

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 (<i>n</i>) 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 <i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i>
☐	☒ 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. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> value noted <i>Give P values as exact values whenever suitable.</i>
☒	☐ 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 <i>d</i> , Pearson's <i>r</i>), 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	no software was used for data collection
Data analysis	AMDIS32 (Automated Mass Spectral Deconvolution and Identification System) Microsoft Excel (Microsoft) XCaliburTM (Thermo Fisher Scientific Inc., USA) Origin 2018 software (OriginLab Corporation, Northampton, MA, USA) No custom scripts or bespoke software were developed or used for the data analysis in this study

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 generated and analysed in this study are available in the manuscript and Supplementary Information and are also deposited in the public repository figshare under <https://doi.org/10.6084/m9.figshare.31369066>.

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender	n/a
Reporting on race, ethnicity, or other socially relevant groupings	n/a
Population characteristics	n/a
Recruitment	n/a
Ethics oversight	n/a

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	Geochemical study assessing the occurrence and distribution of organic and inorganic anthropogenic pollutants in surficial hadal sediments from the Japan Trench. Sediment samples spanning ~1–52 cm below seafloor from seven trench basins (water depth >7.4 km) were analysed for TOC, organic pollutants/biomarkers (e.g., PAHs, hopanes, DDT metabolites), and potentially toxic elements (PTEs) (e.g., As, Ag, Cd, Cr, Pb, Te, Zn). Patterns were evaluated across sites and stratigraphic layers (including pre-/post-event horizons) and explored using multivariate statistics (PCA).
Research sample	Surficial mudline sediments collected from seven basins along the Japan Trench axis at IODP Expedition 386 sites. Material derives from Giant Piston Cores and pilot cores. Sediment samples were kept frozen (< -20 °C) until extraction to minimize alteration and photodegradation. The sample set is intended to represent recent trench-basin depositional environments that receive material via background settling and event-driven sediment transport.
Sampling strategy	Sampling was site-based across the seven basins using IODP Expedition 386 coring locations to capture spatial variability along the trench axis and between basins. Depth intervals were selected to cover near-surface stratigraphy. Sample numbers and locations were constrained by expedition coring and available mudline material.
Data collection	Cores were collected and sampled during IODP Expedition 386.
Timing and spatial scale	Coring acquisition: April–June 2021 (offshore phase; R/V Kaimei). Sampling for this study: November–December 2022 (Personal Sampling Party; D/V Chikyu). Spatial scale: seven hadal basins along the Japan Trench axis (water depth >7.4 km). Vertical scale: surficial sediment interval of approximately 1–52 cm below seafloor.
Data exclusions	No samples/data were excluded. Standard analytical handling of procedural blanks and limits of detection (LOD) was applied, and values below LOD were treated as non-detects.

Reproducibility	Reproducibility and data quality were supported through established QA/QC procedures.
Randomization	Not applicable
Blinding	Blinding was not implemented and was not considered applicable for this study. The work is an observational geochemical analysis of sediment cores where sample identity (site, core, depth interval) is an inherent part of the measurement and interpretation (e.g., stratigraphic context, basin-to-basin comparisons).

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions	Samples were collected with Giant Piston cores at extreme conditions in >8000m water depths
Location	Offshore in the Japan Trench during IODP Expedition 386
Access & import/export	all samples were accessed via the IODP sample request and exported/imported according to national regulations
Disturbance	QA/QC procedures were in place during sampling and laboratory analysis, including the use of pre-cleaned equipment and blanks

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

Methods

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

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

Plants

Seed stocks	n/a
Novel plant genotypes	n/a
Authentication	n/a