

Reporting Summary

Nature Portfolio 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 Portfolio policies, see our [Editorial Policies](#) 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 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 and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

All data employed in this study is publicly available and accession code to their respective data repositories is provided. Specific repositories are described below in the data collection statement.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender

Population characteristics

Recruitment

Ethics oversight

Note that full information on the approval of the study protocol must also be provided in the manuscript.

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	This study highlights the potential of animal borne sensors (ABSs) to overcome limitations of traditional climate measurements. ABSs can provide fine-grained and ecological relevant sampling, and tagged animals could function as environmental sentinels worldwide. We illustrate this potential by providing a brief historical overview into animal borne sensors, providing a collection of case studies, and identifying caveats and solutions for an enhanced collection of meteorological conditions at the scales at which organisms interact with their environment.
Research sample	Research samples were obtained from previously collected and published data consisting of animal tracking data (White stork, elephant seal, African elephant, Galapagos giant tortoise, Wandering albatross and caribou), remote sensing products and local weather sources. Data access and code is described below
Sampling strategy	Not applicable
Data collection	We obtained animal tracking data and in situ station data from publicly available data repositories. Animal tracking data used in this manuscript is available under creative comma zero licensing. Stork data are available at https://www.datarepository.movebank.org/handle/10255/move.1253 and https://www.datarepository.movebank.org/handle/10255/move.. African elephant data are available at https://www.datarepository.movebank.org/handle/10255/move.980 . Caribou data is available at https://www.datarepository.movebank.org/handle/10255/move.956 . Wandering albatross data are available at https://www.datarepository.movebank.org/handle/10255/move.331 . Galapagos tortoise data are available at. Elephant seal Argos tracking and dive data were sourced from the Integrated Marine Observing System (IMOS). IMOS is a national collaborative research infrastructure, supported by the Australian Government. It is operated by a consortium of institutions as an unincorporated joint venture, with the University of Tasmania as lead agent. This work was further also supported by the French Polar Institute (program 109: PI. H. Weimerskirch and 1201: PI. C. Gilbert and C. Guinet), the SNO-MEMO and CNES-TOSCA. Fluxtower data was obtained as part of the Fluxnet2015 ZA-Kru Skukuza Dataset (https://fluxnet.org/doi/FLUXNET2015/ZA-Kru).
Timing and spatial scale	Not applicable
Data exclusions	For showcasing comparison of temperatures collected by animal borne sensors, remote sensing and in situ stations, only night time estimates were employed.
Reproducibility	Data and code used in this analysis is publicly available. Necessary code to replicate figures is available at GitHub (XXX)
Randomization	We did not randomize any samples
Blinding	Blinding was not relevant for this perspective piece
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 and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

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