

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 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 Lidar data acquisition and processing were done with Optech LMS 4.4.0, Terrasolid TerraScan 20.04 and Golden Software Surfer 16.

Data analysis Lidar-derived DEMs were analyzed with ESRI ArcGIS 10.7.1 and QGIS 3.10.2.
The Bayesian analysis of radiocarbon dates was done with Oxcal 4.4.2.
The Oxcal codes for this analysis are included as Supplementary Information.
The analysis of sunrise directions was done with Stellarium 0.19.3.

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 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 database of archaeological sites identified in this study is available at the University of Arizona Campus Repository (<https://repository.arizona.edu/>).

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)

Behavioural & social sciences study design

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

Study description	This is an archaeological study of past society. The primary data derive from lidar surveys. Information on dates and material cultures were obtained through excavations, pedestrian surveys and radiocarbon dating. The study involves quantitative data on site distribution, site sizes and radiocarbon dates. It also includes the qualitative study of site plans, spatial use and social processes.
Research sample	The primary data on site distribution and site forms were obtained from the publicly available lidar data of the INEGI (www.inegi.org.mx). The lidar covers the entire study area of 84,516 km ² in southern Mexico, and thus the data are representative. We also examined high-resolution lidar data for areas of 1,015 km ² obtained by the NCALM, 99 km ² obtained by NASA G-LiHT (publicly available) and 10 km ² obtained by CCGS. The coverage by the high-resolution lidar is not representative, but it provides adequate data for the verification of the INEGI lidar. Locations for excavations were chosen purposefully to obtain necessary data efficiently.
Sampling strategy	The INEGI lidar covers the entire study area, and we recorded all archaeological sites that are detectable in this lidar dataset. The areas for the NCALM lidar were chosen purposefully to examine important sites. No sample size calculation was performed.
Data collection	The INEGI and G-LiHT lidar data were obtained before our research and were made publicly available. We analyzed these publicly-available data. The NCALM data were collected with Optech Titan lidar. Excavation data were recorded on paper forms in the field and then input in computer files. Photographs of excavations were taken with Nikon D750 and D7000 digital cameras. In addition to the authors of this paper, other archaeologists, archaeology students, and local community members participated in excavations.
Timing	NCALM lidar data were collected in May 2017 and June 2019. Lidar data were analyzed December 2017-June 2020. Archaeological fieldwork was conducted July-August 2017, February-April 2018, February-April 2019 and February-March 2020.
Data exclusions	No lidar and excavation data were excluded. In the Bayesian analysis of radiocarbon dates, probable outliers were excluded from the models. This is a standard procedure for this analysis. By comparing sequences of stratigraphically-related radiocarbon dates, we identified those affected by stratigraphic mixing or the use of old wood. We also examined the statistical indicators of outliers (agreement index calculated by Oxcal). In addition, we made an outlier model of Oxcal, which statistically identified probable outliers.
Non-participation	The study did not involve human participants.
Randomization	The study did not involve human participants. Lidar and excavation data were not randomized.

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
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

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