IODP³

INTERNATIONAL OCEAN DRILLING PROGRAMME

CALL FOR PARTICIPATION
IODP³ Expedition 506S:

SIGNALS: Stratigraphic InteGration of North Atlantic Legacy Sites

Deadline: 11 February 2026

9 December 2025

Call for Participation in IODP^3 Expedition 506S: SIGNALS: Stratigraphic InteGration of North Atlantic Legacy Sites

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Introduction

IODP^3 Expedition 506S is a SPARC (Scientific Projects using ocean drilling ARChives) expedition involving sampling and analysis of legacy IODP, ODP, and DSDP cores from the North Atlantic, and held in the Bremen Core Repository (BCR) in Bremen, Germany. We invite applications from scientists with interest and expertise relevant to the objectives of the expedition to apply for membership of the IODP^3 Expedition Science Team. This call is open to applicants based in nations currently participating in IODP^3 or in any nation currently or previously a member of a scientific ocean drilling programme.

New!

To enable the IODP^3 Science Office to provide support to scientists interested in applying for this expedition, we are asking potential applicants to complete our new Expression of Interest Google Form (available **here**). This is not compulsory, does not commit you to apply, and not completing the form does not influence the evaluation of any application you make in any way. However, we strongly encourage completion of this form to ensure that we can best support you if you proceed to apply… completion will take less than two minutes!

This form will close on 11 January 2026 (one month prior to the application deadline of 11 February 2026)

Background and Objectives

The North Atlantic is one of the most climatically variable and sensitive regions in the oceans as it is prone to mode jumps in the Atlantic Meridional Ocean Circulation (AMOC). While many ODP/IODP expeditions have recovered continuous, high-resolution sediment sequences in the North Atlantic, a comprehensive integration of these legacy sites remains incomplete. These cores contain distinct signals of orbital- and suborbital-scale climate variability but many have not been fully exploited because they have not been properly correlated and integrated across the entire North Atlantic. The **SIGNALS** (**S**tratigraphic **I**nte**G**ration of **N**orth **A**tlantic **L**egacy **S**ites)

expedition aims to synthesize and integrate these legacy records into a coherent, four-dimensional stratigraphic framework to provide a regional reconstruction of past climate variability on millennial to orbital timescales since the late Miocene.

Stratigraphic correlation and chronology are at the heart of the SIGNALS project because it is a prerequisite for interpreting past climate history and identifying the forcings and dynamics of climate change. IODP^3 Expedition 506S will synchronize records across multiple North Atlantic sites to answer key paleoclimate questions regarding orbital- and millennial-scale climate variability from the late Miocene to present. Climate variability will be placed in an orbitally-tuned chronologic framework with robust estimates of stratigraphic and temporal uncertainty. The unified framework will provide the basis for generation and synthesis of new and existing proxy data by members of the Expedition 506S Science Team. It will also permit refinement of the ages of isotopic, biostratigraphic and magnetostratigraphic chronologies across the North Atlantic. The geochonologic information will feed into broader initiatives such as Time Integrated Matrix for Earth Sciences (TIMES) (Westerhold et al., 2024).

Stratigraphic correlation (between holes and among sites) will be accomplished mainly using non-destructive, automated measurements used to characterize physical properties and elemental composition of sediment cores (e.g., line-scan images, color reflectance, Gamma Ray Attenuation Porosity Evaluation, magnetic susceptibility, natural gamma radiation, XRF scanning, and down-hole logging). SIGNALS will develop and employ advanced methods of signal alignment and AI-assisted data generation to underpin stratigraphic correlation.

Objectives are grouped into those related to methodological (M) development and paleoclimatology (P):

M1: **Data Collection** – Fill data gaps at key anchor sites and provide robust frameworks to refine the existing bio- and paleomagnetic stratigraphies.

M2: **Construct 4-D Framework** – Establish a synchronized, multi-proxy stratigraphic framework for North Atlantic sites, including uncertainty estimates in stratigraphic correlations and age models.

M3: **Assess Temporal Resolution** – Evaluate the limits of temporal resolution at each site given varying sedimentation rates, bioturbation, and sampling frequency.

M4: **Marine-Ice-Terrestrial correlations** – Precisely correlate climate signals in marine sediment cores to the polar ice cores and terrestrial records to link oceanic, atmospheric, and terrestrial climate and environmental changes.

M5: **Advance Stratigraphic Correlation Techniques** – Develop and apply automated signal correlation algorithms to synchronize sediment records at orbital and suborbital timescales, along with estimated uncertainties.

M6: **Core Imaging, Computer Vision & Deep Learning** – Process high-resolution core images using neural networks to automatically segment and remove unwanted disturbances such as those resulting from bioturbation, redox changes, and core disturbance.

P1: **Reconstructing North Atlantic Climate Evolution** – Investigate how the Earth transitioned from the warm Miocene to the glacial-interglacial cycles of the Pleistocene, with a focus on orbital-scale climate variability and feedbacks in relation to forcing by tectonics and greenhouse gases.

P2: **Causes of cyclic sedimentation** – Develop process models to understand how orbitally-driven climatic processes are expressed as cycles in the stratigraphic record of each site. Understand how cyclicity evolved at each site/region as background conditions changed from late Miocene to present.

P3: **Understanding Millennial-Scale Climate Variability (MCV)** – Reconstruct the timing and spatial patterns of abrupt climate change since the late Pliocene intensification of Northern Hemisphere glaciation (iNHG) and their relationship to a changing AMOC.

P4: **Climate Variability across Timescales** – Characterise the interactions of millennial, orbital and longer timescale climate variability as orbital, glacial and tectonic boundary conditions changed since the late Miocene.

P5: **Linking Surface, Intermediate and Deep Ocean Changes**– Examine how variations in sea surface temperatures (SST), ice-rafted debris (IRD), and deep-water circulation influenced past climate shifts and carbon cycle dynamics. How did Mediterranean Outflow Water and AMOC affect heat and salt transport in the ocean, and what was the role of the North Atlantic in triggering or amplifying global climatic changes?

Timing and Operations

A detailed implementation plan for the expedition will be developed in discussion with all Science Team members invited to participate following evaluation of applications received. This approach means the overall expedition research effort will benefit not only from the individual contributions proposed by all Science Team members in their applications but also from collaborations developed between team members once staffing is complete.

Expedition 506S has €300,000 of core funding from IODP[3]. After selection, Science Team members will engage with the Co-Chief Scientists in developing a detailed budget plan for use of this funding, to ensure the most effective use of this investment and to maximise resulting scientific benefits.

Once the implementation and budget plans are finalised and approved by the IODP[3] MSP Facility Board, a formal start date for the expedition will be agreed with the IODP[3] Science Office and IODP[3] Managing Agency. The funded period will last for three years from this date, with the bulk of the expedition research effort taking place in this period. **Note that there will be no offshore operations.**

Data collection will mainly consist of new XRF analysis and line-scan imaging needed to supplement existing XRF data and images/physical property measurements stored in IODP databases. Individual sample requests by IODP[3] Expedition 506S scientists will be made for any additional discrete samples needed for biostratigraphic or other proxy data generation. XRF scanning, imaging and sampling at the BCR will be conducted by small groups of the Science Team. We will also use XRF laboratory facilities at other institutions for XRF scanning and imaging of existing u-channels previously taken from legacy cores (no new u-channels will be taken).

Expedition 506S scientists will collaborate through a dedicated virtual workspace that will function as the expedition's platform — providing real-time communication, coordination, and data-sharing infrastructure for the Science Team. This digital environment will provide structured channels for each working group (e.g., stratigraphic correlation, XRF data, image analysis, machine learning, chronology, etc.), linking scientists, data systems, and analytical tools in real time.

We anticipate beginning the three-year timeline of IODP[3] Expedition 506S in August or September 2026, with sampling at the Bremen Core Repository likely occurring later in 2026 or early 2027 (pending availability of the Science Team and consultation with the repositories). The Co-proponents will support members of the Science Team who wish to develop external funding proposals for expedition-related research.

Expertise sought

A range of skills will be needed to conduct the core components of the expedition (Table 1). The Science Team will include specialists spanning the full range of disciplines needed to correlate North Atlantic legacy sites across millennial and orbital timescales to create an integrated stratigraphic network. Each participant will be assigned to one or more working groups according to expertise and interests, ensuring that both millennial and orbital correlation objectives are addressed collaboratively and coherently. We particularly welcome early career scientists with a

strong foundation and interest in signal analysis and correlation, statistics, data processing and analysis, and specialized machine-learning.

Table 1. List of areas of expertise needed for IODP^3 Expedition 506S “SIGNALS”

Field / Expertise	Role or Focus Area
Stratigraphy & Chronology	Multi-proxy correlation and chronology at millennial and orbital time scales. Marine, ice-core, terrestrial integration.
Cyclostratigraphy & Astrochronology	Orbital tuning, spectral analysis, and time-series evaluation.
Sedimentology and Process Modeling	Depositional processes, cyclic stratigraphy, and facies analysis.
Geochemistry (XRF, Isotopes, Biomarkers)	Proxy generation, calibration, and inter-site consistency.
Paleomagnetism & Biostratigraphy	Magnetostratigraphic and micropaleontologic age control.
Computational Geoscience / Data Science	Quantitative correlation tools, probabilistic modeling, error analysis, and signal processing.
Computer Vision & Image Analysis	Machine-learning approaches for core imaging and feature extraction.
Data Management and Assimilation	Metadata curation, repository integration, and data interoperability, data-model Integration

We also welcome applications from researchers proposing complementary research projects that go beyond the stated research objectives or wishing to apply additional or novel techniques not listed above.

How to Apply

★★★ Reminder ★★★

Please consider completing our Expression of Interest form (available **here**) to ensure that we can best support you if you proceed to apply… completion will take less than two minutes!

This form will close on 11 January 2026.

Applications must be submitted to the IODP^3 Science Office by the deadline of **23:59 GMT on Wednesday 11 February 2026** using the **IODP^3 Gateway** system, accessed via the **Apply to Participate** link on the **IODP^3 website**.

Information on requesting an IODP^3 Gateway account and on the content required in applications to this call is also available in the IODP^3 **Guide for Applicants**. Note that the applicant roles for this call are “Repository and laboratory” (if you would like to take part in the Core Repository phase of the expedition) and “Laboratory only” (if you do not wish to work at the BCR) - see Section 4.1 in the IODP^3 **Guide for Applicants** for further information.

Applications received by the deadline will be evaluated by the Programme Member Offices and shortlisted candidates considered for selection by the Co-Chief Scientists, with staffing decisions made in April/May 2026.

- For further scientific details, please contact:
  David Hodell, Expedition 506S Co-Chief Scientist, **dah73@cam.ac.uk**
  Arisa Seki, Expedition 506S Co-Chief Scientist, **seki@fgi.or.jp**
- For enquiries about the application process and IODP^3 Gateway, please contact:
  Jodie Fisher, IODP^3 Science Office, **applications@iodp3.org**