Combining FIA and Remote Sensing to Improve Spatial Resolution of Forest Resource Monitoring

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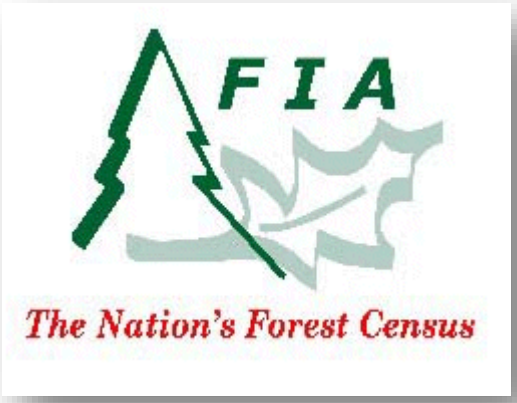
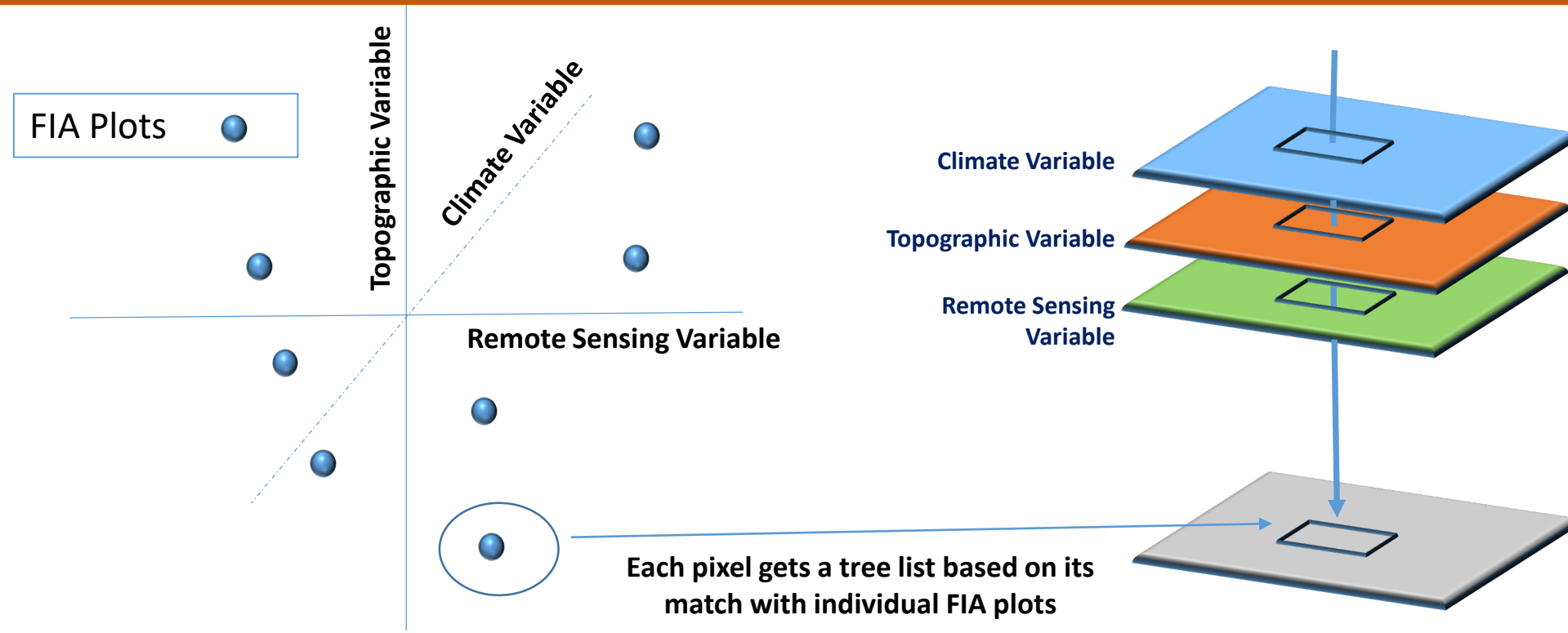


Context

- The FIA plot grid allows estimation with adequate precision starting at about the county scale
- Many groups can (and do) create high-resolution maps using inventory data for pixel-level calibration and validation.
- What is on the horizon that might be of sustained use by FIA and its clients?

Nearest Neighbor Imputation Maps



Useful for: Applications that require a surface (fire, water, habitat)

Applications that require a tree list (FVS)

Small area estimation techniques as ancillary data

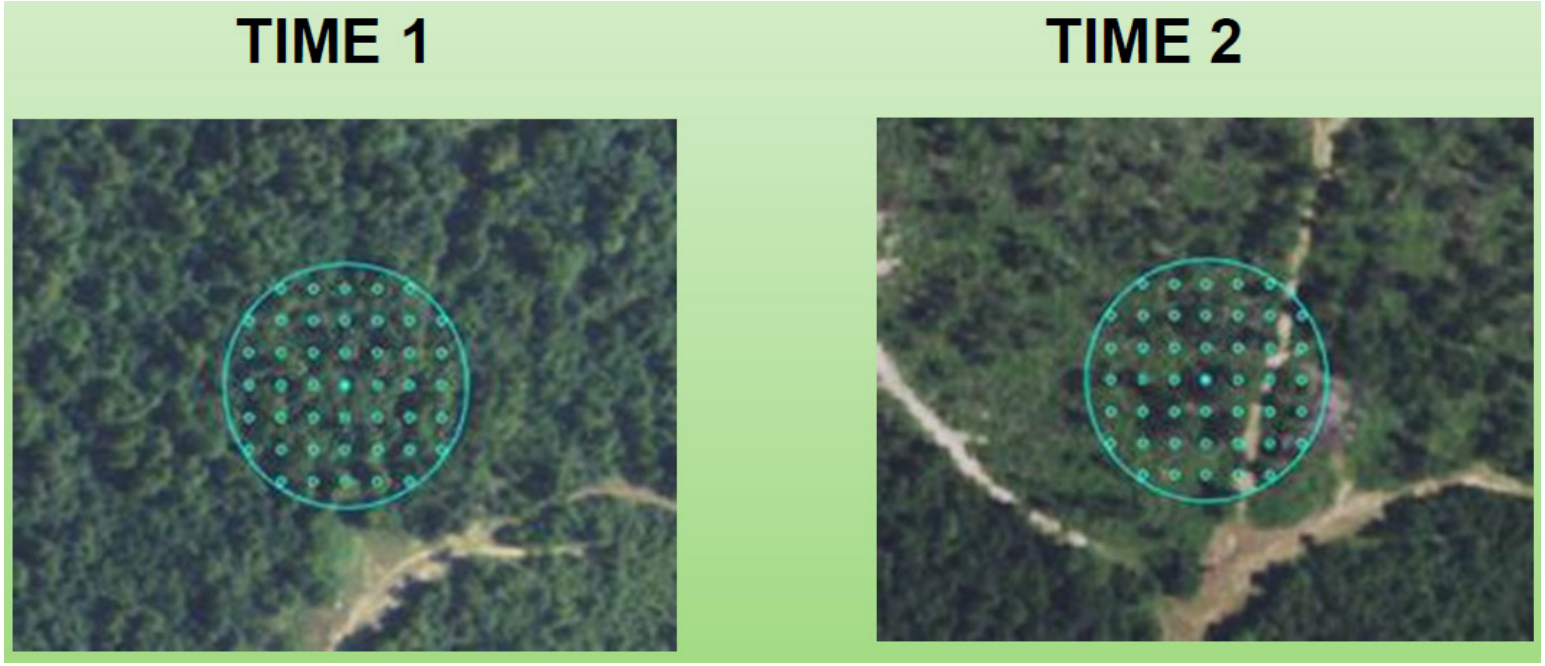
Currently available: 250-m resolution

Coming: 30-m resolution

Change Estimation

Image-based Change Estimation (ICE)

- Pilot production has been completed in several states
- Targets: Land Use, Land Cover, and Change



Change Estimation

Image-based Change Estimation (ICE) - continued

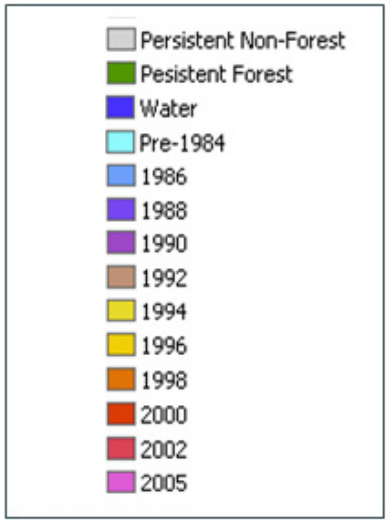
- Measured on FIA plots using each new acquisition of NAIP imagery (every 3 years)
- Will be linked with standard FIA variables to improve temporal precision of change estimates
- Observation grid can be intensified by clients

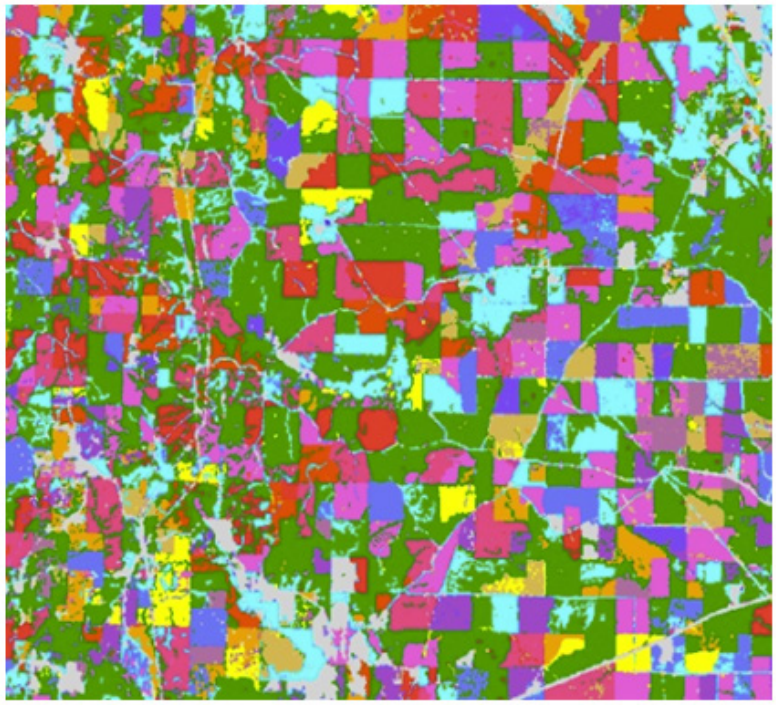
Change Estimation

Landscape Change Monitoring System (LCMS)

US government (Forest Service/USGS/NASA) project that works with leading Landsat change detection scientists to compare and integrate their innovations

1. ***Compare algorithms***
2. ***Explore combination of algorithms***

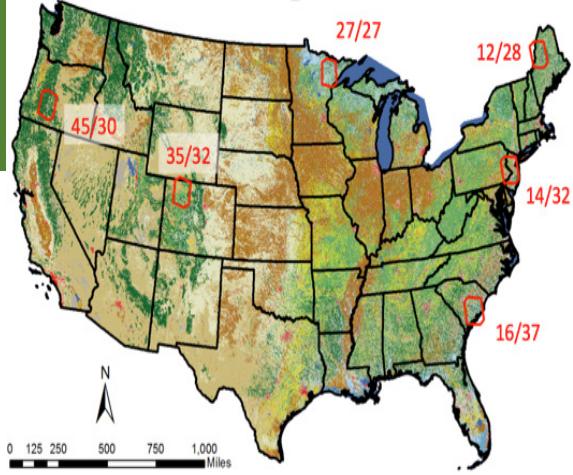


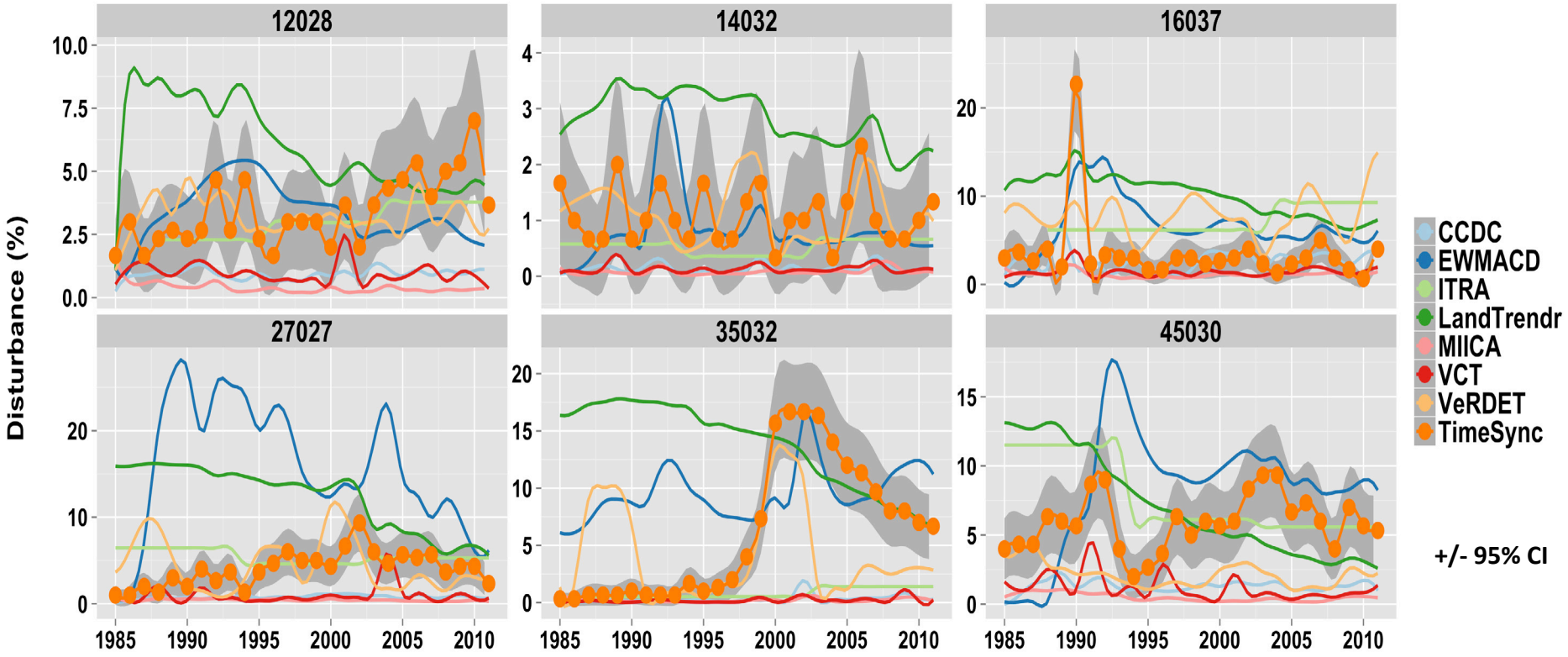


VCT output, Alabama

Change Estimation

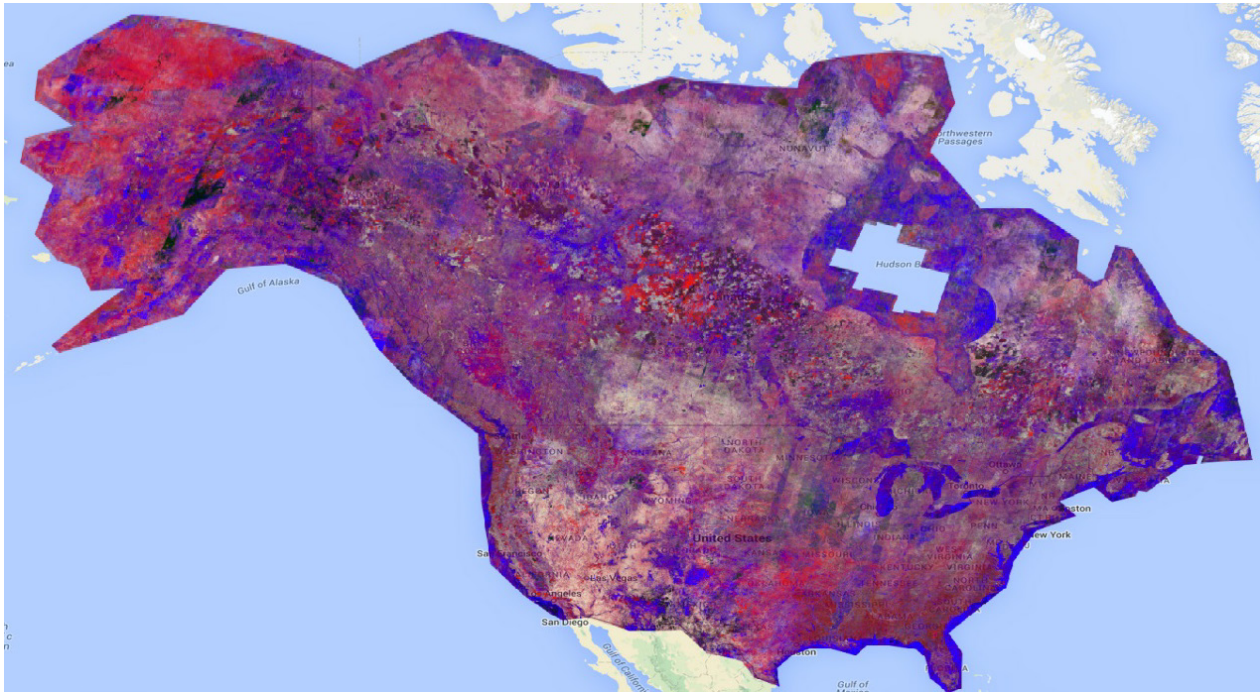
(LCMS) It turns out that automated algorithms disagree a lot at both the pixel level and population level





Change Estimation

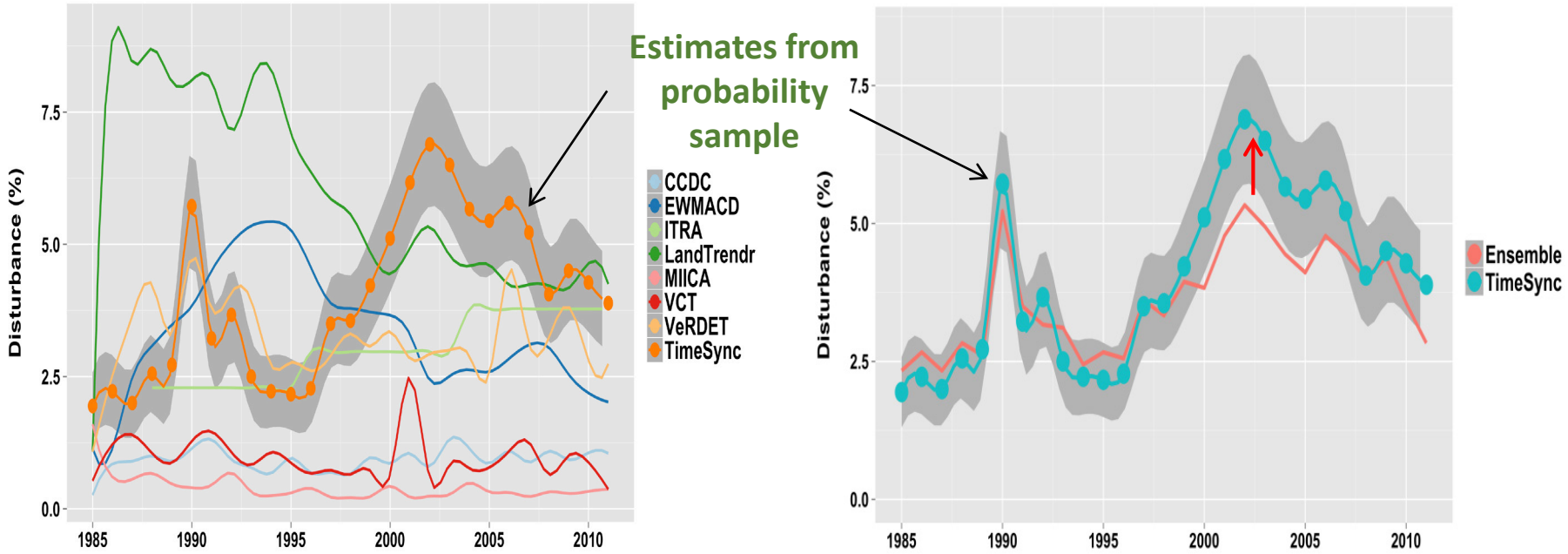
- We found that patterns in what each type of map gets right/wrong can be used in a meta-model that gives us better accuracy than any individual map
- Working closely with Google and developers of each original algorithm, LCMS will produce a national product (back to 1985) in 2017



Change Estimation

How is this relevant to FIA?

1. **May complement more expensive photo interpretation work (ICE)**
2. **Output of meta-model can be "tuned" to match sample-based estimates at broader scales**

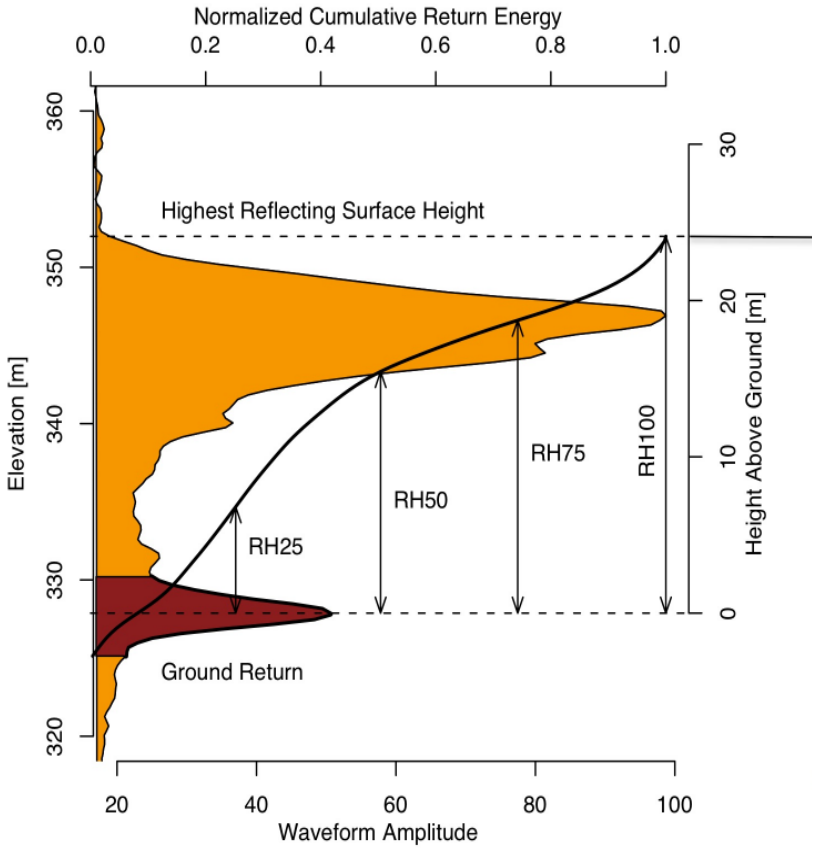


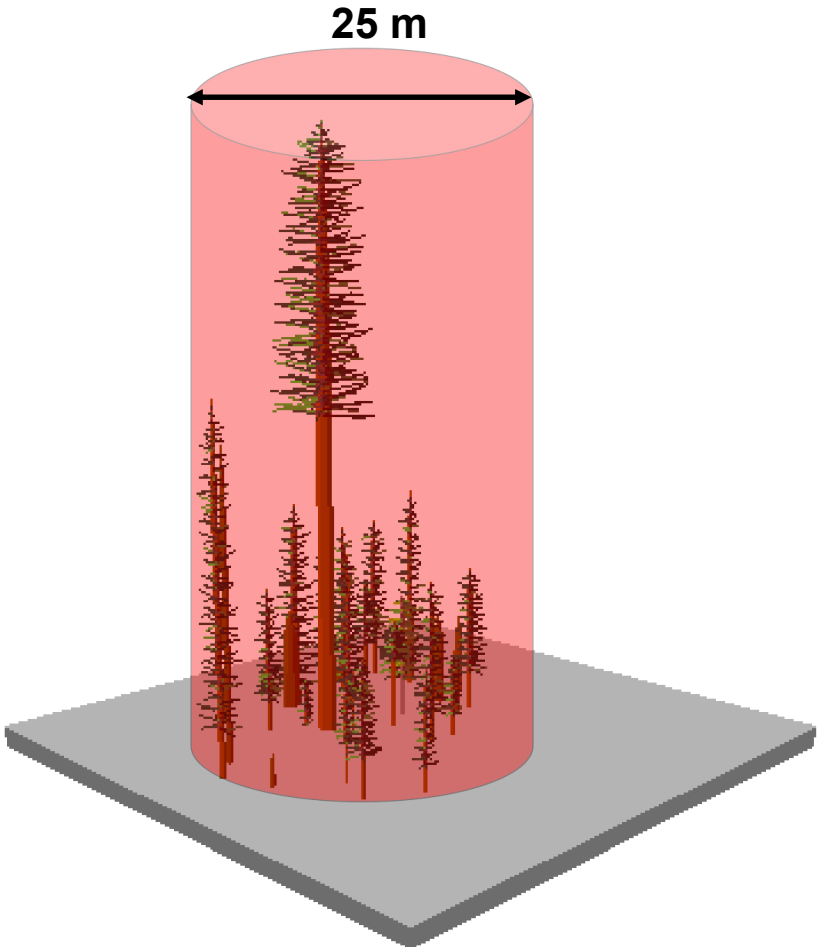
Work with NASA

GEDI Mission
(Global Ecosystem Dynamics Experiment)
LiDAR on the International Space Station

Work with NASA

Like FIA, GEDI will generate a sample of forest conditions around the world

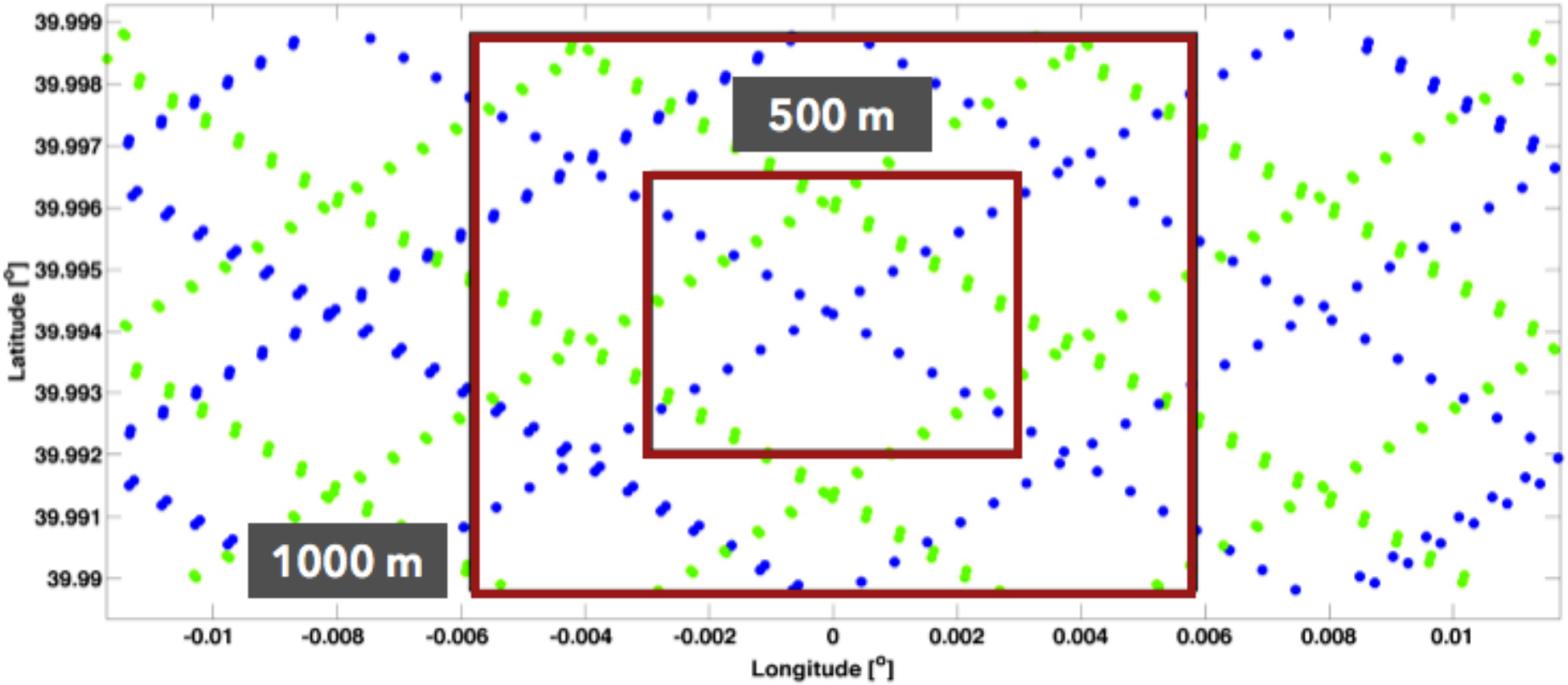




Work with NASA

Using model-based estimation, GEDI will generate gridded biomass estimation & will support estimation over any area

Waveform models are calibrated at locations where both ground and LiDAR data are available



Summary of operational spatial data associated with FIA

- Tree list maps
- Maps of historical and ongoing forest change
- Global LiDAR sample