

Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see [Authors & Referees](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- The statistical test(s) used AND whether they are one- or two-sided
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- A description of all covariates tested
- A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection

The annual aboveground biomass and forest maps are generated based on the freely available satellite images, including the L-band Soil Moisture and Ocean Salinity (<https://directory.eoportal.org/web/eoportal/satellite-missions/content/-/article/smos>) and the MOD09A1 (<https://lpdaac.usgs.gov/products/mod09a1v006/>)

Data analysis

We use ArcGIS 10.1 (<https://www.arcgis.com/index.html>), R (<https://www.r-project.org/>), ENVI/IDL 5.2 (<https://www.harrisgeospatial.com/>), and Matlab R2017a (<https://www.mathworks.com/products/matlab.html>) to carry out data analysis.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

The annual evergreen forest maps (<https://figshare.com/s/802f977f8c73994da238>) and AGB maps (<https://figshare.com/s/49bb5f9bdf3f241965d5>) are freely available in the GeoTIFF format at Figshare. The GFW product is available at <http://earthenginepartners.appspot.com/science-2013-global-forest>. The PRODES forest product is available at <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes>. MOD14A2, MOD16A2, and MCD64A1 products are available at <https://lpdaac.usgs.gov/data/>. The TRMM product is available at <https://pmm.nasa.gov/data-access/downloads/trmm>. The PAR product is from the NCEP/DOE 2 Reanalysis data provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado, USA, from their Web site at <https://www.esrl.noaa.gov/psd/>.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

Life sciences Behavioural & social sciences Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Spatial-temporal dynamics of aboveground biomass (AGB) and forest area affect the carbon cycle, climate, and biodiversity in the Brazilian Amazon. Here we investigate inter-annual changes of AGB and forest area by analyzing satellite-based annual AGB and forest area datasets. We found the gross forest area loss was larger in 2019 than in 2015, possibly due to recent loosening of forest protection policies. However, net AGB loss was three times smaller in 2019 than in 2015. During 2010-2019, the Brazilian Amazon had a cumulative gross loss of 4.45 Pg C against a gross gain of 3.78 Pg C, resulting in net AGB loss of 0.67 Pg C. Forest degradation (73%) contributed three times more to the gross AGB loss than deforestation (27%), given that the areal extent of degradation exceeds deforestation. This indicates that forest degradation has become the largest process driving carbon loss and should become a higher policy priority.
Research sample	Our study did not use sample.
Sampling strategy	Our study did not use sample.
Data collection	<i>Describe the data collection procedure, including who recorded the data and how.</i>
Timing and spatial scale	Our study used (1) annual aboveground biomass maps at 0.25 degree during 2010-2019, and (2) annual evergreen forest maps at 500 m spatial resolution during 2010-2019 and were then aggregated into 0.25 degree.
Data exclusions	No data was excluded from analysis.
Reproducibility	Our study is not based on experiments. We analyzed annual aboveground biomass maps and forest maps derived from satellite images in the Brazilian Amazon.
Randomization	Our study is not based on experiments, so no randomization was needed.
Blinding	Our study is not based on experiments, so no blinding was needed.
Did the study involve field work?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> Antibodies
<input checked="" type="checkbox"/>	<input type="checkbox"/> Eukaryotic cell lines
<input checked="" type="checkbox"/>	<input type="checkbox"/> Palaeontology
<input checked="" type="checkbox"/>	<input type="checkbox"/> Animals and other organisms
<input checked="" type="checkbox"/>	<input type="checkbox"/> Human research participants
<input checked="" type="checkbox"/>	<input type="checkbox"/> Clinical data

Methods

n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> ChIP-seq
<input checked="" type="checkbox"/>	<input type="checkbox"/> Flow cytometry
<input checked="" type="checkbox"/>	<input type="checkbox"/> MRI-based neuroimaging