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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	Data collected and processed using the arcpy module of ArcGIS (v 10.4.1) and custom Python code (v 2.7), which will be made available on GitHub at https://github.com/rasenior/ClimateConnectivity.
Data analysis	All analyses in R (v 3.5.2)

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

Raw climate data available at http://www.worldclim.org/version1, and forest cover data at https://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.0.html. Processed data that support the findings of this study will be deposited in Figshare, DOI: 10.15131/shef.data.8340578.

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

Ecological, evolutionary & environmental sciences study design

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

Study description	Forest patches for the tropics were created for 2000 and 2012 by combining freely available forest cover and climate data. Climate connectivity was calculated in each year, for each patch, using a simple algorithm based on patch adjacency and relative temperature. This connectivity measure, for each patch, was used as the response variable in subsequent statistical analyses. The unit of replication is land mass, representing whole islands (e.g. Borneo) as well as sections of land masses clipped to the extent of the tropics (e.g. tropical part of Africa).
Research sample	We sampled the tropics only.
Sampling strategy	Not applicable - sample size is pre-determined by the number of distinct land masses that exist in the tropics.
Data collection	Data were not collected directly, they were downloaded from existing databases (WorldClim v1.4 and Hansen et al. 2013). See Methods.
Timing and spatial scale	Forest cover data were used for 2000 and 2012, initially at 30 m resolution and resampled to 1 km resolution. Present climate data is an average of the period ~1950-2000 and future climate data for the period 2061-2100, both resampled to 1 km^2 resolution.
Data exclusions	Data beyond the tropics were excluded because they were beyond the scope of this study. Forest patches below 10 km^2 were excluded based on the assumption that patches smaller than this would not support demographic processes for long enough to enable range shifts. This restriction is tested in Supplementary Methods 1.
Reproducibility	This study is not based on experiments. Freely available data and code will facilitate reproduction of the results presented in this study.
Randomization	The study is not based on experiments, so randomization into experimental groups was not necessary.
Blinding	The study is not based on experiments, so blinding into experimental groups was not necessary.

Did the study involve field work? ☐ Yes ☒ 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	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging