



GEO-TREES

Jérôme Chave (CNRS), Klaus Scipal (ESA), Stuart Davies (Smithsonian Institution), Alvaro Duque (Universidad Nacional), Beatriz Marimon (Univ Est. Mato Grosso), Oliver Phillips (University of Leeds), Camille Piponiot-Laroche (CIRAD), Irié Zo-Bi (INPHB)

March 27th, EEBIOMASS webinar

Context

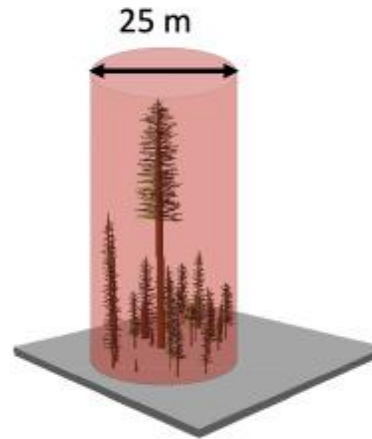
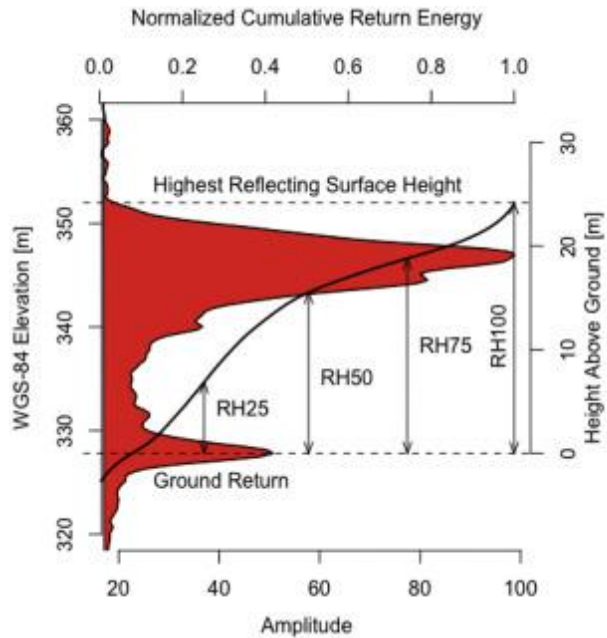
Locking up carbon in forests may, in some conditions, be an affordable strategy for mitigating carbon emissions

But there are risks:

- Forests are vulnerable (insects, wildfires)
- The forest sector is exposed to rapid shifts in the global economy
- Confidence in forest carbon credits is low

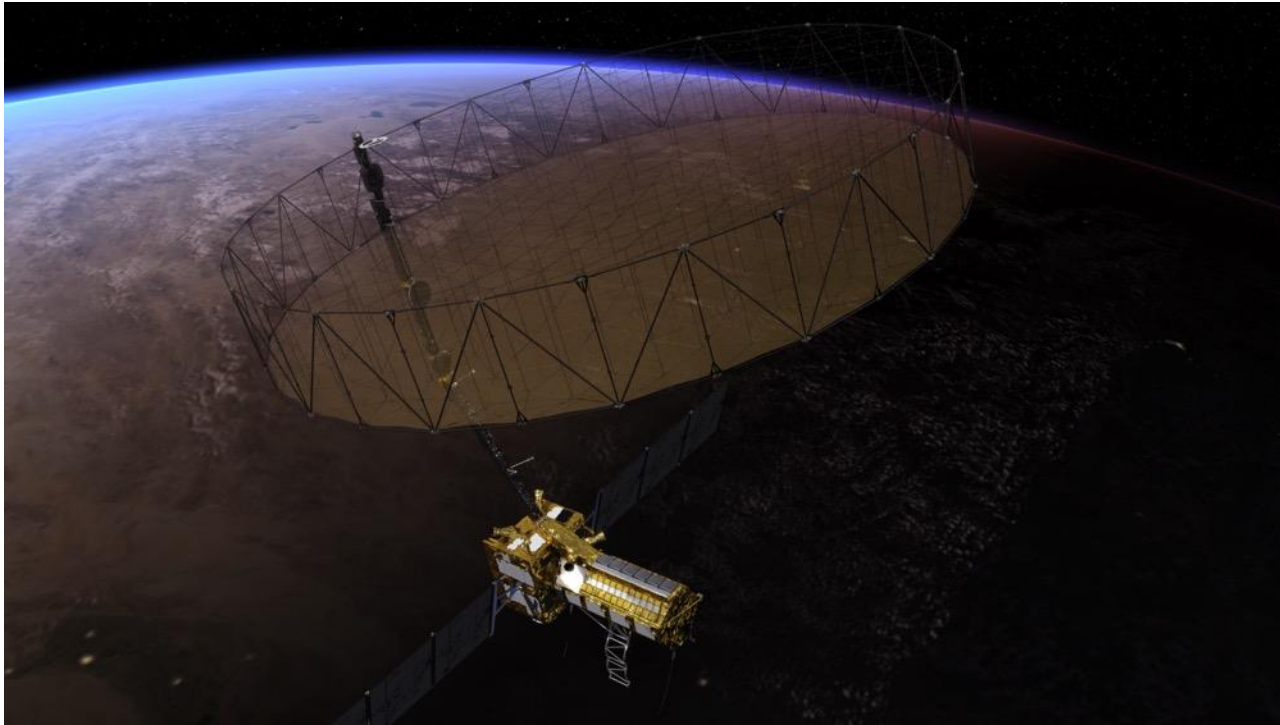
Global forest biomass monitoring is crucial

The GEDI mission



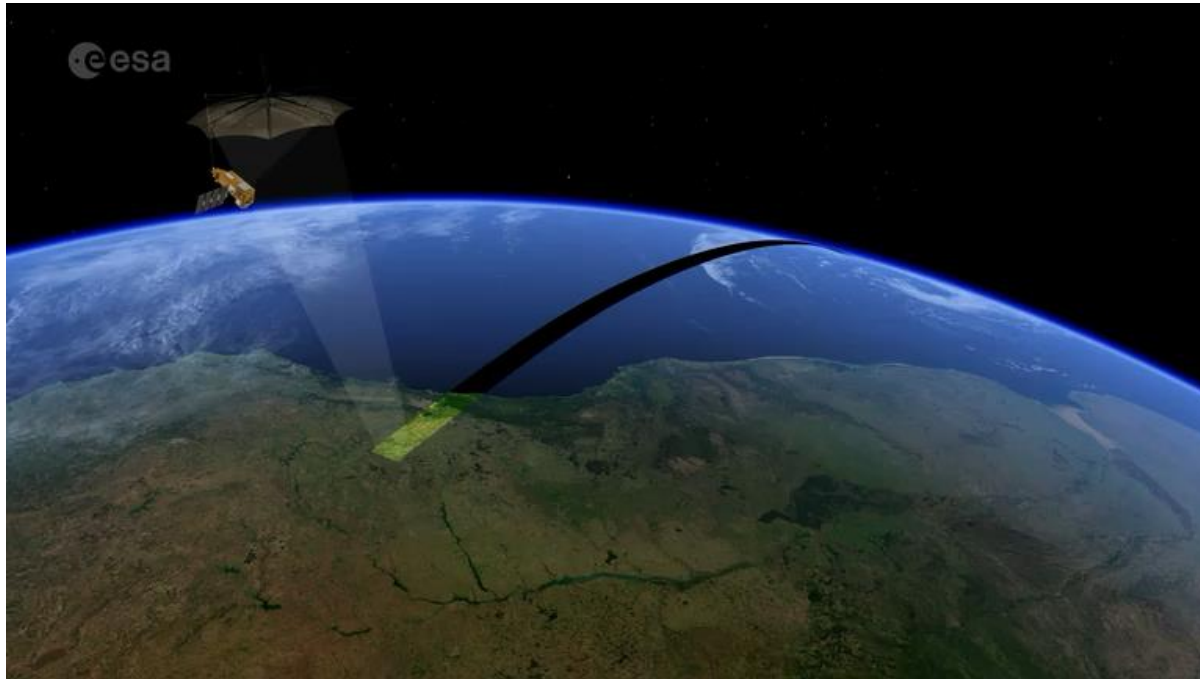
Launched December, 5th 2018

The NISAR mission



To be launched May 2025?
Paul

The BIOMASS mission



To be launched April, 29th 2025

Diversity of biomass distribution in forests



<https://geo-trees.org>

Lopé National Park, Gabon



Diversity of biomass distribution in forests



<https://>

Zhangjiajie National Forest Park



Diversity of biomass distribution in forests



GEO-TREES: Rationale



- **Three satellite Earth Observation missions** ... but none of them measures biomass, they are all based on indirect estimation
- Ground data is essential for validation of global biomass products
- Ground data acquisition is the **4th Earth Observation mission**
- Collectively, we need to ensure that **long-term permanent plot monitoring sites**, and international networks, are sustainably staffed and funded to provide these data

GEO-TREES: Goal

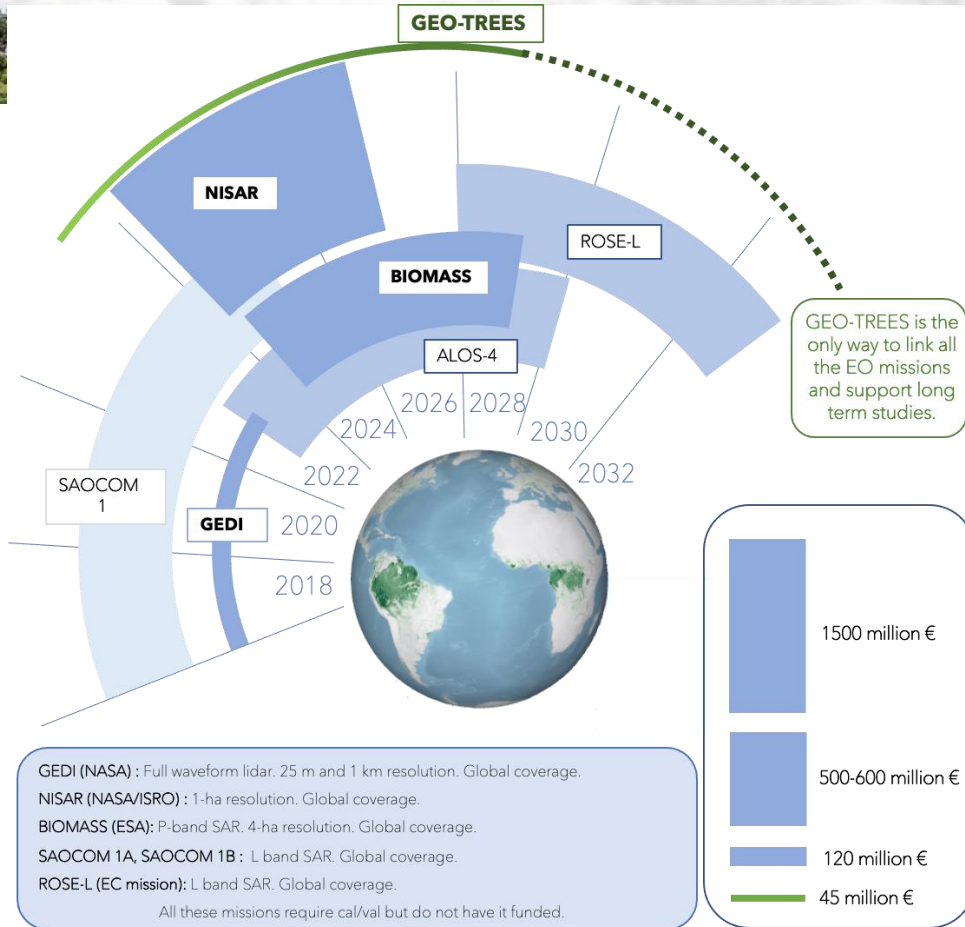


GEO-TREES is an equitable and sustainably-funded system of recurrent site-based measurements that will serve as a lasting interface between the Earth Observation agencies and ground-based tree-by-tree measurement initiatives.

This infrastructure is designed to become a common good for the entire EO community and beyond.



How much does a 4th mission cost?



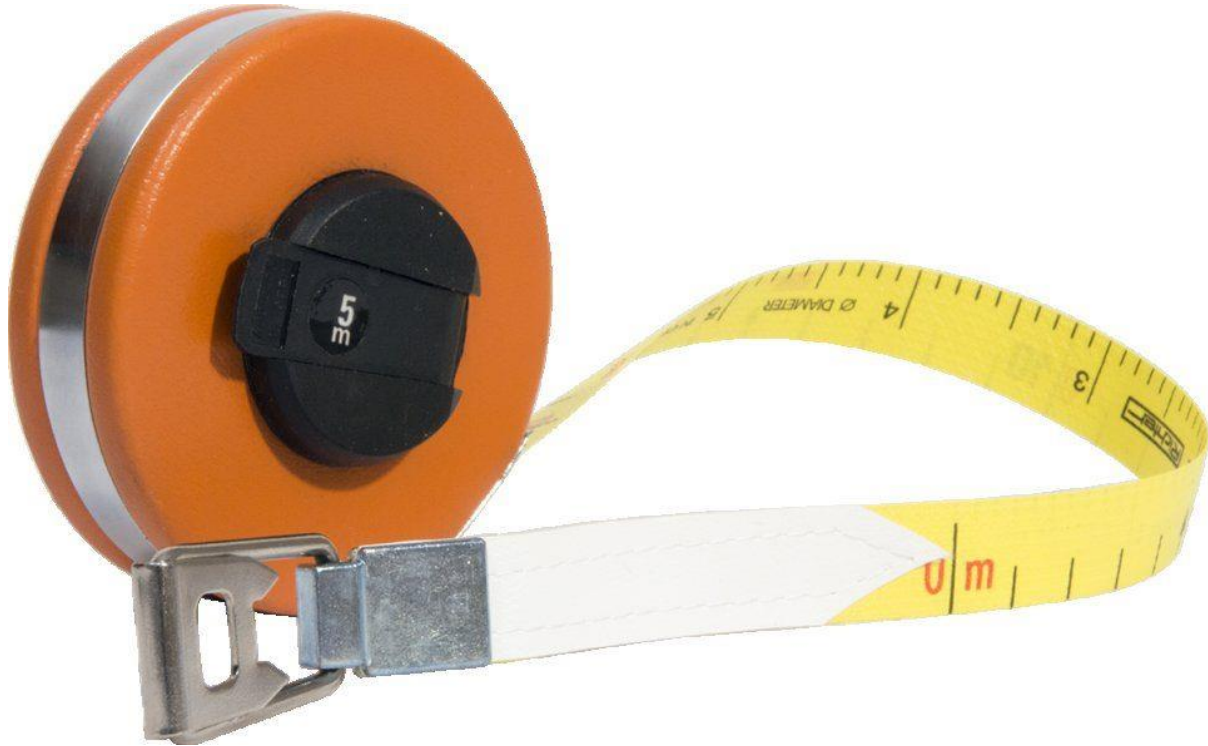
Technology



<https://geo-trees.org>



Technology



<https://geo-trees.org>



GEO-TREES: Activities



- Focus on 100 Biomass Reference Measurement sites representing the global forest typology (+210 lighter sites)
- Establish reference documents for measurement, storage and processing of data
- Combine several streams of data: (i) permanent forest inventory, (ii) airborne laser scanning, (iii) terrestrial laser scanning
- Engage with the international community through in person meetings, training opportunities, and scientific projects

Biomass Reference Measurement sites



Biomass Reference Measurement sites

Permanent forest inventories
(> 10 x 1ha)



Delivrables

Create high-quality **geolocated** AGBD estimates at 0.25 ha scale **using allometric model**

Airborne laser scanning (> 1000 ha)



Upscale plot information over landscapes **using locally calibrated AGBD-height model**

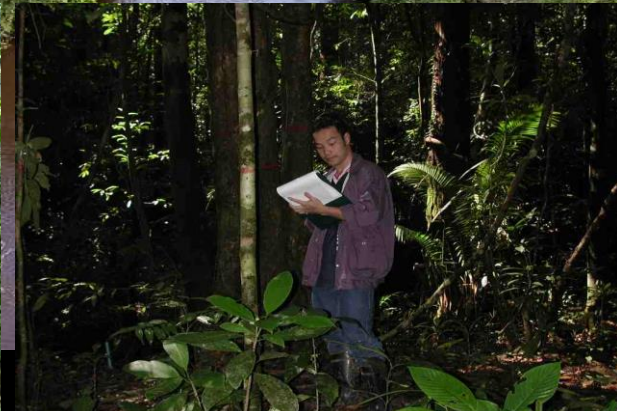
Terrestrial laser scanning (3 x 1ha)



Validate locally fitted AGB models
Provide reliable tree height values

GEO-TREES measurements: Ground plots (10-hectares per site)

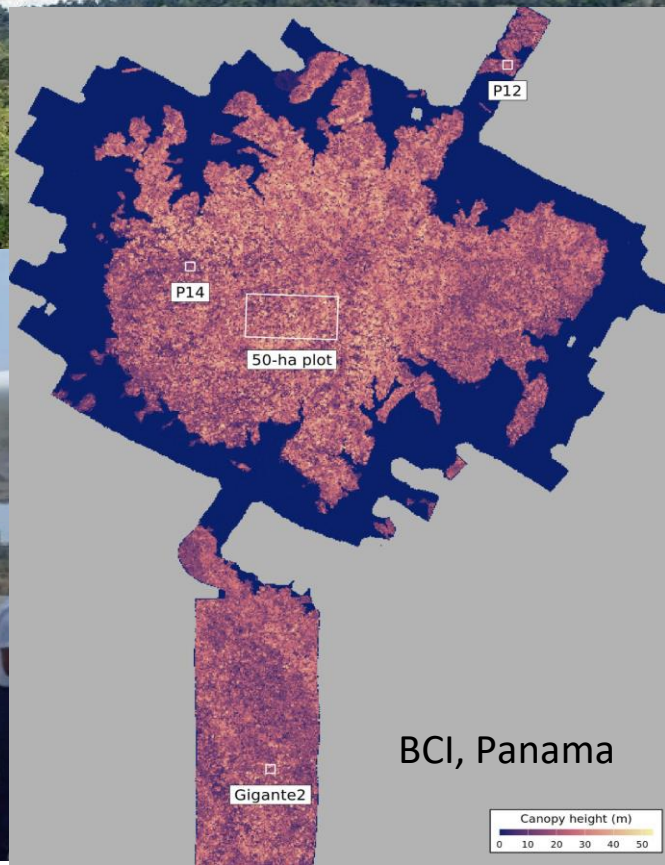
Create high-quality geolocated AGB estimates at 0.25-ha scale using a local allometric model



GEO-TREES measurements: Airborne Laser Scanning

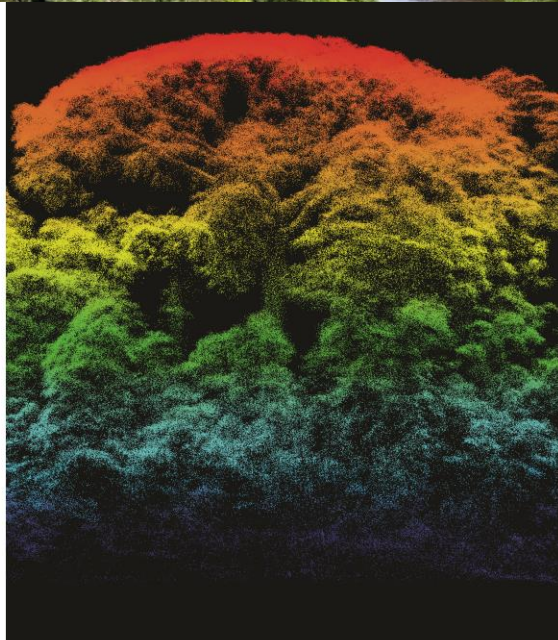
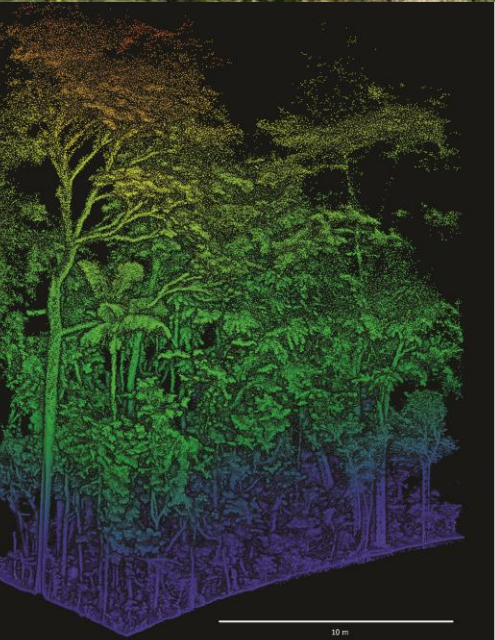
>1,000 hectares per site

Upscale plot information over landscapes using locally calibrated AGB-height model



GEO-TREES measurements: Terrestrial Laser Scanning

Survey 3 one-hectare plots at each site – representing local AGB variation



Above ground biomass validation protocol

Committee on Earth Observation Satellites

CEOS Working Group on Calibration and Validation
Land Product Validation Subgroup

Aboveground Woody Biomass Product Validation

Good Practices Protocol

Version 1.0 – 2021

Editors: Laura Duncanson, Mat Disney, John Armston, David Minor, Fernando Camacho, Jaime Nickeson

→ Consistent with IPCC Guidelines

→ accessible online

Guidance for:

Map producers on how to estimate, propagate and report errors

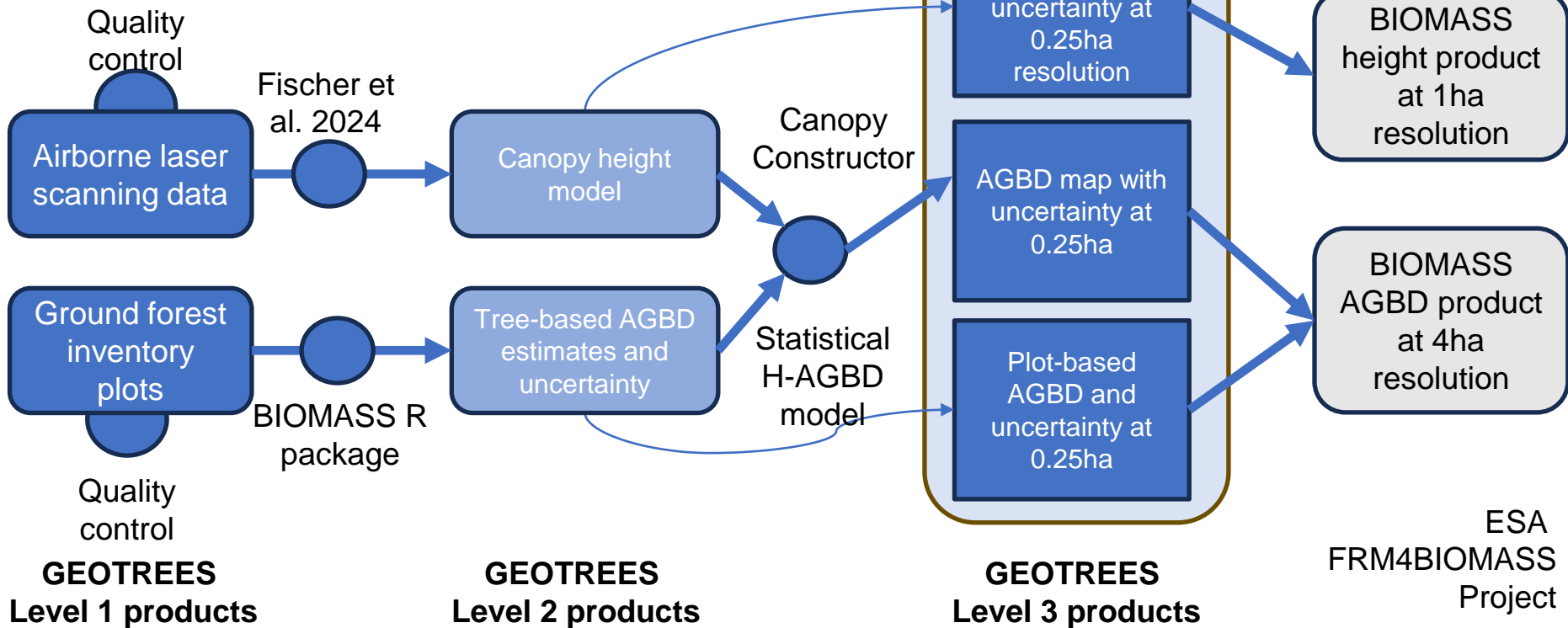
Map users on how to interpret errors:

- How to collect reference data (field and airborne lidar)
- How to use reference data to conduct independent biomass product validation

Summary of:

- State of knowledge of biomass mapping
- Community identified research and tool development priorities
- Recommendations for protocol implementation

Processing data



Technical Implementation Groups

Permanent forest inventories



Genoveva Gatti
CONICET, Argentina



Euridice Honorio Coronado
University of St Andrews, UK

Airborne laser scanning



Laura Duncanson
University of Maryland, USA



Tommaso Jucker
University of Bristol, UK

Terrestrial laser scanning



Mathias Disney
University College London, UK



Helene Muller-Landau
Smithsonian Institution, USA

Training

- GEO-TREES actively invests in the training and career development of scientists
- This includes training programs in remote sensing and Earth observation



ForestGEO workshop 2019, Singapore

Building on existing networks



... and many other projects



Establishing trusted partnerships – an on-going activity

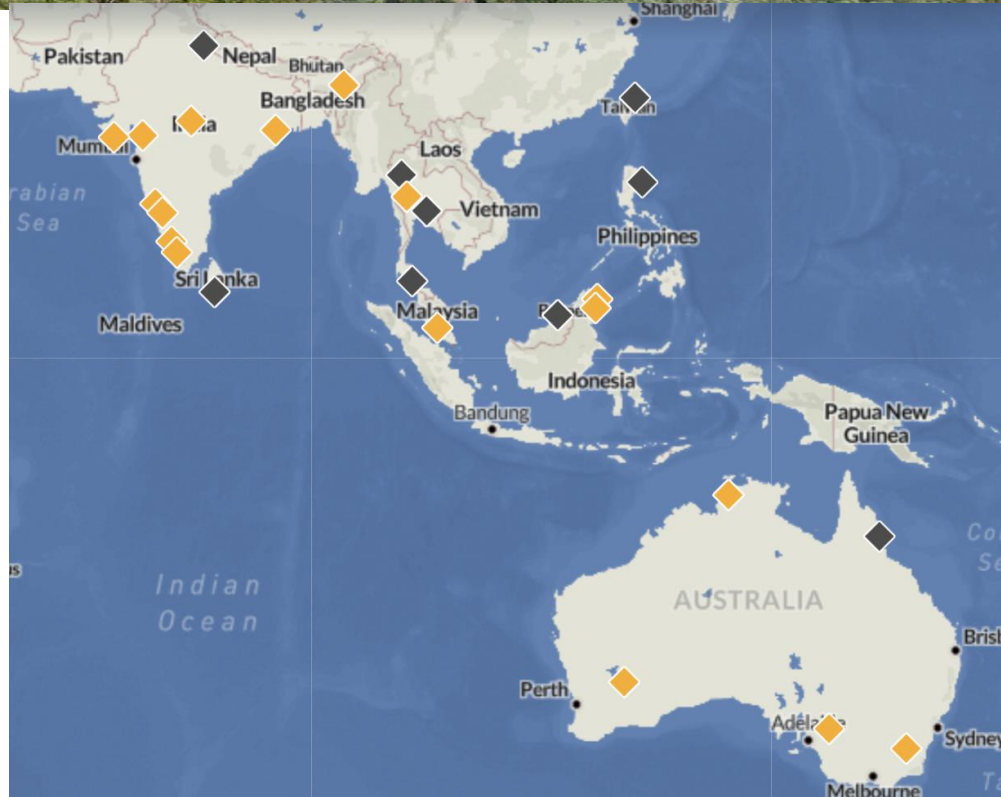
SUPPORTING PARTNERS



Progress: African & American GEO-TREES sites



Asia and Oceania GEO-TREES sites



<https://geo-trees.org>



GEO-TREES: Foster Collaboration, Share the Cost



**Looking forward to
working with you all!**

Jérôme, Klaus, Stuart, Alvaro,
Beatriz, Oliver, Camille, Irié



ขอบคุณ !

Thank you!

Matondi !

¡Gracias!

धन्यवाद !

Asante!

Terima kasih!

Cảm ơn !

Akpe !

Obrigado!

谢谢 !

Merci!

நன்றி !