PMT Meeting #11

December 9, 2007 – San Francisco

Serrano Hotel

ATTENDEES

Core PMT members

Harold Tobin
Masa Kinoshita
Shin'ichi Kuramoto
Adam Klaus
Greg Moore
Hans-Christian Larsen

Specialty Coordinators

Geoff Wheat
Demian Saffer

Others

Casey Moore	Stage 2 CC
Saneatsu Saito	Stage 2 CC
MOE Kyaw Thu	Exp. 314 and Stage 2 EPM
Nobu Eguchi	CDEX
Hisao Ito	CDEX
Peter Blum	USIO
Kelly Oskvig	IODP-MI

Contents

1. STAGE 1A STATUS REPORTS

A. Expedition 314

The first operation was LWD, drilled and logged to 1000mbsf, in the upper section at site NT203. Both the pilot hole and logging hole were drilled successfully. The CHIKYU then moved to the second site, NT3-01, where 1400m was drilled with a full suite of logs; no problems were encountered. The third site was a splay-fault at NT2-01 – 500m into the hole, the drillstring was stuck and they lost the drillstring. 200m of bottom hole assembly is now cemented in. 1 week of downtime was lost prior to NT2-01 problems because of DPS failure. Loss of the LWD string caused 7-8 days of additional downtime. They then moved to a shallower site to drill the splay-fault where they successfully crossed the mega-splay fault but not at the depth intended. Then the CHIKYU moved to the frontal thrust zone, successfully drilling into footwall of that thrust. Five sites were drilled, resulting in thousands of meters of logging (minus the radioactive source). Unfortunately, there was no time left to drill the inputs sites.

C0003 – The drill bit stuck on 314 and there is no plan to try again.

C0004 – Drilled to 400mbsf without drilling problems. They were able to cross the fault, which was imaged clearly in the LWD logs.

The crew tried to drill hole C0005, between 03 and 04, but they were not successful and had to pull out.

The transition to 315 went very well; it was a very busy time, but time well spent.

B. Expedition 315

The primary target is to drill as deep as possible at site NT2-03. RCB coring did not reach the 1000mbsf goal. Using RCB with center bit and washdown was decided upon as method of coring. The team chose not to try the conventional core barrel.
Currently, they are planning to core the upper part of the basin (below 500m) and if everything goes well, they will have time to drill to 3 kmbsf. Exp 315 has until Dec. 19 to do this. The interest on board is higher in the lower basin and in the prism. No one on board was prepared for hydrate sampling and to do so would require a change from piston coring to RCB coring which would use time they did not have.

The core techs are ready for piston coring. The DVTPP is fixed but it is not being used as measurements cannot be made with the DVTPP below 500m and it is difficult to use the DVTPP with the RCB because the RCB is not decoupled from the drillstring.

C0001 –successfully drilled to 1000mbsf twice, on Expedition 314. However, a problem was faced with the “sticky” zone, though they drilled through it. For 315, the operators initially wanted to use a conventional standard industry coring system, but they decided not to do this until the end, and now they have decided not to do it at all. There have been many attempts to

core C0001 (now on hole "i"). Casing was not installed at site C0001 as planned due to strong currents and this will be discussed later.

Currently, there are 10 days left on board and they will try to core at C0002 until the very end. There are shallow piston core sites to drill afterwards if for some reason C0002 cannot be cored.

C. Exp. 316 Planning

The first site is C0004 for first coring. LWD data is available and it should be easy to drill. Second site is to move to C0006 for the same reason as C0004. Beacons are set and remain at C0006 – they will need to remove the beacons after operation without the ROV – they will use the support vessel to pick up beacons. There was discussion of using an n underwater camera for future use – while drilling, they will test the camera to see how well it will work for future use. It will take 20 out of 41 days to do this part of the operation (C0004 and C0006).

Assuming there is little chance for better current condition, what should be done next? It is suggested to use experience from ODP 196 (the JR was able to case in high current). 316 will have 27 days left, so why not try to case as one of the options? For many reasons, this cannot be a primary option. One member proposed to drill site 2-01G which was abandoned earlier due to ROV failure. The third option is to drill 2-01G without casing; the RCB BHA could be used without any piston coring to save time as the ultimate goal of this site is to drill down through the fault zone.

The C0001 – C0004 area is most important at this moment. An observatory is needed on this side of the fault, so it is imperative to install casing. One of the primary goals is to monitor within the fault zone even if this is at a shallow depth.

CDEX needs at least 10 days advance notice to secure the 3rd parties needed to case, so casing does not work as a short-term contingency plan due to the uncertainty of the Kuroshio Current meander. The plan that was made prior to the start of drilling was to bob between drilling and coring and casing to take advantage of Kuroshio location, but this is not possible to do onboard the Chikyu at this time. It seems there were many contingencies that were not feasible, such as coring on Exp. 314.

Two questions to consider for installing casing: 1 – sticky zones, and 2 – high current. The PMT is very unclear on what the real restriction from Kuroshio Current is on casing installation?

If drilling and coring at site NT2-01G is successful, there will still be more contingency time available. Another option to do is testing the AHC.

It appears the plan for Exp 316 hinges on casing possibility. The PMT needs to choose which other sites to drill, but this does not need to be decided today. It should be in the C0001 – C0004 vicinity. One member asked about the possibility of drilling deeper at the frontal thrust; however it was explained that this would present a problem with the agenda of the scientists onboard.

Is there any value to coring the washed-through zone at G? Members think there is value and that this would not take too much time.

The PMT needs some guidance – they will continue to push for attempted casing operation. If considered out of the question, then the entire expedition will be coring. They will need a list of order of contingencies for all probable coring.

What about drilling inputs sites? The likelihood is there will not be time. What about continuing drilling site C0004? Not much enthusiasm due to low scientific priority. C0002 is only half done. We will still have the issue of hydrates present without the equipment or expertise to sample them. If too much core is brought up there may be problems processing the core. Core flow needs to be considered when determining contingencies. From the moment the core hits deck, days pass before the core is split. One reason for this is cutting whole rounds took extensive time. The CT scanning also impedes the flow and before CT scanning can start, the microbiologists need to okay which section is cut, then cores have to….basically things take awhile.

How much of the core flow back-up is a "first time" problem? The response is that it can only improve…and it has improved greatly from first core. It will never be as fast as JR, but there is more to do – CT scan for example. Core flow will be slower no matter how efficient the staff. If piston coring is one of the options, it should be mixed with RCB coring to allow the lab time to catch up.

Co-chiefs noted that when the Chikyu was drilling, time was running smoothly – all the other surprises are what got them off track. The drilling estimates were pretty accurate. Slow-downs are blamed on the Kuroshio.

The PMT will ask CDEX about the casing strategy plan – The PMT would like to have the full range of options to install casing. The PMT encourages CDEX to do everything they can to fulfill the casing contingency if possible.

The PMT should not go through site by site for contingency at this point.

The Current decides whether or not casing can be installed. A key question: is it running the casing itself, or is it deploying the ROV that is the more stringent limit? The PMT would like to test the underwater camera to try and eliminate ROV use in the future as the ROV cannot be used in high current.

D. <u>Sampling C0002 cores during Exp 315</u>

- Sample/data request acceptance for these cores has not yet started.
  - The PMT is responsible for managing this situation
  - Call for SDR should be made in a fair way
  - 315 SAC is responsible for their C0002 cores, with advice from SCs and CPSs.
  - C0002 will be revisited in Jan09 (?) for further sampling.

- Personal sampling: onsite or post-cruise at Kochi?
  - For fairness, NO personal sampling should be made until SAC decision is made.
  - Funding problem on post-cruise sampling– especially for shipboard scientists. How many onboard scientists want to take cores now? More than half want the whole round, but are happy to wait for sampling.
- Community WR and cluster sampling
  - To be made onboard. 3 samples per core basis. Some scientists are taking WR based on their requests previously submitted, and some are taken as a community sample to be used later. If we don't approved individual WR now then the community samples become more important – they become a reserve of unsplit core. We have some sense for the number of WR samples per core people have wanted – this is where the 3-4 WR per core (a little over a meter per core) comes from. We want to prevent individuals from taking the WR on the ship.
  - Keep more WR as a 'library'. The simplest thing to do is take a set of 3 or 4 WR from each core and approve no sampling now that is not time-critical and wait until the sampling party to continue. We should make the scientists submit their requests. The scientists on 315 are okay with this right now – there have been no objections. There is some argument about the scientists getting the right to take their measurements while they are there on board – the policy issue to deal with for Stage 1 is a special case since the science party of 314, 315, and 316 all get first priority to sampling. If it were done in a post-cruise sampling party then it would be in line with the policy. On all paleo legs, you plan from the beginning to do the sampling afterwards. We could give the science party latitude to make the final decision on board but the PMT recommendation is to defer sampling that is not time critical until after the expedition. The bottom line is the WR are well-preserved and no one should have a problem waiting.
- IW sampling
  - To be made as Geoff's guideline – considered as COM sample?
- Microbial sampling
  - No sampling / minimum as long as it does not interfere with WR sampling plan? We should allow some sampling. They don't have to overdo it, but as long as the amount of material is reasonable we should allow it. The complete core is CT scanned before it gets to the biologists anyway. The microbiologists are asking for 30cm max. (1 sample every 5 cores). If micro requests can be transferred to this site then there is a bit of an issue as their work is time critical. For this reason, sampling should be okay. Time trumps the fairness problems. In the end, this is the co-chiefs decision but the PMT can advise…or encourage special sampling for microbiologists.
  - Not prioritized in NanTroSEIZE, but need consideration for IODP community
  - PMT can state that this is 'unexpected' case, and let them know that they will have a chance later.
- Masa's proposal
  - PMT to explain this situation to the community, stating that this could not be predicted (because of postponing casing operation) and that further sampling will be made post-

cruise and during Stage 1B expedition as needed. Also, the PMT will reorganize sample/data requests, including upcoming contingency sites.

- IO to send out sample/data request for C0002 (when?), to all Stage 1A and ex-317 scientists?
  What to do about people that were uninvited from 317 – absolutely we should respect their effort. A general call could be made to ensure the uninvited science party get the message and make sure shipboard scientists have first pick. IODP should send out a request…how to do this? Send message to all Stage 1 scientist and to those disinvited as a courtesy. It is noted that technically, 317 scientists are not part of the party, to extend the courtesy is a little dangerous. IODP should extend the call for sample requests for C0002 to the Stage 1 science party and then let word of the new site get out to the community through the preliminary report.

- 315 SAC makes decision on 315-C0002 sample distribution. 315-C0002 cores will be sampled during Exp315, for WR (3-4 per core) library for community and personal use, IW (1 per core), and minimum MB. Non-destructive and normal shipboard measurements will be made. Other sample requests will be taken post-cruise in Kochi.

- Recommendation to 315 CCs: 3-4 WR samples per core

2. Chikyu operation Plan

A. Overall comments

- The non-IODP slot is fairly firm on the end date.
- We have one less month of time for NanTroSEIZE due to an added 1 month SIT to be used to train a new crew.
- In January, tuna fishing season restrictions start to apply to some of the sites – this could obviously be a problem.
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B. Chikyu Schedule for FY08-10 (Aug. 07 OTF)
(*slides shown in Appendix A)*

- The budget is not yet fixed - it will come from MEXT Dec. / Jan.08
- Non-IODP work scheduled for ExxonMobil from June to November, 2008 in the Indian Ocean off Madagascar. The contract is not complete yet but near complete. The ship would then be back in Japan by the end of October.
- Stage 1B – 3 sites: 1-01, 1-07 and 3-01 riserless coring plus wireline logging.
- In 2009, there is one month left for IODP - this could be Shatsky, Mariana, or Japan Sea Monsoon?
- Stage 1B time estimation shown does not include contingency time
  - NT1-07 Coring + logging
    HPCS: 250 m (5 days)
    RCB: 1200 m (15 days)

- NT1-01 Coring + logging
  - HPCS: 250m (6 days)
  - RCB: 700m (9.5 days)
- NT3-01 Coring
  - HPCS: 250 m (6 days)
  - RCB: 1400 m (15 days)

- NanTroSEIZE fisheries negotiation
  - By Dec. 31: finish sites south of 33 deg. (1-01 and 1-07 sites.)
  - Jan – Feb: finish sites north of 33 deg
  - Mar – May: No agreement
  - Can we drill all the inputs sites in December? In January, site NT3-01 could theoretically be drilled. Add NT3-01 to contingency sites for January operation.

3. Stage 1B (Riser-less) DRAFT schedule (DEC – Jan of 2008-2009)

(See Appendix B for presentation)

- Co-chief selection – due by Jan 15, 2008 (choose 2 for this 2 month operation)
- Pre-expedition meeting – Feb – Mar 2008
- Planning and Scientific Prospectus – due by Mar. 2008
- Call for Participation – Feb – Mar 2008
- Staffing – due by May 2008

A. <u>Stage 1B discussion</u>

In next 10 days, if RCB coring goes well, we will need to choose new sites for Stage 1B. It is possible we may complete most of the objectives during Exp. 316. We need to be careful to define Stage 1B before selecting the Co-chiefs. We cannot keep cancelling casing and going to coring contingency. The PMT is very worried that the SIT is not long enough to train a new drilling crew for riser and non-riser operations. IN 2009, on the IODP side of things, we need to have some significant results from riser drilling.

What is Stage 1B really about? With Stage 1, we are getting to a point where the easy operations have been completed – what is this expedition Stage 1B going to be?

Casing? Maybe we need to take advantage of SeaDrill experience and begin casing while we have the expertise. Casing should not be left as the only option for the new drill crew to do in Stage 1B. We definitely would not want to install the observatory with a new drilling crew.

CORK? From the point of program renewal – we have to show results from riser drilling and make progress with the observatory. Is there anything (w.r.t. the observatory) ready to go for monitoring by this time? No. CDEX operations dept. will not be ready for monitoring plan until late 2009, at the earliest. Lead time for purchasing equipment to make the observatory work prohibits CORKs from being installed in Stage 1B. Definitely would not want to install the observatory with a new drilling crew.

Co-chiefs Selection? The deadline for choosing co-chiefs, listed above, may be unreasonable. What would be the impact of waiting to nominate co-chiefs until the end of Exp. 316? It compresses the schedule, but the pre-meeting could still take place in March. The problem with selecting co-chiefs earlier is that all we could say in a request for staffing is "hey, do you want to do something NanTroSEIZE" – we could not offer much more information than that.

Maybe we need to review the whole thing; there is a lot of momentum with the mega-splay. We can offer that we will set casing somewhere – maybe the Kuroshio Current will have migrated? One option for Stage 1B is to install casing for an observatory…that is about all that can be said. For the splay-fault sites, we need a very careful operation.

NT2-01? If we are going to drill in the NT 2-01 area, we would need to drill deep and do so using riser-drilling. NT2-01 has been tried without success; these sites are high risk. Drilling and casing NT2-01 would be another story and a possible option for success.

There is a lot of value in having early success in the observatory part of the program. Installing casing at NT2-01i (C0004) could help achieve this success. It is a shallow site and went smoothly drilling-wise.

The operations group at CDEX said they could only try to case on Exp. 316, as a test, only if the current is under 3 knots. There is a 90% chance that the current will be above 3 knots during 316. So, 316 should not include casing as the primary plan. They could try NT2-01G – and then could finish C0002 or focus on the inputs sites.

It appears that casing can never be a primary plan due to the Kuroshio!! Does this mean we can never do Stage 2 either?

The PMT needs to strongly encourage CDEX to "try" casing.

Why are casing operations so limited?
What are the criteria behind the 3-knot limit? Is it running the casing or is it because of the ROV? The ROV is the limitation and it is possible to case a hole without the ROV. If we remove the ROV from the operation, can we then case? No, the other problem is the supply boat, which is limited to 3.5-knot current. The supply boat supplies fuel which is needed every 1 0 days. This is confusing because it only takes a few days to deploy casing – it would be possible to fill up the gas tank before starting the casing. There is a lot of confusion about the stipulations. What is actually stopping casing operations? Casing has been run under 2.5 knot current conditions offshore Kenya and the Chikyu lost the casing due to vibration. So, vibration is another concern in deep water. Another issue with the supply boat is that they need to supply bentonite to the ship every 2 days if continuous operations are underway, so, it appears there are many issues to deal with, none of the issues are critical on their own, but perhaps all combined are a problem so we could let them test the operation during 316.

Inputs? Maybe we should send 316 to drill the inputs? If 316 spends all time available drilling NT2-01, then Stage 1B would have to do inputs as the only high priority option.

Measurements in fault zones have not been made in any robust manner before – this would be valuable science.

How to move forward with planning? We need to understand in detail, which is the limiting factor in casing so that we can make plans. The operations department needs to be present at the PMT meetings. The PMT keeps reaching an impasse where it is not clear what can and cannot be done. At this point, we can not plan Stage 2 top-hole casing – everything casing-related should be off the table until we understand what can be done.

IODP-MI will request a meeting with the operations people. The whole concept of NanTroSEIZE is put into jeopardy unless we get started with the casing and observatory. We need to find the quickest way to get something into the hole and the best case scenario for doing so would be late 2009. If no casing is put in during 316, the best case scenario becomes even later. NT2-01i and C-0001 provide the best chance at this time and would fulfill all objectives for relatively shallow mega-splay. Trying to drill deeper in C-0001 then becomes very important as well. Stabilizing the upper hole so you can drill deeper becomes vital. Again, casing during Stage 1 is important. Does CDEX operations department really think casing in the current is impossible or is there something else going on? The operations department will get back with the detail of an answer that we need.

B. <u>Stage 1B Co-chiefs</u>

One likely scenario is that this expedition will be drilling primarily inputs sites. Because of tuna restriction, the only real options are the inputs sites and maybe some casing. Core first, case later.

We need to remember that one year from now, all the problems with casing will still exist. One improvement that needs to be made in the campaign is that we (CDEX) need to communicate more with the science party – we need to schedule planning meetings between operations staff and scientific staff.

The casing issue is obviously a challenge – the Chikyu failed offshore Kenya, but can try again. Supply vessel, ROV, and wellhead design are all issues prohibiting casing from being installed – we need to learn to deal with each issue in order to solve the casing limitation issue.

Is an ROV really needed? We need to be able to re-enter but could use a camera to do so. The JR has drilled thousands of holes without the ROV… Impossibility to drill the hole is unacceptable. OSI thinks the ROV is necessary, but is willing to test the camera capability.

Is the 10 days lead time necessary? Yes, and we cannot predict the Kuroshio location 10 days in advance. Based on 3 months experience, we know the Kuroshio will almost certainly be above 3 knots, then we should not put casing in the primary plan, but keep it as the highest priority. We must keep the priorities clear.

To what point do we need to decide in this meeting?

1. Extend co-chief selection by ½ month or so.
2. Do we need a permanent plan for 1B? We need definition of 1B

Stage 1B has to consist of several scenarios from this meeting.

C. Stage 1B Definition

1B – Must start at inputs sites. We should select co-chiefs appropriate for inputs.
We should define Stage 1B as "inputs +____"

Does 1B have to be 2 months? Could we do 1 month and then start with Stage 2? Casing the upper part of NT3-01 for future observatory could be good since it may lie outside the Kuroshio.

PMT decided at this point that they had done what we can do in terms of Stage 1B planning.

D. 316 Priorities

The highest priority during 316 is putting in 100m or more of casing at C0004 or C0001 depending on the current. Supply boat can go off to measure the currents and keep updated. NT2-04 site is further out of the Kuroshio but you cannot reach the seismogenic zone at this site. It has fallen off the list of priorities for science but could be better for the current.

3. Stage 2 Planning

A. Top Hole Operation (Set WH & CSGs)
Feb. 2008

B. Drilling/Coring/Logging
After June 2008 - There will be 5-6 months to work toward the 3.5 km penetration.

C. Kuroshio contingency
The Kuroshio Current will remain in the same direction and same speed over the next year. The year before meandering away, there will be a detection sign. This sign has not been evident yet, so we can assume it will continue along the present path for the next year. Operational criteria then becomes a serious issue but CDEX does have a plan to install fairings on the riser system. *(See slides on Kuroshio and riser fairing system in Appendix B)*

The DPS system failed due to shaking of the rig from the current. Adding fairings will allow the operation window to be extended. This extends the operational window to 3.5 knots. It would also minimize VIV to reduce fatigue and failure of the riser pipe. Several fairing designs exist. Wave direction, current, and DPS are all factors for developing the fairing.

Any additional constraints for landing BOP in current and for setting casing?
Difference between current movement and ship movement must not be more than 2 knots.

Should we consider changing Stage 2 to work in C0002? Current conditions could be better – If we plan for C0001 it is likely we will not be able to do it. It may be possible to budge C0002 a little more north to get out of the current.

What is the target for Stage 2? The Kuroshio northern boundary tends to lie in the region between NT3-01 and NT2-03. One site of highest priority for all of NanTroSEIZE is NT3-01. We know that drilling 1400m was no problem – at least the top 1400 is not in a highly compressed stress state. NT3-01 is in extension, NT2-03 and NT2-01 are in compression. Stress should rotate or flip as they drill down.

There is high risk in drilling the first site so deep in order to meet objectives, but the drilling is easier than in the more shallow sites. No evidence for overpressure that is high enough to degrade hole conditions – the hole was staying clean.

In terms of learning, it is better to start with the easier site, and better to chose a site that has a chance for casing within the currents. No sites should be abandoned but the order could be changed to ensure casing is installed sooner than later. By going for the easier site, NT3-01, and succeeding, we could meet significant objectives of this stage. We do not want to plan to case NT2-01 during this stage of NanTroSEIZE – this is too much of a bet against the current.

Could any kind of shallow instrumentation be installed at site NT3-01? Could we develop a plan with some immediate return? Putting an observatory in a riser hole is problematic, especially because of the wellhead. We could install an observatory in a riserless hole and drill and case an adjacent riser hole. It may be worth the extra drilling time to make sure we actually get some valuable results from NanTroSEIZE before IODP has to renew.

What would it realistically take to wash down and then drill to 3 km? This would be a quick operation – just casing time is the problem. Wellheads and casing add an enormous amount of expense.

One more option is to drill NT2-03 just below the fault and plan for an observatory that is only ~ 2km deep. The resulting science would more than justify the operation.

How hard is the 3.5 km constraint? Temperature is the constraint. NT3-01 would be 5-5.5 km deep.

If spot coring is done, can you drill a 5 km hole in the time available (6 months)? We can suspend the hole and come back to it later. Approximately 450 days are needed to continuously core NT3-01. Can we have better estimates before we continue with the planning?

If we had a coring program how would you pick intervals? In terms of time estimates, NT2-03 is off the table due to currents, then would that give you more time to do NT3-01 total? Getting one site down may be all that is done before the program ends – it would be better to do NT3-

01 if we only have time for one site. You could at least penetrate the seismogenic zone before 2013.

Continuous coring is not necessary. We can skip cores to save time and drill deeper. We would have to define "spot coring". How much is sufficient? Potentially, the cost would be very different associated with this suggested deeper riser hole.

What would CDEX operations department say about sudden change in plans for Stage 2? We would have a chance of more available days for NT3-01 because of better current conditions.

To sum up:

- Science can not wait for the current to meander; NT3-01 has equal priority to NT2-03.
- IODP should have some nice results for NT2-03 which could help in observatory design
- PMT will come up with 2 options and ask CDEX about the feasibility of each.
- We need to maximize success by changing the order around.
- CDEX wants a time estimate for drilling the NT3-01 site. How much of fiscal year is needed for budgetary point of view. We should do a study for operational planning for this site.

Three options – three questions to answer

- What is the estimated time for drilling all the way down (6 km) with continuous coring from 1400m down to 6 km?
- Estimated time to drill down to 6 km without coring. (has to include casing, logging,…)
- Estimated time to drill down to 6 km, coring 25% of the hole from 1400m to TD.

Scientific rational to ask for this change

- Bottom line is within this 5 months, we would like to have core from the splay fault
- In 2 year time frame, PMT would be very happy if they take cores from 5 and 6 km.

Harold will write out an email to send out to members who are not here to get their input. Need to put together the rationale, fleshed out with the operations department and develop a realistic plan.

D. Stage 2-R1 Scientific Staff

If Stage 2-R1 is strictly a casing operation, then would we still need 2 co-chiefs (no riser drilling/coring)? Would you need science party? You need co-chiefs to make any on the spot decision. The Co-chiefs would have access to a helicopter, so it is not absolutely necessary to stay on board. If there is any chance to core, a staff would be needed to handle it. From the IO standpoint, you would not want to do anything without having the lead proponent out on board, even though there is little science. Someone is needed who can make decisions. In ODP, there were some expeditions that were purely engineering and testing; no co-chiefs were present. The PMT can make a statement that there needs to be PMT representation on board. For Stage 2-R2 – no decision has been made whether or not IODP even has the slot, so…. No need to make decision on staff yet.

The 7 months of riser and riserless operations in 2009 – 2010 is not set in terms of what months the operations happen. If our time gets pushed into tuna season, then we may not get the 5 months of riser-time period.

If we move to NT3-01 sites then we need the geotech core from 0 to 60m for engineering. In this case, 315 should do some piston coring if possible….this needs to be done while beacons are still in place. Does this duplicate the information from the jet-in test? If useful, then of course we should ask them to do so.

1. The PMT needs to confirm with operations that geotech core is necessary – how necessary
2. Harold and Masa will contact co-chiefs and OSI to fit geotechnical coring into the operational plan, if needed.

4. Observatory Plan

(slides from Masa, included in Appendix A)

A. Updates

- Aug. 07: PMT Observatory team submitted a non-riser observatory request to CDEX
- CDEX replied to this, saying that non-riser observatory deployment is possible in 2009 timeframe (reported in OTF/SPC meeting)
- Sep. 17: Observatory implementation team (JAMSTEC+Demian+achim) discussed with CDEX about their practical model
- Nov. 28-30: JAMSTEC observatory implementation team discussed with CDEX about their practical model? (*Ito will report – presentation included as Appendix C*)

B. Masa's notes on the current status of the NanTroSEIZE borehole observatory planning:

- The borehole observatory is one of the key parts of NanTroSEIZE. PMT has been discussing the scientific rationale and how it should be in place in accordance with the drilling plan.
- Recently PMT created a 'NanTroSEIZE Observatory Team' to have a substantial discussion with the actual development groups and IOs.
- The roles between the PMT Observatory Team and each implementation group have not been clear so far.
- The overall observatory roadmap has not been set clearly, either because no one was sure who should take charge on this, or because observatory goals seem complicated.
- To move forward, it is suggested that first we should separate the observatory project into:
    - 1) shallow non-riser observatory, possibly deployed in 2009 by Chikyu, and
    - 2) other observatories and related business, including deep-riser observatory (3.5km and 6km), shallow observatory array, and connecting to DONET.
- The former plan has already been discussed among PMT observatory team, JAMSTEC observatory team (Araki et al.), TAMU, CDEX, and its roadmap is proposed as a product of Sep.17 meeting (Demian).
- Also CDEX unofficially started to investigate technical feasibility of shallow observatory to be deployed in 2009.

Some sensors can be sacrificed, but we need to get the observatory deployed and receive some results.
The USIO should be present at the meeting to figure out how to set the development / implementation up. They need to know what is wanted first – they need some sort of commitment. Science priorities plus OTF commitment is needed in order to move forward.

C. Observatory Roadmap

"Roadmap" for non-riser observatories for CDEX operation in 2008 – 2009 Oct. 12, 2007 *(See Appendix D)*

This roadmap follows the proposal for Stage 1B in advance of the OTF meeting in August – the answer was "2009 would be okay" for observatory installation and roadmap was developed.

1. Installation of combined hydrologic-geodetic observatories at NT2-01 and NT3-01
   Several permutations of the design – eliminate sensors outside casing to eliminate 80% of the headache while losing only a smaller part of the science.
2. Observatories of opportunity: NT3-01 and NT1-07…..see sheet
   hydraulic tubing with sensors taped to the outside
   engineering a slightly modified hanger is the most complex part of this "strap" CORK

We need a timeframe for developing the observatory. Need to define the observatory that is desired.

CDEX should try to include 2 sites in design – that way if one does not work, which is common, you would still have something. Observatory plan is at the stage of "go" or "no go". Actually we have the "go" for 2009 but we don't know that there will definitely be an expedition in 2009.

IOs (USIO) need an acceptable commitment in place to start. They need a proposal of clear priorities. The development has to be an SPC-sanctioned program and the OTF has to put in on the schedule. At this point the other parties can get busy.

The observatory roadmap has circulated. The PMT observatory group does not know where to go with it. They will forward this to Tom for comment.

From today, the roadmap is the PMT-endorsed plan. Can people develop resources to fit it into the schedule?

D. JAMSTEC Observatory Workshop

(See Appendix C)

- Need to clearly state the importance and the fact that we are doing something that has never been done before.
- Instrument lifetime is 5 – 10 years. 30 years is the timeframe of the next earthquake.
- Monitoring is not good enough – we need to show great impact on science.
- Split monitoring into three main themes :

1. Sea floor, ocean borehole and land network
2. In-situ monitoring of slow processes
3. Active source experiment

- 2-day workshop super summary
- VLF events: for detailed analysis
- On land observatory: on going

The workshop plan is based on NT2-03, so they need to change their strategy now.

<u>Comment on Workshop Discussions</u>

- Geochemistry might add some information – see meeting notes.
- Very detailed priority slide – see slide in Appendix C
- Detecting aseismic slip or not is very important
- If non-characteristic asperities exist, it will be difficult for earthquake prediction.
- Tilt due to VLF event – have to think carefully about sensor type and sensor array.
- Non-riser development – what to do and who does it by when – detailed development plan needed.
- This WS observatory design is based on the roadmap except that it adds outside-casing sensors – it is a redesign on what was already agreed upon by the PMT.
- Nonriser development schedule – implementation plan should come sooner – orders need to come sooner. Is implementation different than the science plan? For CDEX, very detailed technical specifications are needed. Some collaboration between the USIO and CDEX could help this process. It is suggested that the ordering of materials needs to happen much sooner – technical specifications need to be approved before any ordering occurs. The plan has been finished for a year – CDEX needs very detailed discussion between themselves, VETCO and Tom Pettigrew. The PMT proposes all the details could be smoothed out by mid January and give CDEX longer to order parts for fabrication.
- Outside casing sensors – Science is small but the impact on technology difficulties is big. Based on conversations with Pettigrew, this is still possible. There was no discussion on change of observatory plans among any observatory PIs or any of the PMT members. Some communication is in need.

Flexibility is needed in the observatory design. Outside casing sensor technology is an exciting development, but, this first try needs to happen soon. . This more complicated design will slow down our progress. The PMT has the job of managing the NanTroSEIZE plan overall. There is an observatory plan in existence. We need to start with the roadmap and implement it - need to keep it simple to assure results. There are enough challenges. JAMSTEC is going to start a new observatory team to obtain funding from Japanese government (next stage of DONET). It will be very important for the observatory to be simple in the early stages. The message from the PMT is for JAMSTEC to go back to the “roadmap” to ensure that something happens in 2009. The sensor must be installed in 2009 – anything that would affect this timescale would be discouraged.

We need a coordinated effort for people working on this observatory ASAP. We need a CDEX-hosted pre-cruise meeting with appropriate leads. Need to work on the observatory as if it is an existing project on the schedule and start working in a coherent way.

The PMT endorses the roadmap as the concept going forward and the next observatory meeting needs to happen soon.

The schedule proposed by JAMSTEC observatory workshop is too long to make sense with the next few years' schedule. Development of the CORK is not going according to PMT-vetted plan. There needs to be a lead proponent to foster the development and assure everyone is on the same page.

JAMSTEC observatory team should not have made a big change from what the PMT had already decided. PMT needs to concentrate on completing the shallow observatories with this simple design.

Next Step…

It is fine for the casing to be added to the observatory but the PMT should have been made aware.

A management plan is needed to move forward. Need someone from JAMSTEC to be a lead point of contact.

Shin'ichi and 3 observatory PIs should meet and work out the issues in an observatory planning meeting. The PMT consensus is that the basic starting document is the "roadmap".

Returning to Ito-san's presentation:
The high priorities for observatories are NT3-01, NT2-01 – if NT2-01 becomes the shallow site, does it remain interesting if the splay fault is only 292 m deep? Yes, it is still worthwhile to install – maybe not the strain meter though? Does it add operational risk or complexity? Strainmeters work well in hard rock, but in softer materials there are problems coupling the instrument with the material.

5. Community WR sampling policy

Circulate email and get some feedback on proposed guidelines. The sampling plan needs to be reiterated to the curators. The PMT needs feedback. The understanding of the PMT is the specialty coordinators and SAC would coordinate the distribution of this material. Both pre-moratorium and post-moratorium procedure included. To be consistent, the SAC makes the decisions, but with advise from the specialty coordinators. Demian will circulate the policy to PMT members for comment within the next week.

6. ORTF

2 -3 days for all three meetings. All co-chiefs, IOs and specialty coordinators to attend. April/May is likely timing. See Appendix E for presentation on reviewing expeditions.

7. Action Items

1. Settle Casing Issues: PMT to ask CDEX about casing strategy plan. PMT to strongly encourage CDEX to try casing operation. CDEX operations department to get back to PMT with detail on operational limitations due to the Kuroshio Current. Representatives from CDEX operations department need to attend future PMT meetings. IODP-MI to request a meeting in the near-term with the CDEX operations team.
2. PMT recommends that science party defer sampling that is not time-critical until after the expedition. PMT to explain necessity for change in sampling policy to community.
3. PMT to extend call for sample requests for C0002 to the Stage 1 science party and then let word of the site get out to the community through the preliminary report.
4. PMT to recommend that the 315 Co-chiefs instruct science party to take 3-4 WR samples per core.
5. PMT to add NT3-01 to contingency sites for January operation.
6. PMT to define Stage 1B as "Inputs + _____", and thus select co-chiefs appropriate for inputs drilling.
7. Change in priorities for Stage 2: PMT to explore different options for drilling down to 3.5 + km during Stage 2. Harold will write to PMT members not present to get their input and then put together a realistic plan to discuss with the CDEX operations team.
8. SPC Approval: Anything that needs to be presented to SPC (in terms of Stage 2 planning) for any kind of endorsement needs to be done by the end of February.
9. Observatory Development: The PMT endorses the Observatory Roadmap as the concept going forward. The PMT encourages JAMSTEC to go back to the roadmap and keep the planning simple at this time. PMT to schedule a meeting for riserless observatory group – between Shin'ichi, and the observatory PIs. There needs to be a lead proponent to foster the development and assure all parties are on the same page – there needs to be someone from JAMSTEC to serve as a lead point of contact. A CDEX-hosted pre-cruise meeting should happen as soon as possible with appropriate leads.
10. Next Meeting: Is there a PMT meeting needed between now and the end of February? Stage 1B and Stage 2 planning is the critical issue to deal with at this time. We need a face-to-face meeting early in the year – early March? Talk with Tom about this? Having the meeting at CDEX would be useful…to answer questions that come up, especially in terms of operational constraints. Do we need to have this meeting before SPC or does it matter? How about Feb. 10? There is an International workshop, in Japan, on Stage 1 NanTroSEIZE at that time.

APPENDIX A

11th PMT Issues

Dec. 9, 2007, Serrano Hotel, SF

Masa Kinoshita

Meeting Agenda

- 1) Stage 1A status report Exps. 314-316 – BRIEF! (Masa, Harold)
- (Urgent) Sampling C0002 cores during Exp315
- 2) Community Whole Round Sampling Policy and Status (Demian)
- 3) Stage 1B planning
  - Platform availability (Shinichi, Tom)
  - Science Plan, including contingency (Masa, Harold)
  - Co-Chief nomination (Shinichi)
  - Timeline for call for shipboard scientists (Shinichi)
- 4) Stage 2 Planning
  - Platform availability (Shinichi, Tom)
  - Operational Constraints – e.g., Kuroshio (Shinichi)
  - Expedition Plan – duration, organization of science party, etc. (Shinichi)
  - Science Plan and contingency – needs revision now in light of casing plan change (Masa, Harold)
- 5) Observatory plan report (Masa, Demian)
  - Report from November JAMSTEC long-term monitoring meeting (Hisao Ito)
  - First riserless observatory planning (Masa, Demian)
- 6) Preview of IODP-MI Operations Review for Expeditions 314-316 (Tom)
  - DC, ~ 2mos. after 316
- 7) Plan for next PMT meeting, observatory team meeting (Masa, Harold)
- 8) Other (Masa, Harold)

Sampling C0002 cores during Exp315

- Sample/data request for this core has not yet started.
  - PMT is responsible to manage this situation
  - Call for SDR should be made in a fair way
  - 315SAC is responsible for their C0002 cores, with advice from SCs and CPSs.
  - C0002 WILL be revisited in Jan09? for further sampling.
- Personal sampling: onsite or post-cruise at Kochi?
  - For fairness, NO personal sampling should be made until SAC decision is made.
  - Funding problem on post-cruise sampling

Sampling C0002 cores during Exp315

- (Community) WR and cluster sampling
  - To be made onboard. 3/4 pair samples/core basis.
  - Keep more WR as a ‘library’
- IW sampling
  - To be made as Geoff’s guideline – considered as COM sample?
- Microbial sampling
  - No sampling / minimum as long as it does not interfere with WR sampling plan ?
  - Not prioritized in NanTroSEIZE, but need consideration for IODP community
  - PMT can state that this is ‘unexpected’ case, and let them know that they will have a chance later.

Sampling C0002 cores during Exp315

- Masa's proposal
  - PMT to explain this situation to the community, stating that this could not be predicted (because of postponing casing operation) and that further sampling will be made post-cruise and during Stage 1B expedition as needed.
  - IO to send out sample/data request for C0002 (when?), to all Stage 1A and ex-317 scientists?
  - 315SAC makes decision on 315-C0002 sample distribution. 315-C0002 cores will be sampled during Exp315, for WR (3-4 per core) library for community and personal use, IW (1 per core), and minimum MB. Non-destructive and normal shipboard measurements will be made. Other sample requests will be taken post-cruise in Kochi.
  - Also PMT reorganize sample/data request, including upcoming contingency sites.

Community WR samples

- Distribution policy should clearly be stated.

Observatory plan

- Updates
  - Aug. 07: PMT Obs. team submitted a non-riser observatory request to CDEX
  - CDEX replied to this, saying that non-riser observatory deployment is possible in 2009 timeframe (reported in OTF/SPC meeting)
  - Sep. 17: Observatory implementation team (JAMSTEC+Demian+Achim) discussed with CDEX about their practical model
  - Nov. 28-30: JAMSTEC observatory implementation team discussed with CDEX about their practical model ?? (Ito will report)

Masa’s Notes on the current status of the NanTroSEIZE borehole observatory planning

- The borehole observatory is one of the key parts of NanTroSEIZE. PMT has been discussing the scientific rationale and how it should be in place in accordance with the drilling plan.
- Recently PMT created a 'NanTroSEIZE Observatory Team' to have a substantial discussion with the actual development groups and IOs.
- However, the roles between PMT Observatory Team and each implementation group has not been clear so far.
- Also, the overall observatory roadmap has not been set clearly, either because no one was sure who should take charge on this, or because observatory goals seem complicated.

Masa's Notes on the current status of the NanTroSEIZE borehole observatory planning (2)

- To move forward, I suggest that first we should separate the observatory project into:
  - 1) shallow non-riser observatory, possibly deployed in 2009 by Chikyu, and
  - 2) other observatories and related business, including deep-riser observatory (3.5km and 6km), shallow observatory array, and connecting to DONET.
- The former plan has already been discussed among PMT observatory team, JAMSTEC observatory team (Araki et al.), TAMU, CDEX, and its roadmap is proposed as a product of Sep.17 meeting (Demian).
- Also CDEX unofficially started to investigate technical feasibility of shallow observatory to be deployed in 2009.

Masa's Notes on the current status of the NanTroSEIZE borehole observatory planning (3)

- I would propose necessary steps for the shallow observatory implementation in the following:
- 1) PMT discuss and define overall scientific rationale for NanTroSEIZE observatory
  - NanTroSEIZE proposals clearly mention the necessity of downhole distributed observatories. I think this is done already.
- 2) Third party group submits their observatory plan to PMT, then to ODP-MI including IOs
  - Discussion on the shallow observatory was made in the Sep. 17 meeting and its minutes and the roadmap was created as its product. It seems that this roadmap can be used as a proposal for shallow observatory. However, the framework of the thir-party group for shallow observatory is not clear to me (PMT). Also I am not clear on how this proposal is submitted to MI/IO.
- 3) PMT discuss if their plan can accomplish scientific goals
  - PMT has not yet officially discussed this proposal, but some informal discussion among some of key scientists (Harold, Demian, Masa,) seem to encourage their plan. However, it needs some more clarification on the PIs, funding model, development plan for sensors/infrastructures, etc. PMT requests these be clearly defined as soon as possible.
  - PMT would like to hear reports both from observatory development groups and from IO. For this shallow observatory I would suggest to hear reports in the next PMT held on Dec. 9 (Sun) in San Francisco.
- 4) IODP-MI discuss their operational, technical, and financial feasibility
  - I am not very clear about this, but PMT should be in the loop of this discussion.
- 5) IODP-MI and IO will determine the GO ot NO-go on their observatory proposal.
  - I am not sure how these process be made actually. However, please note that Eiichiro, Hisao, Demian and Masa had discussed many details with TAMU engineers (Derryl, Mike, ???) and Adam Claus, and some design and drawings already exist. We strongly recommend that these resouraces should fully be utilized for the shallow observatory system, regardless of the drilling platform.

Observatory plan

- Other third-party requests
  - Villinger: Deployment of a seafloor high resolution pressure and tilt monitoring system
  - Stress measurement experiments
    - Doan – what's the current status?? PMT send back 'thum-up' to Greg Myer.
    - Takatoshi Ito
  - Temperature measurements
  - ELOT
  - Hydrofrac test

Casing Issues

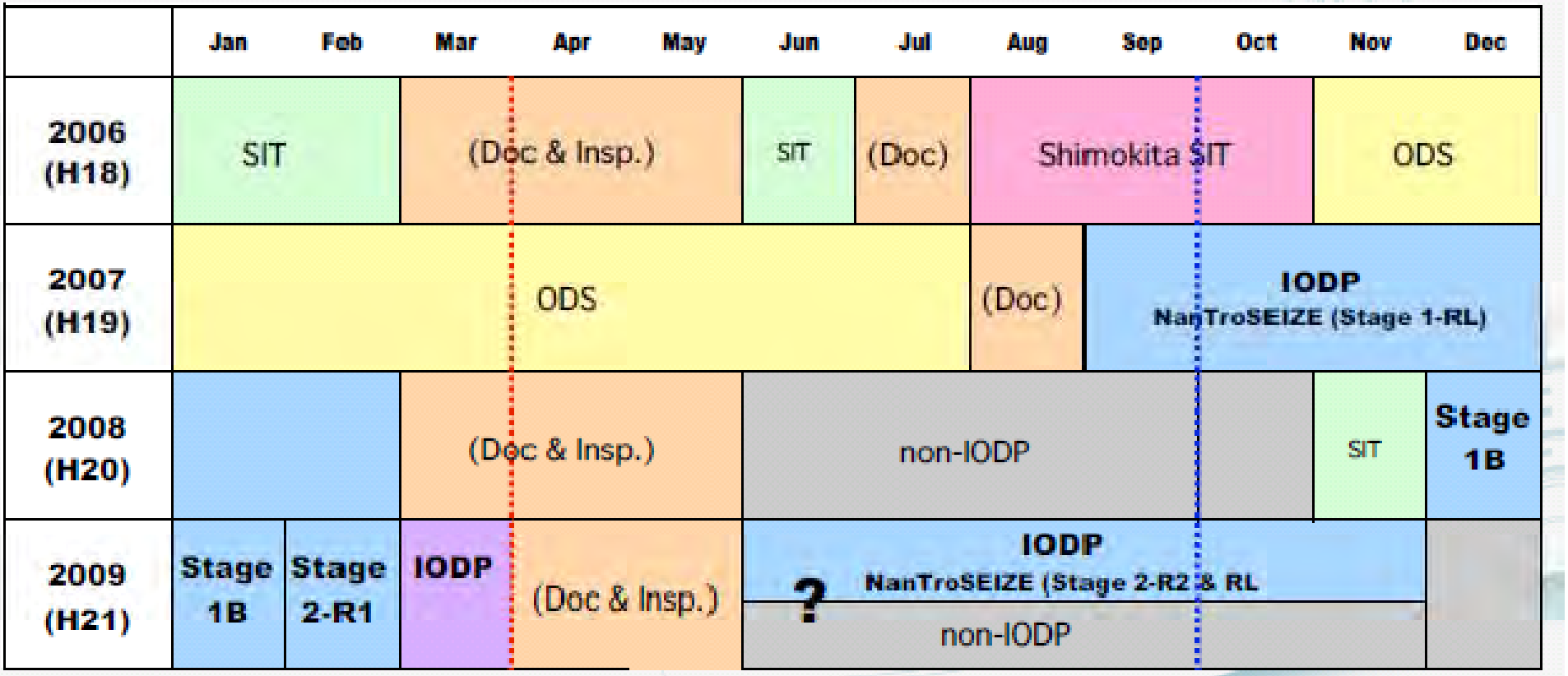
- During Exp315, 20” conductor casing was postponed due to strong current
- CDEX says it is also impossible to set casing for non-riser drilling because of strong current and not being ready for casing through unstable zone
- PMT should encourage CDEX to develop their casing plan, especially for observatory casing!

New Stage2 plan

- NT2-3 sites is still clean, no casing is set.
- NT2-3 may not be possible due to current.
- The alternate site:
  - NT3-01
  - NT2-04
  - NT2-03alt --- same situation?

Chikyu Operation Plan

(DRAFT)

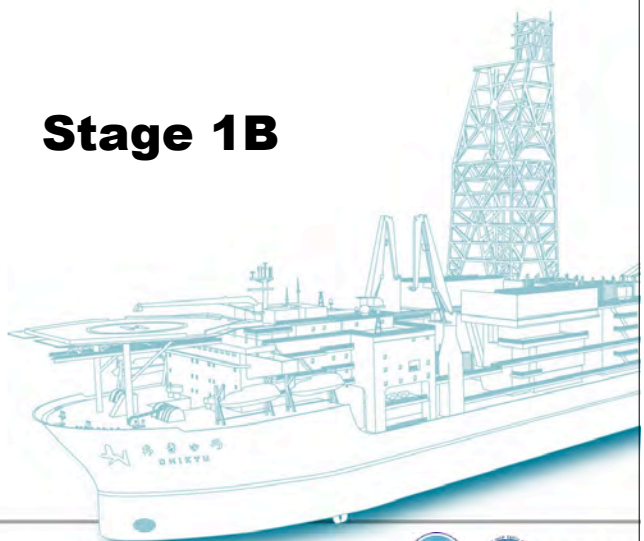


APPENDIX B

CDEX, @SF, Dec. 9, 2007

海洋研究開発機構

Stage 1B



CDEX

CHIKYU Schedule for FY08-10 (Aug. 07 OTF)

2007											
US FY07									US FY08		
JP FY H18			JP FY H19								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ODS (Oversea's Drilling Shakedown)							Dock		IODP:NanTroSEIZE Stage1/RL		

2008											
US FY08									US FY09		
JP FY H19			JP FY H20								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
IODP Stage1/RL		Dock & Inspection			Non-IODP				IODP:NanTroSEIZE Stage1/RL		

2009											
US FY09									US FY10		
JP FY H20			JP FY H21								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
IODP:NanTro Stage2/Riser		Dock	IODP Expedition Availability (5 Months for Riser + 2 Months for Riserless) per Year								

2010											
US FY10									US FY11		
JP FY H21			JP FY H22								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			IODP Expedition Availability (5 Months for Riser + 2 Months for Riserless) per Year								

Chikyu Operation Plan

(DRAFT)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006 (H18)	SIT		(Doc & Insp.)			SIT	(Doc)	Shimokita SIT			ODS	
2007 (H19)				ODS				(Doc)	IODP NanTroSEIZE (Stage 1-RL)			
2008 (H20)			(Doc & Insp.)			non-IODP				SIT	Stage 1B	
2009 (H21)	Stage 1B	Stage 2-R1	IODP	Riser (~5 Mo), Riser-less (~2 Mo), Doc & Inspaction, non-IODP								

Stage 1B Time Estimation

- NT1-07 Coring+WL Log
  - HPCS: 250 m (5 days)
  - RCB: 1200 m (15 days)

  20 days
- NT1-01 Coring+WL Log
  - HPCS: 250 m (6 days)
  - RCB: 700 m (9.5 days)

  15.5 days
- NT3-01 Coring
  - HPCS: 250 m (6 days)
  - RCB: 1400 m (15 days)

  21 days

Total: 56.5 days

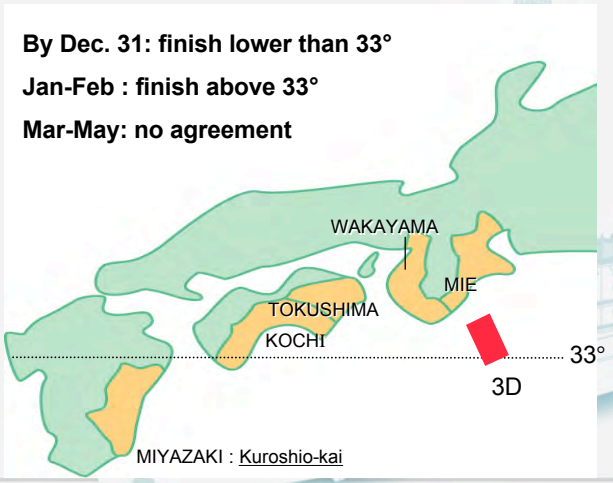
NanTroSEIZE Fisheries Negotiation

+ All Japan Tuna & Bonito Union

By Dec. 31: finish lower than 33°

Jan-Feb : finish above 33°

Mar-May: no agreement



Rest of Stage 1 (Riser-less)

DRAFT (Jul. 07)

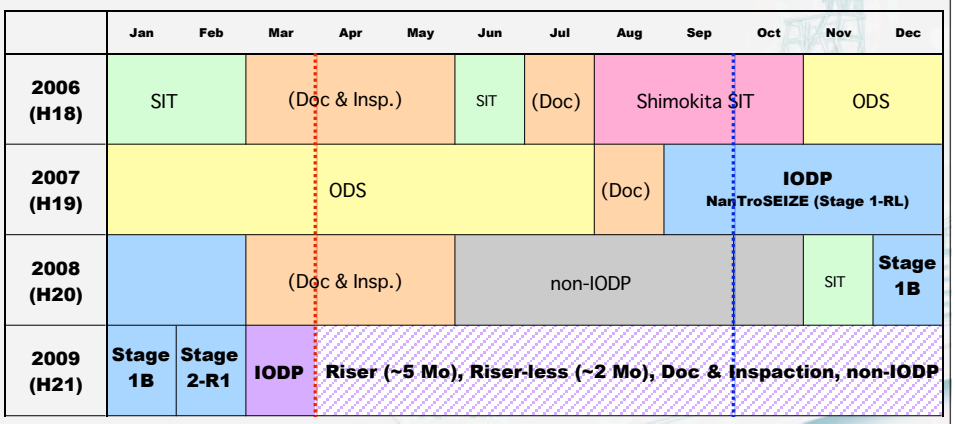
- Co-Chief Selection
  - Due by Oct. 31, 2007
- Pre-Expedition Meeting
  - Nov. 2007 ~April 2008
- Planning & Scientific Prospectus
  - Due by 31 Dec. 2007
- Call for Participation
  - 1 Jan. - 29 Feb. 2008
- Staffing
  - Due by May 2008

Stage 1B (Riser-less)

DRAFT (Dec. 07)

- Co-Chief Selection
  - Due by 15 Jan., 2007
- Pre-Expedition Meeting
  - Feb.~Mar. 2008
- Planning & Scientific Prospectus
  - Due by Mar. 2008
- Call for Participation
  - Feb. - Mar. 2008
- Staffing
  - Due by May 2008

Chikyu Operation Plan
(DRAFT)

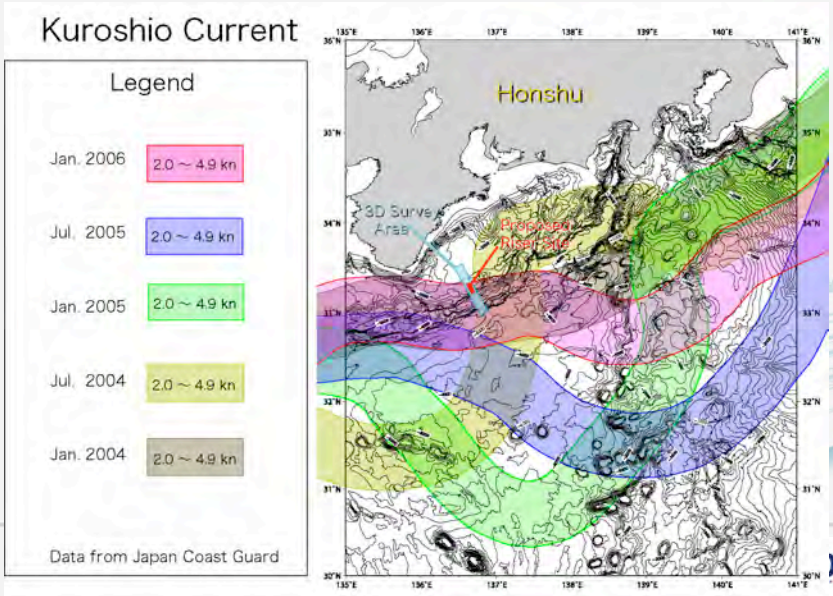


Stage 2 Plan

- Top Hole Operation (Set WH & CSGs)
  - Feb. 2008
- Drilling/Coring/Logging
  - After June 2008

- A big issue to solve
  - Kuroshio contingency
    - Discussion postponed after Feb. 06 Sapporo PMT

Kuroshio Current since 2004



Kurosio current for NanTroSEIZE Stage-1

from 21th September to 28th November

・High speed Kuroshio Current observed at the Stage-1 sites during Exp.314 and Exp.315.

・Average speed of the Kuroshio Current measured by *Chikyu*'s ADCP is over 3 knots. Some times it reaches a maximum of 4 or 5.5 knots. According to the forecast of numerical simulation, the possibility that the Kuroshio current becomes weak is extremely low in the future.

・Riser top-hole operation which is planned during Exp.315 is high risk due to the strong current and postponed.

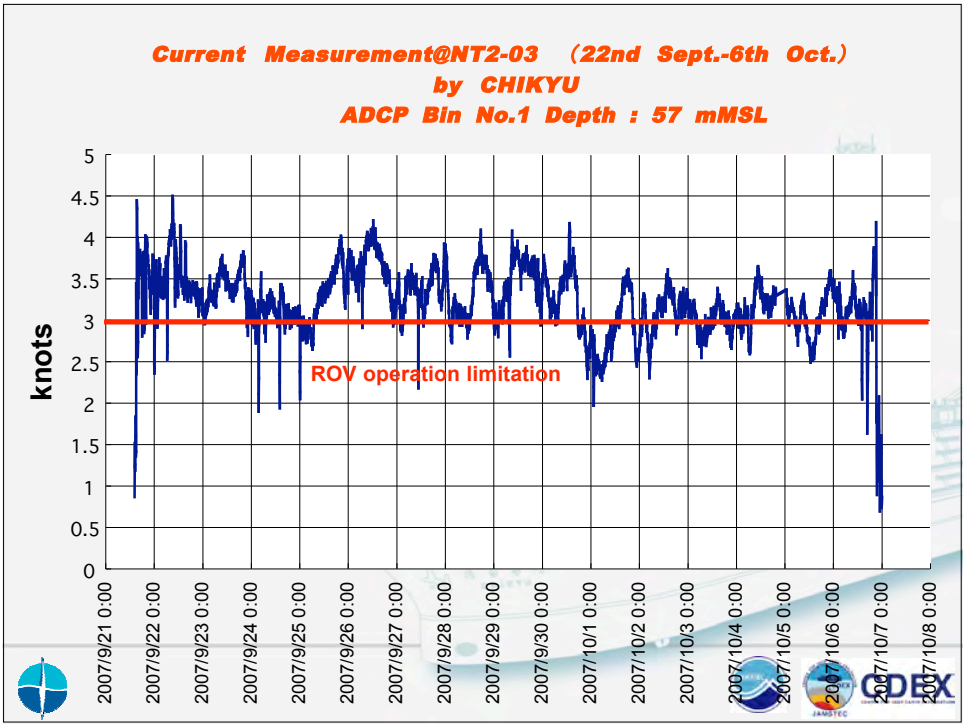
Operation Criteria in Nankai High current

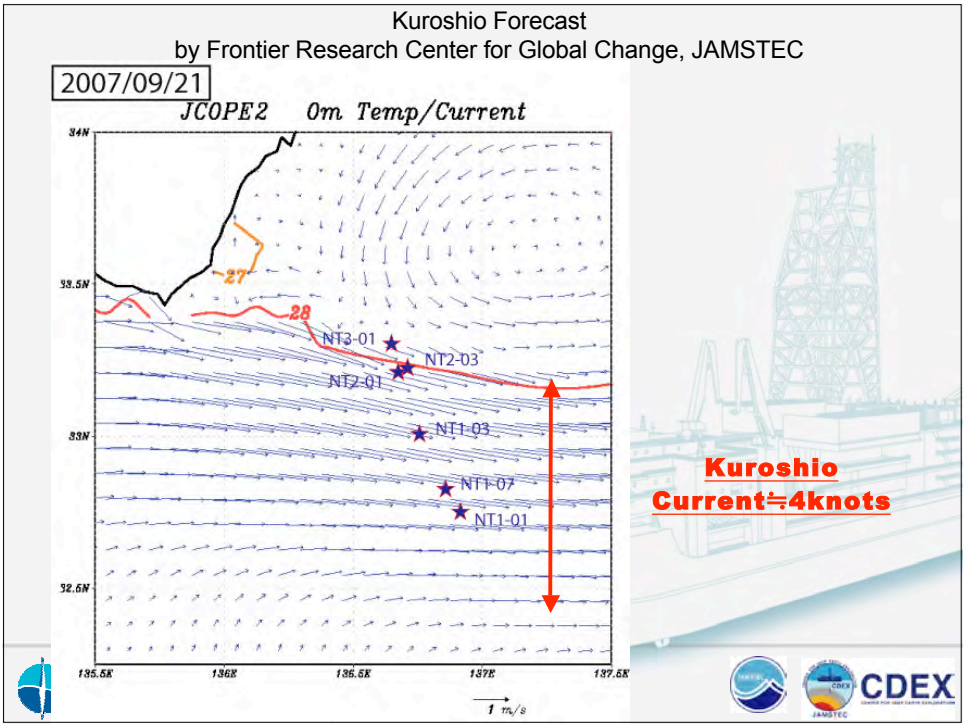
1. Current speed at EX.315
   Measured ： Ave.>3.5Knt、Max5.4Knt（Nov.23）
   Forecast： High current(approx.4knt) expected in Dec. to Jan.2008

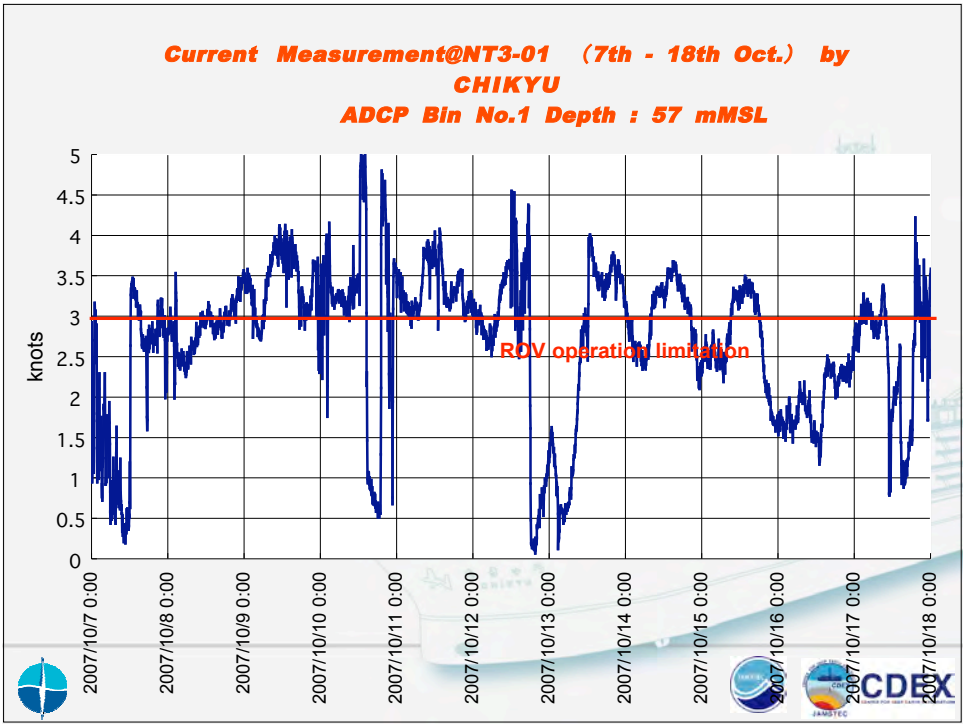
2．Operation Criteria in High Current area
   1） Launch /Recover ROV with Drifting
   a.Oceaneering Max. Current speed (LOG speed to Chikyu) 3.0Knt
   b.Max. Drifting Speed of Chikyu 2.0Knt
   Max. Current (Ground Speed) 4.0Knt= a.3.0+b.2.0- 1.0(Safety Factor)

   2） Wellhead & Casing Running
   Run to 500m at low current AREA(<1.5Knt) and 2000m with Drifting.

3) Supply Boat Alongside to Chikyu
   Max. Ground current speed 3.5Knt by KAIYU DPS Position keeping simulation.




Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC
2007/09/21
JCOPE2 0m Temp/Current
34N
33.5N
33N
32.5N
135.5E
136E
136.5E
137E
137.5E
27
28
NT3-01
NT2-03
NT2-01
NT1-03
NT1-07
NT1-01
1 m/s
Kuroshio
Current≒4knots
CDEX


Current Measurement@NT3-01 (7th - 18th Oct.) by CHIKYU
ADCP Bin No.1 Depth : 57 mMSL
knots
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
ROV operation limitation
2007/10/7 0:00
2007/10/8 0:00
2007/10/9 0:00
2007/10/10 0:00
2007/10/11 0:00
2007/10/12 0:00
2007/10/13 0:00
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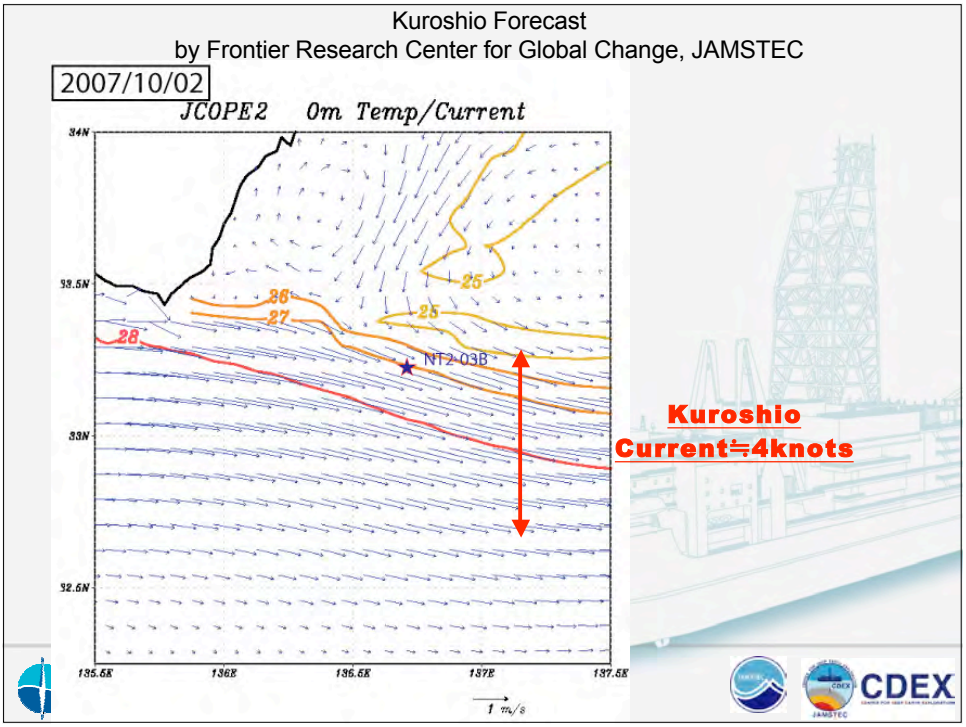
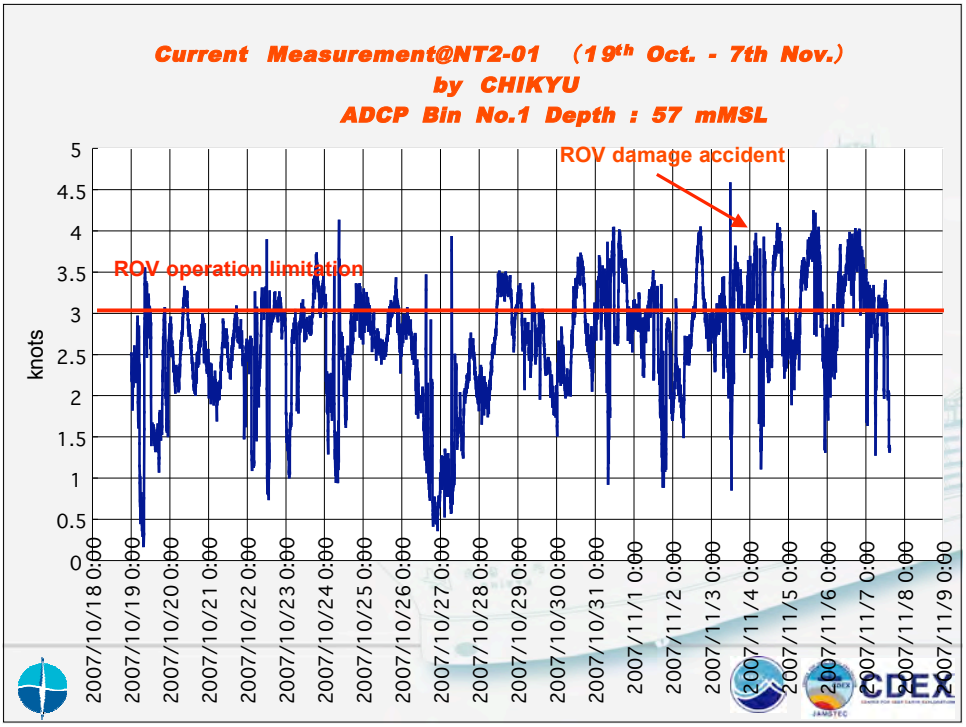
2007/10/17 0:00
2007/10/18 0:00
CDEX


Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC
2007/10/02
JCOPE2 0m Temp/Current
34N
33.5N
33N
32.5N
135.5E
136E
136.5E
137E
137.5E
25
26
27
28
NT2-03B
1 m/s
Kuroshio
Current≒4knots
CDEX


Current Measurement@NT2-01 (19th Oct. - 7th Nov.)
by CHIKYU
ADCP Bin No.1 Depth : 57 mMSL
ROV damage accident
ROV operation limitation
knots
5
4.5
4
3.5
3
2.5
2
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1
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0
2007/10/18 0:00
2007/10/19 0:00
2007/10/20 0:00
2007/10/21 0:00
2007/10/22 0:00
2007/10/23 0:00
2007/10/24 0:00
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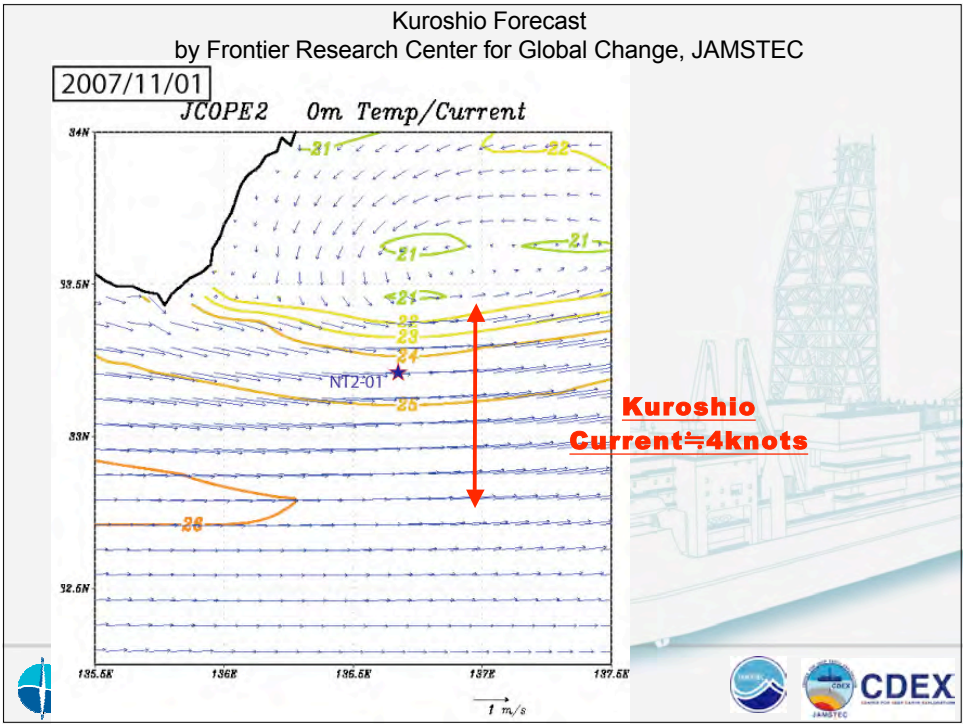
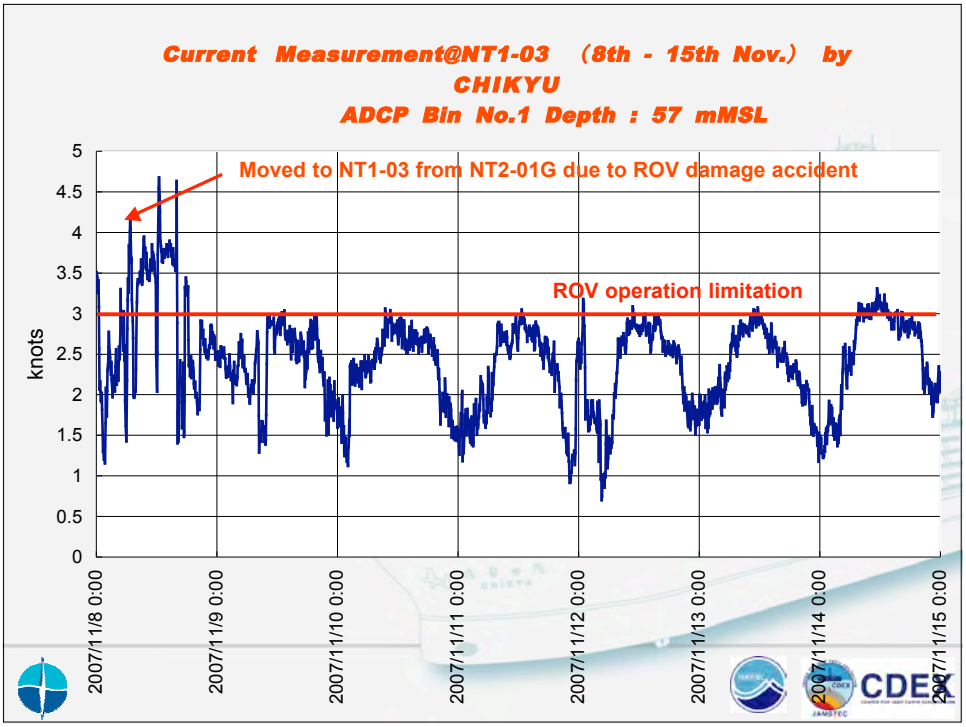
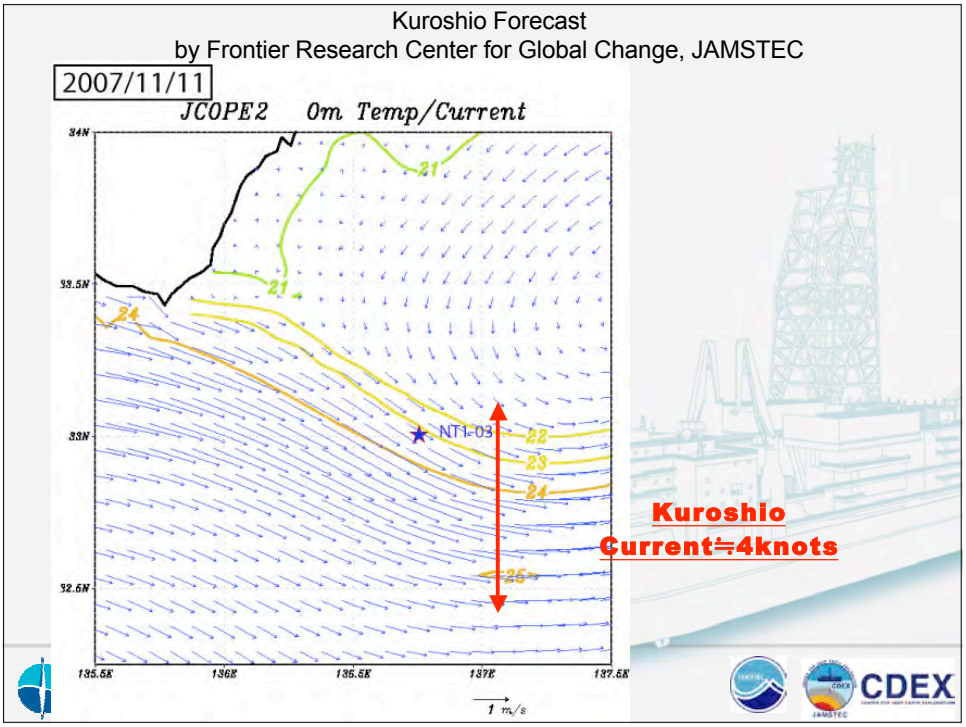
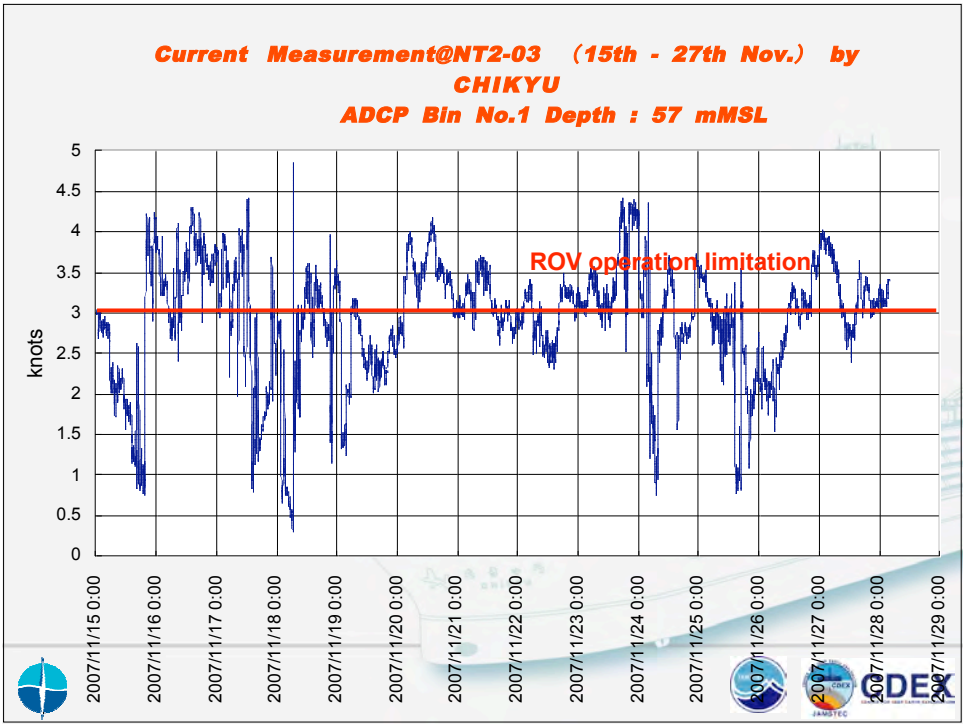
2007/10/26 0:00
2007/10/27 0:00
2007/10/28 0:00
2007/10/29 0:00
2007/10/30 0:00
2007/10/31 0:00
2007/11/1 0:00
2007/11/2 0:00
2007/11/3 0:00
2007/11/4 0:00
2007/11/5 0:00
2007/11/6 0:00
2007/11/7 0:00
2007/11/8 0:00
2007/11/9 0:00
CDEX

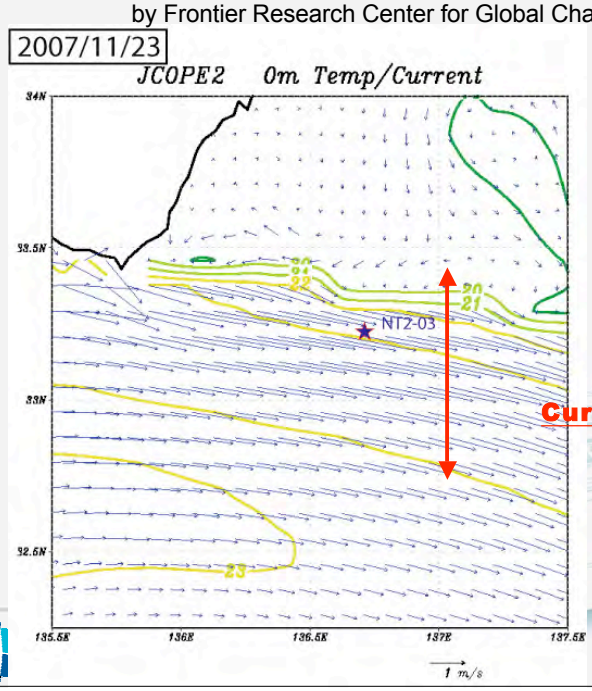

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC
2007/11/01
JCOPE2 0m Temp/Current
34N
33.5N
33N
32.5N
135.5E
136E
136.5E
137E
137.5E
NT2-01
Kuroshio
Current≒4knots
1 m/s
CDEX


Current Measurement@NT1-03 (8th - 15th Nov.) by CHIKYU
ADCP Bin No.1 Depth : 57 mMSL
Moved to NT1-03 from NT2-01G due to ROV damage accident
ROV operation limitation
knots
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2007/11/8 0:00
2007/11/9 0:00
2007/11/10 0:00
2007/11/11 0:00
2007/11/12 0:00
2007/11/13 0:00
2007/11/14 0:00
2007/11/15 0:00
CDEX


Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC
2007/11/11
JCOPE2 0m Temp/Current
34N
33.5N
33N
32.5N
135.5E
136E
136.5E
137E
137.5E
21
21
24
NT1-03
22
23
24
25
1 m/s
Kuroshio
Current≒4knots
CDEX


Current Measurement@NT2-03 (15th - 27th Nov.) by
CHIKYU
ADCP Bin No.1 Depth : 57 mMSL
knots
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
ROV operation limitation
2007/11/15 0:00
2007/11/16 0:00
2007/11/17 0:00
2007/11/18 0:00
2007/11/19 0:00
2007/11/20 0:00
2007/11/21 0:00
2007/11/22 0:00
2007/11/23 0:00
2007/11/24 0:00
2007/11/25 0:00
2007/11/26 0:00
2007/11/27 0:00
2007/11/28 0:00
2007/11/29 0:00
CDEX

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC



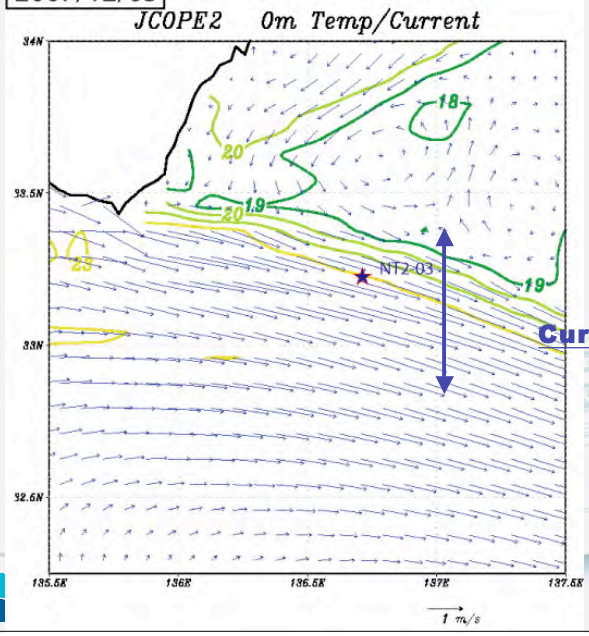
Kuroshio forecast 5th-13th December during riser top hole operation@NT2-03

Riser top operation includes,

- Set 36" conductor@60mbsf
- Drill 26" 0 – 700mbsf
- Set 20" CSG@700mbsf

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC

2007/12/05

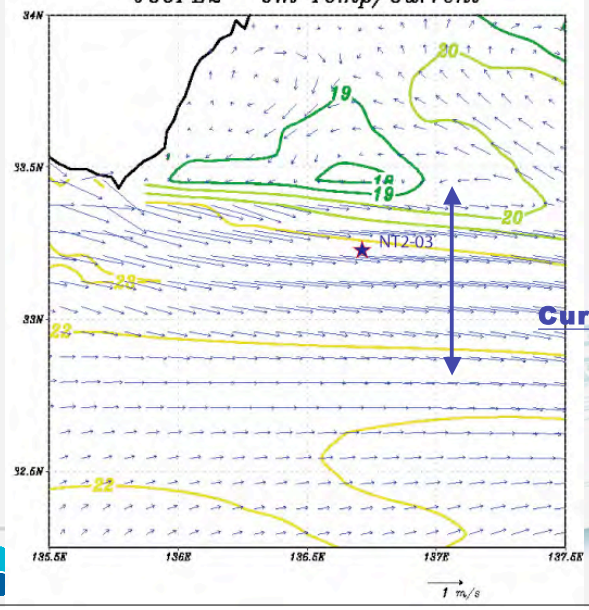


Kuroshio Current≒4knots

CDEX

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC

2007/12/11



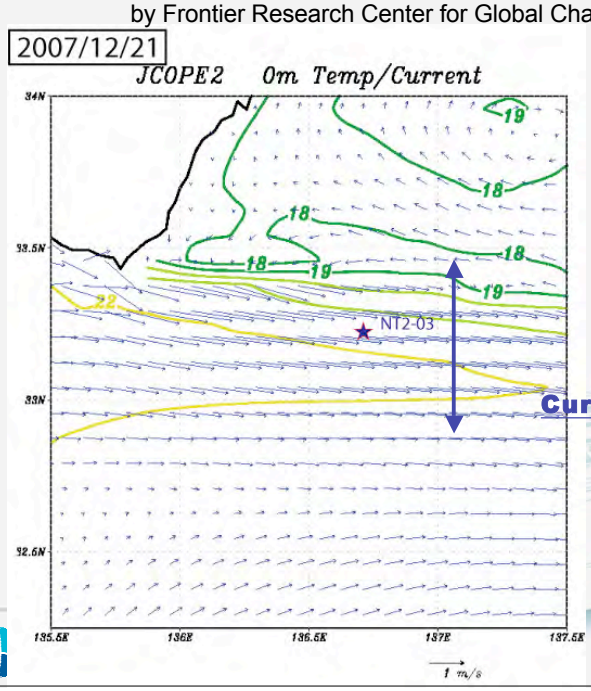
Kuroshio Current≒4knots

CDEX

Kuroshio forecast for Exp. 316

- Coring@NT2-01, and NT1-03
- Set 13–3/8" CSG@1000mbsf

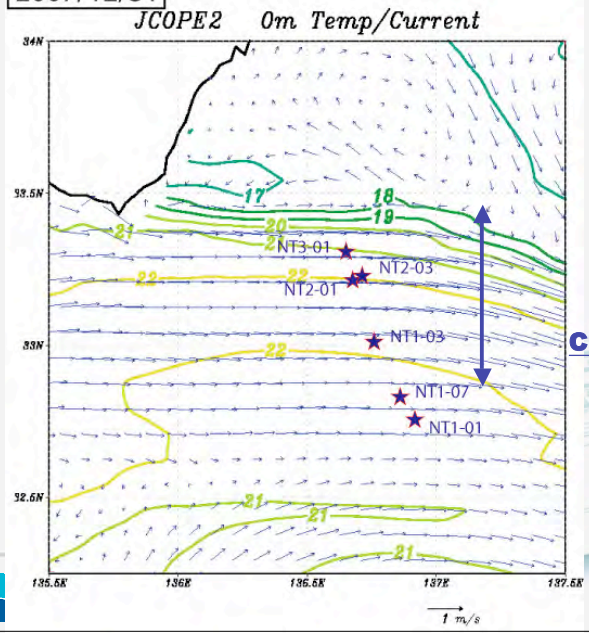
Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC



Kuroshio Current≒4knots

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC

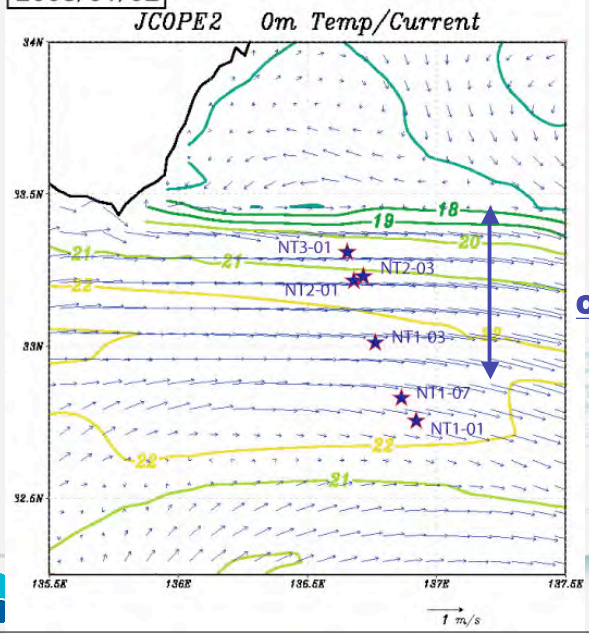
2007/12/31



Kuroshio Current≒4knots

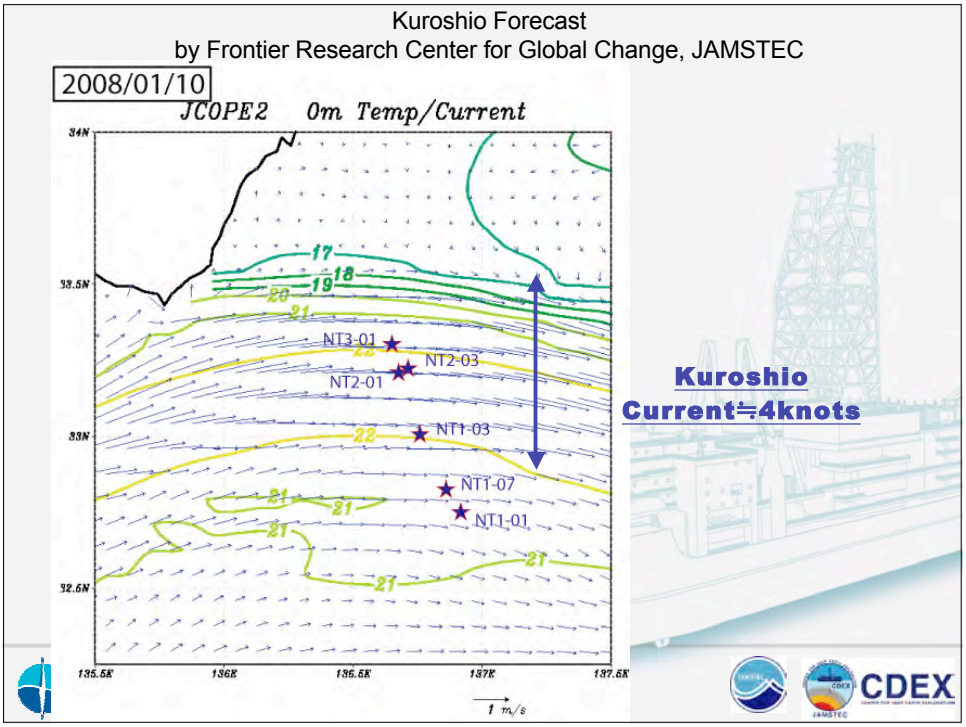
Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC

2008/01/02



Kuroshio Current≒4knots

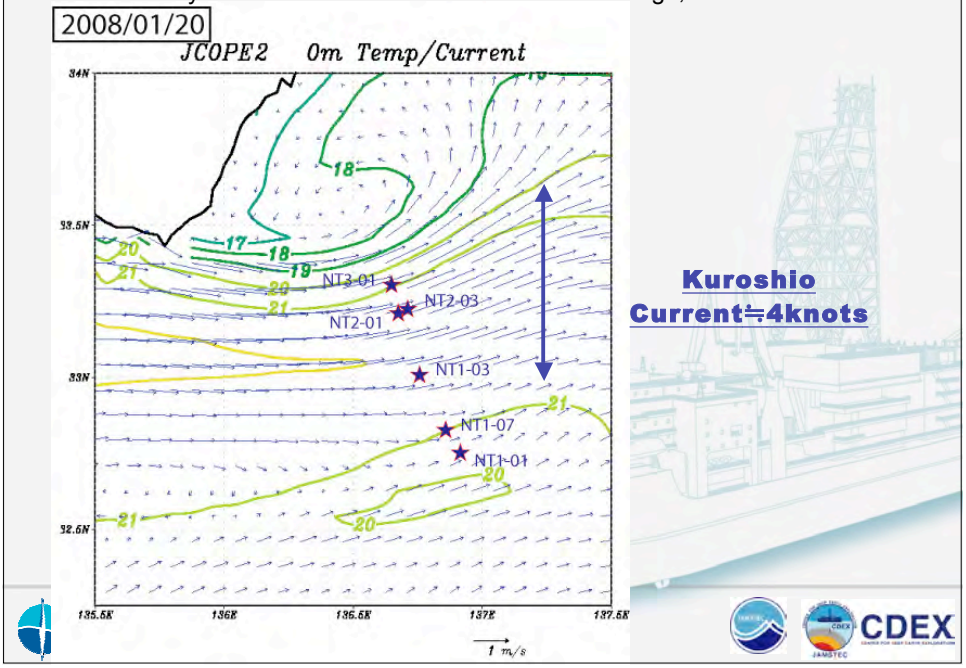
Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC



Kuroshio Current≒4knots

CDEX

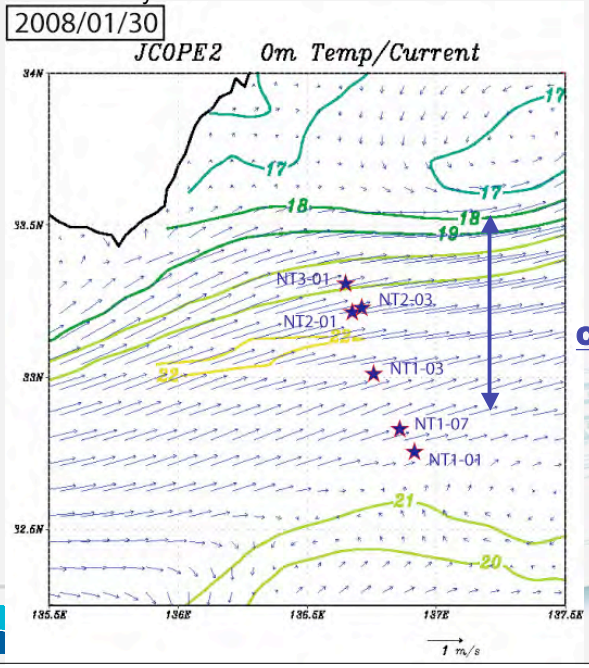
Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC



Kuroshio Current≒4knots

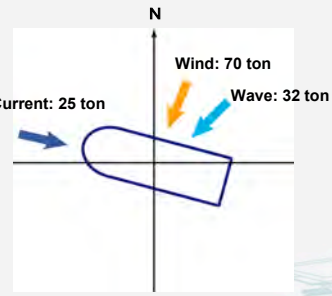
CDEX

Kuroshio Forecast
by Frontier Research Center for Global Change, JAMSTEC



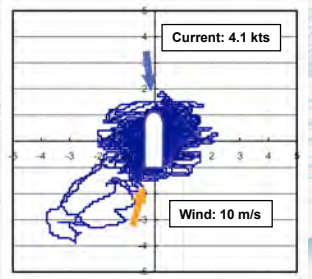
Kuroshio Current≒4knots

DPS Operation



Nov. 6, 2007 @24:00

- Current : 4.5 kt / 103°
- Wind : 12.0 m/s / 22°
- Wave : 2.0 m / 45°
- Azimuth : 285°



26 Sep. 9 hours tack

Purpose to install Riser Fairing

Reduction of Fluid Resistance under high sea current

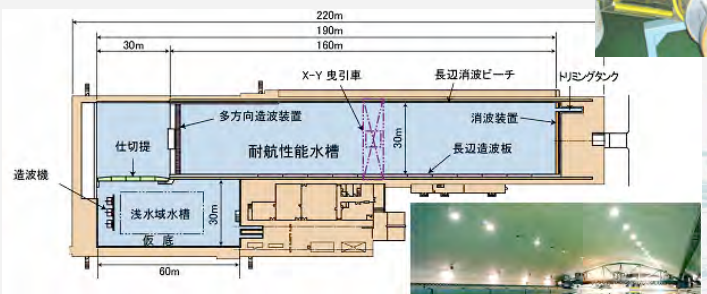
Minimize Voltex Induced Vibration

Reduce fatigue against riser pipe

Reduce vibration of riser pipe

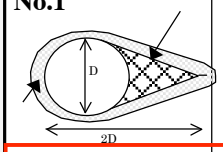
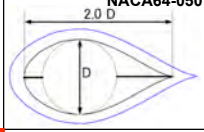
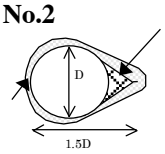
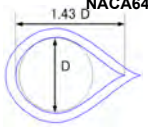
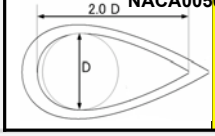
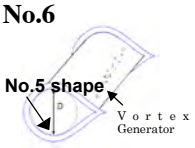
Experimental Study

Fluid Resistivity against riser pipe with various shape of fairing were measured as well as to find out effectiveness against Voltex Induced Vibration



長さ×幅×水深 ： 160 m×30 m×3.3 m
曳航電車最大速度 : 3 m/s

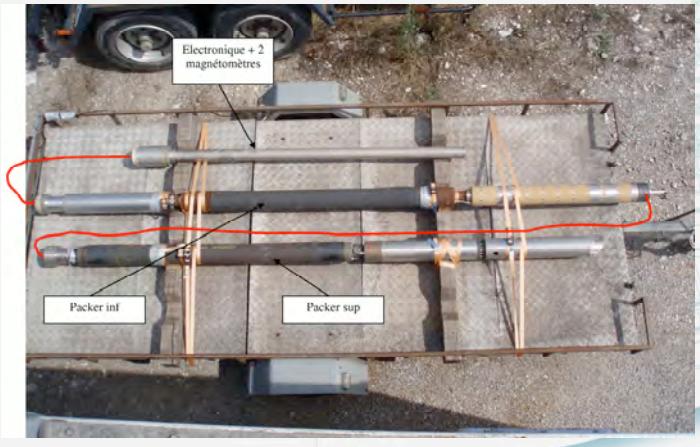
Experimental Results

Cross Section	Resistivity Coeff.	Effect for VIV	Difficulty When Build	Cross Section	Resistivity Coeff.	Effect for VIV	Difficulty When Build
No.1 	0.55	Few	Easy	No.4 Wing shape NACA64-050 	0.64	Yes	Diff
No.2 	0.53	Yes	Easy	No.5 Wing Shape NACA64-070 	0.54	Yes	Diff
No.3 Wing Shape NACA0050 	0.84	Yes	Diff	No.6 	0.55	Yes	Diff

Model No.2 was selected shape for proto type

HTPF

(Hydraulic Tests of Preexisting Fracture)



Main Requestors:

Mai Linh DOAN (University of Joseph Fourier, Grenoble, FRANCE)
Pierre HENRY, (Collège de France, Aix-En-Provence, FRANCE)
Siegfried LALLEMANT (University of Cergy-Pontoise, FRANCE)

APPENDIX C

Seismogenic Zone Observatory/Ocean Borehole Observatory Science -Current goals and challenges for next 10 years-

Report to PMT

Hisao Ito

December 9, 2007

WS Report

- Background
- WS objectives
- Main Theme of the WS
- WS Discussions
- Current and future plans

Background

- NanTroSEIZE
  - San Jose Meeting
  - Discussions at PMT

- Miyazaki WS &

Scientific Drilling Special Issue

Workshop Objectives

- Re-establish seismogenic zone/ocean borehole observatory science priority, based on current and future technology

- Review technology development roadmap, which is necessary for constructing future ocean borehole observatories

- Write Ocean borehole observatory science plan by JAMSTEC for urgent NanTroSEIZE and next 10 years:

Deep Sea Borehole Observatories as Part of Japanese National Key Technology Developments

- Societal goal: Breakthrough in earthquake hazard mitigation
  - Nankai Trough M8 earthquakes specific
- Science: Breakthrough in understanding seismogenesis
  - Why and how does plate stick-slip?
- Challenge: Point-to-Local-to-Regional-Plate scale connection
  - Never done before
  - Never accessed before

Consideration

- IODP holes are international scientific assets.
  - Comply with IODP rules.
- Strategy over 5-to-30 years. M8 probability continues to rise after 1944-46 sequence.
  - Just monitoring is not good enough.
- Open to better ideas.
  - Learn and improve.
- Apply to other deep sea sites.

This Workshop

- Pose specific scientific questions.
- Propose observables to narrow down possible answers.
- Identify critical observations.
- Discuss technological feasibilities.
  Do not wander into non-technical non-scientific issues unless absolutely necessary.

Main Theme of the WS

- Theme 1 Sea floor, ocean borehole and on land network
- Theme 2 In-situ monitoring of slow processes
- Theme 3 Active source experiment

WS program

Seismogenic Zone Observatory/Ocean Borehole Observatory Science

-Current goals and challenges for next 10 years-

Convenors

Kiyoshi Suyehiro (Advisor)
Hisao Ito (Secretary)
Eiichiro Araki
Yozo Hamano
Keir Becker
Selwyn Sacks
Earl Davis

Sponsored by JAMSTEC

Date: November 28-29, 2007

Place: Seminar Room A&B, JAMSTEC Tokyo Office

Workshop Program

Day 1 (November 28, 2007) 9:30~12:30
Morning: Plenary session (Chair: Eiichiro Araki)
Opening Remarks: Kiyoshi Suyehiro:
Brief Review of Existing Observatories
Keir Becker: Ocean Borehole Observatory: Lessons and achievements/CORK and ACORK
Earl Davis: Review of pore pressure observation
Masanao Shinohara/Eiichiro Araki: Ocean Borehole Observatory: Lessons and achievement /NEREID and CORK II
Takeshi Nakamura: Introduction of DONET
Peter Malin/Kazutoshi Imanishi: Lessons from SAFOD/EarthScope
Kentaro Omura: Review of NIED on-land observatories and slow earthquakes in the southwest Japan subduction zone
Afternoon Session 13:45~18:30
Introduction of the afternoon session (Chair: Hisao Ito) 13:45~14:15
Hisao Ito: Introduction of afternoon session: future plan
Eiichiro Araki: Outline of the NanTroSEIZE observatories
(1) Regional/Local Array Science
Moderators: Keir Becker and Hiromi Fujimoto
Key speeches:
14:15-14:45 Ryota Hino/Hiromi Fujimoto (30 min): Sea floor observation :what can be observed?
14:45-15:15 Yoshihiro Ito/ Keisuke Ariyoshi: Integration of on land, sea floor and ocean borehole observatory and new network/array design for earthquake and geodetic studies.
(2) In-situ monitoring
Moderator: Peter Malin and Hisao Ito
Key speeches
15:30-16:00Bunichiro Shibazaki/Yuta Mitsui: Simulation and modeling
16:00-16:15 Kotaro Ujiie: Lessons on deformation from core analysis
16:15-16:30 Hide Sakaguchi: Laboratory experiments and modeling
16:30-16:45 Yasuyuki Kano: Poroelasticity and pore pressure monitoring
16:45-17:00 Mai-Linh Doan: Pore pressure measurement in ICDP boreholes
17:00-17:15 Tadanori Goto, Takefumi Kasaya, Masataka Kinoshita and Yozo Hamano: Road to borehole electromagnetic observatory
17:15~18:30
Discussion
Moderators: Eiichiro Araki and Hisao Ito

Day 2 (November 29, 2007)

9:30~
Morning 9:30~12:30
Brief Summary of the 1st day discussions

Discussion on Technology Development
Moderator: Selwyn Sacks, Ralph Stephen, Tom Pettigrew and Toshiki Watanabe
Toshiki Watanabe/Ralph Stephen: Current status and future development of active experiment using borehole
Selwyn Sacks/ Peter Malin：Current status and future development of borehole sensors
Akiteru Takamori: R&D of a compact tiltmeter for borehole applications

Discussion of future plan (continued) **Chair Keir Becker and Hisao Ito**
Takeshi Sagiya: Observatory plan for Kumano ICDP: Opportunities for coordinated onshore-offshore observations
Reiji Kobayashi and Shigeru Nakao: Observatory plan in KAP (Kanto Asperity Project)

Discussion on observatory plan for the next 10 years and workshop report: Chair Eiichiro Araki and Hisao Ito
Jim Mori: Some issues addressed by future borehole observatories
Tom Pettigrew: Roadmap to future technology development.

Report Writing
Theme 1 Sea floor, ocean borehole on land network
Theme 2 In-situ monitoring of slow processes
Theme 3 Active source experiment

WS Discussions

- Slow slip event は存在するが、観測が網羅されてない

Slow slip event にsensitive であり、robustな観測とは？が議論された。

- 断層帯（splay, seismogenic(?) fault, decollement)の時間変化（すべり現象に伴って変化するかもしれない！）のモニタリング：制御震源等を使ったactive source experiment等のため、短周期の地震観測の重要性が認識された。

- 多点観測（面的展開と垂直展開双方）の重要性：DONETへの接続、海底地震・地殻変動観測との連携
- 安定な観測環境の実現の重要性（セメンチングやporefluid 測定のvolumeを最小化する努力）
- Recoverable は、retrievable を意味しない。
- Outside casing sensor はhydraulic line の展開を中心に検討を進める（電気ケーブルについても議論はされた）

1st priority

- One of the main scientific targets for the NanTroSEIZE project is to investigate the seismic/aseismic transition on the shallow subduction interface. Determining if the fault is locked or slipping aseismically at the locations where boreholes penetrate the megathrust should be a high priority objective that is expected to be resolvable from monitoring. Another related issue is trying to observe aseismic slip that may be occurring on the megathrust in areas outside of asperities. If aseismic slip can be measured, it would support a characteristic asperity model. If there is no aseismic slip, the asperity distribution may not be a fixed feature of the fault.
- Another important objective is recording and understanding the variety of low-frequency seismic events that are occurring near the shallow subduction interface or in the acretionary prism. Locations, mechanisms, and source parameters, of these events will contribute to understanding the earthquake processes of this region. Aseismic events and low-frequency earthquakes may be associated with fluid processes in this region. Fluid monitoring and sampling in the region where these events occur, may provide direct measurement of conditions where these events occur.
- Both borehole and surface arrays of seismometers will provide detailed information of the shallow subduction zone structure. Using both passive and active sources, high resolution images of the splay faults and megathrust are expected. Geological structural information, physical parameters estimates, and observations of the seismic and aseismic events, all will contribute to modeling efforts of the subduction zone processes.
- The establishment of the borehole observatories also provides the opportunities for experiments and temporary array observations. For example, planned responses to the large earthquakes or large slow events in the region may provide exciting new information.
- Specific scientific targets are important for establishing the long-term borehole monitoring. However, it was also pointed out that in such monitoring efforts, there is a great potential for new discoveries and broad-based observations are important.

Technology

- Integration of borehole/sea floor/on land observation

JAMSTEC: DONET system, LTBMS (IODP SOC)
Data Integration

- Sensor
  Sensor Array (Sensor type, sensor interval, outside casing tech.)
  sensor development

- Future Collaboration
  Scientists-Engineers
  JAMSTEC-NanTroSEIZE scientists-sensor developing Gr. -IODP-PMT

- Good use of boreholes (Revisit etc)

- Next steps
  From aseismic observation in interseismic period
  to hazard mitigation, pre-events, co-seismic

APPENDIX D

"Roadmap" for non-riser observatories for CDEX operation in 2008-2009
October 12, 2007

NanTroSEIZE PMT Observatory Team: Eiichiro Araki, Demian Saffer, Achim Kopf, Hisao Ito, Masa Kinoshita, Liz Screaton, Harold Tobin, Earl Davis

Based on outcomes of several recent meetings focused on non-riser NanTroSEIZE observatories, including: (1) PMT meeting #10 in July 25-27, 2007, (2) CDEX evaluation of observatory recommendations from the PMT meeting, and (3) a September 17 meeting of the NanTroSEIZE PMT observatory "team", we have reached consensus on a preferred path forward for implementing non-riser observatories in FY2009-2010.

Based on the NanTroSEIZE science objectives, the PMT defined the minimum observatory needs to include both pore pressure and seismo-geodetic installation in the Kumano Basin at NT3-01 and at a second location near the mega-splay (NT2-03 or NT2-01). In addition, the PMT agreed that for success of NanTroSEIZE science, it is extremely important to install some observatory components as soon as possible, even if the installation is very simple. These key requirements for successful implementation of the science plan have guided the following recommendations.

1. Installation of combined hydrologic-geodetic observatories at NT2-01 and NT3-01.

Scientific Objectives

- Detection and quantitative analysis of slow events (such as VLF events) and micro seismic activity.
- Detection and quantification of strain accumulation and/or release through monitoring of strain, tilt, and pore pressure.
- Ambient pore pressure measurement, evaluation of pore pressure changes as a proxy for volumetric strain, and possible hydrological responses to seismic/geodetic events.
- Technical milestone for observatory installation for future deep riser borehole observatories at NT2-03 and NT3-01.
- Direct comparison and separation of hydrologic and geodetic signals are needed to better understand slow slip events.

Sites

NT2-01 (shallow splay; TD 1000m): This site will be cored during Exp. 316 (Dec07-Feb08). The casing will be set for later observatory installation. This site provides unique opportunities to monitor ***within*** the mega-splay at a shallow depth, and is well suited for monitoring geodetic and seismological signals in the hanging wall.

NT3-01 (Kumano Basin: TD 1400m): Coring at this site is deferred for Oct-Dec., 2008 or later. However, we will conduct LWD at this site during Exp. 314, and may be cased depending on the stability of formation. It would be possible to successfully install an observatory here at depths shallower than the TD for coring/LWD. This site would constitute the landward-most location in the NanTroSEIZE monitoring network, and is ideally located in the hanging wall above the mega-splay for geodetic monitoring.

Planned Observatory

Our plan is to implement the borehole observation system described in ***Figure 1*** as a simple installation for FY2010, at two sites: NT2-1 and NT3-1. Based on the outcome of the August, 2007 SPC and OTF meetings, as well as the need for early data from the monitoring systems, we strongly suggest that observatory installation occur at the beginning of the Sept. 2009-May 2010 Chikyu operations window. We also suggest that NT2-01 be first in the installation sequence, because it will be cased previously during Expedition #316 and the TD is shallower.

The planned installation combines a hydrogeological and seismo-geodetic observatory in the same hole**.** The system shown in ***Figure 1*** is considerably simplified from the original design developed by the proponents and USIO for the now-cancelled “Kumano Basin” expedition, because it does not include the ACORK element. We expect these reductions will significantly simplify installation and reduce cost, but yet not compromise our scientific objectives. The scientific instrumentation for BOTH the hydrologic and geodetic systems is already funded. Substantial progress has been made toward the design, engineering, and deployment (operations) plans, by the 3rd party PI’s, the USIO, and through contract with Mohr Engineering (Tom Pettigrew).

General Observatory Configuration

Strainmeter and broadband seismic sensors, as well as a screened hydraulic port are installed in the open hole below casing. Strainmeter and broadband seismic sensors are cemented, but pressure port is not cemented being protected by a drill collar below the cement port. The cement is pumped through the 4-1/2" casing and discharged from the cement port below the strainmeter and broadband seismic sensors. Cement will seal the section of pressure port from the upper section.

Electrical cables and 1/4" hydraulic tubing are attached to the 4-1/2" casing. The 4-1/2" hangs on casing hanger inside of the 9 5/8" casing. On the CORK head, the cables and hydraulic tubing are terminated by under water mating connectors and a pressure data recorder (***Figure 2***, left). The installation requires a hydraulic seal at the casing hanger with hydraulic tubing and electrical cable feed-throughs (***Figure 2***, right). This seal will ensure that the pressure port measures pore pressure in the formation, not connected to the seafloor. Similar seals have been designed and used successfully in many non-riser observatories (CORKS) in ODP. A pressure port above the seismic sensor section will provide pressure measurement as a proxy for strain. If we have seal at the tubing hanger and perforate casing, we can also measure pore pressure at any depth above the seismo-geodetic sensors. ***Figure 3*** illustrates depths of pore pressure and strain, seismic measurement at the two target sites (NT2-1 and NT3-1).

Current Status

- The USIO plans to provide assistance and information transfer of designs and engineering work for the originally planned Kumano Basin observatory. Timing for a meeting at the USIO is being worked out, likely some time in November, 2007.
- The 3rd party PI's, along with USIO, are working to address the itemized list of queries CDEX generated about the combined observatory. Many (most) of the issues raised have already been addressed and will be discussed at the USIO-CDEX joint meeting.

2. Observatories of opportunity: NT3-01 and NT1-07 multi-level pore pressure (Strap systems).

We strongly recommend that these systems be installed during the anticipated Oct.-Dec. 2008 expedition as an add-on to casing installations, *if casing is run*. Note that we do *not* recommend adding casing operations if they are not already needed for coring objectives. As described below, the "Strap" systems are essentially a series of low-profile umbilical and mini-screen elements strapped to the exterior of 9 5/8" or 13 3/3" casing. They do not increase risk, add only slightly to cost and operational time, and may have significant scientific payoff. The schematic in ***Figure 4*** shows a system strapped to 9 5/8" casing, but the same design and installation procedures can be used for installation with 13 3/8" casing. It is also important to note that the "Strap" systems are meant to augment the full observatory installations described above, *NOT* as a substitute for them or any of their components.

Scientific Objectives

- Ability to obtain earlier, longer duration monitoring that extends our time series of monitoring data by > 1 year, by installing a simple system in early FY2009.
- Seaward location of borehole monitoring (NT1-07) for characterization of strain signals across the

margin.

- Multi-level pore pressure at NT1-07 to characterize subduction inputs and understand fault strength.
- Multi-level pore pressure at NT3-01 to fully characterize hydraulic transients and geotechnical parameters at key site in hanging wall of mega-splay – and at location of future riser site. Small volume at each monitoring level may allow resolution of higher-frequency transients.
- Preparation and casing for possible later seismological or geodetic observatory installations.

Sites

NT3-01 (shallow splay; TD 1340m): This site will be cored during Exp. 316 (Dec07-Feb08). Several hundred m of casing is part of the original operations plan to reach coring objectives.

NT1-07 (Subduction Inputs: TD 1200m): Coring at this site is planned for Oct-Dec., 2008. Several hundred m of casing is part of the original operations plan to reach coring objectives within and below turbidite sands in the lower part of the section.

"Strap" System Concept and Design (*from Tom Pettigrew, as of 9 Oct., 2007*)

The following NantroSIEZE Strap Cork description assumes that the installation will be carried out from the ***Chikyu*** and thus the secondary reentry cone can be deployed as an integral part of the casing hanger/casing string assembly. (Note that the secondary reentry cone can be designed such that it is deployed after installing the casing string. However, this approach requires a more complex secondary reentry cone design that is not thought to be required for deployment from the ***Chikyu.)***

The NantroSIEZE Strap Cork (S-Cork) concept is a simple flat umbilical composed of four to six 1/8" diameter stainless steel tubes sheathed in a urethane jacket, strapped to the outside of casing. The tubes are connected to sampling mini-screens downhole and to sampling ports above the seafloor, in order to monitor formation pore pressure at several levels. The observatory system will only be as deep as the casing strings, which will be dictated by hole conditions and coring objectives. Intervals will be defined based on coring results and LWD.

The individual hydraulic tubes, encased in the umbilical, are attached to individual mini-screens, which are positioned at various depths within the borehole and to sampling ports attached to the secondary reentry cone. The sampling ports are hydraulic connectors that allow pressure meters to be attached to the individual sampling tubes, post deployment, and thus allow the borehole pressure at various levels within the borehole to be monitored long term. For ease of deployment, the sampling ports are made up to the secondary reentry cone prior to deployment. The secondary reentry cone is designed such that it can be easily and quickly attached to

the top of the casing hanger during deployment. A casing hanger tubing by-pass, composed of six to eight 1/8" diameter stainless steel tubes is made up prior to deployment, and can be easily and quickly passed through the casing hanger circulation slot(s). The top of the casing hanger sampling tube by-pass is attached to the sampling port tubing and the bottom to the umbilical, at the time of deployment, completing the hydraulic circuit between the mini-screens downhole and the sampling ports at the seafloor.

Engineering Tasks Required for an S-Cork Deployment (*from Tom Pettigrew, as of 9 Oct., 2007*)

1. Design casing hanger modifications to accept attachment of the secondary reentry cone and installation of the casing hanger sampling tube by-pass.
2. Design secondary reentry cone. The secondary reentry cone is a split design, similar to that of the US-IO Free Fall Funnel. This approach allows the reentry cone to be attached to the casing hanger, in the moonpool, while the casing string is suspended by the drill string. A manifold composed of the sampling ports is fixed to the outside of the reentry cone, just under the cone major diameter rim, for protection during subsequent reentries. The secondary reentry cone must be tall enough to extend above the primary reentry cone far enough to allow easy access to the sampling ports by an ROV or submersible.
3. Coordinate the mini-screen design with the vendor to ensure the mini-screen meets the needs of the scientists and provides adequate clearance with other nested casing strings and/or restrictions within the installation.
4. Coordinate the umbilical design with the vendor to ensure the umbilical meets the needs of the scientists and provides adequate clearance with other nested casing strings and/or restrictions within the installation.
5. Specify off-the-shelf strap on centralizers/protectors to be installed on the casing string to protect the mini-screens from dragging on other nested casing strings and/or restrictions within the installation during deployment.
6. Produce detailed assembly and deployment procedures for the S-Cork.

General S-Cork Deployment Procedures

1. Stage the umbilical and all ancillary parts (mini-screens, centralizers/protectors, banding materials, tubing connectors and plugs, etc.) in the moonpool area. Rig up umbilical such that it can be fed from it's storage reel, up over a sheave hung from the rig floor, and feed down along side of the casing string as it is made up and lowered through the moonpool.

2. Begin deploying the casing string as usual.

3. At the level, as determined by the scientists, for positioning the first, lower most, mini-screen, stop lowering the casing string and attach a centralizer/protector. Break out the #1 sampling tube from the umbilical sheath, attach a mini-screen to the tube, and strap/band the mini-screen and umbilical to the side of the casing string. Note, the individual umbilical tubes must be identifiable over the entire length of the umbilical.

4. Slowly lower the casing string, strapping/banding the umbilical to the side of the casing string at ~10 m intervals.

5. At the next level for attachment of a mini-screen, stop lowering the casing string and attach a centralizer/protector. Remove a 1 m section of the umbilical sheath. Cut the #2 sampling tube in the middle of the 1 m section. Install a plug connector on the lower portion of the #2 sampling tube to prevent communication with the lower monitoring level. Attach a mini-screen to the upper portion of the #2 sampling tube and strap/band the mini-screen and umbilical to the side of the casing string.

6. Slowly lower the casing string, strapping/banding the umbilical to the side of the casing string at ~10 m intervals.

7. Repeat the mini-screen installation procedure, and capping of the sampling tubes, for the remainder of the levels as instructed by the scientists.

8. Slowly lower the casing string, strapping/banding the umbilical to the side of the casing string at ~10 m intervals.

9. When the casing hanger is positioned in the moonpool, attach the secondary reentry cone to the casing hanger, aligning the sampling ports as close as possible to the umbilical.

10. Install the casing hanger sampling tube by-pass and connect the sampling port tubing to the top of the by-pass tubing while making note of which sampling port is connected to which by-pass tube.

11. Sever the umbilical and remove 1 m of the sheath from the end attached to the casing string.

12. Connect the umbilical sampling tubes to the casing hanger by-pass sampling tubes, making note of which sampling port is connected to which umbilical tube. Note, it is recommended that the umbilical individual sampling tubes be connected to the individual sampling ports such that the various monitoring levels within the borehole are aligned either top to bottom, or bottom to top, (within the borehole) to either left to right, or right to left, on the sampling port manifold individual ports, for ease of identification by an ROV or submersible pilot.

13. Lower and install the casing string, with S-Cork attached, as with any other casing string.

Required S-Cork Installation Hardware

Note, this is a general list of hardware required for multiple S-cork installations on a single expedition. Each specific installation may require specific hardware unique to that installation.

1. Umbilical...of sufficient length for all planned S-Cork installations, rolled onto a storage reel(s).
2. Mini-screens...enough for all planned levels of monitoring plus 2 spares.
3. Miscellaneous tubing connectors and plugs...enough for all planned mini-screen installations plus spares.
4. Centralizers/protectors...enough to attach a minimum of one each at all mini-screen installations, 2 or 3 near the bottom of the casing hanger, and spares.
5. Casing hanger sampling tube by-pass...one each for each S-Cork installation plus at least one spare.
6. Secondary reentry cone and installation hardware...one each for each S-Cork installation.
7. Modified casing hanger...one each for each S-Cork installation.
8. Banding/strapping materials...enough to band/strap each umbilical at ~10 m intervals, plus spares.
9. Duct tape...several cases.

Preliminary Cost Estimates & Delivery Times for Hardware Elements

10 m long mini-screens & all connectors	$1000 each	2-3 weeks delivery (standard items)
Full umbilical (4 hyd. lines, 1000 m length)	$30,900	10-12 weeks delivery
Secondary re-entry cone	$3,000 each	6-8 weeks delivery
Hanger bypass	$500 each	2-3 weeks delivery
Installation Hardware	$5,000 each	2-3 weeks delivery
Modified Hangers	$1,500 each	4-6 weeks delivery

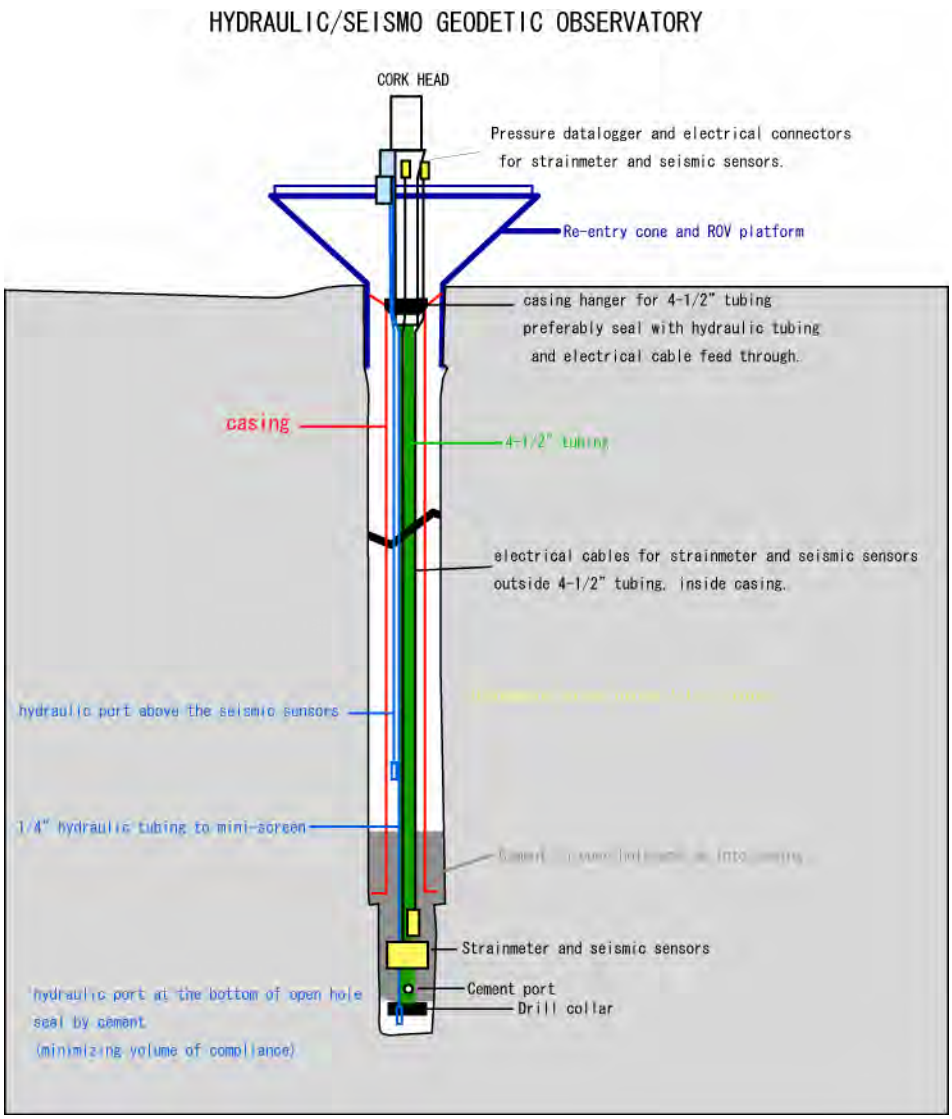


Figure 1. Combined Hydraulic and Seismo-geodetic Observatory in single hole proposed in this document.

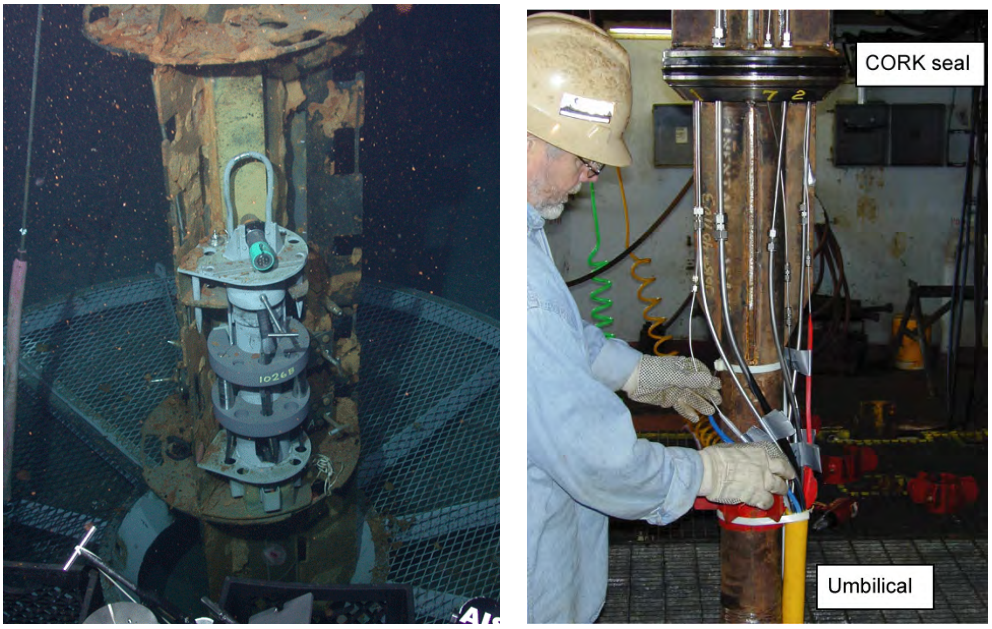


Figure 2. Pressure logger on the CORK head (LEFT) and pressure seal at the casing hanger of CORK head (RIGHT).

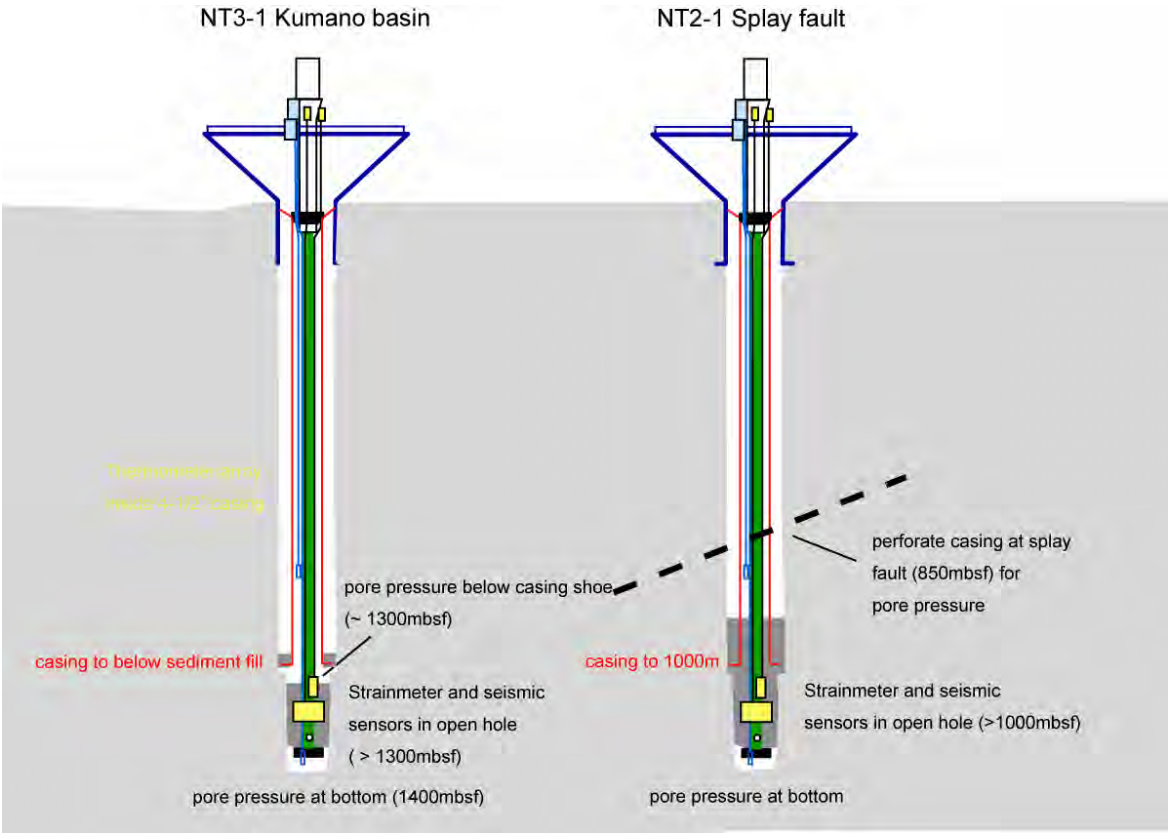


Figure 3. Proposal of deployment of two non-riser borehole observatories for pore pressure, temperature, strain, seismic monitoring in the Nankai Trough.

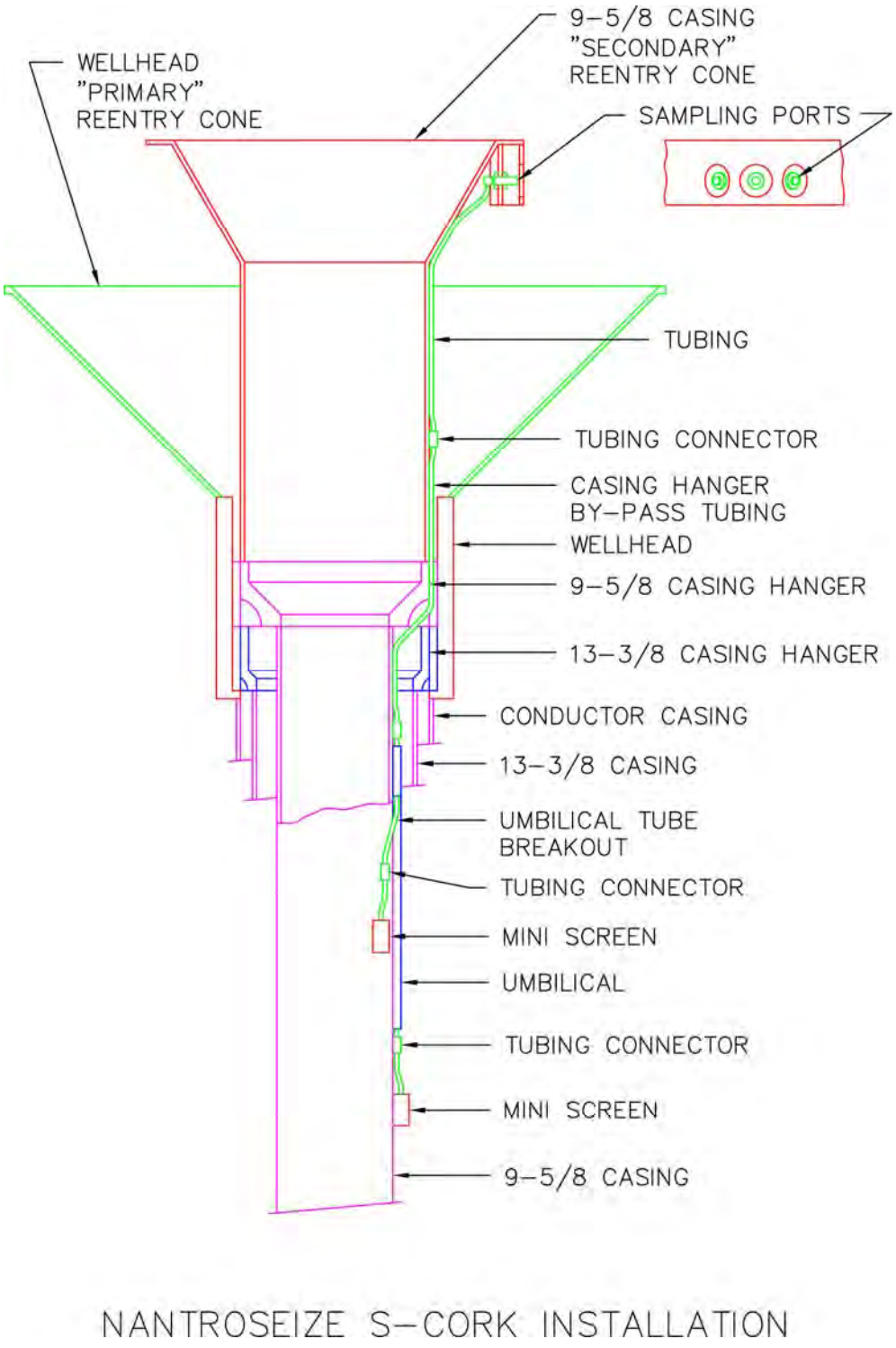


Figure 4. Schematic of Strap observatory system for multi-level pore pressure monitoring with relatively simple add-ons to standard casing installation.