

# Report of NanTroSEIZE Project Management Team Meeting

San Francisco –December 8<sup>th</sup>, 2005

## Attendance

### *Core Members*

Tom Janecek	IODP-Management International, Washington, DC, USA
Gaku Kimura	Department of Earth & Planetary Science, University of Tokyo
Masa Kinoshita	JAMSTEC/IFREE, Japan
Shin'ichi Kuramoto	Center for Deep Earth Exploration (CDEX), JAMSTEC, Japan
Hans Christian Larsen	IODP-Management International, Sapporo, Japan
Harold Tobin	Dept of Earth & Environmental Science, New Mexico Tech, USA
Mike Underwood	Dept of Geological Sciences, University of Missouri, USA

### *Technical Implementation Members*

Adam Klaus	JOI Alliance, Texas A&M University, USA
Jack Baldauf	JOI Alliance, Texas A&M University, USA
Yoshi Kawamura	JAMSTEC, Japan
Jerry Itturino	JOI Alliance, Lamont-Doherty Earth Observatory, USA
Mary Reagan	JOI Alliance, Lamont-Doherty Earth Observatory, USA

### *Guests and Liaisons*

Keir Becker	RSMAS, University of Miami, Miami, USA
Holly Given	USSSP, JOI, Washington, DC, USA
Greg Moore	Dept of Geology and Geophysics, University of Hawaii, USA

## Agenda

- 1) Brief Review of Proposed Stage 1 Operations
- 2) Determine Specific Stage 1 operations for each platform
- 3) Specific Expedition plans
- 4) Collaborations between platforms
- 5) Co-chief scientist selections
- 6) Next meeting date and agenda

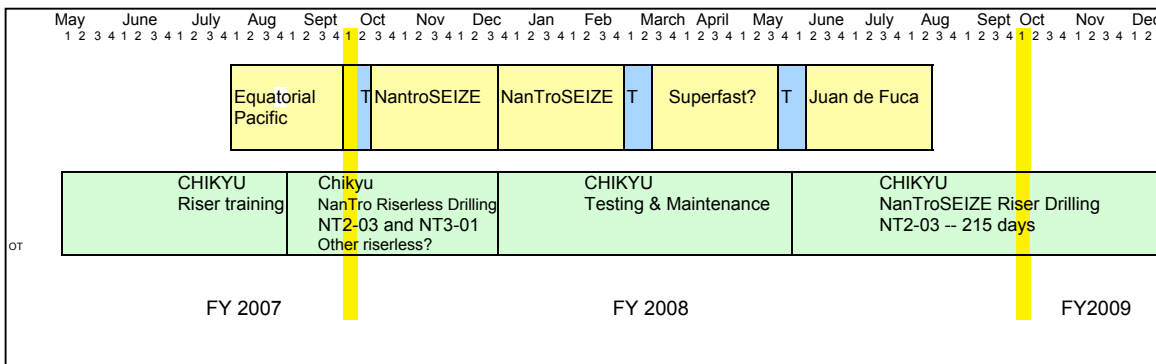
**1) Review of Stage 1 operations and FY07/08 Operations (Appendix 1)**

The meeting began with the chair providing (1) a short review of the proposed Stage 1 plans for NanTroSEIZE developed at the August 2005 PMT in Hawaii and (2) a summary of the FY07/FY08 schedule as developed by the Operations Task Force (Oct 2005) and approved by Science Planning Committee (Oct 2005). Stage 1 operations consist of:

**Table 1: PMT Stage 1 prioritization (From August 2005 PMT meeting)**

NT2-03:	pilot hole coring and logging (~1000 m)
NT1-01:	coring and logging
NT1-07:	coring and logging
NT1-03:	coring and logging
NT2-01:	coring and logging (of 1 hole in pair)
NT3-01:	pilot hole coring and logging (~1340 m)
NT3-01 :	preliminary CORK operation

Subsequent to the August 2005 PMT meeting, the Operations Task Force developed a schedule for FY07/08 operations that included riserless operations for both the Chikyu and the USIO-SODV vessel (See Figure 1, below). The schedule has a 4-month block of time dedicated to Chikyu riserless operations (focusing on pilot holes for the future riser sites NT2-03 and NT3-01). The USIO-SODV NanTroSEIZE operations were not specifically defined by the OTF, but two expeditions were dedicated to NanTroSEIZE Stage 1 riserless operations.



**Figure 1: FY07/FY08 USIO and CDEX operations as approved by OTF and SPC.**

## 2) Specific Stage 1 operations for each platform

The main focus of this PMT meeting was to develop a more specific plan for Stage 1 operations for both the USIO-SODV and Chikyu (i.e., divide the Stage 1 operations into expedition-sized operations).

The PMT used the OTF/SPC approved set of operations (see Figure 1, above) and the following guidelines to help develop an initial expedition plan:

- (1) Riserless operations at NT203 and NT3-01 were allocated to Chikyu.
- (2) The CORK at NT3-01 should be installed by the same vessel that drills the pilot hole.
- (3) For logistical and cost efficiencies, LWD operations are best conducted by one vessel during one operation.
- (4) To assist staffing, groupings of “Stratigraphic” sites (NT1-1 / NT1-7 / NT3-1 / NT2-3) and “Structural” sites (NT1-3 / NT2-1) are preferred.

The initial attempt at dividing Stage 1 operations between platforms resulted in the following draft plan (Table 2, below).

**Table 2:** First draft of the division of operations between Chikyu and USIO-SODV

<b>CDEX</b>	<b>USIO</b>
NT2-03 Pilot Hole	All Sites LWD
NT3-01 Pilot Hole	NT1-01 –reference site
NT3-01 CORK	NT1-07 – reference site
<i>NT2-01?</i>	<i>NT1-03?</i>

In this initial plan, the pilot holes for the riser sites were to be drilled by Chikyu (per OTF/SPC recommendations) with CORK operations for NT3-01 also allocated to Chikyu. LWD operations were allocated to the USIO, as they have considerable experience in these operations. In addition, the reference (stratigraphic) sites NT1-01 and NT1-07 were allocated to the USIO to provide a coherent expedition for staffing.

However, allocating operations for NT2-01 and NT1-03 proved problematic. The sites should be paired as “structural” sites to enhance staffing efficiency, but they could not be paired together on either platform in this scenario as the time necessary to conduct the operations would overrun the allocated time.

The PMT attempted to rectify this situation by allocating both structural sites to the USIO as shown in Table 3 below.

**Table 3:** *Second draft of the division of operations between Chikyu and USIO-SODV*

<b>USIO</b>	<b>CDEX</b>
LWD all sites	NT2-03 Pilot Hole
NT2-01	NT3-01 Pilot Hole
NT1-03	NT3-01 CORK
NT1-07	
NT1-01	

This plan provided for one “stratigraphic” expedition (NT1-07; NT1-01), one “structural” expedition (NT2-01; NT1-03) and one LWD expedition for the USIO. Three separate expeditions for the Chikyu were envisioned with this plan, including two pilot hole expeditions (NT2-03, and NT3-01) and one observatory installation expedition. This plan, however, left as much as 60 days of unallocated time to Chikyu operations.

The PMT then discussed moving NT3-01 operations to the USIO to take advantage of their considerable experience in setting CORKs and moving LWD operations to the Chikyu. These changes resulted in the operations outlined in Table 4 (below)

**Table 4:** *Third draft of the division of operations between Chikyu and USIO-SODV*

<b>USIO</b>	<b>CDEX</b>
NT3-01	NT2-03 Pilot Hole
NT3-01 CORK	All Sites LWD
NT1-07	NT2-01
NT1-01	NT1-03

This plan provides a more even distribution of time and has the benefit of putting most of the “Stratigraphic” sites together as well as keeping CORK and NT3-01 coring operations together. LWD operations, NT2-03 Pilot hole drilling and “Structural” sites NT2-01 and NT1-03 were allocated to Chikyu, providing high-visibility initial operations to both platforms.

### **3) Expedition plans**

The PMT discussed how to allocate operations defined in Table 4 (above) into viable expeditions for staffing. The expedition breakdown was fairly obvious and was done according to similarities of operations and/or science objectives (See Table 5, below).

**Table 5:** Expedition breakdown for NanTroSEIZE Stage 1 operations

<b>USIO expeditions</b>	<b>CDEX expeditions</b>
Expedition #1 NT1-07 NT1-01	Expedition #1 LWD all sites
Expedition #2 NT3-01 riserless coring NT3-01 CORK	Expedition #2 NT2-03 Pilot Hole
	Expedition#3 Fault targets NT1-03 NT2-01

***Additional Discussion of Operations (Appendix 2)***

The timing of 3D Seismic Survey operations and the subsequent interpretation to define precise site locations for drilling was discussed, especially with respect to determining contingencies and alternate sites and obtaining required permits. The PMT is very concerned about the lack of a survey contract at this time. Any delay at this point will be very problematic. Shin'ichi Kuramoto outlined the planned timetable for the acquisition and interpretation of 3D data. If all efforts go according to schedule, interpretation should be concluded towards the end of 2006. This timetable would fit into the required review process by EPSP (December 2006), but any delay would put the permitting process in danger and potentially delay FY07 operations.

NT3-01 operations will require an offset VSP, which will most likely involve both US and Japanese vessels. Operational protocols will need to be developed by both IOs in order to obtain the required permits to operate in the area.

Two specific action Items resulted during the discussion expedition planning:

**Action Item 0512-01:** For next PMT meeting (Feb, 2006), USIO and CDEX to develop more detailed operational timetables for the expeditions listed in Table 5.

**Action Item 0512-02:** An initial protocol document for LWD operations conducted prior to coring will need to be developed by CDEX and submitted for review at the June 2006 EPSP meeting.

### **3) Collaborations between platforms (Appendix 3)**

The PMT and IOs recognize that ensuring consistency of data analyses between platforms and expeditions will be extremely important for an operation like NanTroSEIZE. To provide this consistency, Mike Underwood presented a very detailed plan (see Appendices) for establishing Lead Scientific Specialists for the various disciplines including:

1. Lithostratigraphy and Petrology
2. Age Correlation
3. Structural Geology
4. Geotechnical Properties and Hydrogeology
5. Geochemistry
6. Logging
7. Core-log-seismic integrations

The PMT members (and guests) had numerous questions and concerns surrounding this issue including such items as (1) overlap of roles/responsibilities with co-chief scientists and staff scientists, (2) length of service, (3) Selection criteria, (4) roles of National Offices in selection and funding. However, all the participants generally agreed this Lead Scientist Specialist concept is a very good idea but that they needed time to review the presentation in order to provide specific input, especially with respect to roles/responsibilities and funding.

In order to move forward in a timely manner on this issue, the PMT agreed to review this document between this meeting and the next one in February and provide specific concerns/comments to the Co-chief project scientists (Tobin/Kinoshita) and Mike Underwood. The document would be revised and discussed in more detail at the next meeting.

**Action Item 0512-03:** All PMT members to review Lead Scientist Specialist document and provide detailed input to co-chief project scientists (Tobin/Kinoshita) and Mike Underwood. Mike Underwood will incorporate comments and provide a new draft for discussion and potential implementation at next meeting.

#### **4) Co-chief scientist selection**

The PMT discussed co-chief staffing. The IOs had previously been sent a slate of co-chiefs nominations that included both SPC and PMT recommendations. The PMT and IOs agreed to let the NanTroSEIZE PMT co-chief project scientists (Tobin/Kinoshita) provide co-chief recommendations for each expedition shown in Table 5 (above). The PMT recognizes the IOs have to balance staffing needs with overall national balance and thus there may not be a one –to–one match with the PMT recommendations and Stage 1 operations.

The overall goal is to have co-chief invitations sent out by the IOs in early January so that the co-chiefs can become involved in all future planning of specific expedition operations.

**ACTION ITEM 0512-04:** Tobin/Kinoshita to provide IOs with specific PMT co-chief recommendations for each of the expeditions outlined in Section 2 of this report. These recommendations should be given to the IOs by December 24, 2005.

#### **5) Next PMT meeting: date and agenda**

The next meeting will be held in the IODP-MI offices in Sapporo, Japan in late January (Jan 30, 31) or early February (Feb 1-2 or Feb 2-3).

**Action Item: 0512-05:** Chair to work with Sanny Saito in IODP-MI Sapporo office and finalize date.

The following issues (among others) will be part of the next meeting agenda:

- 1) Presentation and discussion of detailed operational estimates for proposed expeditions
- 2) Development of contingencies for permitting process
- 3) Prospectus development (Overarching Stage 1 and individual expeditions)
- 4) Staffing of expeditions
- 5) Sampling protocols
- 6) Finalize Lead Scientist roles and responsibilities
- 7) Name change for NanTroSEIZE?

The chair will solicit additional agenda items over the next month.

## **APPENDICES**

**APPENDIX 1:** Review of Stage 1 operations and FY07/08 Operations

**APPENDIX 2:** Timetable of 3D data acquisition and interpretation

**APPENDIX 3:** Lead Scientist Specialist concept.



## **Appendix 1**

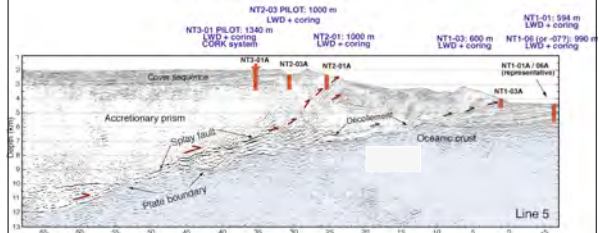
### **Review of Stage 1 operations and FY07/08 Operations**

# IODP NanTroSEIZE Project Management Group

San Francisco, CA  
December 8, 2005



## STAGE 1 Sites and Operations



- 6 sites, all based on riserless drilling
- LWD and coring of sediment section at all sites
- CORK-type system at one site (NT3-01) to monitor pore pressure, seismicity, strain

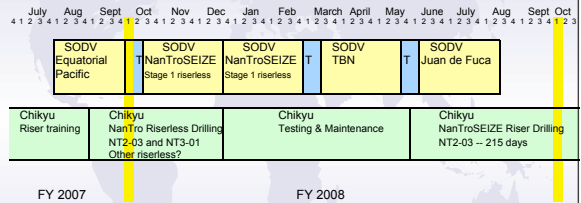


## Stage 1 Prioritization (not necessarily order of operations)

1. NT2-03 pilot hole coring and logging (~1000 m)
2. NT1-01 coring and logging
3. NT1-06 coring and logging (substitution of NT1-07?)
4. NT1-03 coring and logging
5. NT2-01 coring and logging (of 1 hole in pair)
6. NT3-01 pilot hole coring and logging (~1340 m)
7. NT3-01 preliminary CORK operation




## FY07/08 Operations USIO and CDEX



Stage 1 Summary Table							
Location and Water Depth	TD in Stage 1 (mbsf)	Coring/LWD	Anticipated Geology	Wireline	Stage 1 Observatory	Potential Challenges & Drilling Risk	
<b>NT1-01</b> (reference site: basement high)	32° 44.8878' N 136° 55.0236' E 3540m	690m • Core to top of basement • LWD • VSP	hemipelagic beds, turbidites	No	No	None identified	
<b>NT1-06 (or 07)</b> (reference location for site: basal section)	Chicoing 130° 58.6' E 1950m*	-1000m • Core to top of basement • LWD • VSP	hemipelagic beds, turbidites	No	No	Possible unstable sands in LSB facies	
<b>NT1-01</b> <b>PHLOF</b> (planned for later 9km riser site)	33° 17.6' N, 136° 58.6' E 1950m*	1339 m Both core and LWD entire section to -1340 mbsf	a. 1039 m turbidites and hemipelagic beds b. 300m accretionary prism shale and sandstone	WL suite plus offset survey	CORK-II suite, Strain, tilt, temp, pore pressure, seismicity	1. Possible free gas zone associated with gas hydrate reflector at 0.3 sec bsf. 2. Possible unstable sands in upper 100s of m bsf.	
<b>NT1-03</b> (frontal thrust & toe region)	33° 1.23258' N 136° 47.9485' E 4125m	600 m Both core and LWD entire section to TD	600 m turbidites and hemipelagic sediments	WL suite and VSP survey	No	1. Possible unstable hole conditions due to fractured rock 2. Possible unstable sands beneath frontal thrust 3. Possible water overpressures in fault zones(x)	
<b>NT2-01</b> (seaward part of mega-splay)	33° 13.6' N, 136° 42.6' E 2300 m	1000 m Both core and LWD to TD	1000 m turbidites and hemipelagic sediments	WL suite and VSP survey	No	1. Possible free gas although no BSK recognized 2. Unstable hole conditions due to fractured and brecciated rock, possibly with water overpressure at fault zones (0.5s and 1s)	
<b>NT2-01</b> <b>PHLOF</b> (planned for later 3.25 km riser site)	33° 17.6' N, 136° 41.4' E 2200 m	1000 m Core and LWD to TD	1000 m m turbidites and hemipelagic sediments	WL suite, VSP	No	1. Possible free gas although no BSK recognized 2. Possible unstable hole conditions due to fractured and brecciated rock, possibly with water overpressure at fault zones.	

## Agenda

- (1) Specific Stage 1 operations for each platform
- (2) Expedition plan for Chikyu riserless drilling
  - Length?
  - Call for Applications (expedition specific?)
- (3) Collaborations between platforms
  - Lead Scientists
  - Minimum Measurements
  - NanTroSEIZE Specific Measurements
  - Shakedown participation.
- (4) Co-chief scientist selections  
Prospectus Development



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## **Appendix 2**

### **CDEX updates**

Dec. 8, 2005

## 4th PMT Meeting in San Francisco

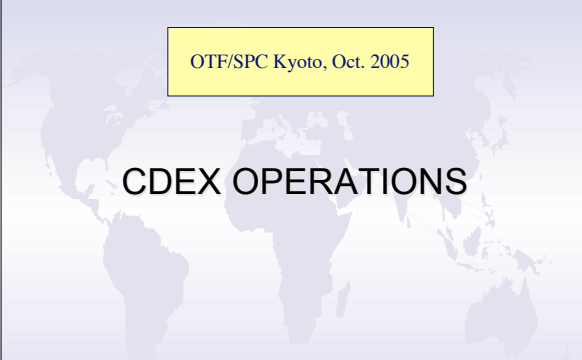



**Kuramoto, S.  
(CDEX/JAMSTEC)**



OTF/SPC Kyoto, Oct. 2005

## CDEX OPERATIONS

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### CDEX Operations - June 05 OTF meeting

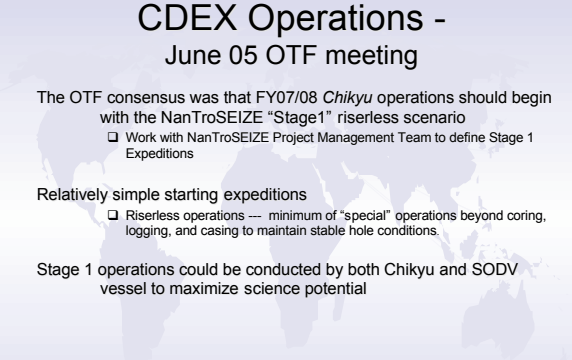

The OTF consensus was that FY07/08 *Chikyu* operations should begin with the NanTroSEIZE "Stage1" riserless scenario

- Work with NanTroSEIZE Project Management Team to define Stage 1 Expeditions

Relatively simple starting expeditions

- Riserless operations --- minimum of "special" operations beyond coring, logging, and casing to maintain stable hole conditions.

Stage 1 operations could be conducted by both *Chikyu* and SODV vessel to maximize science potential

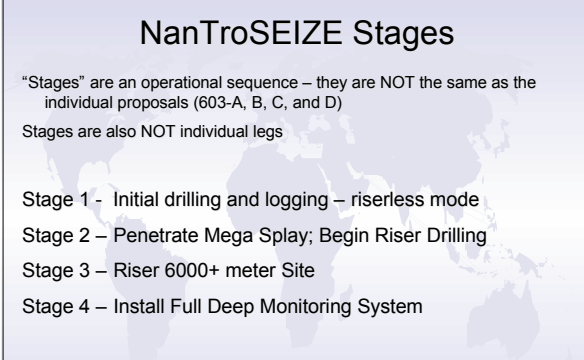

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### NanTroSEIZE Stages

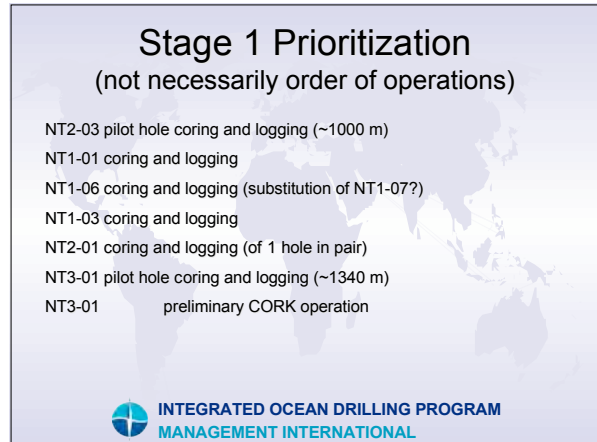
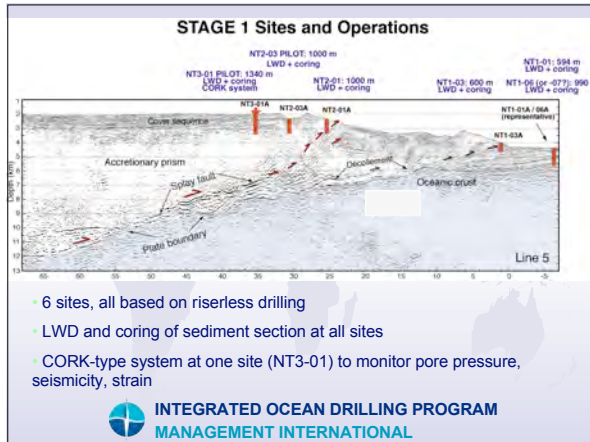
"Stages" are an operational sequence – they are NOT the same as the individual proposals (603-A, B, C, and D)

Stages are also NOT individual legs

- Stage 1 - Initial drilling and logging – riserless mode
- Stage 2 – Penetrate Mega Splay; Begin Riser Drilling
- Stage 3 – Riser 6000+ meter Site
- Stage 4 – Install Full Deep Monitoring System

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### Operations Summary

	Hole Name	Science Support Services	Coring Services	LWD Logging	Wireline Logging	Downhole Measurement	Observatory Installation
Stage 1	NT1-01A (Riserless)	X	X	X			
	NT1-07A (Riserless)	X	X	X			
	NT1-03A (Riserless)	X	X	X	X	X	
	NT2-01A (Riserless)	X	X	X	X		
	NT2-03A (Riserless)	X	X	X	X		
Stage 2	NT3-01A (Riserless)	X	X	X	X		X
	NT1-01A (Riserless)	X	X		X		X
	NT1-07A (Riserless)	X	X		X	X	X
	NT2-01A (Riserless)	X				X	
	NT2-01B (Riserless)	X					X
Stage 3	NT2-04A (Riserless)	X	X	X	X		
	NT2-03A (Riser)	X	X		X		X
	NT1-03A (Riserless)	X	X	X	X		
	NT3-01A (Riser)	X	X		X		X

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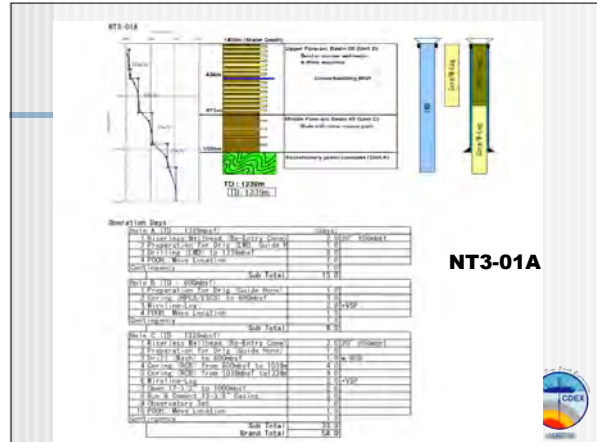
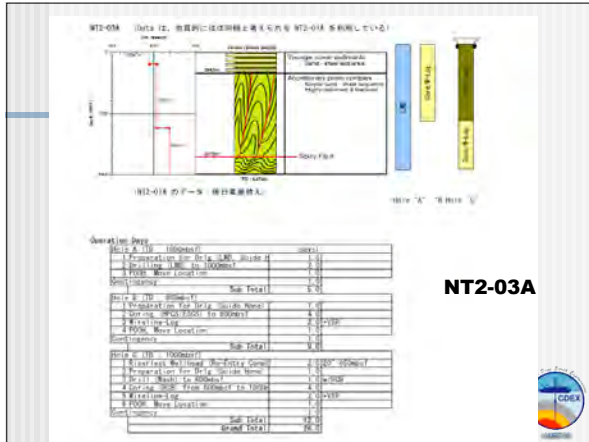
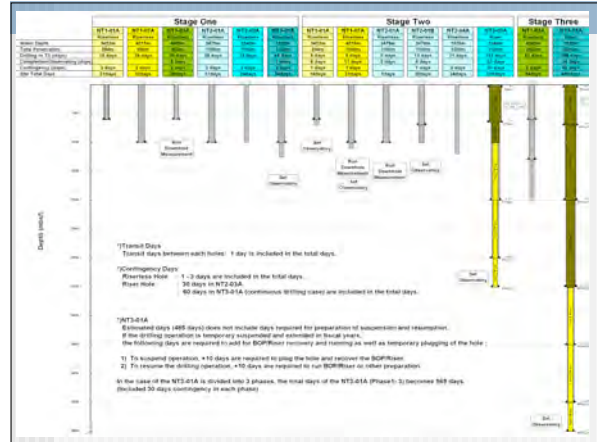
### NantroSEIZE Time Estimates

	Hole Name	Water Depth (m)	Total Penetration (m)	Drilling to TD (days)	Completion/Observatory (days)	Contingency (days)	Site total Days
Stage 1	NT1-01A (Riserless)	3,452	594	18		3	21
	NT1-07A (Riserless)	4,015	990	29		3	32
	NT1-03A (Riserless)	4,069	600	20	5	3	28
	NT2-01A (Riserless)	2,476	1,000	28		3	31
	NT2-03A (Riserless)	2,240	1,000	23		3	26
Stage 2	NT3-01A (Riserless)	1,930	1,339	44	7	5	54
	NT1-01A (Riserless)	3,452	694	9	6	1	16
	NT1-07A (Riserless)	4,015	1,090	9	11	1	21
	NT2-01A (Riserless)	2,476	1,000	0	5		5
	NT2-01B (Riserless)	2,476	1,000	13	6	1	20
Stage 3	NT2-04A (Riserless)	1,925	1,200	21		3	24
	NT2-03A (Riser)	2,240	3,500	152	33	30	215
	NT1-03A (Riserless)	4,069	2,000	52		2	54
Total	NT3-01A (Riser)	1,930	6,000	386	39	60	485
							1,032

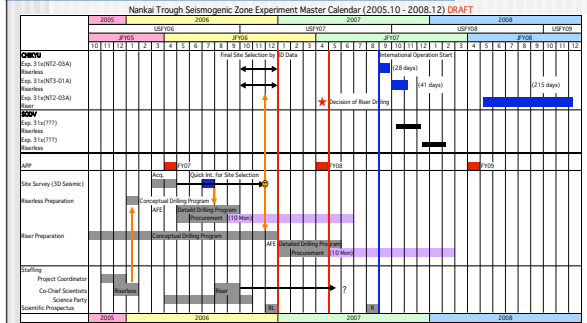
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# CDEX Proposed Drilling Scenario

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	Training		Annual Maintenance Dock		Training		Riser Drilling Exercise					
2007	Riserless Drilling Exercise		Annual Maintenance Dock		Riser Drilling Exercise			NT2-03A & NT3-01A (Riserless)				
2008	Reference? Megasplay? (riserless)		Annual Maintenance Dock		NT2-03A (Riser, 215 Days)							



## Preparation Schedule for the NanTroSEIZE Operation



## CHIKYU General Schedule before International Operation

2005	1	2	3	4	5	6	7	8	9	10	11	12
							Del. 29	SIT			Coring (HPCS)	SIT
2006												
		SIT		(Dock)			SIT					
2007												
		Riser-less Drilling		(Dock)			Riser Drilling (Off Shimokita)					IODP Operation

"Lead Discipline Scientists" will be invited on CHIKYU.



## Other Issue to Consider

- Contingency Plan Development
- Final Site Selection Procedure based on 3-D data
- Staffing
  - "Super Co-Chief" or "Project Coordinators" for the riser drilling expeditions
- Collaboration of IOs
  - Working Group between USIO and CDEX
    - Coordinate logistics, EEZ clearance, negotiation to Fisherman's unions, etc
    - Core curation, Publication, Data management, etc
    - QA/QC, Exchange program, etc
- Nickname
  - NanTroSEIZE is official?
- E&O



## Premises for the Contingency Plan Development

- Riser working condition
  - Kuroshio current
  - Typhoon
- Safety site survey results
  - Topography (flat enough to BOP setting)
  - Optimize target depth



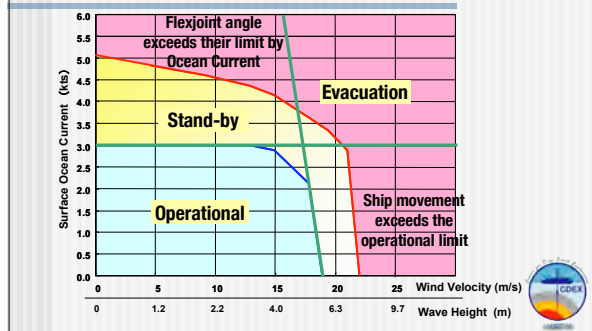


## Working Condition Categories

- **Operational Condition**
  - The condition where all the operations can be conducted.
- **Stand-by Condition**
  - The condition where all the drilling (coring) operations should stop.
    - Wait on Weather
    - Make ready for evacuation, which are to prepare for Drill Strings Hang-off, Riser Disconnect, Riser Hang-off.
- **Evacuation Condition**
  - The condition where the Riser has to be disconnected from BOP and has to be evacuated from the location

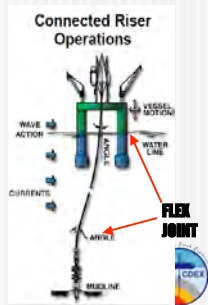


## Operation Windows Chart on Riser Drilling @ 2500m WD



## Meteorological impact

- **Meteorological impact**
  - Wind
  - Wave
  - Currents(Surface)
  - Reactive Force from Riser(subsea currents)
    - Shift the rig from the location
      - Flex joint Angle Control
      - Station Keeping of the rig
    - Ship Movement (Heaving, Pitching, Rolling)
      - Working condition on the rig



Flex joints are used to allow angular misalignment between the riser and the BOP stack, thereby reducing the bending moment on the riser. They are also used at the top of the riser to allow for motion of the rig. (API 16Q)

### Marine Risers Maximum Operating and Design Guidelines (API 16Q)

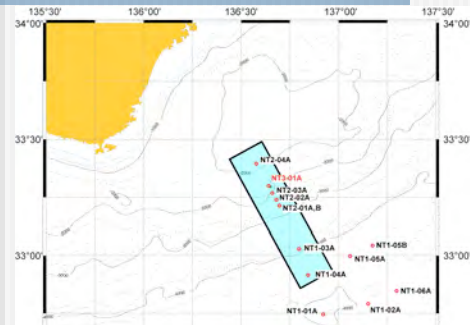
	Drilling	Non-Drilling
Mean Flex Joint Angle (Upr & Lwr)	2.0deg	N/A
Max Flex Joint Angle (Upr & Lwr)	4.0deg	9.0deg

## To Challenge Riser Drilling in NanTroSEIZE

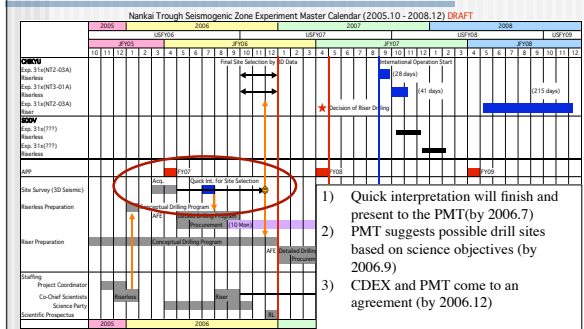
- **Statistics Analysis/Study of Current in NanTroSEIZE Location**
  - Existing applicable data
  - Actual measurement data by current meter
  - Estimation of Kuroshio meandering by Frontier Research Center for Global Change in JAMSTEC (~3 months ahead)
- **Operability study using Current study and Metocean Study**
- **Plan to Test DPS (Station Keeping Test) at proposed NanTroSEIZE Location**



## Final Site Selection Based on the 3-D Seismic Data



## Preparation Schedule for the NanTroSEIZE Operation



## **Appendix 3**

### **Lead Scientist Specialist concept**

## Introduction

- NanTroSEIZE is a multi-expedition, multi-year project that will require an unprecedented amount of coordination among Co-Chief Scientists, Staff Scientists, shipboard scientists, technicians, and Implementing Organizations.
- During their Fall 2005 meeting, the SPC selected a scheduling model in which drilling expeditions on *Chikyu* and the US SODV operate simultaneously in Nankai Trough during FY2007 and FY2008.
- That proposed schedule demands a new type of organizational framework, one that places a high priority on collaboration and continuity among science specialists within each of the major sub-disciplines.

## Lead Science Specialists

- One mechanism for achieving seamless integration of data sets from multiple expeditions (and two platforms) is to appoint Lead Science Specialists.
- At a minimum, we recommend naming Lead Science Specialists in the following seven categories:
  - Lithostratigraphy and petrology
  - Age correlation (paleontology and magnetostrat.)
  - Structural geology
  - Geotechnical properties and hydrogeology
  - Geochemistry
  - Logging (LWD, wireline, P-T)
  - Core-log-seismic integration (including VSP)

## Nominations

- We recommend that the NanTroSEIZE PMT be given the responsibility for nominating Lead Science Specialists.
- Appointments would be subject to approval by IODP-MI and the IOs.
- Criteria for selection would include:
  - Prior research experience in Nankai Trough
  - Proven history of successful interdisciplinary and international collaboration
  - Good communication skills
  - Management style conducive to consensus-building
  - Track record of working harmoniously with fellow Nankai colleagues

## Input from PMOs

- Suggestions from USAC and J-DESC might be helpful for PMT to consider.
- Direct nominations from those committees, however, probably won't provide a knowledgeable assessment of the desired criteria, especially for subtle nuances of team-building.
- National balance is desirable, but it should not be the overriding concern.

## Duration

- Once appointed, a Lead Science Specialist would remain eligible to serve as a shipboard scientist or as a Co-Chief Scientist during any particular expedition.
- Responsibilities as LSS would extend for the duration of the NanTroSEIZE seagoing expeditions, including installations of long-term observatories.
- Appointments would be subject to annual review and renewal by the IOs and PMOs.

## Specific Duties

- Participate in all pre-expedition planning meetings with IOs and PMT.
- Accept primary responsibility for Quality Assurance and Quality Control within the specialty, including inter-laboratory ship-shore calibration.
- Provide consistent hands-on training and written tutorials for shipboard operations within the specialty.
- Supervise daily activities of shipboard scientists within the specialty.
- Assign appropriate divisions of responsibility among shipboard scientists within the specialty.

## Specific Duties

- Foster free and open discussions of data interpretation among specialists (both intra-leg and inter-leg).
- Guide and build consensus for data interpretation among specialists (both intra-leg and inter-leg).
- Help coordinate interdisciplinary data interpretations among Co-Chief Project Scientists, Co-Chief Scientists, and fellow Lead Science Specialists (both intra-leg and inter-leg).
- Meet periodically with all Lead Science Specialists, taking advantage of opportunities of convenience (e.g., crossovers, AGU, PMT meetings, etc.).

## Specific Duties

- Visit both platforms periodically, particularly during expedition crossovers when Staff Scientists, shipboard scientists, technicians, and Co-Chiefs rotate.
- When shore-based, communicate daily with platforms via E-mail and, when warranted, use conference calls or video conferencing to resolve problems.
- Help coordinate sampling plans for each expedition and foster collaborations for essential shore-based lab measurements within the specialty.
- Identify and help rectify gaps or inconsistencies in essential shore-based data sets.

## Specific Duties

- Publicize opportunities to sail within specific science communities (via professional societies) and recruit new participants within each specialty.
- Serve on the Editorial Boards for proceedings volumes (together with Co-Chiefs and Staff Scientists) and co-author expedition summaries.
- Participate in all post-expedition meetings.
- Assist IODP-MI and PMOs with Education and Outreach.
- Deliver written and oral progress reports to the SAS, PMOs, and national committees upon request.

## Funding Model

- Responsibilities will be at least as time-consuming as those assigned to a Co-Chief Scientist.
- Commensurate release time will be required for university professors (and others?).
- Funding model should parallel the long-established precedent for ODP and IODP Co-Chief Scientists.
- Recommendation: Six months of salary per year.**
- Stints as shipboard scientist would be included in the 6 months (total = 6).
- One-time stint as Co-Chief Scientist would add 3 months of salary for that year (total = 9).

