IODP Proposal Cover Sheet

866 - Full 2

Japan Trench Paleoseismology

Received for: 2017-10-02

Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Proponents	Michael Strasser, Ken Ikehara, Toshiya Kanamatsu, Shuichi Kodaira, Cecilia McHugh, Yasuyuki Nakamura, Antonio Cattaneo , Timothy Eglinton, Chris Goldfinger, Takuya Itaki, Arata Kioka, Achim Kopf, Jasper Moernaut, Jim Mori, Yoshitaka Nagahashi, Volkhard Spieß, Witold Szczuciński, Mike Underwood, Kazuko Usami, Stefan Wiemer
Keywords	Paleoseismology, Earthquake, Sedimentology, Event Stratigraphy
Area	Japan Trench

Proponent Information

Proponent	Michael Strasser
Affiliation	University of Innsbruck
Country	Austria

☑ Permission is granted to post the coversheet/site table on www.iodp.org

Abstract

Short historical and even shorter instrumental records limit our perspective of earthquake maximum magnitude and recurrence, and thus are inadequate to fully characterize Earth´s complex and multi-scale seismic behaviour and its consequences. Examining prehistoric events preserved in the geological record is essential to reconstruct the long-term history of earthquakes and to deliver observational data that help to reduce epistemic uncertainties in seismic hazard assessment for long return periods. “Submarine paleoseismology” is a promising approach to investigate deposits from the deep sea, where earthquakes leave traces preserved in the stratigraphic succession. However, at present we lack comprehensive data sets and long-term records that allow for conclusive distinctions between quality and completeness of the paleoseismic archives.

Motivated by the mission to fill the gap in long-term records of giant (Mw9-class) earthquakes, J-TRACK Paleoseismology aims at testing and developing submarine paleoseismology in the Japan Trench (JT). We propose a multi-coring approach by Mission Specific Platform shallow-subsurface (40m) piston coring to recover the continuous Upper Pleistocene-to-Holocene stratigraphic successions of trench-fill basins along an axis-parallel transect of the 7-8km deep trench. The cores from 18 proposed primary (and/or 13 alternate) sites will be used for multi-method applications to characterize event-deposits, for which the detailed stratigraphic expressions and spatio-temporal distribution will be analyzed for proxy-evidence of earthquakes.

Sediment remobilization related to the 2011-Mw-9.0-Tohoku-oki earthquake and the respective deposits are preserved in trench basins, formed by flexural bending of the subducting Pacific plate. These basins are ideal study areas for testing event-deposits for earthquake triggering, because they are poorly connected for sediment-transport from the shelf, experience high sedimentation rates and low benthos activity (and thus high preservation potential) in the hadal environment. Results from conventional coring covering the last ~1.500 years reveal good agreement between the sedimentary record and historical documents. Subbottom profiles images are consistent with basin-fill successions of episodic muddy turbidite deposition, thus defining clear targets for paleoseismologic investigations on longer time scales accessible only by IODP coring.

We will apply, further refine and implement new methods for establishing event-stratigraphy in the deep sea and for recognizing giant vs. smaller earthquakes vs. other driving mechanism. The results of this proposal can potentially produce a fascinating record unravelling an earthquake history that is 10 to a 100 times longer than currently available information. This would contribute to a tremendous advance in the understanding of the recurrence pattern of giant earthquakes and earthquake-induced geohazards globally.

866 - Full 2

Scientific Objectives

There is a high potential of using event-stratigraphy of trench-fill sedimentary successions in the Japan Trench to reconstruct a long history of giant earthquakes off NE Japan: The primary research objectives of JTRACK-Paleoseismology are to:

O-1: Identify the sedimentological, physical, chemical, and biogeochemical proxies of event-deposits in the sedimentary archive that allow for confident recognition and dating of past Mw9-class earthquakes vs. smaller earthquakes vs. other driving mechanism.
O-2: Explore the spatial and temporal distribution of such event-deposits to investigate along-strike and time-dependant variability of sediment sources, transport and deposition processes, and stratigraphic preservation.
O-3: Develop a long-term earthquake record for giant earthquakes.

O-1 and O-2 are related to the mission of testing and developing submarine paleoseismology to produce robust long-term records as input for addressing O-3 in the Japan Trench, for comparison with global examples. To address these objectives we propose IODP Mission Specific Platform shallow-subsurface (40m) piston coring to recover the continuous Upper Pleistocene-to-Holocene stratigraphic successions of isolated trench-fill basins along an axis-parallel transect of the 7-8km deep Japan Trench. The cores from proposed 18 primary (and/or 13 alternate) sites will be used for multi-method applications to characterize event-deposits, for which the detailed stratigraphic expressions and spatio-temporal distribution will be analyzed for proxy-evidence of earthquakes.

Non-standard measurements technology needed to achieve the proposed scientific objectives

Mission Specific Platform shallow-subsurface (40m) piston coring in deep waters of 7-8 km depth

Proposed Sites (Total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPS-01A (Primary)	36.07202 142.73503	8030	40	0	40	(i) Recover an expanded (relative to coupled site JTPS-02A) continuous Holocene stratigraphic succession (potentially reaching the upper Pleistocene) comprising event-deposits from the deepest depocentre in the southernmost-part of the JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-02A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-02A (Primary)	36.10118 142.75813	8000	40	0	40	(i) Recover a condensed (relative to coupled site JTPS-01A), continuous upper Pleistocene-to-Holocene stratigraphic succession, comprising thin sedimentary event-deposits on a trench-floor high near the deepest depocentre in the southernmost-part of the JT study area. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with results from the expanded couple site JTPS-01A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-03A (Alternate)	36.22997 142.88166	7990	35	0	35	(i) Recover a condensed (relative to coupled site JTPS-04A) continuous upper Pleistocene-to-Holocene stratigraphic succession, comprising event-deposits on an elevated trench-floor morphology in the southernmost trench-basin (Alternate site to JTPS-02A in <8km water depth). (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-04A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-04A (Alternate)	36.24424 142.89031	7990	40	0	40	(i) Recover an expanded (relative to coupled site JTPS-03A), continuous Holocene stratigraphic succession (potentially reaching the upper Pleistocene), comprising event-deposits from a local depocentre on an elevated trench-floor morphology in the southernmost trench-basin (Alternate site to JTPS-01A in <8km water depth). (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-03A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2), to develop a long-term record for giant earthquakes (O-3).
JTPS-05B (Primary)	36.89173 143.40772	7700	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession (condensed in the upper part and more expanded in the lower part; relative to coupled site JTPS-06B), comprising event-deposits from a small isolated trench-basin in the central part of the southern JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-06B to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2), to develop a long-term record for giant earthquakes (O-3).
JTPS-06B (Primary)	36.91171 143.42432	7710	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession (expanded in the upper part and more condensed in the lower part; relative to coupled site JTPS-05B), comprising event-deposits from a small isolated trench-basin in the central part of the southern JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-05B to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the northward-extent of sediment-transport routed through the Nakaminato canyon (O-2), to develop a long-term record for giant earthquakes (O-3).

Proposed Sites (Continued; total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPS-07A (Primary)	37.41496 143.73196	7820	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated trench-basin in the north-central part of the southern JT (would be expanded section relative to coupled contingency-option site JTPS-08A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics (at best integrated with contingency-coring site JTPS-08A) and compare with integrated results from JTPS-09A,-10A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-08A (Alternate)	37.42749 143.73726	7820	30	0	30	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from the isolated trench-basin in the north-central part of the southern JT. Contingency-option site as condensed section relative to coupled site JTPS-07A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-07A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-09A (Primary)	37.68110 143.86610	7550	40	0	40	(i) Recover an expanded (relative to coupled site JTPS-10A) continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated trench-basin in the northernmost part of the southern JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-10A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPS-10A (Primary)	37.70031 143.87689	7540	40	0	40	(i) Recover a condensed (relative to coupled site JTPS-09A) continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from the isolated trench-basin in the northernmost part of the southern JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPS-09A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-01A (Primary)	38.00853 144.00566	7570	30	0	30	(i) Recover a condensed (relative to coupled site JTPC-02A) continuous Holocene stratigraphic succession (potentially reaching the upper Pleistocene) comprising event-deposits from the isolated trench-basin in the structurally-complex area affected by 2011-coseismic-rupture-propagation-to-the-trench. (ii) Recover and analyze the top of an older trench-fill deformation event. (iii) Analyze the stratigraphic-pattern and event-deposit characteristics and integrate with JTPC-02A to assess local variability and establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iv) Compare results with all other sites to explore spatio-temporal distribution of earthquake-event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-02A (Primary)	38.02804 144.00227	7570	35	0	35	(i) Recover an expanded (relative to coupled site JTPC-01A) continuous Holocene stratigraphic succession (potentially reaching the upper Pleistocene) comprising event-deposits from the isolated trench-basin in the structurally-complex area affected by 2011-coseismic-rupture-propagation to the trench. (ii) Recover and analyze the top of an older trench-fill deformation event. (iii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-01A to assess local variability and establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iv) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).

Proposed Sites (Continued; total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPC-03B (Primary)	38.29761 144.05920	7460	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from the isolated trench-basin within the relatively-elevated trench-floor segment in the central JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and compare with integrated results from the couple sites JTPC-01A & -02A (in the south) and JTPC-05B (in the north) to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-04A (Alternate)	38.57586 144.12499	7560	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated graben-fill basin in the structurally-complex central part of the central JT, where the neighboring trench-basin only comprises disturbed sections. Contingency-option site as condensed section relative to coupled site (s. l.) JTPC-05A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-05A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-05A (Primary)	38.75801 144.12942	7620	40	0	40	(i) Recover continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from a trench-basin in the central JT (expanded section of coupled contingency-option graben-basin sites (s.l.) JTPC-04A,-07A). (ii) Analyze stratigraphic-pattern and event-deposit characteristics (at best integrated with contingency sites JTPC-04A&-07A) and compare with results from the couple sites JTPC-8A,-09A in the north and JPTC-03A in the south, to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1) (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits(O-2) to develop a long-term record for giant earthquakes(O-3).
JTPC-06B (Alternate)	38.86920 144.15224	7630	35	0	35	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from the isolated trench-basin in the northern-to-central part of the central JT. Alternate sites to JTPC-05B&-09A, and contingency-option coring site (coupled (s.l.) with the relatively-condensed site JTPC-07A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-07A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-07A (Alternate)	38.91249 144.21916	7400	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated graben-fill basin in the northern-to-central part of the central JT. Alternate sites to JTPC-04A&-08A, and contingency-option coring site (coupled (s.l.) with the relatively-expanded sections at sites JTPC-06B/-10A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-06B/-10A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-08A (Primary)	39.03126 144.24752	7340	40	0	40	(i) Recover a condensed (relative to coupled site s.l. JTPC-09A) continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated graben-fill basin in the structurally-complex northern part of the central JT, where the neighboring trench-basin is at the same water-depth but only comprises disturbed sections. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-09A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).

Proposed Sites (Continued; total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPC-09A (Primary)	39.08195 144.21682	7440	35	0	35	(i) Recover an expanded (relative to coupled site s.l. JTPC-08A) continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from an isolated narrow trench-basin in the structurally-complex northern part of the central JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-08A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPC-10A (Alternate)	38.90768 144.15905	7640	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession comprising event-deposits from the isolated trench-basin in the northern-to-central part of the central JT. Alternate sites to JTPC-05A & -09A, and contingency-option coring site (coupled (s.l.) with the relatively-condensed site JTPC-07A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPC-07A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-01A (Alternate)	39.24858 144.20297	7460	30	0	30	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from the trench-basin south of the large >1km-high escarpment at 39.4°N (Alternate site to JTPN-02A). (ii) Recover and analyze the top of mass-transport deposits potentially linked to the mega-landslide. (iii) Analyze the stratigraphic pattern and event-deposit characteristics and compare with JTPC-8A & -9A to assess local variability and establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iv) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-02A (Primary)	39.44436 144.21630	7520	30	0	30	(i) Recover continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from the trench-basin north of the large >1km-high escarpment@39.4°N. (ii) Recover and analyze the top of mass-transport deposits potentially linked to mega-landslide. (iii) Analyze the stratigraphic pattern and event-deposit characteristics (at best integrated with contingency-coring site JTPN-03A) and compare with JTPN-04A,-05A/JTPC-08A,-09A to assess local variability and establish robust stratigraphic-pattern-recognition of proxy-evidence of earthquakes (O-1). (iv) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-03A (Alternate)	39.51979 144.32902	7250	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from an isolated graben-fill basin near the large >1km-high escarpment and petit-spot volcano field. Contingency-option site as condensed section relative to coupled site (s.l.) JTPN-02A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPN-02A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-04A (Alternate)	39.76647 144.26910	7470	40	0	40	(i) Recover continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from the isolated trench-basin in the central part of the northern JT. Alternate site to JTPN-07A and contingency-option site as condensed section relative to coupled site JTPN-05A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPN-05A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).

Proposed Sites (Continued; total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPN-05A (Primary)	39.78013 144.27636	7480	40	0	40	(i) Recover continuous upper Pleistocene-to-Holocene (potentially reaching the middle Pleistocene) stratigraphic succession comprising event-deposits from a trench-basin in the central area of northern JT (would be expanded section relative to coupled contingency-option site JTPN-04A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics (at best integrated with JTPN-04A) and compare with JTPN-02A,-07A, to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-06A (Alternate)	40.05940 144.31855	7570	40	0	40	(i) Recover a continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from a trench-basin in the central area of the northern JT. Alternate site to JTPN-05A and contingency-option site as condensed section relative to coupled site JTPN-07A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPN-07A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-07A (Primary)	40.09392 144.32612	7560	40	0	40	(i) Recover continuous upper Pleistocene-to-Holocene (potentially reaching the middle Pleistocene) stratigraphic succession comprising event-deposits from the isolated trench-basin in the central part of the northern JT (would be expanded section relative to coupled contingency-option site JTPN-04A). (ii) Analyze the stratigraphic pattern and event-deposit characteristics (at best integrated with JTPN-06A) and compare with JTPN-05A, to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-08A (Alternate)	40.32440 144.40110	7600	40	0	40	(i) Recover an expanded (relative to coupled site JTPN-11A) continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from the isolated trench-basin in the northernmost JT. Alternate site to JTPN-09. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with results from couple site JTPN-11A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-09A (Primary)	40.39568 144.42047	7620	40	0	40	(i) Recover an expanded (relative to coupled site JTPN-10A), continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from the deepest depocentre in the northernmost part of the JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with results from couple site JTPN-10A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).
JTPN-10A (Primary)	40.43742 144.43687	7600	30	0	30	(i) Recover a condensed (relative to coupled site JTPN-09A), continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits on a trench-floor high near the deepest depocentre in the northernmost part of the JT. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with results from coupled site JTPN-10A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).

Proposed Sites (Continued; total proposed sites: 31; pri: 18; alt: 13; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
JTPN-11A (Alternate)	40.25341 144.39081	7550	30	0	30	(i) Recover a condensed (relative to coupled site JTPN-08A) continuous upper Pleistocene-to-Holocene stratigraphic succession (potentially reaching the middle Pleistocene) comprising event-deposits from an isolated trench-basin in the northernmost JT. Alternate site to JTPN-10A. (ii) Analyze the stratigraphic pattern and event-deposit characteristics and integrate with JTPN-08A to establish robust stratigraphic pattern recognition of proxy-evidence of earthquakes (O-1). (iii) Compare results with all other sites to explore spatio-temporal distribution of event-deposits and the southward-extent of sediment-transport routed through the Ogawara canyon (O-2) to develop a long-term record for giant earthquakes (O-3).