MAAP #199: Amazon Carbon Update, based on NASA's GEDI Mission

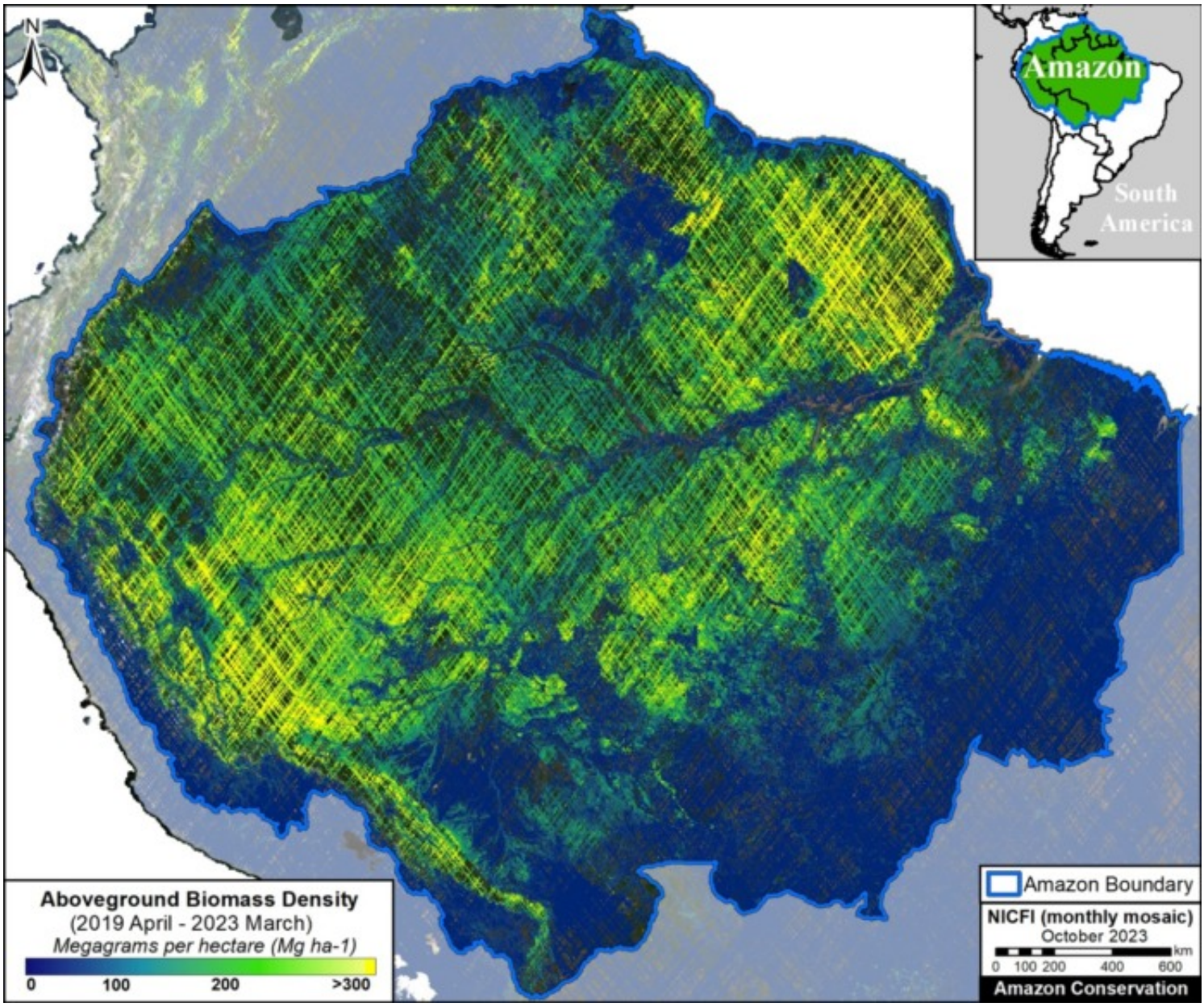

Figure 1. Aboveground biomass density (carbon estimate) across the Amazon biome. Data: NASA/GEDI, NICFI.

As we approach the **COP28 climate summit**, starting in Dubai in late November, we provide here a concise update on the current state of remaining Amazon carbon reserves.

We present the newly updated version of **NASA's GEDI** data[1], which uses lasers aboard the International Space Station to provide cutting-edge estimates of aboveground biomass density on a global scale.

Here, we zoom in on **the Amazon** and take a first look at the newly updated data, which covers the time period of April 2019 – March 2023.[2]

This data, which is measured in megagrams of aboveground biomass per hectare (Mg/ha) at a 1-kilometer resolution, serves as our estimate for **aboveground carbon** reserves.

Figure 1 displays aboveground biomass across the Amazon biome. Note the highest carbon densities (indicated in bright yellow) are located in both the northeast Amazon and southwest Amazon.

Aboveground Biomass across the Amazon

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Figure 2 also displays aboveground biomass across the Amazon biome, but this time with country boundaries and labels added.

Note that the peak biomass concentrations in the **northeast Amazon** include Suriname, French Guiana, and the northeast corner of Brazil. The peak biomass concentrations in the **southwest Amazon** are centered in southern Peru. Also note that many parts of Ecuador, Colombia, Venezuela, Guyana, Bolivia, Brazil and northern Peru have high carbon densities as well.

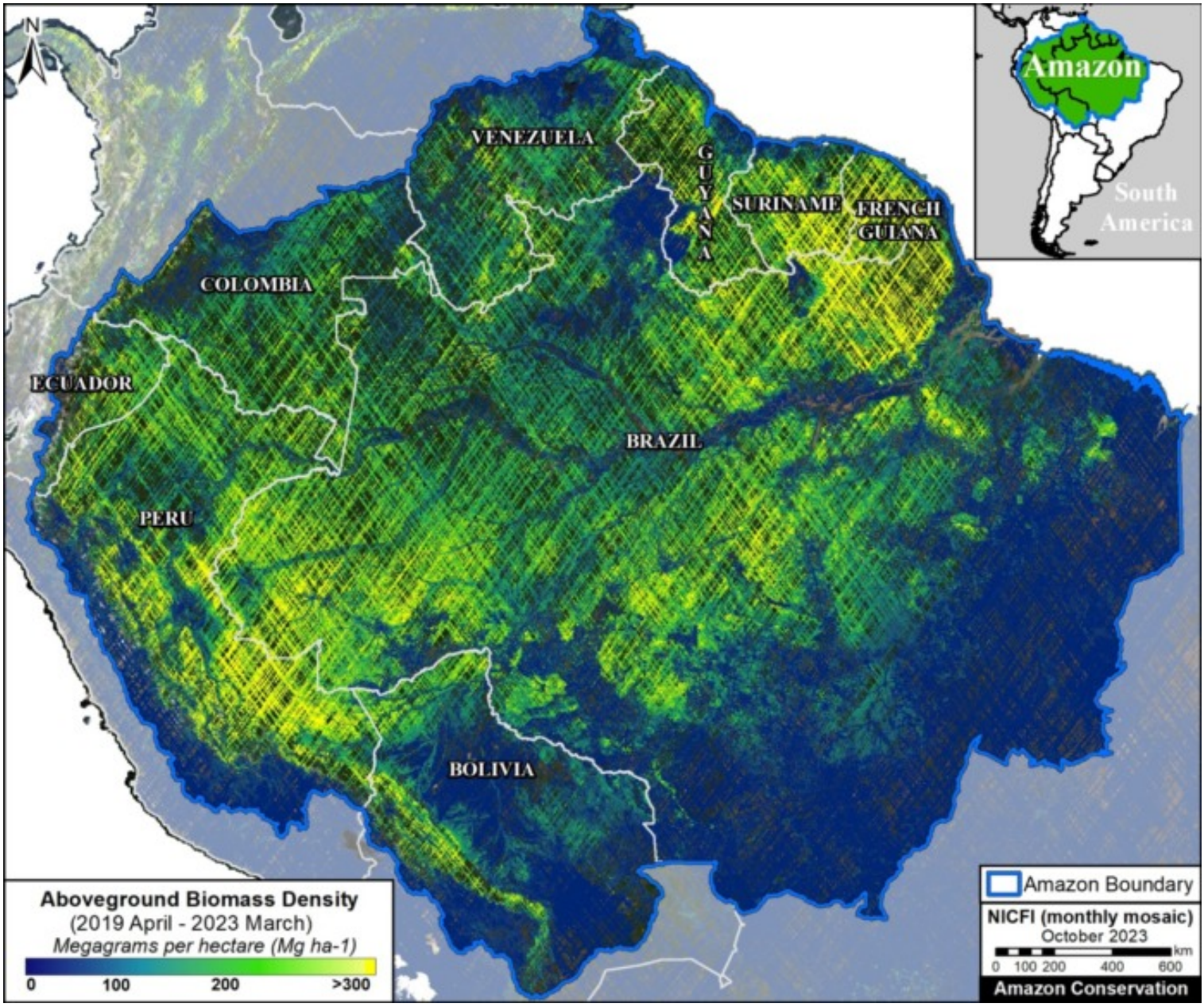

Figure 2. Aboveground biomass density (carbon estimate) across the Amazon biome, with country boundaries. Data: NASA/GEDI, NICFI.

Carbon Estimates

We calculated **over 78 billion metric tons of aboveground biomass** across the Amazon biome (78,184,161,090 metric tons to be exact). Using a general assumption that 48% of this biomass is carbon[3], we estimate **over 37 billion metric tons of carbon** across the Amazon (37,528,397,323 metric tons).

Note that these totals are likely underestimates given that the laser-based data has not yet achieved full coverage across the Amazon (that is, there are many areas where the lasers have not yet recorded data, leaving visible blanks in the maps above).

This is consistent with a previous study based on another independent dataset, where we estimated 6.7 billion metric tons of

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carbon in the Peruvian Amazon as of 2013 (MAAP #148). The current GEDI data estimates at least 5.3 billion metric tons in the Peruvian Amazon.

Carbon Sink

In a previous report, we showed that the Brazilian Amazon has become a net carbon source, whereas the total Amazon is still a net carbon sink (MAAP #144). Our current report goes one step further in terms of showing just how much carbon is left in that sink.

Notes

[1]GEDI L4B Gridded Aboveground Biomass Density, Version 2.1. https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2299

[2]Note that we previously reported on the initial data release, which covered the time period of April 2019 – August 2021 (see MAAP #160).

[3]Domke et al (2022) How Much Carbon is in Tree Biomass?. USDA/Forest Service.

Acknowledgements

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