IODP Proposal Cover Sheet

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Japan Trench Paleoseismology

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Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
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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.

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).

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INTRODUCTION

The 2004-M_w9.2-Sumatra and the 2011-M_w9.0-Tohoku-oki earthquakes and tsunamis were catastrophic geologic events with major societal consequences. Both ruptured portions of subduction plate boundaries that had been deemed incapable of these "giant" earthquakes and had unexpectedly shallow and large coseismic slip, which contributed to the large tsunamis (Ide et al.,2011; Fujii and Satake, 2007). More than 90% of the stress accumulated by global plate tectonics is released along active margins by subduction earthquakes. On a global average one M_w8-class earthquake occurs per year and most subduction boundaries have produced such "great" earthquakes. In contrast, only four "giant" (M_w9-class) earthquakes are well documented by instrumental data. Despite considerable research since the 1960-M_w9.5-Chile and the 1964-M_w9.2-Alaska events, our understanding of giant earthquakes is still limited. From the restricted historic record we can tentatively generalize that giant earthquakes

- are multi-segment ruptures of patches of the megathrust that may not have previously ruptured in M_w8 events (Sieh et al.,2008)
- rupture over large distances and into the shallowest part of the subduction boundary (Lay, 2015)
- produce long-period, high-amplitude, long-duration seismic waves that can lead to resonance with offshore sediment layers (Nakamura et al.,2015)
- generate tsunamis that propagate into the far-field (Fujii et al.,2011)

The long recurrence time causes these catastrophic geologic events to be poorly sampled in the instrumental and historic records. Thus, answers to critical questions such as; **what are the effects of giant earthquakes?** and **how often to expect them?**, rely on limited examples. Examining prehistoric events preserved in the geological record is essential to reconstruct the history of giant earthquakes on time scales long enough to study relevant subduction zone processes. Furthermore, such paleoseismic-data interpretation remains the only path to deliver data that help to reduce epistemic uncertainties in seismic-hazard assessment for long return periods.

J-TRACK Paleoseismology is motivated by the mission to fill the gap in long-term records of giant earthquakes and aims at testing & developing submarine paleoseismology in the deep-sea environment of the Japan Trench (JT).

Subduction earthquakes affect offshore environments, including deep-sea trenches formed by the downward bending of the oceanic lithosphere along convergent plate boundary systems. Most trenches are deeper than 6000m; comprising the hadal zone as one of the least-explored aquatic environment on Earth (Jamieson et al.,2010). Sediment supply to terminal trench-basins has been linked to large-scale sediment remobilization and translocation processes initiated by earthquake shaking (Oguri et al.,2013; Ikehara et al.,2016; Migeon et al.,2017). Shaking of seafloor can trigger landslides or surficial sediment resuspension that evolve downslope into turbidity currents or mud density flows, respectively (Talling 2014; Goldfinger et al.,2017). Widespread shaking causes nearly synchronous sediment instability over 100's of kilometers producing widely distributed event-deposits (Cattaneo et al.,2012; McHugh et al.,2016b). Widespread remobilization over such large distances are not expected with other triggers. Exceptional super-typhoons might have comparable spatial footprints, but initiation of sediment remobilization would be limited to relatively shallow waters.

Submarine paleoseismology relies on the premise that the marine environment preserves long and continuous records that allow for identification of earthquake-triggered deposits (and to distinguish them from non-seismically-triggered deposits). In subaquatic environments, the sedimentary archive provides high sensitivity and continuity, so event-deposits are better preserved and dateable than their terrestrial counterparts. Due to eustatic sea-level fluctuations, for example, coastal records (e.g. tsunami deposits) only cover the last 8ka of the Holocene high-stand.

Several submarine paleoseismic studies along subduction zones (Cascadia, Calabria, Chile, Sumatra, Hikurangi and the JT; see compilations by Strasser et al. (2015), DeBatist et al. (2017) and references therein) have been successful in obtaining sedimentary event-records that can be positively correlated to instrumentally-recorded and historical earthquakes, and/or reveal evidence for prehistoric events. These studies, which are mostly based on conventional 10-m-long cores, demonstrate the potential to advance our understanding of earthquake recurrence beyond timescales of the last few thousand years.

IODP is uniquely positioned to provide such paleoseismologic data by coring sedimentary sequences comprising continuous depositional conditions and records of earthquakes occurrence over longer time periods. The 2015-IODP workshop in Zürich has discussed and identified strategies on how and where we could best make use of giant piston coring efforts within IODP to make some major advancements in submarine paleoseismology (Strasser et al.,2015; Mc Hugh et al.,2016a). Workshop discussion revealed endorsement of the JT as a primary target for understanding causes, consequence and recurrence of giant earthquake (see below describing why). **The central theme of this IODP proposal thus is to test and develop submarine paleoseismology, en-route towards understanding earthquake and tsunami in the JT, and eventually other margins with similar settings.**

SCIENTIFIC OBJECTIVES

The primary objective is 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 M_w9-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 JT, as comparison with global examples. To address these objectives we propose IODP Mission Specific Platform (MSP) 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 JT. The cores from 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 extreme-events.

Background to objectives

At subduction margins, earthquake sources include faults within the upper and lower plates and the interplate-megathrust that can rupture over a wide range of depths possibly reaching the trench. Differences in seafloor motion from these distinct sources result in distinct driving forces (Ye et al. 2013; Nakamura et al.,2015) for sediment remobilization. Accordingly, recent observations have demonstrated a wide range of earthquake-related sedimentary signatures linked to exceptionally-large subduction earthquakes and their aftershock sequences: Slumps in the trench linked to the 2011-Tohoku-oki-earthquake (Fujiwara et al.,2011; Strasser et al.,2013); Turbidites released simultaneously in different canyon-heads travelling down-canyon to merge below confluences during the 1700AD-M_w9.0-Cascadia earthquake (Goldfinger et al. 2012; 2017); Homogeneous sediment extending for large distances across the abyssal plain of the Mediterranean linked to the 365AD-Crete earthquake (Polonia et al.,2013; 2016); dense plumes of sediment remaining in suspension above the seafloor for months after the 2004-M_w9.2-Sumatra and the 2011-M_w9.0-Tohoku-oki earthquakes (Seeber et al.,2007; Oguri et al.,2013). For a given margin, where physiography, sediment properties, sediment-routing systems and downslope transport can be reliably assessed, this complexity in both structure and sedimentary deposits provides opportunities and suggests that distinct classes of earthquakes may leave characteristic sedimentary signatures.

Multi-method characterization for detailed structural, physical, chemical, and biological characterization has revealed distinct signatures and patterns for event-deposit sedimentary sequences that result from: (i) the remobilized material and its original provenance (as a proxy for sediment source and/or routing processes); (ii) grain-size distribution and structural orientation reflecting transport and depositional dynamics; and (iii) consolidation and microbial organic matter (OM) degradation reflecting post-depositional processes (McHugh et al.,2011; Polonia, et al.,2016; Goldfinger et al.,2017). Positive stratigraphic correlation of such multi-proxy signatures between widely-separated sites favours a common causative mechanism, especially if the respective sites are isolated from each other (Goldfinger et al.,2012; Talling, 2014; Ikehara et al.,2017). Above-referred studies and more, many of which investigating event-deposits positively correlated to historic earthquakes, have proposed characteristic patterns or signals to be potentially distinctive for earthquake origin, subsequent tsunami and their aftershock series (Goldfinger et al.,2012; Oguri et al.,2013; Ikehara et al. 2016; 2017, Polonia et al.,2016; 2017). The currently available datasets are

mostly limited by conventional 10-m long coring. They often only comprise few events-deposits that can be linked to earthquakes for a given margin. Therefore, the conceptual depositional models are not validated against a longer temporal record. Furthermore, deposition and preservation of event-layers and their stratigraphic signal varies by location and may change through time (Sumner et al.,2013; Bernhardt, et al.,2015; Ikehara et al.,2017). Long temporal (i.e. reaching back in time to sample several low-recurrence events) and spatially extensive (to sample different types of events over long distances at locations with different preservation potential) records are needed to test the robustness of the proposed models and relations.

Gracia et al.(2010), Pouderoux et al.(2012) and St-Onge et al.(2012) tracked inferred earthquake-related event-deposits recovered by the CALYPSO coring system further back in time. These few pioneer studies demonstrated the potential for paleoseismologic application. However, they were performed on a limited number of cores, taken with partly palaeoceanography as a primary objective and site location may not have been optimal for paleoseismology. Site localization and assessing site variability is a key issue in subaquatic paleoseismology (Goldfinger et al.,2017; Ikehara et al.,2017). Detailed characterization of the depositional history of a site can reveal the causes of apparent gaps in the paleoseismic record and identify sites ideal for preserving earthquake-related deposits.

Since likely no single technique can provide the full paleoseismic history at an individual site, and since feedback between earthquake type, seafloor motion and its eventual manifestation in the stratigraphic record are complicated, **our strategy includes (i) a multi-coring approach to sample, characterize and date a wide range of event-deposits over a wide area along the entire JT, and (ii) accompanying studies that will combine field observation with physical experiments and numerical models**. The latter will explore mechanisms that link coseismic seafloor motions, shaking and deformation, sediment remobilization and transport dynamics, with their signatures in the sedimentary record, there while providing the knowledge base to translate sedimentary observations into constraints on prehistoric seismicity. This multi-disciplinary approach is expected to deliver answers to *research question* such as:

- *Can we distinguish different earthquake events and types from the sedimentary records?*
- *Is there an earthquake magnitude threshold for a given signal/pattern in the sedimentary record?*

- *Does record sensitivity change along strike and/or through time?*
- *Can we link the sedimentary signal to the earthquake rupture characteristics*?
- *Can we assess seismic activity of different along strike segments?*

Building on what we have learned from the 2011-M_w9.0-Tohoku-oki earthquake, an established correlation of event-deposits to historical earthquakes, and the JT characteristics that are suitable for submarine paleoseismology (see below), there is high potential that our objectives can be achieved. At a minimum, we will identify the giant M_w9-class tsunamigenic earthquakes that stand in contrast to the frequently occurring M_w7.5-8 earthquakes that have relatively modest consequences. Thus, addressing O-3 is expected to provide a long-term record of M_w9-class earthquakes, significantly expanding currently available paleoseismic records of such upper-end-member events at other subduction margins (Chile:5.5ka (Kempf et al.,2017), Cascadia:7.6ka (Goldfinger et al.,2017), Sumatra:6.5ka (Patton et al.,2015), Hikurangi:16ka (Pouderoux et al.,2014). Based on these so far available records, the occurrence of earthquake supercycles has been hypothesized (Sieh et al.,2008; Goldfinger et al.,2013; Ratzov et al.,2015). Earthquake supercycles have also been proposed based on seismo-mechanical models (Herrendörfer et al.,2015; Shibazaki, et al. 2011). Some seismologists (e.g. Geller, 2011; Mulargia et al.,2017) question the seismic cycle hypothesis. Instead, they propose Poissonian behaviour for earthquake recurrence (i.e. large earthquakes can occur anytime with a low, but on average, constant probability).

Studying prehistoric events preserved in the geological record is the best way to reconstruct the history of megathrust earthquakes on time scales long enough to provide statistically rigorous tests to answer the research question: ***Do giant earthquakes recur quasi-periodically, clustered or randomly through time?***

WHY THE JAPAN TRENCH?

Recent literature and community input during the IODP paleoseismology workshop have discussed characteristics that predispose margins to being suitable for submarine paleoseismology, and formulated guidelines to be considered for designing scientific experiments (Tab.1 compiled after Sumner et al.,2013; Goldfinger et al.,2014; Strasser et al.,2015; McHugh et al.,2016a). The JT (Fig.1) is a well-suited area according to these criteria:

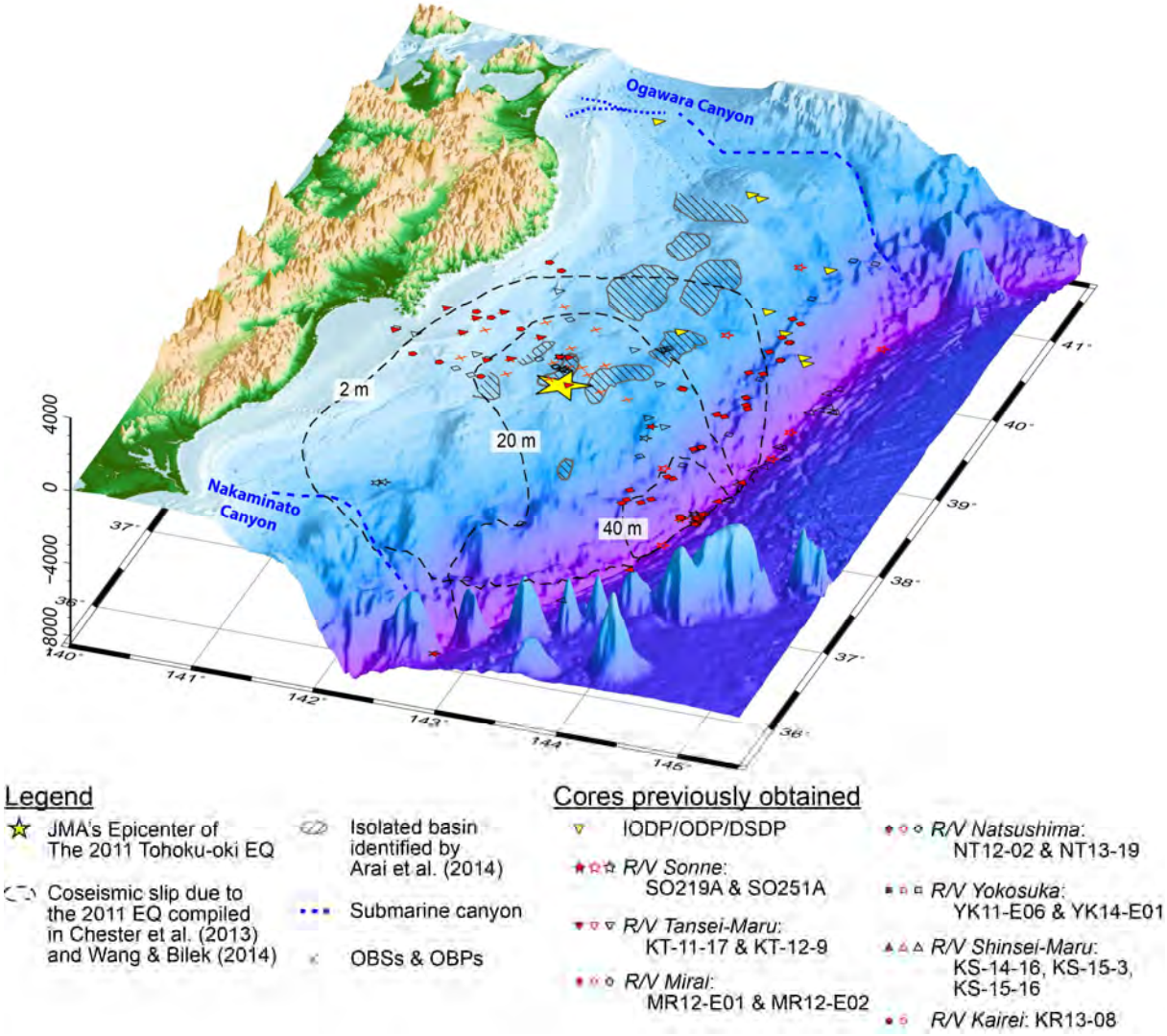


***Figure 1**: Overview of the Japan Trench subduction margin illustrating its physiography, as well as the epicenter and co-seismic slip distribution of the 2011-M_w9.0-Tohoku-oki earthquake (40m- and 20m-slip contour lines are from the compilation in Chester et al. (2013); 2m contour line from Sun et al. (2017)). Also shown are previous IODP, ODP and DSDP drilling sites in the region, along with sites where surface-cores and/or conventional, up to 10-m long gravity and piston cores have been retrieved after the 2011 earthquake. Filled red symbols indicate core locations with water depth >100m, where recent publications (Arai et al., 2013; Ikehara et al., 2014, 2016; 2017; McHugh et al., 2016; Noguchi et al., 2012; Nomaki et al., 2016; Oguri et al. 2013; Strasser et al.,2013; Usami et al., 2017; Yoshikawa et al., 2016) or preliminary results from the most recent R/V Sonne cruise SO-251 (unpublished data) document various distinct earthquake-related event-deposits linked to the 2011-earthquake and tsunami. Red open symbols indicate locations where core data reveal no indication for recent sediment deposition (or erosion) related to the 2011-earthquake and tsunami as documented by Fink et al. (2014); Ikehara et al. (2016); Yoshikawa et al. (2016), or by preliminary data from cores from the recent R/V Sonne cruise SO-251 (McHugh et al., 2017). Black open symbols show location of cores for which no detailed information is available. Cross symbols represent the sediment-trapped OBSs or the buried/displaced OBPs associated with the 2011 Tohoku-oki earthquake (Arai et al., 2013; Miura et al., 2014).*

Table1. Characteristics that may predispose margins to being suitable for paleoseismology and requirements to be considered for designing experiments (compiled after Sumner et al., 2013; Goldfinger et al.,2014; Strasser et al., 2015; McHugh et al., 2016)

General key requirements for turbidite paleoseismology	**Characteristic of the Japan Trench and approach of this proposal**
Good records of historic events for calibrating the stratigraphic record for paleoseismology	• The 2011 Magnitude 9 Tohoku-oki earthquake • A rich offshore data sets available from before and after 2011, • Written historic catalogue spanning more than 1000 years back
Good site selection and detailed knowledge about erosion and sedimentation processes influencing the site-specific stratigraphic record	• Small isolated terminal basins (subducting horst-graben topography) • Most basins are only fed by relatively local submarine sources and poorly connected for sediment transport by gravity flow along the strike of the trench • With the exception of two submarine canyons in the very north and south of the study area (Fig.1) the main central part of the JT-margin contains no canyon systems directly connecting the shore or shelf to the deep-water trench-floor. • Composite-stratigraphy approach (i.e. two sites in individual basins) • Site selection avoids influence of large landslides
Depocenter of rapidly accumulating sediments	• Very high sedimentation rate (1-3m/ka in average, partly reaching up to 4m/ka in depocenters of terminal trench basins). • High and continuous sediment accumulation protects the turbidite from physical erosion and biological disturbance (the latter is low due to hadal conditions)
Datable material across study area	• Frequent volcanic tephra layers provide excellent marker horizons for regional chronostratigraphic correlation by tephra stratigraphy. • Newly-developed innovative dating techniques to constrain chronology of deep-sea sediments below the CCD show robust results (organic matter ^{14}C analyses, paleomagnetic secular variation)
Distinction between (or purposive combination of) experimental approach(es): i. the confluence test ii. studying isolated basins focusing sediment resuspended from surficial sediment remobilization iii. studying deposits from large earthquake-triggered subaquatic landslides	• Isolated terminal basins in the Japan Trench not feed by significant canyon systems provide high potential for approach (ii), see also row 2 above. • Therefore, additional criteria (3, 4, 5, and 6) listed in Table 2 of Sumner et al., (2013) are not considered here, since they mostly apply for paleoseismology approaches considering confluence test and/or deposits of large submarine landslides [approach (i) and (iii)]. The Japan Trench and our detailed site selection is conditioned to avoid the caveats related to these approaches.

The 2011-Tohoku-oki earthquake is the first event of its kind worldwide, for which the entire activity was recorded by offshore geophysical, seismological and geodetic instruments. Additionally, direct observation for sediment re-suspension and re-deposition was documented across the entire margin by seafloor monitoring systems and/or rapid-response research missions. Shirasaki et al.(2012) and Pope et al.(2017) report submarine cable breaks along the southern and central JT due to turbidity currents generated by the 2011-Tohoku-oki earthquake. Sediment remobilization related to the earthquake and tsunami is also attested

by measured turbidity in the bottom waters (Noguchi et al.,2012; Oguri et al. 2013) and ocean-bottom instruments data (Arai et al.,2013). Submarine landslides were documented by differential bathymetry (Fujiwara et al.,2011; Strasser et al.,2013). In particular, cores document various distinct earthquake-related event-deposits throughout an extensive region from the coastal sea to the JT floor (Fig.1; see references in caption). Correlation of the event-deposit to the 2011-earthquake has been proved-positive by short-lived radionuclide (Oguri et al.,2013; McHugh et al.,2016b; Ikehara et al.,2016) and transient disequilibrium pore-water profiles (Strasser et al.,2013). Although there is local variability in deposition and preservation of the event-layers (Yoshikawa et al.,2016; Ikehara et al.,2017), the general pattern obtained from 68 cores revealed a good along-strike correlation of documented event-deposit occurrence with the reconstructed ruptures area (McHugh et al.,2016b, Ikehara et al.,2017; Fig.1). Extensive research is still ongoing to further calibrate the sedimentary record of the 2011-Tohoku-oki-earthquake and assess what earthquake parameters can reliably be deduced from the geological record, making the JT among the best study areas for calibration of submarine paleoseismology.

High sedimentation rates of diatomaceous-hemipelagic mud reflect the influence of high oceanic productivity as consequence of the interplay between the cold Oyashio and warm Tsugaru and Kuroshio currents (Saino et al., 1998). Bioturbation of 2011-event-deposits as documented from surface cores is strong to moderate on the upper and lower slope, respectively (Ikehara et al.,2017). There, comparably low sedimentation rates (6-50cm/ka on the upper slope (vonHuene et al., 1980) and ~23cm/ka on the mid-slope terrace (Shipboard Party, 1980), and thinner deposition observed for the 2011-event-layer suggest low preservation potential of the earthquake-related bed in the stratigraphic record. In contrast, very high sedimentation rates occur in JT (1-3m/ka; Ikehara et al.,2017). This prevents the destruction of thick fine-grained event-deposits by currents and benthos activity, resulting in high preservation potential of the earthquake-related bed.

Indeed, cores obtained during the last 6 years from trench-fill basins preserve evidence for at least two older major sediment-remobilization events. These deposits comprise thick multi-pulse fine-grained turbidite sequences, which correlate throughout cores taken from separated trench-fill basins and extend along-strike for ~120 km (Ikehara et al.,2016; 2017;

Figs.1&2). Interbedded volcanic ashes provide well-constraint tephra-chronological age control, suggesting that the prominent event-deposits correlate to the 869AD-Jogan and to the 1454AD-Kyotoku earthquakes (Ikehara et al.,2016). Sawai et al. (2015) and Namegaya & Satake (2014) also suggested major megathrust earthquakes as the source of the 1454AD and 869AD tsunamis, based on onshore tsunami records and historical documents. Age chronology of JT event-deposits and their correlation to historical earthquake is corroborated by pioneer studies applying innovative dating methods for deep-sea sediments (i.e. below the carbon-compensation depth (CCD), where traditional ^{14}C-dating and stable isotope stratigraphy on carbonate biominerals are confounded). Bao et al. (subm.) shows a successful application of OM-radiocarbon analyses for constraining the chronology of event-deposits related to historic earthquakes (Fig.3); Kanamatsu et al. (2017) found that the sediment recovered in the JT contain excellent paleomagnetic secular variation (see below).

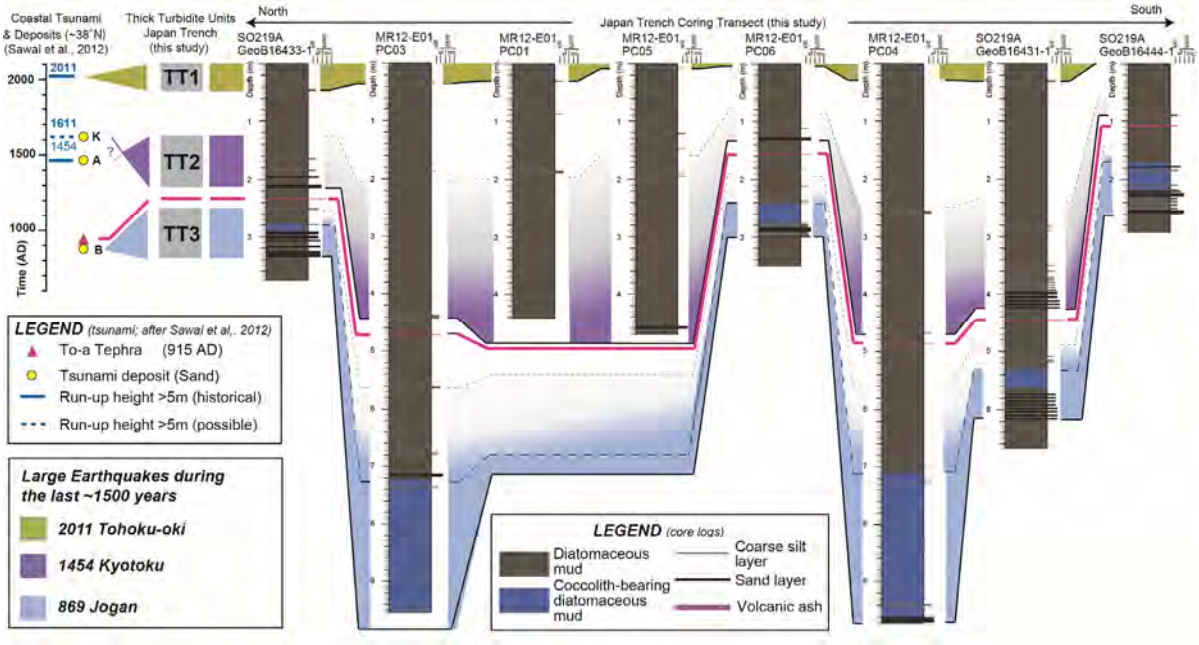


Figure 2: *Stratigraphic correlation between cores from isolated trench-fill basins in the central part of the Japan Trench (between 37°40´N and 38°10´N (along trench-axis distance ~50km). The records preserve evidence for three major sediment-remobilization events (referred to as thick turbidite units (TT-units), each consisting of 30-240cm thick, stacked fine-grained turbidites. Also shown is correlation of TT-units to coastal tsunami deposits and reported run-up heights >5m from historical documents (Sawai et al., 2012), and inferred occurrence of three earthquakes with comparable sedimentary imprint as the 2011 Tohoku earthquake (Ikehara et al., 2016).*
We note that most TT-1 beds are thinner and interpret that (i) near the 2011-epicentral area, where these cores have been retrieved during rapid-response cruises immediately after the 2011-earthquake, trench-floor accommodation space was likely reduced by deformation of trench-fill sediments induced by co-seismic slip propagation and slumping (Kodaira et al., 2013; Strasser et al., 2013) prior to turbidite deposition. Furthermore, repetition of coring at site GeoB164-31 in 2016 reveals evidence that TT-1 has grown in thickness from repeated deposition of fine-grained turbidites likely triggered by M_w7+ aftershocks, indicating that TT-successions in the geological record represent sequences related to giant earthquakes and their after-shock sequences (see Fig.8)

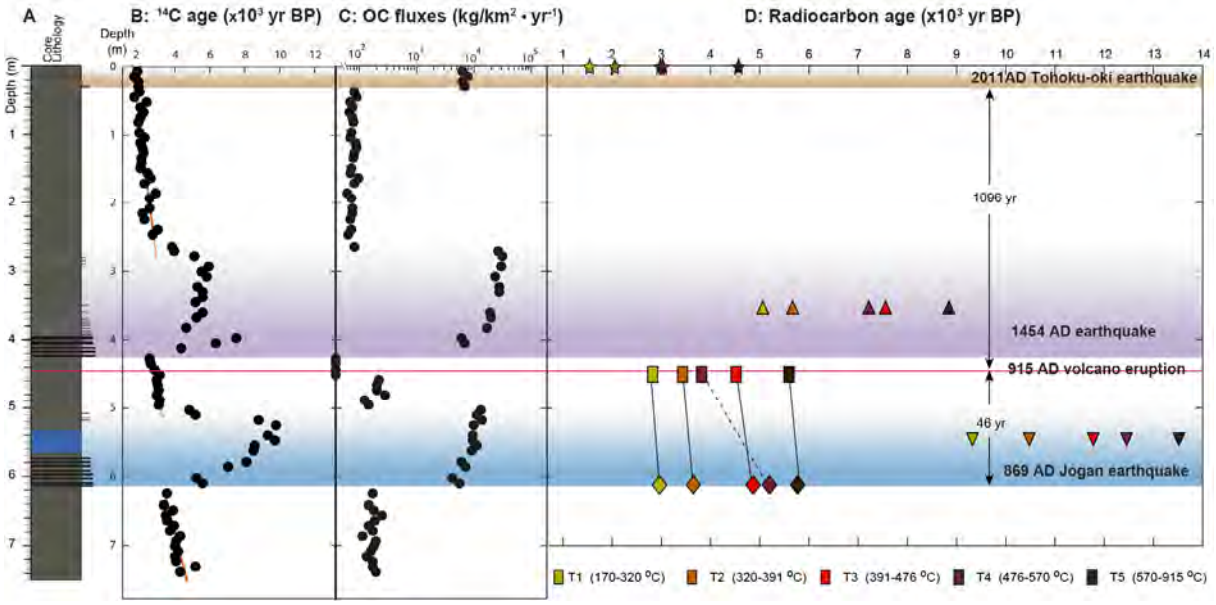


Figure 3: *Compiled results from organic matter (OM) radiocarbon analyses on samples from GeoB 16431-1 (Bao et al., sub.)* ***A:*** *Lithology core log with volcanic tephra (pink) and colored thick-turbidite units linked to historic volcanic eruption and earthquakes, respectively (legend for symbols in Fig.2).* ***B:*** *high-resolution bulk organic carbon (OC) ^{14}C age profile measured using the new online $\delta^{13}C$ & ^{14}C gas measurements by coupled elemental analyzer - isotope-ratio mass spectrometry – accelerated mass spectrometry (EA-IRMS–AMS) at ETH Zürich (McIntyre et al., 2016), which allows for high-throughput bulk sediment OC ^{14}C determination.* ***C:*** *OC-flux calculated using TOC measured at the EA-IRMS-AMS system, sedimentation rates calculated by ratio of sediment depth spanning time intervals constraints by historic events, and density measured by gamma-ray attenuation.* ***D:*** *Chronology and radiocarbon characteristics of ramped pyrolysis/oxidation ("Ramped PyrOX", RPO) thermal fractions of OM for 5 selected samples. The measurement error is smaller than the symbol. The method following Rosenheim et al., (2008) analyses CO_2 gas-samples collected from ramped temperature pyrolysis/oxidation integrated over five temperature intervals (color-code of symbols) by AMS radiocarbon measurements.*
Results document (i) very high organic carbon (OC) fluxes (two order of magnitude higher than "background") of pre-aged OC input to the hadal environment of the Japan Trench that are directly linked to the earthquake-triggered sediment remobilization process. (ii) Bulk OM radiocarbon ages have consistent offsets of ~2000 years, likely related to constant transport of pre-aged OM to the trench. (iii) Consistency in ^{14}C differences of thermal fractions ages ("parallel" lines in D) and their correspondence (in terms of absolute time between known volcanic and correlated tectonic events), which might reflect radioactive decay within the sediment after deposition. The latter result holds promise for placing chronological constraints on Japan Trench sediment cores (accurate floating chronology), which can be anchored to dated tephra layers.

These studies show that large-scale re-sedimentation events recorded as widespread fine-grained turbidite sequences occur less frequently despite the generally high seismicity with M_w7-8 earthquakes occurring regularly every few tens-to-hundreds of years. This finding supports the hypothesis that JT event-deposit record is representative for exceptionally-large events with low recurrence. The occurrence of three giant earthquakes within the last 1500 years is consistent with return times of 260–880 years for M_w9 earthquakes off Tohoku, as calculated from seismic moment-frequency relation (Uchida, 2011). Smaller earthquakes may have the potential to locally re-suspend unconsolidated seafloor sediments, as reported by

Oguri et al. (2016) for a M_W7.3-aftershock of the 2011-Tohoku-oki earthquake. The global cable-break database by Pope et al. (2016) reveals for JT that for the time-period covered by cable monitoring, no earthquake <M_w7.0, and out of 25 earthquakes with ≥M_w7 only 5 actually triggered cable-braking sediment flows. This data supports the concept that slope stability is greater in areas with high seismic activity, where sediments are consolidated and strengthened during low-magnitude events (Sawyer and DeVore, 2015; tenBrink et al, 2016). During regional moderate-sized earthquakes (M_w7-8 range), and potentially even triggered by remotely-generated earthquake waves (Johnson et al.,2017), however, sediment resuspension and remobilization in regions with high sedimentation rate may redistribute sediment to the trench floor. These processes do not form distinct thick and regionally extensive event-deposits, but may rather contribute and maintain the high "background" (with respect to the great events) sedimentation rate in the trench (Ikehara et al.,2016; 2017).

Examination of the acoustic facies from high-resolution subbottom (HRS) profiles of the trench-fill reveals variably-thick, acoustically-transparent bodies interbedded in the otherwise parallel-reflection pattern of the trench-fill basins (Ikehara et al.,2017). Seismic-to-core correlation reveals ground-truth of the upper-most acoustically-transparent bodies to reflect thick, massive fine-grained event-deposits linked to historic earthquakes (Fig.4). HRS-profiles from the small isolated trench-basins along the entire JT-axis image acoustic reflection pattern consistent with basin-fill successions interbedded by episodic deposition of fine-grained turbidites (Fig.5), thus defining clear target successions for deeper coring to sample older events not reached by conventional coring.

Figure 4 *(figure on next page)****: Upper left panel:*** *High-resolution bathymetric map (acquired in October 2016 during Cruise SO251-1 with the state-of-the-art EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne) with the 5-m contours and track lines of high-resolution subbottom profiles.* ***Upper right panel:*** *SSW-NNE noise-attenuated Parasound line GeoB21806-part2 along the Japan Trench (for un-interpreted profile see Site Summary Form 6 of Site JTPS-07A).* ***Lower left panel:*** *WNW-ESE noise-attenuated Parasound line SLF120318225 crossing the Japan Trench (for un-interpreted profile see JTPS-07A site summary form 6). Colored units represent low-amplitude-to-homogenous seismic facies within an otherwise layered reflection pattern (color-coding as in the lower right panel). Dotted lines are continuous high-amplitude reflections, often traceable throughout multiple basins.* ***Lower right Panel:*** *Core-to-seismic correlation of core KS-15-03 PC08 of Ikehara et al. (2017). The fine-sandy tephra at 2.1 m subsurface is identified as the To-a (Towada-a) tephra and clearly corresponds to a strong reflection on the Parasound data. Homogenous units in the core interpreted as sedimentary event-deposits (i.e. yellow, purple and blue layers) correspond to low-amplitude acoustic units with a basin-fill geometry (see upper right panel)). Green color coding is for similar low-amplitude units below the cored interval, forming targets for IODP piston coring. This HRS-data was acquired using the ATLAS PARASOUND P70 echosounder onboard of R/V Sonne. Interference of two signals with high frequencies (18 and 22 kHz) produces a secondary low frequency (SLF) of ~4 kHz, which is used for subbottom profiling. Generally, the acquisition parameters were as follows: low-pass filter at 6 kHz, pulse length 1 ms, sampling rate 12.2 kHz.*

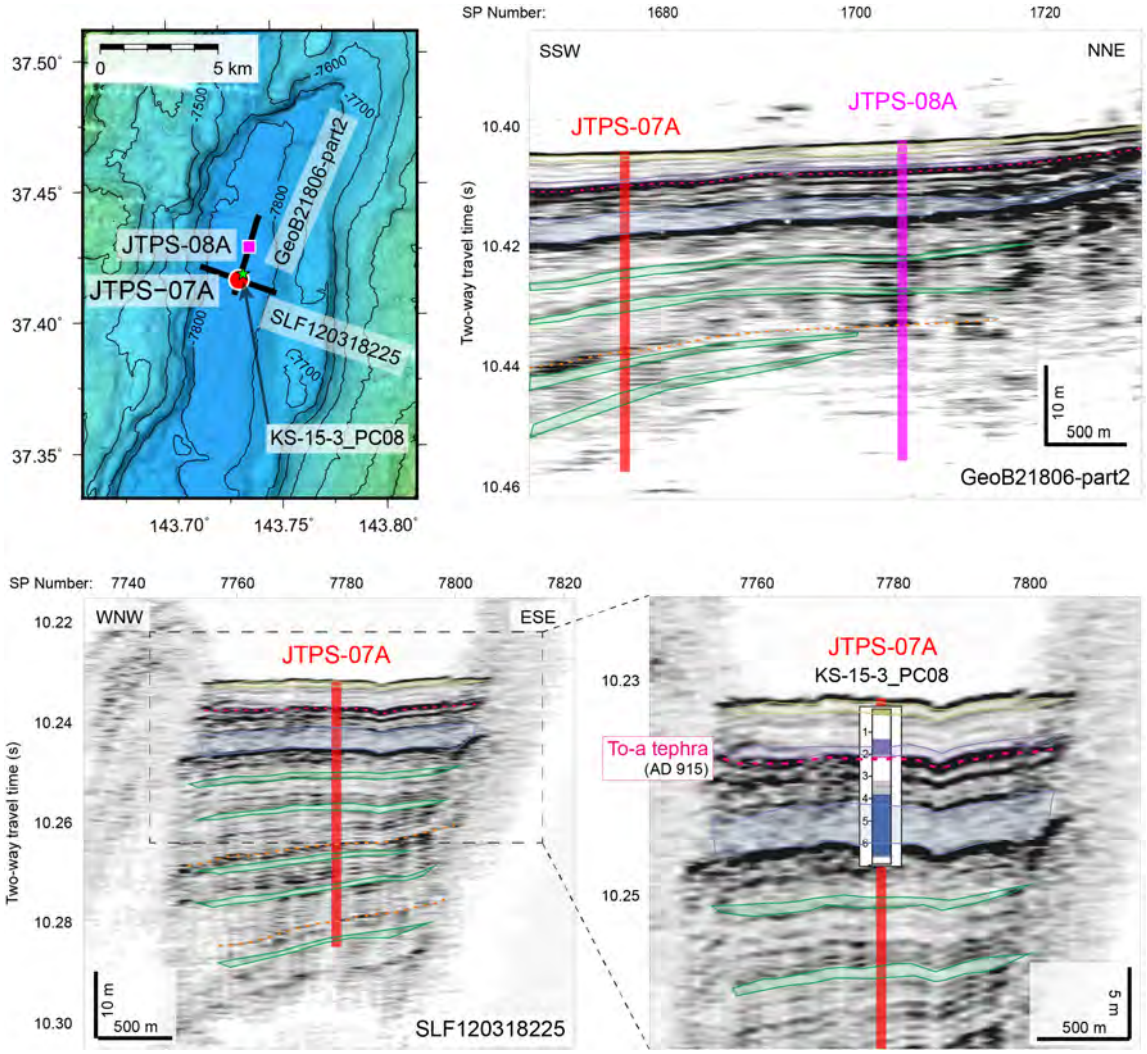


Figure 4: *see previous page for figure caption*

According to the available data and research results, large earthquakes and related tsunamis are the most probable origin of major sediment remobilization events recorded in JT stratigraphic sequences. However, alternative mechanisms have to be considered, and will be primary objective in this proposal (O-1). With the exception of the Ogawara and Nakaminato submarine canyons in the north and south, respectively (Fig.1) the JT-margin contains no submarine canyon systems directly connecting the shore or shelf to the deep-water trench-floor. Instead, several isolated basins, that form in concert with tectonic subsidence on the upper slope (Arai et al.,2014: Fig.1) serve as natural sediment traps receiving sediment from the shelf. Ogawara and Nakaminato canyons have not been reported as significant sediment routing systems. Thus, the physiographic setting of the entire JT convergent margin limits the formation and mobility of meteorologically induced turbidity currents such as by storm surges, hyperpycnal flows from rivers (floods) and large storm waves, to reach the central part of the deep-sea trench (Ikehara et al.,2017).

However, at this stage, we cannot exclude that sediment delivery mobilized in shallow waters and routed through the Ogawara and Nakaminato canyons, potentially enhanced during Upper Pleistocene sea-level low-stands, may reach the trench. This is also suggested by results from sediment routing systems analysis by 3D turbidite-flow simulations (details below). However, the modelling results also reveal that large mass-flows are unlikely to be sustained along strike over long distances due to the rough subducting horst-graben topography. The influence of sediment remobilization of these two canyons on the event-stratigraphic record will be investigated by the proposed IODP expedition.

RELATIONSHIP TO IODP AND OTHER PROGRAMS

The proposed expedition addresses goals of the 2013-2023 IODP Science Plan, with particular relevance to **"Earth in Motion: Processes and Hazards on Human Times Scales"**, specifically **Challenge 12: The occurrence of destructive earthquakes, landslide and tsunami.**

Establishing a long-term record of giant tsunamigenic earthquakes in the JT is one of the two main scientific goals of the overarching JTRACK project, as originally proposed in IODP-Proposal-835Pre (Kodaira et al., 2013). Following recommendations from SEP and community input at the 2014 JTRACK-Workshop, a staged approach with independent proposals was adopted. Thus, here we propose to unravel the trench-fill archive for past earthquakes as highly complementary to (and still interlinked) with 835Full2 that will investigate the shallow fault to elucidate key factors that control large slip on the JT megathrust.

JTRACK (including JTRACK-paleoseismology) links to other IODP efforts at the Sumatra, Hikurangi, Nankai, and Costa Rica margins that aim at advancing our understanding of subuduction zone processes and associated earthquakes. With the sizeable volume of geophysical data and shallow-subsurface samples, that suggest high preservation potential of prehistoric earthquakes recorded in the JT sedimentary sequence, IODP coring is the crucial next step to ground-truth and date these potentially-earthquake related sedimentary event-deposits. This will elucidate the long-term earthquake history and allow evaluation of recurrence pattern of JT giant earthquakes. Comparison with results from the other sites will lead to a better understanding of causes, consequences and frequency of occurrences of giant subduction earthquakes, therefore also contributing to other subduction zone and hazard-related research programs including GeoPRISMS and EarthScope activities.

CORING OBJECTIVES & RESEARCH STRATEGY

We propose 18 primary (13 alternates) sites to sample the continuous Upper Pleistocene-to-Holocene stratigraphic successions of physically-separated trench-fill basins along the entire JT-axis-parallel transect (Fig.5), for which the spatio-temporal distribution of sedimentary event-deposits will be analyzed for proxy-evidence of past earthquakes. Only such a multi-coring approach allows for sampling different event-deposit types to assess common vs. distinctly variable characteristics linked to different and/or common trigger mechanisms, and to study their variability along the margin and through time (O2). Along with the strategy of coring several basins separated by subducting horst-structures, we also apply a "composite-stratigraphy concept" by coring both the depocenter, as well a condensed stratigraphic section at the basin margin (see details below). This will allow to (i) establish a robust stratigraphic pattern recognition; (ii) quantify local variability; (iii) minimize risk of sampling incomplete stratigraphy at one single site, potentially affected by basal erosion, deformation, or landslides; (iv) reach further back in time.

Target depth of coring is defined by the objective of sampling event-deposits beyond Holocene ages well into the Upper Pleistocene. As robust age control is key for establishing the history of past earthquakes, a 40-50ka time target is motivated by the fact that it remains within the radiocarbon dating range; and for the last ~70ka there are several well-defined bio- and volcanic events, which can be used as chronological markers (Fig.6). Sedimentation rates in the central JT are very high, 1-3m/ka in average, reaching up to 4m/ka (Ikehara et al., 2017). According to preliminary age information from cores collected in 2016, sedimentation rates are estimated to be even higher in the deepest southernmost basin (McHugh et al.,2017), but lower in the northern part, where the 15.7ka-To-H tephra was recovered at 1m depth (Ikehara, unpubl.data). With our "composite-stratigraphy strategy", our objective of sampling continuous Upper Pleistocene (at least back to 40-70 ka)-to-Holocene sections can be achieved by 30-40m long cores. If the occurrence of 3 large earthquakes in the last 1500 years is representative average recurrence over longer time, we expect to sample 10-15 Holocene event-deposits. Acoustically not resolvable as transparent bodies, but stratigraphically correlatable event-deposits that are identified as thin fine-grained turbidite layers in the medium-sedimentation rate sites (Ikehara et al.,2017) will be recovered back to ~40-70 ka. In the northern part, the stratigraphy may reach further back in time, and also comprise exceptionally-thick acoustically transparent bodies as imaged in the 2016-HRS-data (Fig.5).

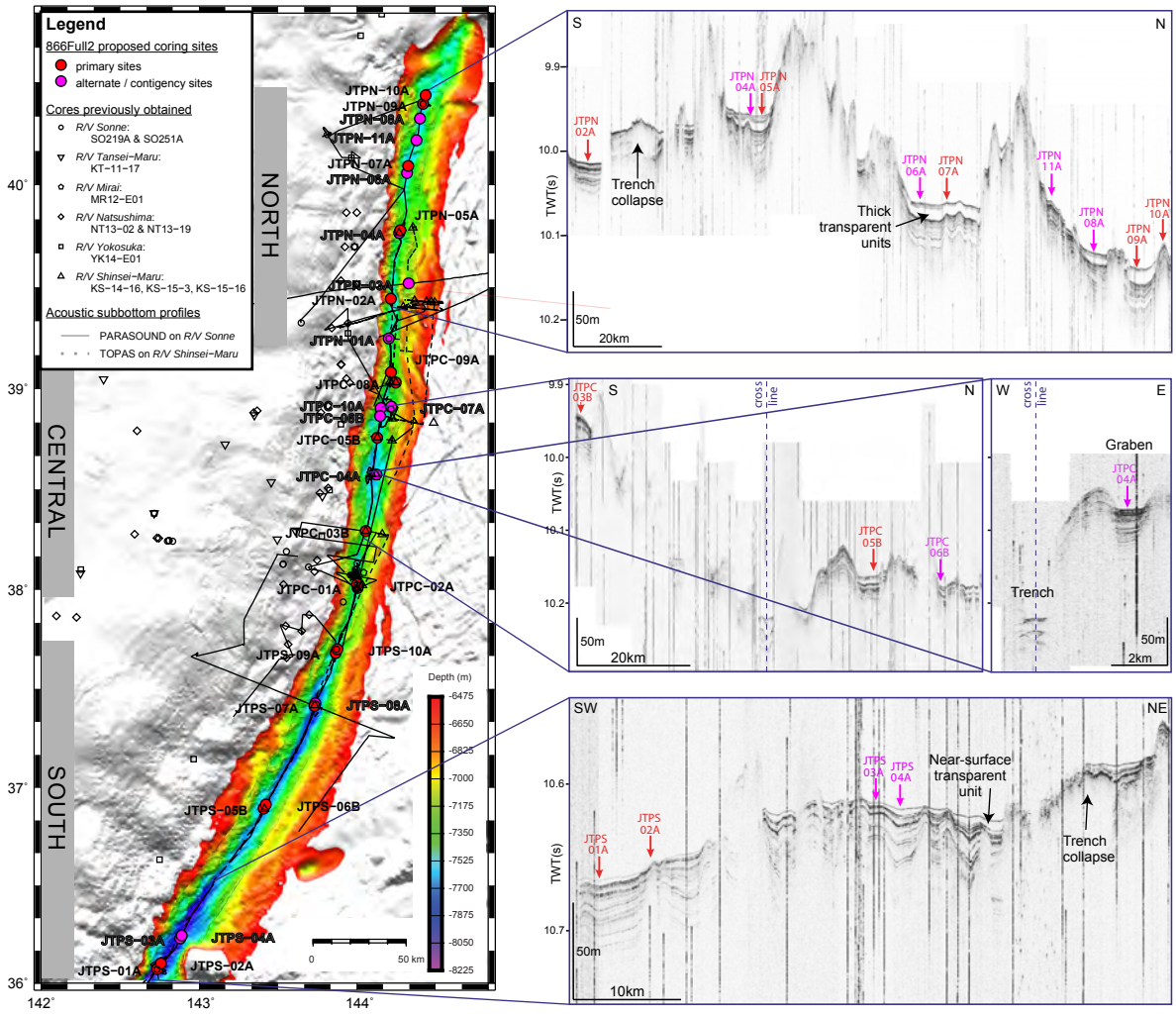


Figure 5

Left panel: *High-resolution bathymetric map with ship-track of R/V Sonne and R/V Shinsei-Maru cruises, where high-resolution subbottom data by ATLAS PARASOUND P70 echosounder and KONGSBERG Topas Chirp subbottom profiler have been acquired. Also shown are locations of proposed IODP sites and available cores from conventional coring during recent research cruises conducted since 2011. The colored bathymetry combines two different data sets: (1) data acquired in October 2016 with the state-of-the-art EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne (please zoom in in the digital version of this figure to appreciate the high-level of details imaging the Japan Trench hadal trench axis (data and figure courtesy of Christian Ferreira). (2) 150m grid acquired by JAMSTEC. Shaded relief in the background for water depth <6475 meter is also from 150m grid by JAMSTEC*

Right panel: *Along-trench Parasound seismic profiles representing the northern, central and southern part of the Japan Trench. Additionally, one W-E profile illustrates the approach of coring a graben basin instead of the trench-fill as the latter shows a too complex/disturbed seismic stratigraphy. The shown Parasound profiles are compo sites of selected parts of SEG-Y files. For the coring sites, the detailed Parasound profiles and their location can be found in the respective site summary forms. The high-resolution subbottom profiles from the small isolated trench-basins along the entire JT-axis image acoustic reflection pattern with transparent units consistent with basin-fill successions interbedded by episodic deposition of fine-grained turbidites (c.f. "homogenites" in the Mediterranean Sea linked to giant earthquakes (Polonia et al., 2013))*

IODP Proposal 866Full Japan Trench Paleoseismology **Tabel 2** Summary of methodological approaches to achieve the scientific objectives		**coring strategy**		**Post-cruise analyses**						**Accompanying integral studies**		
				Advanced facies and fabric analyses	**quantifiying post-depositional processes**	**Sediment and organic matter provenance analyses**		**High resolution stratigraphy and age control**				
		multiple coring of physically-separated trench-fill basins along the entire Japan Trench	composite-stratigraphy concept in individual basins	medical X-CT, micro-CT & synchrotron CT; Anisotropy of magnetic susceptibility	X-CT, pore water & solid phase geochemistry, geotechnical testing	sediment petrography, trace element and isotope geochemistry, quantiative X-ray-difraction, and benthic forams	palaeogenetics & organic geochemistry (C/N ratios,δ13 CTOC, δ15NTN, 14C-OM)	Tephra-, and Biostratigraphy, OM radio-carbon, Paleomagnetic secular variation & seismic stratigraphy	age-depth modelling	conventional coring and sufrace sediment sampling on the shelf, slope and within canyon thalwegs	Combining seismic site response & slope stability, with sediment routing and transport modelling	statistical seismology
O-1	**Identify proxies of event-deposits that allow for confident recognition and dating of past earthquakes vs. other driving mechanism**	assess common vs. distinctly variable characteristics linked to different and/or common trigger mechanisms	establish a robust stratigraphic pattern recognition	constrain coring disturbance, 3D micro-facies, and grain fabric to identify event-deposits and assess depositional models	constrain bio-logical, chemical and physical processes that control pre-servation and manifestation of event-deposit charateristics	constrain sediment source (shallow water vs. deep water) and descriminate sediment delivery path to identify seismic vs. aseismic trigger		stratigraphic correlation and dating of event deposit	test for synchronicity vs. multiple independent occurrences		establish the linkages between the relationship among different driving mechanisms (e.g. low frequency seismic waves, high frequency seismic waves, sediment properties, surface slope), sediment remobilization, transport and structure of re-sedimentation deposits	
O-2	**Explore the spatio-temporal distribution of event-deposits to investigate along-strike and time-dependant variability of sediment sources, transport and deposition processes, and stratigraphic preservation.**	spatio-temporal distribution of sedimentary event deposits				spatio-temporal variablity of source and delivery systems, identification and separation of commen sources as input for identifying, localizing and quantifying causative event			derivative from above	composition of source materials and surface sediments along transport routes		
O-3	**Develop a long-term earthquake record for giant earthquakes**	derivative from above	reach further back in time			identification and separation of different events		derivative from above	estimates of mean recurrence of events and relative recurrence patterns	additional records from upperslop records	identification and separation of different events, expanded to quantitative constraints on earthquake parameters	Deliver answers to reseach questions: Do giant earthquakes recur quasi-periodically, clustered or randomly through time?

Methodology of post-cruise analyses

Recovered samples from IODP coring will be analysed by common IODP "shipboard" methodology and focused post-cruise research as an integral part of this research program. We will apply both "standard" sedimentological, geochemical and stratigraphy research approaches as well as new emerging methodologies to be further developed and tested to advance submarine paleoseismology and research in deep-sea environments of hadal trenches. Below and in Table 2, we outline the most relevant methods that will allow addressing JT Paleoseismology objectives. We highlight innovative approaches, which we promised to develop in the pre-proposal in 2014. Our successful achievements applicable for addressing the grand challenges for establishing event-stratigraphy in the JT are presented below, and the respective studies now have been published since the last SEP evaluation of our Full1 proposal in June 2017:

Advanced facies and fabric analyses:

State-of-the-art facies and fabric analyses will be applied to identify and characterize sedimentary event-deposits resulting from likely complex turbidity-current flow processes in the trench. In particular, we plan to use **X-ray computed tomography (X-CT)**. This includes standard medical CT of whole-round cores that will reveal coring disturbances and provides a rough event-deposit identification before opening cores for optimizing sampling plans. Additionally, we will conduct advanced **micro-CT and synchrotron CT** of subsamples for 3D micro-facies identification. These analyses allow imaging and quantification of sedimentary structures of fine-grained turbidites, its particulate-matter framework, post-depositional compaction and bioturbation processes. Such data will constrain the reconstruction of turbidity current flow direction and reoccupation of benthos activity after event deposition. Recent application of these technologies have proven successful by permitting to develop and test depositional models of event-deposits such as those caused by earthquakes, landslides and tsunamis (Sakaguchi et al.,2011; Strasser et al.,2011; van Daele et al.,2014; 2017; Falvard et al.,2017).

Similarly, **Anisotropy of magnetic susceptibility (AMS)** as proxy for grain fabric in fine-grained turbidite deposits has been used to identify earthquake-related event-deposits in closed-basins (Campos et al.,2013). As magnetic fabric is formed during settling of grains on

the sea bottom, AMS azimuthal data allows for extracting bottom current information recorded in sediments (Tarling and Hrouda 1993).

High resolution stratigraphy and age control will be key to the success of JT-Paleoseismology research. Stratigraphic marker beds resulting from volcanic eruptions provide important and robust isochrons that can be used to establish age-models and inter-site core correlations (**Tephrachronology**; Lowe, 2011). Several tephras have been reported off Tohoku (Fig.6; references in captions). Examination of 52 cores collected from the forearc-slope and JT-trench-floor by Ikehara et al. (in press) reveal three Holocene tephras (To-a, Hr-FP, and To-Cu) as key marker beds in this region. For the southernmost JT, there are no reports on tephra occurrence from cores recovered from the JT-floor. This is likely due to the fact that cores do not reach back far enough in time due to the very high sedimentation rates. Numerous tephra beds, however, are reported from a forearc slope core in this southern area (Aoki et al.,2008; Fig.6) and are thus expected as marker beds in deeper subsurface to be cored by IODP.

Further chronostratigraphic markers are expected from Radiolarian **Biostratigraphy**. According to paleoceanographic changes over the NW Pacific during the Upper Pleistocene, marine planktic assemblages have changed. Ten bio-events in radiolarian assemblages within the last 90ka were reported (Fig.6). Although some of these events were so far only reported in subarctic regions, most of the events should have also been recorded in the JT-region and are expected to provide biostratigraphic age control for the proposed cores.

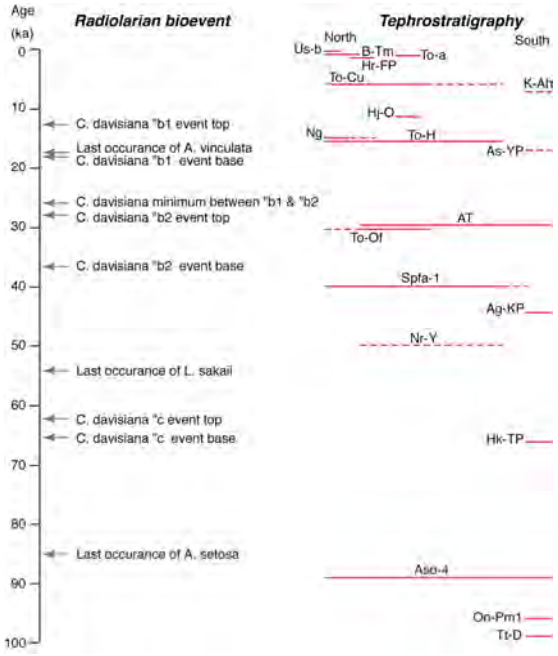


Figure 6: *Upper Pleistocene and Holocene stratigraphic events in the Japan Trench:* ***Tephras are****: Asama-Itahana-Yellow (As-YP), Akagi Kanuma (Ag-KP), Baegdusan-Tomakomai (B-Tm), Towada-a (To-a), Towada-Chuseri (To-Cu), Towada-Hachinohe (To-H), Aira-Tanzawa (AT), Towada-Ofudo (To-Of), Shikotsu Daiichi (Spfa-1) Hakone-Tokyo (Hk-TP), Aso-4, Ontake-Daiichi (On-Pm1), Tateyama-D (Tt-D) and Numazawa-Tagashira (Nm-Tg) (Machida and Arai, 1992; Aoki and Arai, 2000; Aoki et al., 2000; 2008; Ikehara et al., 2013, 2016, in press). Also shown is propable occurrence and arial distribution of Usu b (Us-b), B-Tm, To-a, Haruna-Futatsudake-Ikaho (Hr-FP), To-Cu, To-H, Nigorikawa (Ng), AT, To-Of, Spfa-1, and Naruko-Yanagisawa (Nr-Y) tephras as documented in 52 cores from the Japan Trench margins by Ikehara et al., in press)* ***Biostratigraphic events*** *are compiled after Itaki et al., 2007, 2009; Matsuzaki et al., 2014; Yasudomi et al., 2014)*

Apart from using bioevents and volcanic markes, establishing a continuous high-resolution chronostratigraphic framework for hadal-zone sedimentary records deposited below the CCD has been a critical challenge for many years, because of the absence of datable carbonate material. Based on innovative research conducted on material sampled from site-survey cores to this proposal (GeoB16431-1; near proposed Site JTPC-01A), Bao et al. (submitted) shows a successful application of **OM radiocarbon analyses** for constraining the chronology of event deposits related to historic earthquakes (Fig.3). This study shows that (i) bulk OM radiocarbon ages have consistent offsets of ~2000 years, likely related to constant transport of pre-aged OM to the trench; and (ii) that ^{14}C ages of specific organic carbon(OC)-thermal-decomposition products can yield valuable chronological constraints on sedimentary sequences (Fig.3). Thus, this approach holds promise for placing chronological constraints on JT sediment cores.

Another way of overcoming the challenges of obtaining a continuous high-resolution chronology for deep-sea sediments is presented by Kanamatsu et al. (2017). These authors found that the sediment samples recovered by conventional piston coring in the JT contain excellent **paleomagnetic secular variation** records to constrain age models for the past up to 9000 years (Fig.7). Unique aspects of this method are: 1) the signal is available in any water depth; 2) it is effective for synchronizing event-layers for large distances, because the sediment has recorded an imprint of change in the geomagnetic field.

For integrating chronology information resulting from the above-mentioned methods, **age-depth relation** will be analysed using **Bayesian models** (Blaauw 2007; Bronk-Ramsey, 2008). We will first assess continuity of sedimentation and establish sedimentation rates for individual basins by comparing cores recovered within the same trench-fill basin (composite-stratigraphy approach). We will then test for synchronicity vs. multiple independent occurrences of recorded events in different basins (each with independent “floating” chronology fixed at correlatable stratigraphic markers). This will be accomplished by statistically analysing the probability density function of overlap and, thus, failure or success of the hypothesized synchronicity vs. multi-event hypothesis, respectively. Apart from aiming at absolute ages of events, even floating chronology will allow robust estimates of mean recurrence of events and relative recurrence patterns (Blaauw and Heegaard, 2012).

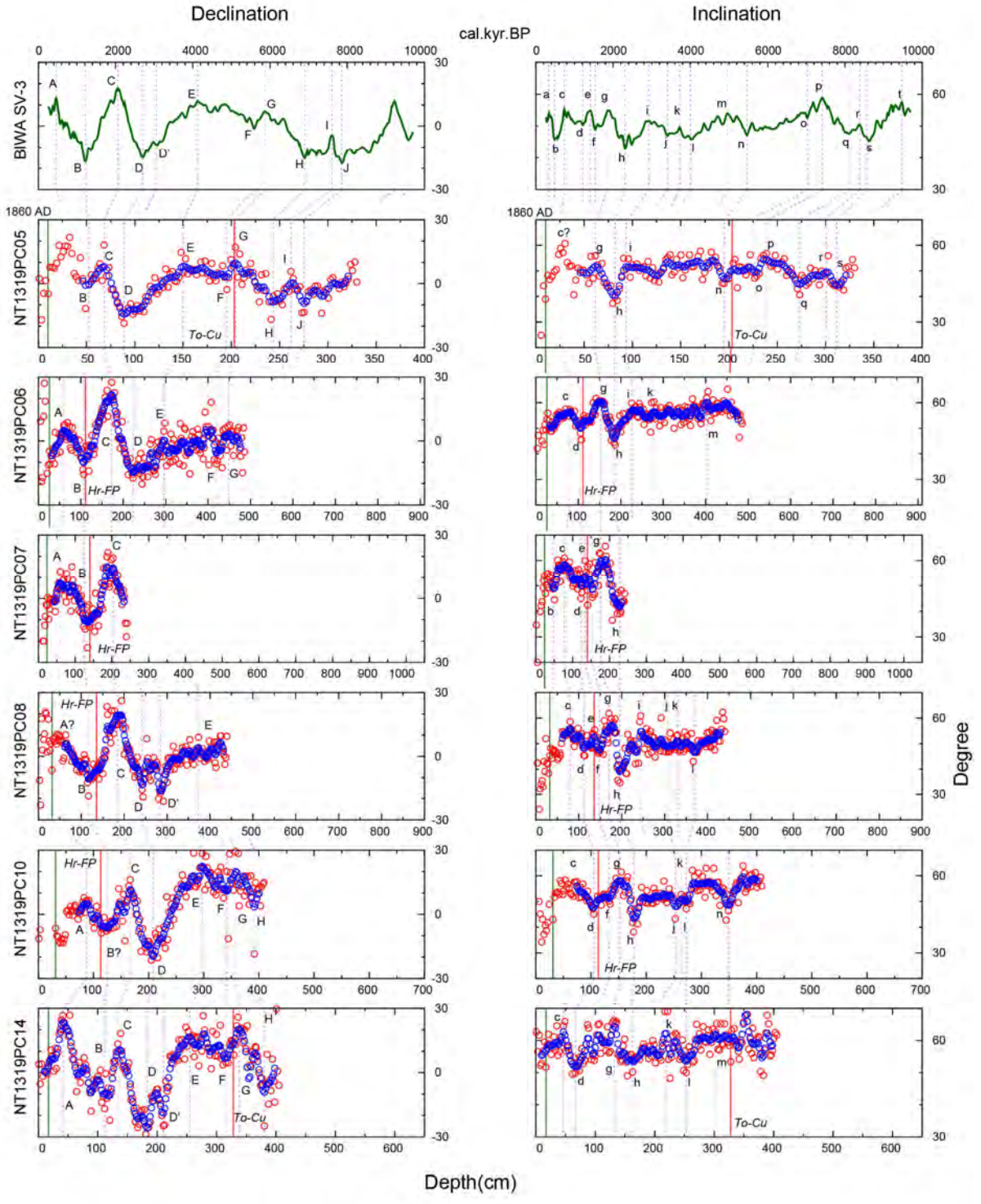


Figure 7: *Declination and inclination curves of studied cores from Japan Trench area. Intervals corresponding to event-deposits are removed. Blue circle: smoothed line; red circle, raw data. Green line in A), and C) are reference of paleomagnetic secular variation of Lake Biwa, western Japan (Ali et al., 1999). To-a: Towada-a Tephra: 915 AD, Hr-FP: Haruna-Futatsudake Ikaho tephra 6th Century, To-Cu: Towada-Chuseri tephra: 6.0 ka. The figure is modified from Kanamatsu et al., 2017)*

Provenance analyses: A detailed understanding of sediment sources (i.e. where the actual earthquake or alternative trigger mechanism exceed threshold conditions to initiate sediment remobilization), flow paths and potential further sediment entrainment mechanisms (as a function of flow-path morphology and seafloor roughness), and depositional subtleties is critical for interpretation of event-deposits. Sediment source and sediment entrainment will be important, especially, to discriminate among transverse delivery paths to the trench (best candidates for earthquake triggers, given the margin physiography) as opposed to inputs from the north (Ogawara-) or from the south (Nakaminato Canyon). Samples obtained from IODP-coring will be analysed using several independent approaches to constrain the sediment provenance of the event-deposits. "Classical" **sediment petrography** and advanced approaches (e.g. **trace elements** of clinopyroxenes (Buchs et al.,2015) and **isotope geochemistry** using Sr, Nd, and Pb isotope compositions as tools to infer sediment source (Saitoh et al.,2015) will be applied. The Japanese archipelago, with Honshu and Hokkaido as sources to be considered have distinct provenance characteristics that can be tracked by these methods (Marsaglia et al., 1992, Buchs et al.,2015; Saitoh et al.,2015). Furthermore, **quantitative X-ray diffraction** will also provide constraints on sediment sources and transport paths, including differences between the background of hemipelagic fallout and turbidites (Underwood & Pickering, 1996). We will also quantify the "expandability" of smectite and the "crystallinity" of detrital illite (Warr & Mählmann, 2015) as fingerprints of diagenetic/metamorphic grade within the source areas.

In situ **benthic foraminiferal assemblages** of surface sediments show bathymetric distributions corresponding to properties of the water masses. In contrast, planktonic foraminifera assemblages in surface sediments differ depending on the latitude (Takayanagi and Oda, 1983). Thus foraminiferal assemblages within event-deposits preserve information of the original assemblages of the source area and/or of the seafloor sediment along the sediment-transport path, as documented from turbidites associated with the 2011-earthquake-related event-deposits (Usami et al.,2017). Combined benthic/planktonic foraminiferal analyses will reveal the water depth and the range of latitude of the event-deposit's provenance. Rapid deposition of thick event-deposits in the JT contributes to the preservation of carbonate tests even below the CCD.

Furthermore, recent progress in **palaeogenetic studies** (Pedersen et al.,2015) suggests that DNA remnants of marine organisms can be applied also in more unstable settings, such as

well-oxygenated deep-sea sediments exposed to bioturbation (Lejzerowicz et al.,2013). The remnants of DNA, often sufficient to identify the taxonomic unit, could be adsorbed at mineral surfaces and subjected to further transport, for example, in a turbidity current. Thus, the analyses of ancient sedimentary DNA may provide a link to the sediment source areas (slope, shelf, and coast). This novel approach following extraction and analyses method after Esling et al. (2015) is focused first on foraminifera as their lineages are clearly identifiable and will be likely expanded to other groups, for instance diatoms and radiolarians.

OM accumulating in trench sediments may contain a mixture of OC derived from autochthonous contemporary marine productivity, as well as laterally-transported OC comprised of continentally-derived OC and reworked marine OC. Characterization of sedimentary OM **elemental (*C/N* ratios) and Isotopic composition ($\delta^{13}C_{TOC}$, $\delta^{15}N_{TN}$)** will be used to determine its origin and preservation state (Hedges et al.,1995). The recent study of Bao et al. (subm.) also applies **radiocarbon analyses** to investigate provenance of OM. The study documents allochthonous OM-input by tracing "pre-aged" OM as a consequence of its pre-depositional histories.

Above-mentioned applications to constrain provenance of event-deposits cored by IODP will be complemented by studies that characterize the initial distribution of the seafloor sediment composition, chemistry, fauna assemblages and age over the entire study regions including potential terrestrial sources, shelves, canyons and slope environments (see below).

Post-depositional processes:

Research on the preservation potential and eventual manifestation of event-deposit characteristic in the geological record will be conducted by **geochemical** and **geotechnical** approaches (for bioturbation see facies analyses above). A promising pilot study integrates **XRF-analyses** and **interstitial-porewater geochemistry** on cores from a repeated-coring experiment in the central JT. The studied cores were retrieved at the same location in early 2012 and late 2016 to study the evolution of the event-deposits linked to the 2011-Tohoku-oki earthquakes (and its aftershock sequence) and how it gets preserved in the geological record. Comparison between the two cores reveals evidence of stacked deposition of successive remobilisation events and a growing Mn-peak at the base of the 2011-event bed (Fig.8). Thus, stacked fine-grained sequences and Mn-peak might be indicative of past event-

deposition following similar depositional and postdepositional processes as being documented for the 2011-sequence. Previous studies also documented Mn-anomaly peaks associated to earthquake-triggered event-deposits in the Mediterranean and Caribbean, showing that this is a common process associated to event-deposits (Polonia et al.2016; McHugh et al.,2011).

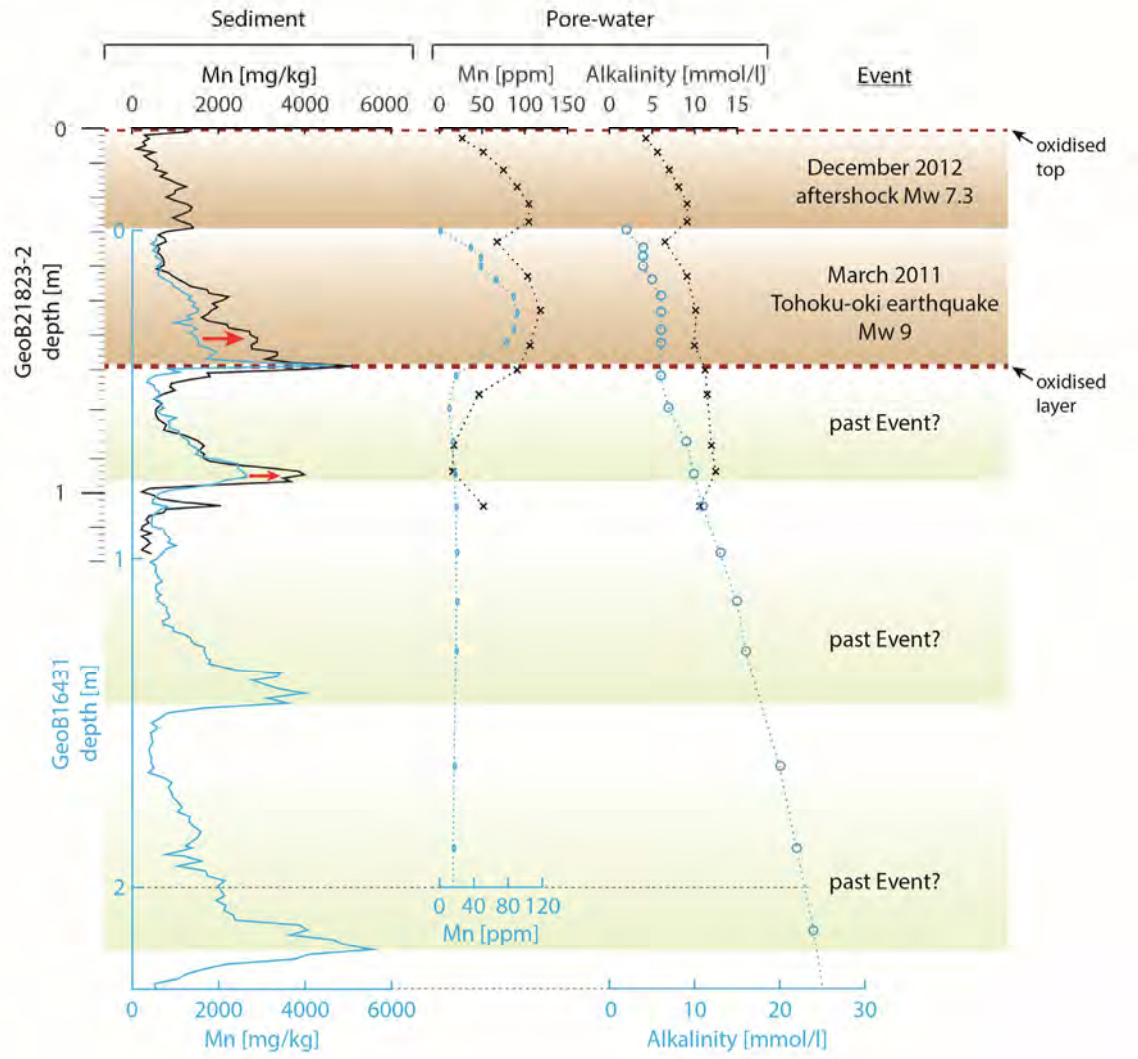


***Figure 8**: Avaatech XRF core scanner Mn (calibrated by powdered XRF measurements on discrete samples) and pore-water geochemistry data from core GeoB21823-2, retrieved in October 2016, compared with the data from core GeoB16431, retrieved in March 2012. Light brownish marked are a lower and upper surficial event-deposit layers (supported by disequilibrium profiles of alkalinity) linked to the 2011-earthquake (Ikehara et al., 2016) and a younger remobilization event that occurred after coring in March 2012. We tentatively interpret the M_W 7.3 aftershock of the 2011 Tohoku-oki earthquake on 7 December 2012, for which re-suspension of unconsolidated seafloor sediments have been reported by Oguri et al., (2016) within the upper slope terrace off Sanriku coast at a water depth of ~1000 m, as potential trigger for the uppermost layer. Light greenish-shaded intervals potentially represent past events.*

Data reveal a growing Mn-peak at the base of event layers (marked with red arrows), possibly linked to $MnCO_3$ precipitation, which will remain stable in the geological record. Several Mn-peaks in the subsurface correlating with bases of fine-grained turbidite layers, suggest similar processes might have occurred in the past (unpublished data courtesy Tobias Schwestermann and Martin Kölling).

Shipboard physical property and post-cruise **geotechnical experiments** (e.g. oedometer tests) will assess degree of consolidation and dewatering in event-deposits vs. "background" sediment and how it evolves downsection, as the stratigraphic sequences compacts. This will allow for robust core-seismic integration and provide the means to estimate sediment volume from **mapping event-deposits in HRS-data**. **Geotechnical experiments** will further offer interesting opportunities to study evolving physical properties upon compaction (and eventual subduction) of predominately diatomaceous sediments, which links to objectives addressed in JTRACK-proposal 835Full2 regarding the role of input sediment on the evolution of the megathrust and shallow, tsunamigenic slip.

Accompanying studies

A large accompanying coordinated research effort forms an integral part of the JTRACK-paleoseismology research. The efforts include continuing to analyze available **surface samples and conventional up-to-10-meter long cores** retrieved (and to be retrieved during future "ship of opportunity" cruises) from the canyon, slope, and shelf areas. Although the latter settings reveal lower preservation potential of earthquake-related event-deposits due to lower sedimentation rates and high benthos activity (Ikehara et al.,2014; 2017), some sites may reveal a **condensed long-term record of earthquake-related event-deposits** (Kanamatsu et al.,2017) as comparison to the record to be established from the proposed IODP expedition.

As importantly, the cores and surface samples from these settings will be analyzed by applying the same methods outlined in section "provenance analyses", and integrated with available information from offshore geological mapping (Ohta et al.,2010; Geological Survey of Japan; 2015). This will document the **initial distribution of composition, chemistry, fauna assemblages and age of seafloor sediments** and thus constrain variability in source materials and along downslope or down-canyon evolving sediment-gravity-flow pathways to decipher initial (seismic vs. aseismic) sediment remobilization vs. along-transport-path sediment entrainment processes.

Furthermore, cores from the source regions of JT-event-deposits provide samples for **geotechnical seismic slope stability and seismic site response analyses** (Noguchi et al, 2012; Nakamura et al.,2015; Wiemer et al.,2015), towards beginning to constrain how seismic seafloor motion links to sediment remobilization initiation.

Complementary to the provenance analysis, we will perform **sediment-routing systems analysis and 3D turbidite flow simulations** (Waltham et al.,2008). This aims at a profound 3D assessment of the entire regional system from sediment mobilization in the source area, to sediment sorting and further entrainment (as a function of flow-paths morphology and seafloor roughness) to the depositional sink of the JT. It includes testing for sediment sources potentially routed by axial flows along the trench axis, originated from the Ogawara or Nakaminato Canyon (Figs.1&9). Furthermore, turbidite modelling will allow for a robust theoretical framework that will reveal for each coring site a detailed knowledge about how bathymetry, sediment-transport dynamics and depositional processes influenced the site-specific stratigraphic record, as a base for reliable event-deposit interpretation and reconstruction of source and trigger of the causative event.

Integrating results from IODP core analyses and accompanying studies will improve our basic understanding of processes by linking coseismic motions at the seafloor, shaking and permanent deformation, with sediment remobilization, transport, deposition and their signatures in the sedimentary record. The strategy of these studies **combines field observations with physical experiments and numerical modelling** to establish the relationship among different driving mechanisms and structure of resedimentation deposits.

The to-be-established long earthquake record from IODP cores, expanded to quantitative constraints on earthquake parameters from accompanying studies, then can be evaluated and analysed by **statistical seismology** methods (e.g. Vere-Jones et al.,2005) and will eventually improve analysis of risk for tsunami-generating giant earthquakes at subduction margins.

Figure 9: *(figure on next page): Modelling of 3D, depth-averaged turbidity currents offshore Tohoku area demonstrating the aftermath of depositional thickness of sediment density flow deposit associated with a hypothetical large mobilization event in the catchment area of the Nakaminato submarine canyon ("Nakaminato Model"), near epicentral area of the 2011 Tohoku-oki earthquake ("Epicentral Model"), and in the outshelf region in the headwaters of the Ogawara canyon ("Ogawara Model"). Depositional thickness at water depths <4,000 m is not displayed and the 0–10 cm thickness has blank colors: i.e., 100% transparency. All the models are run using the Midland Valley software Move 2016 under the 300 m-spacing of bathymetry grid data (Kioka et al. 2017). Results suggest that mass flows routed through the Nakaminato and Ogawara canyon can affect the southernmost and northern most parts of the trench study area. The thick transparent units imaged in HRS-data in these areas (Fig. 5), thus will need to be tested for a potential source in the headwaters of canyons. However, the results also suggest that large mass-flows are unlikely to be sustained along-strike the trench over long distances. For the central JT, HRS-data do not image several-meter thick units, suggesting that the hypothetical large submarine landslide "epicentral model" might not be a realistic scenario, but rather sediment remobilization by giant earthquakes in this area is by surficial sediment remobilization over wide areas (McHugh et al., 2016).*

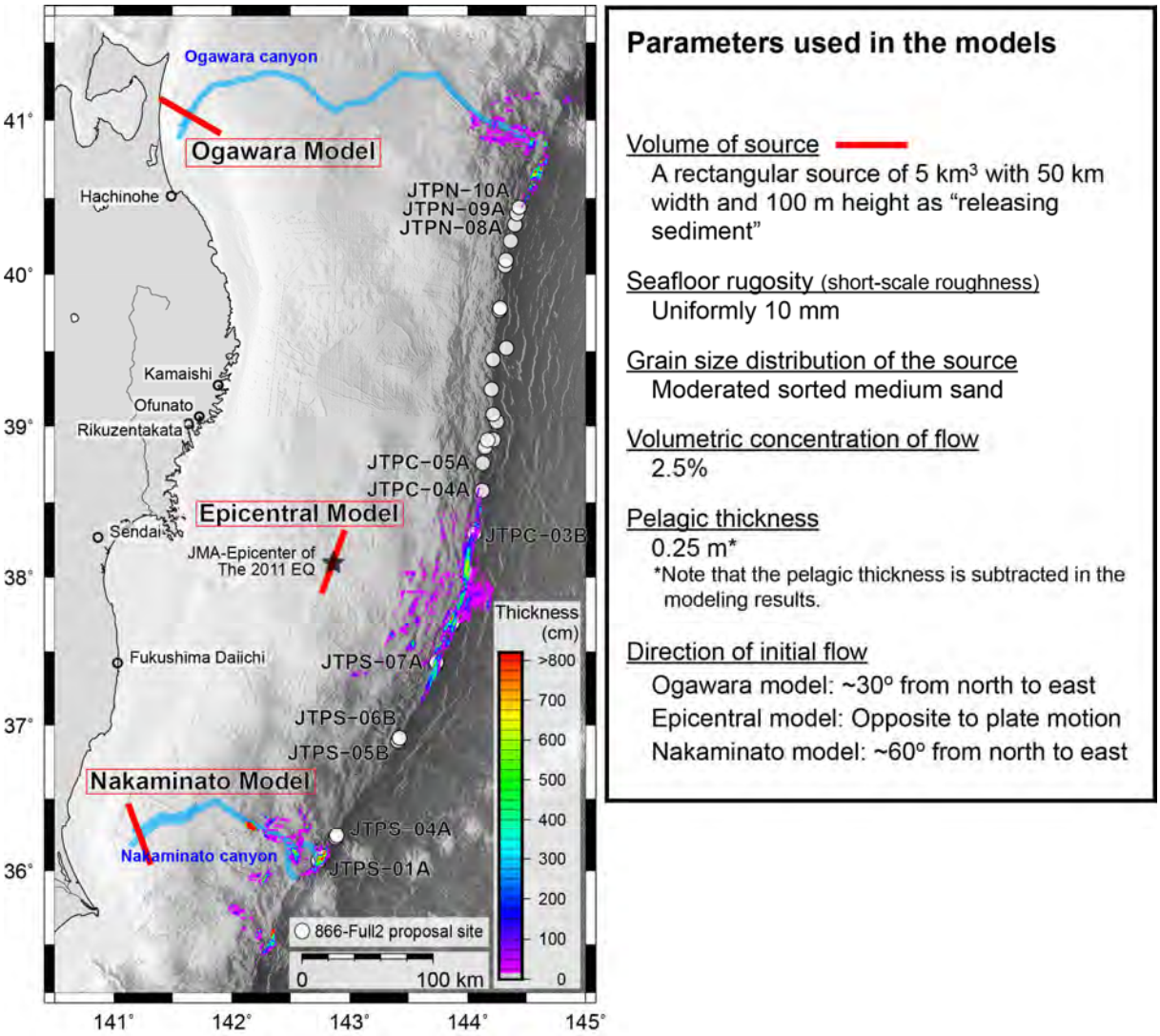


Figure 9: *see previous page for figure caption*

SITE CHARACTERIZATION AND SITE SELECTION

JT structural characteristics

The Pacific plate is subducting beneath the Okhotsk Plate along the JT at a rate of 8.0–8.6cm/yr (DeMets et al.,2010). The trench strikes N–S to NNE–SSW, originating at the triple junction of the Pacific, Philippine Sea, and Okhotsk plates at the south and intersecting the Kuril Trench to the north. The plate interface is erosional, with subduction erosion producing tectonic subsidence (von Huene and Lallemand, 1990) that forms a low-gradient (1-2°) upper slope terrace. Although there is no clear forearc basin, isolated basins occur on the upper slope terrace (Arai et al.,2014; Fig.1). The lower slope is steeper with an average gradient of ~5°. Active faulting along the subduction margin (Tsuru et al.,2002; Kodaira et al.,2017) forms

a narrow mid-slope terrace at water depths of 4000-6000m. N-S to NNW-SSE trending horst-and-graben structures formed by flexural bending of the subducting Pacific plate results in relatively rough trench-floor morphology with small elongated, physically-separated trench-fill and graben-fill basins. Vertical relief within the basins is typically on the order of a few hundreds of meters.

The study area of the deep JT (7600m, 7500m and 8000m in the northern, central and southernmost part, respectively) is bounded to the north and south by subducting seamounts (Erimo and Daiichi-Kashima seamount, respectively), where the trench-floor is elevated to 6000 and 5500m, respectively. The trench-floor is also relatively shallower (~7400m) around 39.4°N, where a petit-spot volcano field (Hirano et al.,2006) enters the subduction system. There, a large >1km-high escarpment suggests large-scale gravitational collapse and mega-landslides on the lower-most landward slope. HRS-profiles, however, do not show young large-scale landslide deposits, suggesting that the collapse structure is significantly older.

Site Survey Data, Site Selection and Prioritization:

The JT is a well-imaged margin with many seismic surveys conducted since the 1970's, including high-resolution multi seismic (HRMCS) data collected across the trench-axis since 2011 (Fig.10). In 2016, we collected ~2000km of HRS-data (*Parasound system onboard R/V Sonne*; Figs.4, 5, 10) that is now being integrated with HRS-Chirp data acquired during recent *R/V Shinsei-Maru* cruises. The footprint of such (parametric) ship-mounted systems comprises a few hundred meters in diameter for >7km deep waters, but the data from the small trench- and graben-fill basins confirm coherent, horizontally-stratified sediments interbedded with acoustically-transparent events-deposits (Figs.4&5) defining clear targets, that (i) are bigger than the accuracy of positioning coring equipment (~100m; see below) and (ii) show well-imaged promising event-stratigraphy of mostly 40m and more (occasionally limited to 30m; e.g. JTPN-02A). Following SEP suggestions, we also mapped trench-fill sediment thickness and individual basin morphologies from HRMCS- and HRS-data, respectively (Fig.10). Isopach maps of trench-fill sediments reveal variable thickness ranging from practically 0 to >300m, reflecting along-strike variation in structural style of horst-graben basins bending along faults in the downgoing slab and Mesozoic-to-Cenozoic sediment cover of the Pacific plate (Nakamura et al. 2013, Boston et al.,2014). Based on HRMCS-data we located sites in basins where trench-fill sediment thickness is >50m. This confirms that the upper 50m of sediment

can be cored, even where the lower part of the trench-fill is not well imaged in the HRS-data. There the acoustic basement in HRS-data is interpreted to be linked to local landslides or deformation of trench-fill sediments by coseismic slip-propagation to the trench (Kodaira et al.,2012). Although likely linked to past giant earthquakes, our site locations generally avoid such features because stratigraphic control will be difficult to assess. At proposed sites JTPC-01A,-02A, and JTPN-01A,-02A the well-stratified trench-fill deposits comprising our coring target is overlying such trench-fill deformation structures by less 40m. Thus, these sites constitute opportunities to ground-truth, sample, characterize and date the interpreted occurrence of slumps in and/or coseismic rupture propagation to the trench.

Figure 10: *(figure on next page):*

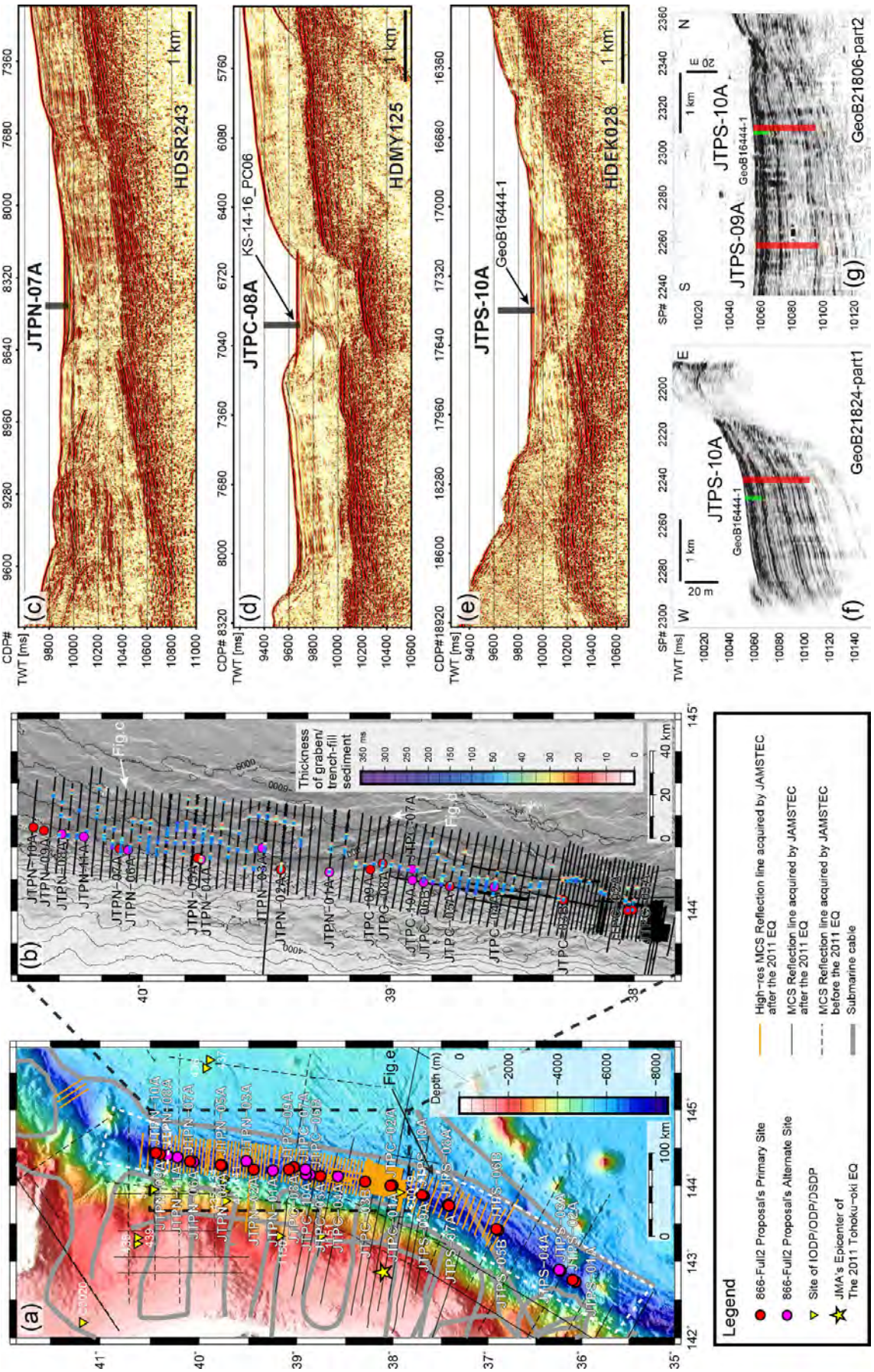
A: Left panel: *Seismic profiles acquired by JAMSTEC since 1997 and herein-proposed IODP Mission Specific Platform primary and alternate coring sites (red and purple circles, respectively). Profiles from before the earthquake (dashed black lines) were acquired using the following parameters: 12,000 cu. inches non tuned air gun array, 3,000-4,500 m long 120-168 ch. streamer cable. Parameters for profiles acquired after the earthquake are: 7,800 tuned airgun array and 6000 m long 444 ch (black solid lines), and 320 – 380 cu. inch cluster gun array with 37.5 m shot interval and 1,200 m long 192 ch with 6.25 m channel interval streamer cable (high-resolution multi-channel seismic (HRMCS): orange lines). Yellow triangles indicate previous sites of DSDP, ODP and IODP drilling. Also shown by thick grey lines are submarine cables. All coring sites are placed >8km away from submarine cables to eliminate operational risk. White-dashed outlined rectangle in the south and north indicate working areas of three scheduled cruises for further site-survey data acquisition: Cruise YK17-22 (R/V Yokosuka Oct.-Nov. 17) for HRMCS-survey in the south. Cruise KS17-13 (R/V Shinsei-Maru Oct.12-25 2017) for conventional piston coring at JTPS-02A, -06A, & -09A and high-resolution subbottom (Chirp) data acquisition across JTPS-02A, -05A. Cruise MR17-06 by R/V Mirai (Oct. 5 – 14 2017) plan includes to obtain subbottom profiles and conventional piston coring around JTPN-10A.*

B: Middle panel: *Isopach map of thickness of trench-fill sediment mapped in HRMCS-profiles (orange lines in left panel) and proposed sites for 30-40m long piston coring, most of which we located in basins where trench-fill sediment thickness is more than 50m (blue to purple colours on the isopach map). Exceptions to this are JTPN-02A and JTPN-04A, which both show well-defined deeply-imaged targets in high-resolution subbottom data (see respective site summary forms).*

C-E upper right panels: *Examples of high resolution multi-channel reflection seismic profiles (see location of lines on the left panel A and middle panel B) showing character of horizontally-stratified, undisturbed trench-fill and graben-fill basins, and proposed coring sites. See "Explanatory Notes" submitted to SSDB for specs of HRMCS acquisition and processing. The vertical resolution is ~10 m in the sediment layer.*

F-G lower right panels: *Examples of noise-attenuated high-resolution subbottom profiles acquired by ATLAS PARASOUND P70 multi-parametric system equipped on R/V Sonne: (f) W-E Parasound and (g) S-N Parasound lines across proposed site JTPS-10A (zoomed-to-trench-location of panel e). The two cross lines exemplarily illustrate that trench-fill basins typically are asymmetric basins (in W-E direction; formed by normal faults in the downward-bending subducting oceanic crust (panel e), are of limited N-S extend, and show ponding geometries in the depocentre and more condensed sections towards the basin margins. Site JTPS-09A and -10A thus represent a typical examples of our "coring composite-stratigraphy concept" with a two-site couple that allows for coring both an expanded (JTPS-09A) and a condensed stratigraphic section (JTPS-10A).*

Figure 10: *see previous page for figure caption*



We identified 31 sites that allow sampling of event-deposits, well-characterized by homogenous acoustic facies intercalated within acoustically-stratified sediments as imaged by HRS-data (Figs.4,5&10). In most cases, two sites are located <2-5km apart within an individual trench-fill basin, for which site-to-site correlation is well-constrained by good reflector-continuity. The two sites form a couple that allow for coring both an expanded and a condensed stratigraphic section, applying our "composite-stratigraphy concept" (Fig.10) to address objective O-1 and reach further back in time (O-3). Correlation between sites across different basins is possible in a few cases in the northern and southern JT (Fig.5). But these correlations are mostly obscured by steep morphologies across subducting horst or landslides structures. To study along-strike variability (O-2), we locate fewer coring sites in basins with better along-strike continuity, while high site-location density is chosen where basins are smaller and continuity is restricted.

Primary site couples are defined preferentially in basins where <10m-long cores are already available and show promising event-stratigraphy in the shallow subsurface and high potential for expanding the record further back in time. Where already-cored event-stratigraphic patterns can be correlated across several separated basins (Ikehara et al.,2017) and/or where HRS-data suggest correlatable reflection patterns across basins, high spatial coverage of proposed site couples seems less critical to achieve the scientific objectives, and not all correlatable basins must necessarily be sampled by the "composite-stratigraphy concept". Following this logic, we prioritize 18 sites that ***need*** to be cored to meet all scientific objectives. The remaining 13 sites could be considered as alternate sites to one or the other primary site. However, coring these "second priority" sites in addition to the primary sites remains a highly-valuable operational objective ***to refine*** the spatial resolution for reconstructing the earthquake history of different along-strike segments. To this end, we also locate coring sites in small graben-fill basins on the incoming downward-bending Pacific plate (JTPC-04A, -07A, -08A, JTPN-03A; Figs.5&10), to secure enough density of site locations in structurally complicated areas.

OPERATION AND TIME ESTIMATES

The coring objectives can be achieved by coring from a MSP that has the capability of recovering cores from the uppermost 30-40m below seafloor in water depth up to 8030 or 7990m (deepest primary site JTPS-01A, or its alternate site JTPS-04A, respectively). Although, technically, APC/HPC coring with a drilling platform can also recover cores from the shallow subsurface in deep sea trenches (c.f. IODP Expedition 343), we have focused initial inquires with operators of ultra-deep water Giant Piston Coring (GPC) systems: (i) the new Japanese *R/V Kaimei* (40m-GPC-system in water depth <12000m, currently under sea trial but scheduled to become open for scientific operation in 2019), (ii) the French *R/V Marion* Dufresne (<75m-GPC-system in water depth of up to 8000m). Detailed information about these platforms and evidence for their technical feasibilities to achieve our coring objectives at individual sites is uploaded to SSDB and provided to ESO.

To mitigate operational risk of the proposed GP-coring (submarine cables, positioning-accuracy of coring equipment in ultra-deep water, dropping the system, pipe-bending, coring disturbance) we highlight the following site characteristics and propose respective mitigation strategies:

- All coring sites are placed >8km away from submarine cables (Fig.10)
- We will use acoustic transponders capable to operate in 8km depth to maximize the accuracy with which GPC-system is positioned. During site-survey-coring cruises, positioning of transponder attached to the cable at 6km-depth was well within 100m of ship positioning (see data in SSDB-JTPC-05A). HRS-data of all proposed site locations image clear targets of several 100s of meters in diameter (minimum target size is 175m for JTPS-05B,-06B, JTPC-03B,-06B), thus positioning uncertainty has no impact on addressing our scientific objectives.
- Several factors indicate that a GP-corer should smoothly penetrate the sediment deep enough not to risk pipe-bending due to limited penetration, and should not have to resist major shear forces upon retrieval from the sub-seafloor: 1) good-to-excellent penetration of conventional gravity and piston cores; 2) under-consolidated sediments with very low shear strength values (<30kPa in 10m core depth; see data in SSDB); 3) the fine-grained nature of the sediment, with only thin

intercalated ash or fine-sand layers and (4) continuously well-stratified sections imaged in HRS-data.

- Our strategy to mitigate the remaining minimal risk for pipe bending / getting stuck is to approach the target depth by repeated coring with consecutively-longer corer length. We intend to monitor the penetration with acceleration sensors and assess resistance upon retrieval to guide onsite-decision for maximal corer length.
- To mitigate the impact of worst-case incident (dropping the corer; very low probability of occurrence due to above-mentioned mitigation measures) we consider having a spare coring system available during the expedition.
- Repeated coring at each site with consecutively-longer corer length will also help to overcome the issue of coring disturbance typical of piston cores (Jutzeler et al.,2014; Marsaglia, 2015): Comparison between the monitored penetration depth and the actual recovery length of double-cored intervals, as well as X-CT analyses revealing the degree of disturbance clearly, will allow to formulate quality-assurance and quality-control protocols and will help judging the scientifically relevant depth intervals.
- Repeated coring will further secure enough sampling material for the intense post-cruise research programs and allows for maintaining continuous stratigraphic control even with whole-round sampling plans for geotechnical and microbiological studies.

Applying a conservative time estimate of 12h/core (including 5 hour round-trip in 8000m water depth, core handling and recharging) and planning with up to 3 cores with consecutively-longer corer length to reach the target depth at each of the 18 primary sites, a maximum of 27 days at 24h/day operation will be required. Considering the cumulative time for the many transits and positioning manoeuvres (~3days) and adding 8 days contingency for bad weather and coring-gear maintenance, we propose a 38-days MSP operation. If contingency time can be used for operation, we will also core alternate sites, as coring these "2nd-priority" sites in addition to the primary sites remain a highly-valuable operational objective *to refine* the spatial resolution for reconstructing the earthquake history of different along-strike segments.

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Sakaguchi, A., et al., 2011. Seismic slip propagation to the updip end of plate boundary subduction interface faults: Vitrinite reflectance geothermometry on Integrated Ocean Drilling Program NanTroSEIZE cores. Geology.

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ten Brink, U.S., et al., 2016. Seismicity and sedimentation rate effects on submarine slope stability. Geology, 44:563-566

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Usami, K., et al., 2017. Benthic foraminiferal evidence of deep-sea sediment transport by the 2011 Tohoku-oki earthquake and tsunami. Marine Geology, 384: 214-224

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von Huene, R., et al., 1980. Summary, Japan Trench Transect. Initial Reports of the Deep Sea Drilling Project, 56, 57, doi:10.2973/dsdp.proc.5657.111.1980

von Huene, R., & Lallemand, S., 1990. Tectonic erosion along the Japan and Peru convergent margins. Geological Society of America Bulletin, 102(6): 704-720.

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Wiemer, G., et al., 2015. The role of sediment composition and behavior under dynamic loading conditions on slope failure initiation: a study of a subaqueous landslide in earthquake-prone South-Central Chile. **International Journal of Earth Sciences,104,** 1439-1457

Yasudomi, Y., et al., 2014. Environmental fluctuations in the northwestern Pacific Ocean during the last interglacial period: evidence from radiolarian assemblages. Marine Micropaleontology, 108: 1-12.

Ye, L., et al., 2013. Ground shaking and seismic source spectra for large earthquakes around the megathrust fault offshore of northeastern Honshu, Japan. Bulletin of the Seismological Society of America, 103(2B): 1221-1241.

Yoshikawa, S., et al., 2016. Small-scale spatial variation in near-surface turbidites around the JFAST site near the Japan Trench. Geochemistry, Geophysics, Geosystems.

Curriculum Vitae: Michael Strasser

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Education:

2003-2007 Ph.D. student at the Geological Institute, ETH Zurich, Switzerland: *Title of PhD thesis:* Quantifying Late Quaternary Natural Hazards in Swiss Lakes: Subaquatic Landslides, Slope Stability Assessments, Paleoseismic Reconstructions and Lake Outbursts,

1998-2003 Diploma in Earth Sciences at ETH Zurich: *Diploma thesis:* Erosion Processes and geomorphologic landscape evolution in arid climatic environment; 'Lluta collapse', northern Chile

Appointments:

Since 2015 Full Professor in Sedimentary Geology at the Institute of Geology at University of Innsbruck, Austria

2011 - 2015 Assistant Professor in “Sediment Dynamics” at Department of Earth Science at ETH Zurich, Switzerland, (Swiss National Science Foundation - Professorship)

2008-2011 MARUM fellow and postdoctoral researcher at DFG Research Center/Cluster of Excellence "The Ocean in the Earth System" Univ. of Bremen, Germany

2007-2008 Swiss National Science Foundation Fellowship for Prospective Researcher and postdoctoral researcher at RCOM – Research Centre Ocean Margins, Univ. of Bremen, Germany.

2003-2007 Scientific assistant at the Department of Earth Science, ETH Zurich

Awards:

2017 Asahiko Taira Prize (AGU & JpGU) for outstanding transdisciplinary research accomplishment in ocean drilling

2014 Int. Association of Sedimentologists (IAS) Young Scientist Award 2014

2011 Hans-Cloos-Preis for significant contributions to Geosciences (Geologische Vereinigung Germany)

2008 ETH Medal for outstanding PhD thesis at ETH Zurich, Switzerland

2007 CHGEOL Award for the thesis in earth science written at Swiss universities with the most practical relevance in 2007;

2004 Willi-Studer Award ETH Zurich for best diploma student in Earth Sci. in 2003

5 most relevant articles with respect to this proposal

Strasser, M., Kölling, M., dos Santos Ferreira, C., Fink, H.G., Fujiwara, T., Henkel, S., Ikehara, K., Kanamatsu, T., Kawamura, K., Kodaira, S., Römer, M., Wefer, G. and the Cruises SO219A and MR12-E01 scientists (2013) A Slump in the Trench: Tracking the impact of the 2011 Tohoku-Oki earthquake, ***Geology, 41***, 935-938.

Ikehara, K., Kanamatsu, T., Nagahashi, Y., Strasser, M**.,** Fink, H., Usami, K., Irino, T., Wefer, G., (2016) Documenting large earthquakes similar to the 2011 Tohoku-oki earthquake from sediments deposited in the Japan Trench over the past 1500 years. ***Earth and Planetary Science Letters, 445,*** 48-56.

Strasser, M., Monecke, K., Schnellmann, M., Anselmetti, F.S. (2013) Lake sediments as natural seismographs: A compiled record of Late Quaternary earthquakes in Central Switzerland and its implication for Alpine deformation. ***Sedimentology, 60,*** 319-341.

Moernaut, J., Van Daele, M., Strasser, M., Clare, M.A., Heirman, K., Viel, M., Cardenas, J., Kilian, R., Ladron de guevara, B., Pino, M., Urrutia, R., De Batist., M. (2017) Lacustrine turbidites produced by surficial slope sediment remobilization: A mechanism for continuous and sensitive turbidite paleoseismic records. ***Marine Geology, 384,*** 159–176, doi:10.1016/j.margeo.2015.10.00.

Moernaut, J., Van Daele, M., Heirman, K., Fontijn, K., Strasser, M., Pino, M., Urrutia, R., De Batist, M. (2014) Turbidites as a tool for quantitative earthquake reconstruction: new evidence for a variable rupture mode in South-Central Chile, ***Journal of Geophysical Research, Solid Earth, 119,*** 1607-1633.

Publication record:

70 peer-reviewed papers published (or in press) since 2005, 14 as 1st author, 15 papers by supervised students. 52 in journals listed in the ISI Web of Science. 3 co-edited books. Current Hirsch index (H = 21), 1423 total citations (google scholar Sept 2017).

IODP expeditions:

2012	**IODP** Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) **Expedition 338** offshore Japan. *Co-chief scientist*
2010/2011	**IODP** Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) & Nankai Trough Submarine Landslide History (NanTroSLIDE) **Expedition 333** offshore Japan. *NanTroSLIDE PI and Stratigraphic Correlator*
2007/2008	**IODP** NanTroSEIZE **Expedition 316** offshore Japan. *Sedimentologist*
2002	**ODP Leg 205** offshore Costa Rica, *Sedimentologist / Student Trainee*

Selected Scholarly Activities/Services:

Alternate delegate for Austria in ECORD Sci. Support & Advisory Committee (since 2017)

Member of the IODP Proposal/Science Evaluation Panel 2011-2014: Sub-group chair (Theme: Earth in Motion); 2011-2014

Chair of MagellanPlus/USSSP workshop on "Submarine Paleoseismology" in Zürich, July15

Swiss IODP Board Member; 2013-2015

Co-chair of UNESCO – International Geoscience Program IGCP-585; 2010 - 2014: Earth´s continental Margins: assessing the geohazard from submarine landslides (E-MARSHAL) and IGCP-640; 2015-2019: Significance of Modern and Ancient Submarine Slope LandSLIDEs (*S^{4}LIDE*)

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EMPLOYMENT

2015-present	Prime Senior Researcher, Institute of Geology and Geoinformation (IGG), Geological Survey of Japan (GSJ), National Institute of Advanced Industrial Science and Technology (AIST)
2015-2016	Lecturer at Tokyo Gakugei University
2014	Principle Research Manager, IGG, GSJ, AIST
2009-2013	Deputy Director, IGG, GSJ, AIST
2004-2010	Research Group Leader of Marine Geology Research Group, IGG, GSJ, AIST
2002-2004	Senior Research Scientist at the Institute for Marine Resources and Environment, GSJ, AIST
1998-1999	Lecturer at the Faculty of Education, Ibaraki University
1994-1995	Senior Staff at the Ocean Development Division, Science and Technology Agency
1982-2001	Research Scientist/Senior Research Scientist at Marine Geology Department, GSJ

EDUCATION

1978-1982	Faculty of Education, Tokyo Gakugei University
	Awarded the degree of BSc in education
1992.3	Kyushu University
	Awarded the degree of PhD in Science

PROFESSIONAL ACTIVITIES

2009.5-2011.3	SSEP member
2011.8	Exp. 332&333 ORTF External reviewer
2012.6-2013.9	SCP member
2013.8-2013.9	Exp. 346 (Asian Monsoon) sedimentologist
2013.10-2014.9	SEP member
2016.7	Lecturer, JAMSTEC & J-DESC Chikyu Onboard School 2016
Co-proponent	IODP #605 (Asian Monsoon), #777 (Okinawa Trough Quaternary Paleoceanography)

MEMBERSHIP

International Association of Sedimentologists, Society for Sedimentary Geology,
American Geophysical Union, Geological Society of America, Japan Geoscience Union, Geological Society of Japan, Sedimentological Society of Japan

SELECTED PUBLICATIONS RELEVANT TO THIS PROPOSAL

1) **Ikehara, K.**, Usami, K., Kanamatsu, T., Arai, K., Yamaguchi, A., Fukuchi, R., 2017, Spatial variability in sediment lithology and sedimentary processes along the Japan Trench: Use of deep-sea turbidite records to reconstruct past large earthquakes. In: Tsunamis: Geology, Hazards and Risks, *Geological Society, Special Publication*, **456**, doi:10.1144/SP456.9.
2) **Ikehara, K.**, Usami, K., Kanamatsu, T., Danhara, T., Yamashita, T., Three important Holocene tephras off the Pacific coast of Tohoku region, Northeast Japan: Implications for correlating onshore and offshore event deposits. *Quaternary International*, doi:10.1016/j.quaint.2017.08.022.
3) Usami, K., **Ikehara, K.**, Jenkins, R.G., Ashi, J., 2017, Benthic foraminiferal evidence of deep-sea sediment transport by the 2011 Tohoku-oki earthquake and tsunami. *Marine Geology*, **384**, 214-224.
4) Kase, Y., Sato, M., Nishida, N., Ito, M., Mukti, M.M., **Ikehara, K.**, Takizawa, S., 2016, The use of microstructures for discriminating turbiditic and hemipelagic muds and mudstones. *Sedimentology,* **63**, 2066-2086.
5) **Ikehara, K.**, Kanamatsu, T., Nagahashi, Y., Strasser, M., Fink, H., Usami, K., Irino, T., Wefer, G., 2016, Documenting large earthquakes similar to the 2011 Tohoku-oki earthquake from sediments deposited in the Japan Trench over the past 1500 years. *Earth and Planetary Science Letters*, **445**, 48-56.
6) Patton, J., Goldfinger, C., Morey, A.E., **Ikehara, K.**, Romsos, C., Stoner, J., Djadjadihardja, Y., Udrekh, Ardhyastuti, S., Gaffar, E.Z., Viscaino, A., 2015, A 6600 year earthquake history in the region of the 2004 Sumatra-Andaman subduction zone earthquake. *Geosphere*, **11**, 2067-2129, doi:10.1130/GEOS01066.1
7) Tamura, T., Sawai, Y., **Ikehara, K.**, Nakashima, R., Hara, J., Kanai, Y., 2015, Shallow-marine deposits associated with the 2011 Tohoku-oki tsunami in Sendai Bay, Japan. *Journal of Quaternary Science*, **30**, 293-297.
8) **Ikehara, K.**, Irino, T., Usami, K., Jenkins, R., Omura, A., Ashi, J., 2014, Possible submarine tsunami deposits on the outer shelf of Sendai Bay, Japan resulting from the 2011 earthquake and tsunami off the Pacific coast of Tohoku. *Marine Geology*, **358**, 120-127.
9) Arai, K., Inoue, T., **Ikehara, K**., Sasaki, T., 2014, Episodic subsidence and active deformation of the forearc slope along the Japan Trench near the epicenter of the 2011 Tohoku Earthquake. *Earth and Planetary Science Letters*, **408**, 9-15.
10) Ashi, J., Sawada, R., Omura, A., **Ikehara, K.**, 2014, Accumulation of an earthquake-induced extremely turbid layer in a terminal basin of the Nankai accretionary prism. *Earth Planets and Space*, **66**, 51.
11) Strasser, M., Kolling, M., dos Santos Ferreira, C., Fink, H.G., Fujiwara, T., Henkel, S., **Ikehara, K.**, Kanamatsu, T., Kawamura, K., Kodaira, S., Romer, M., Wefer, G., R/V Sonne Cruise SO219A and JAMSTEC Cruise MR12-E01 scientists, 2013, A slump in the trench: Tracking the impact of the 2011 Tohoku-Oki earthquake. *Geology*, **41**, 935-938.
12) **Ikehara, K.**, Ohkushi, K., Noda, A., Danhara, T., Yamashita, T., 2013, A new local marine reservoir correction for the last deglacial period in the Sanriku region, northwestern North Pacific, based on radiocarbon dates from the Towada-Hachinohe (To-H) tephra. *The Quaternary Research (Daiyonki-kenkyu)*, **52**, 127-137.

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Education:

1992-1996 Ph.D. student at Faculty of Science, University of Tokyo, Japan: *Title of PhD thesis:* "*A study on the magnetic fabric of the sediment in the accretionary complex, the Boso and Miura Peninsulas, central Japan*"

1991-1992 Diploma in School of Sciences at Hokkaido University: *Diploma thesis:* "*Paleomagnetic study of the Paleogene deposits, Eastern Hokkaido-Tectonic evolution of Eastern Hokkaido from view point of paleomagnetic declinations*"

Appointments:

2013-Presnt	Principal Research Scientist at JAMSTEC, Japan
2009-2013	Senior Research Scientist at JAMSTEC, Japan
1998-2009	Research Scientist at JAMSTEC, Japan
1996-1998	PhD fellow at JAMSTEC, Japan

5 most relevant articles with respect to this proposal

Kanamatsu, T., Usami, K., McHugh, C.M.G., Ikehara, K. (2017) High-resolution chronology of sediment below CCD based on Holocene paleomagnetic secular variations in the Tohoku-oki earthquake rupture zone, ***Geochem. Geophys. Geosyst.*, *18***, 2990–3002, doi:10.1002/2017GC006878.

Strasser, M., Kölling, M., dos Santos Ferreira, C., Fink, H.G., Fujiwara, T., Henkel, S., Ikehara, K., Kanamatsu, T., Kawamura, K., Kodaira, S., Römer, M., Wefer, G. and the Cruises SO219A and MR12-E01 scientists (2013) A Slump in the Trench: Tracking the impact of the 2011 Tohoku-Oki earthquake, ***Geology*, *41***, 935-938, doi:10.1130/G34477.1.

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McHugh, C.M., Kanamatsu, T., Seeber, L., Bopp, R., Cormier, M.-H., Usami, K. (2016) Remobilization of surficial slope sediment triggered by the A.D. 2011 Mw 9 Tohoku-Oki earthquake and tsunami along the Japan Trench, ***Geology***, ***44***, 5, 391-394, doi:10.1130/G37650.1.

Kanamatsu, T., Kawamura, K., Strasser, M., Novak, B., Kitamura, Y. (2014) Flow dynamics of Nankai Trough submarine landslide inferred from internal deformation using magnetic fabric, ***Geochem. Geophys. Geosyst.***, ***15***, 4079–4092, doi:10.1002/2014GC005409

Publication record:

73 peer-reviewed papers published since 1992, 13 as 1st author. 40 in journals listed in the ISI Web of Science. Current Hirsch index (H = 12), 331 total citations (Web of science Feb 2017).

IODP expeditions:

2010/2011	**IODP** Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) & Nankai Trough Submarine Landslide History (NanTroSLIDE) **Exp. 333** offshore Japan. *Co-chief scientist*
2007	**IODP** NanTroSEIZE **Exp. 315** offshore Japan. *Paleomagnetist*
2005	**IODP** North Atlantic Climate 2 **Exp. 306** North Atlantic. *Co-chief scientis*
1999	**ODP** Western Pacific Geophysical observatories **Leg 186** Japan Trench**.** *Paleomagnetist*
1998	**ODP** Costa Rica Accretionary Wedge **Leg 170** off Costa Rica. *Paleomagnetist*
1993	**ODP** Iberia abyssal plan **Leg 149** off Iberia. *Paleomagnetist*

Selected Scholarly Activities/Services:

2007-2011	IODP NantroSEIZE Specialty coordinator (Biostratigraphy and Paleomagnetism)
2006-2008	IODP Site Survey Panel member

Biographical Sketch for Shuichi Kodaira
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History of Employment

2015-	Assistant Executive Director, JAMSTEC
2014-	Director/Principal Scientist, R&D Center for Earthquake and Tsunami, JAMSTEC
2011-2014	Program director/Principal Scientist, IFREE, JAMSTEC
2011-	Visiting professor, Yokohama National University
2009-	Visiting professor, Tohoku University,
2007 – 2011	Principal Scientist, IFREE, JAMSTEC
2001 – 2007	Group leader, IFREE, JAMSTEC
1998 - 2001	Sub-group leader, IFREE, JAMSTEC
1996 -1998	Research Scientist, Deep Sea Research Dep., JAMSTEC
1993 -1995	Visiting researcher, University of Berge
1992 -1996	Assistant Professor, Hokkaido University

Degrees:

Dr. Sci. 1992	Geophysics, Hokkaido University
M. Sci. 1990	Geophysics, Hokkaido University
B.A. 1988	Geophysics, Hokkaido University

Research Experience

1997-	PI of many JAMSTEC seismic cruises
2012	Co-PI of JAPAN-German research cruise in the Japan Trench
2010	Co-PI of JAMSTEC and Geological Survey Canada Cascadia OBS cruise

Honors

1992	Norwegian Research Council visiting researcher fellowship
2014	AGU fellow
2017	Beno Gutenberg Lecture, American Geophysical Union

Service to the community

2015-2016	AGU Seismology Section Fellows Committee
2013-	Editorial board, Marine Geophysical Research
2012	Workshop convener, GeoPRISMS-Jamstec Ulatra-deep drilling into arc crust workshop
2011	Co-Chair Detailed Planning Group on IODP Rapid Response Drilling Following the Tohoku Earthquake
2010	Steering committee, IODP, InterRidge, Jamstec workshop, The Mohole
2008-2010	IODP New Science Plan Writing Committee
2007-2009	Theme editor, G-cubed
2007	Steering committee, MARGINS workshop on Subduction Factory Studies in the Izu-Bonin-Mariana Arc System

Five Relevant Publications

Kodaira, S., Y. Nakamura, Y. Yamamoto, K. Obana, G. Fujie, T. No, Y. Kaiho, T. Sato & S. Miura (2017). Depth-varying structural characters in the rupture zone of the 2011 Tohoku-oki earthquake. *Geosphere*, DOI:doi.org/10.1130/GES01489.1

Boston, B., G. F. Moore, Y.Nakamura, **S. Kodaira** (2017). Forearc slope deformation above the Japan Trench megathrust: Implications for subduction erosion. *Earth and Planetary Science Letters*, *462*, 26-34, doi:10.1016/j.epsl.2017.01.005.

Nakamura, Y., **S. Kodaira**, S. Miura, C. Regalla, N. Takahashi (2013) High-resolution seismic imaging in the Japan Trench axis area off Miyagi, northeastern Japan, *Geophysical Research Letters*, *40*, 1713–1718, doi:10.1002/grl.50364.

Kodaira, S., T. No, Y. Nakamura, T. Fujiwara, Y. Kaiho, S. Miura, N. Takahashi, Y. Kaneda, and A. Taira (2012), Coseismic fault rupture at the trench axis during the 2011 Tohoku-oki earthquake, *Nature Geoscience*, *5*(9), 646-650, doi:10.1038/ngeo1547.

Fujiwara, T., **S. Kodaira**, T. No, Y. Kaiho, N. Takahashi, and Y. Kaneda (2011), The 2011 Tohoku-Oki Earthquake: Displacement Reaching the Trench Axis, *Science*, *334*(6060), 1240-1240, doi:10.1126/science.1211554.

Other Selected Publications

Kodaira, S., Fujie, G., Yamashita, M., Sato, T., Takahashi, T., & Takahashi, N. (2014). Seismological evidence of mantle flow driving plate motions at a palaeo-spreading centre. *Nature Geoscience*, *7*, 371–375, doi:10.1038/ngeo2121.

Fujie, G., **S. Kodaira**, M. Yamashita, T. Sato, T. Takahashi and N. Takahashi (2013), Systematic changes in the incoming plate structure at the Kuril trench, *Geophys. Res. Lett.*, *40*, 88–93, doi:10.1029/2012GL054340.

Kodaira, S., T. Fujiwara, N. Noguchi, and N. Takahashi (2011), Structural variation of the Bonin ridge revealed by modeling of seismic and gravity data, *Earth Planets and Space*, *63*(9), 963-973, doi:10.5047/eps.2011.06.036.

Kodaira, S., N. Noguchi, N. Takahashi, O. Ishizuka, and Y. Kaneda (2010), Evolution from fore-arc oceanic crust to island arc crust: A seismic study along the Izu-Bonin fore arc, *Journal of Geophysical Research-Solid Earth*, *115*, B09102, doi:10.1029/2009jb006968.

Obana, K., and **S. Kodaira** (2009), Low-frequency tremors associated with reverse faults in a shallow accretionary prism, *Earth and Planetary Science Letters*, *287*(1-2), 168-174, doi:10.1016/j.epsl.2009.08.005.

Kodaira, S., T. Sato, N. Takahashi, A. Ito, Y. Tamura, Y. Tatsumi, and Y. Kaneda (2007a), Seismological evidence for variable growth of crust along the Izu intraoceanic arc, *Journal of Geophysical Research-Solid Earth*, *112*, B05104, doi:10.1029/2006jb004593.

Kodaira, S., T. Sato, N. Takahashi, S. Miura, Y. Tamura, Y. Tatsumi, and Y. Kaneda (2007b), New seismological constraints on growth of continental crust in the Izu-Bonin intra-oceanic arc, *Geology*, *35*(11), 1031-1034, doi:10.1130/g23901a.1.

Kodaira, S., Iidaka, T., Kato, A., Park, J. O., Iwasaki, T., & Kaneda, Y. (2004). High pore fluid pressure may cause silent slip in the Nankai Trough. *Science*, *304*(5675), 1295-1298.

Kodaira, S., Takahashi, N., Nakanishi, A., Miura, S., & Kaneda, Y. (2000). Subducted seamount imaged in the rupture zone of the 1946 Nankaido earthquake. *Science*, *289*(5476), 104-106.

Curriculum Vitae

Cecilia M. Gonzalez-McHugh

Work Addresses:

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Marine Geology and Geophysics
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Education:

1993 - Ph. D: Marine Geology and Geophysics, Columbia University, USA, *Cum Laude*
1987 - B. A.: Earth Science/Geology, Western Connecticut State University, Danbury, CT., USA, *Summa Cum Laude*

Occupations:

Queens College	2002-Present	Professor	Earth and Env. Sciences
Queens College	1998-2002	Associate Professor	Earth and Env. Sciences
Queens College	1993-1998	Assistant Professor	Earth and Env. Sciences

Doctoral Faculty of The Graduate School and University Center's Ph.D. Program in Earth and Environmental Sciences - C.U.N.Y. 1993 – Present.
Adjunct Senior Researcher - Lamont-Doherty Earth Observatory of Columbia University

RELEVANT PUBLICATIONS

Kanamatsu, T., Usami, K., McHugh, C.M., Ikehara, K., 2017. High-resolution chronology of sediment below CCD based on Holocene paleomagnetic secular variations in the Tohoku-oki earthquake rupture zone. 2017. *Geochemistry Geophysics Geosystems*. doi:10.1002/2017GC006878.

Groenveld, J., Henderiks, J., Renema, W., McHugh, C.M., De Vleeschouwer, D., Christensen, B.A., Fulthorpe, C., S., Reuning, L., Gallagher, S.J., Bogus, K., Auer, B., Ishiwa, T., and Expedition 356 Scientists, 2017, Australian shelf sediments reveal shifts in Miocene Southern Hemisphere Westerlies. *Science Advances 2017;3:e1602567*

Christensen, B.A., Renema, W., Henderiks, J., De Vleeschouwer, D., Groenveld, J., Castaneda, I., Reuning, L., Bogus, K., Auer, G., Ishiwa, T., McHugh, C.M., Fulthorpe, C.S., Gallagher, S. J., and IODP Expedition 356 Scientists, 2017. Indonesian Throughflow drove Australian climate from humid Pliocene to arid Pleistocene. *Geophysical Research Letters* 44, 6914–6925, doi:10.1002/2017GL072977.

McHugh, C.M., Kanamatsu, T., Seeber, L., Bopp, R., Cormier, M.-H., Usami, K., 2016a. Remobilization of surficial slope sediment triggered by the A.D. 2011 M_w9 Tohoku-Oki earthquake and tsunami along the Japan Trench. *Geology* 44(5), 391-394.

McHugh, C.M., Strasser, M., Cattaneo, A., Ikehara, K., 2016b. Submarine Paleoseismology: Using Giant Piston Coring within IODP to fill the gap in the Long-term Records of Great Earthquakes. Ocean Discovery, *The US Scientific Ocean Drilling Community Newsletter*, Spring 2016, pgs. 4-5.

Ryan, W.B.F., Vachtman, D., McHugh, C., Cagatay, M.N., Mart, Y., 2014a. A Channeled Shelf Fan Initiated by Flooding of the Black Sea. S. Goffredo and Z. Dubinsky (eds.), The

Mediterranean Sea: Its history and present challenges: pg 11-27. Springer Science, Business Media Dordrecht 2014. DOI 10.1007/978-94-007-6704-1_2

McHugh, C.M.G., Braudy, N., Çağatay, M. N., Sorlien, C., Cormier, M.-H., Seeber, L., Henry, P., 2014b. Seafloor ruptures along the North Anatolia Fault in the Marmara Sea, Turkey: Link with the adjacent basin turbidite record. *Marine Geology* 353:65-83.

McHugh, C.M., L. Seeber, M.-H. Cormier, M. Hornbach, 2014c. Submarine Paleoseismology along Populated Transform Boundaries: The Enriquillo-Plantain-Garden Fault, Canal du Sud, Haiti, and the North Anatolian Fault, Marmara Sea, Turkey. Oceanography Special Issue on Submarine Natural Hazards. *Oceanography* 27(2):118-131.

McHugh, C.M., Seeber, L., Çağatay, N., Henry, P., Sorlien, C., Steckler, M., Uçarkuş, G., 2012. Tectonic Hazards along Continental Transform Boundaries "An Integrated Ocean Drilling Program Marmara-Trans Workshop on Continental Transform Boundaries: Tectonic Evolution and Geohazards. *Integrated Ocean Drilling Program Scientific Drilling Journal* No. 13 Pages 60-64.

McHugh, C., Seeber, L., Braudy, N., Cormier, M.-H., Davis, M., Dieudonne, N., Deming, J., Diebold, J., Douilly, R., Gulick, S., Hornbach, M., Johnson, H., Mishkin, K., Sorlien, C., Steckler, M., Symithe, S., Templeton, J., 2011a. Offshore sedimentary effects of the 12 January Haiti earthquake. *Geology* 39, 8, 723-726. doi:10.1130/G31815.1

McHugh, C.M.G., Seeber, L., Cormier, M.-H., Dutton, J., Cagatay, N., Polonia, A., Ryan, W. B. F., and Gorur, N. 2006. Submarine earthquake geology along the North Anatolia Fault in the Marmara Sea, Turkey: A model for transform basin sedimentation. *Earth and Planetary Sciences* 248, 661-684. doi:10.1016/j.epsl.2006.05.038

IODP EXPEDITIONS AND RELEVANT PUBLICATIONS

Participated in ODP Legs 150, 150X, 174A, IODP Expeditions 317 and 356 as Sedimentologist
Ocean Drilling related: 20 publications in peer-reviewed journals as 1st or 2nd author

SELECTED PROFESSIONAL SERVICES

1. Google Scholar Citations 1561; h index 24; i10-index 35
2. Lecturer Ocean Discovery Series (former Distinguished Lecturer Series), 2017-2018
3. International Ocean Discovery Program Science Evaluation Panel, 9/1/15-8/31/18
4. Integrated Ocean Drilling Program Science Steering Evaluation Panel, 9/1/09–8/31/12
5. IODP Workshop "Submarine Paleosesimology" Zurich, July 2015. Co-organizer with Michael Strasser (ETH, Zurich), Antonio Cattaneo (IFREMER) and Ken Ikehara (AIST)
6. IODP Workshop "Tectonic Hazards Along Continental Transform Boundaries", June 2011. Main organizer together with P. Henry (CEREGE, France) and N. Çağatay (Istanbul Technical University, Turkey).
7. Queens College Division of Mathematics and Natural Sciences, Undergraduate Research Conference. Main Coordinator. 2004-2011.

STUDENTS MENTORED

Since 2012 7 PhD's (main advisor and committee member), 5 MA's (main advisor), 10 undergraduates (senior projects) in earthquake geology and tectonics, sedimentology and geochemistry for paleoclimate and sealevel research, sedimentology and geochemistry for environmental research.

September, 2017

Yasuyuki Nakamura

Deputy Group Leader, Research Scientist

Structural Seismology Group, Research & Development Center for Earthquake and Tsunami

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Educational Background

Ph.D. in Geophysics, 1998, Kyoto University

Advisor: Prof. Masataka Ando

Thesis : Surface wave analysis in the Philippine Sea region

M. Sc. in Geophysics, 1995, Kyoto University

B. Sc. in Geophysics, 1993, Kyoto University

Professional Experiences

2014/4 -	Deputy Group Leader, Research Scientist, Research and Development Center for Earthquake and Tsunami, Japan Agency for Marine-Earth Science and Technology
2010/10 – 2014/3	Research Scientist, Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology
2010/4-2010/10	Assistant Professor, Atmosphere and Ocean Research Institute, The University of Tokyo
2002/1 - 2010/3	Assistant Professor, Ocean Research Institute, The University of Tokyo
2001/4- 2001/12	Marine Science Cooperative Researcher, Ocean Research Institute, The University of Tokyo
1999/4 - 2001/3	COE Post-Doctoral Researcher, Ocean Research Institute, The University of Tokyo
1998/4 - 1999/3	COE Post-Doctoral Researcher, Disaster Prevention Research Institute, Kyoto University

Research Expertise

Reflection Seismology, Geophysics

Selected Publications

Kodaira, S., Nakamura, Y., Yamamoto, Y., Obana, K., Fujie, G., No, T., Kaiho, Y., Sato, T., Miura, S., Depth-varying structural characters in the rupture zone of the 2011 Tohoku-oki earthquake. Geosphere, doi:10.1130/GES01489.1, 2017

Boston B., Moore G.F., Nakamura Y., Kodaira S., Forearc slope deformation above the Japan Trench megathrust: Implications for subduction erosion, Earth and Planetary Science Letters, 462, 26-34, 2017

Nakamura Y., Kodaira S., Cook B. J., Jeppson T., Kasaya T., Yamamoto Y., Hashimoto Y., Yamaguchi M., Obana K., Fujie G., Seismic imaging and velocity structure around the JFAST drill site in the Japan Trench: low Vp, high Vp/Vs in the transparent frontal prism, Earth, Planets and Space, 66:121 doi:10.1186/1880-5981-66-121, 2014

Obana K., Kodaira S., Nakamura Y., Sato T., Fujie G., Takahashi T., Yamamoto Y., Aftershocks of the December 7, 2012 intraplate doublet near the Japan Trench axis, Earth, Planets and Space, 66:25, 2014

Nakamura Y., Kodaira S., Miura S., Regalla C., Takahashi N, High-resolution seismic imaging in the Japan Trench axis area off Miyagi, northeastern Japan, Geophysical Research Letters, 40, doi:10.1002/grl.50364, 2013

Lin W., Conin M., Moore J. C., Chester F. M., Nakamura Y., Mori J. J., Anderson L., Brodsky E.E., Eguchi N., Cook B., Jeppson T., Wolfson-Schwehr M., Sanada Y., Saito S., Kido Y., Hirose T., Behrmann J. H., Ikari M., Ujiie K., Rowe C., Kirkpatrick J., Bose S., Regalla C., Remitti F., Toy V., Fulton P., Mishima T., Yang T., Sun T., Ishikawa T., Sample J., Takai K., Kameda J., Toczko S., Maeda L., Kodaira S., Hino R., Saffer D., Stress state in the largest displacement area of the 2011 Tohoku-Oki earthquake, Science, 339, 6120, 687-690, doi:10.1126/science.1229379, 2013

Kodaira S., No T., Nakamura Y., Fujiwara T., Kaiho Y., Miura S., Takahashi T., Kaneda Y., Taira A., Coseismic fault rupture at the trench axis during the 2011 Tohoku-oki earthquake, Nature Geoscience, 19, doi:10.1038/NGEO1547, 2012

Potential Reviewers:

Dr. Kelin Wang, Pacific Geoscience Centre, Geological Survey of Canada, kelin.wang@canada.ca,

Expert in subduction zone geodynamics and hazards

Dr. Jean-Noel Proust CNRS Géosciences Univ. Rennes, France, jean-noel.proust@univ-rennes1.fr

Expert in Sedimentology with research focus on impacts of climate and tectonic deformation on sediment fluxes (from source to sink)

Dr. Roland von Huene emeritus, USGS, GEOMAR, UC Davis, rhuene@mindspring.com

Expert in convergent margin tectonics

Dr. Dick Kroon, School of Geosciences, The University of Edinburgh, D.Kroon@ed.ac.uk

Expert in Paleooceanography, Marine Geology and Stratigraphy

Dr. Kenji Satake, Earthquake Research Institute, The University of Tokyo, satake@eri.u-tokyo.ac.jp

Expert in Seismology and Tsunami research

Dr. Hans Nelson, Emeritus USGS, now CSIC Granada and Univ. Leeds, hansnelsonugr@hotmail.com

Expert in turbidite research

Dr. Philip Barnes, National Ins. of Water & Atmos. Research, New Zealand, p.barnes@niwa.co.nz

Expert in submarine geohazard and submarin paleoseismology

Dr. Kevin Pickering, University College London, kt.pickering@ucl.ac.uk

Expert in deep-marine sedimentology, stratigraphy and tectonics

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-01A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 36.07202	Distance to Land: (km)	172
Longitude:	Deg: 142.73503		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	8030

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-01A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21802and03 Position: SP 1066 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21805 Position: SP 263 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)		
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a & 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	GeoB21804
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 1b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPS-01A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

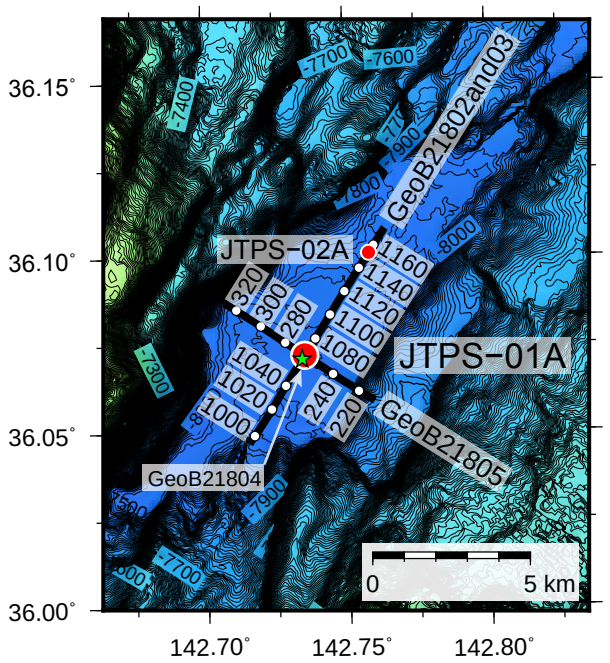
Proposal #: 866 - Full 2	Site #: JTPS-01A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

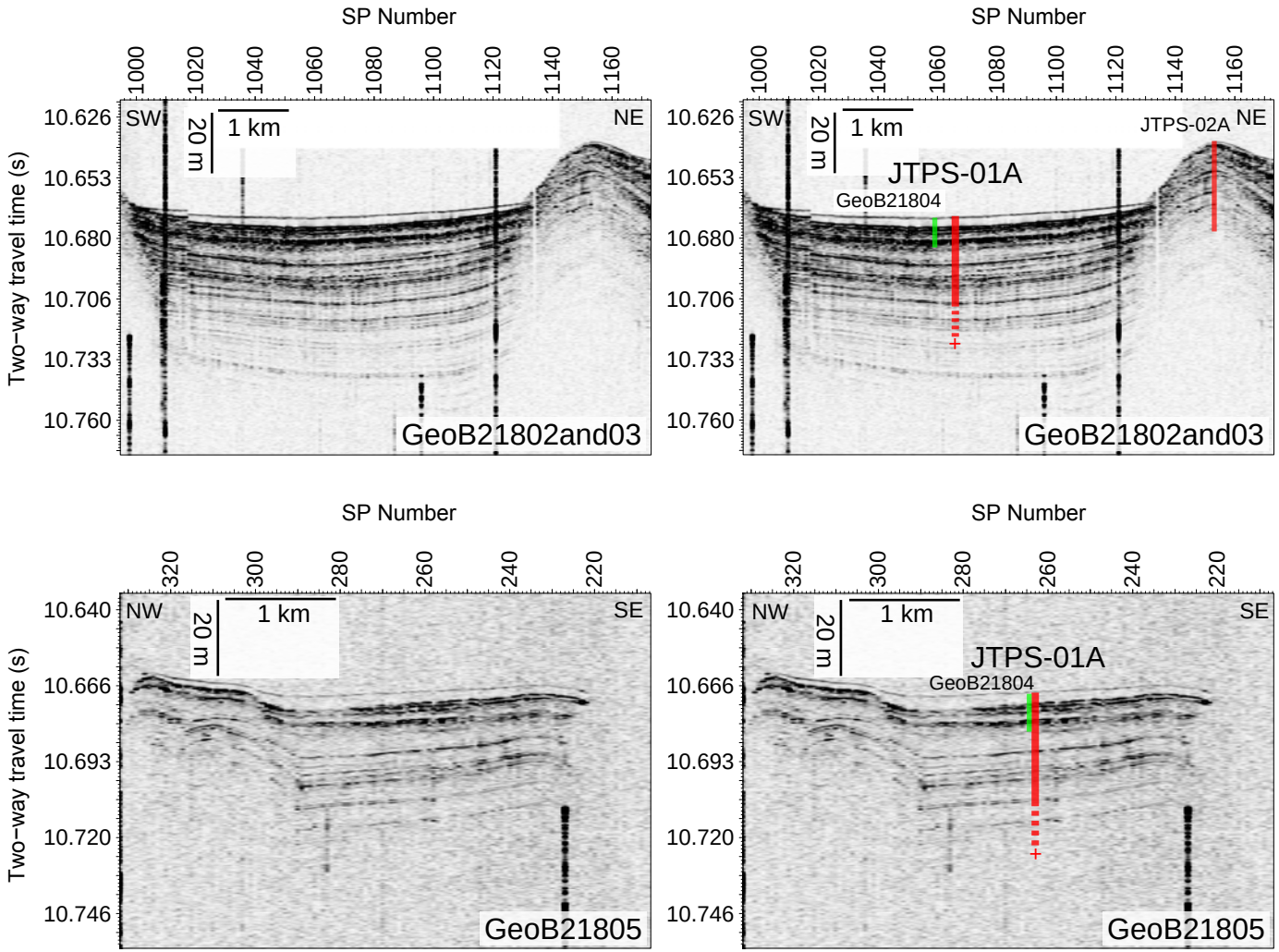
Site JTPS−01A (Primary)

Site Summary Form 6



Profiles annotated using shot point (SP) numbers

Site JTPS−01A
SP 1066 on GeoB21802and03
SP 263 on GeoB21805



SSDB locations of these graphics and supporting data
Location map: JTPS-01A_Location.pdf
Figures of seismic data:
JTPS−01A_GeoB21802and03.pdf & JTPS−01A_GeoB21805.pdf
SEG−Y data:
JTPS−01A_GeoB21802and03.sgy & JTPS−01A_GeoB21805.sgy
Figures of reference core data: GeoB21804.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with dm- to m-thick muddy turbidites and thin tephra layers.

This is the expanded section relative to site JTPS-02A

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-02A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 36.10118	Distance to Land: (km)	175
Longitude:	Deg: 142.75813		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	8000

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-02A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21802and03 Position: SP 1153 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is planned during upcoming cruise KS-17-13 (R/V Shinsei-Maru: Oct.12-25, 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-6-m cores is planned during upcoming cruise KS-17-13 (R/V Shinsei-Maru: Oct. 12-25, 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPS-02A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

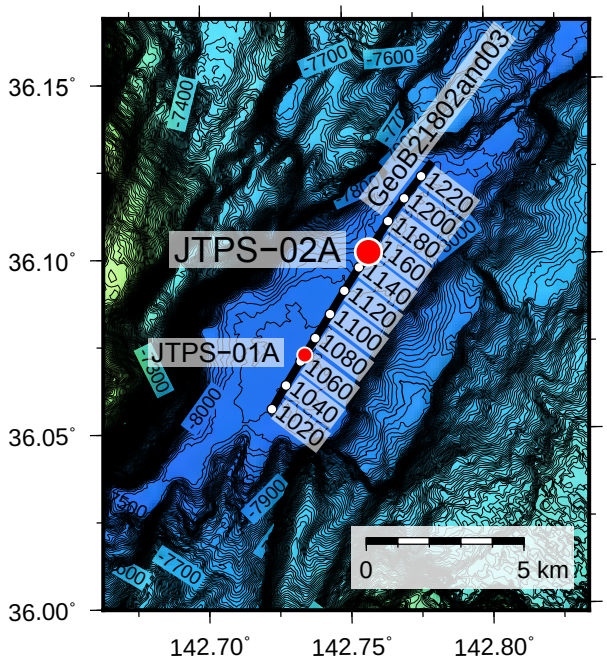
Proposal #: 866 - Full 2	Site #: JTPS-02A	Date Form Submitted: 2017-10-05 19:55:01

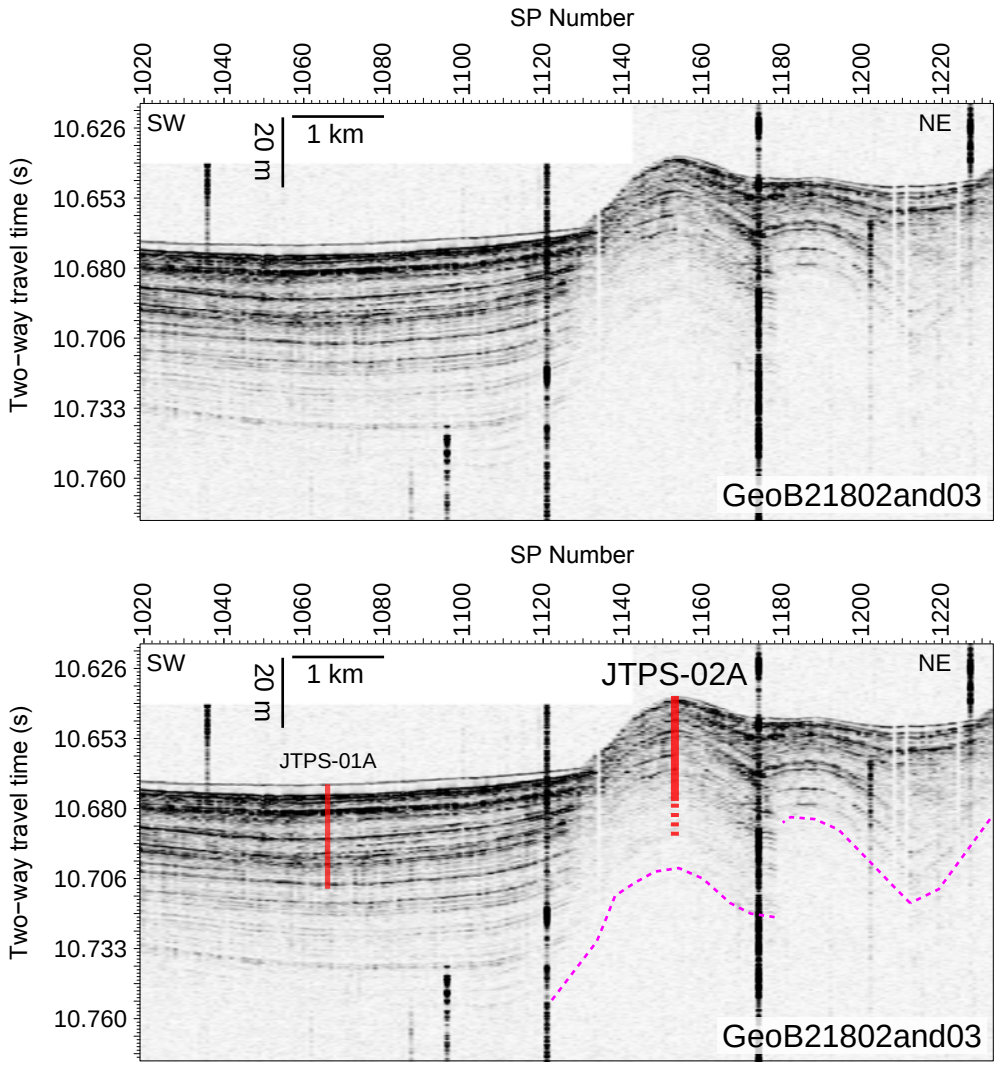
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites and thin tephra layers deposited on a trench-floor high at the foot of the landward-slope of the trench	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

Site JTPS−02A (Primary)

Site Summary Form 6





Profiles annotated
using shot point (SP) numbers

Site JTPS−02A
SP 1153 on GeoB21802and03

SSDB locations of these graphics and supporting data
Location map: JTPS-02A_Location.pdf
Figures of seismic data:
JTPS−02A_GeoB21802and03.pdf
SEG−Y data:
JTPS−02A_GeoB21802and03.sgy

Interpretation: Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers deposited on a trench-floor high at the foot of the landward-slope of the trench.
This is the condensed section relative to site JTPS-01A.
Magenta: limit of acoustic penetration and possible top of deformed trench-fill deposits (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-03A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 36.22997	Distance to Land: (km)	189
Longitude:	Deg: 142.88166		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7990

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	35	0
Total Sediment Thickness (m)	35	
Total Penetration (m):	35	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-03A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part1-replay2 Position: SP 496 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPS-03A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (35 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

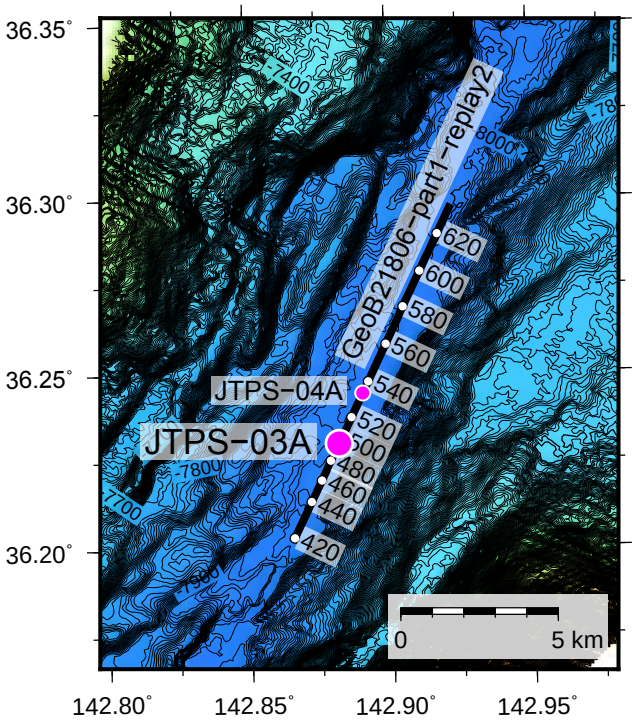
Proposal #: 866 - Full 2	Site #: JTPS-03A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

Site JTPS−03A (Alternate)

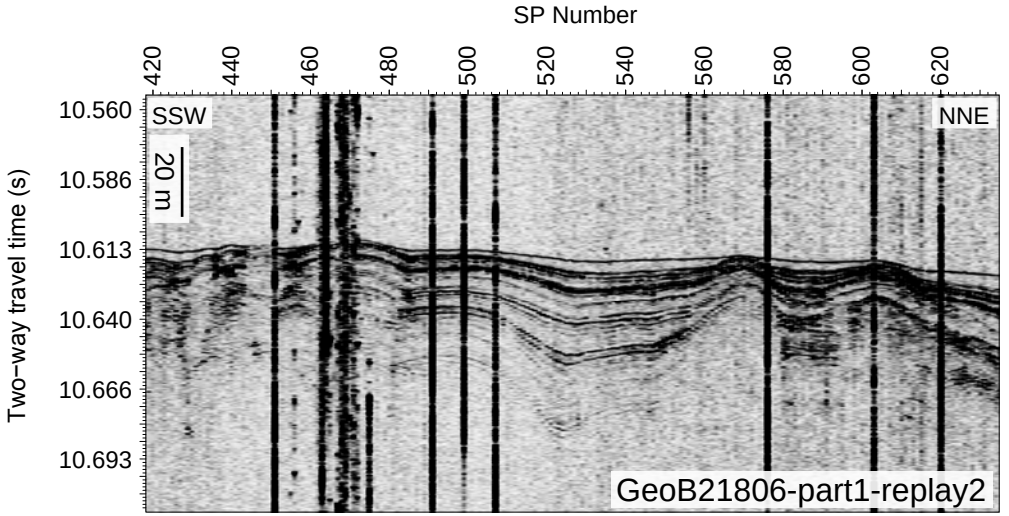
Site Summary Form 6

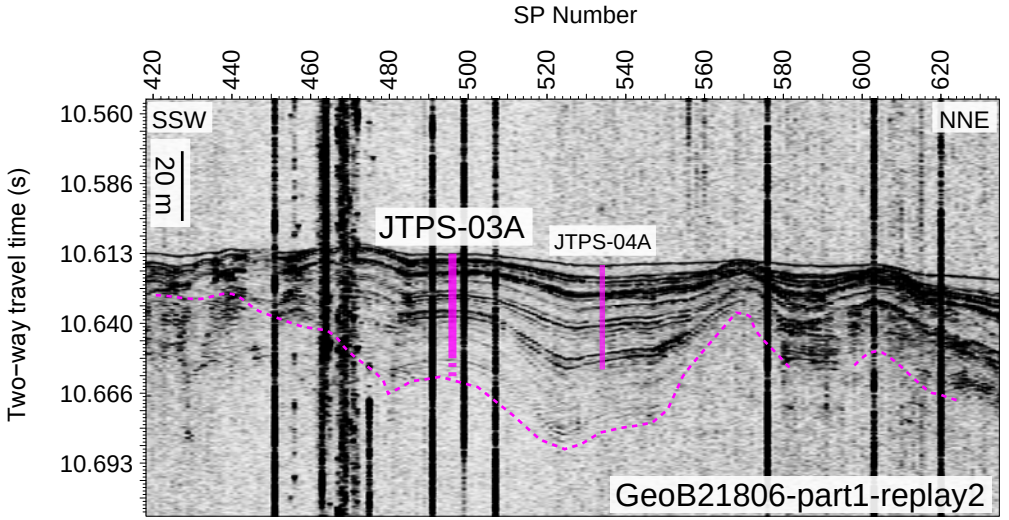


Profiles annotated using Shot point (SP) numbers

The distance over a given SP inverval is variable due to change in vessel speed:
~60 m/SP (SP < 440, SP > 520)
~35 m/SP (440 ≤ SP ≤ 520)

Site JTPS−03A
SP 496 on GeoB21806−part1−replay2





SSDB locations of these graphics and supporting data
Location map: JTPS-03A_Location.pdf
Figures of seismic data:
JTPS−03A_GeoB21806−part1−replay2.pdf
SEG−Y data:
JTPS−03A_GeoB21806−part1−replay2.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers.
This is the condensed section relative to site JTPS-04A.
Magenta = Top of deformed trench-fill deposits (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-04A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 36.24424	Distance to Land: (km)	189
Longitude:	Deg: 142.89031		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ✓	Water Depth (m):	7990

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-04A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part1-replay2 Position: SP 534 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPS-04A	Date Form Submitted: 2017-10-05 19:55:01

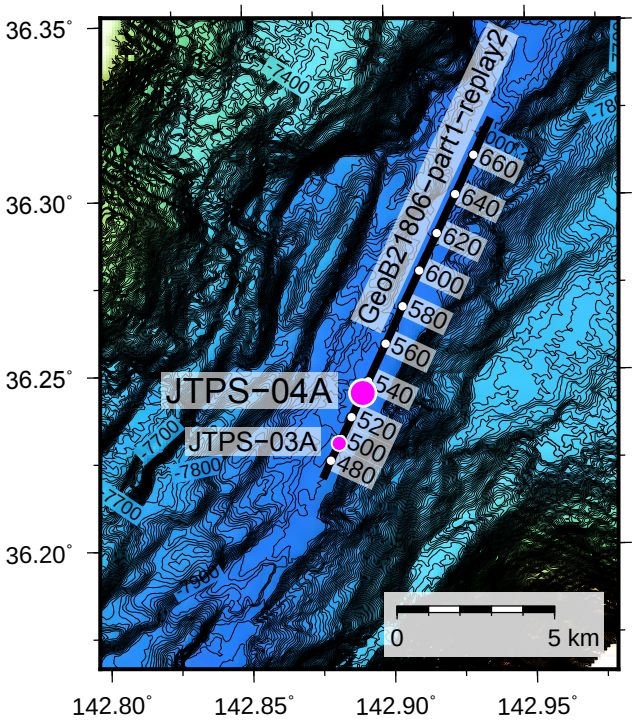
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPS-04A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

Site JTPS−04A (Alternate)

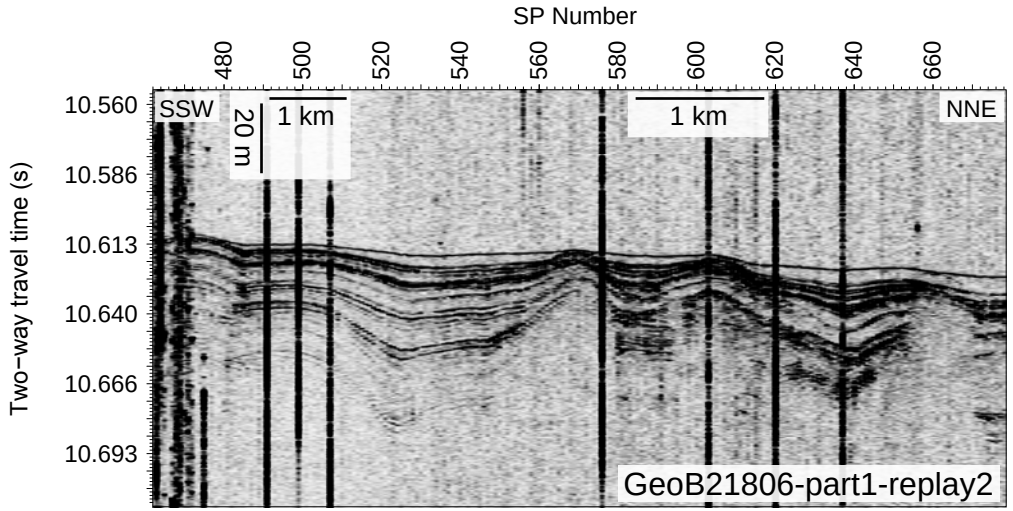


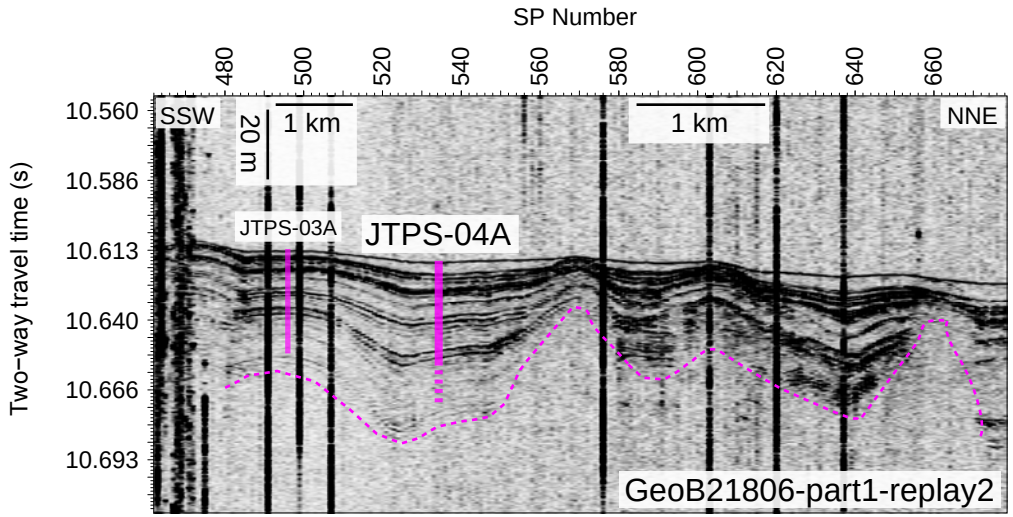
Profiles annotated using Shot point (SP) numbers

The distance over a given SP inverval is variable due to change in vessel speed:
~35 m/SP (SP ≤ 520)
~60 m/SP (SP > 520)

Site JTPS−04A
SP 534 on GeoB21806−part1−replay2

Site Summary Form 6





SSDB locations of these graphics and supporting data
Location map: JTPS-04A_Location.pdf
Figures of seismic data:
JTPS−04A_GeoB21806−part1−replay2.pdf
SEG−Y data:
JTPS−04A_GeoB21806−part1−replay2.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with dm- to m-thick muddy turbidites and thin tephra layers.
This is the expanded section relative to site JTPS-03A.
Magenta = Top of deformed trench-fill deposits (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-05B	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 36.89173	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.40772	Distance to Land: (km)	215
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7700

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-05B	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part2 Position: SP 512 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is planned during upcoming cruise KS-17-13 (R/V Shinsei-Maru: Oct. 12-25, 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-14-16_PC01
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPS-05B	Date Form Submitted: 2017-10-05 19:55:01

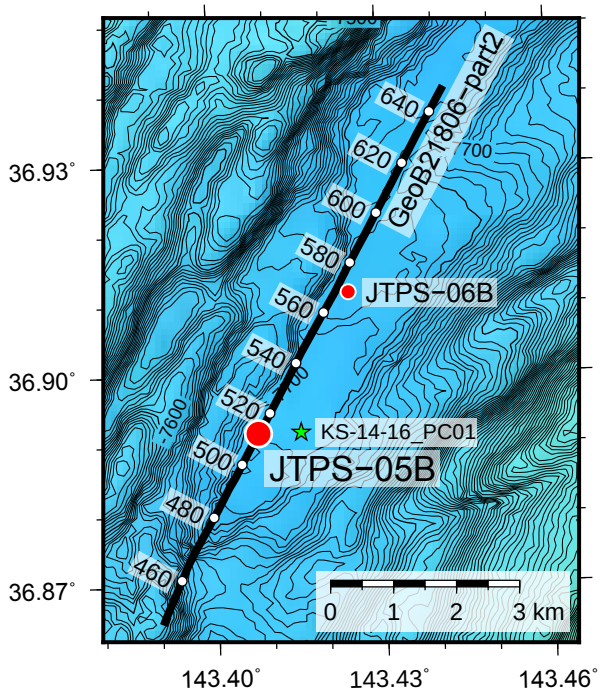
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPS-05B	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

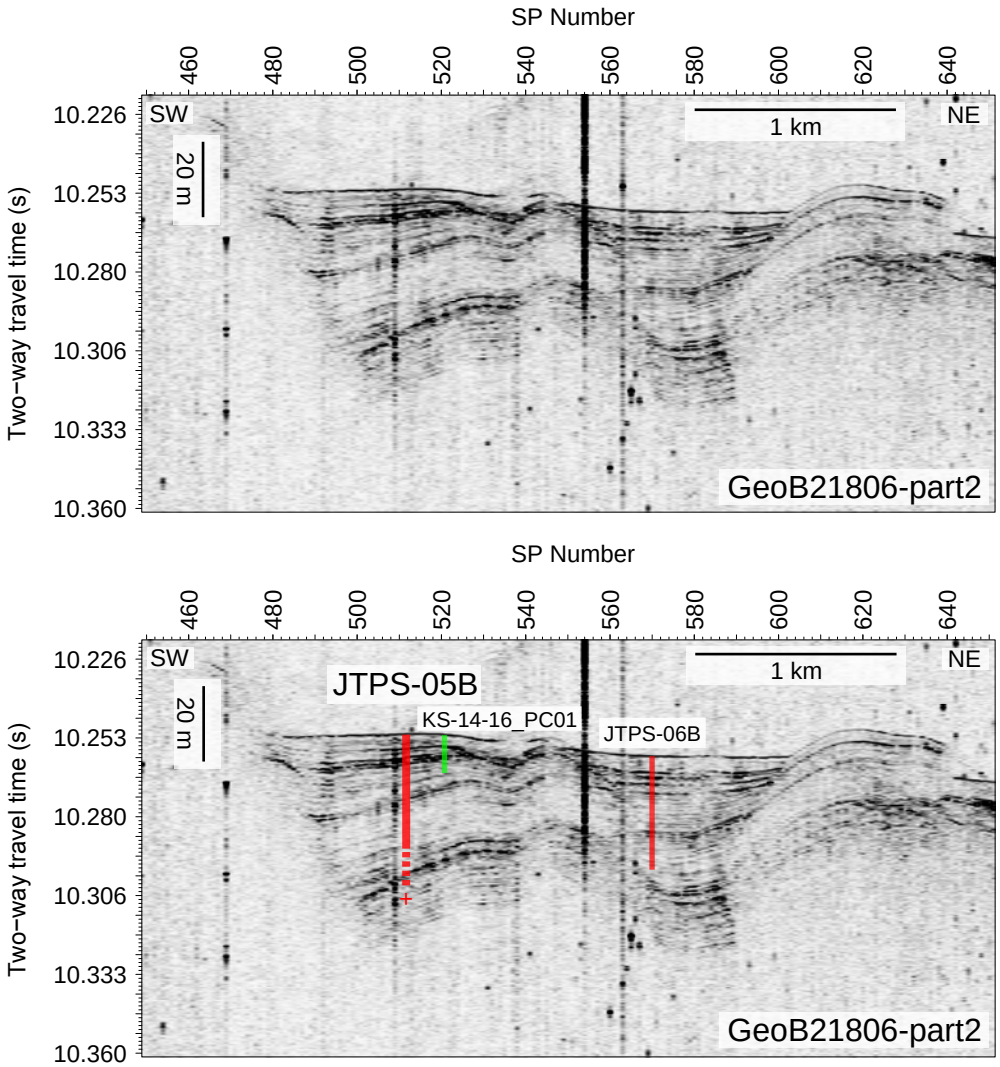
Site JTPS−05B (Primary)



Profiles annotated
using Shot point (SP) numbers

Site JTPS−05B
SP 512 on GeoB21806−part2

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPS-05B_Location.pdf
Figures of seismic data:
JTPS−05B_GeoB21806−part2.pdf
SEG−Y data:
JTPS−05B_GeoB21806−part2.sgy
Figures of reference core data: KS-14-16_PC01.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to m-thick muddy turbidites and thin tephra layers. This is the composite section relative to site JTPS-06B, (i.e. a condensed section in the upper part and a more expanded section in the lower part)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-06B	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 36.91171	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.42432	Distance to Land: (km)	216
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7710

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-06B	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part2 Position: SP 570 (projected) high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: 20140904061324_1_014_1 Position: SP 6656 high-resolution subbottom data (Topas)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-6-m cores is planned during upcoming cruise KS-17-13 (R/V Shinsei-Maru: Oct. 12-25, 2017).
13 Rock sampling		
14a Water current data		
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation		Navigation data of 1a & 1b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPS-06B	Date Form Submitted: 2017-10-05 19:55:01

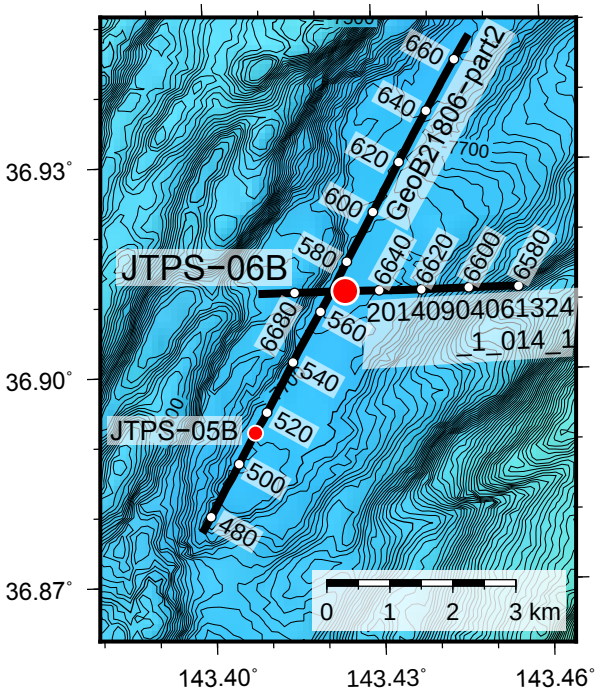
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPS-06B	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

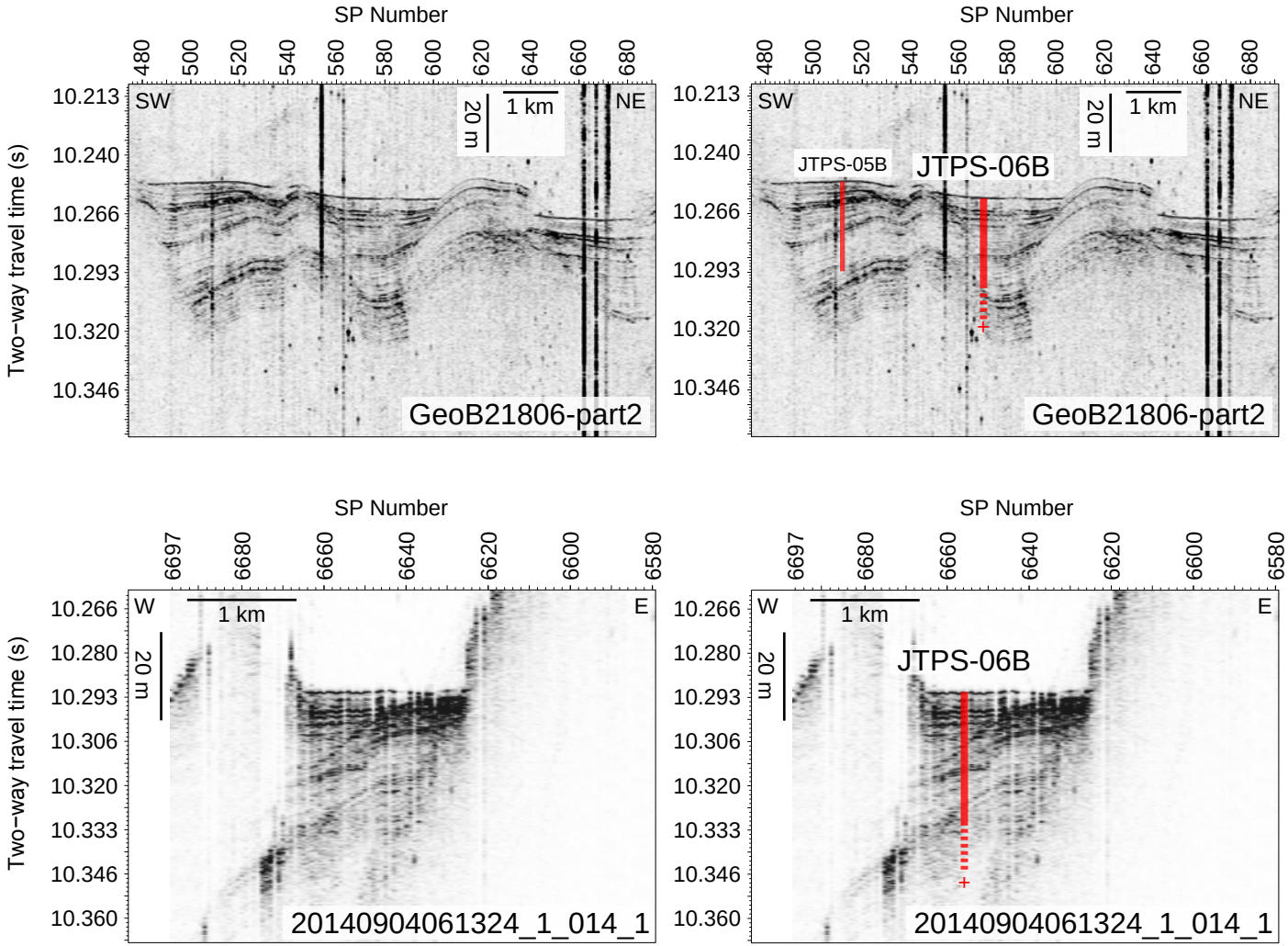
Site JTPS−06B (Primary)



Profiles annotated
using Shot point (SP) numbers

Site JTPS−06B
SP 570 on GeoB21806−part2
(Projected)
SP 6656 on 20140904061324_1_014_1

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPS-06B_Location.pdf
Figures of seismic data: JTPS−06B_GeoB21806−part2.pdf &
JTPS−06B_20140904061324_1_014_1.pdf
SEG−Y data: JTPS−06A_GeoB21806−part2.sgy &
JTPS−06B_20140904061324_1_014_1.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to m-thick muddy turbidites and thin tephra layers.

This is the composite section relative to site JTPS-05B (i.e. an expanded section in the upper part and a more condensed section in the lower part).

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-07A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.41496	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.73196	Distance to Land: (km)	212
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7820

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-07A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part2 Position: SP 1676 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: SLF120318225 Position: SP 7778 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	yes	Line: HDFK060_mig Position: CDP 16554 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	no	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-15-3_PC08
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPS-07A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

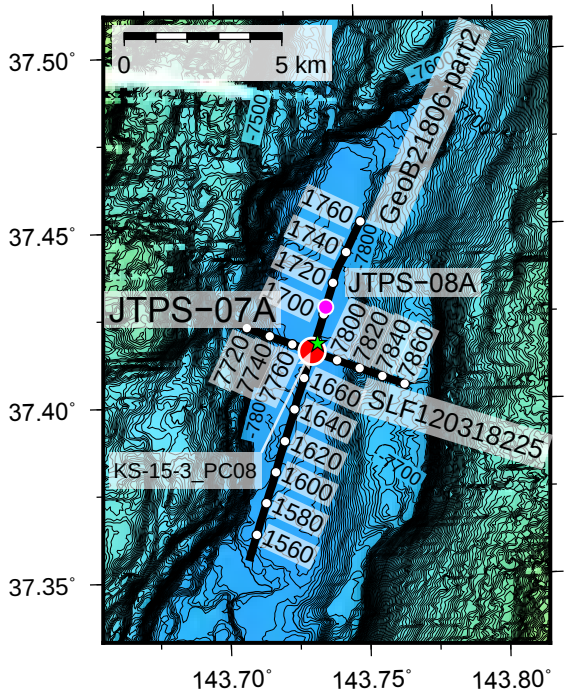
Proposal #: 866 - Full 2	Site #: JTPS-07A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

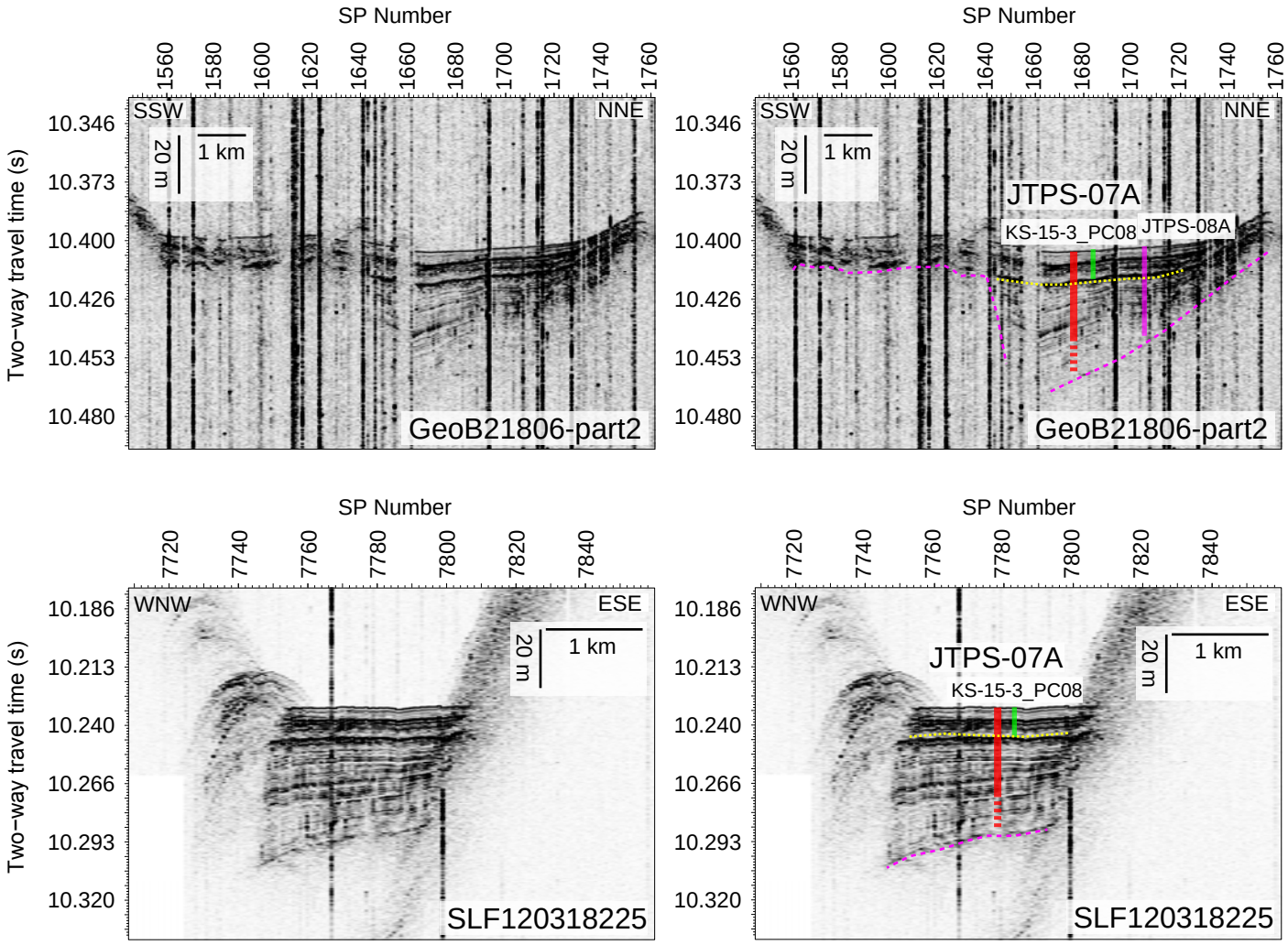
Site JTPS−07A (Primary)

Site Summary Form 6



Profiles annotated
using Shot point (SP) numbers

Site JTPS−07A
SP 1676 on GeoB21806−part2
SP 7778 on SLF120318225



SSDB locations of these graphics and supporting data
Location map: JTPS-07A_Location.pdf
Figures of seismic data:
JTPS−07A_GeoB21806−part2.pdf, JTPS−07A_SLF120318225.pdf
& JTPS-07A_HDFK060_mig.pdf
SEG−Y data:
JTPS−07A_GeoB21806−part2.sgy, JTPS−07A_SLF120318225.sgy
& JTPS-07A_HDFK060_mig.pdf
Figures of reference core data: KS-15-3_PC08.pdf

Interpretation: Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to m-thick, muddy turbidites and thin tephra layers. This is the expanded section relative to site JTPS-08A.

Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)
Yellow = Base of relatively-thick muddy turbidite filling-in local trench-floor depression (potentially time-correlative event-stratigraphic horizon to deformation in the southern part of the profile).

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-08A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.42749	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.73726	Distance to Land: (km)	211
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ✓	Water Depth (m):	7820

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-08A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21806-part2 Position: SP 1705 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-15-3_PC08
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPS-08A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

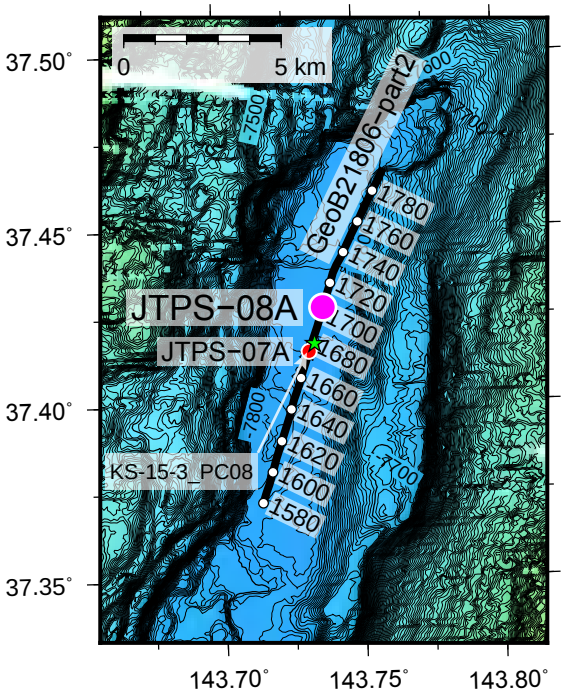
Proposal #: 866 - Full 2	Site #: JTPS-08A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

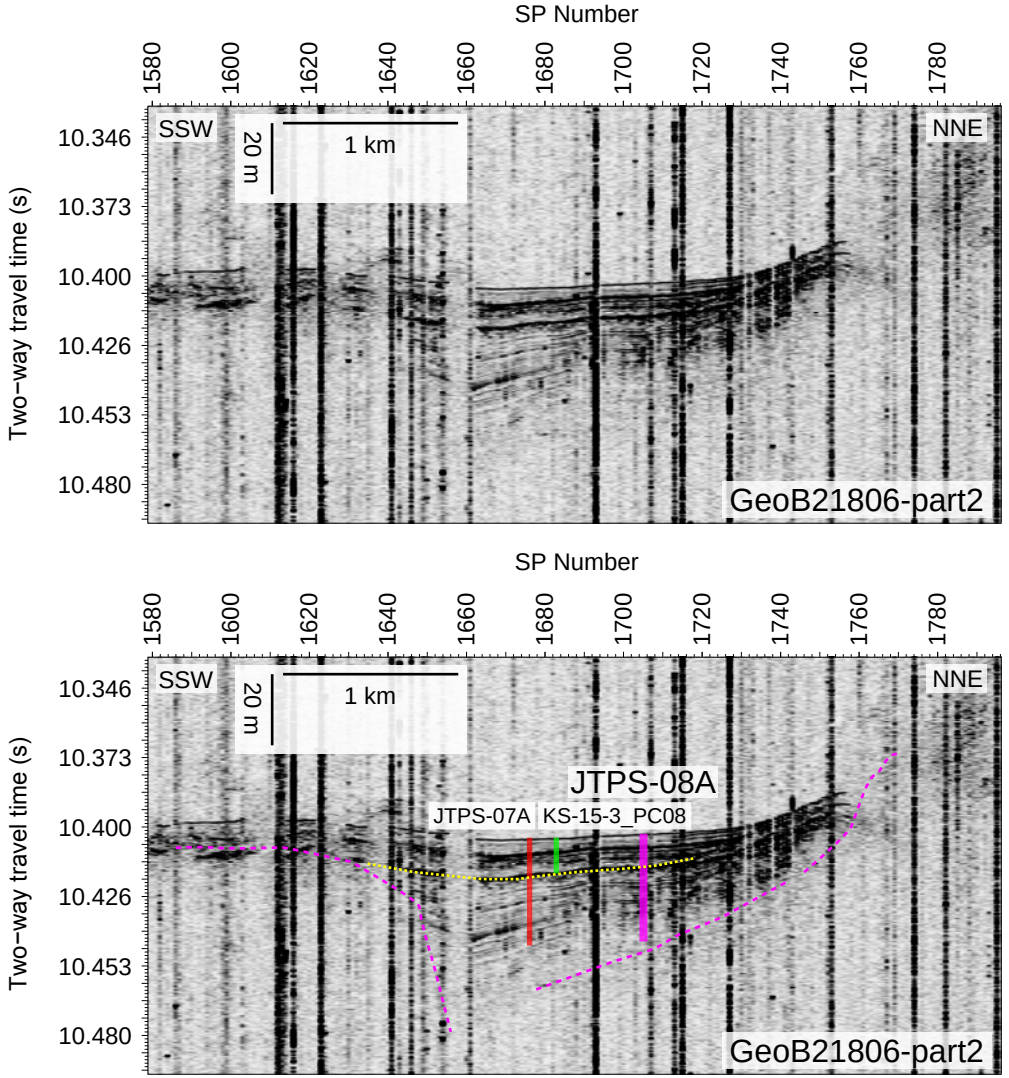
Site JTPS−08A (Alternate)

Site Summary Form 6



Profiles annotated
using Shot point (SP) numbers

Site JTPS−08A
SP 1705 on GeoB21806−part2



SSDB locations of these graphics and supporting data
Location map: JTPS-08A_Location.pdf
Figures of seismic data:
JTPS−08A_GeoB21806−part2.pdf
SEG−Y data:
JTPS−08A_GeoB21806−part2.sgy
Figures of reference core data: KS-15-3_PC08.pdf

Interpretation: Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers. Condensed section relative to JTPS-07A.
Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)
Yellow = Base of relatively-thick muddy turbidite filling-in local trench-floor depression (potentially time-correlative event-stratigraphic horizon to deformation in the southern part of the profile).

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-09A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.68110	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.86610	Distance to Land: (km)	211
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7550

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-09A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21824-part1 Position: SP 2424 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21806-part2 Position: SP 2258 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	yes	Line: HDFK028_mig Position: CDP 17436 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-6-m cores is planned during upcoming cruise KS-17-13 (R/V Shinsei-Maru: Oct. 12-25, 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPS-09A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

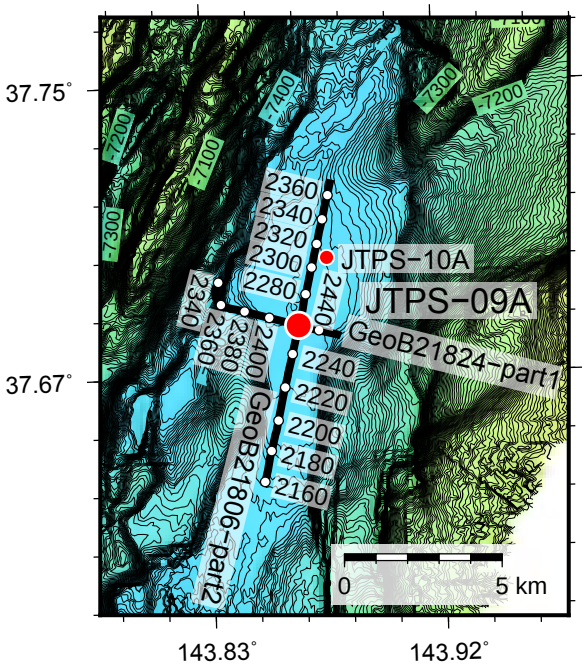
Proposal #: 866 - Full 2	Site #: JTPS-09A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

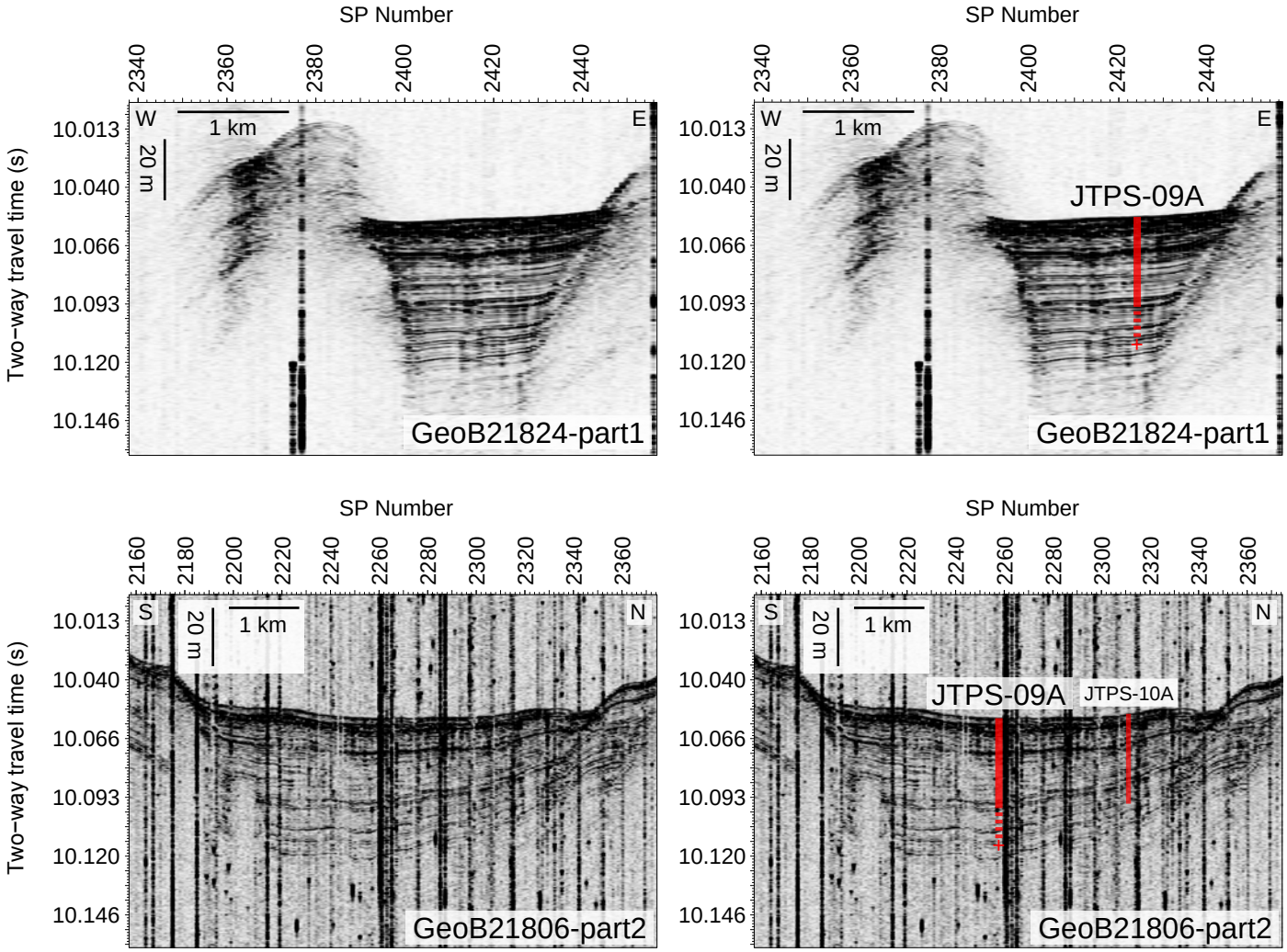
Site JTPS−09A (Primary)

Site Summary Form 6



Profiles annotated
using Shot point (SP) numbers

Site JTPS−09A
SP 2424 on GeoB21824−part1
SP 2258 on GeoB21806−part2



SSDB locations of these graphics and supporting data
Location map: JTPS-09A_Location.pdf
Figures of seismic data:
JTPS−09A_GeoB21824−part1.pdf, JTPS−09A_GeoB21806−part2.pdf
& JTPS-09A_HDFK028_mig.pdf
SEG−Y data:
JTPS−09A_GeoB21824−part1.sgy, JTPS−09A_GeoB21806−part2.sgy
& JTPS-09A_HDFK028_mig.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with dm- to m-thick muddy turbidites and thin tephra layers.

This is the expanded section relative to site JTPS-10A.

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPS-10A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.70031	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 143.87689	Distance to Land: (km)	211
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7540

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPS-10A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21824-part1 Position: SP 2240 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21806-part2 Position: SP 2311 (projected) high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	GeoB16444-1
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation		Navigation data of 1a & 1b
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPS-10A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	giant piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (giant piston coring)
7. What abandonment procedures need to be followed?	n.a. (giant piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	deep-water giant piston coring with 7-8km long cable

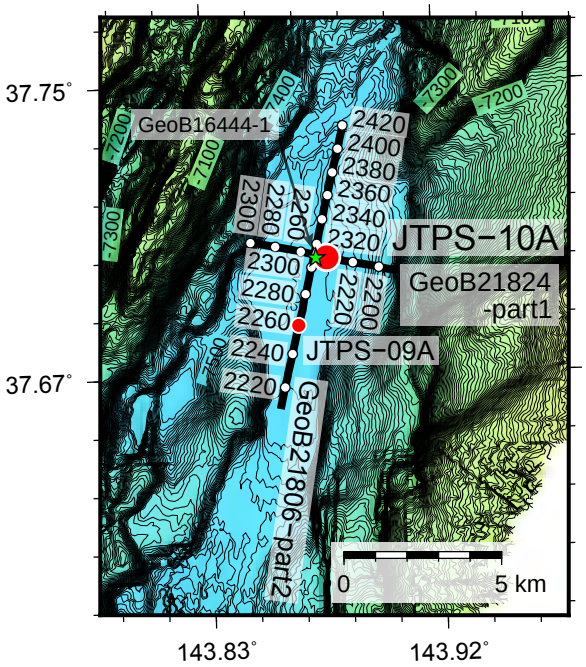
Proposal #: 866 - Full 2	Site #: JTPS-10A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

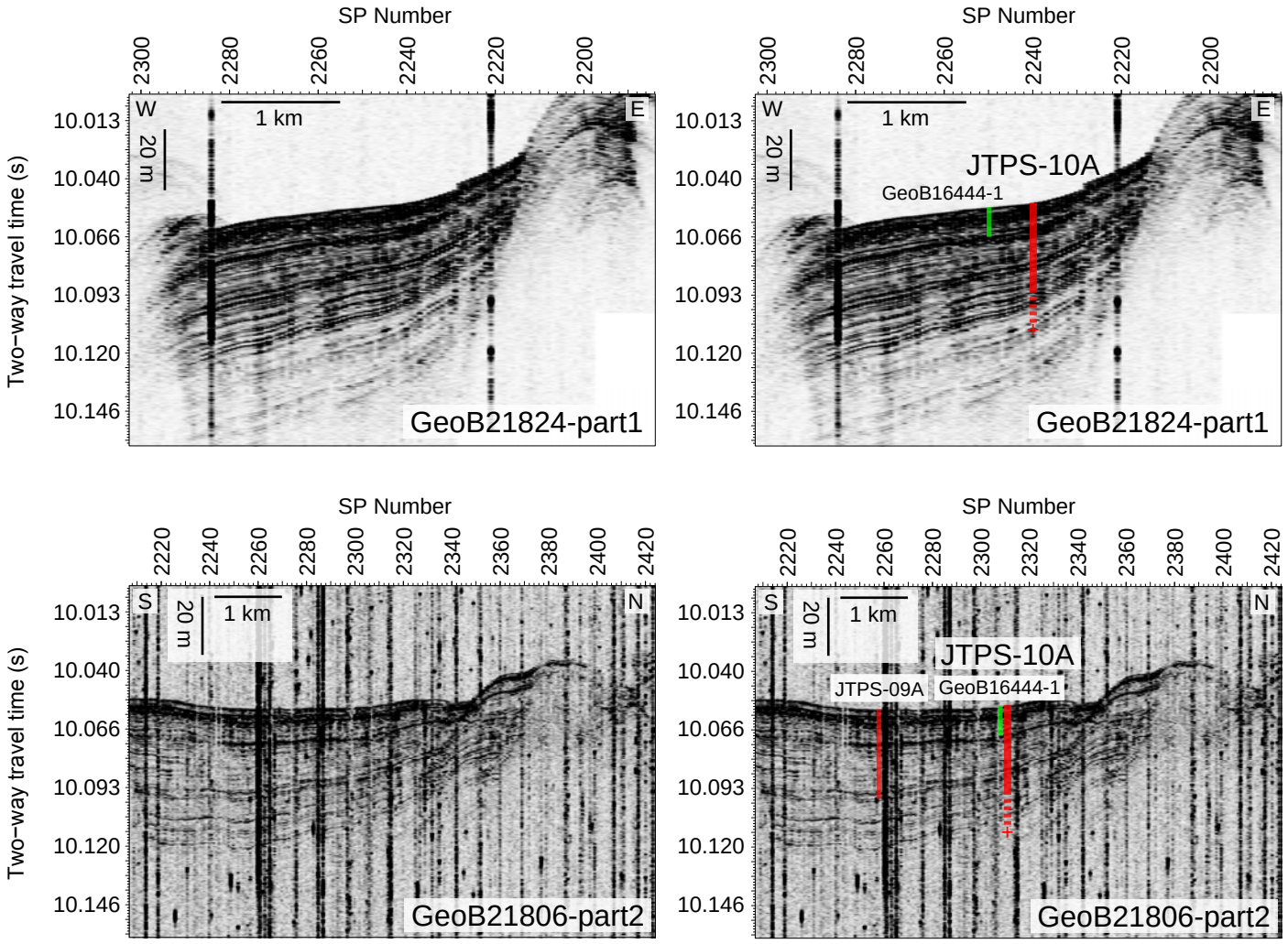
Site JTPS−10A (Primary)

Site Summary Form 6



Profiles annotated
using Shot point (SP) numbers

Site JTPS−10A
SP 2240 on GeoB21824−part1
SP 2311 on GeoB21806−part2
(projected)



SSDB locations of these graphics and supporting data
Location map: JTPS-10A_Location.pdf
Figures of seismic data:
JTPS−10A_GeoB21824−part1.pdf & JTPS−10A_GeoB21806−part2.pdf
SEG−Y data:
JTPS−10A_GeoB21824−part1.sgy & JTPS−10A_GeoB21806−part2.sgy
Figures of reference core data: GeoB16444-1.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers.

This is the condensed section relative to site JTPS-09A.

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-01A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.00853	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.00566	Distance to Land: (km)	214
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7570

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-01A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 20140905041734_1_023_1 Position: SP 10831 high-resolution subbottom data (Topas)
1b High resolution seismic seismic reflection (crossing)	yes	Line: 2014090503_1_021_022_1 Position: SP 10626 (projected) high-resolution subbottom data (Topas)
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY009_mig Position: CDP 7027-7033 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-14-16_PC02, GeoB21809, GeoB21823, GeoB16431-1
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPC-01A	Date Form Submitted: 2017-10-05 19:55:01

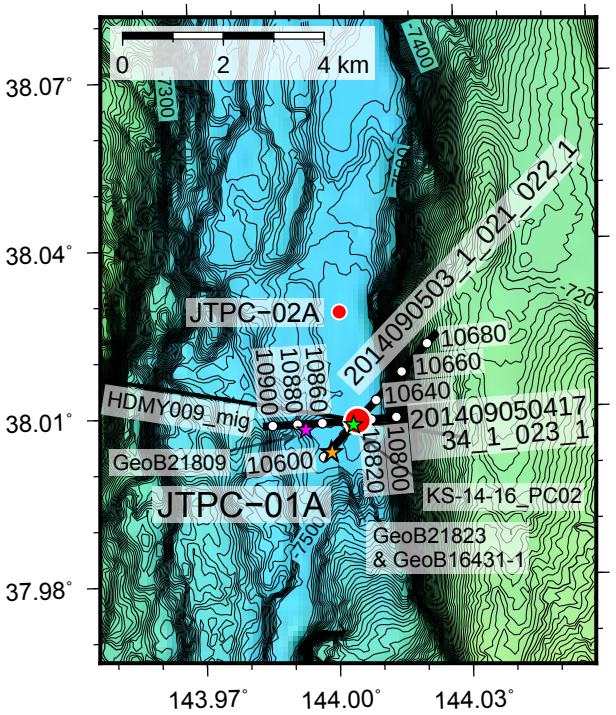
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPC-01A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm-to-dm-thick, muddy turbidites and thin tephra layers, overlying deformed trench-fill deposits	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

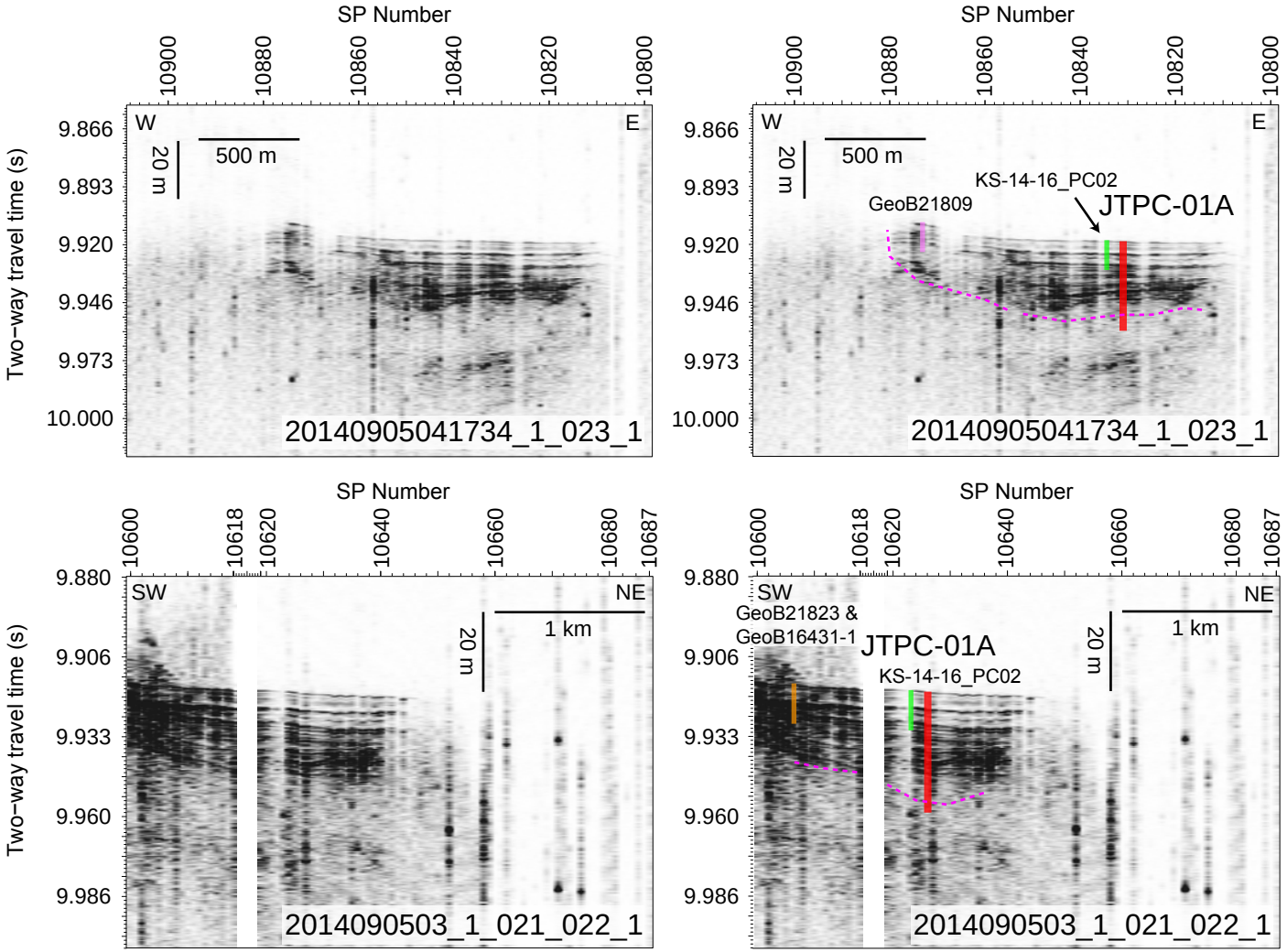
Site JTPC−01A (Primary)



Profiles annotated using Shot point (SP) numbers

Site JTPC−01A
SP 10831 on 20140905041734_1_023_1
SP 10626 on 2014090503_1_021_022_1 (projected)

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPC-01A_Location.pdf
Figures of seismic data: JTPC−01A_20140905041734_1_023_1.pdf, JTPC−01A_2014090503_1_021_022_1.pdf, JTPC−01A_HDMY009_mig.pdf
SEG−Y data: JTPC−01A_20140905041734_1_023_1.sgy, JTPC−01A_2014090503_1_021_022_1.sgy, JTPC−01A_HDMY009_mig.sgy
Figures of reference core data: KS-14-16_PC02.pdf, GeoB21809.pdf, GeoB21823.pdf, GeoB16431-1.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm-to-dm-thick, muddy turbidites and thin tephra layers, overlying deformed trench-fill deposits

Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-02A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.02804	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.00227	Distance to Land: (km)	213
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7570

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	35	0
Total Sediment Thickness (m)	35	
Total Penetration (m):	35	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-02A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: SLF1203280704 Position: SP 332 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY011_mig Position: CDP 7078 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	MR12-E01_PC04
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPC-02A	Date Form Submitted: 2017-10-05 19:55:01

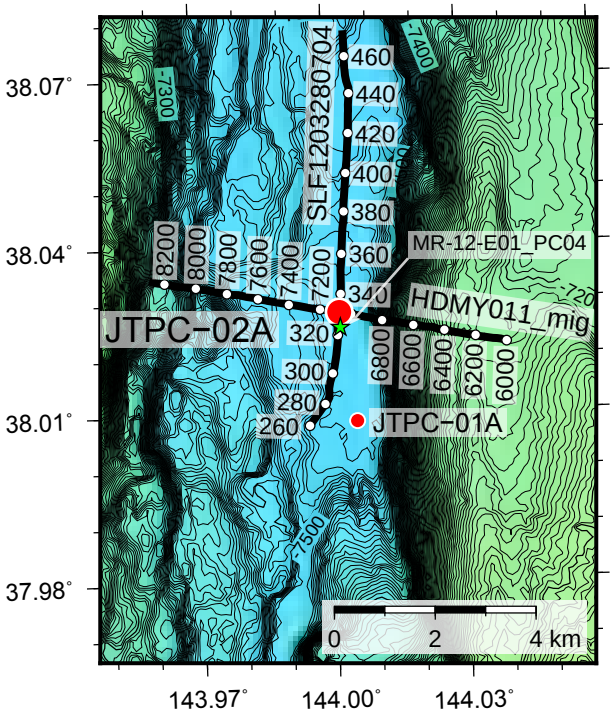
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (35 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPC-02A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick, muddy turbidites and thin tephra layers, overlying deformed trench-fill deposits	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

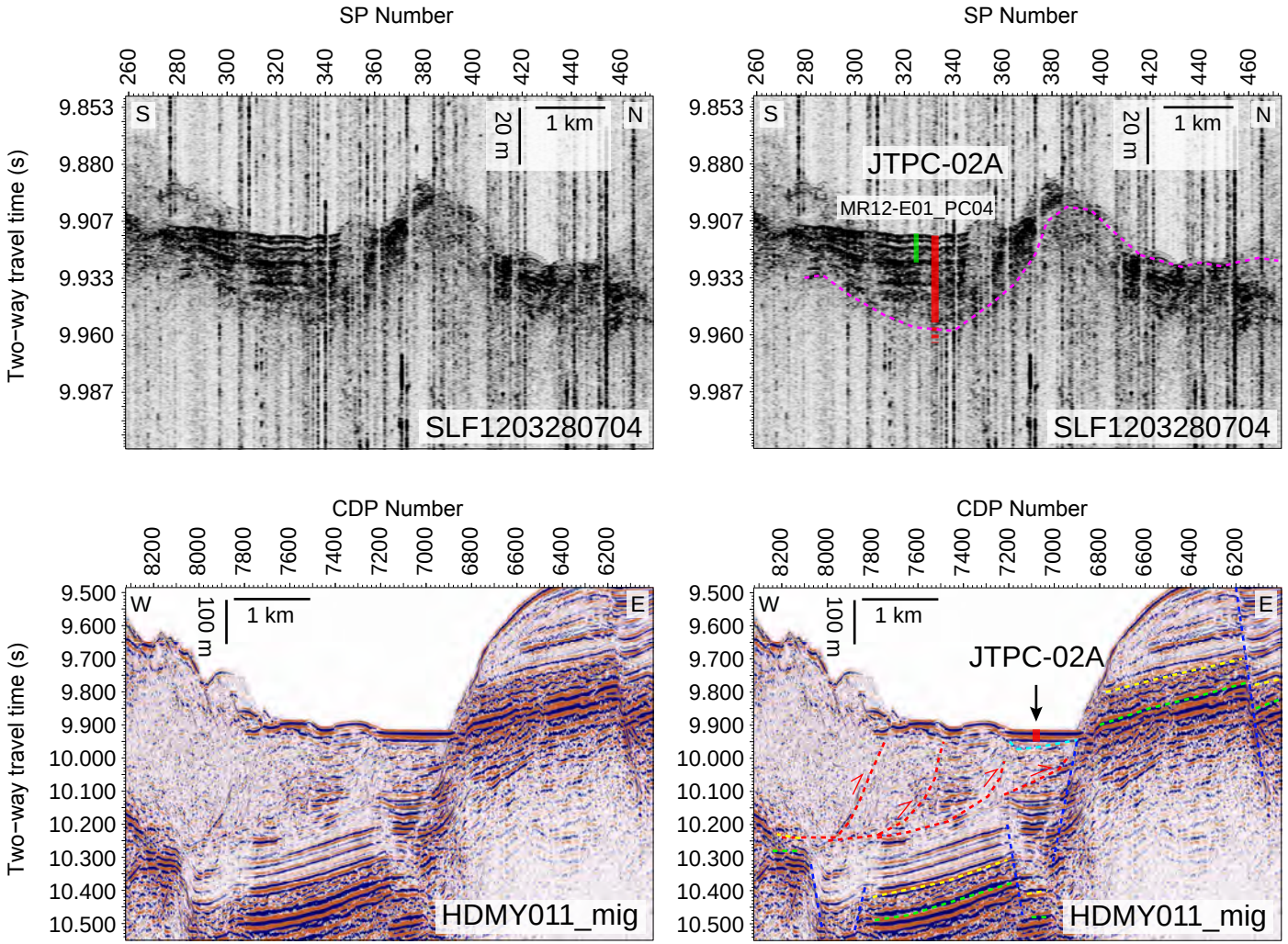
Site JTPC−02A (Primary)



Profiles annotated using shot point (SP) and CDP numbers

Site JTPC−02A
SP 332 on SLF1203280704
CDP 7078 on HDMY011_mig

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPC-02A_Location.pdf
Figures of seismic data:
JTPC−02A_SLF1203280704.pdf & JTPC−02A_HDMY011_mig.pdf
SEG−Y data:
JTPC−02A_SLF1203280704.sgy & JTPC−02A_HDMY011_mig.sgy
Figures of reference core data: MR12-E01_PC04.pdf

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick, muddy turbidites and thin tephra layers, overlying deformed trench-fill deposits
Magenta = Top of deformed trench-fill deposits

Deeper seismic: Green = Top of oceanic crust, Yellow = Top of chert unit, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-03B	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.29761	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.05920	Distance to Land: (km)	206
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7460

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-03B	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811_total Position: SP 566 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: SLF1203270849 Position: SP 3203 (projected) high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-15-3_PC10
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 1b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-03B	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

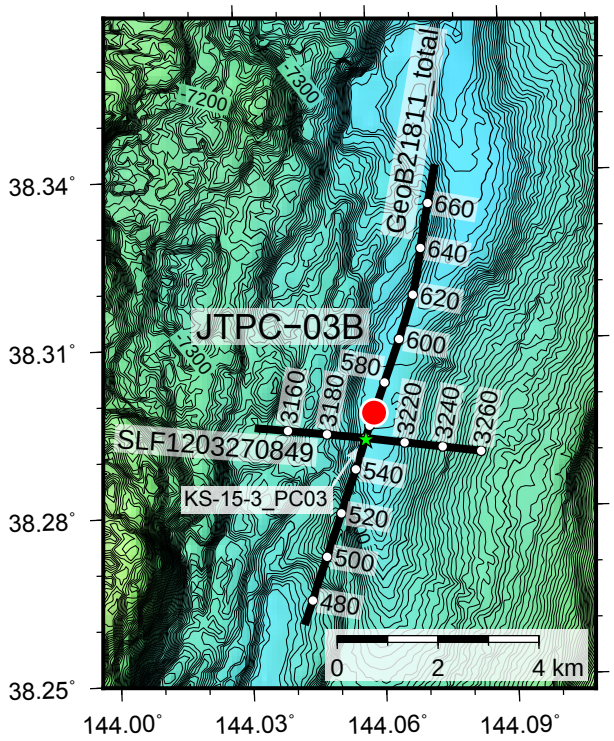
Proposal #: 866 - Full 2	Site #: JTPC-03B	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

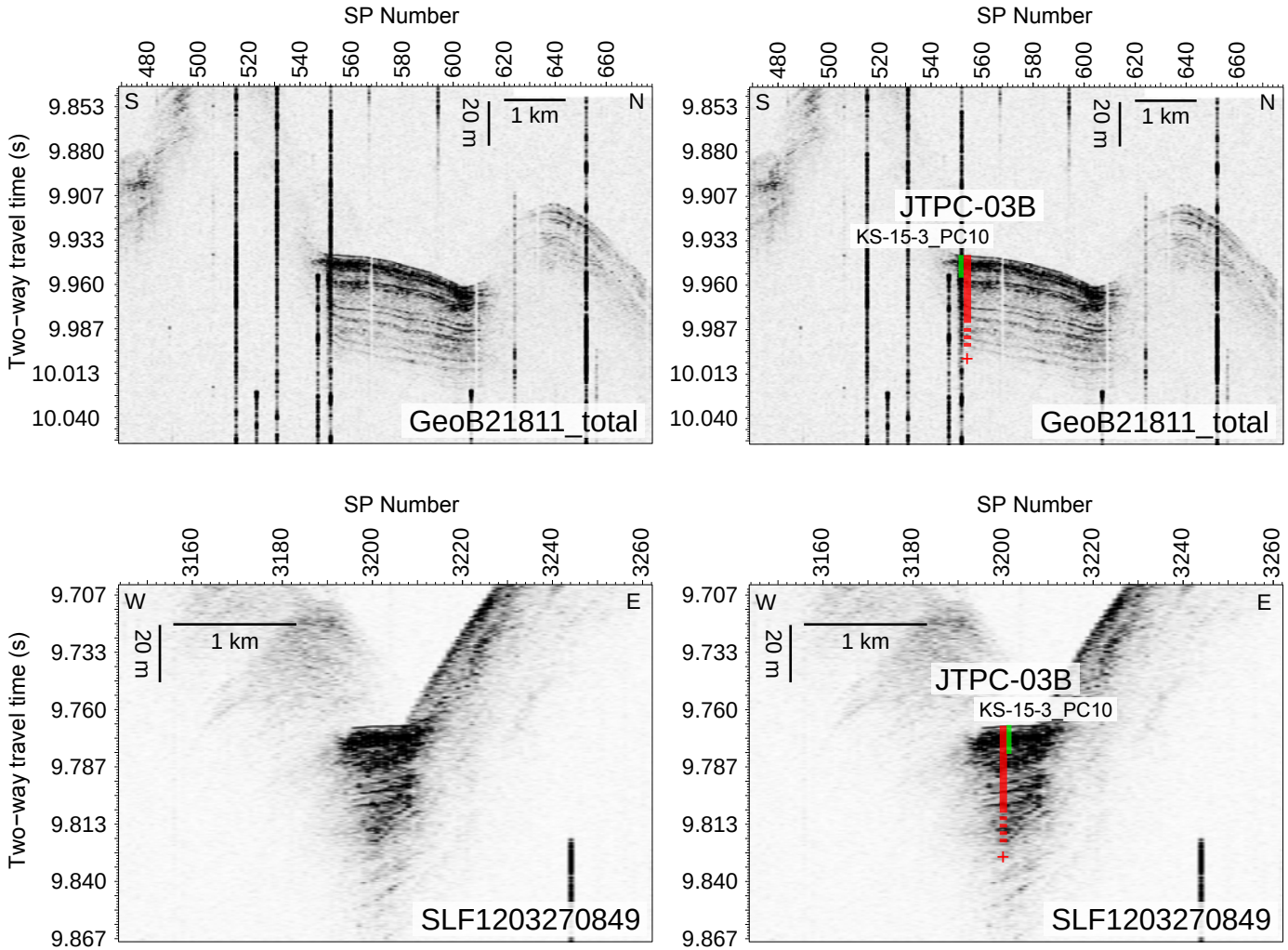
Site JTPC−03B (Primary)

Site Summary Form 6



Profiles annotated using Shot point (SP) numbers

Site JTPC−03B
SP 566 on GeoB21811_total
SP 3203 on SLF1203270849
(Projected)



SSDB locations of these graphics and supporting data
Location map: JTPC-03B_Location.pdf
Figures of seismic data:
JTPC−03B_GeoB21811_total.pdf & JTPC−03B_SLF1203270849.pdf
SEG−Y data:
JTPC−03B_GeoB21811_total.sgy & JTPC−03B_SLF1203270849.sgy
Figures of reference core data: KS-15-3_PC10.pdf

Interpretation

Narrow trench-basin with undisturbed trench-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick, muddy turbidites and thin tephra layers.

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-04A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.57586	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.12499	Distance to Land: (km)	200
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ✓	Water Depth (m):	7560

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-04A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811-part1 Position: SP 1451 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: JTXN03_mig Position: CDP 5034 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	yes	Line: HDMY073_mig Position: CDP 7228 high-resolution multichannel seismic data
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	High-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-14-16_PC10
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 2a, and 2b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-04A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

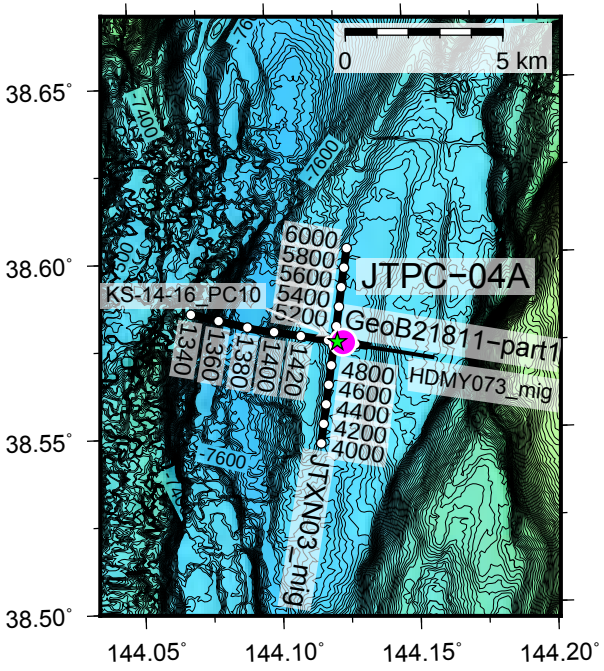
Proposal #: 866 - Full 2	Site #: JTPC-04A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

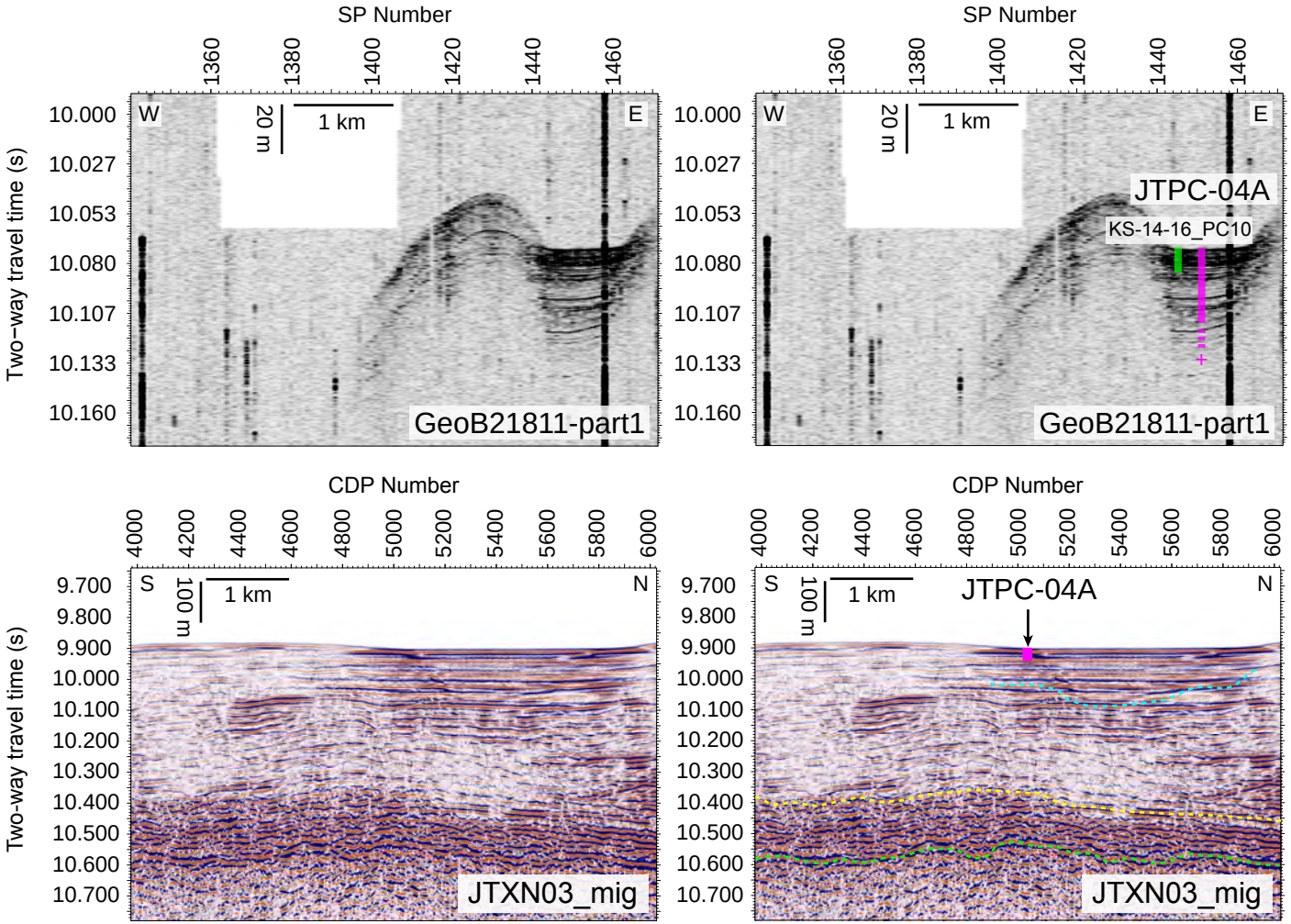
Site JTPC−04A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPC−04A
SP 1451 on GeoB21811−part1
CDP 5034 on JTXN03_mig



SSDB locations of these graphics and supporting data
Location map: JTPC-04A_Location.pdf
Figures of seismic data: JTPC−04A_GeoB21811−part1.pdf,
JTPC−04A_JTXN03_mig.pdf, JTPC−04A_HDMY073_mig.pdf
SEG−Y data: JTPC−04A_GeoB21811−part1.sgy,
JTPC−04A_JTXN03_mig.sgy, JTPC−04A_HDMY073_mig.sgy
Figures of reference core data: KS-14-16_PC10.pdf

Interpretation

Undisturbed graben-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick, muddy turbidites, and thin tephra layers.

Green = Top of oceanic crust, Yellow = Top of chert unit, Cyan = Base of graben fill

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-05A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 38.75801	Distance to Land: (km)	194
Longitude:	Deg: 144.12942		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7620

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-05A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 20151121220301_132 Position: SP 13605 high-resolution subbottom data (Topas)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21811-part1 Position: SP 2365 (projected) high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY093_mig Position: CDP 8334 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-15-16_PC01
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	yes	Positioning accuracy of deep-water coring at the neighboring site KS-15-16_PC01 (Lon: 144.131175, Lat: 38.758330, WD: 7620 m) for reference.

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-05A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

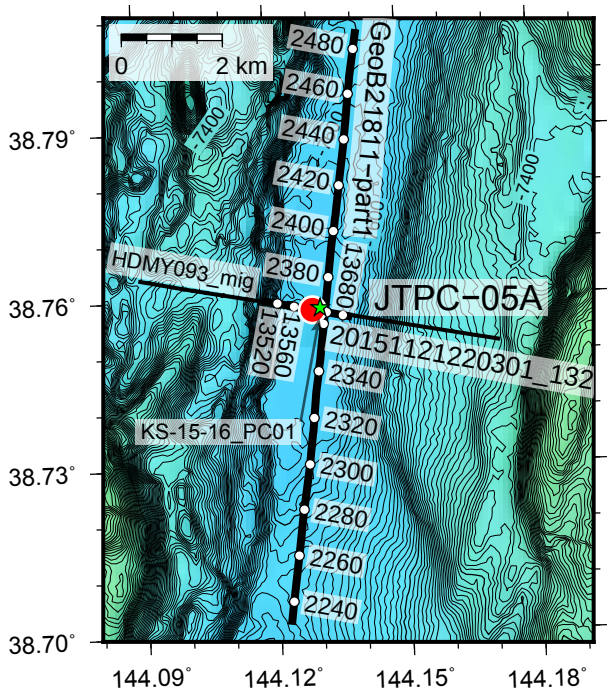
Proposal #: 866 - Full 2	Site #: JTPC-05A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

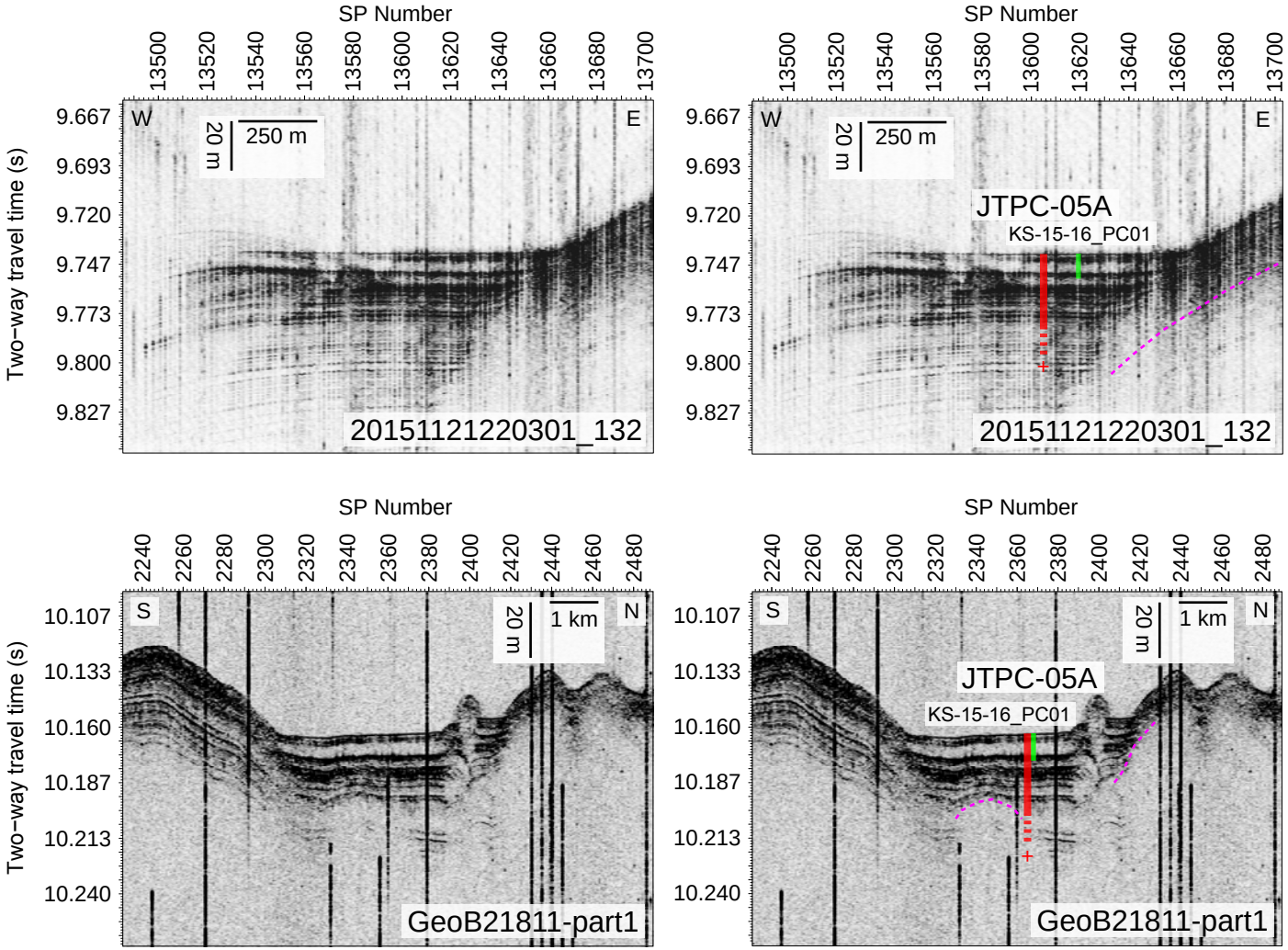
Site JTPC−05A (Primary)

Site Summary Form 6



Profiles annotated using Shot point (SP) numbers

Site JTPC−05A
SP 13605 on 20151121220301_132
SP 2365 on GeoB21811−part1 (projected)



SSDB locations of these graphics and supporting data
Location map: JTPC-05A_Location.pdf
Figures of seismic data: JTPC−05A_20151121220301_132.pdf,
JTPC−05A_GeoB21811−part1.pdf, JTPC−05A_HDMY093_mig.pdf
SEG−Y data: JTPC−05A_20151121220301_132.sgy,
JTPC−05A_GeoB21811−part1.sgy, JTPC−05A_HDMY093_mig.sgy
Figures of reference core data: KS-15-16_PC01.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites.

Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-06B	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.86920	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.15224	Distance to Land: (km)	192
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7630

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	35	0
Total Sediment Thickness (m)	35	
Total Penetration (m):	35	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-06B	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 20151121201717_100 Position: SP 11916 (projected) high-resolution subbottom data (Topas)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21811-part1 Position: SP 2640 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY105_mig Position: CDP 8247 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	yes	Line: JTXP05_mig Position: CDP 15433 high-resolution multichannel seismic data
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation		Navigation data of 1a, 1b, 2a, and 2b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-06B	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (35 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

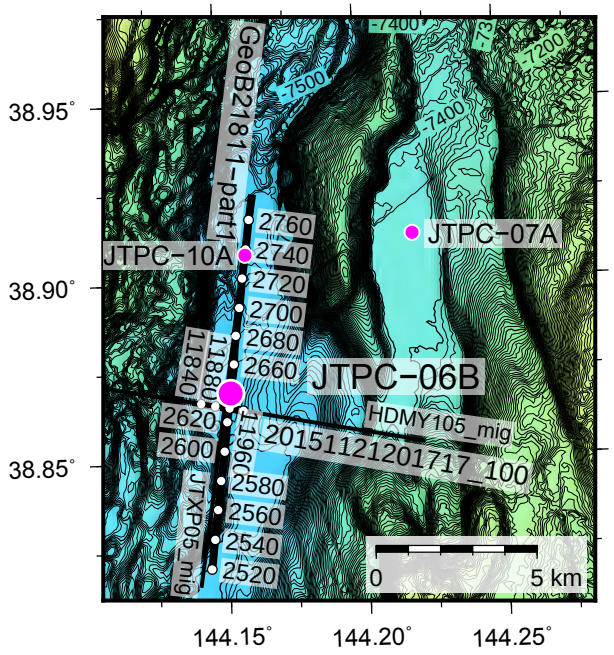
Proposal #: 866 - Full 2	Site #: JTPC-06B	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

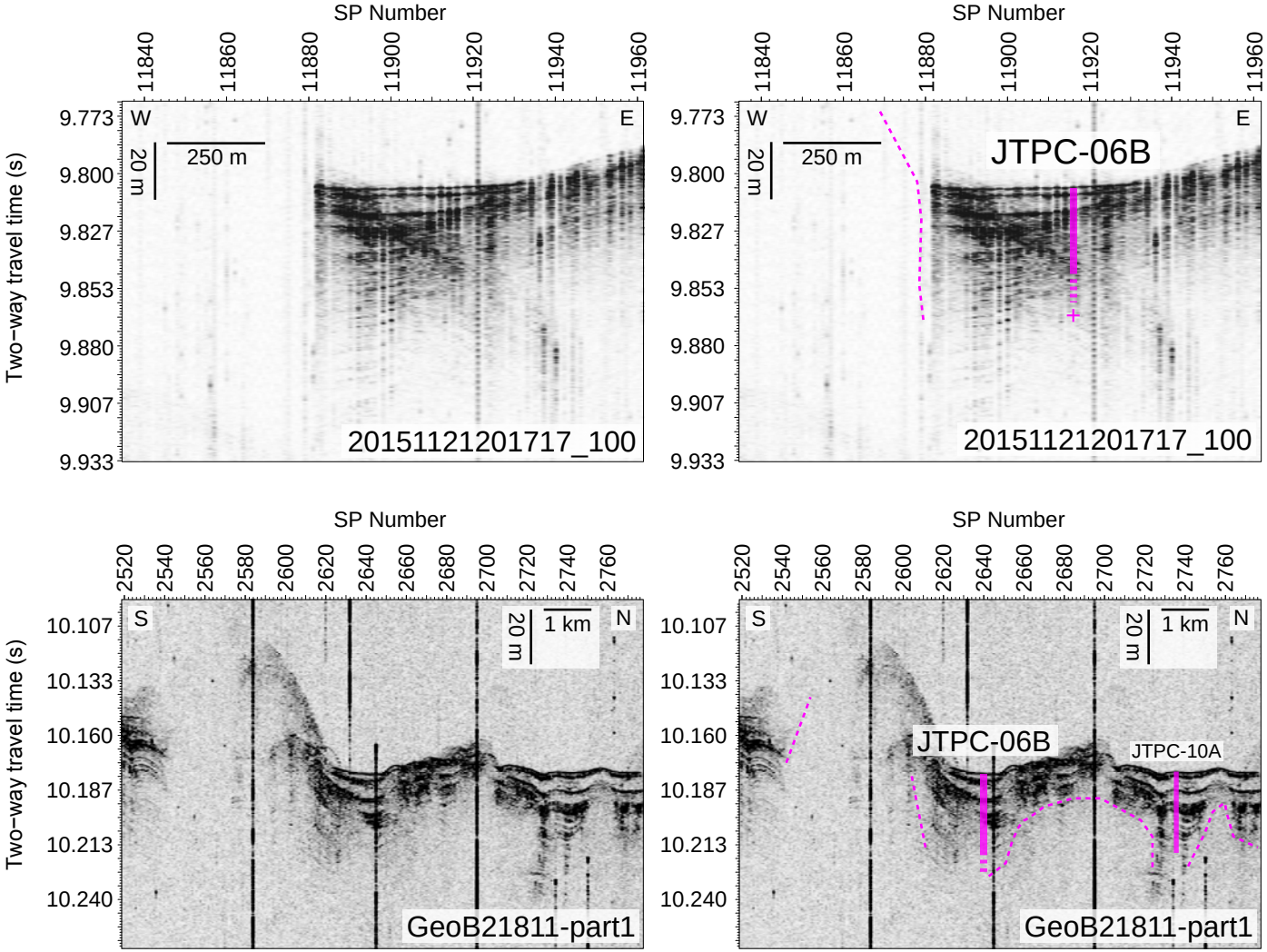
Site JTPC−06B (Alternate)

Site Summary Form 6



Profiles annotated using Shot point (SP) numbers

Site JTPC−06B
SP 11916 on 20151121201717_100 (projected)
SP 2640 on GeoB21811−part1



SSDB locations of these graphics and supporting data
Location map: JTPC-06B_Location.pdf
Figures of seismic data:
JTPC−06B_20151121201717_100.pdf, JTPC−06B_GeoB21811−part1.pdf, JTPC−06B_HDMY105_mig.pdf, JTPC−06B_JTXP05_mig.pdf
SEG−Y data:
JTPC−06B_20151121201717_100.sgy, JTPC−06B_GeoB21811−part1.sgy, JTPC−06B_HDMY105_mig.sgy, JTPC−06B_JTXP05_mig.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites.

Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-07A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.91249	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.21916	Distance to Land: (km)	196
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ✓	Water Depth (m):	7400

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-07A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811_total Position: SP 3573 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21811_total Position: SP 3149 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	GeoB21821
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 1b
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-07A	Date Form Submitted: 2017-10-05 19:55:01

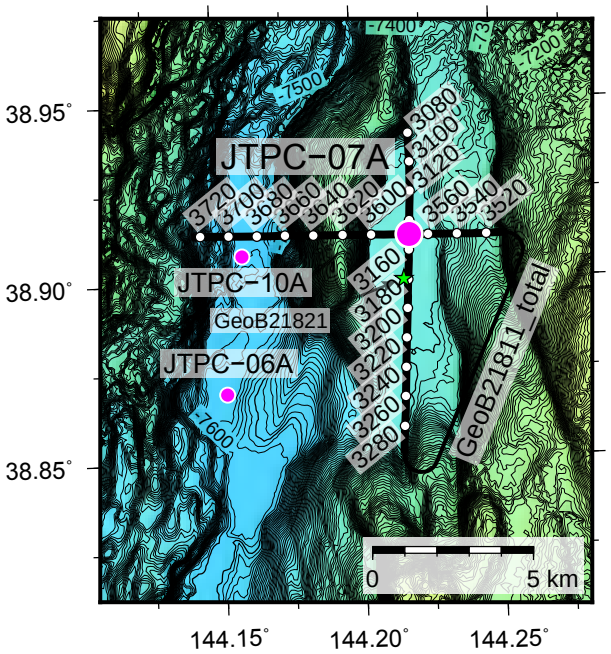
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPC-07A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

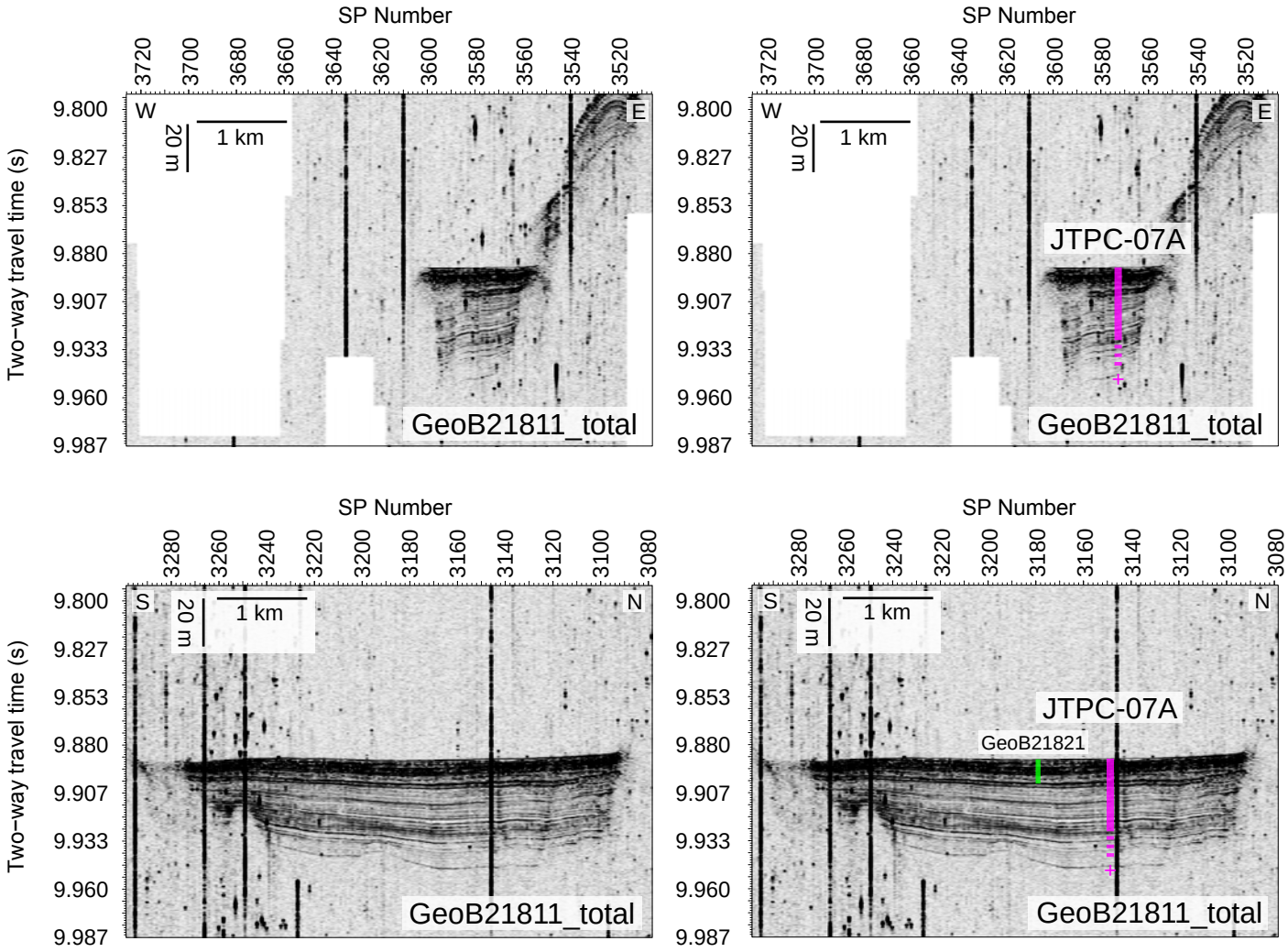
Site JTPC−07A (Alternate)



Profiles annotated using Shot point (SP) numbers

Site JTPC−07A
SP 3573 on GeoB21811_total
SP 3149 on GeoB21811_total

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPC-07A_Location.pdf
Figures of seismic data:
JTPC−07A_X_GeoB21811_total.pdf & JTPC−07A_Y_GeoB21811_total.pdf
SEG−Y data:
JTPC−07A_GeoB21811_total.sgy
Figures of reference core data: GeoB21821.pdf

Interpretation

Undisturbed graben-basin-fill succession of dominantly diatomaceous mud interbedded with cm-thick muddy turbidites and thin tephra layers.

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-08A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 39.03126	Distance to Land: (km)	194
Longitude:	Deg: 144.24752		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7340

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-08A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: 2014090704_1_023_024 Position: SP 18341 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY125_mig Position: CDP 6926 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-14-16_PC06
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-08A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

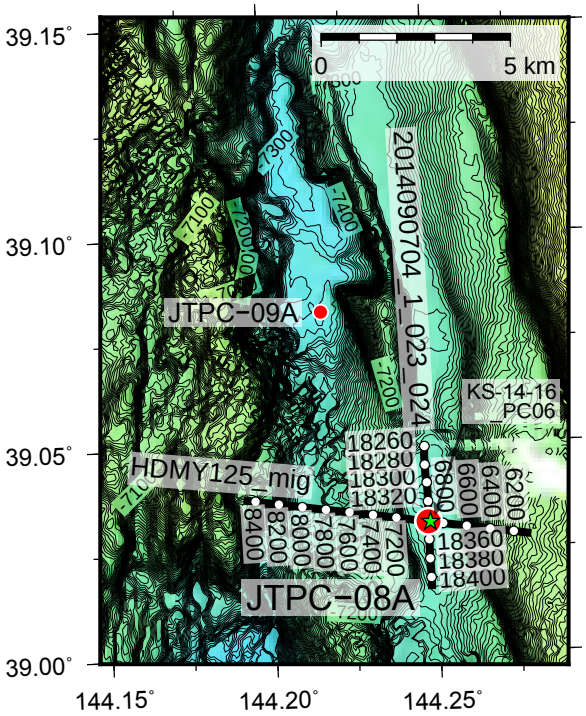
Proposal #: 866 - Full 2	Site #: JTPC-08A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

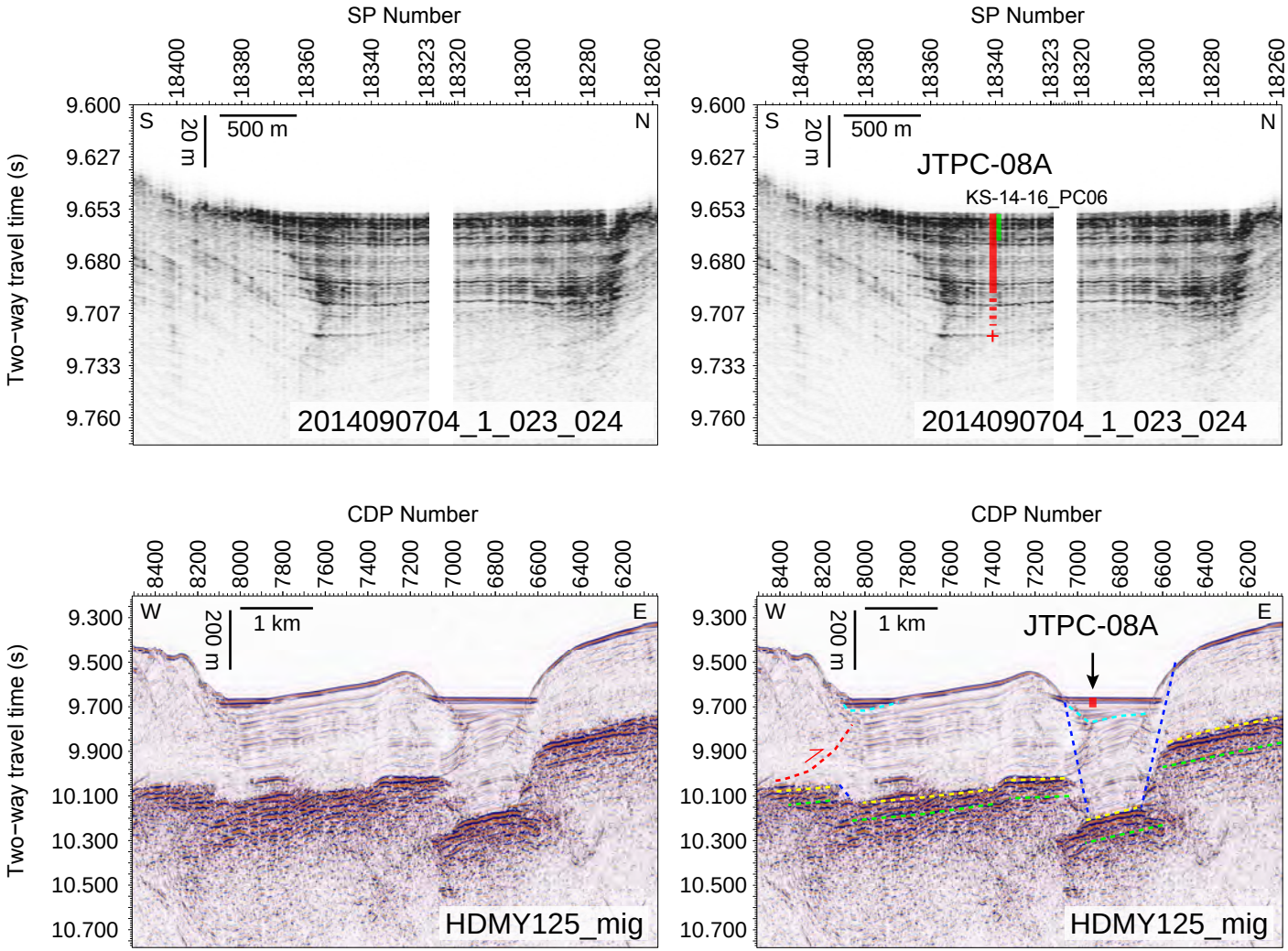
Site JTPC−08A (Primary)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPC−08A
SP 18341 on 2014090704_1_023_024
CDP 6926 on HDMY125_mig



SSDB locations of these graphics and supporting data
Location map: JTPS-08A_Location.pdf
Figures of seismic data:
JTPC−08A_2014090704_1_023_024.pdf & JTPC−08A_HDMY125_mig.pdf
SEG−Y data:
JTPC−08A_2014090704_1_023_024.sgy & JTPC−08A_HDMY125_mig.sgy
Figures of reference core data: KS-14-16_PC06.pdf

Interpretation

Undisturbed graben-basin-fill succession of dominantly diatomaceous mud interbedded with cm-thick, muddy turbidites thin tephra layers

Deeper seismic: Green = Top of oceanic crust, Yellow = Top of chert unit, Cyan = Base of graben fill Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-09A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 39.08195	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.21682	Distance to Land: (km)	191
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate:	Water Depth (m):	7440

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	35	0
Total Sediment Thickness (m)	35	
Total Penetration (m):	35	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-09A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811_total Position: SP 4888 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a).
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPC-09A	Date Form Submitted: 2017-10-05 19:55:01

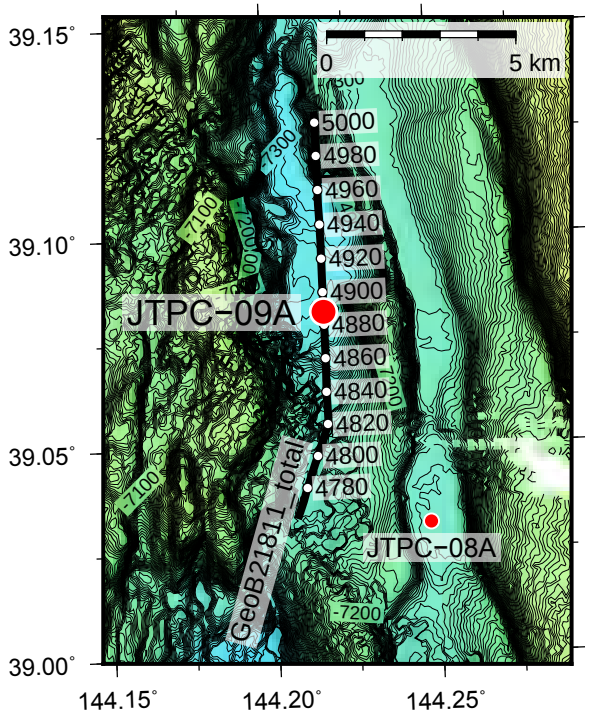
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (35 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPC-09A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites, overlying deformed trench-fill sediments	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

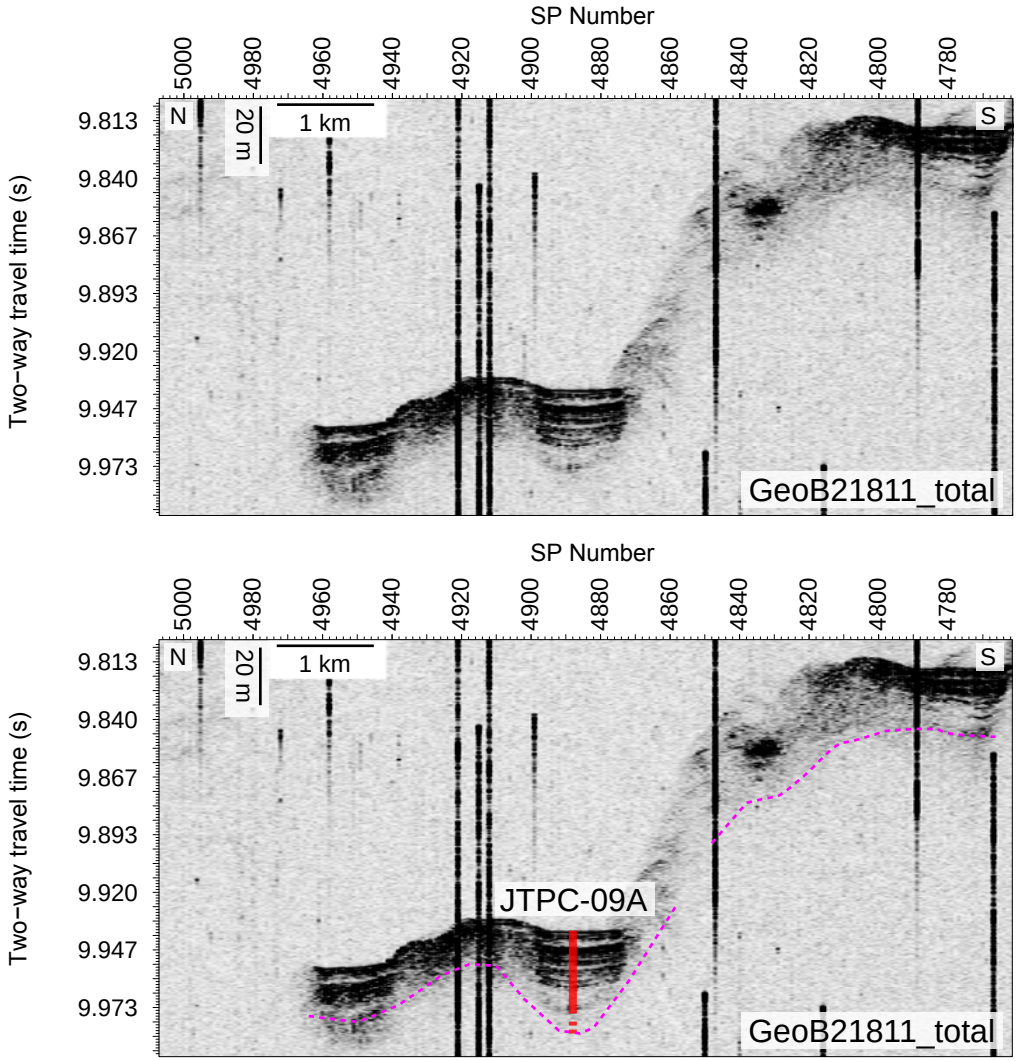
Site JTPC−09A (Primary)



Profiles annotated using Shot point (SP) numbers

Site JTPC−09A
SP 4888 on GeoB21811_total

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPC-09A_Location.pdf
Figures of seismic data:
JTPC−09A_GeoB21811_total.pdf
SEG−Y data:
JTPC−09A_GeoB21811_total.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites, overlying deformed trench-fill sediments
Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPC-10A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 38.90768	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.15905	Distance to Land: (km)	191
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7640

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPC-10A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811-part1 Position: SP 2736 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: JTXP05_mig Position: CDP 16814 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)		
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPC-10A	Date Form Submitted: 2017-10-05 19:55:01

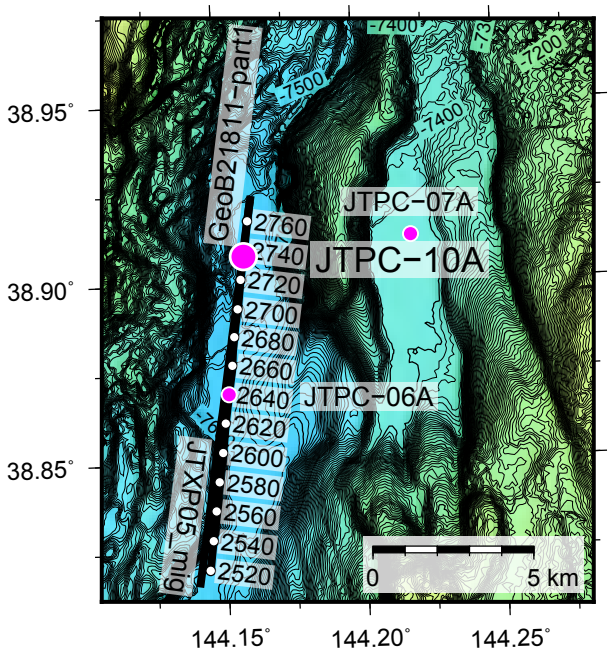
Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8 km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

Proposal #: 866 - Full 2	Site #: JTPC-10A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

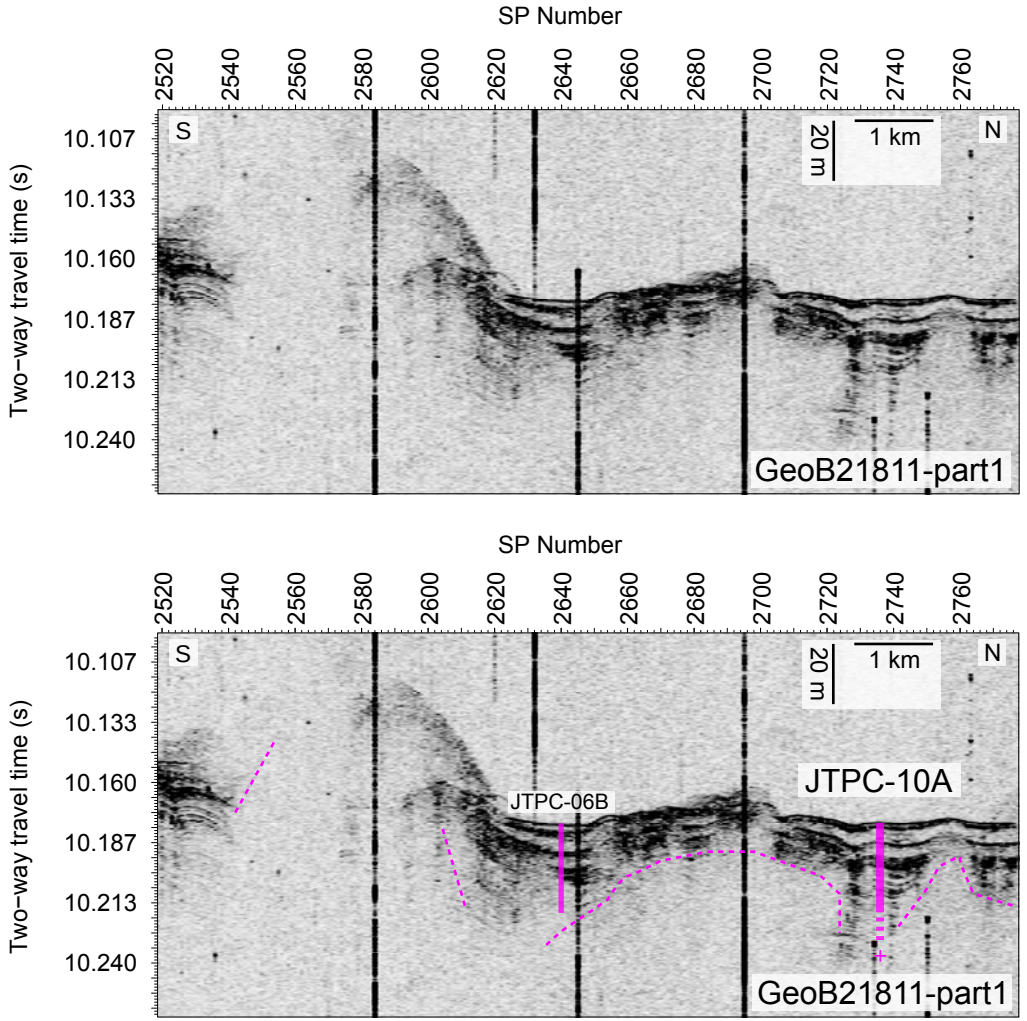
Site JTPC−10A (Alternate)



Profiles annotated using Shot point (SP) numbers

Site JTPC−10A
SP 2736 on GeoB21811−part1

Site Summary Form 6



SSDB locations of these graphics and supporting data
Location map: JTPC-10A_Location.pdf
Figures of seismic data:
JTPC−10A_GeoB21811−part1.pdf, JTPC−10A_JTXP05_mig.pdf
SEG−Y data:
JTPC−10A_GeoB21811−part1.sgy, JTPC−10A_JTXP05_mig.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites.

Magenta = Top of deformed trench-fill deposits (e.g. by slumping or compression during co-seismic slip to trench)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-01A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 39.24858	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.20297	Distance to Land: (km)	186
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7460

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-01A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21811_total Position: SP 5308 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: 20151123010940_246 Position: SP 26277 high-resolution subbottom data (Topas)
2a Deep penetration seismic reflection (primary)	yes	Line: HDMY149_mig Position: CDP 9149 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	GeoB21812
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-01A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

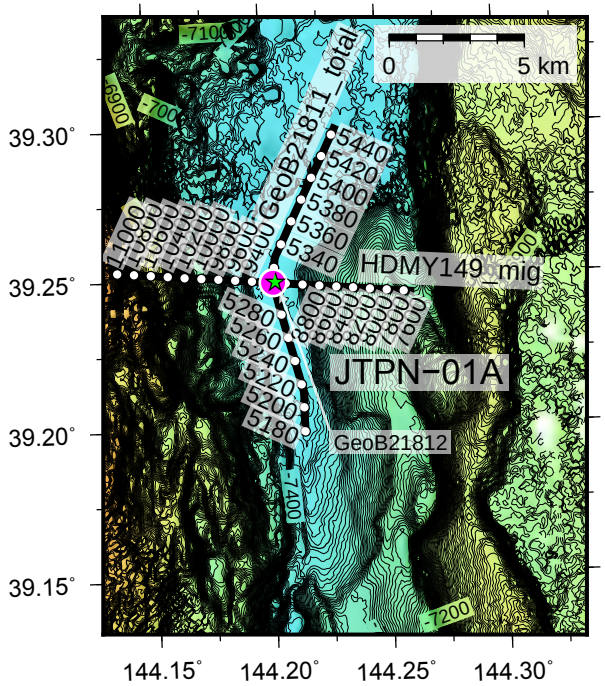
Proposal #: 866 - Full 2	Site #: JTPN-01A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites, overlying deformed trench-basin or mass-transport deposits (MTD)	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

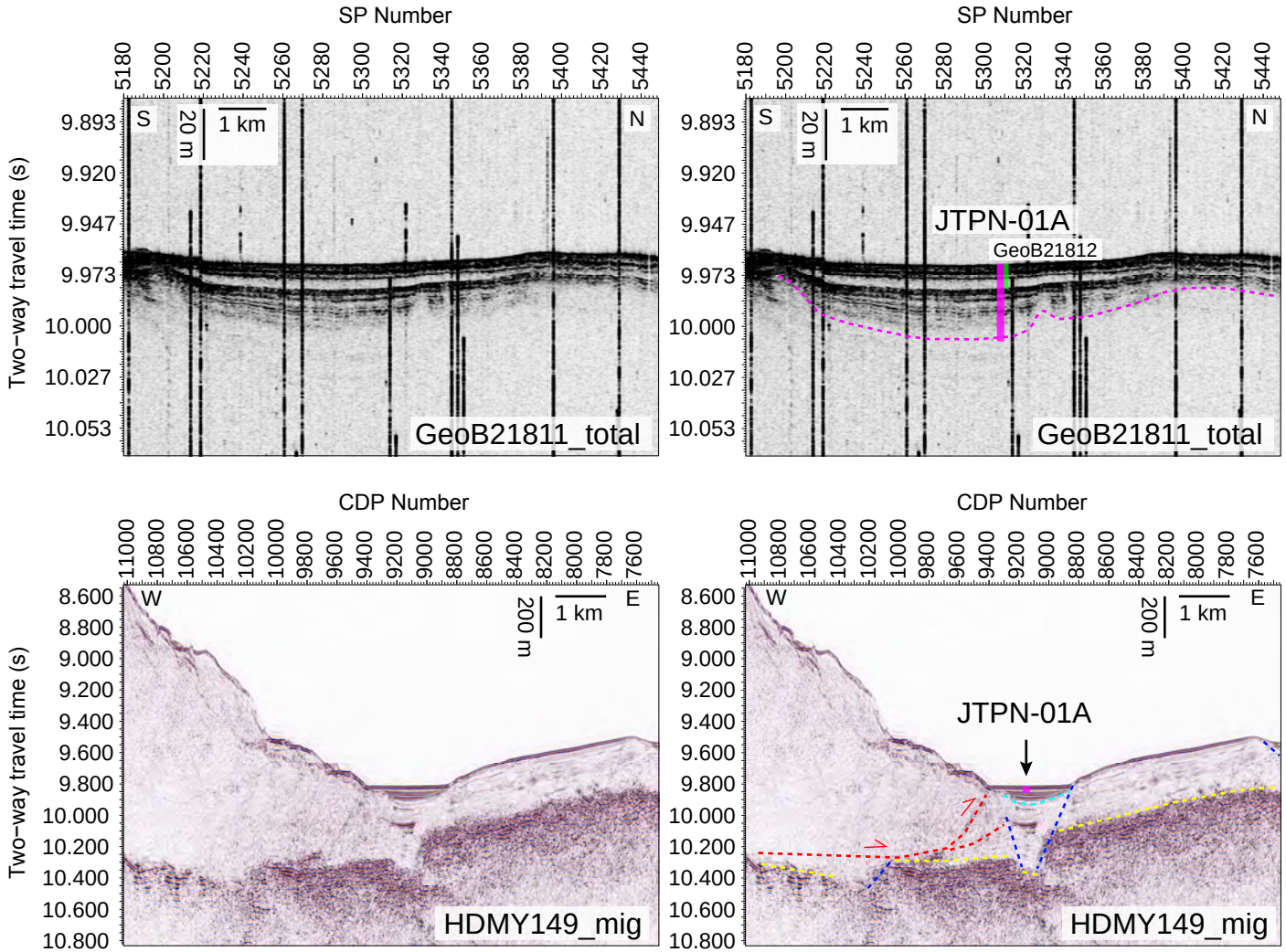
Site JTPN−01A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−01A
SP 5308 on GeoB21811_total
CDP 9149 on HDMY149_mig



SSDB locations of these graphics and supporting data
Location map: JTPN-01A_Location.pdf
Figures of seismic data: JTPN−01A_GeoB21811_total.pdf,
JTPN−01A_HDMY149_mig.pdf, JTPN−01A_20151123010940_246.pdf
SEG−Y data: JTPN−01A_GeoB21811_total.sgy,
JTPN−01A_HDMY149_mig.sgy, JTPN−01A_20151123010940_246.sgy
Figures of reference core data: GeoB21812.pdf

Interpretation Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers, and few m-thick homogenites, overlying deformed trench-basin or mass-transport deposits (MTD).

Magenta = Top of deformed trench-fill / MTDs
Deeper seismic: Yellow = Top of chert unit or oceanic crust, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-02A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 39.44436	Distance to Land: (km)	184
Longitude:	Deg: 144.21630		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7520

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-02A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21819-part2 Position: SP 385 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: 2014090722_1_010_011 Position: SP 20526 (projected) high-resolution subbottom data (Topas)
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR171_mig Position: CDP 9655 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a, 1b, and 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-02A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

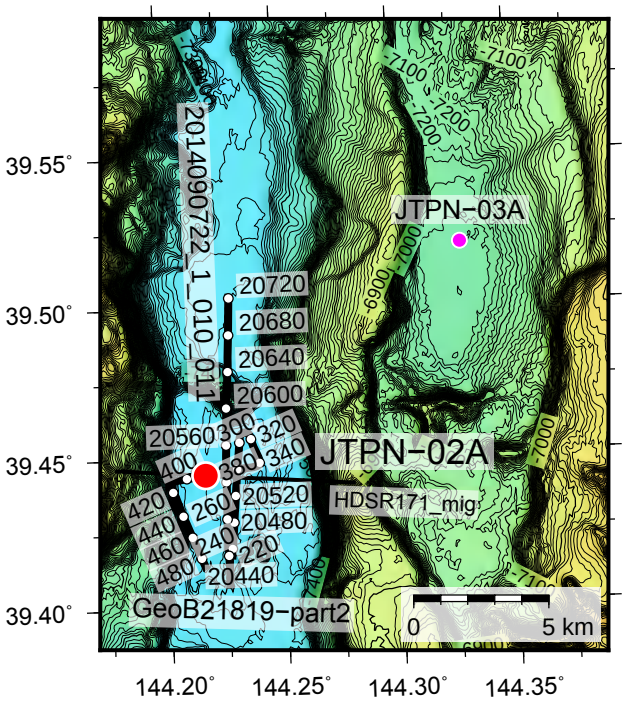
Proposal #: 866 - Full 2	Site #: JTPN-02A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and few-m-thick homogenites, overlying deformed trench-basin or mass-transport deposits (MTD)	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

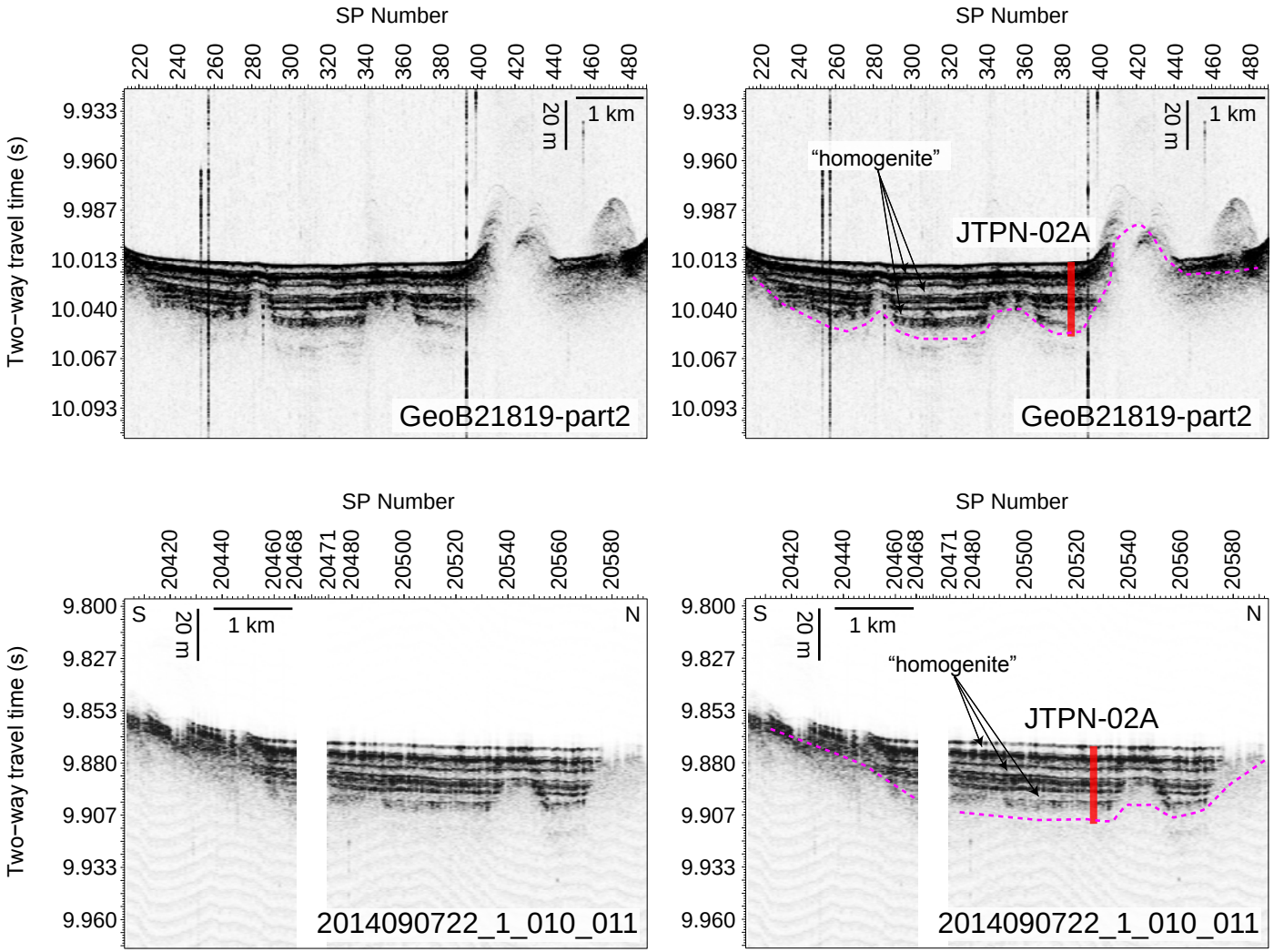
Site JTPN−02A (Primary)

Site Summary Form 6



Profiles annotated using shot point (SP) and SP numbers

Site JTPN−02A
SP 385 on GeoB21819−part2
SP 20526 on 2014090722_1_010_011 (projected)



SSDB locations of these graphics and supporting data
Location map: JTPN-02A_Location.pdf
Figures of seismic data:
JTPN−02A_GeoB21819−part2.pdf,
JTPN−02A_2014090722_1_010_011.pdf, JTPN−02A_HDSR171_mig.pdf
SEG−Y data:
JTPN−02A_GeoB21819−part2.sgy,
JTPN−02A_2014090722_1_010_011.sgy, JTPN−02A_HDSR171_mig.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and few-m-thick homogenites, overlying deformed trench-basin or mass-transport deposits (MTD)

Magenta = Top of deformed trench-fill or MTDs

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-03A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 39.51979	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.32902	Distance to Land: (km)	194
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7250

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-03A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21814-part2 Position: SP 1095 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR179_mig Position: CDP 6981 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-03A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

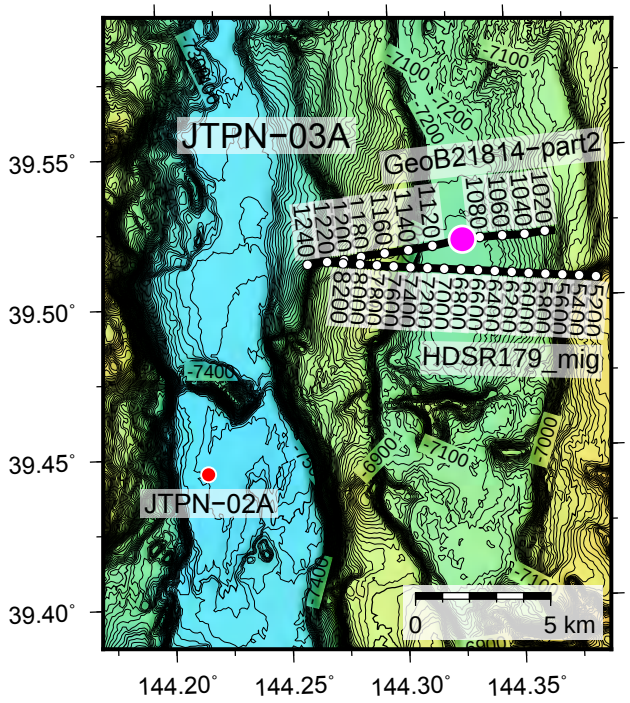
Proposal #: 866 - Full 2	Site #: JTPN-03A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

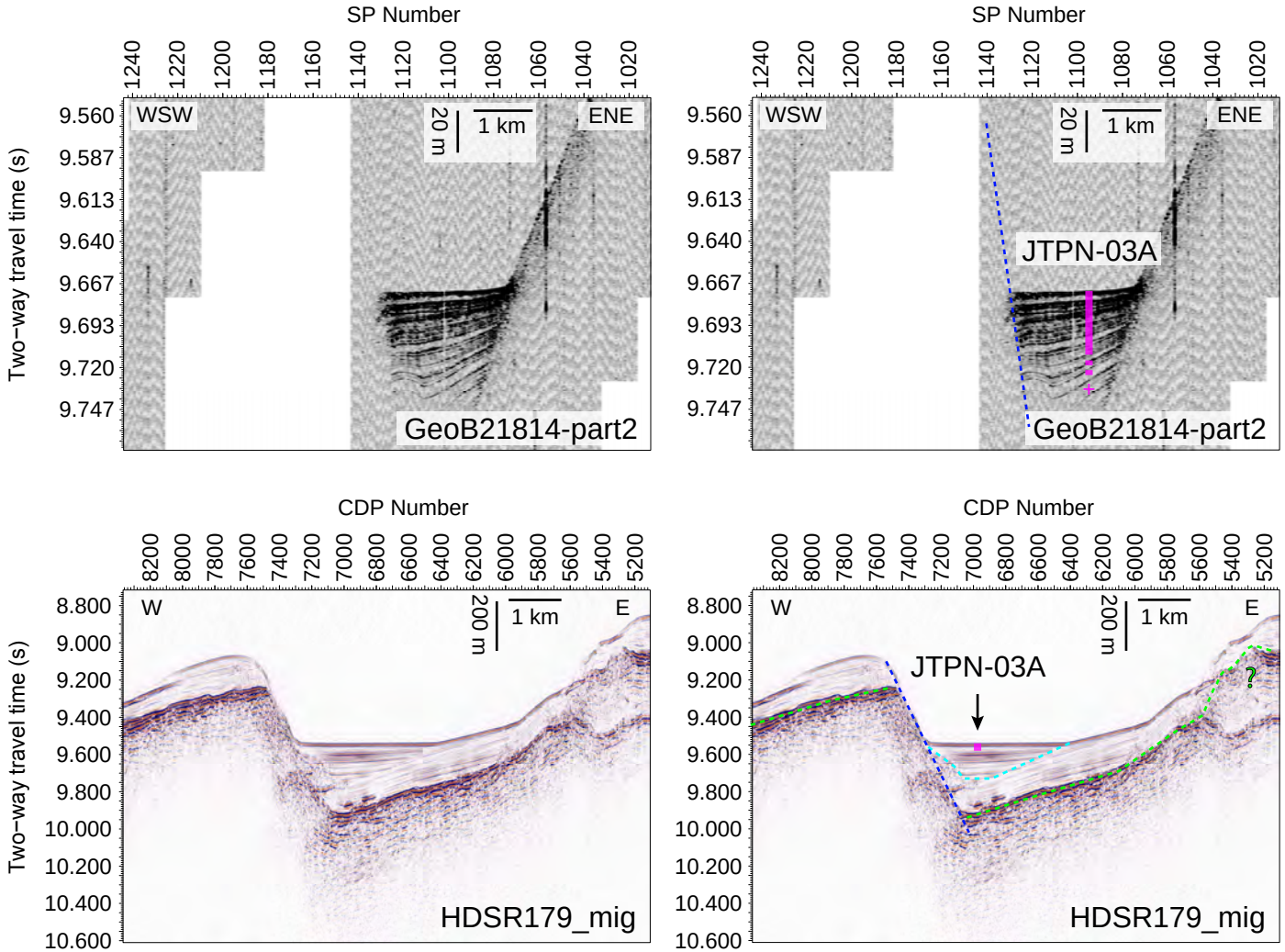
Site JTPN−03A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−03A
SP 1095 on GeoB21814−part2
CDP 6981 on HDSR179_mig



SSDB locations of these graphics and supporting data
Location map: JTPN-03A_Location.pdf
Figures of seismic data:
JTPN−03A_GeoB21814−part2.pdf & JTPN−03A_HDSR179_mig.pdf
SEG−Y data:
JTPN−03A_GeoB21814−part2.sgy & JTPN−03A_HDSR179_mig.sgy

Interpretation

Undisturbed graben-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers

Deeper seismic:
Green = Top of basalt (? petit-spot volcanism?),
Cyan = Base of graben fill, Blue = Horst-graben normal faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-04A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 39.76647	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.26910	Distance to Land: (km)	190
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7470

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-04A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21819 Position: SP 2475 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR207_mig Position: CDP 8972 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	KS-14-16_PC08
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPN-04A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

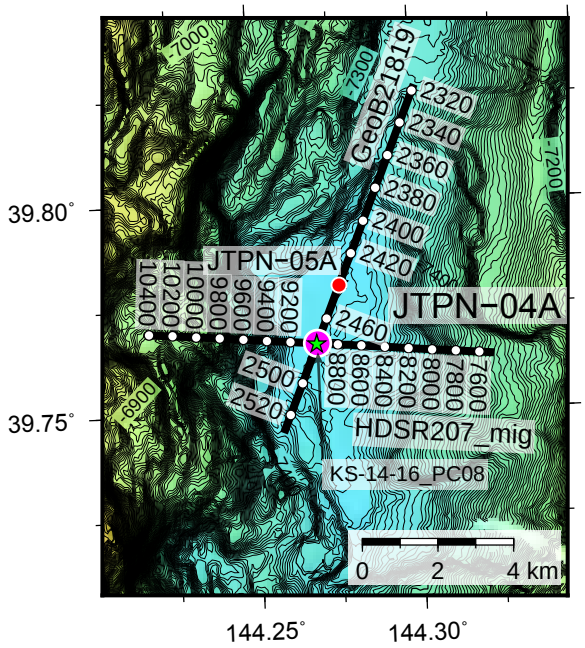
Proposal #: 866 - Full 2	Site #: JTPN-04A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

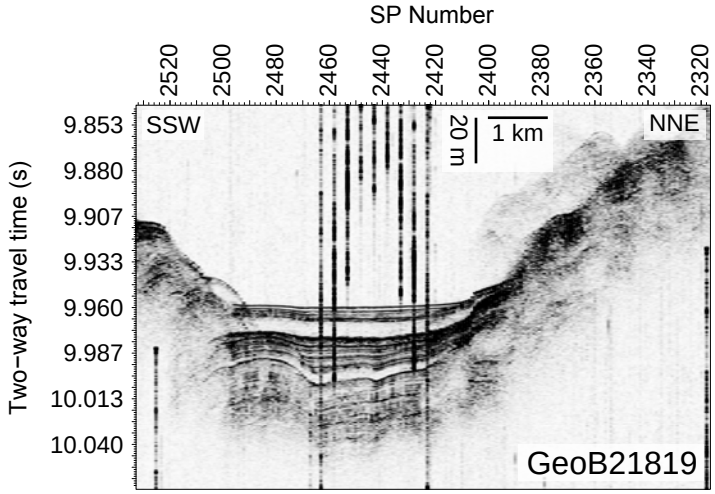
Site JTPN−04A (Alternate)

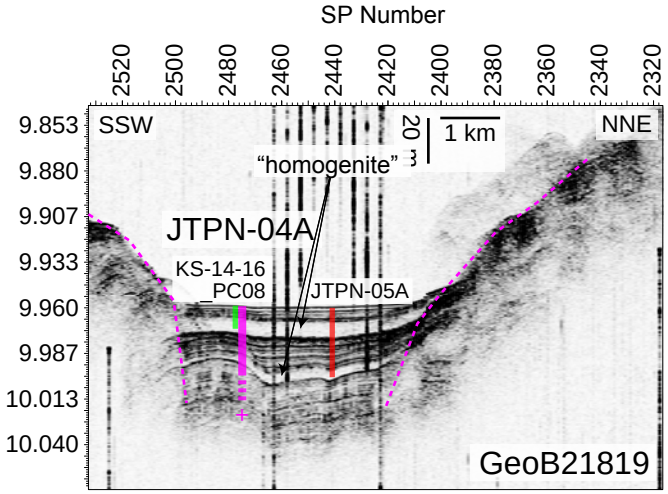
Site Summary Form 6

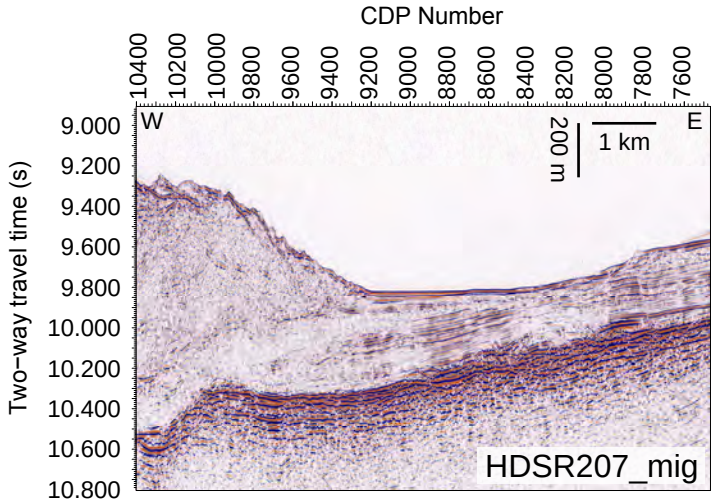


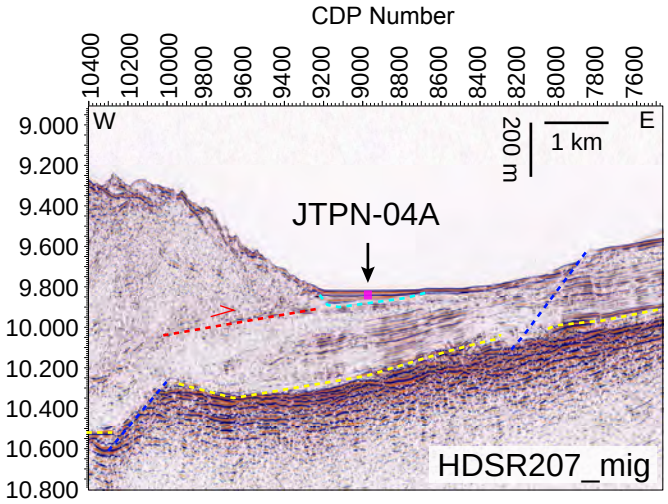
Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−04A
SP 2475 on GeoB21819
CDP 8972 on HDSR207_mig









SSDB locations of these graphics and supporting data
Location map: JTPN-04A_Location.pdf
Figures of seismic data:
JTPN−04A_GeoB21819.pdf & JTPN−04A_HDSR207_mig.pdf
SEG−Y data:
JTPN−04A_GeoB21819.sgy & JTPN−04A_HDSR207_mig.sgy
Figures of reference core data: KS-14-16_PC08.pdf

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites. This is the condensed section relative to JTPN-05A. Magenta = Top of deformed trench-fill deposits (e.g. by local slumping). Deeper seismic: Yellow = Top of chert unit or oceanic crust, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults.

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-05A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 39.78013	Distance to Land: (km)	190
Longitude:	Deg: 144.27636		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7480

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-05A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21819-parthomogenites Position: SP 138 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21819-parthomogenites Position: SP 429 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 1b
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-05A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

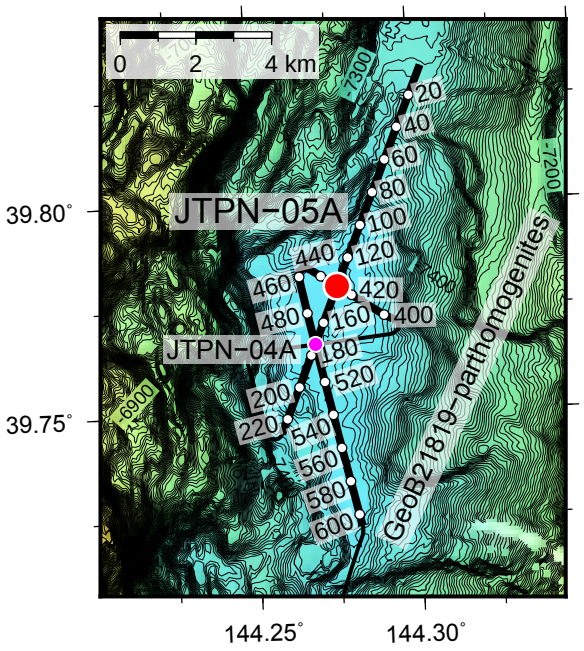
Proposal #: 866 - Full 2	Site #: JTPN-05A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

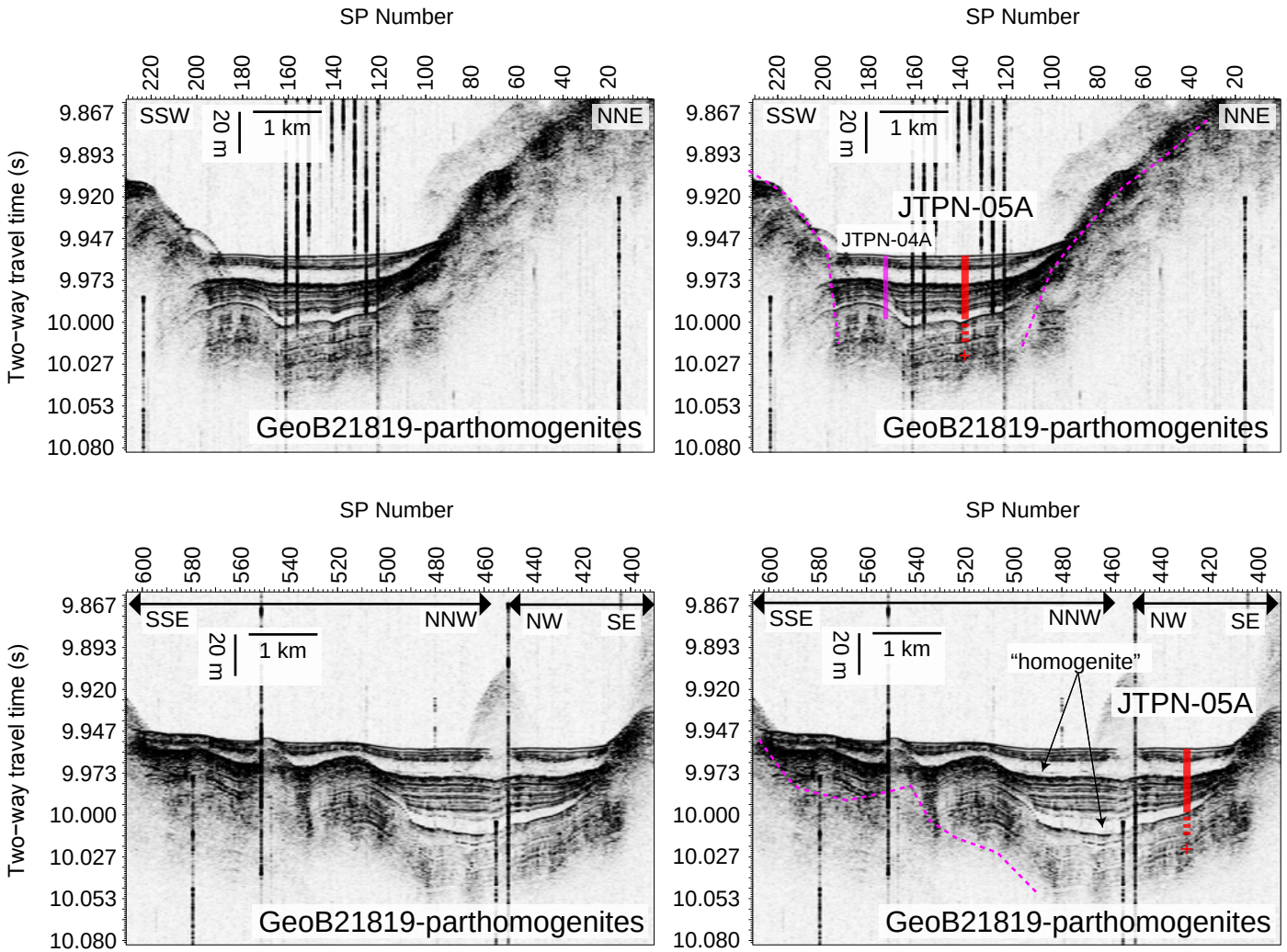
Site JTPN−05A (Primary)

Site Summary Form 6



Profiles annotated using Shot point (SP) numbers

Site JTPN−05A
SP 138 on GeoB21819−parthomogenites
SP 429 on GeoB21819−parthomogenites



SSDB locations of these graphics and supporting data
Location map: JTPN-05A_Location.pdf
Figures of seismic data:
JTPN−05A_01_GeoB21819−parthomogenites.pdf,
JTPN−05A_02_GeoB21819−parthomogenites.pdf
SEG−Y data:
JTPN−05A_GeoB21819−parthomogenites.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites. This is the expanded section relative to JTPN-04A.

Magenta = Top of deformed trench-fill sediments (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-06A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 40.05940	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.31855	Distance to Land: (km)	200
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7570

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-06A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 2990 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017).
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR239_mig Position: CDP 8522 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

IODP Site Forms

Form 4 - Environmental Protection

Proposal #: 866 - Full 2	Site #: JTPN-06A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

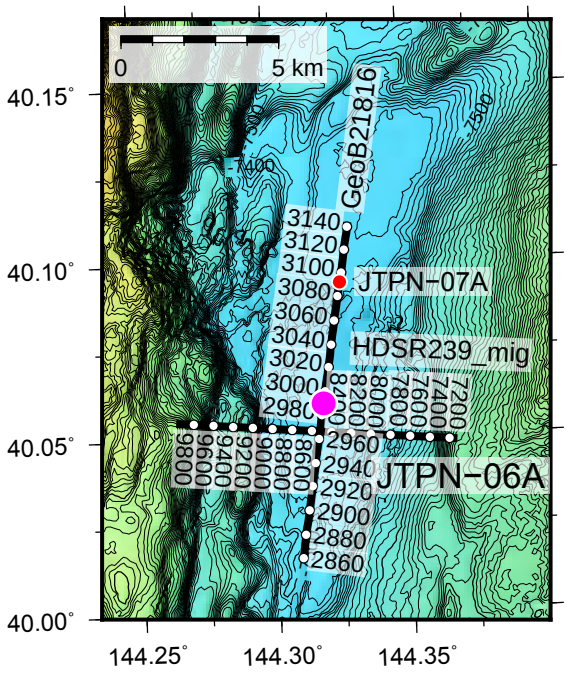
Proposal #: 866 - Full 2	Site #: JTPN-06A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

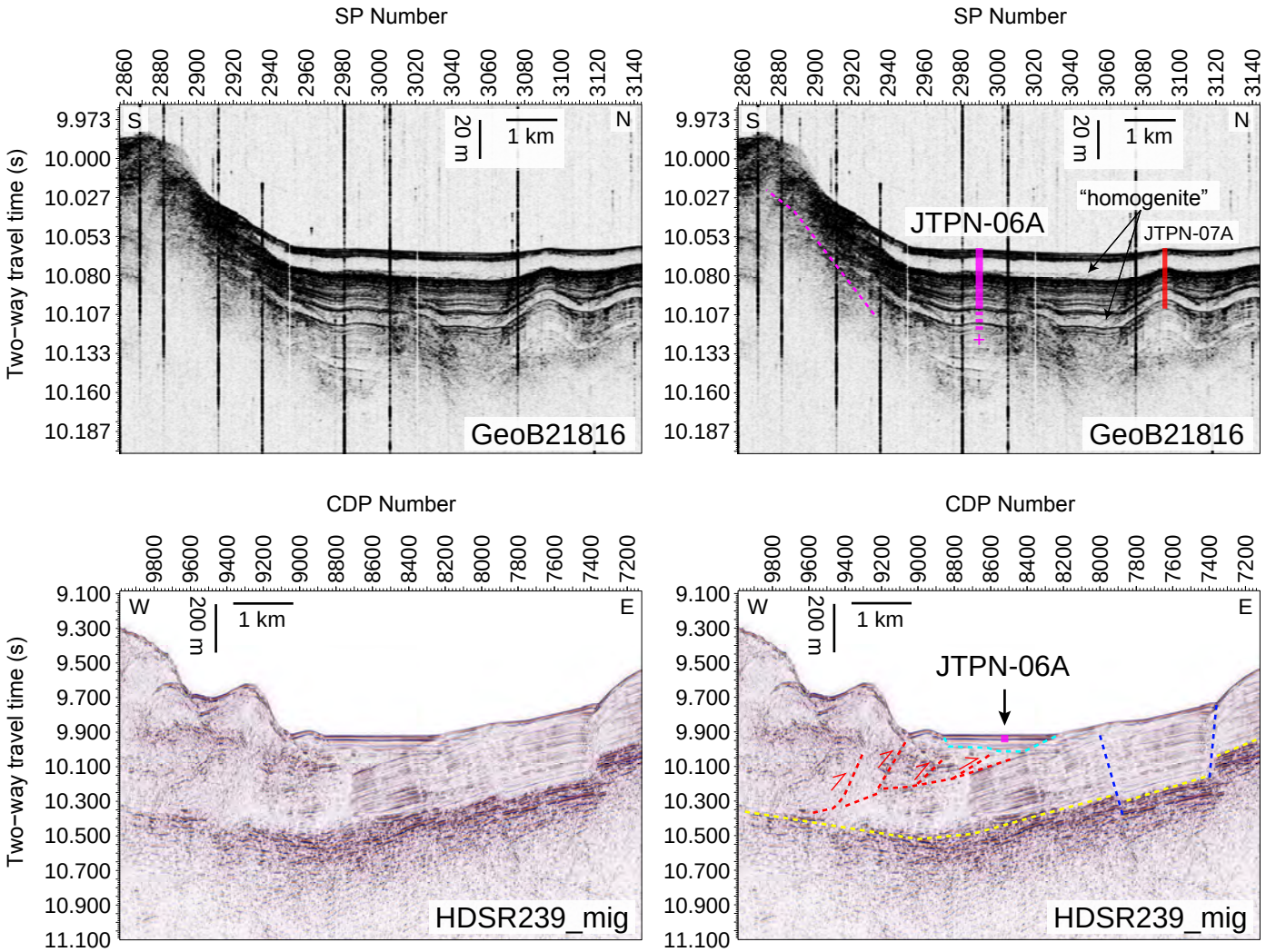
Site JTPN−06A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−06A
SP 2990 on GeoB21816
CDP 8522 on HDSR239_mig



SSDB locations of these graphics and supporting data
Location map: JTPN-06A_Location.pdf
Figures of seismic data:
JTPN−06A_GeoB21816.pdf & JTPN−06A_HDSR239_mig.pdf
SEG−Y data:
JTPN−06A_GeoB21816.sgy & JTPN−06A_HDSR239_mig.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites. This is the expanded section relative to JTPN-07A. Magenta = Top of deformed trench-fill sediments (e.g. by local slumping)
Deeper seismic: Yellow = Top of chert unit or oceanic crust, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-07A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 40.09392	Distance to Land: (km)	201
Longitude:	Deg: 144.32612		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7560

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-07A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 3092 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR243_mig Position: CDP 8445 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-07A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

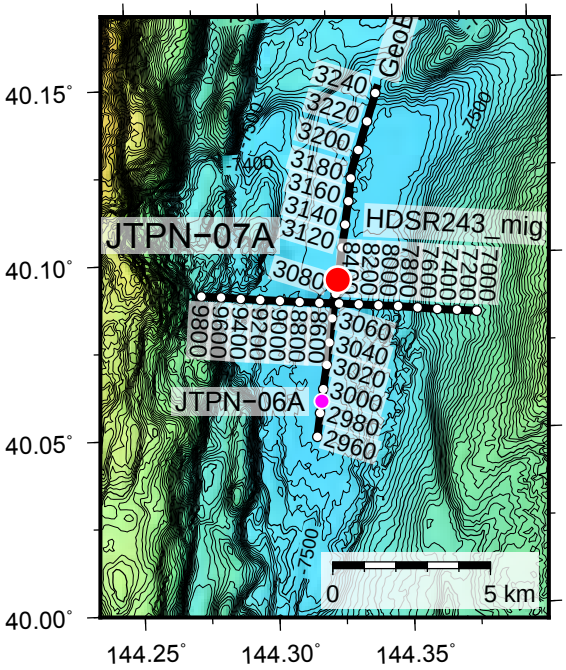
Proposal #: 866 - Full 2	Site #: JTPN-07A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

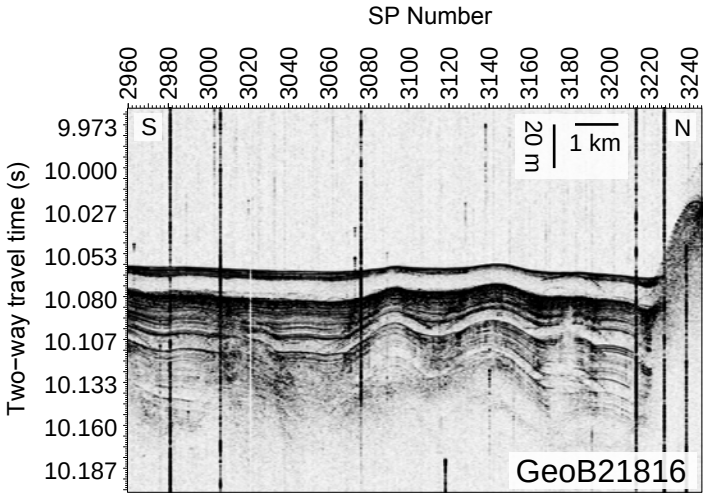
Site JTPN−07A (Primary)

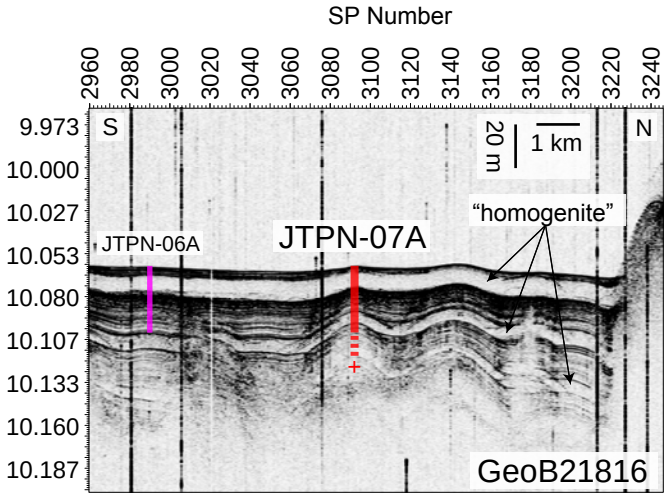
Site Summary Form 6

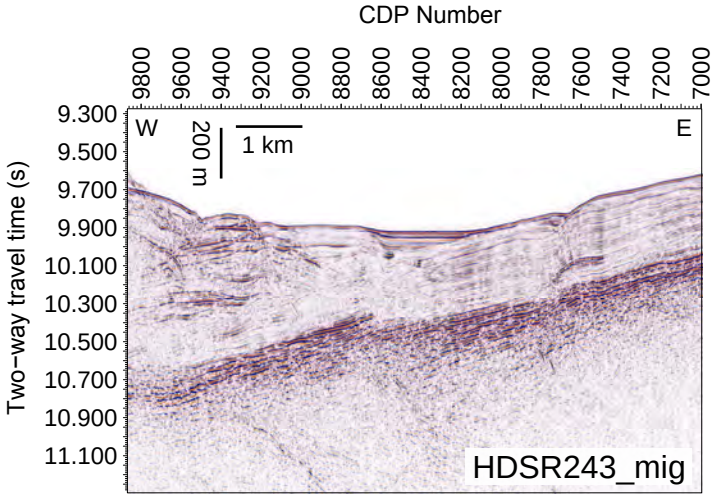


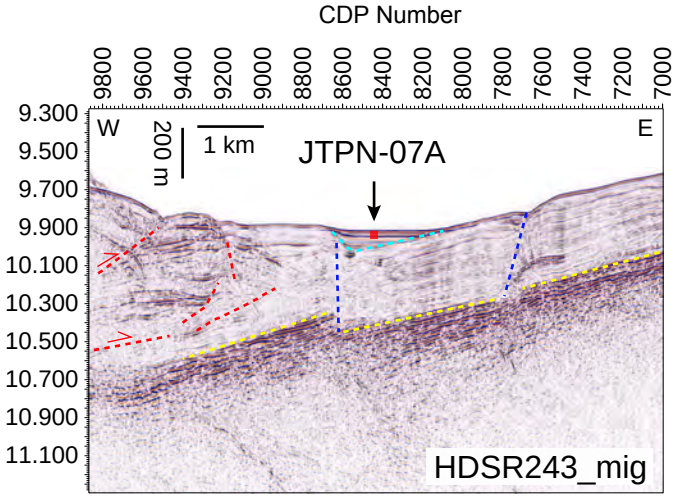
Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−07A
SP 3092 on GeoB21816
CDP 8445 on HDSR243_mig









SSDB locations of these graphics and supporting data
Location map: JTPN-07A_Location.pdf
Figures of seismic data:
JTPN−07A_GeoB21816.pdf & JTPN−07A_HDSR243_mig.pdf
SEG−Y data:
JTPN−07A_GeoB21816.sgy & JTPN−07A_HDSR243_mig.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several m-thick homogenites. This is the condensed section relative to JTPN-06A.
Deeper seismic: Yellow = Top of chert unit or oceanic crust, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-08A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 40.32440	Distance to Land: (km)	202
Longitude:	Deg: 144.40110		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7600

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-08A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 3675 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
2a Deep penetration seismic reflection (primary)	yes	Line: HDSR271_mig Position: CDP 8029 high-resolution multichannel seismic data
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 2a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-08A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

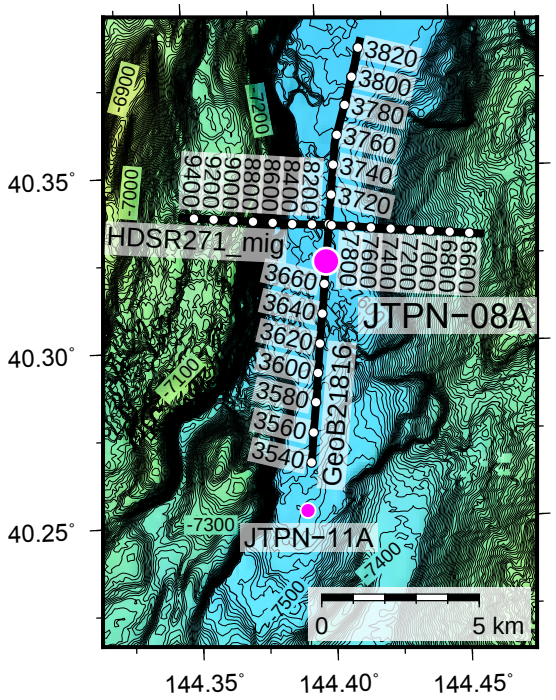
Proposal #: 866 - Full 2	Site #: JTPN-08A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

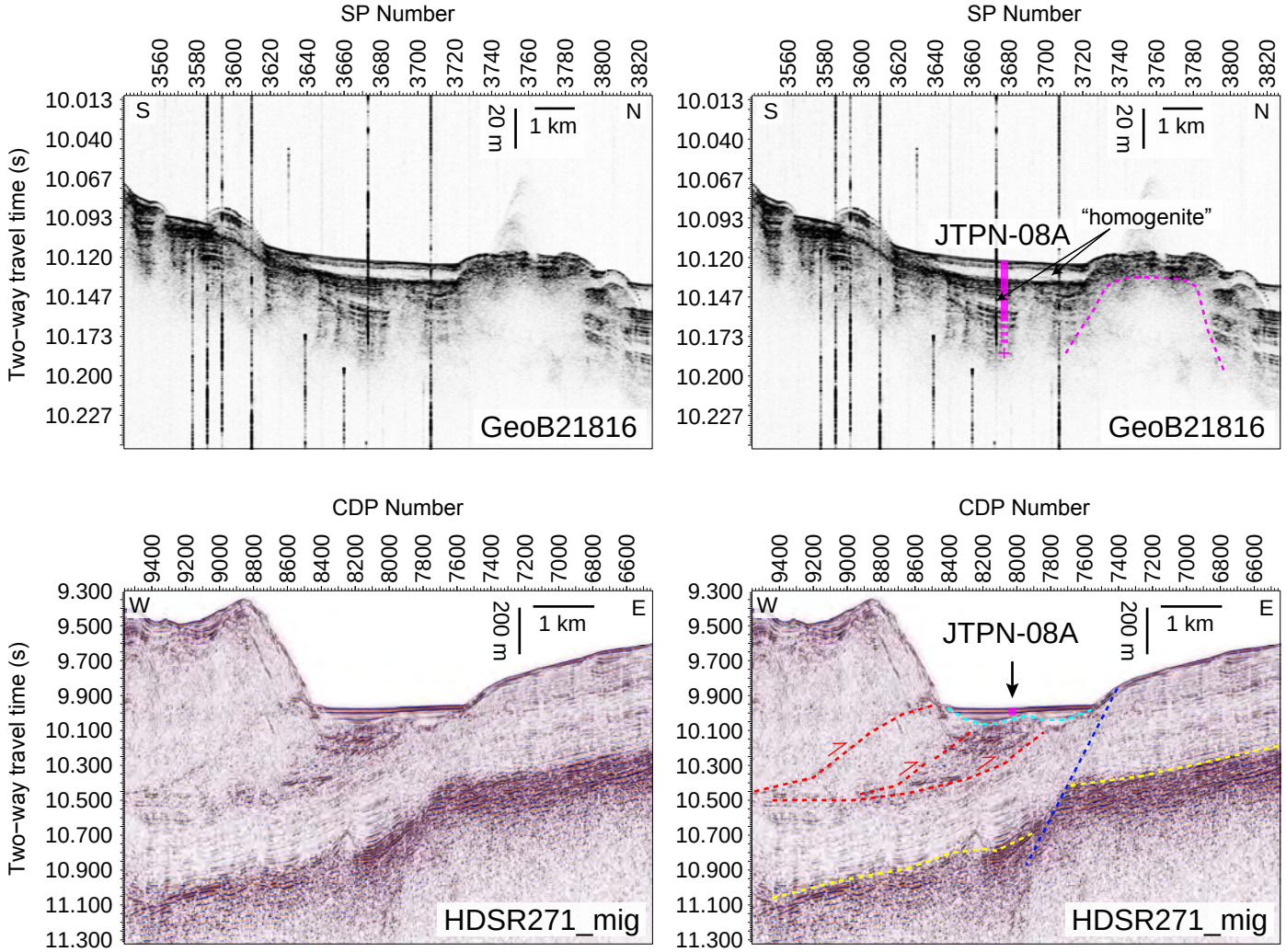
Site JTPN−08A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−08A
SP 3675 on GeoB21816
CDP 8029 on HDSR271_mig



SSDB locations of these graphics and supporting data
Location map: JTPN-08A_Location.pdf
Figures of seismic data:
JTPN−08A_GeoB21816.pdf & JTPN−08A_HDSR271_mig.pdf
SEG−Y data:
JTPN−08A_GeoB21816.sgy & JTPN−08A_HDSR271_mig.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several m-thick homogenites.
Magenta = Top of deformed trench-fill deposits (e.g. by local slumping)
Deeper seismic: Yellow = Top of chert unit or oceanic crust, Cyan = Base of trench fill, Blue = Horst-graben normal faults, Red = Frontal prism thrust faults

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-09A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Japanese EEZ
Latitude:	Deg: 40.39568	Distance to Land: (km)	196
Longitude:	Deg: 144.42047		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7620

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	40	0
Total Sediment Thickness (m)	40	
Total Penetration (m):	40	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers

Basement: none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-09A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 3846 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	yes	Line: GeoB21818 Position: SP 968 high-resolution subbottom data (Parasound)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a and 1b)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	yes	GeoB21817
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a & 1b
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-09A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (40 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

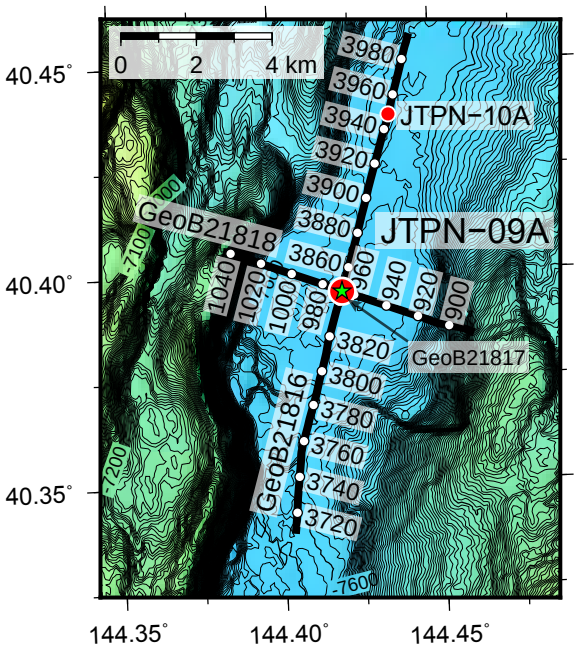
Proposal #: 866 - Full 2	Site #: JTPN-09A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

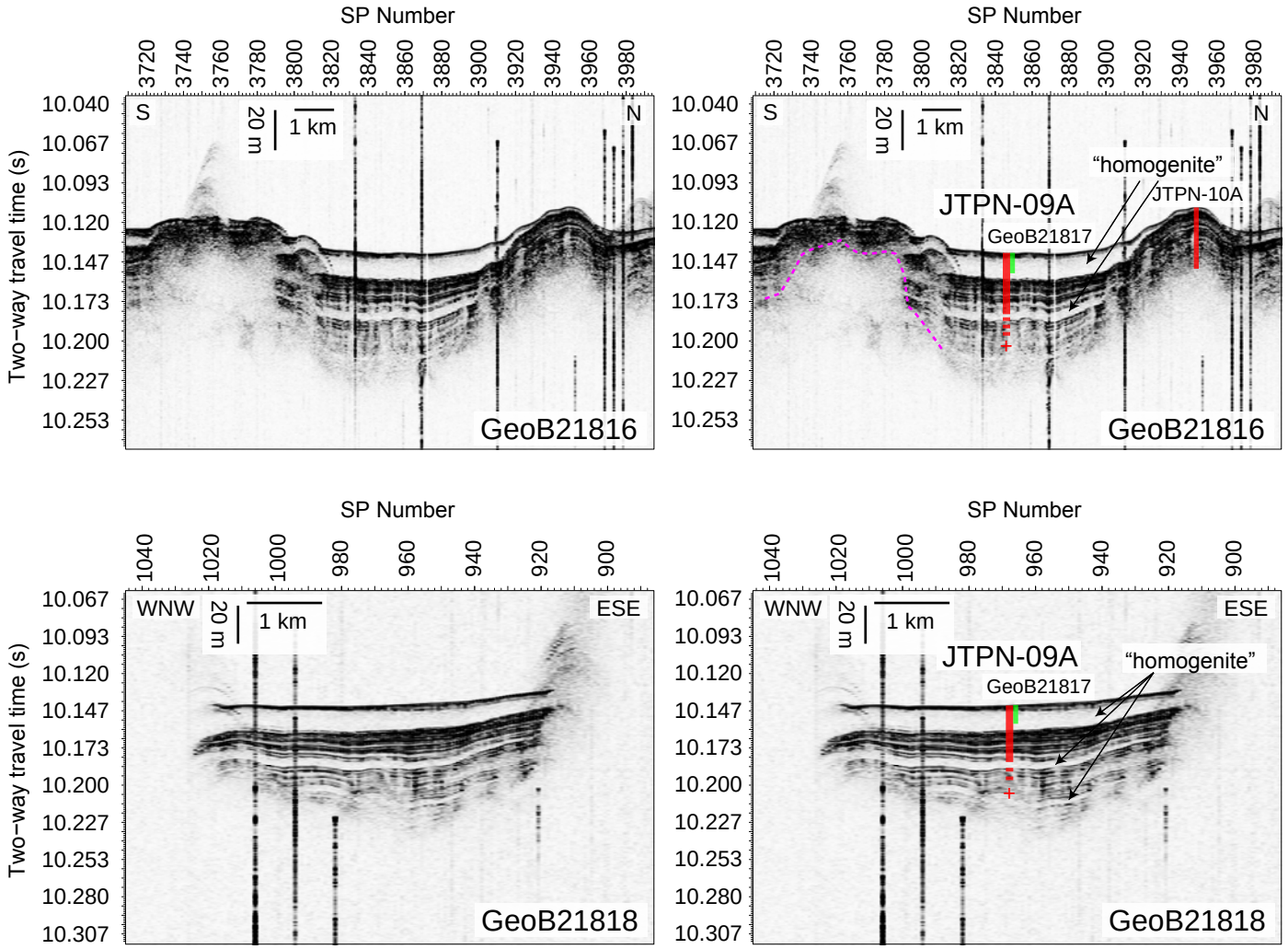
Site JTPN−09A (Primary)

Site Summary Form 6



Profiles annotated using shot point (SP) numbers

Site JTPN−09A
SP 3846 on GeoB21816
SP 968 on GeoB21818



SSDB locations of these graphics and supporting data
Location map: JTPN-09A_Location.pdf
Figures of seismic data:
JTPN−09A_GeoB21816.pdf & JTPN−09A_GeoB21818.pdf
SEG−Y data:
JTPN−09A_GeoB21816.sgy & JTPN−09A_GeoB21818.sgy
Figures of reference core data: GeoB21817.pdf

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites, thin tephra layers and several-m-thick homogenites. This is the expanded section relative to JTPN-10A.

Magenta = Top of deformed trench deposits (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-10A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 40.43742	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.43687	Distance to Land: (km)	193
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	7600

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-to-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers | none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-10A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 3949 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (SyQwest-Bathy2010) is planned during upcoming cruise MR17-06 (R/V Mirai: Oct. 5-14, 2017)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 10-m cores is planned during upcoming cruise MR17-06 (R/V Mirai: Oct. 5-14, 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-10A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

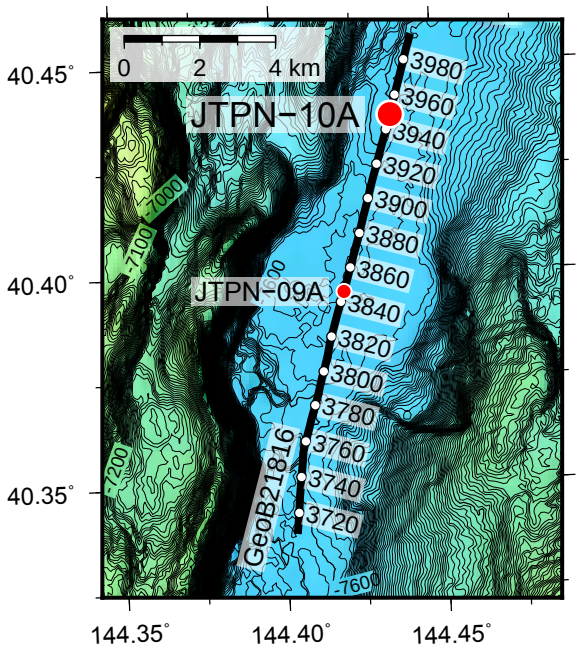
Proposal #: 866 - Full 2	Site #: JTPN-10A	Date Form Submitted: 2017-10-05 19:55:01

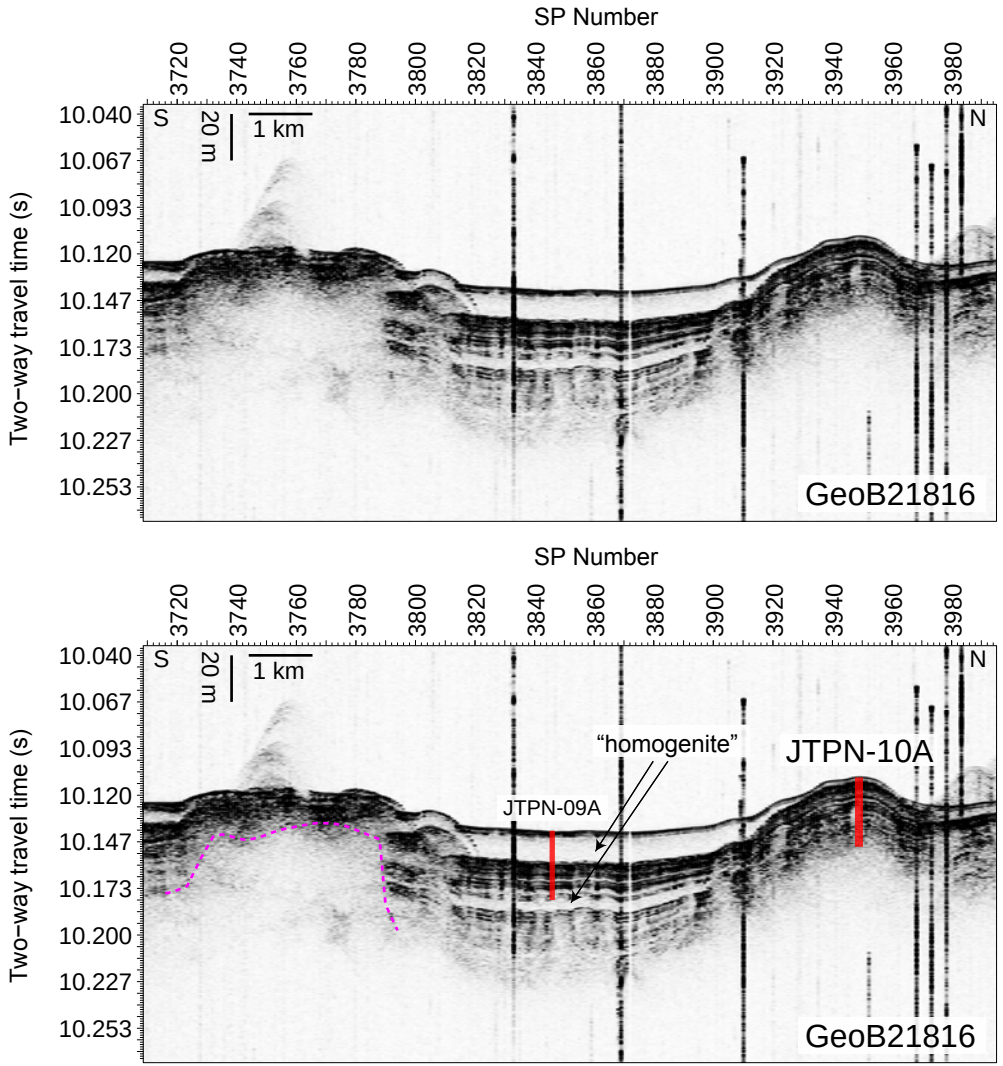
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to m-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

Site JTPN−10A (Primary)

Site Summary Form 6





Profiles annotated using shot point (SP) numbers

Site JTPN−10A
SP 3949 on GeoB21816

SSDB locations of these graphics and supporting data
Location map: JTPN-10A_Location.pdf
Figures of seismic data:
JTPN−10A_GeoB21816.pdf
SEG−Y data:
JTPN−10A_GeoB21816.sgy

Interpretation
Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers. This is the condensed section relative to site JTPN-09A comprising thick homogenites.
Magenta = Top of deformed trench-fill deposits (e.g. by local slumping)

IODP Site Forms

Form 1 – General Site Information

866 - Full 2

Section A: Proposal Information

Proposal Title	TRACKing past earthquakes in the sediment record along the Japan Trench: Testing and developing submarine Paleoseismology in the deep sea (JTRACK-Paleoseismology)
Date Form Submitted	2017-10-05 19:55:01
Site-Specific Objectives with Priority (Must include general objectives in proposal)	(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).
List Previous Drilling in Area	DSDP Leg 56/57, 87, ODP Leg 186, IODP Expedition 343

Section B: General Site Information

Site Name:	JTPN-11A	Area or Location:	Japan Trench
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 40.25341	Jurisdiction:	Japanese EEZ
Longitude:	Deg: 144.39081	Distance to Land: (km)	209
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	7550

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	30	0
Total Sediment Thickness (m)	30	
Total Penetration (m):	30	

General Lithologies: diatomaceous mud intercalated with cm-m-thick, fine-sand to mostly muddy turbidites and thin tephra layers | none

Coring Plan: (Specify or check): piston coring

APC ☐ XCB ☐ RCB ☐ Re-entry ☐ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☐	Magnetic Susceptibility	☐	Other tools:
Porosity	☐	Borehole Temperature	☐	
Density	☐	Formation Image (Acoustic)	☐	
Gamma Ray	☐	VSP (walkaway)	☐	
Resistivity	☐	LWD	☐	
Sonic (Δt)	☐			
Formation Image (Res)	☐			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☐			

Other Measurements:

Estimated Days: Drilling/Coring: 1.5 | Logging: | Total On-site: 1.5

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas ☐	Complicated Seabed Condition ☐	Hydrothermal Activity ☐	Preferred weather window
Hydrocarbon ☐	Soft Seabed ☐	Landslide and Turbidity Current ☑	March to early September is preferable because of strong winds in autumn and winter
Shallow Water Flow ☐	Currents ☐	Gas Hydrate ☐	
Abnormal Pressure ☐	Fracture Zone ☐	Diapir and Mud Volcano ☐	
Man-made Objects (e.g., sea-floor cables, dump sites) ☐	Fault ☐	High Temperature ☐	
H_2S ☐	High Dip Angle ☐	Ice Conditions ☐	
CO_2 ☐			

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 866 - Full 2	Site #: JTPN-11A	Date Form Submitted: 2017-10-05 19:55:01

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	yes	Line: GeoB21816 Position: SP 3507 high-resolution subbottom data (Parasound)
1b High resolution seismic seismic reflection (crossing)	no	Acquisition of high-resolution subbottom data (Topas) is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
2a Deep penetration seismic reflection (primary)	no	
2b Deep penetration seismic reflection (crossing)	no	
3 Seismic Velocity	no	
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	We consider high-resolution subbottom data as our primary high-resolution reflection data (see 1a)
7 Swath bathymetry	yes	high-resolution bathymetry grid (100m grid size) collected with EM 122 KONGSBERG multibeam echosounder system installed on the new R/V Sonne
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	Taking of 4-to-10-m cores is proposed for Japanese Fiscal Year 2018 (proposal submitted in September 2017)
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Navigation data of 1a
17 Other	no	

Proposal #: 866 - Full 2	Site #: JTPN-11A	Date Form Submitted: 2017-10-05 19:55:01

Pollution & Safety Hazard	Comment
1. Summary of operations at site	shallow subsurface (30 m) piston coring
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	none
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	none
4. Indications of gas hydrates at this location	no
5. Are there reasons to expect hydrocarbon accumulations at this site?	no
6. What "special" precautions will be taken during drilling?	n.a. (shallow subsurface piston coring)
7. What abandonment procedures need to be followed?	n.a. (shallow subsurface piston coring)
8. Natural or manmade hazards which may affect ship's operations	All coring sites are placed >8 km away from submarine cables
9. Summary: What do you consider the major risks in drilling at this site?	operating piston coring in ultra-deep waters

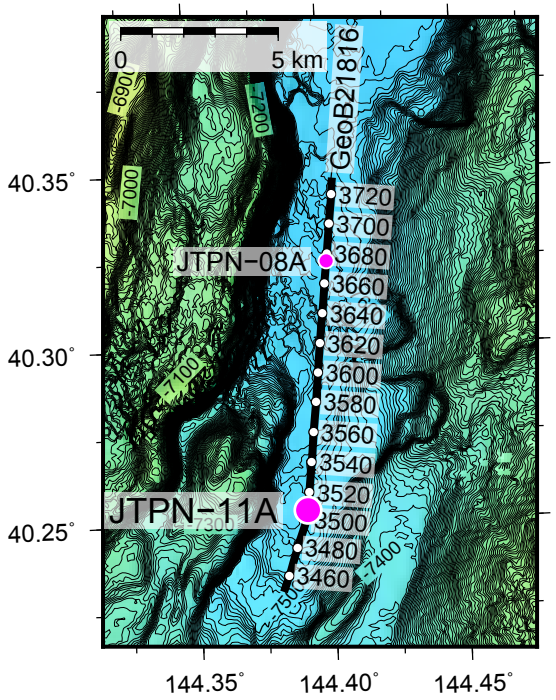
Proposal #: 866 - Full 2	Site #: JTPN-11A	Date Form Submitted: 2017-10-05 19:55:01

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
30 - 50	interbedded cm to dm-thick, fine-sand to mostly muddy turbidites and thin tephra layers	max 0.001	1550	dominantly diatomaceous mud	deep-sea hadal trench	10-3 m/ka	

Proposal 866−Full2

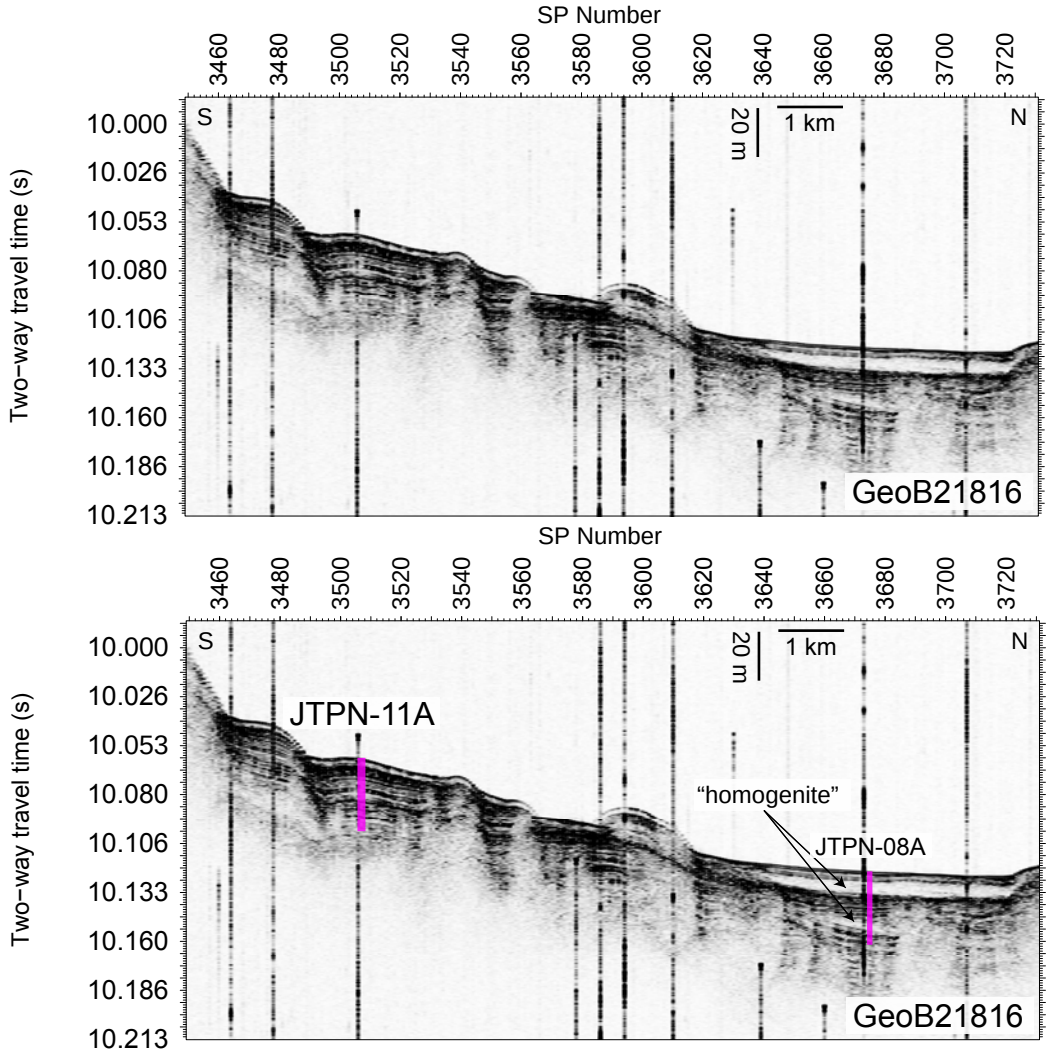
Site JTPN−11A (Alternate)

Site Summary Form 6



Profiles annotated using shot point (SP) and CDP numbers

Site JTPN−11A
SP 3507 on GeoB21816



SSDB locations of these graphics and supporting data
Location map: JTPN-11A_Location.pdf
Figures of seismic data:
JTPN−11A_GeoB21816.pdf
SEG−Y data:
JTPN−11A_GeoB21816.sgy

Interpretation

Undisturbed trench-basin-fill succession of dominantly diatomaceous mud interbedded with cm- to dm-thick muddy turbidites and thin tephra layers. This is the condensed section relative to site JTPN-08A comprising thick homogenites.