Global Forest Monitoring: CTFS-ForestGEO network

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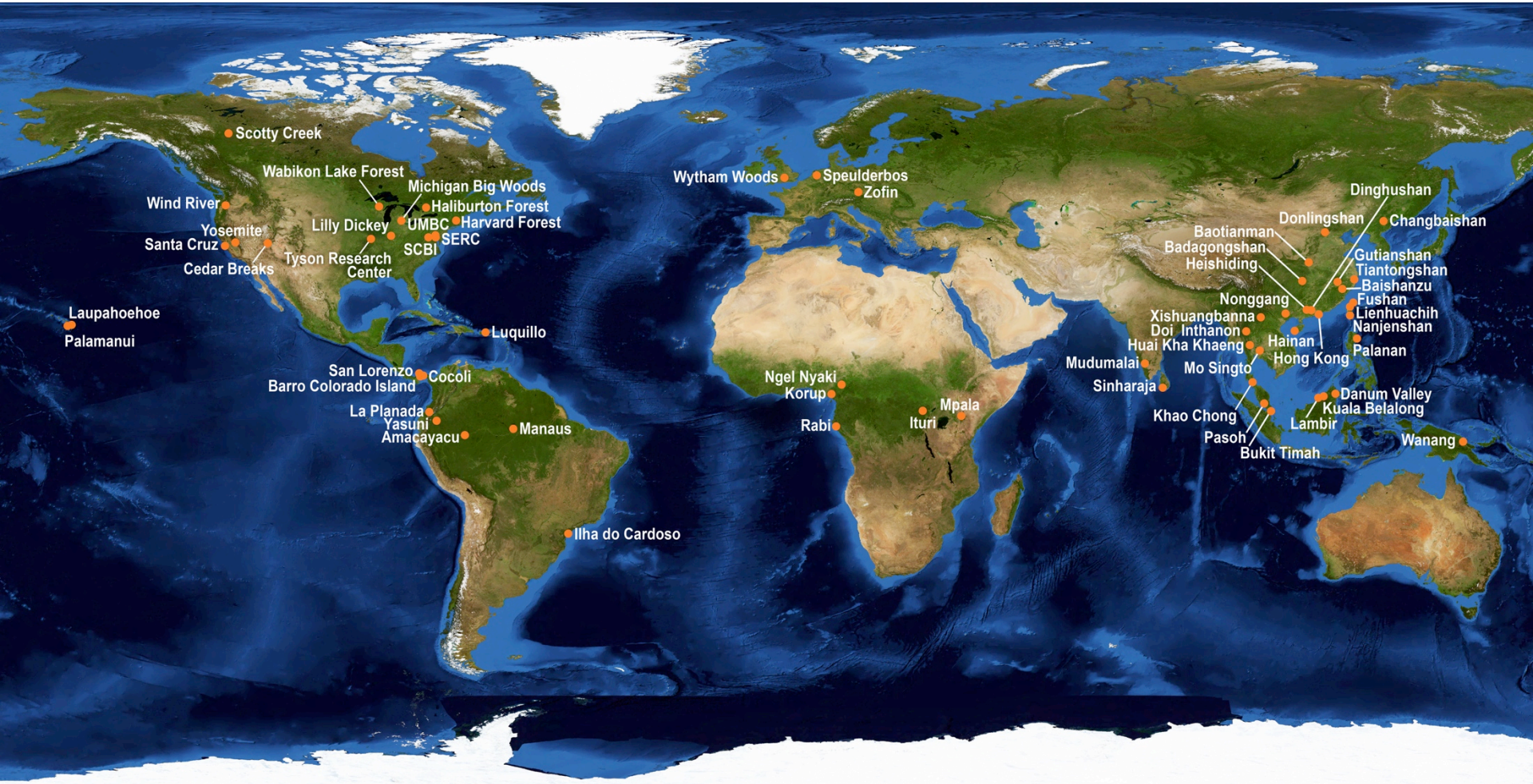
Center for Tropical Forest Science (CTFS)- Forest Global Earth Observatory (ForestGEO)

the only ground-based forest monitoring network applying the same protocol to forests globally



64 sites | 25 countries | 100 partner institutions

> 10,000 species | > 6 million trees | > 15 million DBH measurements

Global Change Biology
celebrating 20 years

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REVIEW

CTFS-ForestGEO: a worldwide network monitoring forests in an era of global change

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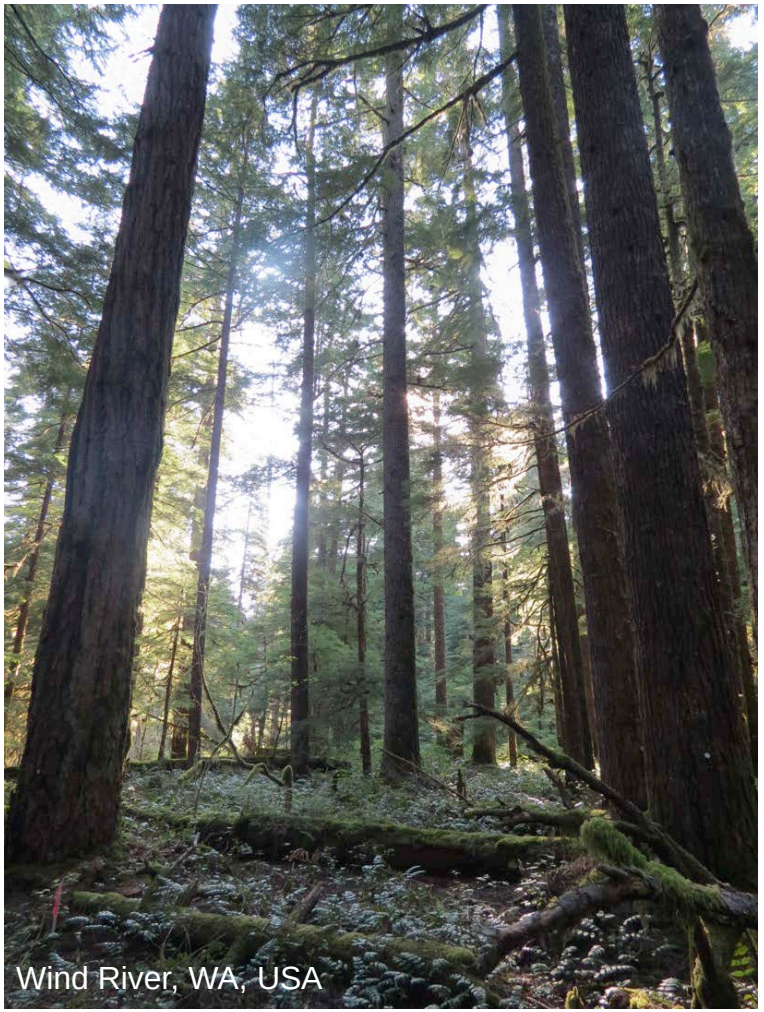
Outline

1. Core census
2. The network
3. Supplementary measurements
4. Network growth & operations

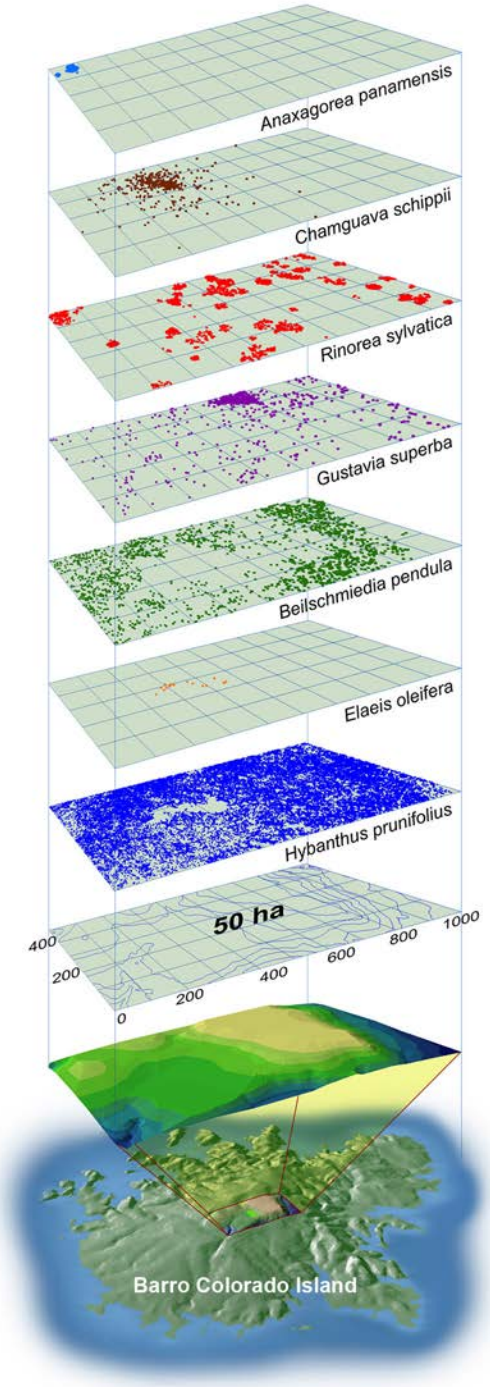
1- Core Census

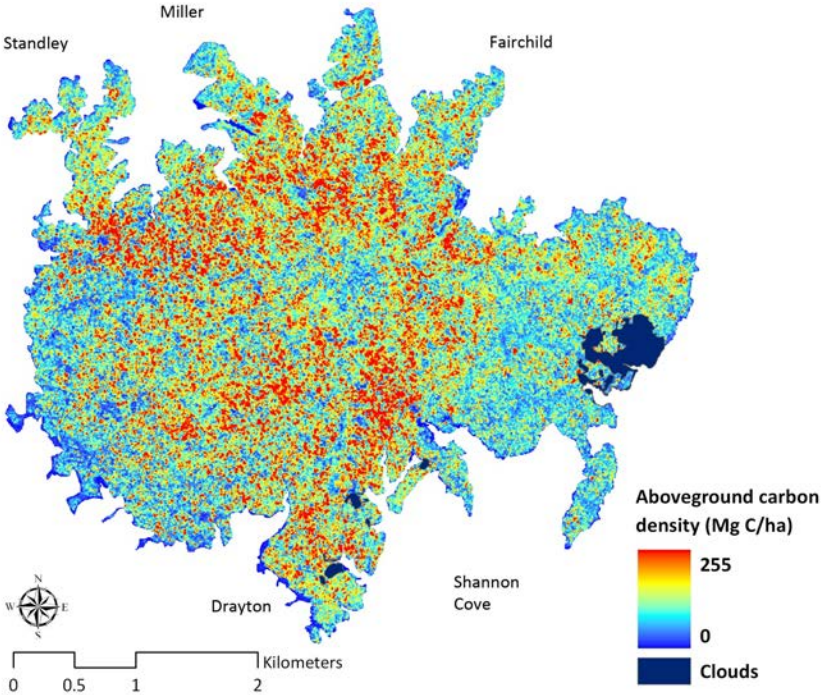
Attributes of a CTFS-ForestGEO Census

- Very large plot size
- Includes every freestanding woody stem ≥1cm DBH
- All individuals identified to species
- Diameter measured on all stems
- Mapping of all stems and fine-scale topography
- Census typically repeated every 5 years


Wind River, WA, USA

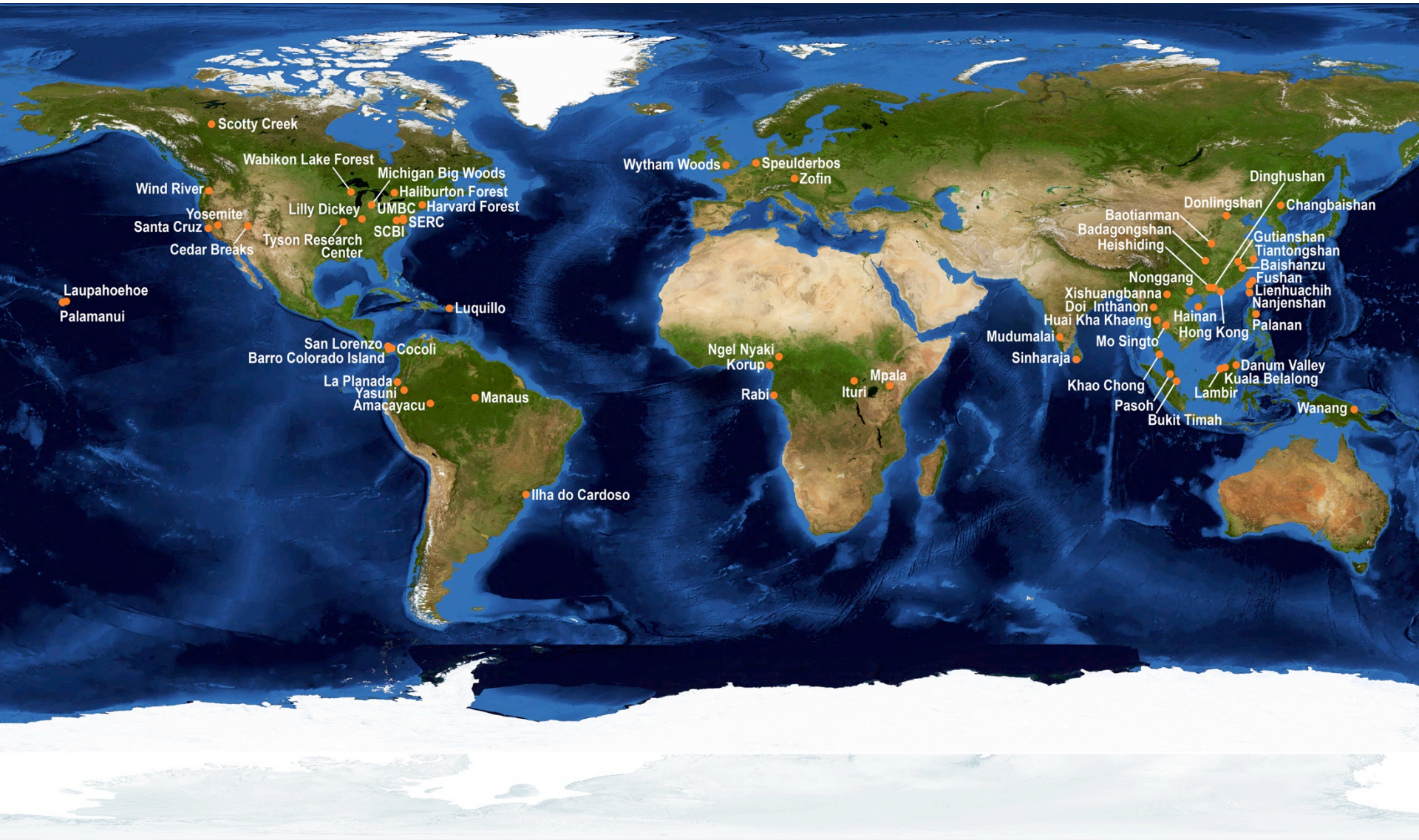
Example applications of core census: mapping species distribution and C stocks on Barro Colorado Island (Panama)





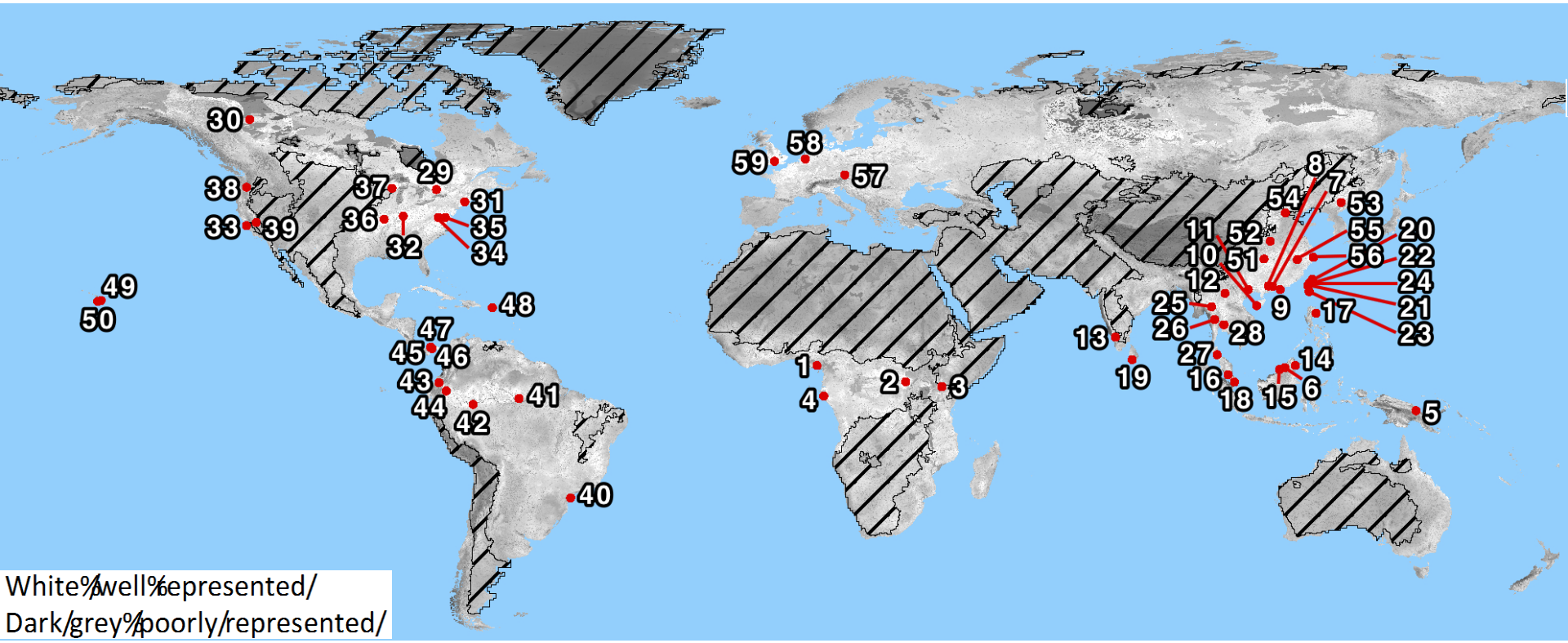
Mascaro et al., 2010

2- The Network



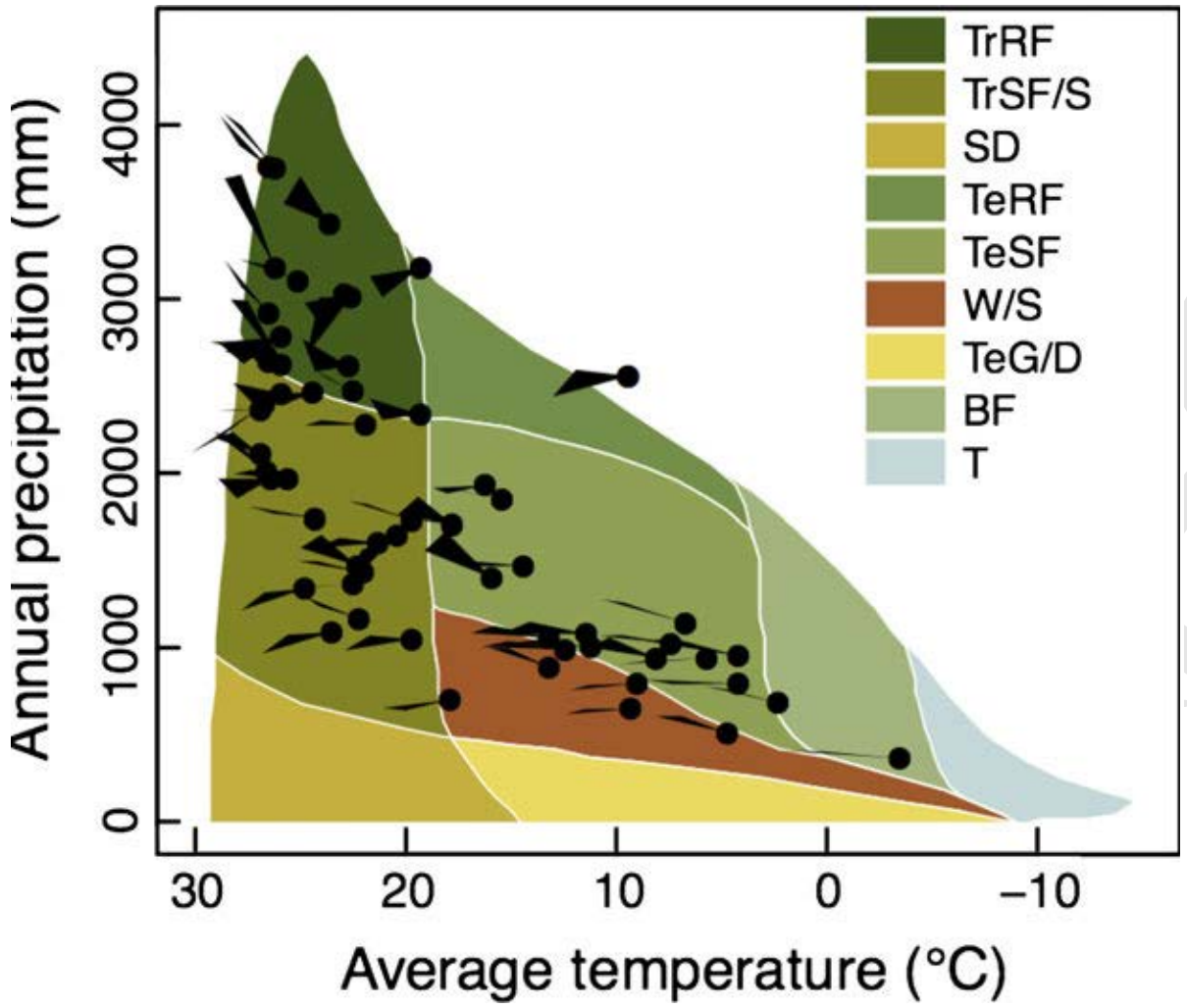
The CTFS-ForestGEO network represents the range of bioclimatic, edaphic, and topographic conditions experienced by forests globally.

Multivariate spatial clustering analysis



Anderson-Teixeira et al. 2015

Current Climate & Future Climate projections (HadGEM2-ES for 2050)



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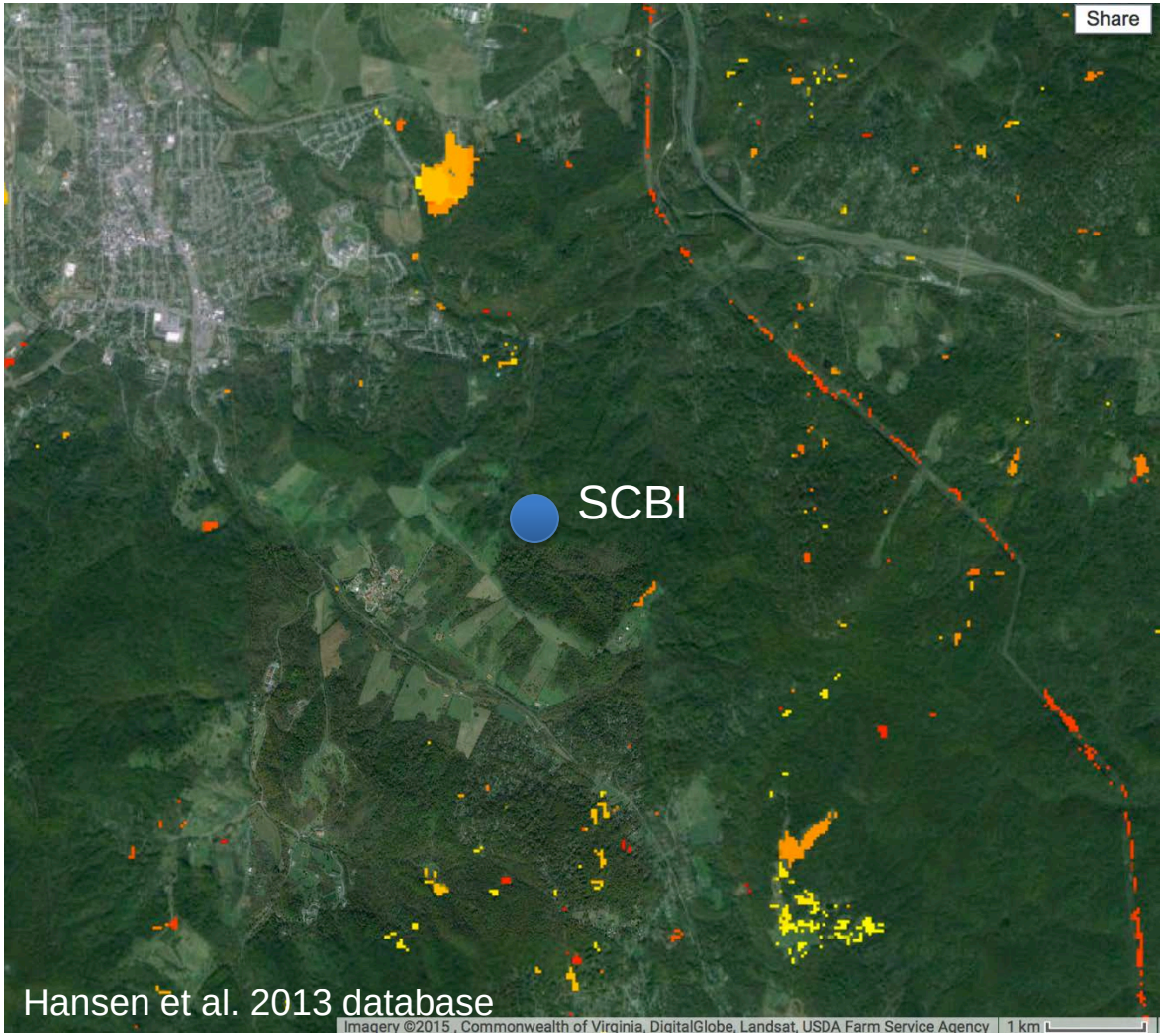
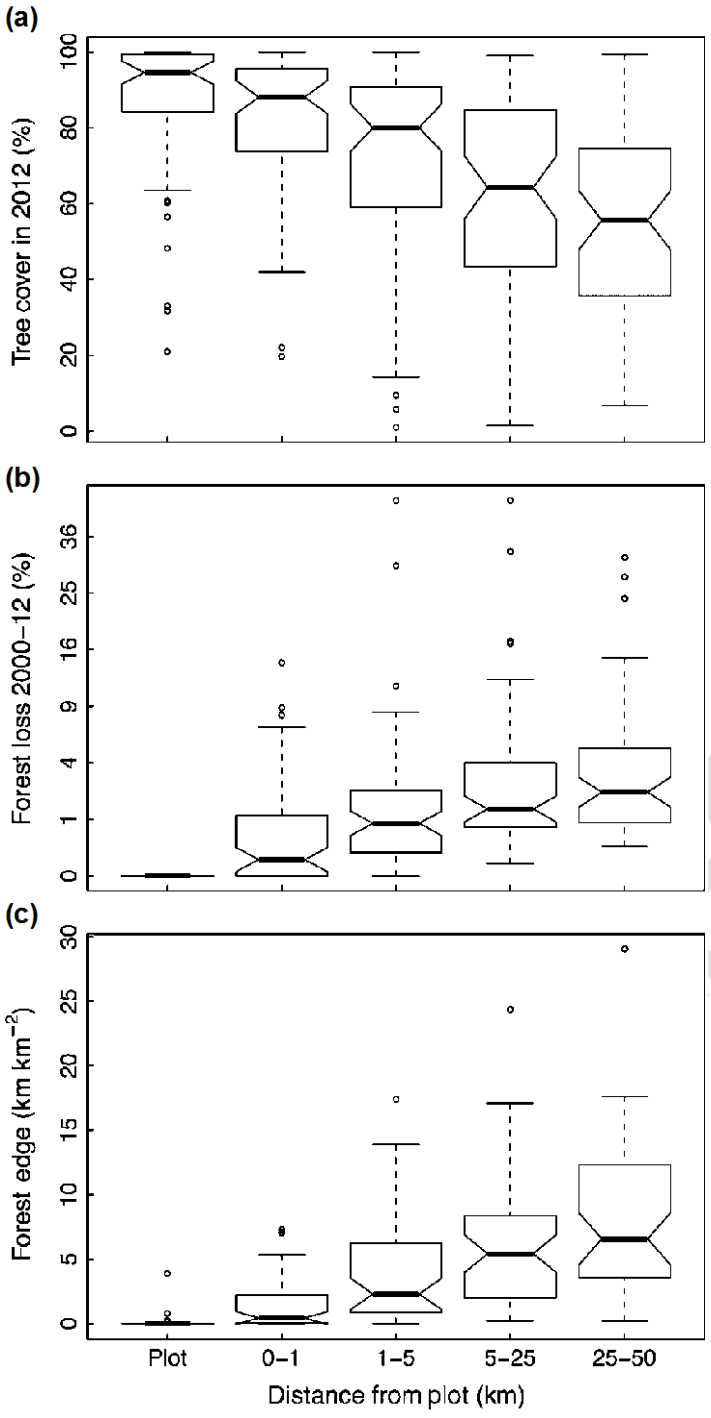
CTFS-ForestGEO plots in the landscape setting

Forest loss 2000(yellow)-2012 (red)

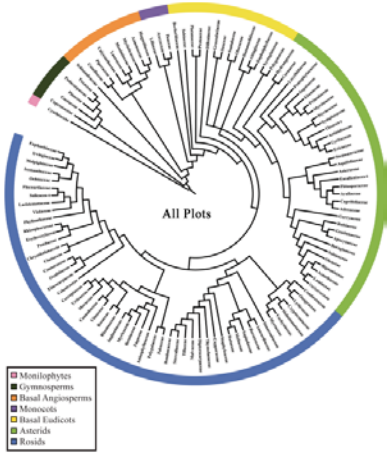




3- Supplementary Measurements

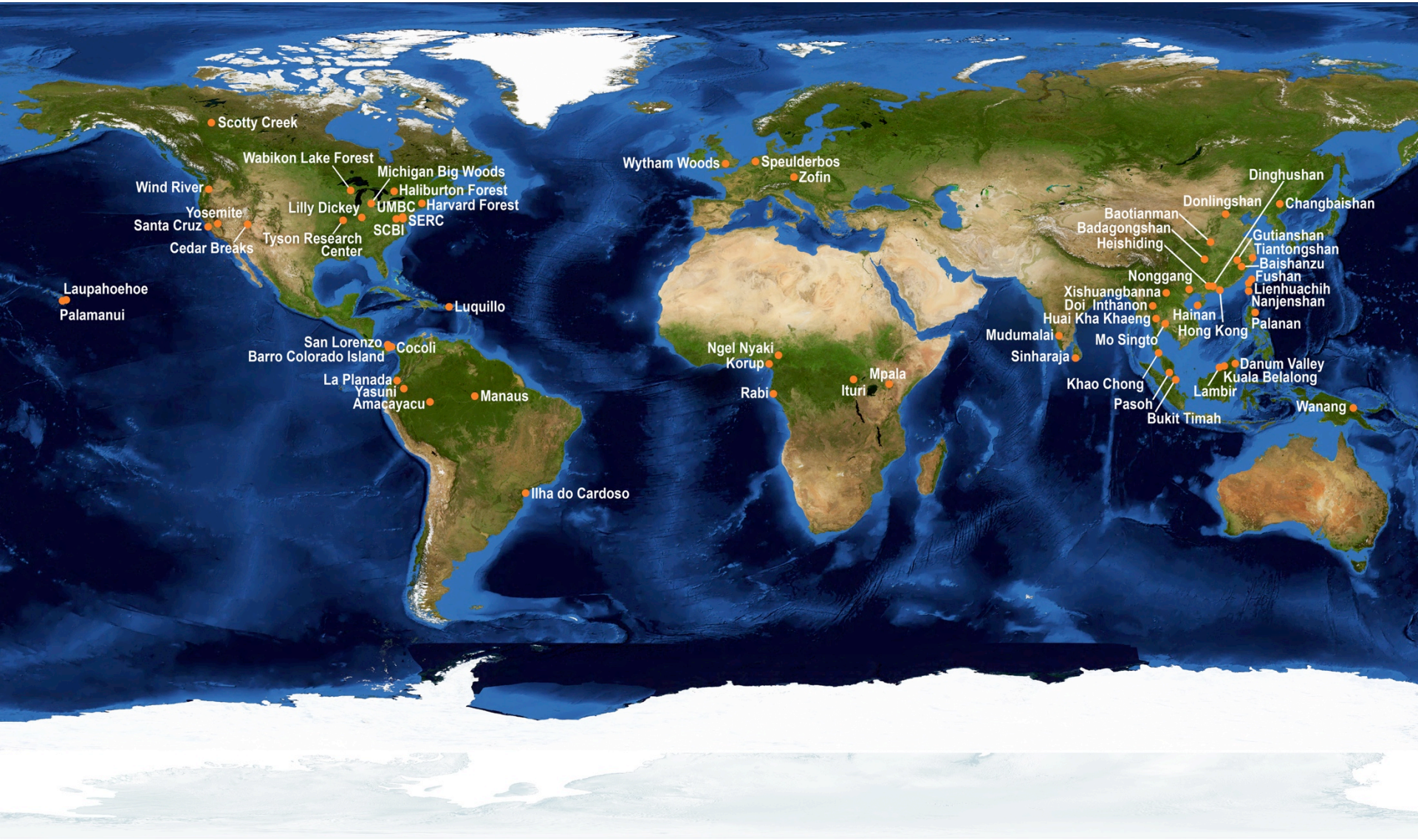
Standardized measurements quantify multiple aspects of forest structure and function.

Measurement

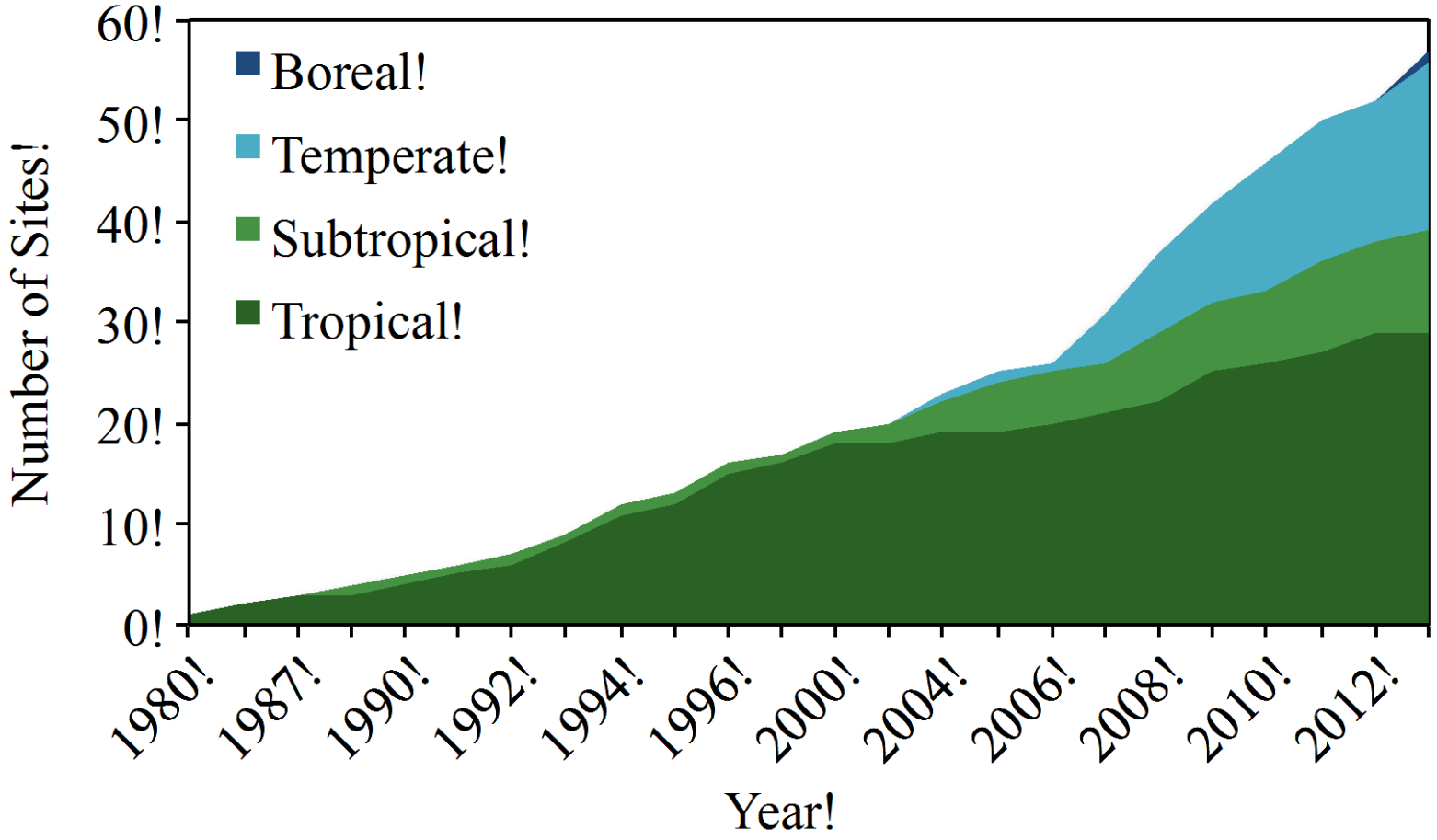


phere gas exchange (15)

4- Network Growth & Operations



Growth of CTFS-ForestGEO



Investigators

Network leadership: Smithsonian

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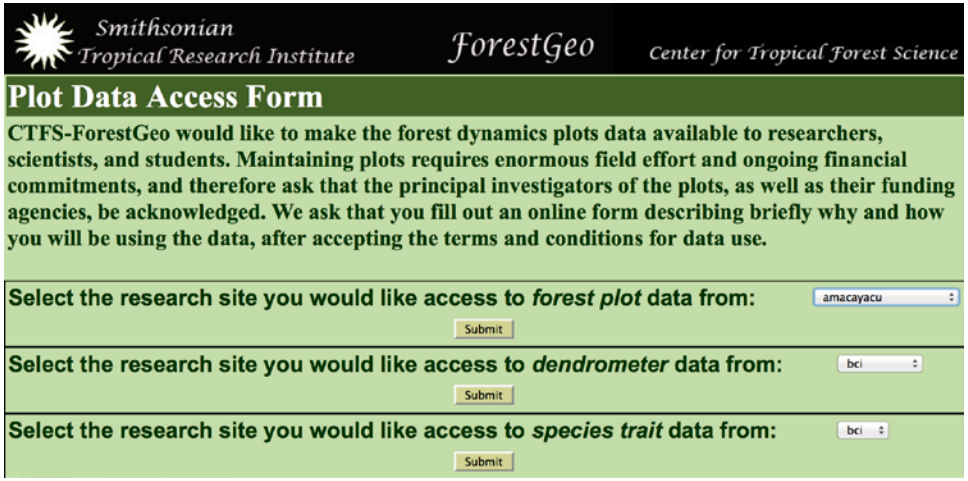
National and International Training and Capacity Building

Strengthens scientific capacity across the global network of sites

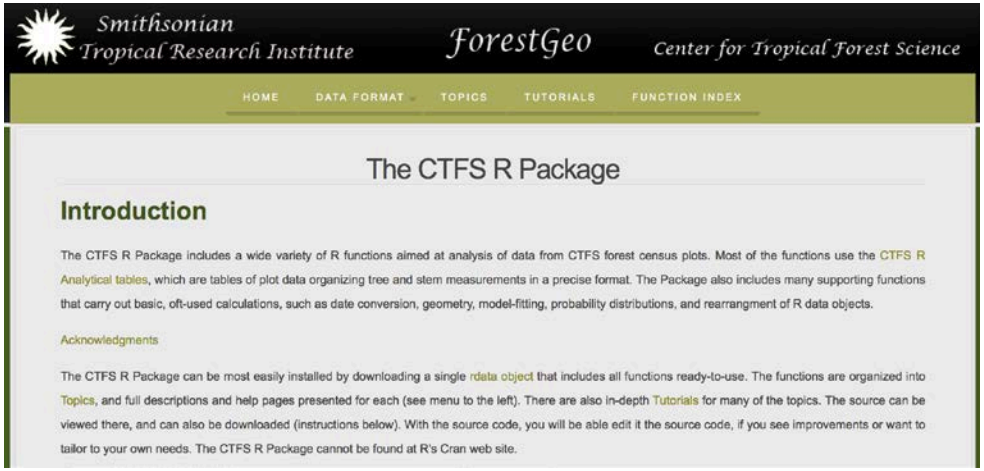
Provide open-access analytical and data management tools

Data & Analysis

- Data archived in standardized format
- Stored in CTFS database or managed locally
- Owned by site PIs



- CTFS R package facilitates analysis



Leveraging CTFS-ForestGEO to understand forest dynamics in an era of global change

Smithsonian Institution Global Forest Observatory
Center for Tropical Forest Science

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Thank you!

Results: Diversity & Dynamics of Tropical Forests

1. Tree species have aggregated spatial distributions driven by specific habitat requirements and limited dispersal.

2. The functional characteristics and demography of species depend on the resources available in their preferred sites.

3. Habitat specialization is not sufficient to explain local tree diversity (evidence for resource-based niches needed).

1. Negative density-dependent effects are pervasive. Pests/pathogens are implicated.

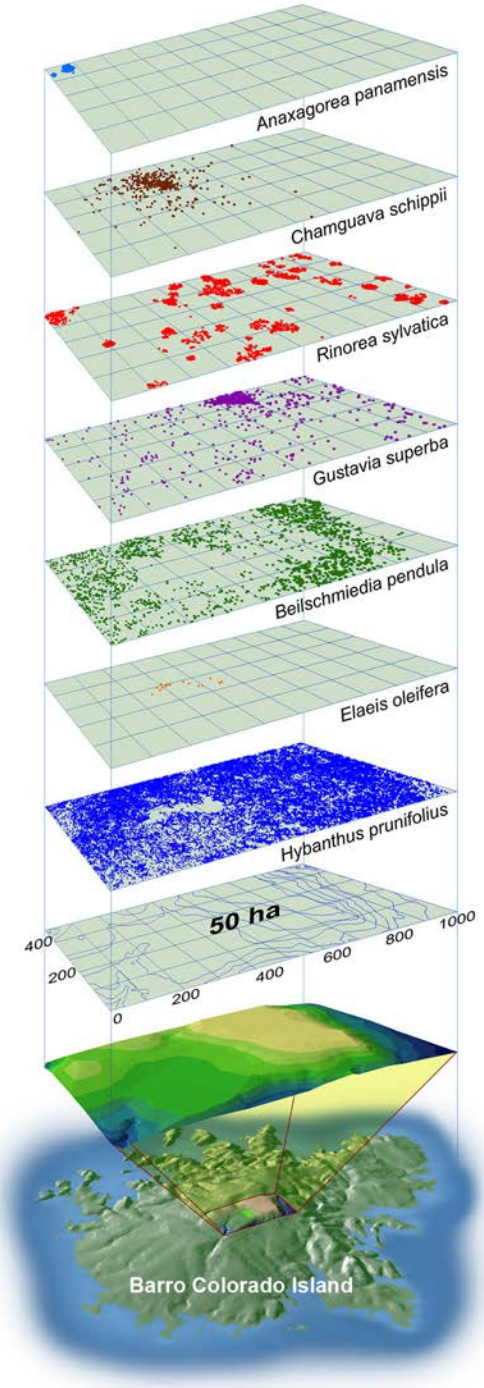
2. Biomass & C storage depend on habitat, biogeography & phylogeny.

3. Forest communities are not in steady-state compositional equilibrium

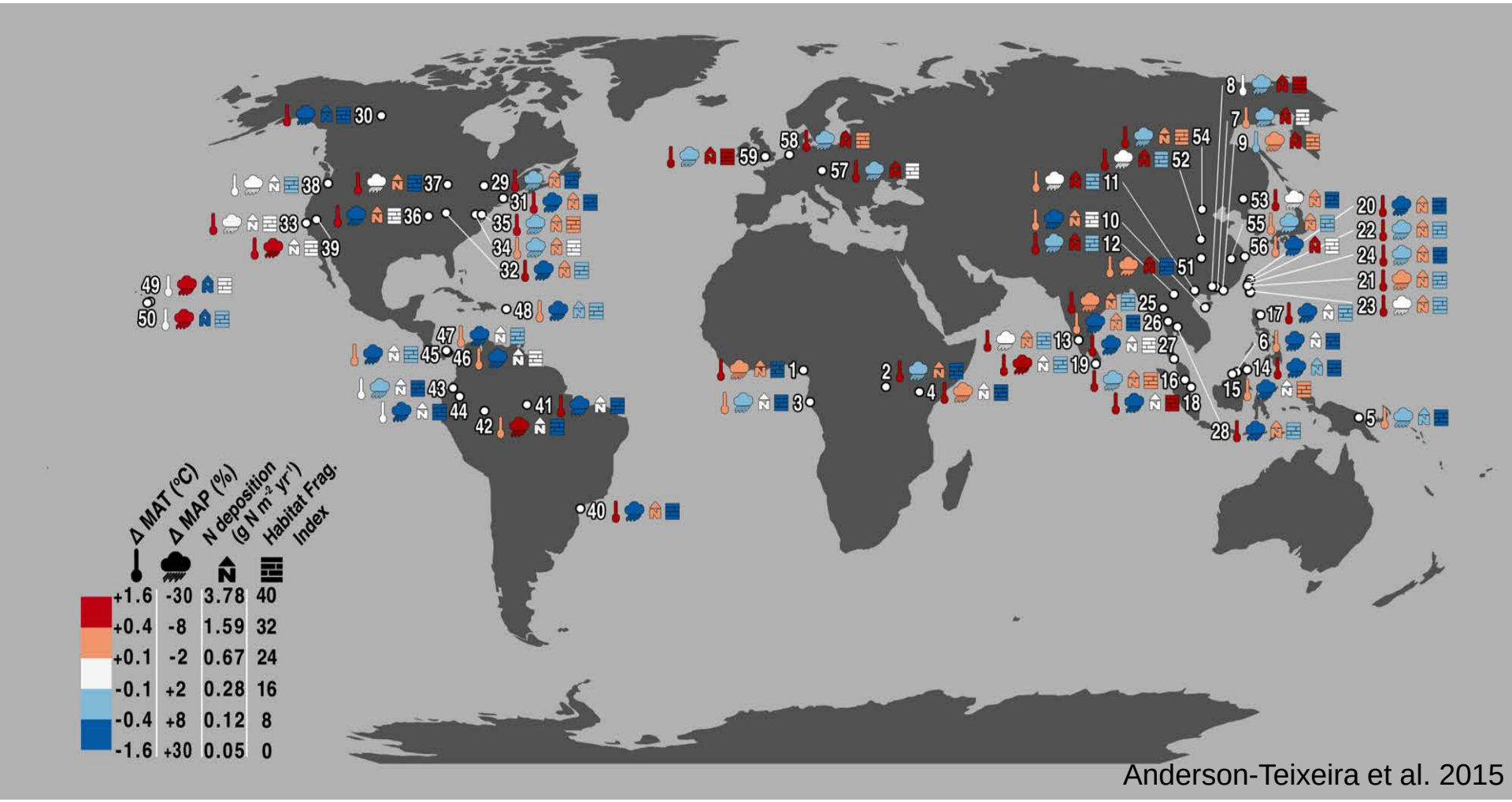
1. Some (?most) tropical forests are increasing biomass stocks.

2. Trees are growing more slowly in some tropical forests.

3. Extirpation of animals is changing forest diversity.



Global change pressures across CTFS-ForestGEO



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NEXT GENERATION ECOSYSTEM EXPERIMENT - TROPICS

BERKELEY LAB
Lawrence Berkeley National Laboratory

BROOKHAVEN NATIONAL LABORATORY

Los Alamos NATIONAL LABORATORY EST. 1943

OAK RIDGE National Laboratory

Pacific Northwest NATIONAL LABORATORY

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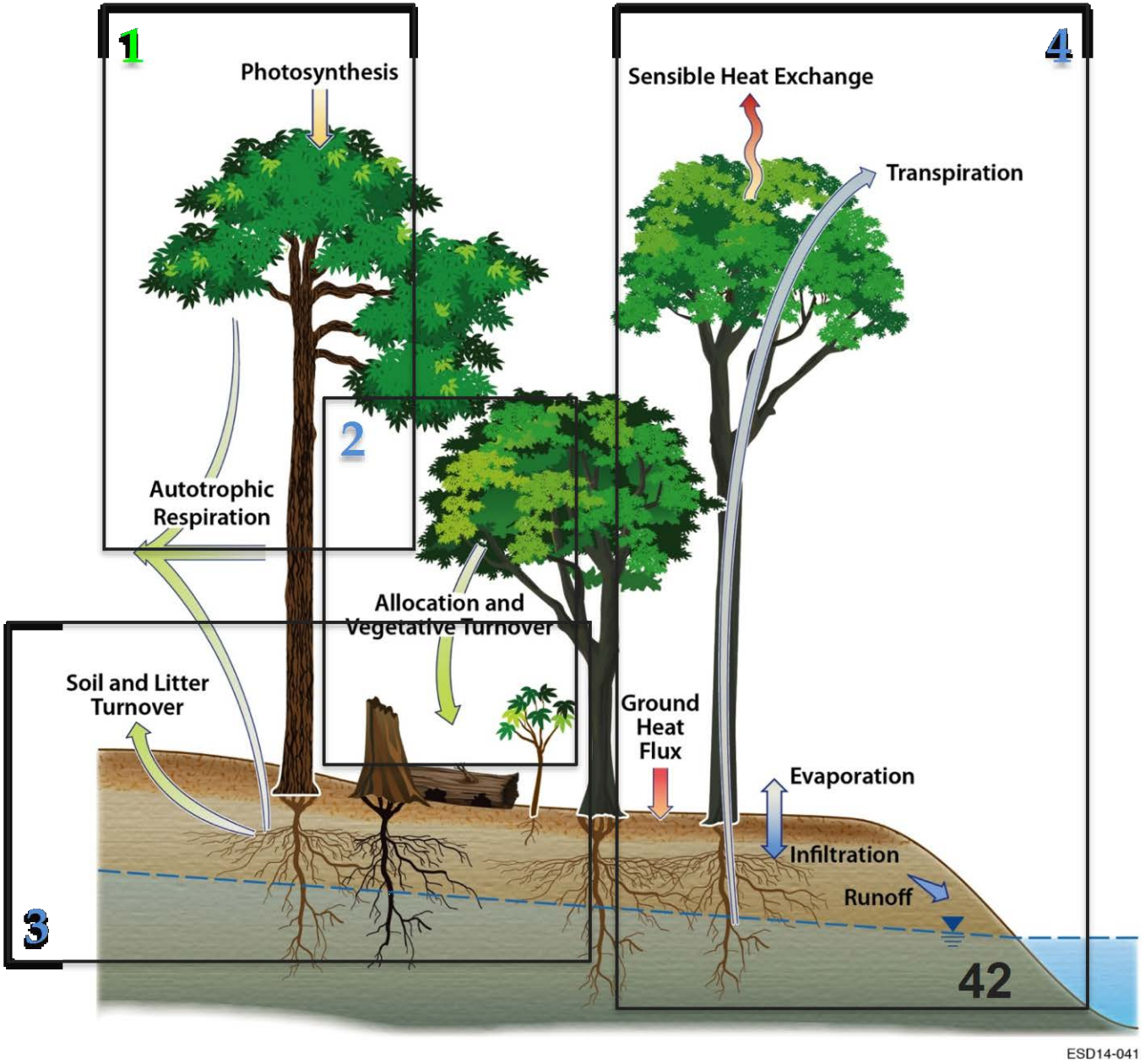
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

More detailed mechanistic models of processes determining carbon/energy balance in the tropics



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Title 1–20	Cited by	Year
The unified neutral theory of biodiversity and biogeography (MPB-32) SP Hubbell Princeton University Press	5023	2001
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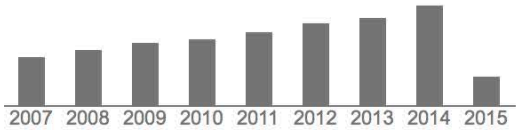

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