Global Ecosystem Dynamics Investigation

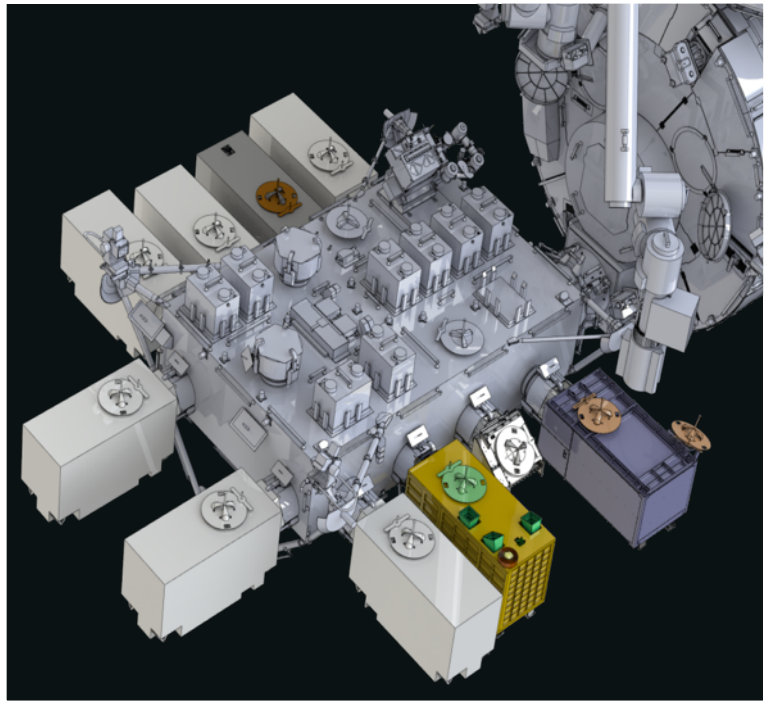
Mission Status

The GEDI Science Team

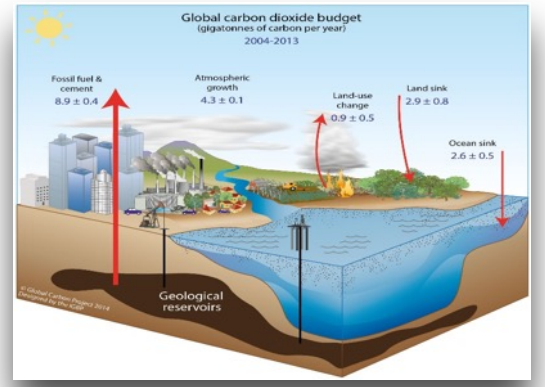
GEDI
ECOSYSTEM LIDAR

GEDI: NASA Earth Ventures Instrument (EVI)

High Resolution Laser Ranging of the Earth's Forests and Topography



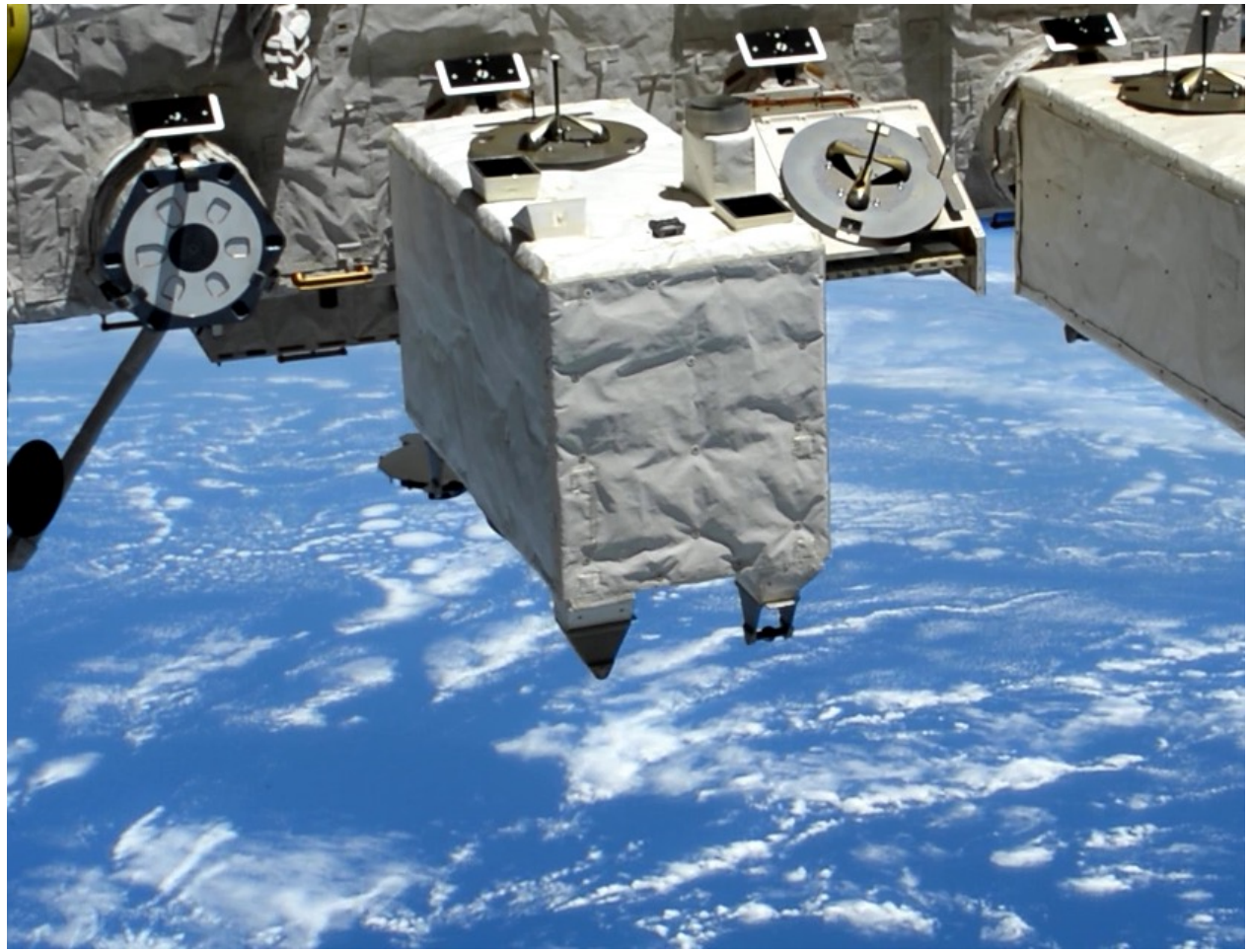
GEDI Goal: Advance our ability to characterize the effects of changing climate and land use on ecosystem structure and dynamics



Carbon Cycle

Biodiversity

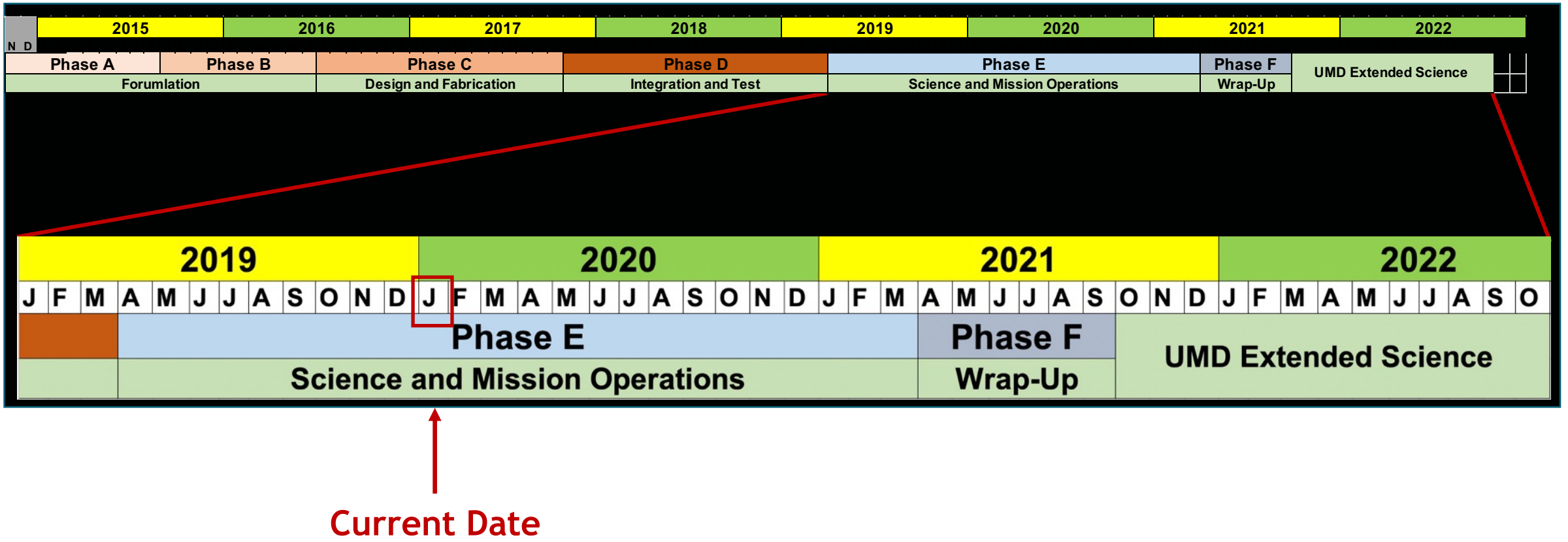
GEDI: NASA Earth Ventures Instrument (EVI)



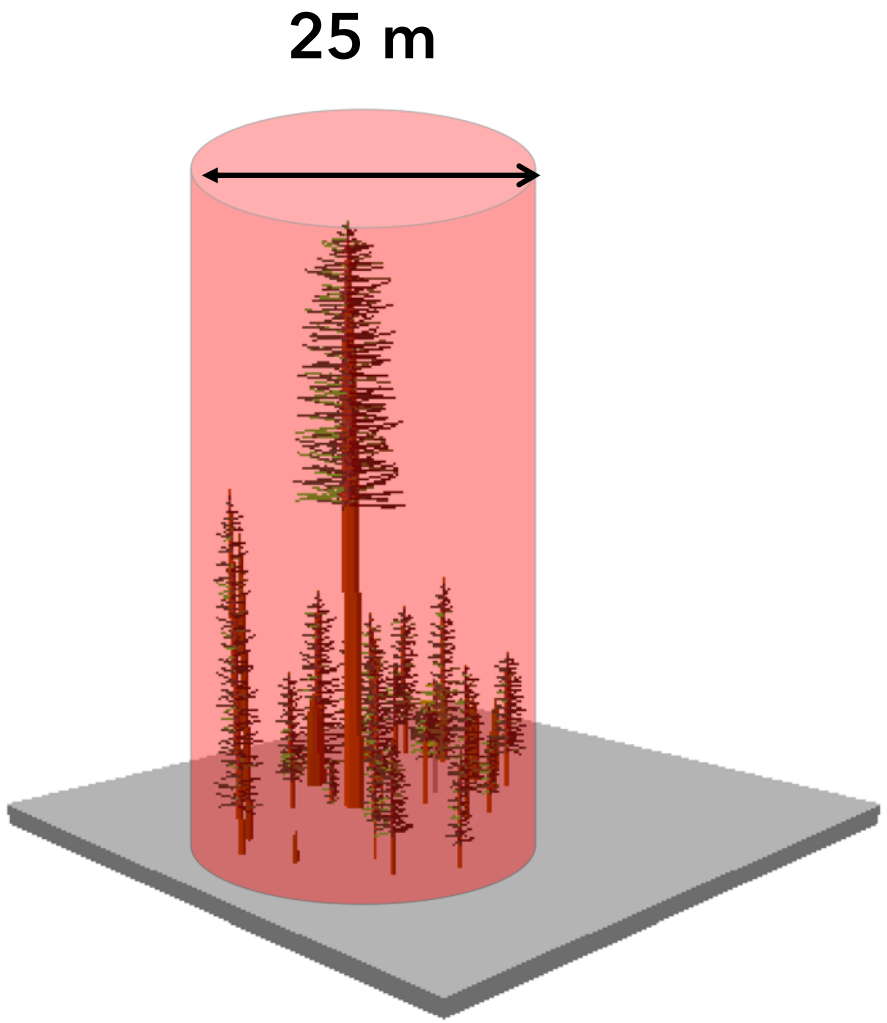
Key Facts

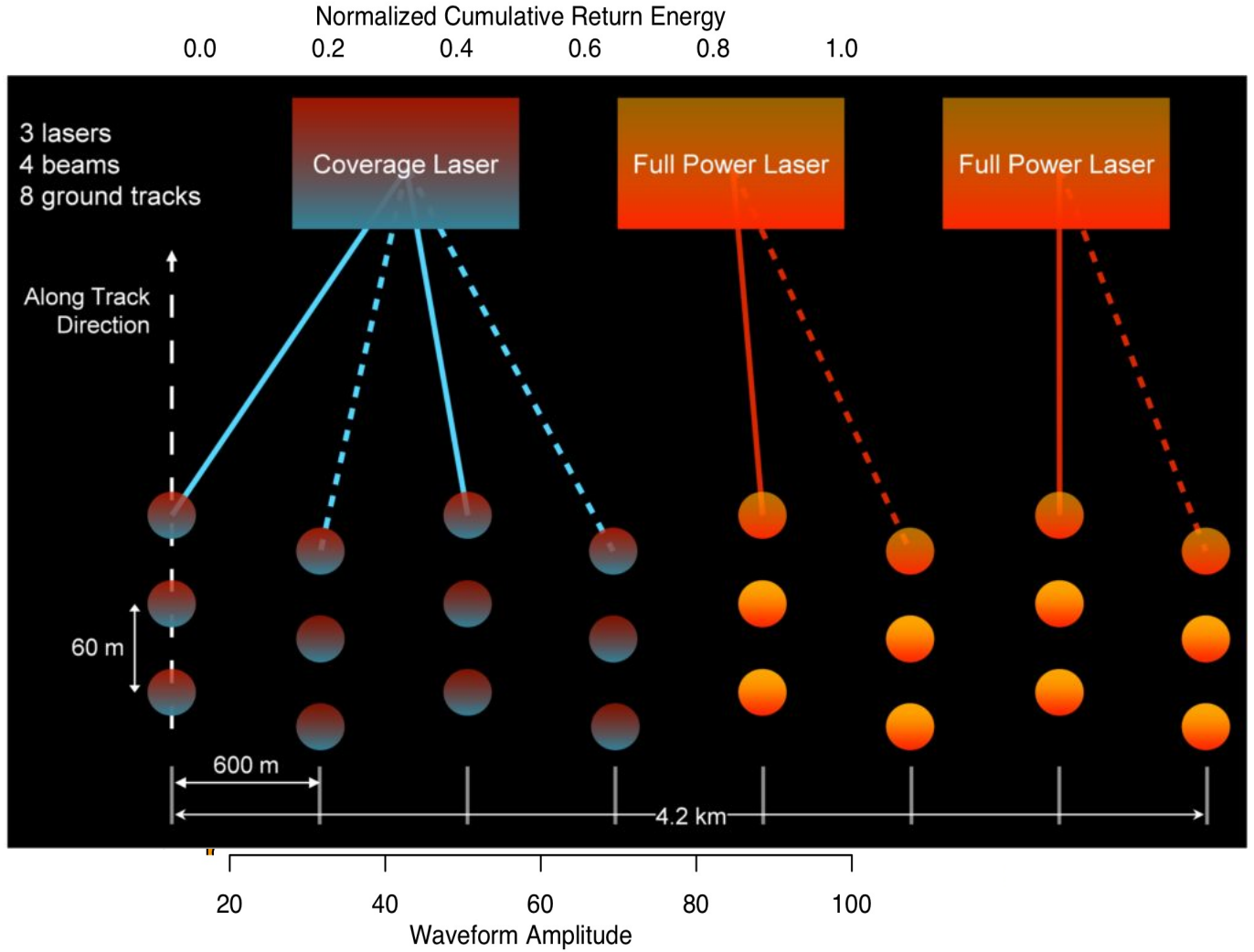
- Selected in 2014 for $94 M
- Deployed on ISS
  - Launch on SpaceX-16 in December 2018
  - Fully commissioned on 18 April 2019
- Nominal 2-year mission length
- First data was released to LP DAAC on 28th November and to the public on 21st January

Current Mission Timeline

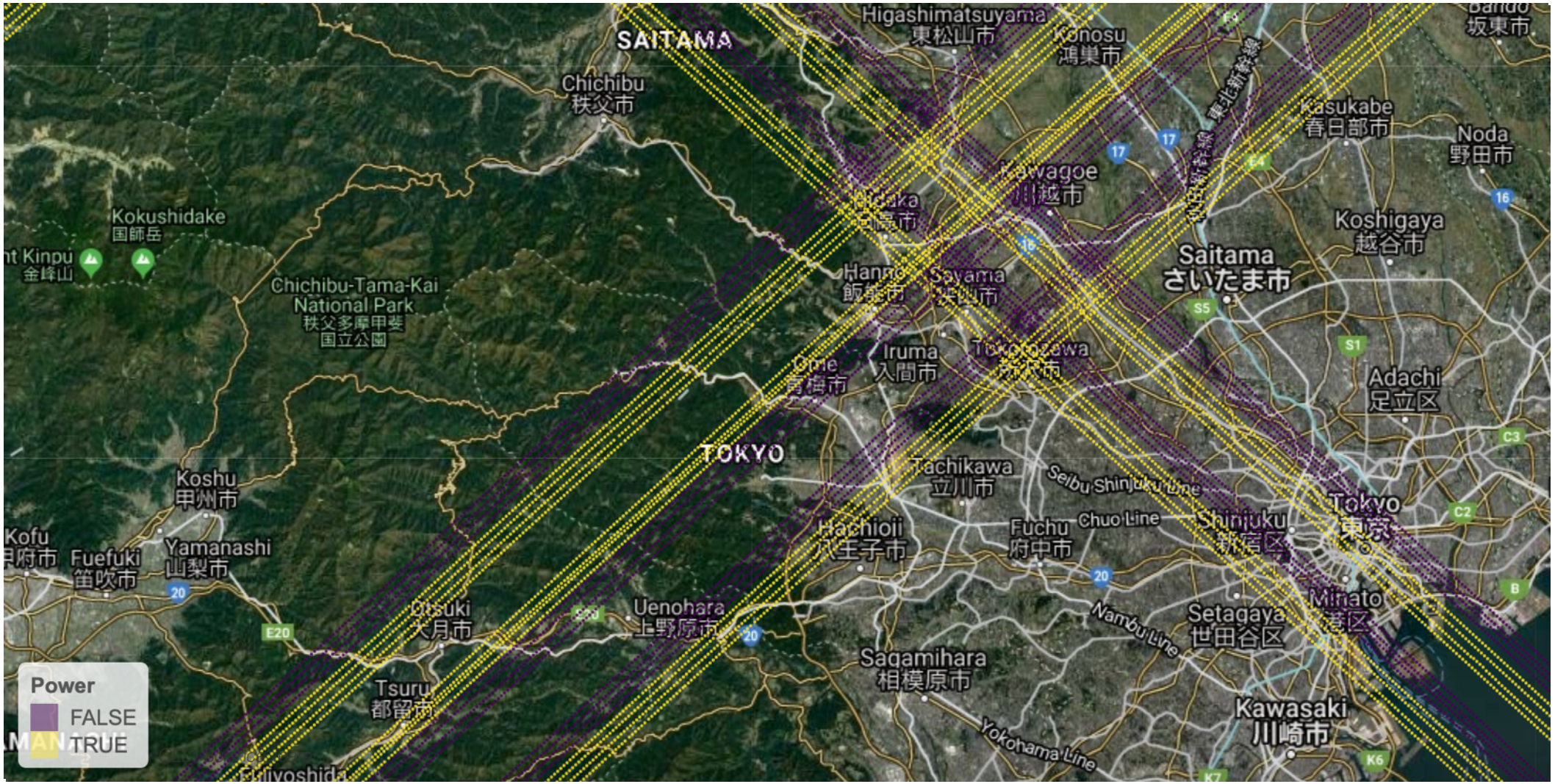


GEDI Lidar Measurements

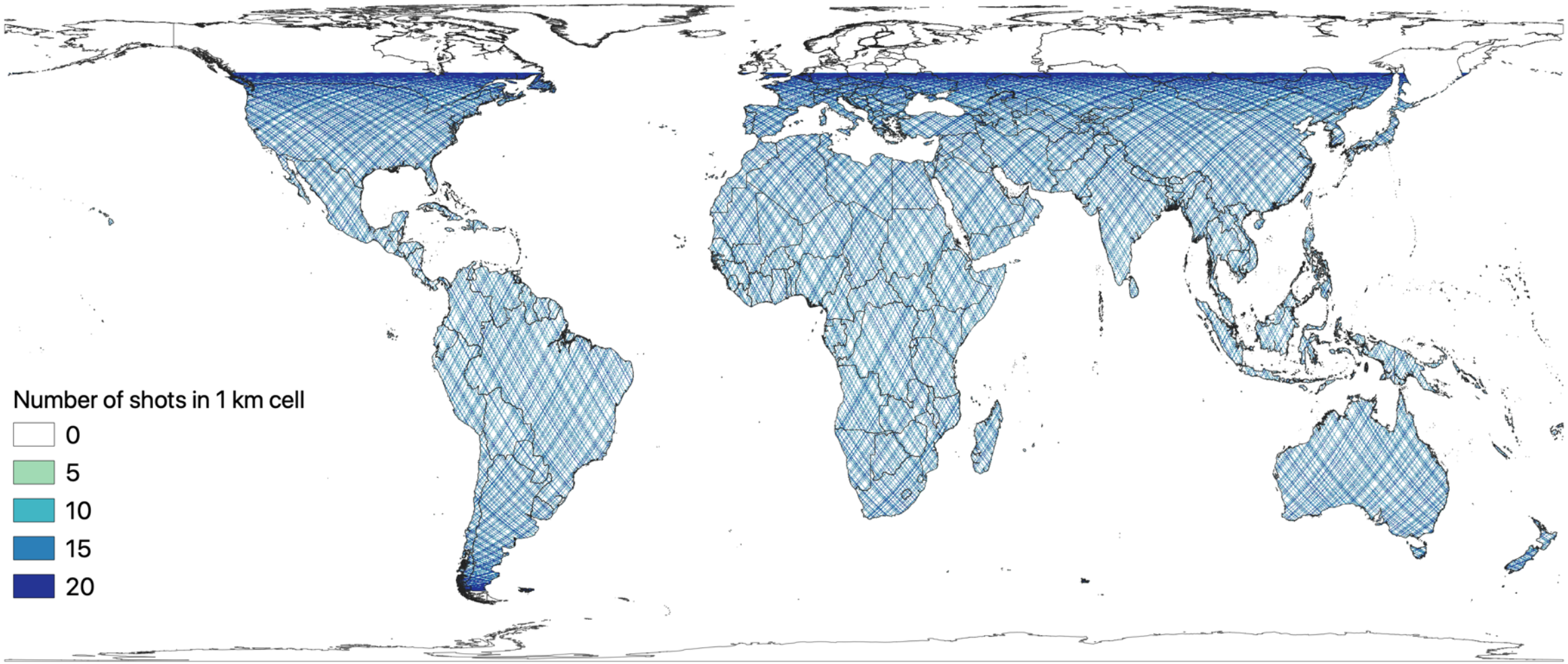




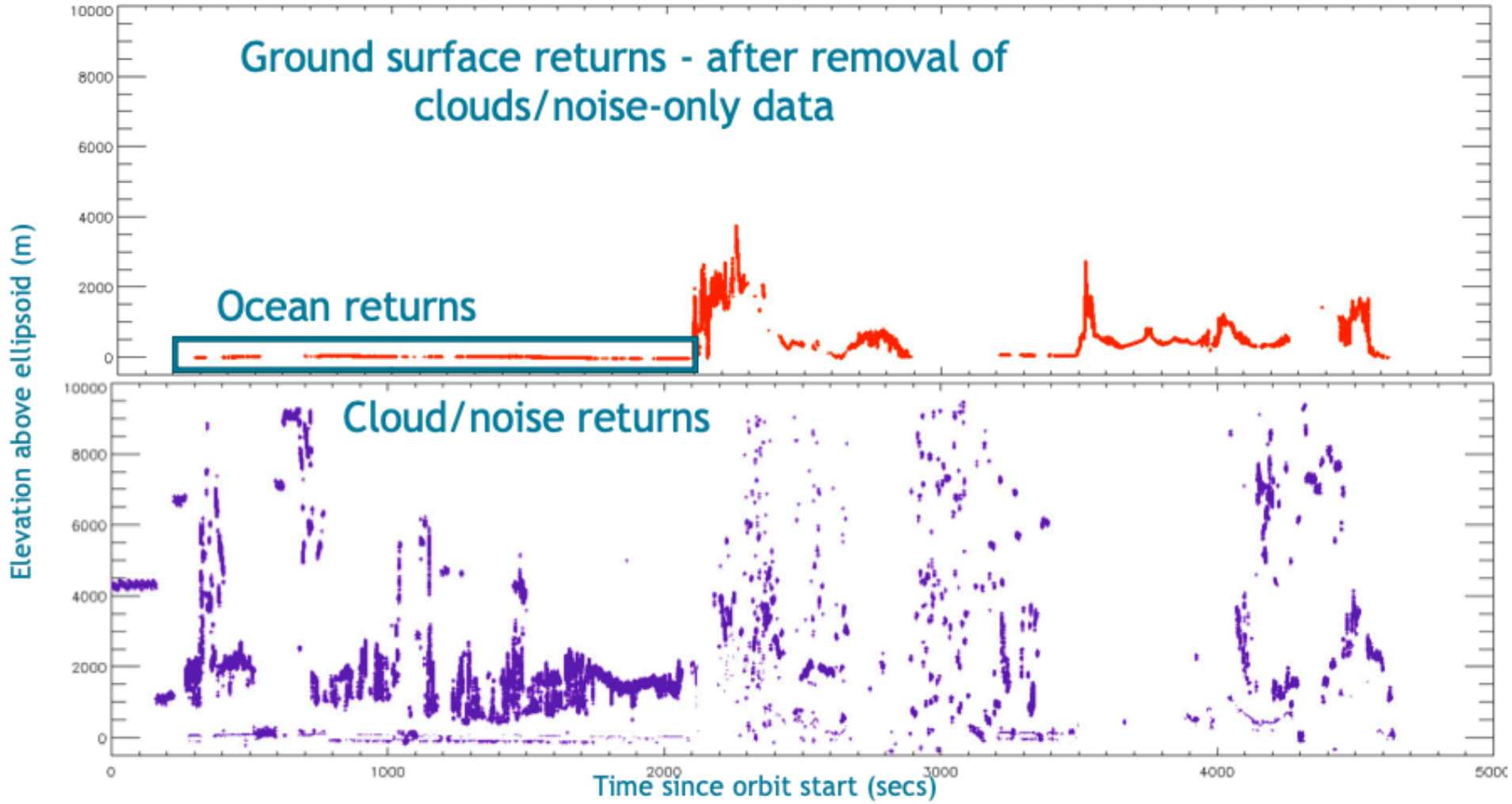
GEDI Lidar Measurements



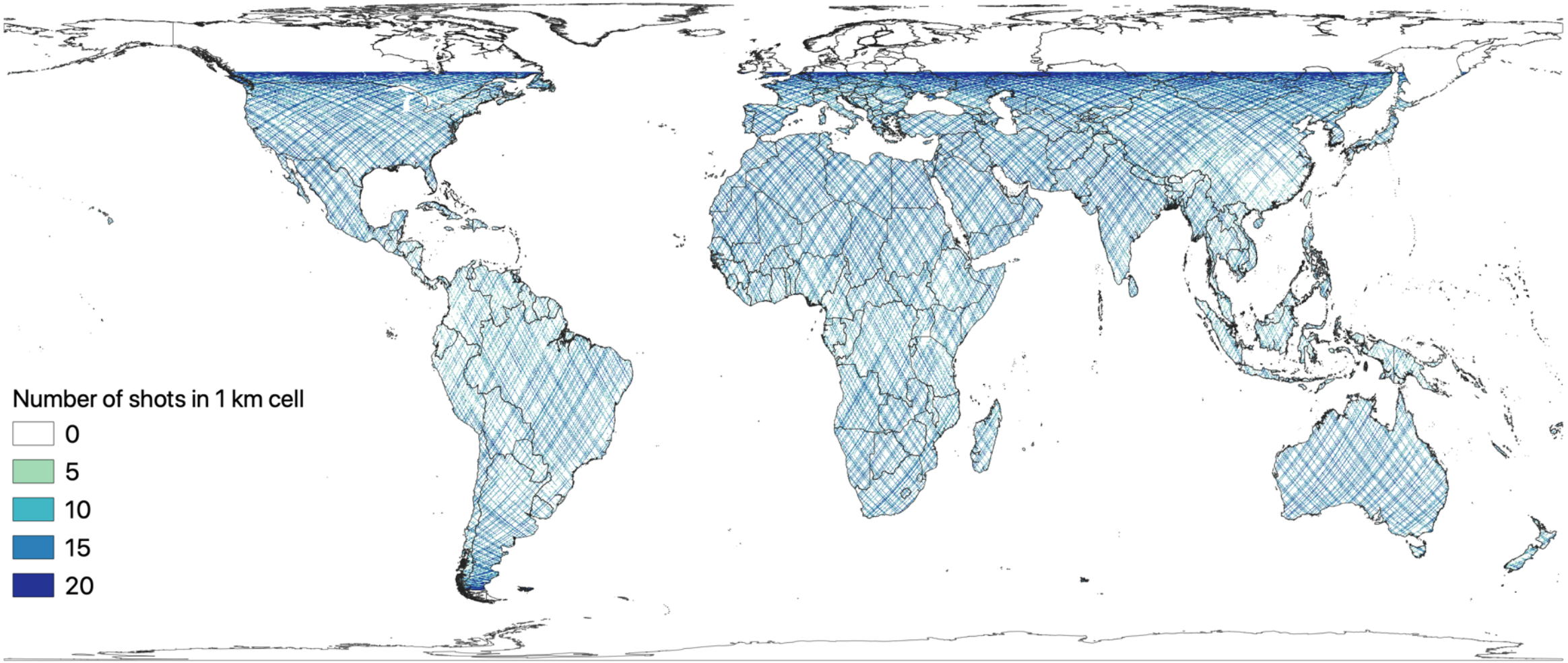
GEDI Lidar Measurements



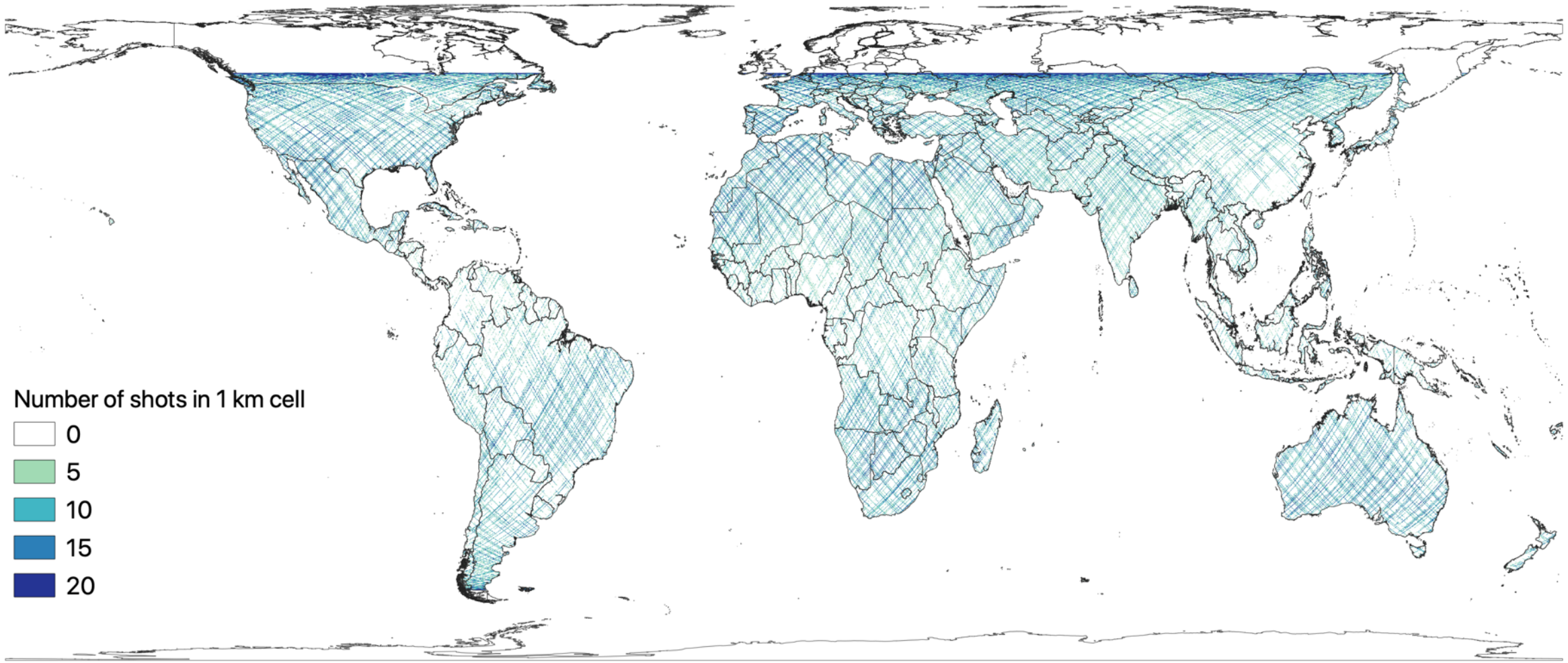
GEDI Lidar Measurements



GEDI Lidar Measurements (Land Surface)



GEDI Lidar Measurements (95% Sensitivity)

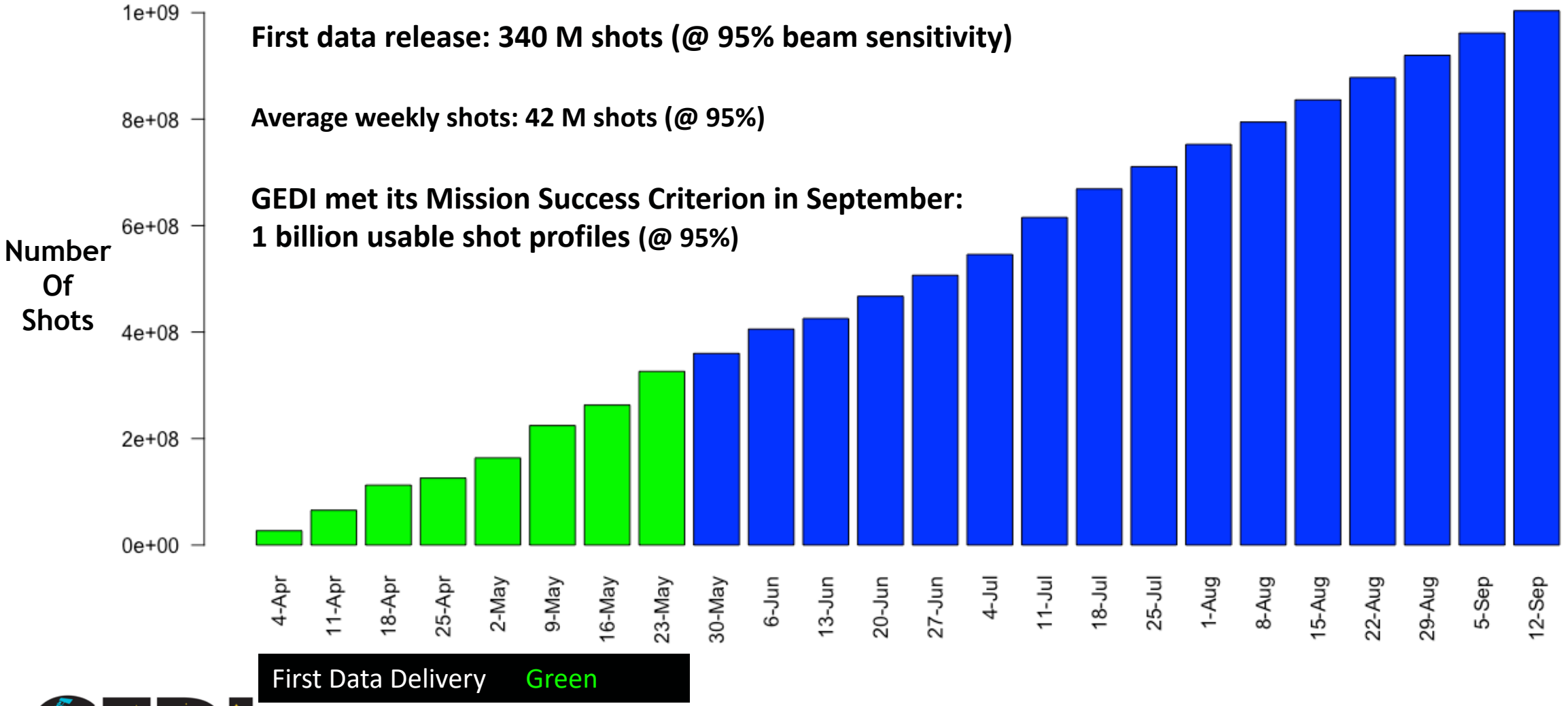


GEDI Shot Accumulation Over Land

First data release: 340 M shots (@ 95% beam sensitivity)

Average weekly shots: 42 M shots (@ 95%)

GEDI met its Mission Success Criterion in September:
1 billion usable shot profiles (@ 95%)



GEDI ECOSYSTEM LIDAR

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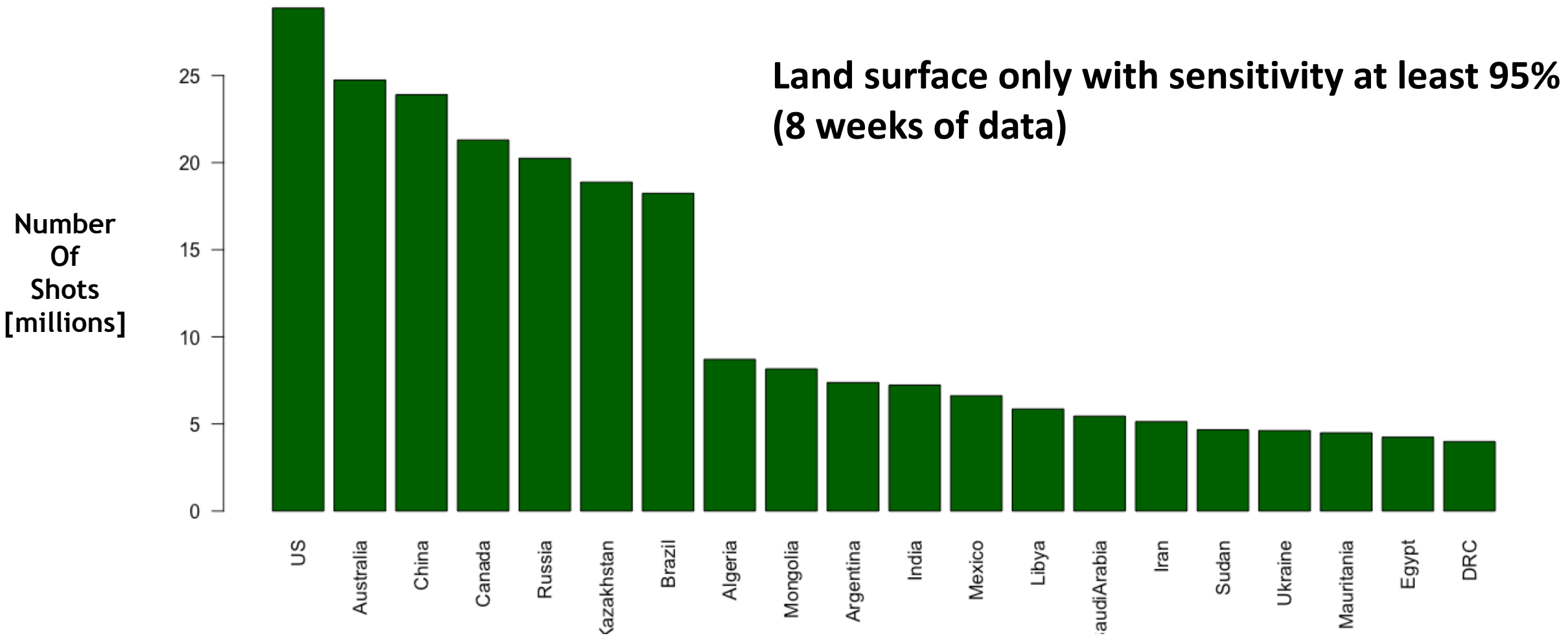
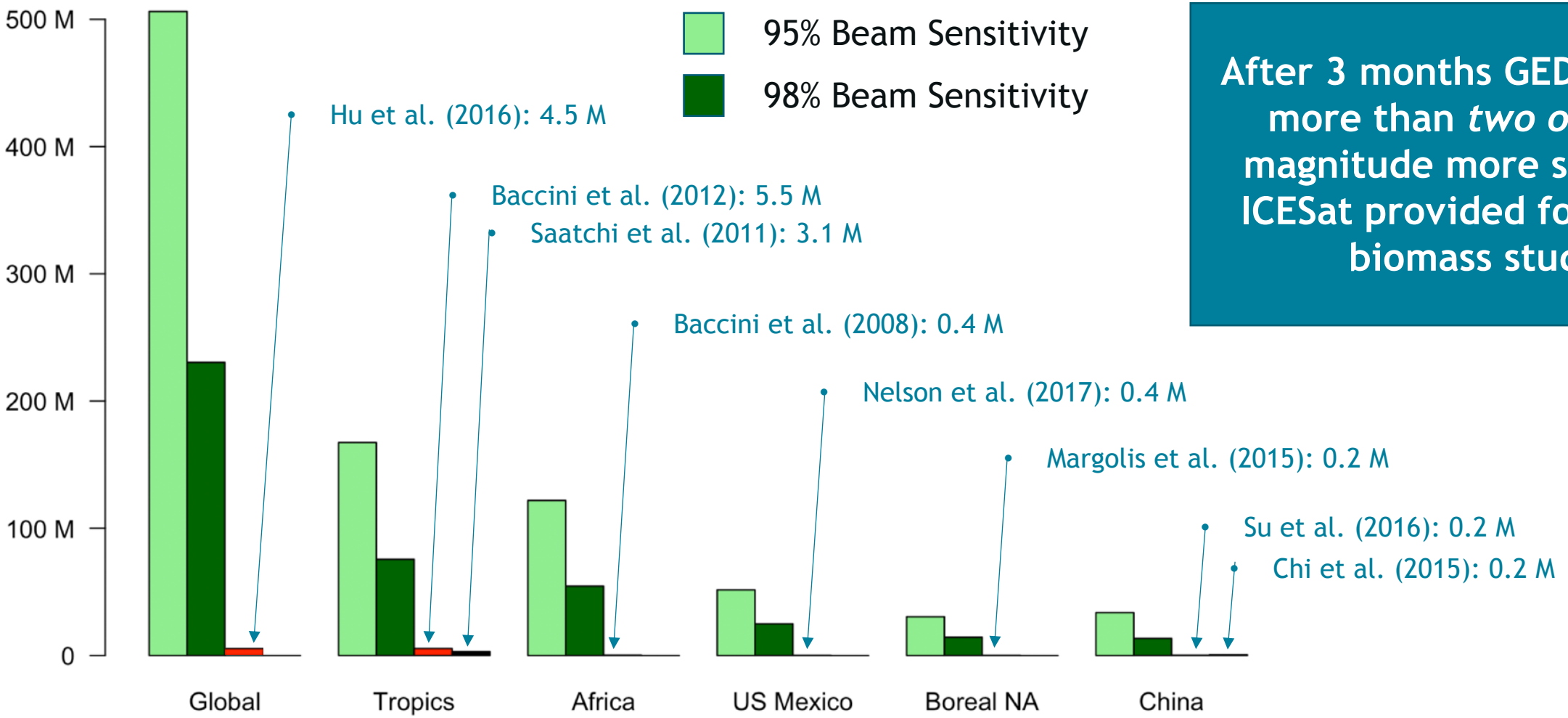
First Data Release - Shots by Country



Land surface only with sensitivity at least 95% (8 weeks of data)

GEDI Potential Impact on Biomass Estimation

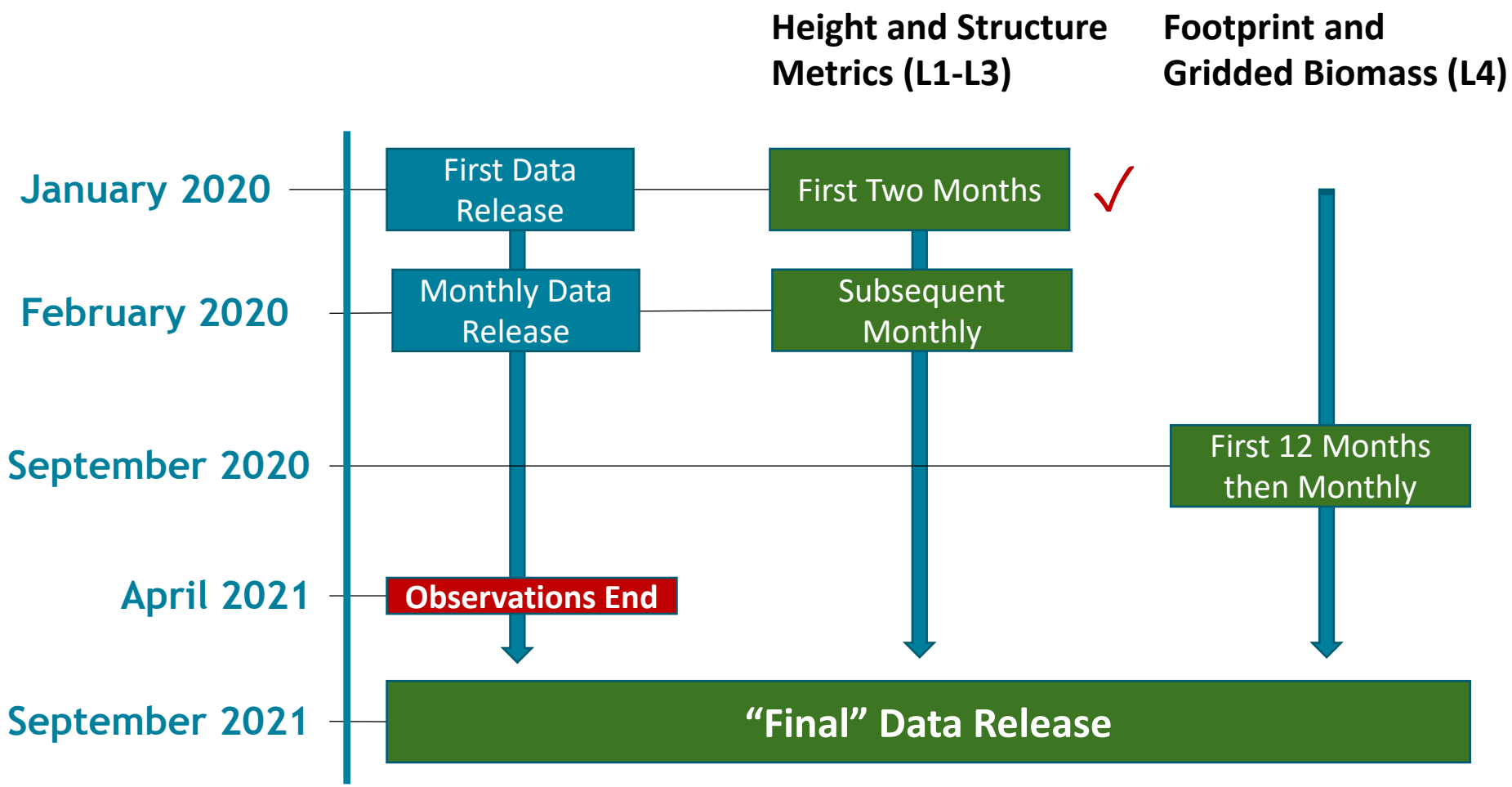


After 3 months GEDI provided more than *two orders* of magnitude more shots than ICESat provided for seminal biomass studies

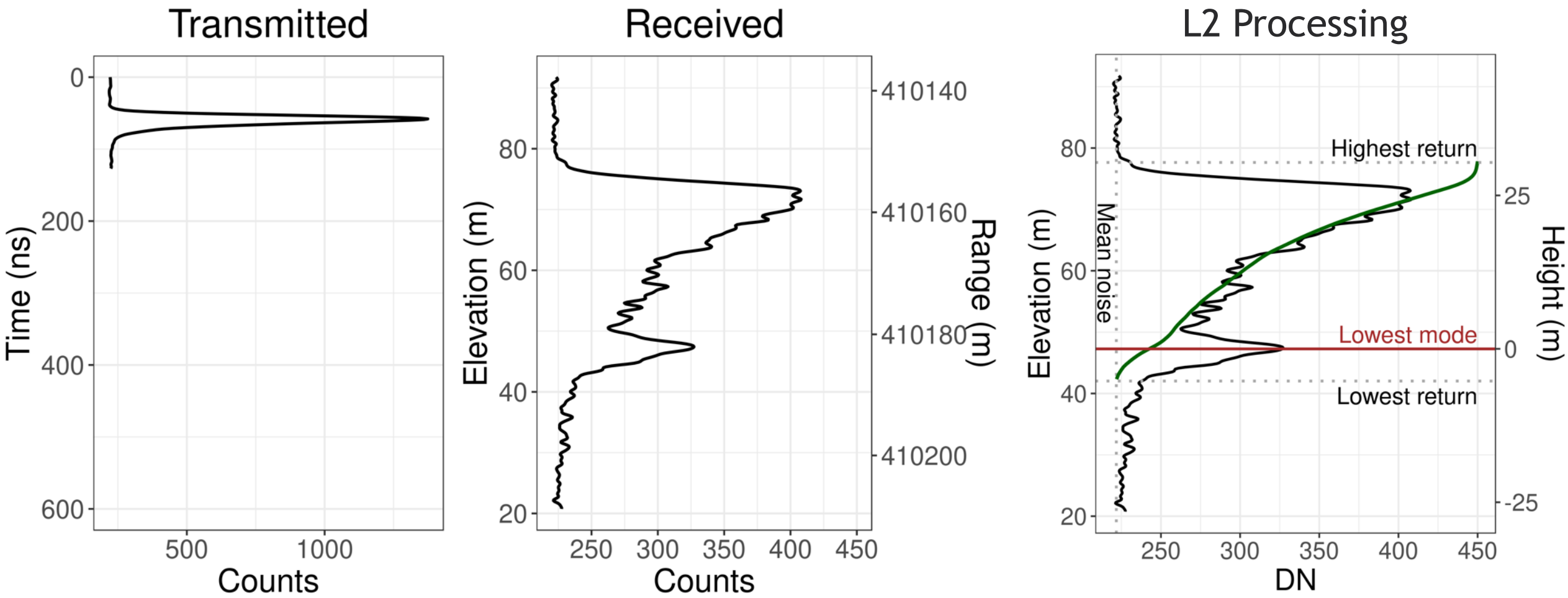
GEDI Data Products

Product	Description	Source
GEDI00_B	Level 0B: (not available)	LPDAAC
GEDI01_A GEDI01_B	Level 1A: (not available) **Level 1B: Geolocated Waveforms**	**LPDAAC**
GEDI02_A	**Level 2A: Footprint Elevation and Height Metrics**	**LPDAAC**
GEDI02_B	**Level 2B: Footprint Cover and Vertical Profile Metrics**	**LPDAAC**
GEDI03	Level 3A: Gridded Land Surface Metrics (2A and 2B)	ORNL DAAC
GEDI04_A	Level 4A: Footprint Biomass	ORNL DAAC
GEDI04_B	Level 4B: Gridded Biomass	ORNL DAAC

Data Product Release Schedule

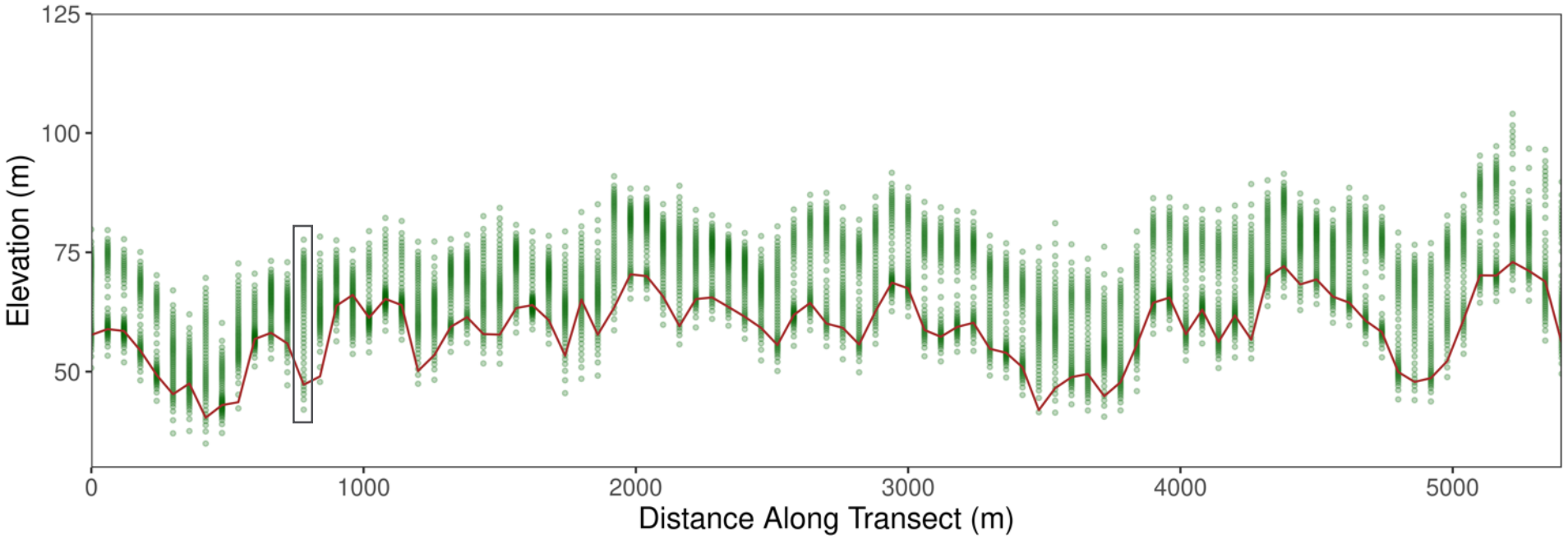


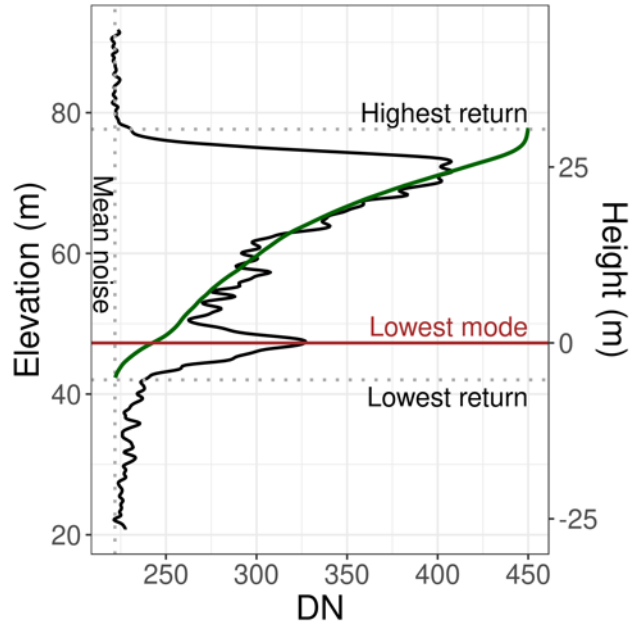
GEDI Level 1B Data Product



GEDI Level 2A Data Product

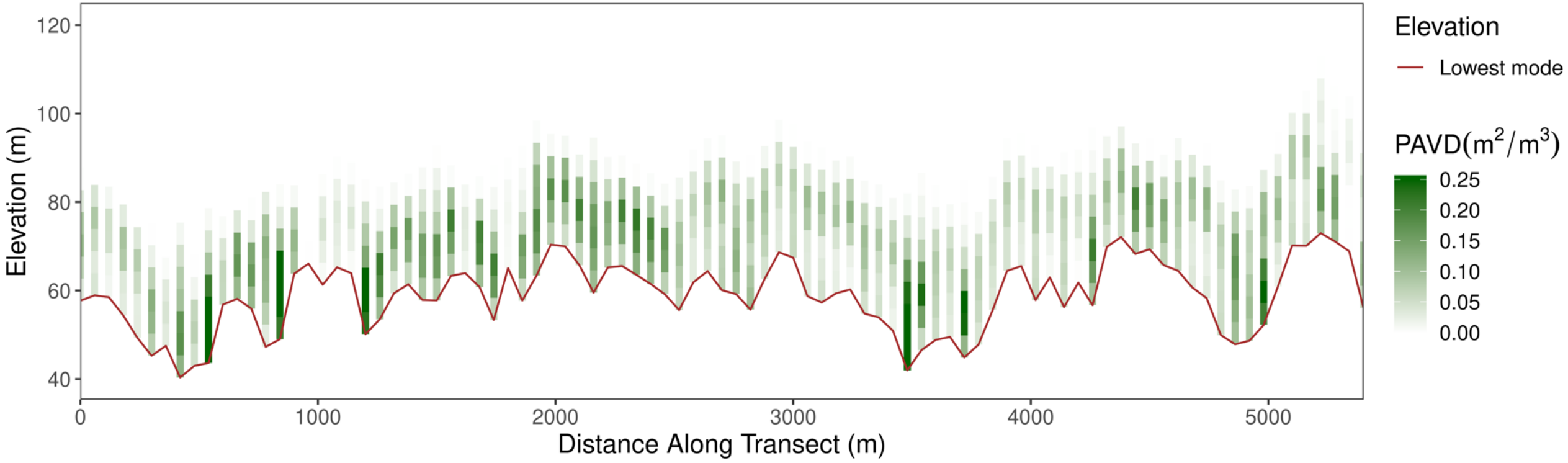
Footprint Elevation and Height Metrics



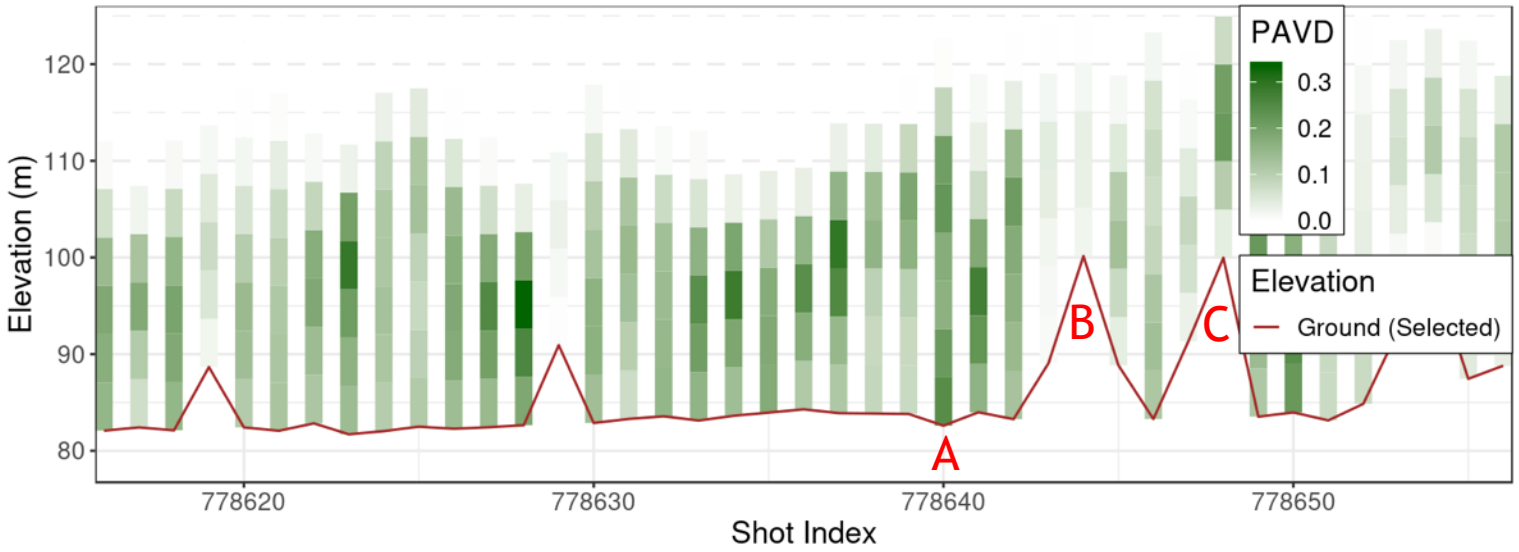


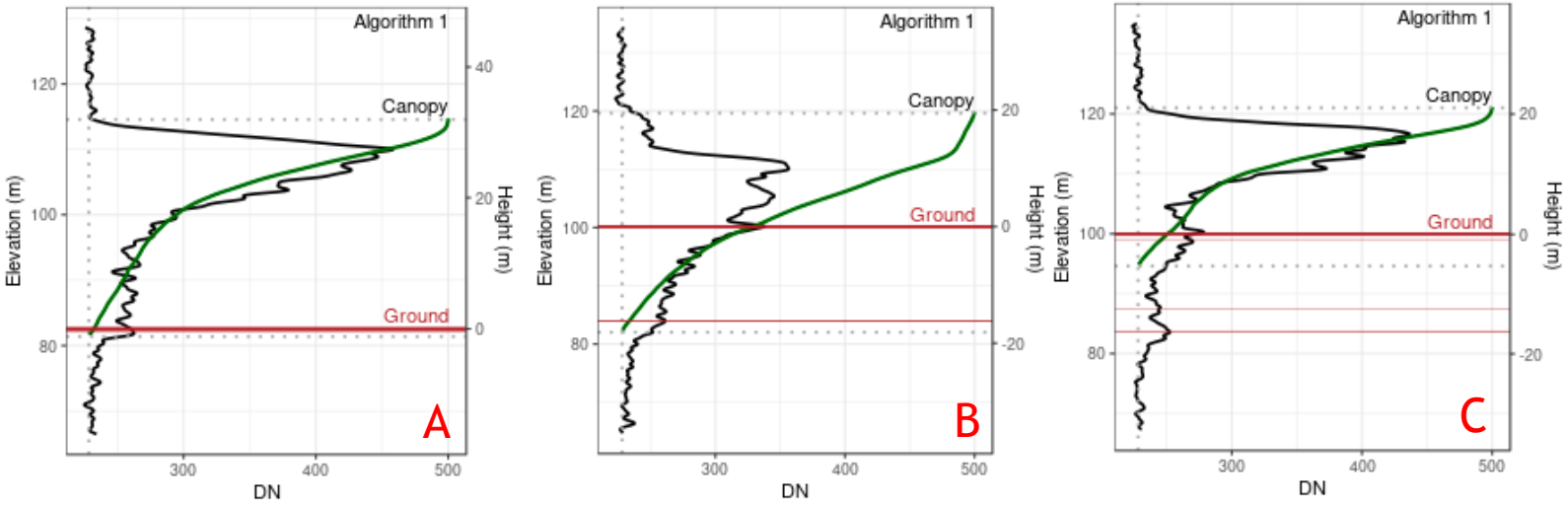
GEDI Level 2B Data Product

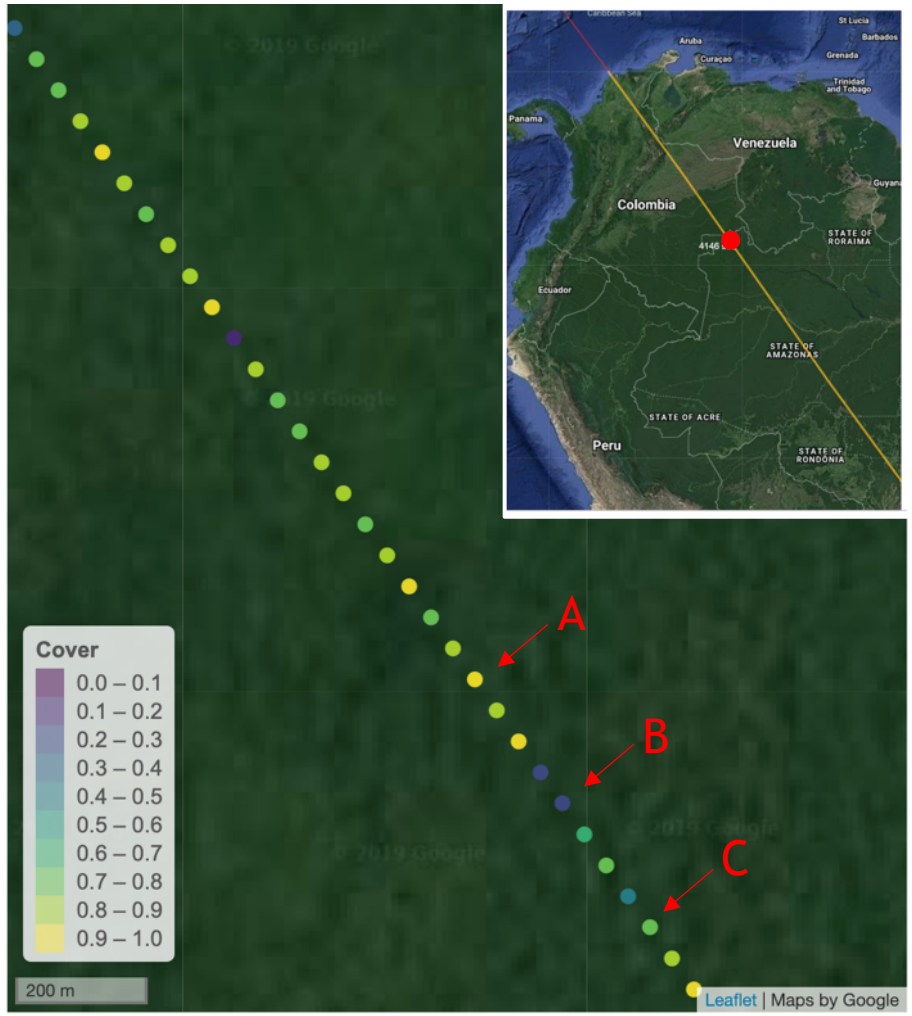
Footprint Cover and Vertical Profile Metrics



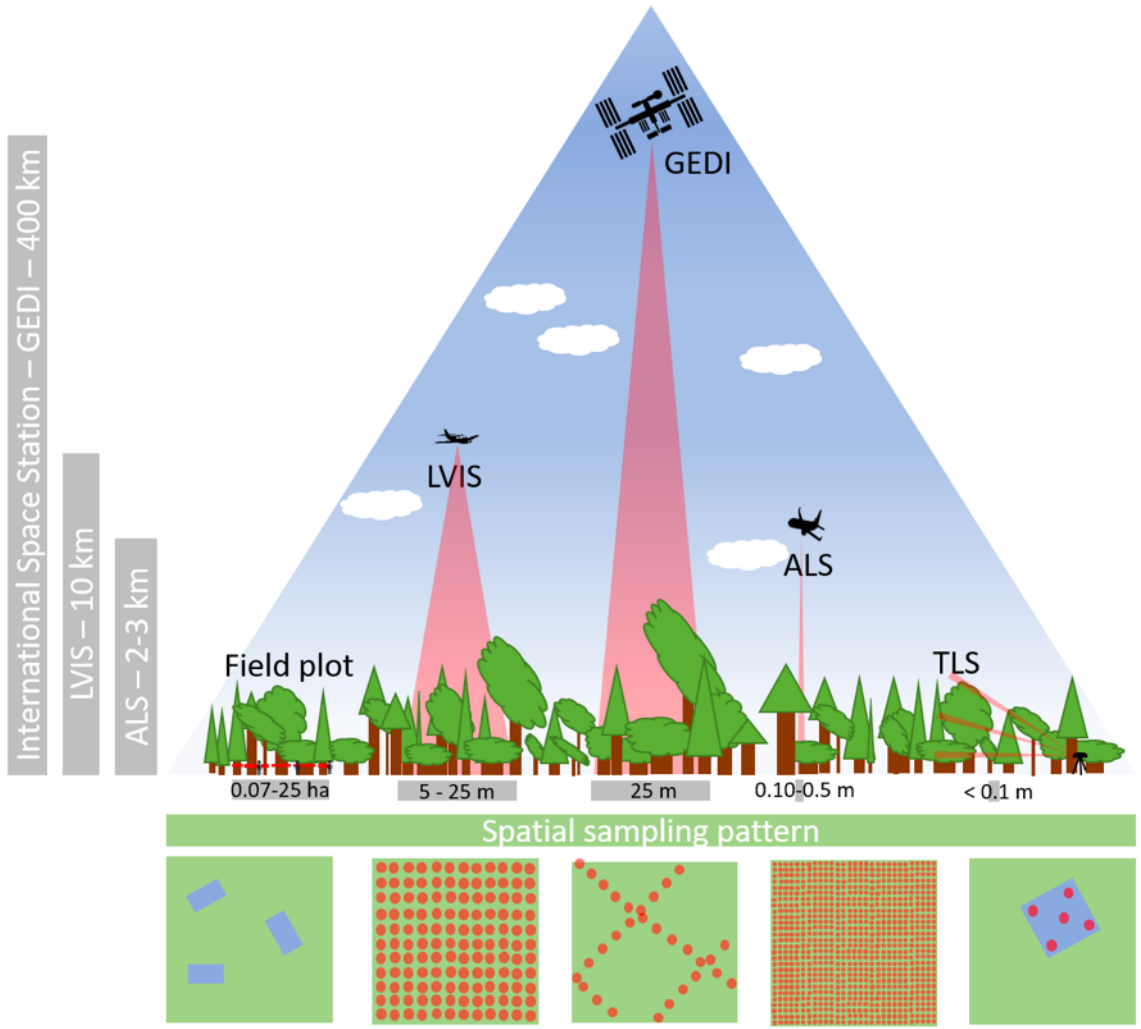
GEDI Level 2 Algorithm Settings Groups

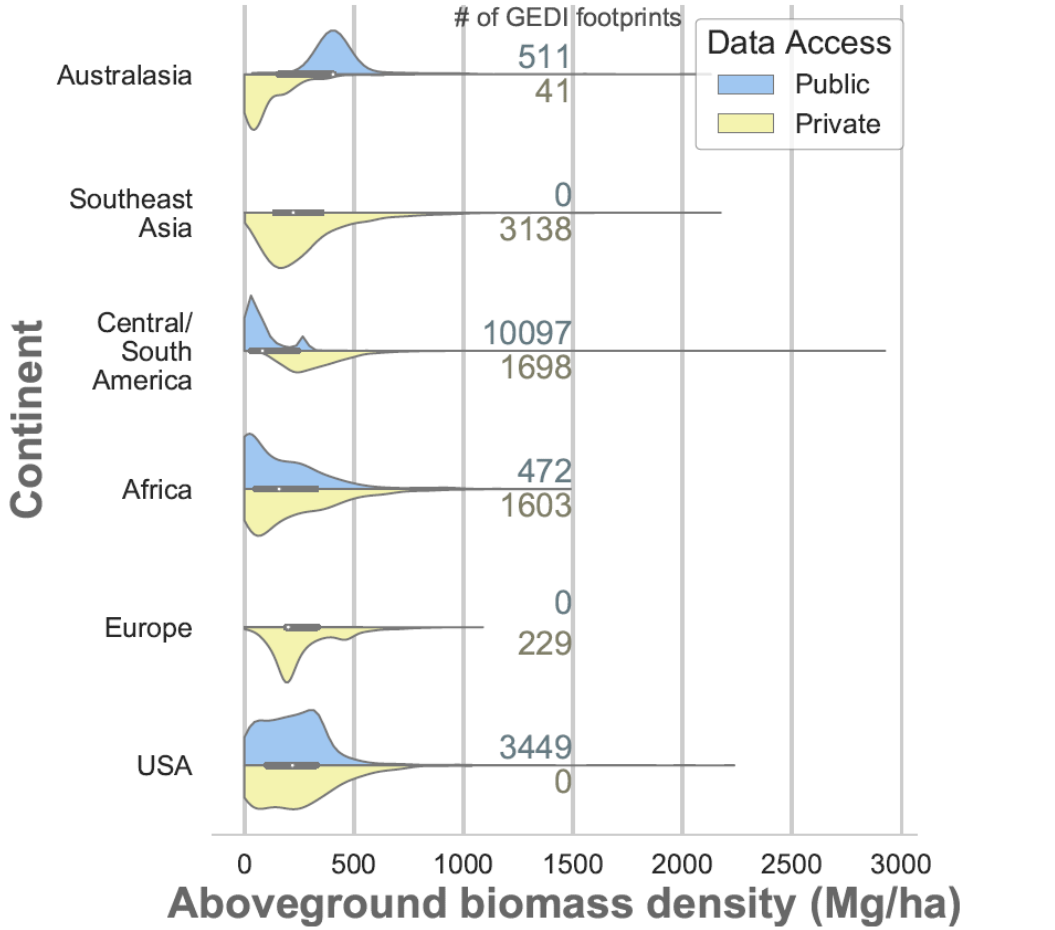






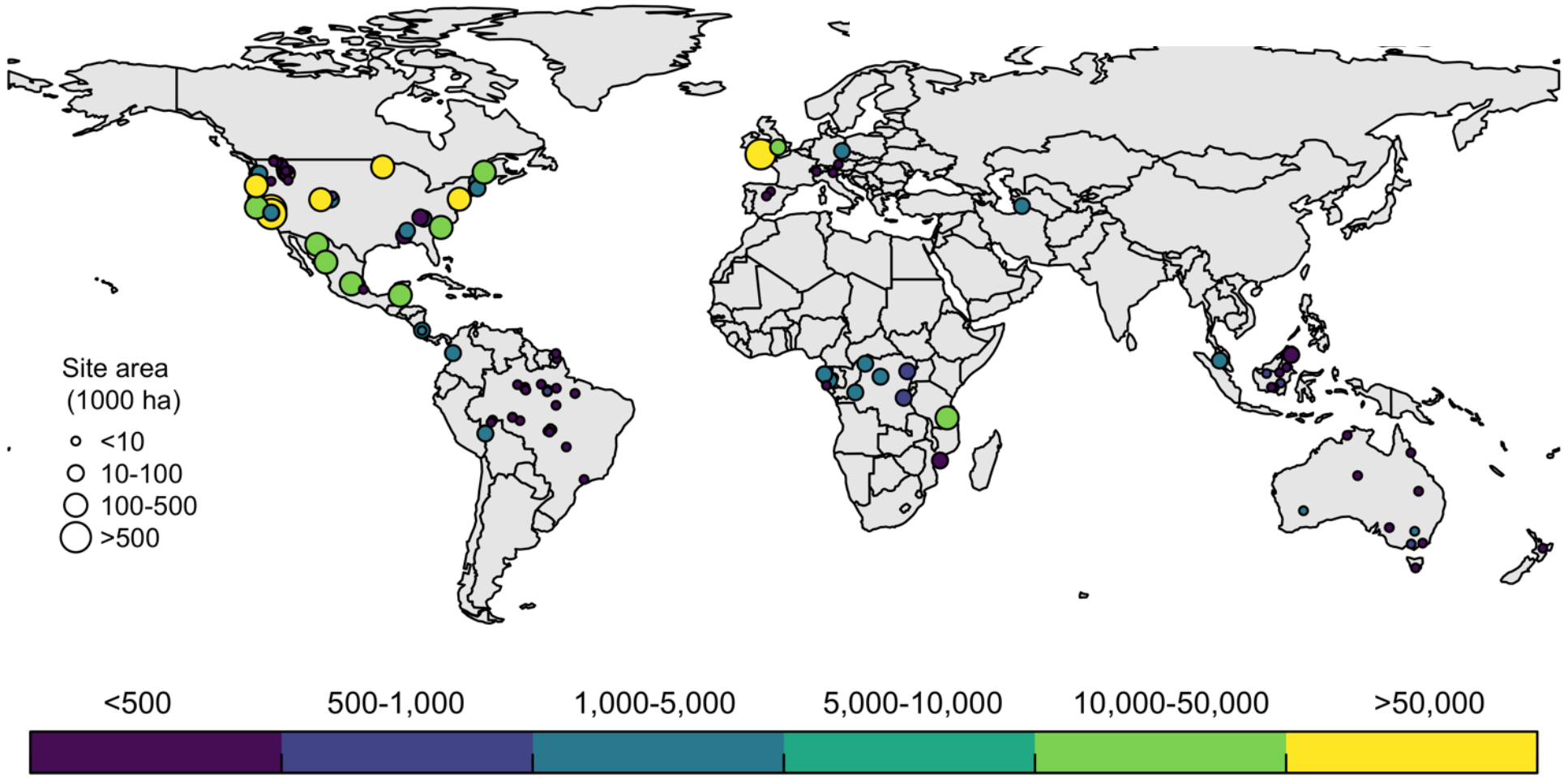
The GEDI calibration and validation program





Collocation of ALS and field plot data

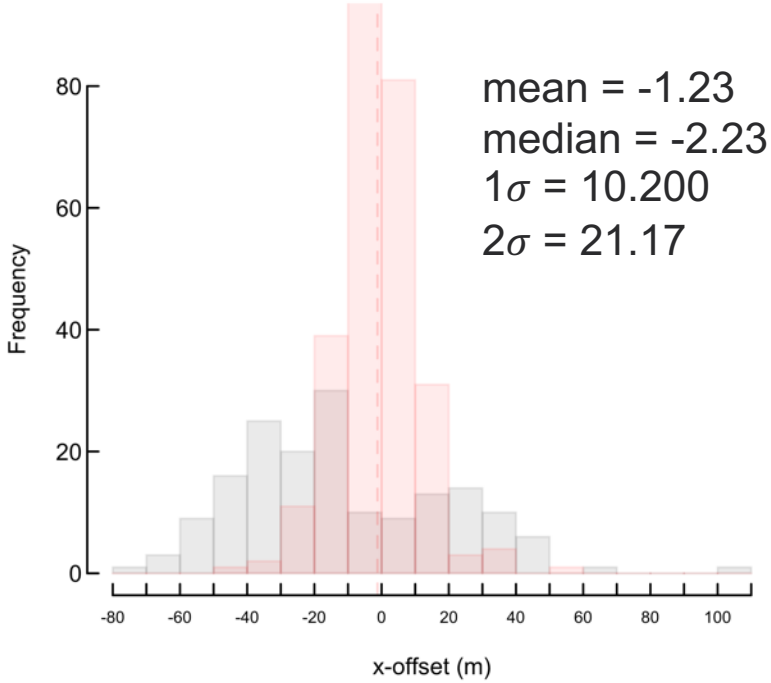
The GEDI Forest Structure and Biomass Database



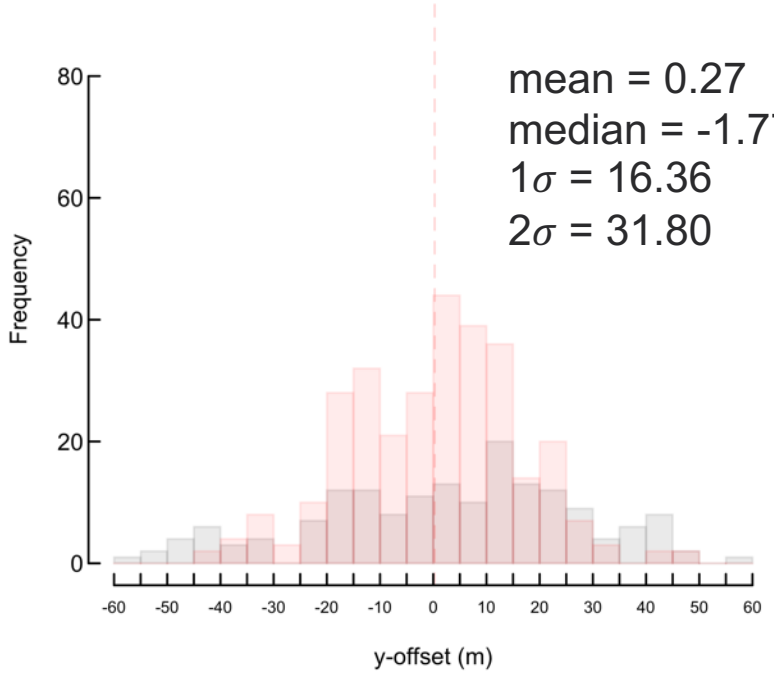
178,768 GEDI footprints have been collocated with ALS data across a wide range of conditions

Validation of GEDI footprint geolocation

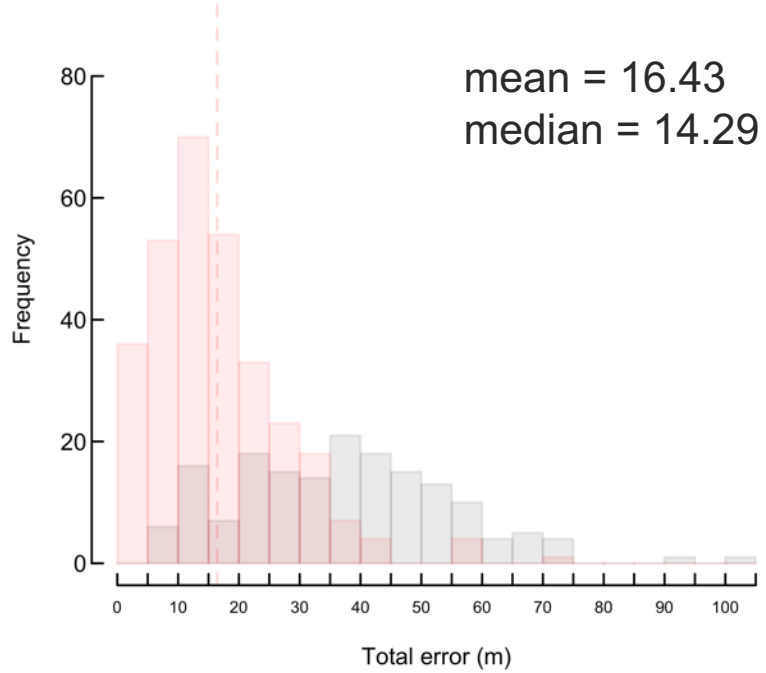
Easting Offsets



Northing Offsets

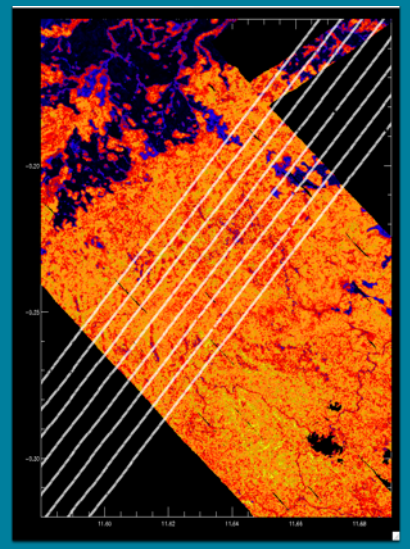


Total Offsets

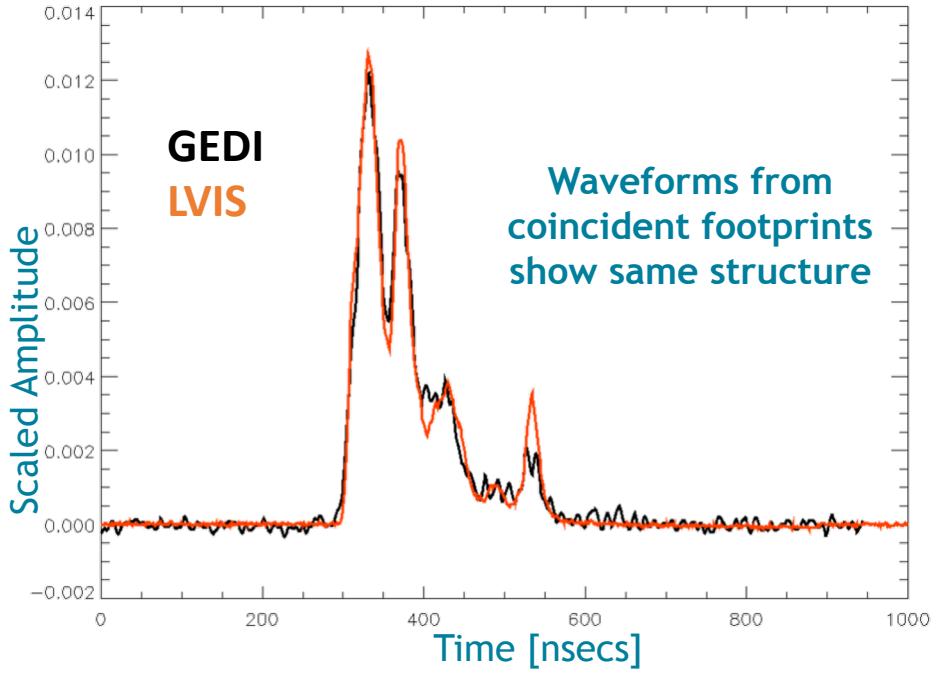


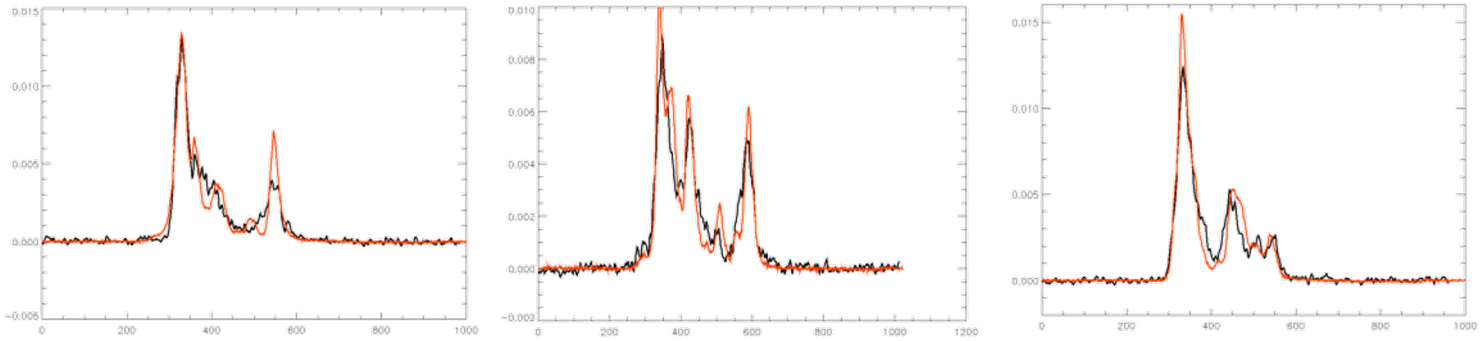
Final Rapid

Early Validation of GEDI Waveforms in Gabon



8 GEDI tracks crossing LVIS data image in Gabon





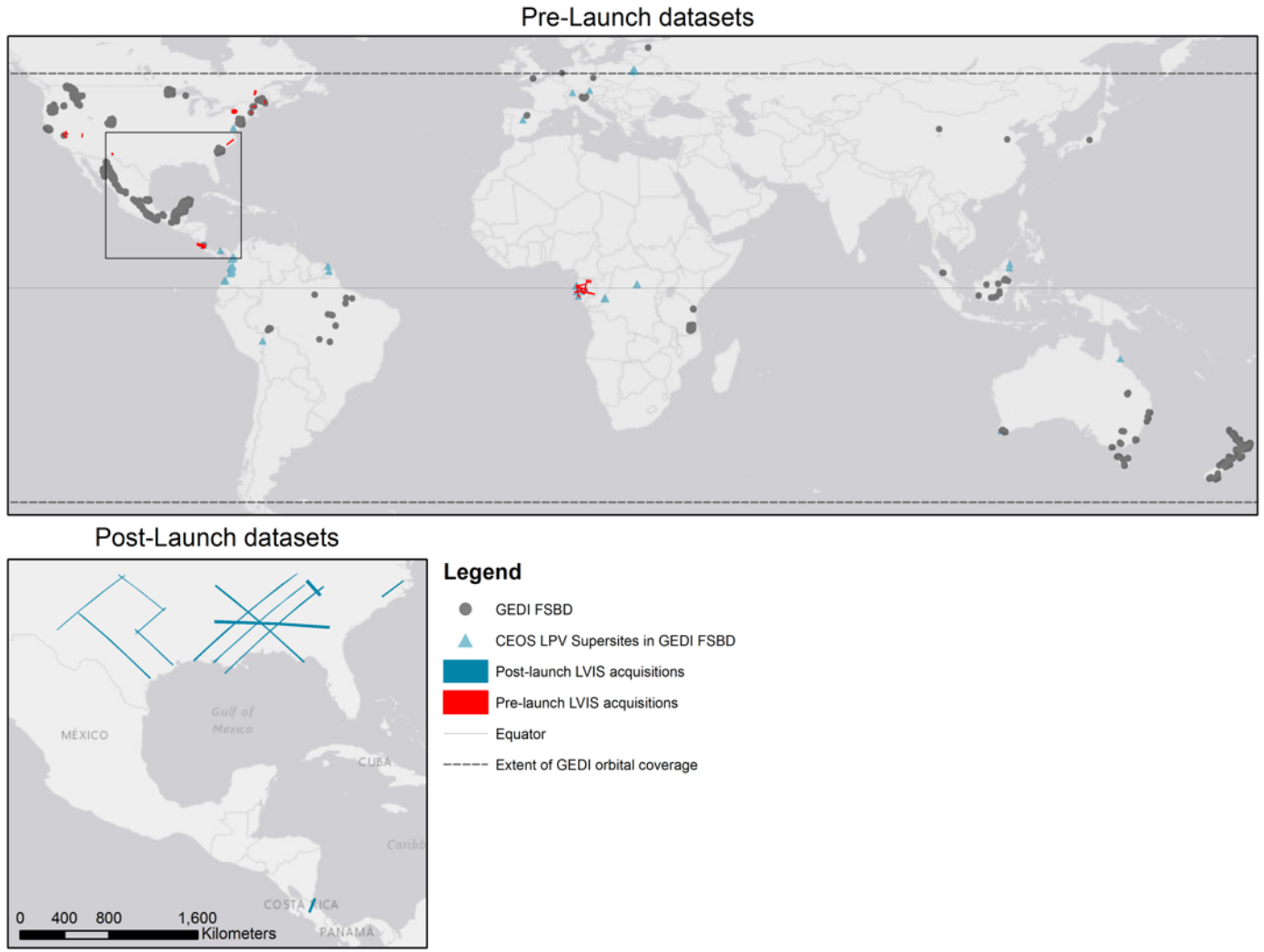
New GEDI Airborne Validation Campaigns

NASA GEDI/LVIS Airborne Campaigns May - July 2019

1. **Orbital under flights > 1000 km** for all GEDI beam configurations to underpin post-launch calibration and validation of Level 1 and 2 product algorithms

2. **East - west transects > 1000 km** to expand the range of GEDI laser periods and day/night conditions sampled

3. **Large area (e.g., 100 x 30 km) mapping boxes** over established ground monitoring sites with historical LVIS data
   - La Selva Biological Station, Costa Rica
   - ORNL (NEON) / Coweeta



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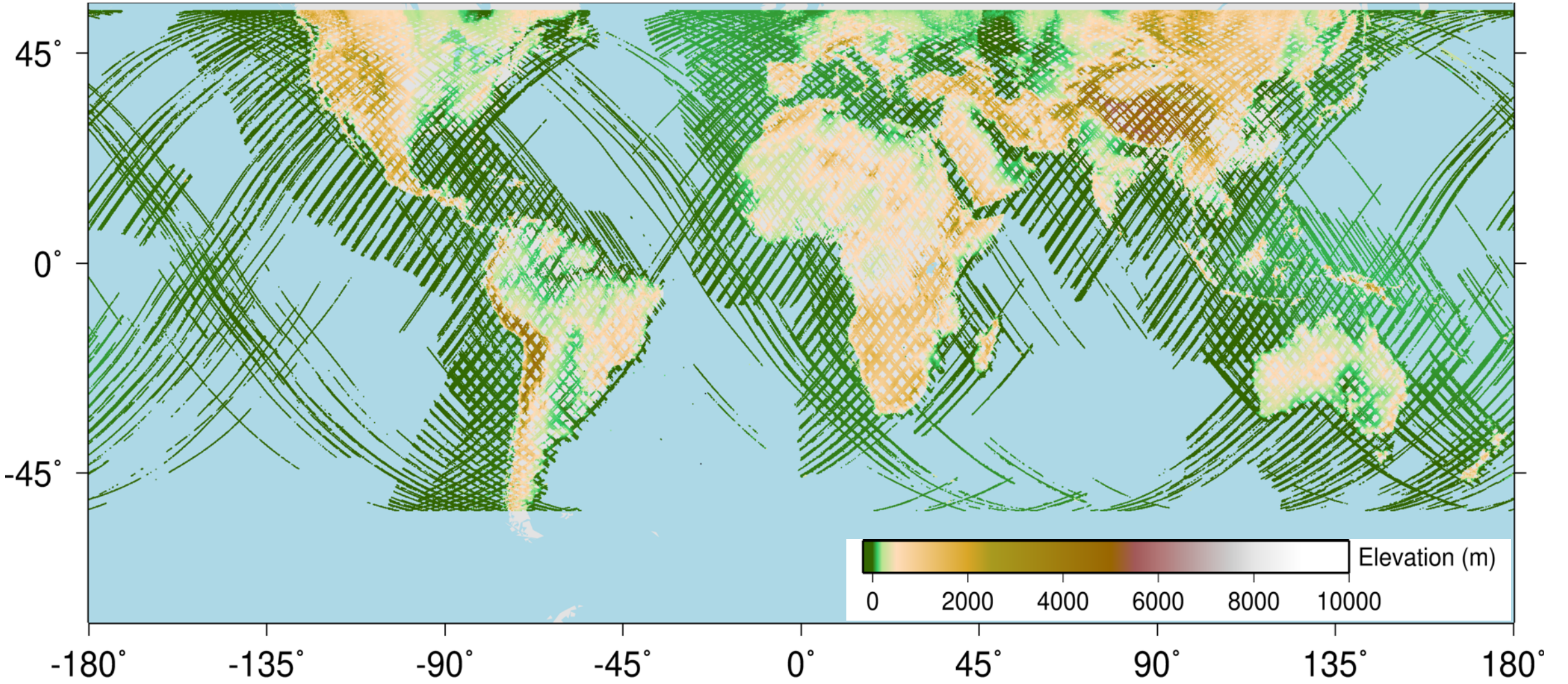
Global Topography from GEDI



GEDI-MOLI Collaboration (JAXA EO-RA2)

Calibration and validation of JAXA MOLI aboveground biomass products: Collaboration with NASA GEDI

Proposal accepted for "Calibration and validation of standard products"

PI: John Armston (UMD)

Co-Is: Ralph Dubayah (UMD), Koji Kajiwara (CU)

Aim:

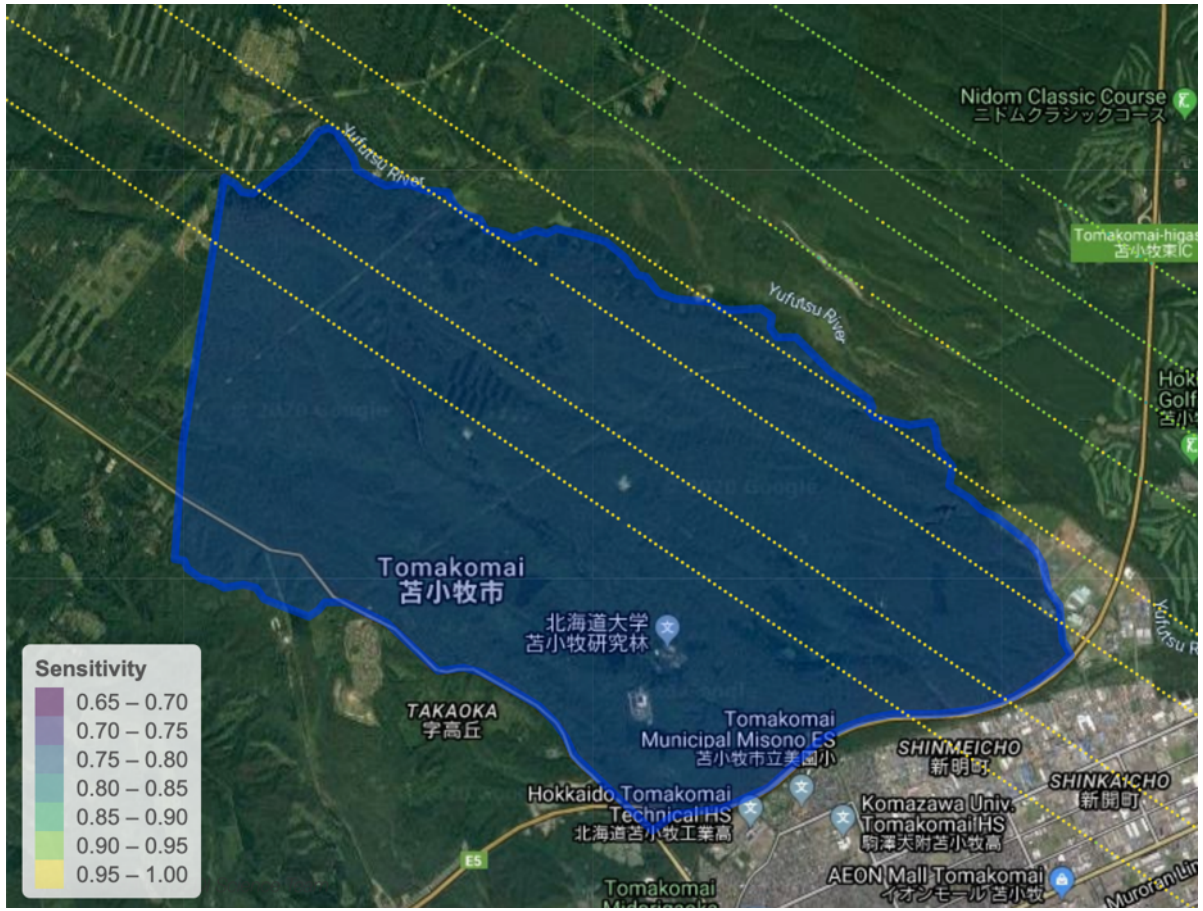
The aim of this research is to harmonize components of the JAXA MOLI and NASA Global Ecosystem and Dynamics Investigation (GEDI) calibration and validation (cal/val) programs to support the joint development of aboveground biomass products and ensure data continuity between the GEDI and MOLI missions.

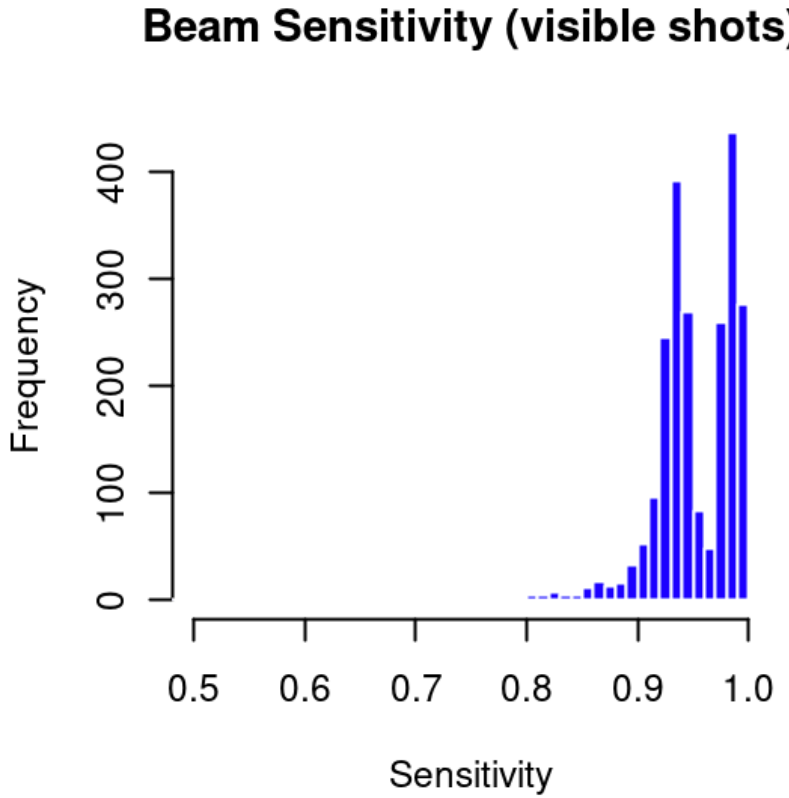
Research Objectives:

1. Compare MOLI and GEDI (using MOLI parameters) waveform simulators and validate using measured waveform data from the MOLI airborne prototype and NASA LVIS
2. Calibrate GEDI L2 algorithms for application to simulated MOLI waveforms across a range of environmental conditions
3. Evaluate GEDI L4 data products over cal/val sites in Japan (site selection has changed)

GEDI-MOLI Collaboration (JAXA EO-RA2)

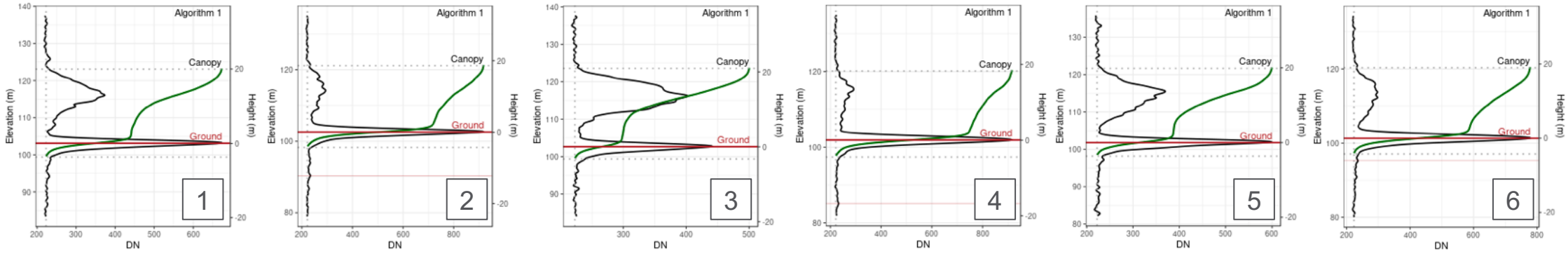
Tomakomai Experimental Forest and Daigo-machi (Ibaraki Prefecture)

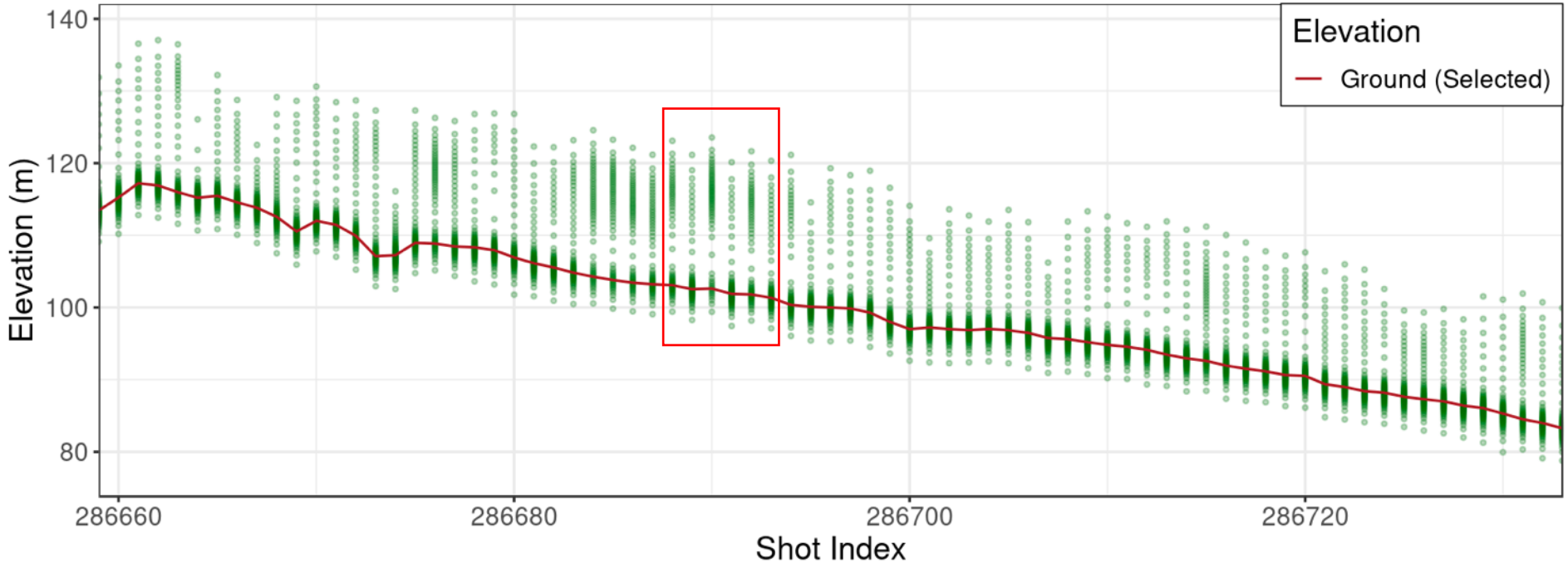




GEDI-MOLI Collaboration (JAXA EO-RA2)

Tomakomai Experimental Forest





Summary

- **After one year on orbit GEDI continues to operate nominally**
  - Noteworthy feat given its early launch and low cost
- **The first data sets are now available from the DAAC**
  - Monthly updates as well as regular reprocessing
- **Encourage user community to analyze first data sets exhaustively**
  - Aid in improving calibrations and algorithms as mission progresses
- **Expect greatly increased data quality as calibrations and algorithms improve**
  - Post-launch validation of L2 products proceeding on schedule
- **Collaboration with MOLI underway as part of JAXA EO-RA2**