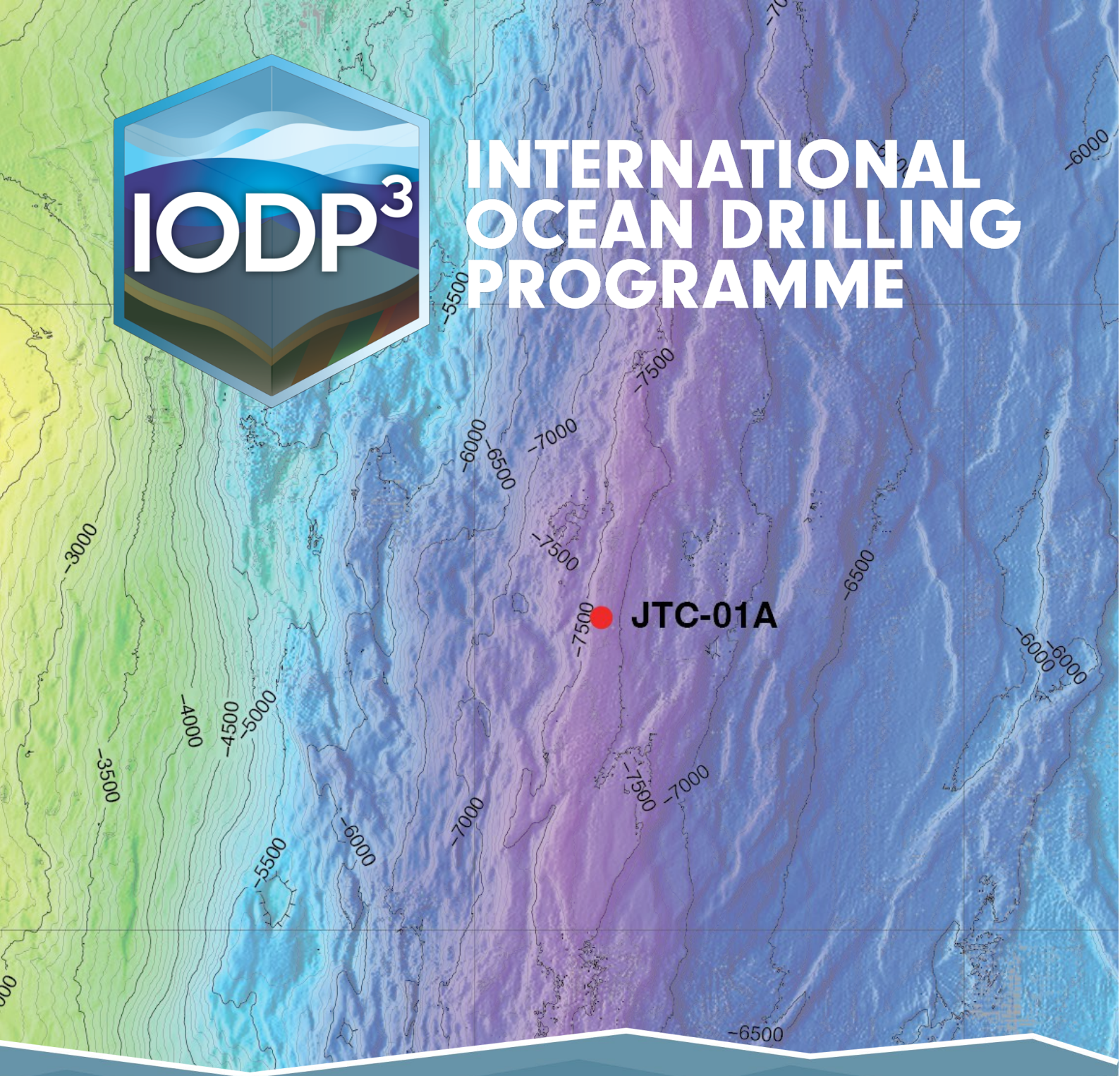

INTERNATIONAL OCEAN DRILLING PROGRAMME

SECOND CALL FOR PARTICIPATION

IODP³ Expedition 503:
Hadal Trench Tsunamigenic Slip History

Deadline: 21 September 2026

19 August 2026

Second Call for Participation in IODP^3 Expedition

Hadal Trench Tsunamigenic Slip History

Co-Chief Scientists: Ken Ikehara & Michael Strasser
Expedition Project Manager: Lena Maeda

Introduction

Hadal oceanic trenches are the deepest places on our planet. They form due to downward bending of subducting ocean crust along subduction zones, act as terminal sinks for sediment, particulate and dissolved organic carbon, and form high-resolution archives to unravel the history of subduction zone processes including subduction megathrust earthquakes and tsunamis.

IODP^3 Expedition 503 aimed to recover the complete trench-fill sedimentary succession in the central Japan Trench to reconstruct the long-term history of megathrust earthquakes and tsunamigenic slip-to-the-trench events. The expedition further sought to establish an integrated chronology of event deposits and deformation horizons, investigate earthquake-related fluid migration, and characterize carbon cycling, early diagenetic processes, and subseafloor microbial activity within the hadal trench-fill succession (**Ikehara et al., 2025**).

Nature and extent of core materials recovered

IODP^3 Expedition 503 successfully recovered a continuous sedimentary succession from five holes (C0028A–E) at Site C0028 in the central Japan Trench using the Hydraulic Piston Coring System (HPCS). Hole C0028B recovered the principal stratigraphic record to 178.0 m below seafloor with 106.5% recovery, complemented by a parallel section in Hole C0028C and targeted overlap and microbiological sampling in Holes C0028D and C0028E. In total, 384.5 m of high-quality core was recovered, spanning the complete sedimentary succession of the hadal trench basin and extending into the underlying sedimentary sequence. Magnetostratigraphic constraints indicate that the recovered record extends back to at least the Middle Pleistocene (~773 ka). The recovered material comprises background hemipelagic and biosiliceous sediments, numerous earthquake-triggered event deposits, volcanic ash layers, deformation structures, as well as preserved interstitial waters and headspace gas aliquots and microbiology community whole-round samples, together with a comprehensive suite of physical property, geochemical, paleomagnetic, micropaleontological, structural geological, and stratigraphic datasets that form the basis for post-expedition research.

Analyses already being conducted by the Science Team

The original Expedition 503 Science Team developed a broad, multidisciplinary analytical portfolio integrating a wide range of shipboard and post-expedition analytical approaches for chronological, sedimentological, stratigraphic, geochemical, paleomagnetic, structural geological, micropaleontological, microbiological, and petrophysical investigations.

Planned chronological approaches include tephrostratigraphy, radiolarian biostratigraphy, high-resolution paleomagnetic stratigraphy (including secular variation stratigraphy), and integrated chronologies combining radiocarbon dating of bulk organic carbon, pollen, and calcareous microfossils. Sedimentological investigations combine grain-size analysis, microscopic observations, Micro-XCT imaging, XRF core scanning, XRD mineralogical analyses, ichnology, and anisotropy of magnetic susceptibility (AMS) to establish lithostratigraphy and event stratigraphy, and to reconstruct event deposits, sediment provenance, depositional processes, and facies evolution.

Structural geological and petrophysical studies include microstructural characterization, AMS, SEM/EDS and synchrotron diffraction and texture analyses, geotechnical testing under static and dynamic loading, consolidation testing, P-wave and S-wave velocity measurements.

Geochemical investigations encompass bulk geochemical and mineralogical analyses addressing the carbon, iron, phosphorus, sulfur, and silicon cycles; measurements of total organic carbon (TOC), total inorganic carbon (TIC), total nitrogen (TN), and total sulfur (TS); sequential sediment extractions and complete digestions, followed by ICP-OES/MS, to investigate the partitioning and binding forms of iron, phosphorus, sulfur, and silicon; pore-water analyses of phosphorus, δ^{13}C-DIC, silicon and lithium isotope compositions, with the latter determined by MC-ICP-MS. Additional approaches include dissolved organic matter characterization, including DOC and δ^{13}C-DOC; biomarker and organic geochemical analyses; radio- and stable-isotope analyses of pyrolytically separated organic-carbon components; Rock-Eval and temperature-programmed pyrolysis; Raman spectroscopic characterization; and analyses of carbohydrates and extracellular polymeric substances (EPS).

Micropaleontological studies include benthic foraminifera, radiolaria, diatom and palynology. Planned microbiological investigations include cell counting; DNA extraction, quantification, and sequencing; metagenomic and metatranscriptomic analyses, including the reconstruction of metagenome-assembled genomes (MAGs); single-cell genomics; cultivation-based approaches including direct and anaerobic culturing and stable isotope probing.

In addition, the analytical portfolio includes chemostratigraphic analyses, core-seismic integration, and stratigraphic integration and correlation.

Potential new approaches identified by the Science Team

The Expedition Science Team identified analytical directions that could complement the original research portfolio and further enhance the scientific value of Expedition 503 materials without duplicating ongoing studies. These include, but are not limited to:

- **Additional chronological constraints,** including absolute dating of volcanic ash to further refine the age model. The science team can provide information on which tephra samples are suitable for measurement, depending on the dating methodology and the target materials and minerals.
- **Expanded interstitial-water and sediment geochemistry**, including sulfur isotope systems, fluid-mobile element isotope systems, and complementary solid-phase isotope and mineral-specific geochemical analyses to further investigate fluid migration, fluid-rock interaction, early diagenesis, and elemental cycling.
- **Additional dissolved and gas-phase organic geochemical approaches**, including radioisotope analyses of dissolved inorganic and organic carbon (e.g., Δ^{14}C-DIC and Δ^{14}C-DOC), headspace gas geochemistry, and related isotope systems to further constrain carbon sources, transformation processes, and subseafloor carbon cycling.
- **Additional approaches to constrain low-temperature diagenesis and organic matter reactivity**, including thermogravimetric analyses (TGA/DTG), amino acid racemization (AAR; D/L ratios), silica dissolution kinetics, and related thermolysis-based approaches to better constrain time- and temperature-dependent diagenetic reaction kinetics affecting organic matter and reactive mineral phases.

Applications are welcomed from scientists proposing to either: (a) adopt these or any other approaches to address the original objectives of the expedition without duplicating the plans of the original Science Team; or (b) use core samples recovered during the expedition to address new objectives and deliver new science not envisaged by the original expedition proposal (**Ikehara et al., 2025**).

How to Apply

Applications from scientists based in **IODP^3 Core and Associate Member nations** must be submitted to the IODP^3 Science Office by the deadline of **23:59 BST on Monday 21 September 2026** using the **IODP^3 Gateway** system, accessed via “Apply to Participate” on the **IODP^3 website**.

Information on the content required in applications to this call is available in the IODP^3 **Guide for Applicants** (Note that the applicant role for this call is **Sample Request**; see Section 4.1 in the guide)

Applications received by the deadline will be evaluated by the IODP^3 Programme Member Offices and shortlisted candidates will be considered for selection by MarE3 and the Co-Chief Scientists.

- For further expedition details from MarE3, please contact:
  Lena Maeda, Expedition Project Manager/Staff Scientist, **maedal@jamstec.go.jp**
- For further scientific details, please contact:
  Ken Ikehara, Expedition 503 Co-Chief Scientist, **k-ikehara@aist.go.jp**
  Michael Strasser, Expedition 503 Co-Chief Scientist, **Michael.Strasser@uibk.ac.at**
- For enquiries about the application process and IODP^3 Gateway, please contact:
  Jodie Fisher, IODP^3 Science Office, **applications@iodp3.org**