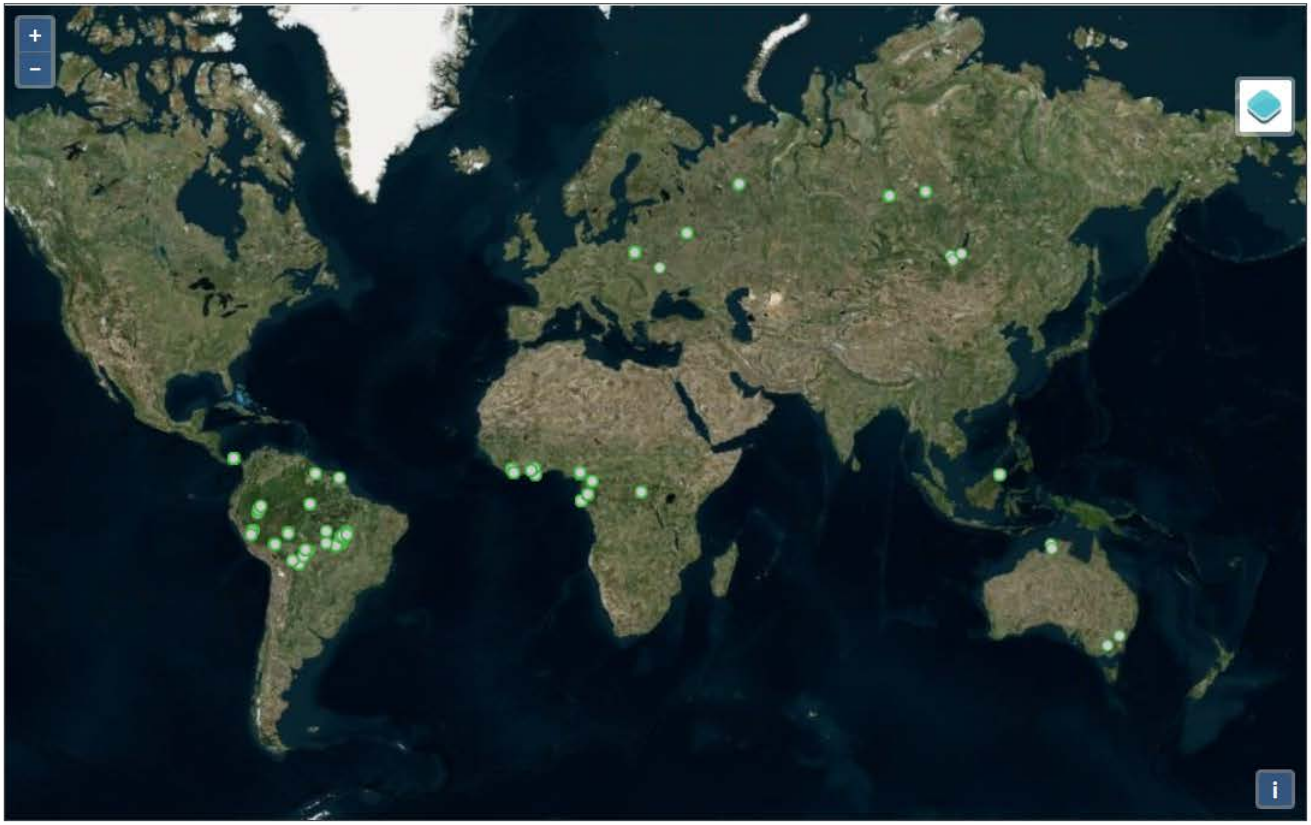
See et al. (2014) in ISPRS Photogrammetry and Remote Sensing

Forest-Observation-System.net

forest-observation-system.net

FOREST OBSERVATION SYSTEM

MAP ABOUT RESOURCES CONTACTS



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)

UNIVERSITÉ TOULOUSE III PAUL SABATIER

gend:

Resources:

ference

Smithsonian Tropical Research Institute

UCL

UNIVERSITY OF LEEDS

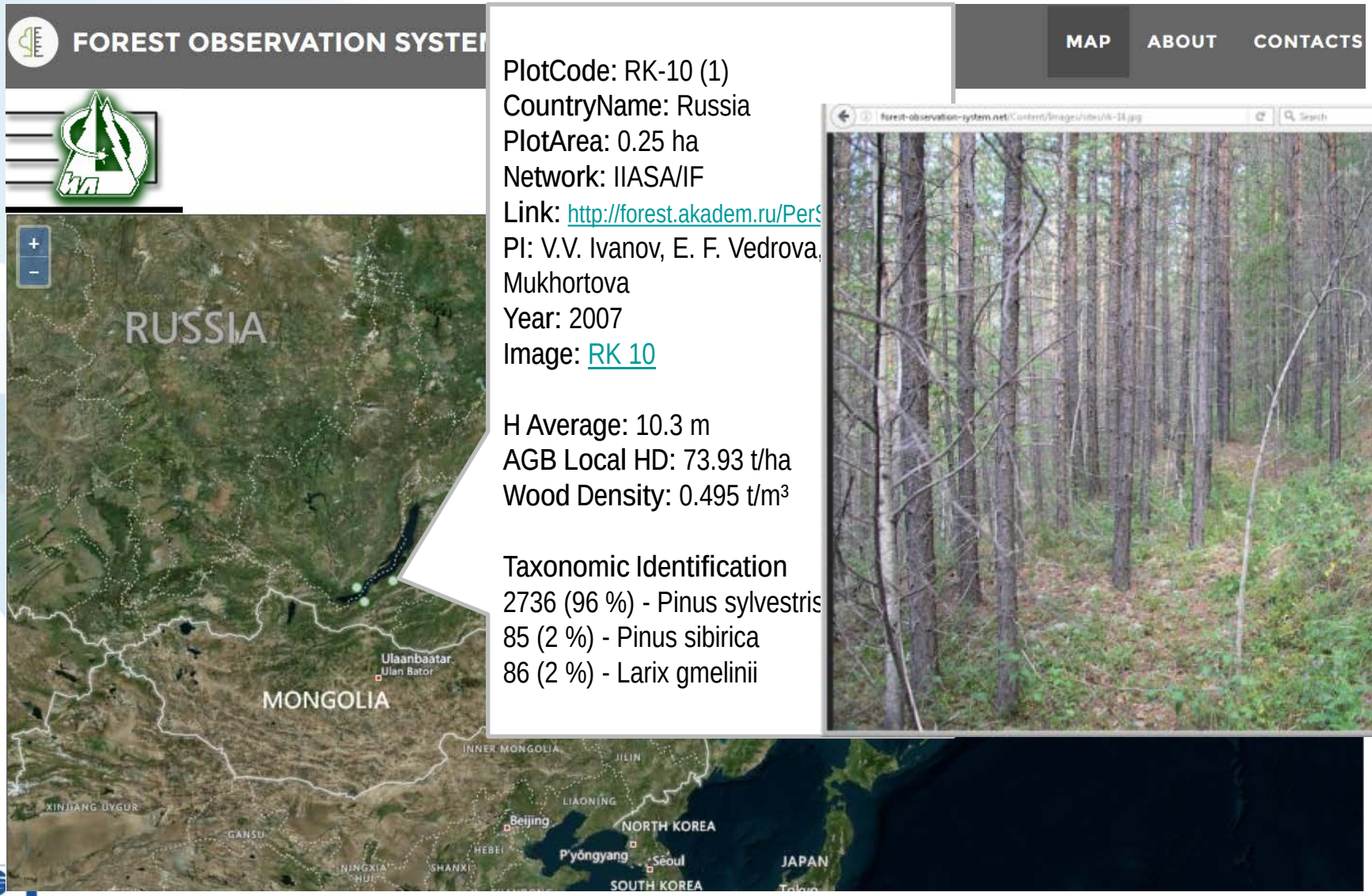
DOWNLOAD DATA

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 larger)
  - Every tree (over 10 cm dbh) got species identification and DBH is measured

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

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

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

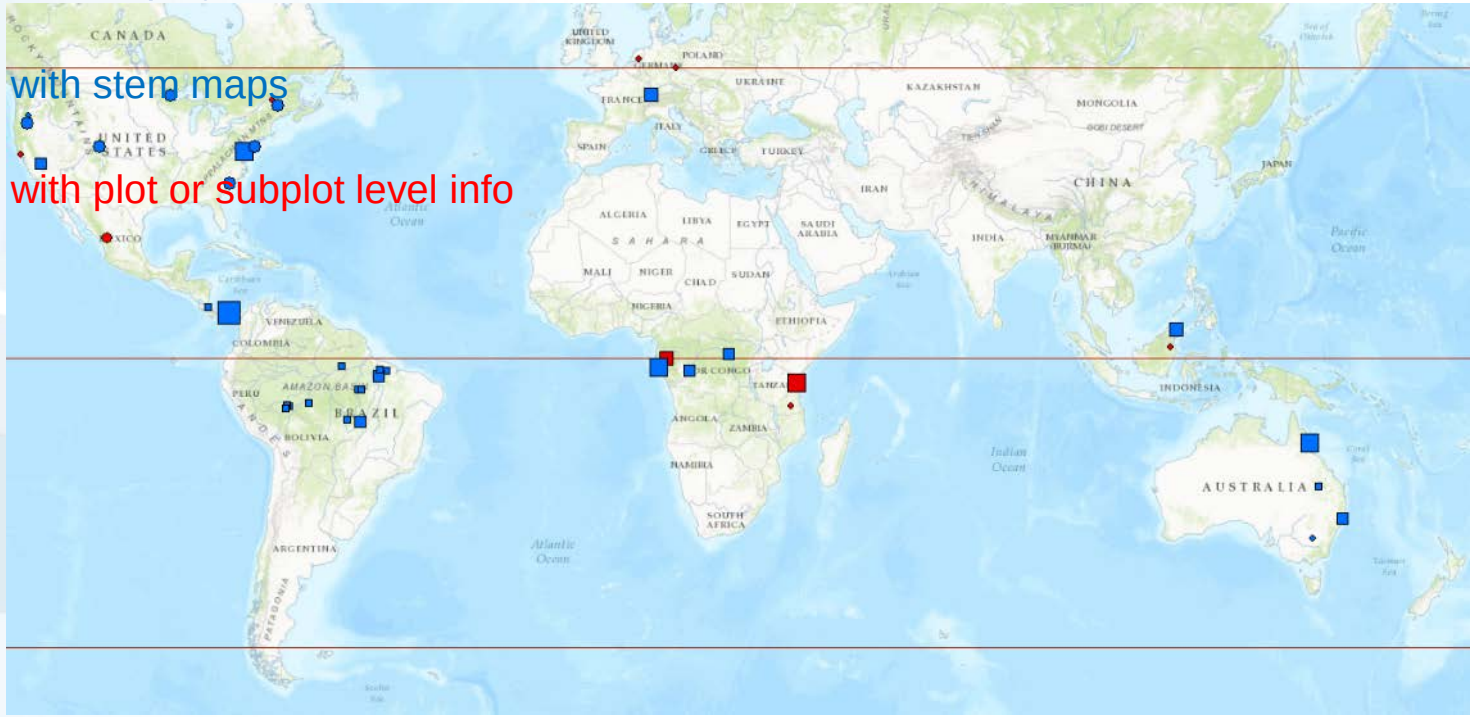
CTFS-ForestGEO

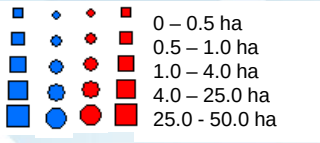
Distribution of FOS sample plots by continents

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

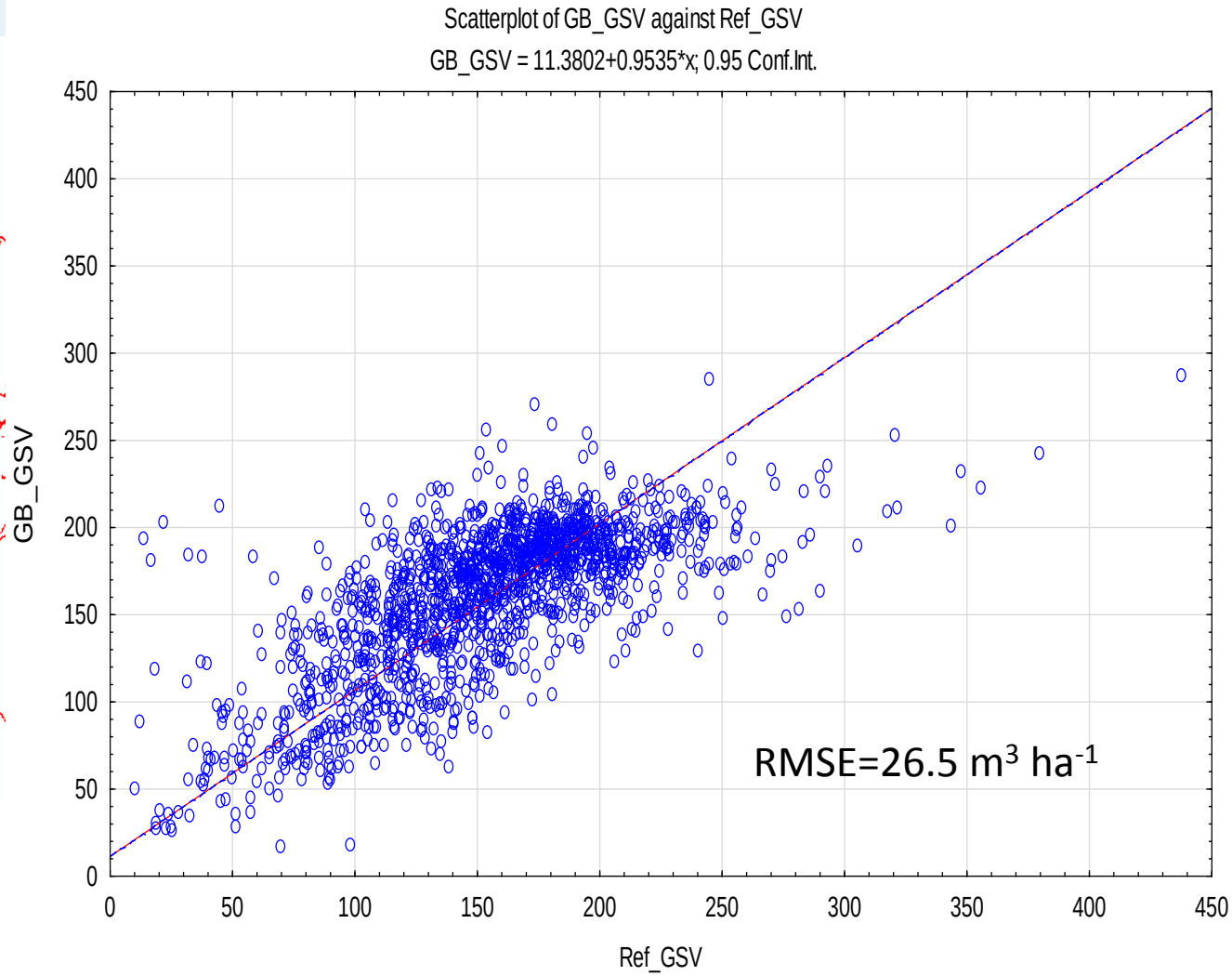
FOS schedule

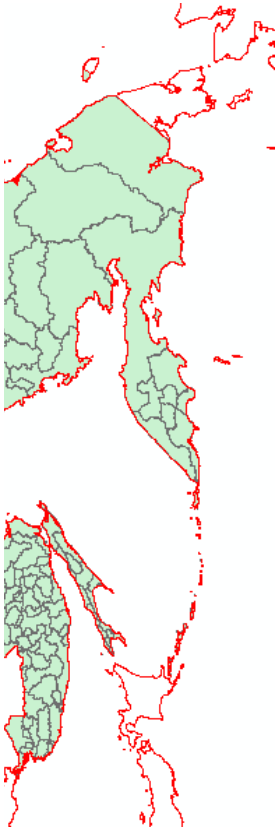
1. Phase 1 (2016-2017) – Demonstration
    a. Set up the infrastructure & web portal
    b. Establish a collaboration with RAINFOR, AfriTRON and CTFS-ForestGEO
    c. Run the web portal in a Demo mode including first data

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

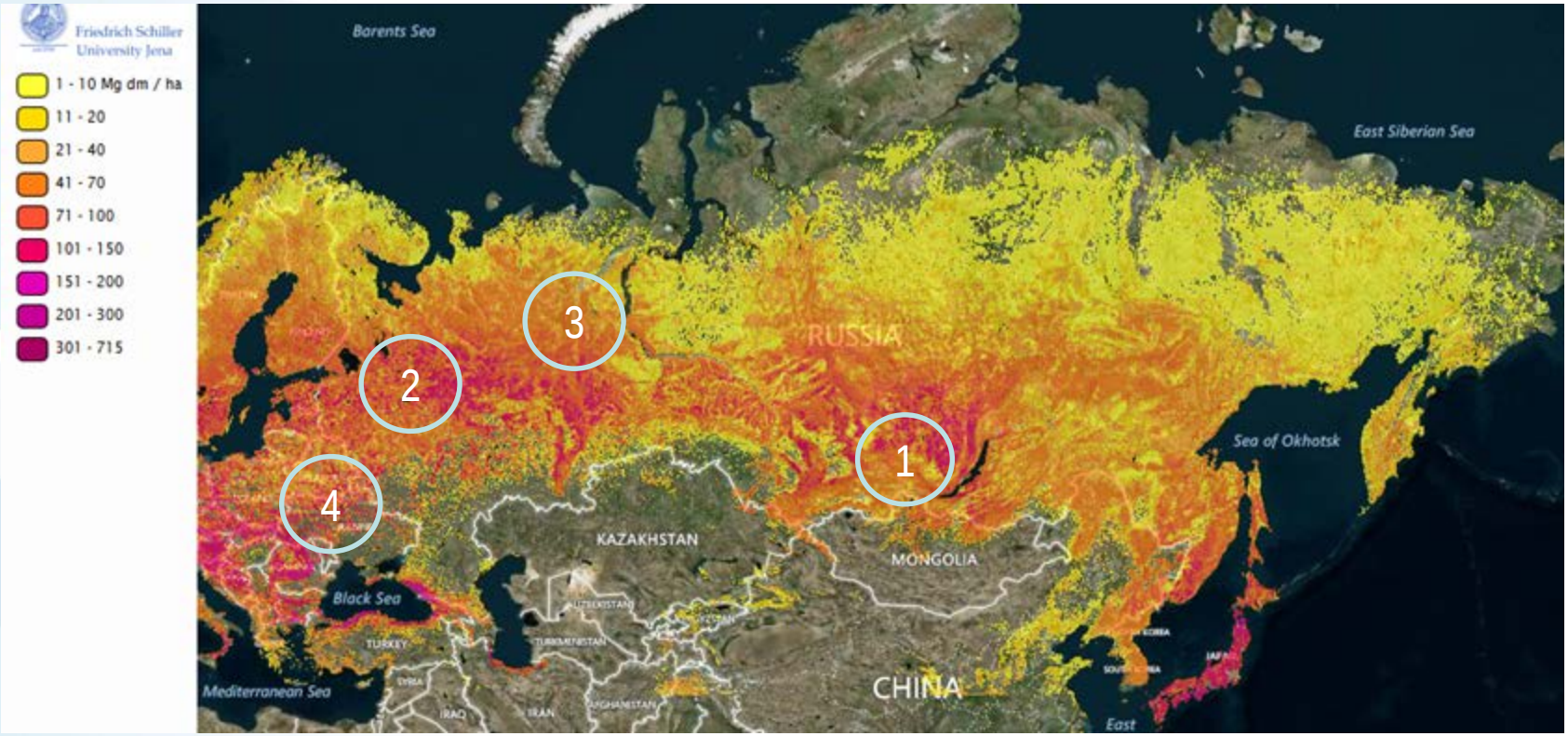
Russian Forest Management Units

ca 1600, which range in size from 1 Kha - 30 Mha





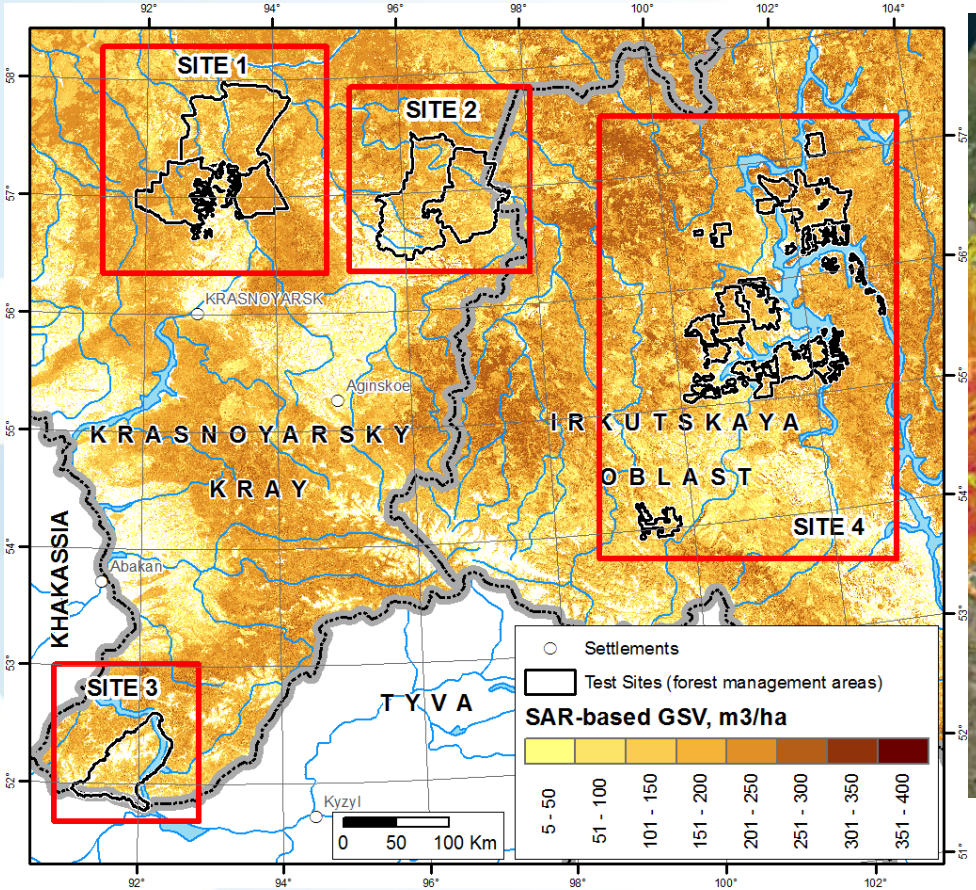
IIASA validation network in Northern Eurasia

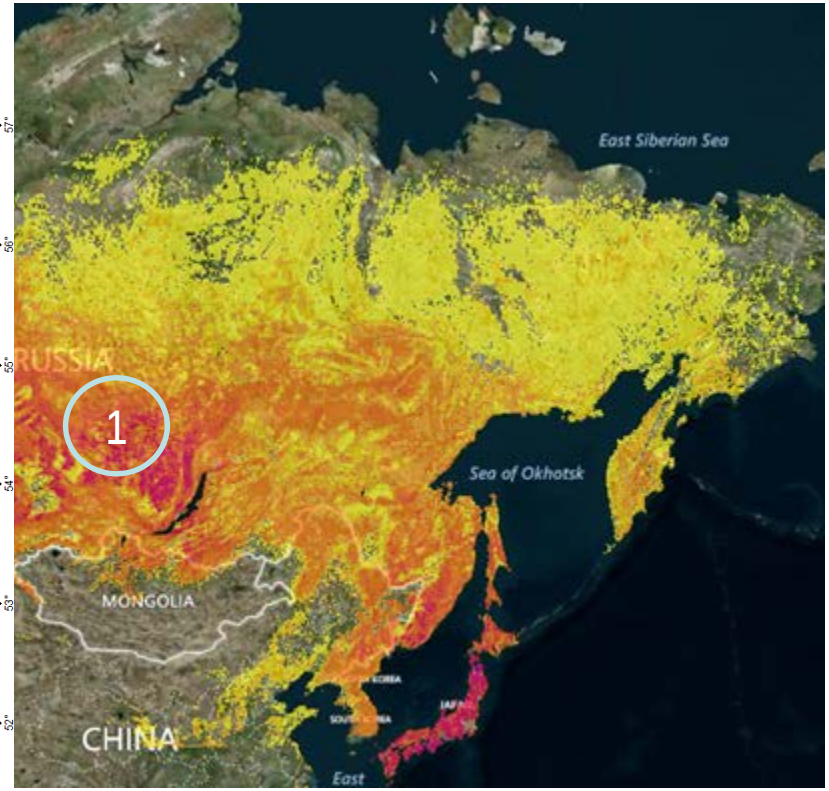


1. Sukachev Institute of Forest, Krasnoyarsk
2. Moscow State Forest University
3. Central Forest Inventory Enterprise
4. Univ. of Life and Environmental Sciences, Kiev, Ukraine

Forest inventory in Middle Siberia

PI: Mikhail Korets, Sukachev Institute of Forest, Krasnoyarsk

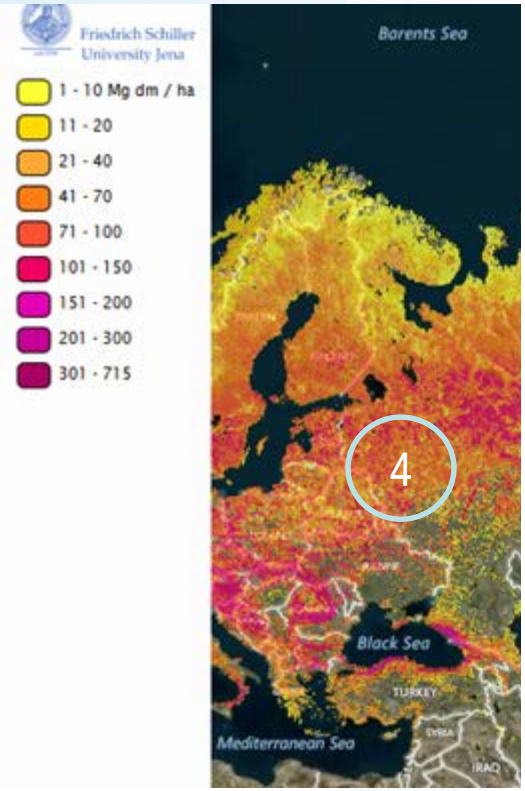


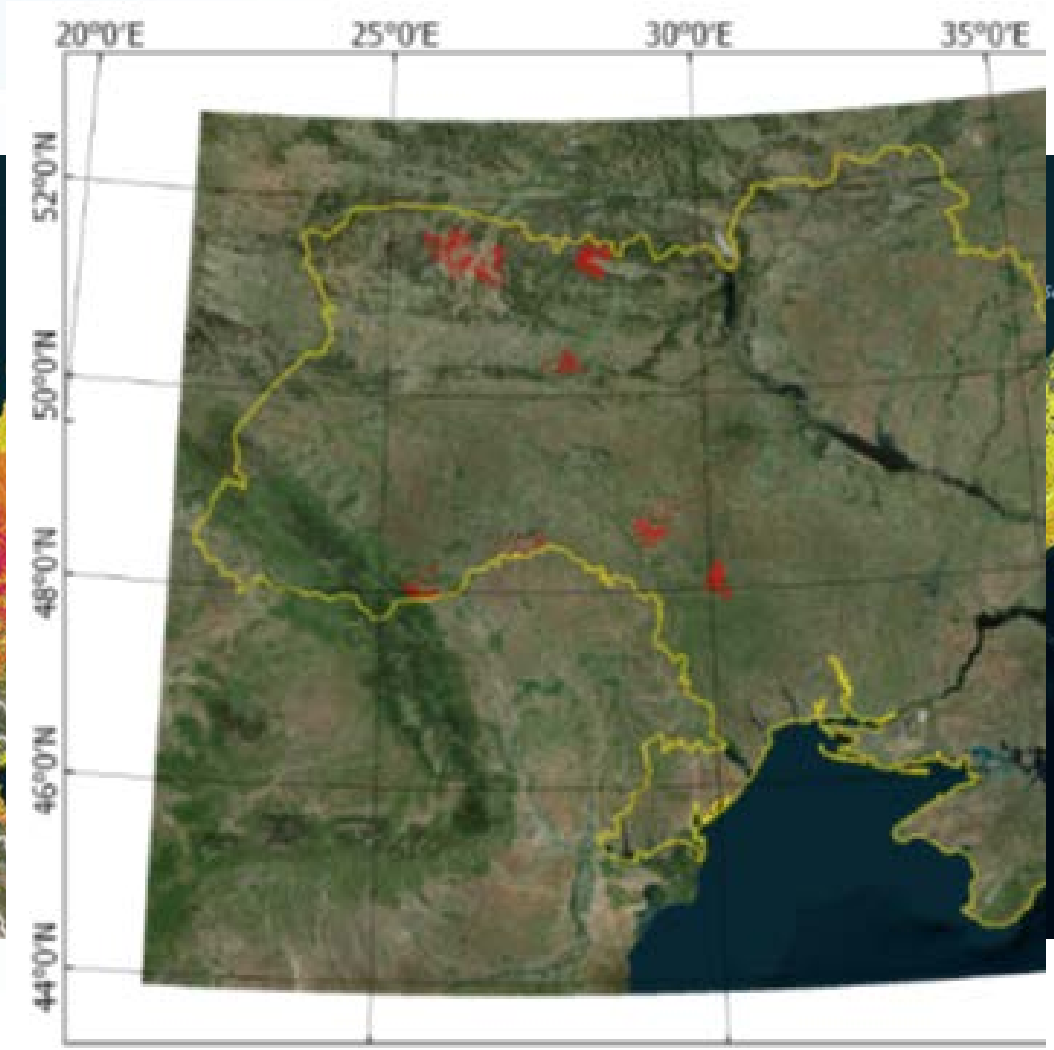


Forest inventory: 3.1 M ha of Siberian forest

Ukrainian forest inventory

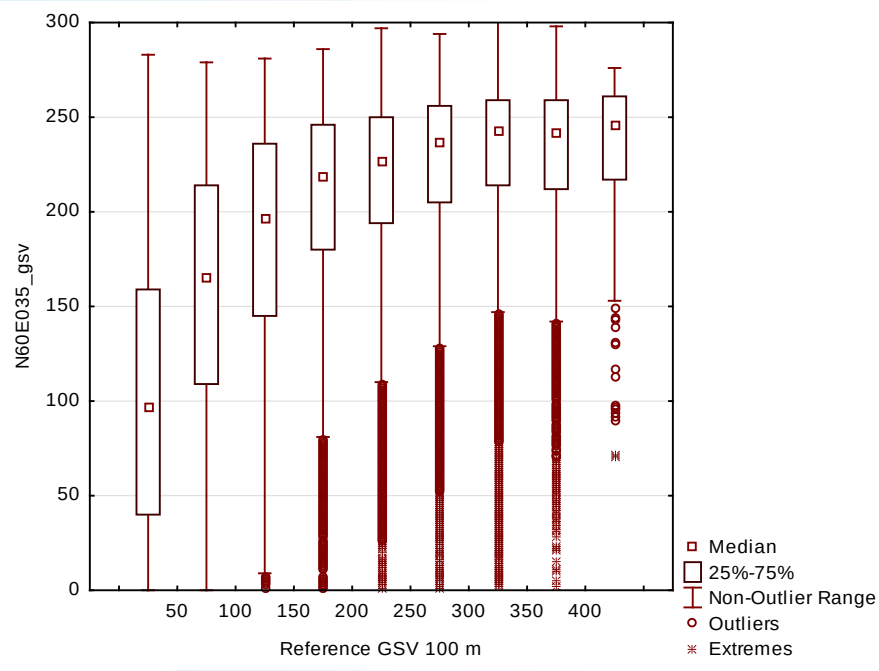
PI: Viktor Myroniuk (NULESU, Kiev)



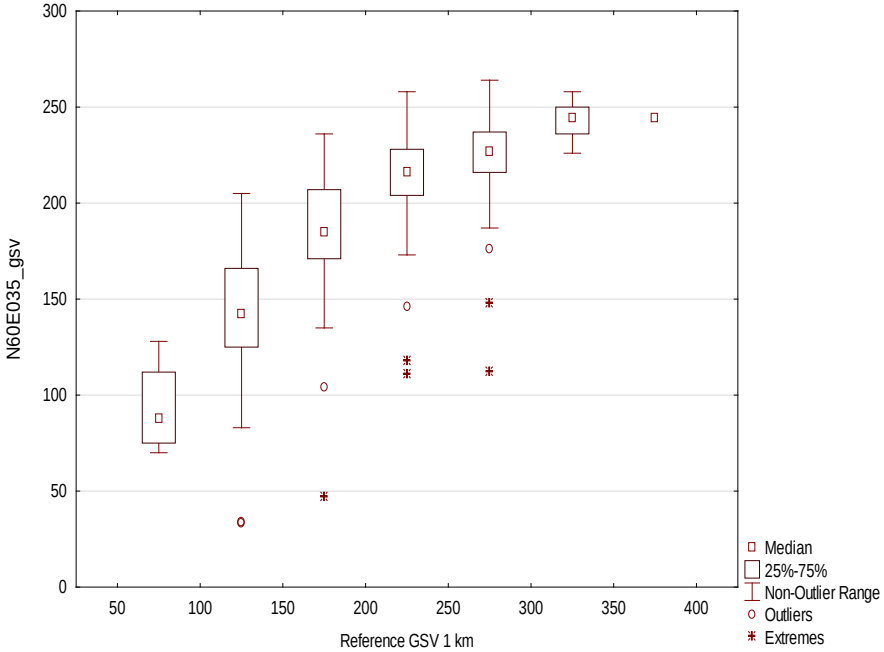


Validation of early version GSV map

100 m res., RMSE=85 m3/ha

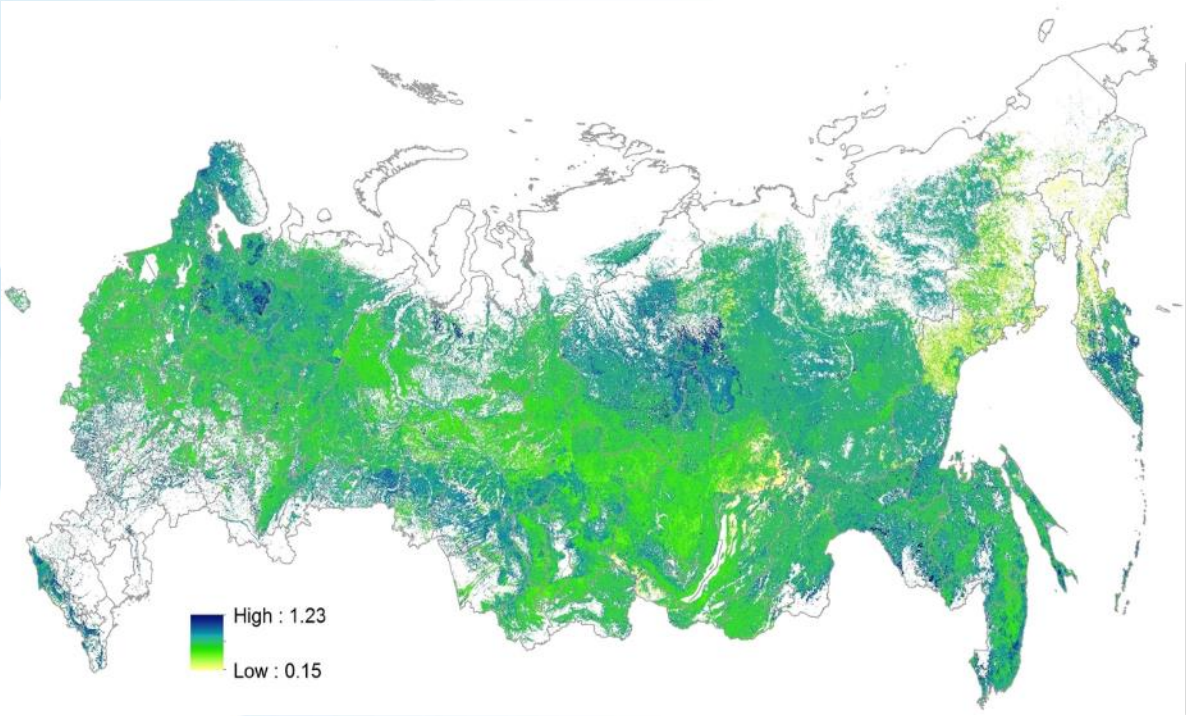


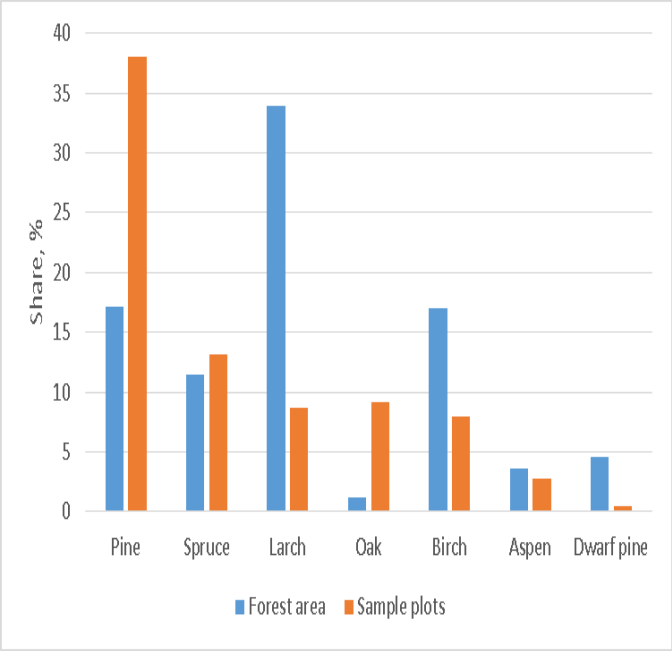
1 km res., RMSE=41 m3/ha



Biomass conversion and expansion factor

$$BCEF = {}^{AGB}\!/_{GSV} = a_0 + Age^{a_1} \cdot SI^{a_2} \cdot RS^{a_3} \cdot exp(a_4 \cdot Age + a_5 \cdot RS)$$





Summary of IIASA contribution to the GlobBiomass project

- User requirements and definitions
- Geo-Wiki.org – tool for dissemination, comparison, forest mask
- Forest-observation-system.net – sample plot collection for validation
- Forest inventory based GSV maps for the region in Russia and Ukraine for validation
- Biomass conversion and expansion factor map for Russia

Thank you for your attention

More information:
http://geo-wiki.org

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

More readings:

Schepaschenko D, See L, Lesiv M, et al. (2015). Development of a global hybrid forest mask through the synergy of remote sensing, crowdsourcing and FAO statistics. *Remote Sensing of Environment*, 162:208-220.

See L, Fritz S, Perger C, Schill C, McCallum I, Schepaschenko D etc. (2015). Harnessing the power of volunteers, the internet and Google Earth to collect and validate global spatial information using Geo-Wiki. *Technological Forecasting and Social Change*

Fritz S, McCallum I, Schill C, Perger C, See L, Schepaschenko D, Kraxner F, Obersteiner M (2012). Geo-Wiki: An online platform for improving global land cover. *Environmental Modelling and Software*. V.31: 110-123 .