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TAKING THE PULSE
OF OUR PLANET FROM SPACE



Use of global map products from Earth observation data to support estimates of carbon loss and gain

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Sentinel-1 for Science Amazonas - Project objectives in brief:

1. Develop a Multi-temporal forest Change Detection (MCD) algorithm for the Amazon Basin using Sentinel-1 time-series
2. Estimate change in land use by type of change
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Strategy for biomass loss estimation:

1. Evaluate existing global biomass map products with temporal resolution matching the chosen time period
2. Choose a global map product which is most similar to «a biomass estimate of greater quality»
3. Estimate net biomass loss by coupling the MCD loss pixels with bi-temporal biomass pixels of the global biomass map product

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IPCC Good Practice Guidance (2003, 2006):

“Defines inventories consistent with good practice as those which contain **neither over- nor underestimates** so far as can be judged, and in which **uncertainties are reduced as far as is practicable**”

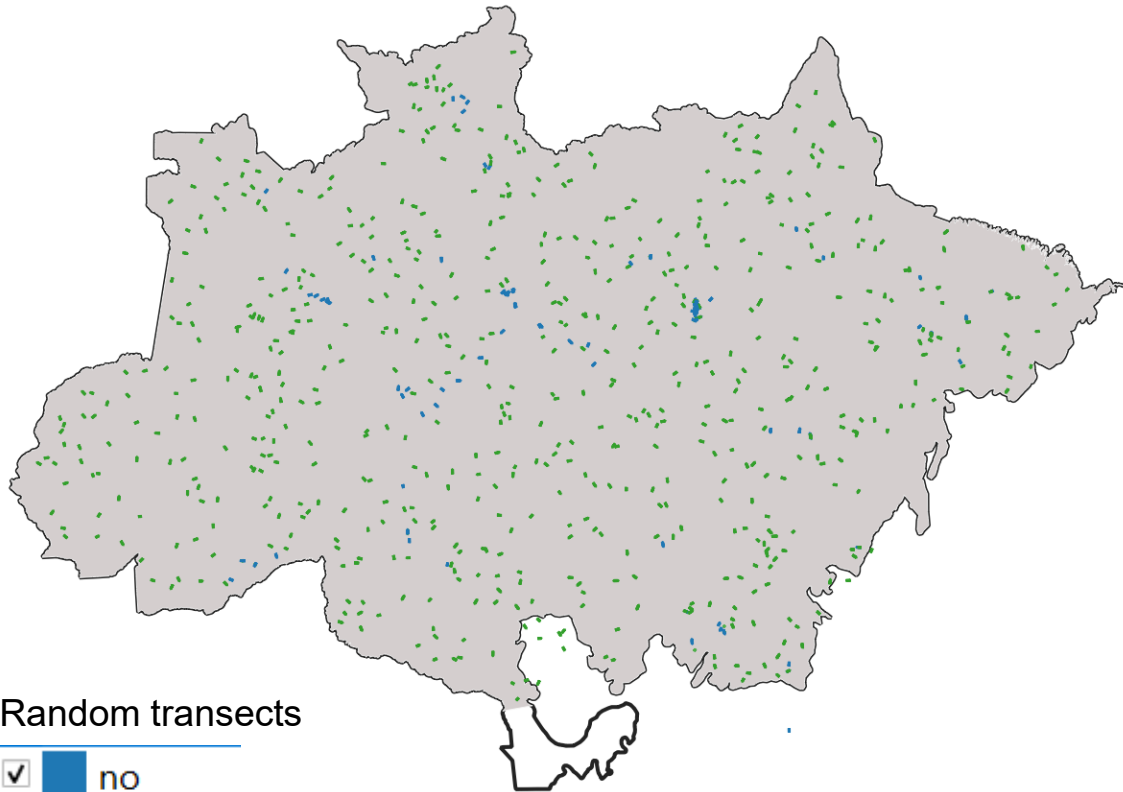
Implications:

1. We should use **unbiased** or at least **asymptotically unbiased** estimators
2. We should be capable of estimating and documenting the **precision** (variance) of the estimates and produce a confidence interval

Target area for global biomass map assessment



EBA (Estimating Biomass in the Amazon - INPE) project data



Random transects

- no
- yes

- 4.1M km²
- 531 random ALS transects (12 km)
- 246 field plots

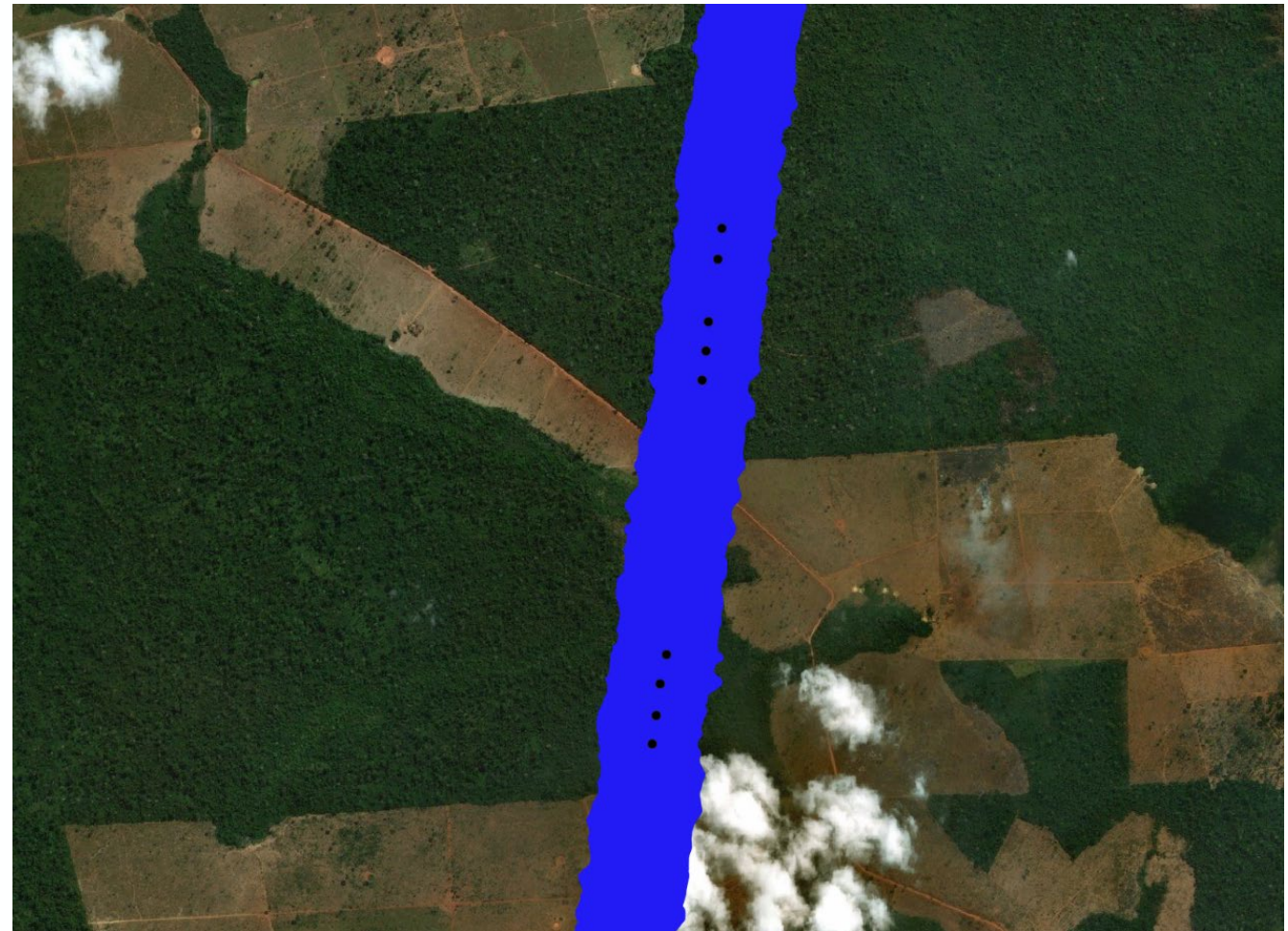
Estimation in ALS sample survey

Design:

- No design-assumptions for field sample
- Simple random sample of ALS transects

Estimation and inference:

- A single linking AGB model field-to-ALS
- Hybrid inference – two components:
 - Design component: ALS transects
 - Model component: parameters



Estimation in ALS sample survey

Mean AGB/ha: 248.7 Mg/ha

Confidence interval (95%): [236.2, 261.2]

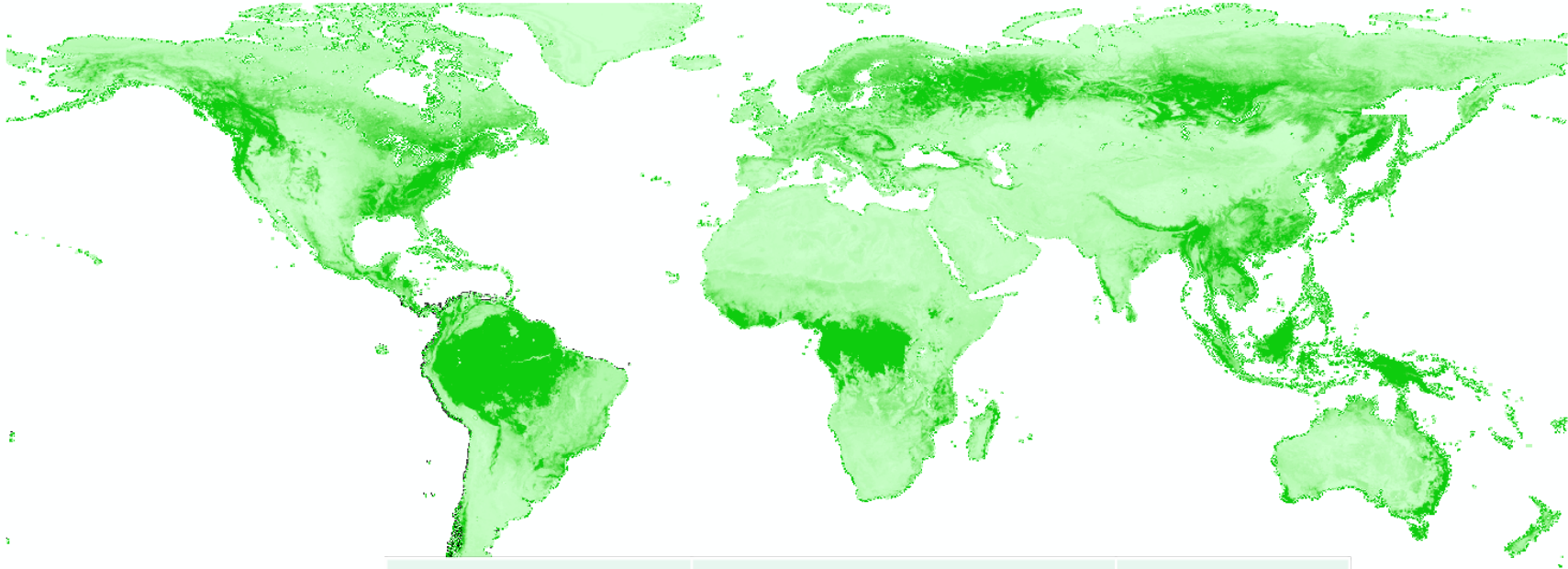
Proportion of variance:

ALS sampling: 34%

Model: 66%

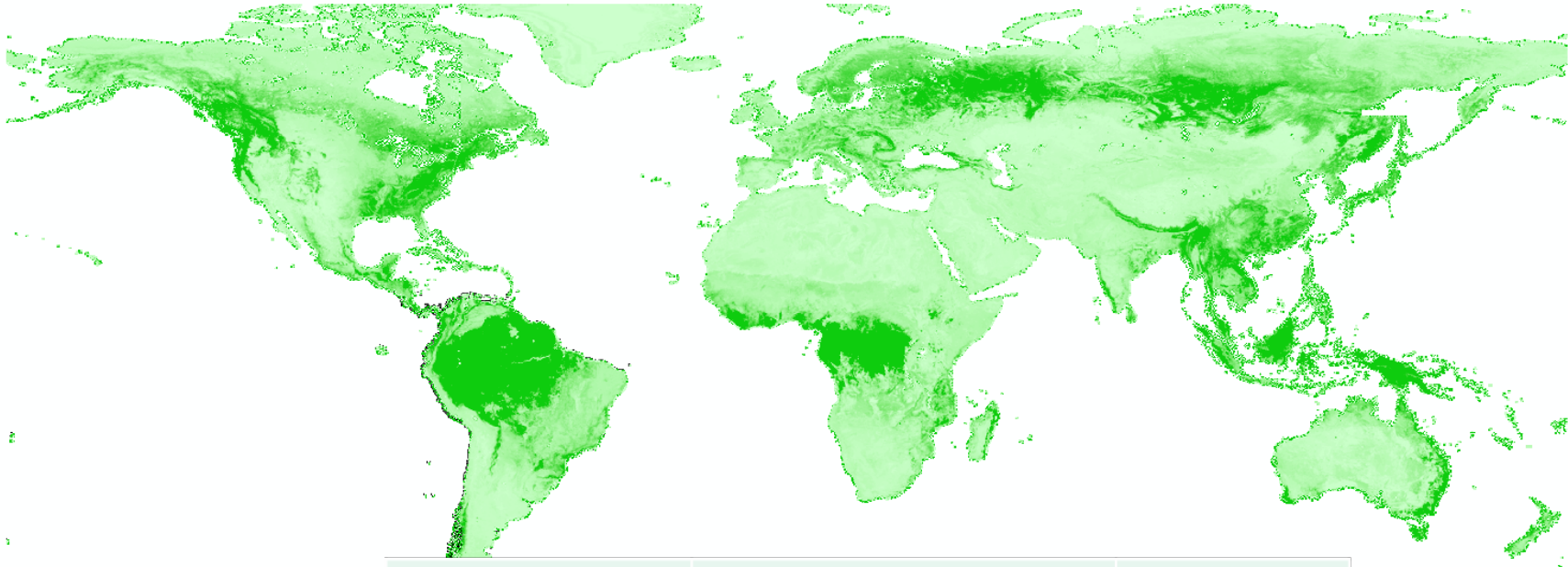


Comparison to global biomass maps



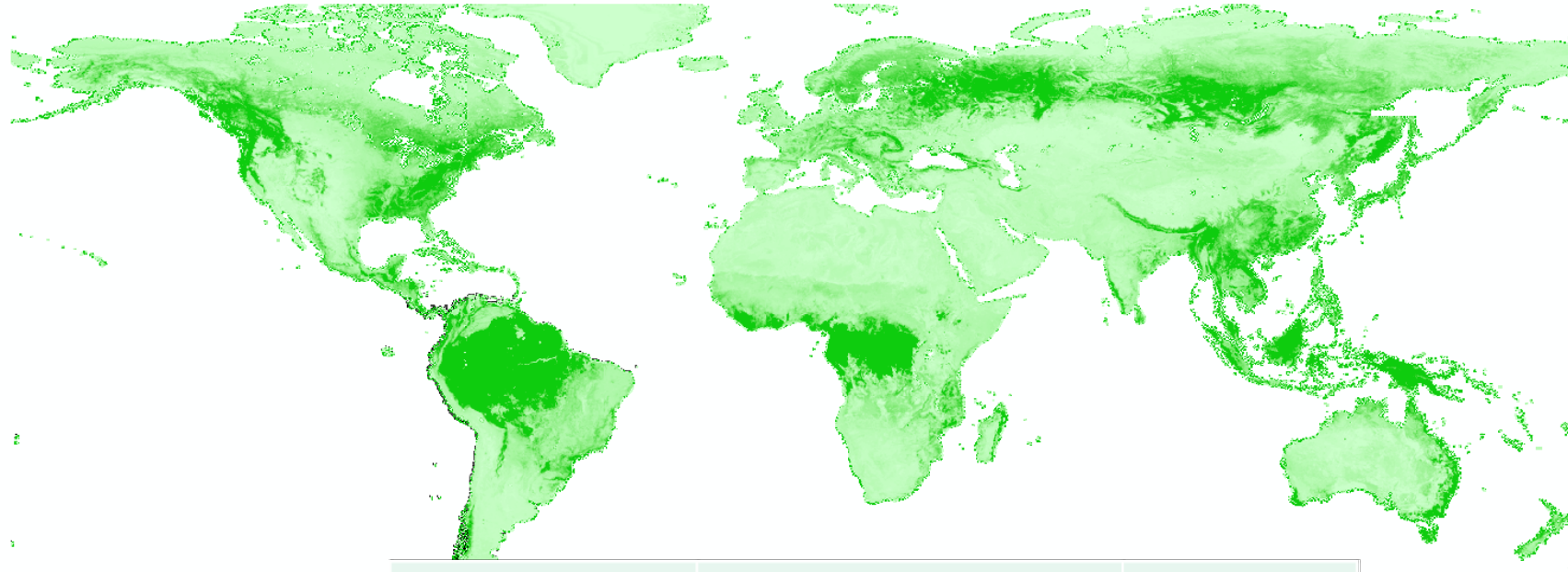
	AGB Mg/ha	
ALS (2016-18)	248.7	(236.2, 261.2)

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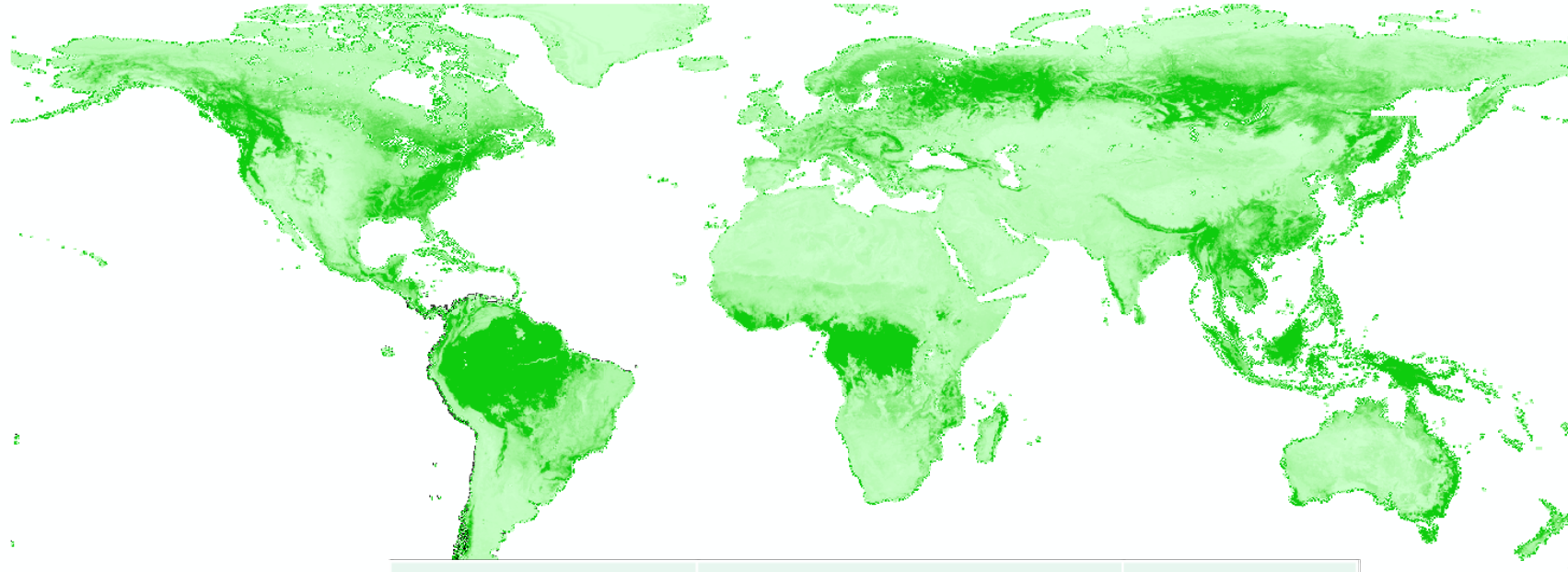
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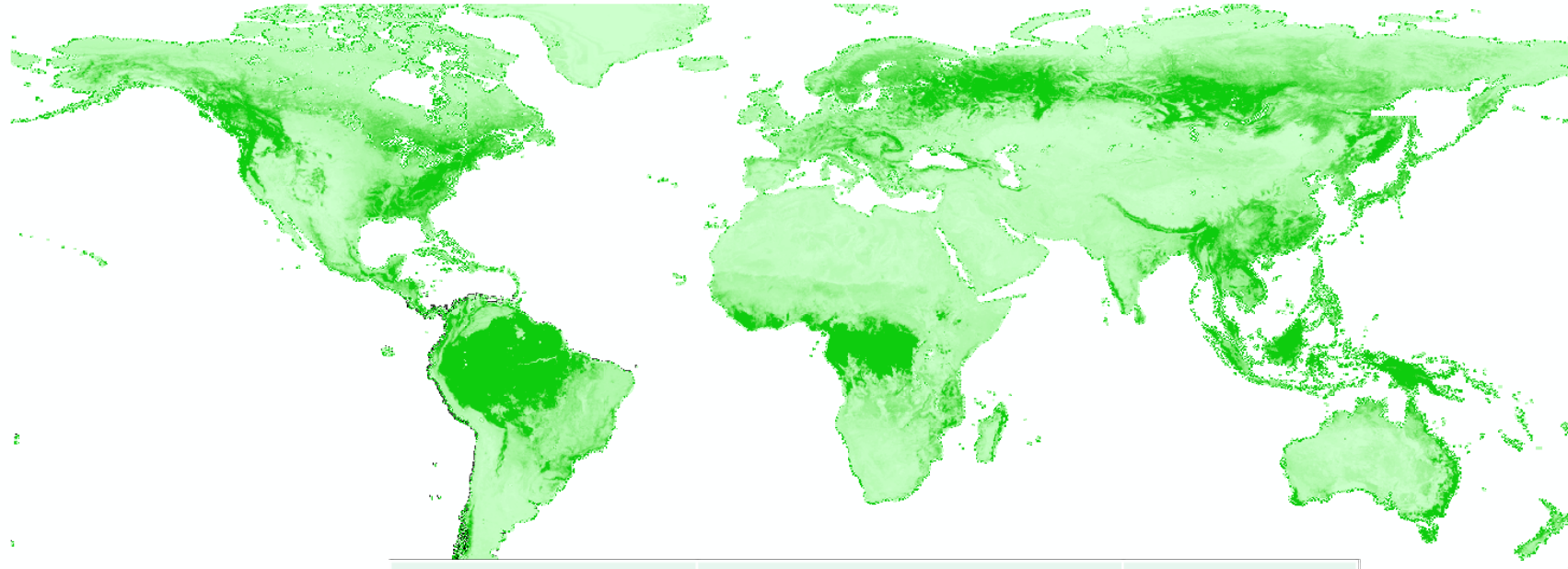
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JPL 2020	218.4	

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GEDI L4A	???	Yet to be estimated

Conclusions

Global biomass maps come without necessary information to produce confidence intervals, limiting their usefulness for AGB estimation

No statistically significant difference between ALS-based and CCI-based estimates of AGB since CCI estimate within ALS confidence interval

Current CCI 2017 and 2020 maps inconsistent but will be used for net AGB loss estimation when harmonized