Received 1 April 2005

IODP Proposal Cover Sheet

603D-Full2

☐ **New** ☒ **Revised** ☐ **Addendum**

Please fill out information in all gray boxes

Above For Official Use Only

Title:	The Nankai Trough Seismogenic Zone Experiment: Observatory Science at the Reference Sites		
Proponent(s):	Elizabeth Screaton, Michael Underwood, Demian Saffer, Kelin Wang, Geoff Wheat, Koichiro Obana, Greg Moore, Kevin Brown, Juichiro Ashi		
Keywords: *(5 or less)*	Subduction inputs; hydrogeology; long-term observatories	Area:	Nankai Trough Shikoku Basin

Contact Information:

Contact Person:	Elizabeth Screaton		
Department:	Department of Geology		
Organization:	University of Florida		
Address	PO Box 112120, 241 Williamson, Gainesville FL 32611 USA		
Tel.:	(352) 392-4612	Fax:	(352) 392-9294
E-mail:	screaton@ ufl.edu		

Permission to post abstract on IODP-MI Sapporo Web site: ☒ Yes ☐ No

Abstract: (*400 words or less)*

The NanTroSEIZE Complex Drilling Plan describes a multi-phase strategy to get at the root cause of the transition from stable sliding to stick-slip fault behavior -- by intersecting the "seismogenic conveyor belt" of Nankai Trough on either side of its up-dip limit of seismicity. With a campaign of coring, logging, downhole measurements, and long-term observatory science, NanTroSEIZE will test hypotheses concerning the onset of seismogenic behavior and locking of subduction thrusts. Characterizing the inputs to the seismogenic zone through examination of reference sites is a vital component of NanTroSEIZE. This revised full proposal outlines scientific rationale and plans for installation of long-term borehole observatories at NantroSEIZE reference sites. Monitoring at these observatories serves two distinct purposes. First, the observatories will provide information on material properties and background geophysical and geochemical conditions. The state of stress and strength of coupling on the plate-boundary fault are acutely sensitive to 3-D variations in pore pressure, and these pore pressures will be greatly affected by the distribution and permeability of turbidites and the permeability of the ocean crust. Second, observatories allow us to detect temporal changes in the geophysical or geochemical conditions and even the material properties. Temporal changes include the gradual stress build-up during the interseismic period. Associated variations in the thermal and hydrological regimes, and episodic seismic and aseismic strain events, could show how the seismogenic zone adjusts to new conditions caused by the stress build-up, which elevates predictive understanding of the seismogenic zone. Two reference sites in Shikoku Basin, on a basement high and basement plain, will show how stratigraphy, basement topography, and thermal structure affect the physical and hydrologic properties of subduction inputs. Each will require a pair of screened intervals: one targeting open basement and one targeting the overlying sediment. A site located 7 km seaward of the deformation front will indicate how far pressure and chemistry anomalies are transmitted seaward of the deformation front. CORK monitoring at the toe of the accretionary prism will isolate temperature and pressure signals in the frontal décollement from signals in the subducting turbidites. A second shallow observatory at the prism toe will monitor micro-seismicity and strain. An observatory in Kumano Basin provides an important complement to background and transient data obtained within and seaward of the mega-splay system. This monitoring network will provide a vital context for observations within the plate boundary fault system.

603D-Full2

Scientific Objectives: (*250 words or less*)

Coring, logging, and conventional downhole measurements will commence at four reference sites during Phase I and II of the Nankai Trough Seismogenic Zone Experiment. This proposal describes scientific objectives for long-term borehole observatories to be installed at four of these sites and one additional site. The fundamental objectives of the proposed observatory science are to map background properties of the incoming sediment and crust and to monitor temporal changes associated with the seismic cycle. Specific objectives include:
(1) Monitor the differences in hydrologic properties and fluid-flow signals where basement highs are subducting versus where basement plains are subducting.
(2) Determine if, where, and why compartments of excess pore pressure develop seaward of the deformation front; if present, determine their effect on early-subduction fault dynamics.
(3) Compare hydrologic properties and fluid-flow signals in turbidite sand bodies before and after they have passed beneath the toe of the accretionary prism Assess the role of these turbidite sand bodies in drainage of deeper sediments, and impacts of drainage on plate boundary strength.
(4) Monitor hydrologic properties and fluid-flow signals within the frontal décollement zone for rigorous comparison against properties and flow in subducted sand lenses beneath the décollement.
(5) Determine how basement fluid flow influences margin-scale patterns of heat flow and fluid flow.
(6) Monitor micro-seismicity, strain, and fluid flow response to tectonic events.

Please describe below any non-standard measurements technology needed to achieve the proposed scientific objectives.

Proposed Sites:

Site Name	Position	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
NT1-01A	Lat: 32° 44.8878'N Long: 136° 55.0236'E	3540	460m	40m	500m	One CORK hole with screened interval in position equivalent to turbidites and sealed basement. Companion CORK hole with fully cased sediment & open basement.
NT1-02A	Lat: 32° 47.4996'N Long: 137° 09.2784' E	4210	730m	40m	770m	One CORK hole with screened interval in turbidites and sealed basement. Companion CORK hole with fully cased sediment and open basement.
NT1-03A	Lat: 33° 01.23258'N Long: 136° 47.9485'E	4125	1200m	0m	1200m	CORK monitoring of décollement and turbidites; will not extend to basement. Monitor micro-seismicity and strain.
NT1-05A	Lat: 33° 01.3482'N Long: 137° 3.3432'E	4310	1528m	40m	1568m	One CORK hole with screened intervals in turbidites and sealed basement. Companion CORK hole with fully cased sediment and open basement.
NT1-06A	Lat: 32° 51.35'N Long: 137° 17.58'E	4200	990m	40m	1030m	Alternate to NT1-02A. One CORK hole with screened interval in turbidites and sealed basement. Companion CORK hole with fully cased sediment and open basement.
NT2-04A	Lat: 33° 23.4'N, Long: 136° 34.6'E	1990	1400m forearc basin	40m acoustic basement	1440m	One CORK hole with screened intervals in sediments. Monitor micro-seismicity and strain.