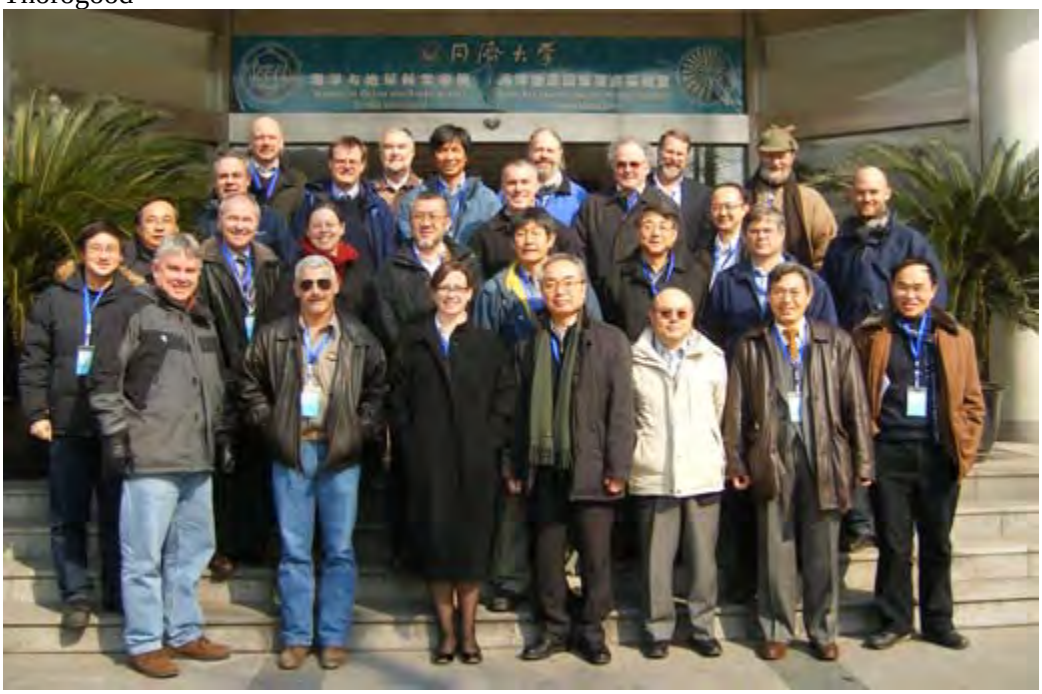
MINUTES
Eighth Meeting of the Engineering Development Panel (EDP) of the IODP

January 14 – 16, 2009
Shanghai, China

1. 2. Sean Higgins, 3. Kevin Grigar, 4. Kelly Oskvig, 5. Makoto Miyairi, 6. Sumio Sakuma, 7. Yoshiyasu Watanabe, 8. Quianyu Li, 9. Ying Ye, 10. Lothar Wohlgemuth, 11. Maria Ask, 12. Hiroshi Asanuma, 13. Masafumi Fukuhara, 14. Hisao Ito, 15. Saneatsu Saito, 16. Bill Ussler, 17. Simon Barry, 18. David Gray, 19. Tom Janecek, 20. David Wallis, 21. Roy Wilkens, 22. Nori Kyo, 23. Greg Myers, 24. John Tauxe, 25. Roland Person, 26. Leon Holloway, 27. John Thorogood



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IODP Engineering Development Panel
Eighth Meeting
January 14-16, 2009
Shanghai, China
Members and Guests

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Executive Summary
IODP Engineering Development Panel
Eight Meeting
January 14-16, 2009
Shanghai, China

EDP Consensus Statements, Recommendations, and Action Items

The EDP forwards the following consensus statements and action items to the SPC or the IODP-MI as appropriate.

EDP Consensus 0901-01: Approval of Agenda
The EDP approves the agenda for EDP Meeting #8.
Routing: IODP-MI
Priority: Medium

EDP Consensus 0901-02: Approval of EDP Meeting #7 Minutes
The EDP approves the minutes from EDP Meeting #7.
Routing: IODP-MI
Priority: High

EDP Consensus 0901-03: EDP SPC Representative
EDP designates Bill Ussler as the EDP representative at the next SPC meeting to be held in March 16-19, 2009 in Miami, Florida, USA.
Background: Cost effective.
Routing: IODP-MI, SPC
Priority: High

EDP Consensus 0901-04: EDP SSEP Liaison
EDP designates Maria Ask as the EDP representative at the next SSEP meeting to be held May 25-27, 2009 in Utrecht, Belgium.
Background: Cost effective.
Routing: IODP-MI, SSEP
Routing: High

EDP Consensus 0901-05: EDP Meeting #9
EDP recommends that EDP Meeting #9 be held in Luleå, Sweden from July 15-17, 2009.
Routing: IODP-MI
Priority: High

EDP Consensus 0901-06: EDP Meeting #10
EDP recommends that EDP Meeting #10 be held in Sendai, Japan, tentatively from January 13-15, 2010.

Routing: IODP-MI
Priority: Medium

EDP Consensus 0901-07: Engineering Testing Time Policy on IODP Platforms
The EDP endorses the IODP-MI policy for allocating engineering testing time at sea on IODP platforms.

Background: The EDP is responding to a written request by the USIO-LDEO for consideration of a specific need for at-sea engineering testing time and of a general request for an at-sea engineering testing time policy.
Routing: IODP-MI, SPC, PMOs, IOs, STP
Priority: High

EDP Action Item 0901-08: Request by INVEST Steering Committee for EDP White Paper on Technological Needs of Scientific Ocean Drilling
The EDP responds to the INVEST Steering Committee request for a white paper on the technological needs of scientific ocean drilling by establishing an EDP Ocean Drilling Technology White Paper Working Group. The working group and their assignments includes: Bill Ussler (coordinator), Hiroshi Asanuma (high temperature measurements), Maria Ask (geotechnical measurements), John Thorogood (project management of deep water DP riser drilling and well engineering), Leon Holloway (improving core quantity and quality), Sumio Sakuma (high temperature drilling), Yoshiyasu Watanabe (deep water drilling), Roy Wilkins (in situ measurements), and Lothar Wohlgemuth (ultra-deep drilling).

Routing: INVEST-SC, IODP-MI, SPC, STP, IOs
Priority: High

EDP Consensus 0901-09: IODP-MI FY2010 Engineering Development Plan
The EDP re-affirms its endorsement of the existing IODP-MI FY10 Engineering Development Plan.

Routing: IODP-MI, SPC
Priority: High

EDP Consensus 0901-10: STP Science and Technology Roadmap
The EDP thanks Saneatsu Saito for his informative presentation of the STP Science and Technology Roadmap (STR). The STR is helpful for prioritizing several key EDP technical challenges. We acknowledge the need for continued collaboration.

Routing: IODP-MI, STP, SPC
Priority: Medium

EDP Consensus 0901-11: STP Core Disturbance Case Studies
The EDP requests that the STP develop a set of examples that illustrate core quality issues that compromise scientific drilling objectives. These might include drilling biscuits, sapropels, chert/chalk interbeds, and core disturbance.

Routing: STP, IODP-MI
Priority: High

EDP Action Item 0901-12: EDP Technology Roadmap
The EDP will examine and revise the Technology Roadmap (version 3.0) by email and create a document ready for formal approval at its July 2009 meeting. The approved version will be posted on the IODP-MI website after the July meeting.

Routing: IODP-MI, STP
Priority: High

EDP Consensus 0901-13: Proposal 698-Full2
Based on new site survey data contained in the 698-Full2 Addendum, the EDP chose not to provide a technical review of this proposal at this time.

Routing: SSEP, SPC, IODP-MI
Priority: High

EDP Action Item 0901-14: Proposal 734-APL
The EDP reviewed Proposal 734-APL and is forwarding its review to the IODP-MI.

Routing: SSEP, SPC, IODP-MI
Priority: High

EDP Action Item 0901-15: At-sea Engineering Testing Time Request by the USIO-LDEO
The EDP reviewed a letter proposal concerning allocation of at-sea engineering testing time and is forwarding its response to the IODP-MI.

Routing: IODP-MI
Priority: High

EDP Consensus 0901-16: Deep Rock Stress Tester (DRST) Engineering Development Proposal
The EDP recommends to the IODP-MI that an external scientific and technical review be obtained for this proposal. The EDP re-affirms the existing grouping number for this proposal and endorses IODP-MI's efforts to conduct an external review and use this information as part of the IODP engineering plan creation process.

Background: The DRST proposal was initially reviewed and grouped at the EDP meeting #7 (Salt Lake City). The EDP agreed to ask for more information from the proponent for consideration at the EDP meeting #8 (Shanghai), with the possibility of increasing the grouping if the reply was satisfying. The panel recognizes that it cannot fully evaluate the response letter; therefore, the EDP abstains from voting, and recommends to the IODP-MI to submit the proposal for an external scientific and technical review.
Routing: SSEP, SPC, IODP-MI

Priority: High

EDP Action Item 0901-17: Integrated Engineering Development Efforts within the IODP
The EDP recognizes that technology development within the IOs should be better coordinated with the entire POC- and SOC-supported engineering efforts. The EDP will send a letter outlining its concerns and suggestions to IODP-MI.

Background: Presentations at the EDP 8 meeting by CDEX and ESO caused the panel some concern that there appears to be parallel engineering development efforts within the IODP that may result in duplication of effort.
Routing: IODP-MI
Priority: High

EDP Consensus 0901-18: Outgoing EDP members
The EDP thanks Masafumi Fukuhara and Ye Ying for their service to the panel.

Routing: PMOs, IODP-MI
Priority: Medium

Minutes
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Eighth Meeting
January 14-16, 2009
Shanghai, China

Wednesday, January 14, 2009

In these minutes, the Recommendations, Consensus Statements, and Action Items are not repeated in detail. Please refer to the Executive Summary for the full text of each, as indicated.

Meeting was convened at 0840 at Tongji University.

Agenda Item #1: Welcoming remarks (Miyairi/Ying)

Makoto Miyairi, chairman of the EDP, thanked Ye Ying for hosting the meeting at Tongji University. Ye Ying thanked IODP-China for sponsoring this meeting and providing financial support for lunches and the reception banquet. Yi Ying reviewed safety issues, particularly being careful when crossing streets. Self-introduction of members and other participants occurred. This is the last meeting for Fukuhara. Miyairi reviewed Robert's Rules, the general purpose of the EDP, the EDP mandate (Appendix A). Miyairi requested that the following panel members take notes for the minutes: Ussler—Wednesday morning, Ask—Wednesday afternoon, Tauxe—Thursday morning, Asanuma—Thursday afternoon, Wilkins—Friday morning.

Agenda Item #2: Approval of meeting agenda (Miyairi)

Miyairi reviewed the meeting agenda. Motions were made to approve the agenda—1st Wilkins and 2nd Holloway, and it was approved by consensus without discussion.

Agenda Item #3: Quorum discussion (Miyairi)

Fourteen voting members comprise the EDP. Twelve were present plus one alternate—von Herzen and Tamura were absent; Sumio attended as an alternate for Tamura. Miyairi asked if anyone would leave before the end of the 3rd day. No one planned to leave early.

Agenda Item #4: Approve minutes from EDP Meeting #7 (Miyairi)

The minutes from EDP #7 were approved without discussion—1st motion by Thorogood, 2nd by Wilkins.

Agenda Item #5: Preliminary discussion of the next two meeting locations (Miyairi)

Ask presented background information on having the EDP #9 meeting in Luleå, Sweden (Appendix B). Ask will be the local host for EDP #9. Asanuma has offered to host EDP #10 in Sendai, Japan (Appendix C). Tentative dates of January 13-15, 2010 were suggested. There is a

Japanese bank holiday on 1/11/10. Transportation to Sendai from Narita is not simple, however STP has met in Sendai in the past.

Agenda Item #6: Review status of previous meeting action items and recommendations (Oskvig)

Oskvig reviewed previous meeting action items and recommendations (Appendix D).

COFFEE BREAK

Agenda Item #7: SPC report (Li)

Li provided an update on the SPC meeting held in Sapporo, August 25-27, 2009 (Appendix E). He reviewed the status of the NanTroSEIZE drilling project. He reviewed the timetable for the INVEST science plan. A 1st draft will be completed by late 2010; and finalized in 2011. Approval by the national science boards will occur between late 2011 and 2012, and by funding agencies in 2012.

Agenda Item #8: SSEP report (Ussler)

Ussler reviewed highlights from the SSEP meeting (Appendix F).

Agenda Item #9: STP report (Saito)

Saito provided background information on the STP and its reporting relationship with the Science Advisory Structure (SAS) (Appendix G). He also reviewed recent consensus items and the on-going development of a Science and Technology Roadmap (STR).

Agenda Item #10: Status of current engineering development projects (Myers)

Myers reviewed the 2009 engineering development projects currently underway, the projects that may be included in the 2010 annual program plan (APP), and the direction for 2011 (Appendix H). Current projects in 2009 include the long-term borehole monitoring system (LTBMS), and the simple observatory initiative that would support deployment of the S-CORK and SCIMPI systems. Both of these projects are not moving along at this time, but may start in 2010. The motion decoupled hydraulic delivery system (MDHDS) is in year one of its funding. He also reviewed current in-house scoping studies—coring case study analysis that is focusing on core quality and quantity. Externally funded projects include the riserless mud recovery (RMR) system supported by the Deep-Star Consortium. The current phase is a feasibility study for a system that is rated for 5,000 feet water depth. The desire is to develop a system to operate in up to 12,000 feet of water. The intention is to develop a system that would be used for top-hole drilling, not an entire well. This will aid in initiating riser drilling in the shallow subsurface. The hydrocarbon industry likes this RMR concept because it may result in a significant cost savings. The JOIDES Resolution has to be modified in order to accommodate RMR technology. This would include adding cantilevered decks for the mud pumps and other equipment. Modification of the ship would require significant down-time, perhaps on the order of a month to refit for the

RMR system. Field trials might be as long as four moths. An ROV would also be needed, and space is available for an ROV on the starboard aft deck area. The RMR would allow retrieval of cuttings, thus mud logging would become possible. Field trials would cost about $25 million. It is likely that field trials would be liked with the JIP gas hydrate program. The RMR could be used to achieve some of the gas hydrate goals set forth by the JIP.

Holloway asked whether in situ testing technologies could be utilized. Myers replied, not yet, but in the next phase this might become possible, using a sea-floor clamping system, for example. Myers stated that the IODP needs to be looking at the next level of technology, and be doing something different. One way is to get hydraulics to the seafloor.

Thorogood asked if the EDP can see the RMR report, even if it is confidential. Myers replied that this would probably not be possible because of confidentiality agreements, but the Deep-Star Consortium is interested in working with the academic community. The report is over 300 pages.

Thorogood remained interested in seeing the report, and suggest that at least it could be circulated to the EDP. Of all the SAS committees, the EDP is the most appropriate one. He asked Greg to check on this possibility.

Thorogood asked a second question regarding large diameter pipe, and high flow rates. Huge differences in infrastructure would be required on the drill rig.

Myers replied that the most driving issue is to put together a plan that does meet the needs of the hydrocarbon industry, i.e., high flow rates. However, the current concept design for the RMR system cannot operate at 12,000-foot depths. Flow would have to be cut in half compared to the current 5,000-foot design and the head capacity of the mud pumps would have to be increased. Perhaps drilling a narrow hold would be more suitable for deeper water depth, perhaps an 11 7/16” diameter hole (RCB) would be possible in 12,000-foot water depths. Special pumps would have to be constructed by AGR.

Thorogood and Myers continued to discuss the trade-off between water depth and flow rate. The industry wants as high a flow rate as possible, but flow may need to be throttled down.

Wilkins asked about the MDHDS project.

Myers gave a thumbnail sketch of the MDHDS engineering development project. It is currently not possible to get repeated, reliable pressure measurements from a heaving drillstring. The MDHDS concept places the pressure measurement device in the sediment and decouples it from the motion of the drillstring during the pressure measurement. The MDHS has a real-time data acquisition system in contrast with past measurement devices which were memory tools. It wasn’t until the tool was recovered that it was realized that the measurement was a failure.

Holloway suggested that stabilization of the drillstring/pressure measurement tool could be accomplished with a seabed frame clamping system. This would isolate the drillstring from the geotechnical measurement tool.

Ask inquired about how much motion was acceptable for an in-situ pressure measurement.

Myers – None, no motion

Myers continued by reviewing the 2010 engineering development proposals examined by the EDP at its Salt Lake City, UT meeting (EDP #7). The MDHDS would enter its second year in 2010. The MMM was recommended for funding. The DRST proposal would be included in the 2010 program if the grouping number changes.

In 2011 Myers suggested that the simple observatory feasibility study may be implemented and the MMM project would continue. Any new projects that were submitted by April 15, 2009 might also be included pending the outcome of the review process.

Agenda Item #11: Status of 2010 Engineering Development plan (Myers)

Discussion of this topic was included in Agenda Item #11. Miyairi asked the EDP for a consensus in support of the FY2010 engineering development plan. The motion was called: 1st motion by Ask and 2nd by Holloway. No discussion occurred, and a consensus was reached.

Holloway asked if there were any patent rights issues between IODP-MI and the University of Texas-Austin regarding the development of the MDHDS. Myers replied that there were none.

Agneda Item #12: Final EDP comments on FY10 engineering development plan (Miyairi)

A consensus was obtained regarding this plan during Agenda Item #11.

Agenda Item #13: Operator reports and the status of FY09 engineering developments (including 3rd party tools)

a. CDEX (Kyo)

Kyo updated the EDP on the status of the LTBMS telemetry system (Appendix I). The hardware design has been finalized except for how the system will interface with submarine cables. Power and time synchronization have not been completely specified. Specification of the final power management design and component evaluation (both mechanical and electrical) have been completed. The prototype testing will utilized the AIST on-land borehole, which meets the needed criteria. Environmental life testing has not been completed, and will push construction of the test mockup into the future by 3 months. Thus, the project will have to be extended into FY 2010. Kyo discussed failure issues associated with testing of the Christmas tree mockup. Tauxe asked about the mechanical alignment of the tubing hanger body with the shoulder of the Christmas tree. Holloway asked if the batteries being used were rechargeable, or single-use. Kyo replied that they would be single-use batteries.

LUNCH

b. ESO (Smith)

Smith updated the EDP on the MSP project—the New Jersey margin drilling and the Great Barrier Reef (Appendix J). Current status of the NJ margin is that the contract should have been signed by now, but it has not been signed. Once the contract is signed, LWD will be amended to the contract, however it is not clear if LWD will be conducted. A vessel suitable for the Great Barrier Reef drilling is being solicited. Permits have not been issued by the Australian authorities. Drilling the GBR will be slightly different from the Tahiti drilling (Leg 310). It is planned to use a top drive with an API coring string. This should be more efficient and will have a smaller footprint than the drilling around Tahiti. There will be less impact on the seafloor.

Future MSP projects – ECORD aims at running a MSP project each year until 2013, but whether adequate funding will be available is not clear.

Smith and Holloway discussed various deepwater drilling systems that might be implemented on a MSP, including seabed drilling technology, the MeBo system, and a system at Cardiff spearheaded by Chris McLeod. Holloway asked if the new Williamson new waves drill and the Perry Slim system were being considered too. Smight noted that these new developments have wireline logging capability. Holloway stated that the claim is that these new systems can achieve 100-150m penetration, but time limitations have restricted penetration to about 40 mbsf.

Tauxe asked what the limitations were on depth of coring.

Smith stated that transferring enough power to maintain weight on bit was a major limitation. ROV technology is needed for control.

c. USIO (Higgins)

Higgins noted the recent death of Gene Pollard, a drilling engineer with the USIO and recounted his accomplishments with the ODP and IODP (Appendix K). The JR successfully completed harbor trials January 9-11, 2009 and is schedule to depart from Singapore on January 25, 2009 for a 1-month sea trial with a small science party. Eleven days of drilling and coring is planned in the areas of Site 807 (Leg 130). The transit will end in Honolulu, where the first of two PEAT equatorial legs will begin.

Higgins commented on the newly installed rig instrumentation system, which can monitor 100 data inputs at 1-Hz sampling frequency. He also commented on the lockable flapper valve. This valve is intended to prevent backflow into the drillstring. It is used with the APC and XCB and has been tested at LDEO. The sediment temperature pressure tool (STP) replaces the DVTP/P tool. The STP incorporates a common data acquisition system developed at TAMU. A wireline heave compensator (WHC) has been installed on the JR as part of the refit. The WHC has been moved from the back of the ship, closer to the rig floor. This will result in more efficient wireline logging, and the WHC can be used for other tools. Higgins stated this the WHC is a significant improvement that was spearheaded by a partnership between Schlumberger and LDEO. From an operations point of view, the WHC will integrate logging functionality.

Higgins also reviewed the multifunction telemetry module (MTFM) which is a universal data telemetry system also developed by Schlumberger and LDEO. LDEO also developed a magnetic

susceptibility sonde (MSS) that produces significantly higher quality susceptibility data. In the future the MSS can be added to the MMM, which has been proposed for construction to the IODP.

Higgins stated that construction of the simulated borehole test facility (SBTF) at TAMU has been put on hold because of limited funding and loss of engineering staff over the past year. The project to construct the instrumented water sampler (IWS) as a replacement for the old WSTP has also been put on hold. However, the design of the IWS has been completed. The drilling sensor sub (DSS) project has also been put on hold because a land test could not be completed as scheduled.

COFFEE BREAK

Agenda Item #14: Contamination report from WG (Thorogood/Ussler)

Ussler initiated discussion by indicating that the objective is to have a report by the July meeting. The WG is seeking industry input. He stated that developing a drilling mud that minimizes contamination of in-situ microbial populations is a difficult and complicated problem. He reviewed some of the potential sources of contamination and the function of the complex array of mud constituents in use today by the hydrocarbon industry (Appendix L). The panel discussed potential options for reducing contamination of core for microbiological sampling. Questions raised included: Can exotic DNA be removed? Are there substitutes for xanthan gum, which has been identified as a major source of exotic DNA? Are there squirt-ahead sealing compounds that could seal a core, preventing penetration of drilling fluids? It was agreed that gel-coating core during its entry into the core barrel is probably not a viable technique.

Further discussion shifted to reducing contamination of hard rock cores. Wilkins suggested that injection of a sealing compound or epoxy combined with a decoupled lander may result in better quality core. Holloway suggested that vibracoring and a water drill would be better tools for hard rock coring. Wilkins suggested that decicated microbiology expeditions would be potentially more effective than having microbiological sampling as an add-on to most expeditions.

Ask suggested that ultraviolet light might be suitable for killing exotic microorganisms in the drilling fluids. This approach has been used by the Swedish Nuclear Fuel and Waste Management organization in 1000 m deep holes. Holloway suggested that a seafloor drill might be a better way to obtain uncontaminated core samples. Higgins responded to the discussion by indicating that potential tools are available, but they seem to be mismatched to the task of obtaining uncontaminated samples. Which strategy is right for each platform? It way be different. Seabed frames and motion-decoupled systems are two potential approaches for minimizing drillstring motion. Ussler pointed out that the 2-month expedition model for the JR typically has many science objectives. Microbiology has been added as a frontier science to existing scientific drilling objectives. Potentially, one site does not provide all the opportunities desired, but the SSEP likes to include as many disciplines in a proposal as possible during it maturation phase. However, the existing drilling platforms may not fit the drilling proposal objectives. Higgins stated that it is frustrating to see how hard it has been to development microbiology sampling programs and strategies in the IODP. Although strategies exist,

contamination is an issue that has not yet been resolved. There is no doubt that significant findings have been already achieved.

Agenda Item #15a: Plan for engineering testing at sea (Myers)

Myers reviewed a proposed plan for allocating at-sea testing time for engineering development projects (Appendix M). He indicated that SOC funds are typically used for engineering development and that IODP-MI requests that all funded projects have testing time built into the budget and development time-line. Once a tool is land tested, IODP-MI will decide if a request for at sea testing should be forwarded to the OTF.

Discussion of the at-sea testing policy ensued. Holloway suggested that many geotechnical vessels can do the types of testing that is required to validate the function of a newly developed tool. Wilkins and Janecek pointed out that the day rate for geotechnical vessels is high relative to the day rate for the JR. Smith suggested that an MSP may be a more suitable platform for tool testing. Ussler pointed out the historical issue with testing tools on the JR has been that each day of engineering testing is one less day of scientific operations. Higgins suggested that the EDP should reconfirm the need for allocation of engineering testing time at-sea. A proposal for a standard allocation of engineering testing days be made each year, and that if those days are not used by engineering testing, then those days revert to the respective drilling leg.

Agenda Item #15b: USIO-LDEO request for LWD-RAB testing time (Ussler)

This discussion was postponed until the next moring.

Agenda Item #16: European Petrophysical Consortium (EPC) presentation (Barry)

Barry reviewed slimline borehole geophysical tools in use and development by the EPC (Appendix W).

Agenda Item #17: Review/Status of existing Technology Roadmap (version 2.0) Session 1 (Ussler)

Ussler reviewed how rankings of previous technology roadmaps (TR) were accomplished. Initially, simple rankings were created by voting for each technology development item in the 3 sub-groupings for TR version 1.0: A – Sampling, Logging, and Coring; B – Drilling/Vessel Infrastructure; and C – Borehole Infrastructure. The top ten in each sub-group was listed in unranked order and posted on the IODP website along with version 1.0 of the TR. Version 2.0 of the TR was ranked by an expertise-weighted sum, maintaining the same sub-groupings. At the Salt Lake City meeting a priority matrix was discussed which ranked each technology development based on need for a particular drilling proposal. This was the first time that ‘proposal pressure’ was considered in the ranking process. The inadvertent outcome of this approach to ranking was that new technologies that were not considered by active drilling proposals were ranked low or not at all. It was decided that the priority matrix approach was not suitable for fostering new and innovative technologies. This approach was abandoned as a possible prioritization scheme.

Thorogood initiated discussion of having higher-level integrated groupings of technological needs. By creating higher-level groupings, potential scoping studies will become more obvious and the functional relationships of the technologies would be identified. Myers indicated that by creating integrated groupings the technological constriction points and critical paths to engineering development would be better identified. Discussion then moved to the graphical presentation of the hierarchal relationship of technologies needs developed by Holloway. The hierarchal graphics were distributed to the panel for consideration overnight.

Thursday, January 15, 2009

Agenda Item #15a: Plan for engineering testing time at sea (Myers)

Myers presented a revised version of a plan for engineering testing at sea (Appendix M). A pathway was added for at-sea-testing using non-IODP vessels, termed 'vessels of opportunity'. Holloway asked if witnessing of non-IODP testing was necessary. Myers stated that this would not be required, however a comprehensive report would be required before using the technology on any IODP vessel. Janecek stated costs for testing of the technology need to be provided. He also encouraged interaction between the developers and IODP-MI concerning the testing program and equipment. Myers emphasized that the proponents need to know what is expected of then up-front, during proposal development; IODP-MI need to be explicit about what is expected. A consensus adopting the Engineering Testing Time at Sea policy was obtained; Wohlgemuth 1st, and Wilkins 2nd.

Agenda Item #15b: USIO-LDEO request for LWD-RAB testing time (Ussler)

Ussler presented the request by the USIO-LDEO for at sea testing (Appendix N). Discussion of the technical issues ensued. Fukuhara asked how improved core recovery could be demonstrated. What criteria would be used? Ussler stated that the proponents need to provide a plan for demonstrating how improved core recovery would be measured. Thorogood asked about the mismatch between the bit and core barrel and the jamming of core. Holloway stated that there are bit design issues that need to be resolved. One problem is that the bit cones are too far from the core catcher, which causes jamming of core during entry into the core barrel. Janecek ask the EDP for a list of concerns and potential solutions.

Agenda Item #19: Discussion of white paper for the IODP INVEST meeting (Ussler)

The INVEST steering has asked the EDP to assemble a white paper on the technological needs of the IODP and possible future needs relevant to the renewal of scientific ocean drilling (Appendix O). Ussler asked for suggested topics and volunteers for a working group. A working group was identified and writing assignments were made. The goal is to assemble a rough draft at the July EDP meeting in Sweden.

COFFEE BREAK

Agenda Item #20: Follow-up review of FY10 Deep Rock Stress Tester Engineering Development Proposal (Myers)

Those who have conflict of interest left the meeting room. Myers presented an overview of the DRST proposal on behalf of Tamura, who was unable to attend (Appendix P). At the Salt Lake City meeting, the EDP assigned a grouping number of 3. The proponents have addressed EDP concerns raised during review of the DRST proposal at the Salt Lake City meeting. The EDP discussed further the technical issues and the response by the proponents. Ask had a major concern about hole orientation—if the hole is oriented along the principal stress, then good results should be expected, however if the hole is oblique to the principal stress, then it will be difficult to interpret the results. The laboratory results presented were performed along the principal stress. Preservation of core material and heave compensation were also of concern. Holloway stated that this is another example of the need for a seabed frame to stabilize the drillstring during a geotechnical measurement. Ask added that such an expensive tool should function on all IODP platforms, not just the Chikyu. Ask suggested that sleeve fracture is another possible approach to measuring stress. Further discussion of detailed technical issues occurred. Fukuhara suggested that the panel summarize its concerns and delay further discussion to the executive session.

Agenda Item #18b: Discussion of the STP Technology Roadmap (Saito)

Saito presented an overview of the STP Scientific Technology Roadmap (STR) and it current status (Appendix Q). The STR will be completed by the next STP meeting, and will be posted on the IODP-MI website. There was some discussion about overlap between the STP and EDP technology roadmaps. Janecek pointed out that the two roadmaps are going after different things. The STR emphasizes laboratory and measurement technologies, and the EDP emphasizes drilling, coring, sample acquisition, and logging. There is some overlap. Higgins pointed out that the overlap emphasizes the bottlenecks in getting the science done. It's an re-affirmation of the needs, rather than a duplication. Thus, it identified those engineering needs that the STP would like the EDP to work on. Thorogood suggested that the EDP could used the STR to help prioritize the EDP TR. Ussler pointed out that it is relatively easy to separate the STR into the analytical part and the engineering part (those technologies relevant to the EDP).

LUNCH

Agenda Item #21: Technical review of active drilling proposals forwarded from SSEP (Myers)

Myers introduced reviews requests from IODP-MI and the SSEP for proposals 698-Full2 and 734-APL (Appendix R). The EDP unexpectedly received a newer version of 698-Full2-Addendum on January 14, 2009. He asked the EDP to answer the following questions: (a) feasibility, (b) key technical issues, and (c) recommendations. For proposal 698, the EDP had the following comments/questions:

1. What is the reason for changing the target drilling depth from 8km to 5km (Chikyu has the ability to penetrate 7kmbsf), as outlined in the 698-Full2-Addendum.

2. What is the appropriateness of the drilling target identified in the new seismic survey presented in the Addendum?

Proposal 698-Full2 and its Addendum was not reviewed because it was not possible to adequately evaluate the technical implications of the changed target depth. The EDP was not given ample time to perform this evaluation.

For proposal 734-APL:

1. The proposal lacked detailed information on the mechanical design for deployment and recovery.
2. There were concerns about whether enough mass was being added to withstand possible lithostatic-like pressure in the borehole.

Comments on 734-APL will be sent to the proponents.

Agenda Item #22: Chikyu riser drilling exercises (Saruhashi)

Saruhashi outlined the operational plan for riser drilling with the Chikyu (Appendix S). Chikyu has drilling to 3,660 mbsf off Australia, however there are problems for riser drilling at the Nankai Trough. The main concerns are vibration of the riser (vortex-induced vibrations – VIV) and running the BOP stack. Fatigue life is significantly reduced when the riser is exposed to VIV.

Agenda Item #23: CDEX technology development plan (Isozaki)

Isozaki explained the technology development plan at CDEX (Appendix T). The Chikyu is currently at the dock for repairs of the thruster. The next-generation exploration projects being planned by CDEX include ultra-deep drilling, ultra-deep water drilling, and deep investigations of the deep biosphere. Myers suggested future communications between CDEX and EDP to discuss technology development plans.

COFFEE BREAK

Agenda Item #24: Technology Roadmap session (Ussler)

Ussler led a discussion of the overlap and differences between the EDP TR and the STR of the STP. Further discussion of the hierarchal chart occurred. It was decided that this chart should be further developed. A complete version will be presented at the EDP meeting in Sweden.

Friday, January 16, 2009

Agenda Item #25: Preliminary agenda for EDP meeting #9 (Ussler)

Ussler reviewed a draft agenda for the July meeting in Sweden (Appendix U).

Agenda Item #26: Next meeting location and time (Miyairi)

It was decided to propose meeting in Luleå, Sweden, July 15-17, 2009. Asanuma proposed hosting EDP #10 in Sendai, Japan, January 15-17, 2010.

Agenda Item #27: Status and discussion of scoping studies (Myers)

Myers reviewed that status of 3 scoping studies being considered by IODP-MI—ultra-deep drilling, integrated surface drilling systems, and integrated downhole coring systems (Appendix V). The ultra-deep drilling study is the only one that has advanced since EDP #7. Myers suggested hiring a contractor to handle the other two studies. Cost would be relatively low (~$10,000). Holloway suggested that these studies would probably cost more than estimated. Myers asked Holloway, Wohlgemuth and Tauxe (and others listed in the appendix) form a working group to review the contractors before the next EDP meeting. Thorogood commented that a study of integrated coring systems needs to be built on the initial work in the core quality study being conducted by IODP-MI. He asked rhetorically what is it in the present coring system that keeps recovery and quality from improving? Once that is understood, then surface drilling systems can be studies with coring results in mind. There was a consensus that these studies should be done more or less sequentially. Wohlgemuth suggested contacting an ICDP coring specialist (Berndt Wundes). These scoping studies would be most helpful if they can be completed before the INVEST meeting in September 2009.

A discussion ensued to formulate an outline for the two scooping studies. Discussion of the many reasons for variable core recovery, including human factors, suggests an increase in automation. Fukuhara reiterated that poor coring results might mean that important sections are missed in otherwise high recovery sections. Saito volunteered to be a liaison between STP and the scoping study working group(s). Ask reminded us that we need to remember the special needs of the MSPs. The MSPs have perhaps been more adaptable using lessons learned from the mining and technical fields.

Agenda Item #32: Review of consensus items (Ussler)

Ussler reviewed the status of the consensus items thus far in the meeting.

Agenda Item #20b: Discussion of DRST (Ito)

Ito led a discussion of the DRST development and its importance (relevance) to the Nankai measurement program. The problem with the current measurement system is that is does not resolve the horizontal stress. Compliance problems are probably the reason for the lack of resolution of previous attempts. Stress measurements are needed to assess borehole stability. Ask inquired as to how many stress measurements are anticipated. Ito replied that the requirement differ—more are needed near the fault zone, less are needed distributed along the borehole. Problems with the existing systems were further discussed.

LUNCH

EXECUTIVE SESSION

Meeting adjourned at 1700.

EDP Meeting #8

January 14 – 16, 2009

Shanghai, China

Robert's Rules of Order

- Some basic principles and procedures apply to all decision making processes; these principles and procedures are referred to formally as 'parliamentary procedure'. Parliamentary procedures are the rules that help us maintain order and fairness in all decision-making processes. Robert's Rules of Order is one man's presentation and discussion of parliamentary procedure that has become the leading authority in most organizations today. The basic principles behind Robert's Rules of Order are:

Robert's Rules of Order

- someone has to facilitate and direct the discussion and keep order.
- all members of the group have the right to bring up ideas, discuss them, and come to a conclusion.
- members should come to an agreement about what to do.
- members should understand that the majority rules, but the rights of the minority are always protected by assuring those members the right to speak and vote.

Robert's Rules of Order

- Each meeting follows an order of business (agenda)
- Only one main motion can be pending at a time
- Only one member can be assigned the floor at a time
- Members take turns speaking
- No member speaks twice about a motion until all members have had the opportunity to speak

Robert's Rules of Order

- Members take their seats promptly when the chair calls the meeting to order, and conversation stops
- Members raise their hands to be recognized by the chair and don't speak out of turn
- In debate, members do not 'cross talk', or talk directly to each other, when another member is speaking
- Members keep their discussion to the issues, not to personalities or other members' motives
- Members speak clearly and loudly so all can hear
- Members listen when others are speaking

EDP General Purpose

- **The Engineering Development Panel (EDP) reports to the Science Planning Committee (SPC), and may communicate directly with IODP Management International (IODP-MI).**
- **The panel shall provide advice on matters related to the technological needs and engineering developments necessary to meet the scientific objectives of active IODP proposals and the IODP Initial Science Plan (ISP) to the SPC; through the SPC, to the Science Planning and Policy Oversight Committee (SPPOC) and IODP-MI; and, through IODP-MI, to the implementing organizations (IOs).**

EDP Mandate

The EDP **shall identify long-term (two to five year lead time) technological needs** determined from active IODP proposals and the ISP, and **recommend priorities for engineering developments** to meet those needs, both for the annual IODP engineering plan and on a longer term.

⇒ **Technology Roadmap (TR)**

As requested by the Science Steering and Evaluation Panel (**SSEP**) or **SPC**, the EDP shall **review IODP drilling proposals to assess IODP technological readiness** to achieve the proposed objectives, and where appropriate, **recommend** priorities for technological approaches and necessary engineering developments

Schedule for taking the meeting minutes

Day 1 morning – Bill Ussler
Day 1 afternoon – Maria Ask

Day 2 morning - John Tauxe
Day 2 afternoon – Hiroshi Asanuma

Day 3 morning - Roy Wilkins
Day 3 afternoon executive session – Bill Ussler

DAY 1: Wednesday, January 14 (8:30-5:30)

1. IODP-China welcoming remarks; meeting logistics, safety, introduction, Robert's Rules (Miyairi)
2. Approval of meeting agenda (Miyairi)
3. Quorum discussion (Miyairi)
4. Approve minutes from EDP Meeting #7 (Miyairi)
5. Preliminary discussion of next 2 meeting locations and times
   a. EDP #9 – Sweden (Ask)
   b. EDP #10 – Japan (Asanuma)
6. Review status of previous meeting action items and recommendations (IODP-MI)

COFFEE

7. SPC Report (Mori)
8. SSEP Report (Ussler)
9. STP Report (Saito)
10. Status of Current Engineering Development Projects (Myers)
11. Status of 2010 Engineering Development Plan (IODP-MI)

LUNCH

12. Final EDP Comments on FY10 Engineering Development Plan (Miyairi)
13. Operator Reports and status of FY09 Engineering Developments (including 3rd party tools)
    a. CDEX (Kyo)
    b. ESO (Smith)
    c. USIO (Grigar)

COFFEE

14. Contamination report from WG (Thorogood)
15. a. Plan for Engineering Testing at Sea (Myers)
    b. USIO-LDEO request for LWD-RAB testing time (Ussler)
16. European Petrophysical Consortium (EPC) presentation (Simon Barry)
17. Review/Status of existing Technology Roadmap (version 2.0) Session 1 (Ussler)

Day 2: Thursday, January 15 (8:30-5:30)

18. Technology Roadmap Session 2 (Ussler)
    a. Discuss clustering schemes for 3 sub groups (hierarchial charts)
    b. Discuss draft STP TR (Saito)
    c. Compare roadmaps – define common elements (All)

COFFEE 10:00-10:20

19. Discussion of white paper for the IODP INVEST meeting (Bremen, Germany) concerning science proposals outside of today's technical envelope (Ussler)
20. Follow-up review of FY10 Deep Rock Stress Tester Engineering Development Proposal (Tamura)

LUNCH

21. Technical Review of Active Drilling Proposals forwarded from SSEP (Myers)

COFFEE

22. Chikyu Riser Drilling Exercises (Saruhashi)
23. CDEX Technology Development Plan (Isozaki)
24. Technology Roadmap Session 3 (Ussler)
    a. Discuss prioritization schemes – proposal weighted + expert opinion; clustering; critical path
    b. Status and plans

DAY 3: Friday January, 16, 8:30 – 12:00

25. Preliminary Agenda for EDP Meeting #9 (Miyairi)
26. Next Meeting Location and Time (Miyairi/Ask)
27. Status and Discussion of Scoping Studies (IODP-MI/Thorogood)
28. Resume discussion of Scoping Studies (IODP-MI/Thorogood)

EXECUTIVE SESSION

29. Compile Technology Roadmap version 3.0 (Ussler/EDP)
30. Review critical components of Technology Roadmap. Finalize and review TR additions and changes (Ussler)
31. Discuss re-reviews of FY10 ED proposals (Miyairi)
32. Review and Finalize Consensus Items and Recommendations (Miyairi/Ussler)

TR Consensus

EDP Action Item 0807-15: EDP Technology Roadmap Working Groups

The EDP has established 3 working groups to review draft version 3.0 of the Technology Roadmap to identify technological interdependencies and to show their hierarchical relationship. Working groups are: (A) Sampling/Logging/Coring – Holloway (lead), Asanuma, Ask, and Wohlgemuth; (B) Drilling/Vessel Infrastructure – Thorogood (lead), Tamura, and Watanabe; and (C) Borehole Infrastructure – Ussler (lead), Miyairi, Person, and Fukuhara.

EDP Action Item 0807-14: Coordination of Technology Roadmaps between the STP and EDP

The EDP will send version 2.0 of the EDP Technology Roadmap to the STP for use in developing their own Technology Roadmap. The EDP will follow the development of STP's Technology Roadmap and will identify opportunities for interconnectivity of the two documents through dialogue between the panel members.

Contamination Consensus

EDP Action Item 0807-08: Microbial Contamination of Core

EDP responds to STP Consensus 0802-06 by establishing a Microbiology Contamination Working Group (Holloway, Ussler, Tamura, and Thorogood) to investigate technologies and strategies for reducing microbial and drilling fluid contamination of cores.

Background: The EDP is responding to STP Consensus 0802-06 and the presentation by Rick Colwell on Microbial Contamination of Core.
Routing: SPC, STP, IODP-MI
Priority: High

Engineering Time Consensus

EDP Consensus 0807-12: Engineering Testing Time on IODP Platforms

At-sea engineering testing is part of any Engineering Development project in the program, whether it is a 3rd party tool development, or an internal engineering project conducted by the IOs. Allocation of engineering testing time is critical for proper engineering development and must be included in future operational planning on an as needed basis. We endorse IODP-MI efforts to develop a means for accepting formal requests for engineering testing time at sea. The EDP is willing to review requests for at sea testing forwarded by IODP-MI.

Background: The EDP is responding to a written request by the USIO-LDEO for consideration of a specific need for at-sea engineering testing time and of a general request for an at-sea engineering testing time policy. Before the specific request can be considered, a formal mechanism for accepting requests for at-sea engineering testing needs to be established by IODP-MI. The proposed mechanism will be presented to EDP at the January 2009 meeting for review, adjustment if needed, and adoption.
Routing: IODP-MI, SPC, IOs
Priority: High

Scoping Study Consensus

EDP Consensus 0807-11: Ultra-deep Drilling Scoping Study
The EDP recognizes SPC's interest in understanding the technological challenges associated with a future Moho drilling project (in reference to SPC Consensus 0708-30) and has initiated discussions about this problem that will continue at future panel meetings. EDP requests that IODP-MI prepare a draft scoping study on ultra-deep drilling to be reviewed at the January 2009 EDP meeting.

Routing: SPC; IODP-MI; IOs
Priority: High

Follow-up review

20. Follow-up review of FY10 Deep Rock Stress Tester Engineering Development Proposal

At the last EDP meeting, we stated that we would consider revising the grouping number if key issues were addressed in the proponents response. The proponent's response has been sent to the watchdogs and EDP can now decide if they'd like to keep the grouping number or revise, or provide other advice.

Message from Benoit Ildefonse

- Miyairi-San,
- I am writing to you on behalf of the "Deep Earth Sampling" InterRidge Working Group (http://www.interridge.org/en/WG/DeepEarthSampling). We had a short meeting in San Francisco prior to AGU, to discuss coming activities in preparation for the INVEST meeting in september 2009. One consensus that came out of the meeting is that we (as a hard rock / ocean drilling community) would like to see IODP taking action on technology/engineering development related to very deep drilling in the ocean crust.
- I co-chaired the Mission Moho workshop in 2006 and I was the lead proponent of the Mission Moho proposal in 2007. One of the important aspects of the mission was to provide a mechanism to start as early as feasible the technology/engineering development that is necessary to accomplish very deep hard rock drilling in the future, including the extension of the Chikyu riser to at least 4000m. Although, eentually, no mission was approved by IODP, the scientific objectives related to deep drilling in the ocean crust remain essential to the community.
- We believe, in the context of the long-term scientific planning that starts in 2009, that it is now urgent to start planning the technology/engineering development for very deep drilling in the ocean crust. The best mechanism for doing so would be a committee allowing discussions between engineers and scientists to identify common, realistic scientific and operational mid-term and long-term objectives. We propose that IODP set up a planning group (DPG or PPG) on this topic.
- I understood from discussing with Ito-San at the last AGU that you will review at the next EDP meeting the outcome of the japanese Technology Development Workshop that took place last december in Tokyo. We respectfully ask you if you could also consider our proposition, to setup an IODP Detailed or Program Planning Group on ultra deep drilling in the ocean crust, during your discussions at the next EDP meeting in Shanghai, and assist us in forwarding this proposition to SPC.
- Best regards,
- Benoit Ildefonse
- Chair of the InterRidge "Deep Earth Sampling" Working Group

Request from IODP-MI & SSEP

Dear Makoto and Bill,

IODP-MI and the Science Steering and Evaluation Panel (SSEP) have requested that EDP provide a technology readiness review of two drilling proposals, 698 Full-2 and 734 APL. These two proposals and the science reviews are available for EDP use on the EDP work room. These materials are confidential and must not be circulated outside of EDP.

Proposal 698 Full-2 is highly ranked based on scientific merit. There is concern within SSEP that that extreme depth of the hole to be drilled (~8,000 meters) is beyond the current technological capability of IODP. It is important for EDP to provide SSEP with advice on the issues associated with drilling deep boreholes from a dynamically positioned drillship. Advice on the likely duration for a deepbore project, technology needed and drilling specific site characterization data needed (e.g. state of stress, etc.)

Proposal 734 APL is also highly ranked based on scientific merit. Due to the deployment of new borehole observation technology described in the proposal, SSEP needs EDP input on the likelihood of deployment success and another advice on the proposal.

EDP should generate confidential technological advice for each proposal to be forward to SSEP in time for their next meeting in March. The content and format of the advice is left to EDP's discretion.
Please contact me if you have any questions.

Sincerely,
Greg

Re-Review of The Deep Rock Stress Tester (DRST) By Lead Watchdog

- **1. Proposal rationale**
- **At the 6th EDP meeting in Nice January 2008, it was discussed and agreed that borehole stability and measurement of in-situ stress should be added to the roadmap as separate item. Also, at in-situ stress measurement, we recognize that there exists essential problem in the conventional method i.e. failure in measuring the maximum horizontal stress. It is clear that there is the scientific need and the proposal will develop a unique tool to overcome the problem.**

- **2. Background information**
- **At the 7th EDP meeting in SLC July 2008, the proposal was reviewed and a consensus was reached for the grouping number of 3. IODP-MI summarized the discussion with two major concerns, seven minor concerns and four questions and then sent them to the proponent.**
- **In August 2008, the proponent submitted the first response letter.**
- **In September 2008, the lead watchdog made additional comments which were sent through IODP-MI to the proponent.**
- **In December 2008, the proponent submitted the second response letter.**
- **IODP-MI plans to have a full panel discussion of this proposal at the 8th EDP meeting in Shaghai, January 2009, if the previously assigned grouping number is still appropriate.**

- **3. Review of proponent response letters**
- **The proponent submitted appropriate response to clarify our all concerns, questions and comments. One of the major concerns is that theory needs experimental confirmation. The proponent has conducted a laboratory fracture opening test using field scale straddle packers which was installed into a rectangular granite block. The detected re-opening pressure agrees well with the predicted one from the theory. Another major concern is that outside annulus may not be preserved. I confirmed that the overcoring is not planned on the proposal and the max stress direction will be measured by the impression packer. On the other hand, the proponent found out the way to use the multi-functional telemetry system from USIO with minor modification, resulting in significant cost reduction of this project.**

- **5. Recommendation and conclusion**
- **As it is clear that there is the scientific need and the proposal has been strengthened against our concerns through the proponent response letters, it is recommended to raise the grouping number from 3 to 4.**

LULEÅ UNIVERSITY OF TECHNOLOGY

EDP #9, Luleå, 15-17July 2009

Host:
Maria Ask, LTU

Alternatives:
- Luleå downtown - kulturens hus / LTU
- Conference - Brändö

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LULEÅ UNIVERSITY OF TECHNOLOGY

Luleå (65° 35′ 4″ N)

- Citizens: ~45 000
- How to get to Luleå:
  - By air: Kallax airport (LLA),
    - ~1h15' flight time ARN-LLA
    - SAS: 5 flights/day, Norwegian: 3 flights/day
    - < 10 km to city ARN-LLA, airport bus, taxi
  - By air/bus: Kemi-Tornio airport (KEM), Finland, 160 km from Luleå (Finnair, short and cheap travel from Asia (last leg trip arrangement required)
  - By train: SJ
    - ~13-15 hrs from Stockholm
    - SJ, 2 night trains per day
- Summer likely sunny (~15-25°C/(15-77°F), mid-night sun
- Small town w/ hotels, restaurants within walking distance ("Arctic" cuisine)
- Industrial visits: Ice-breaker, Steel-industry

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Meeting down-town in Luleå

- Hotel, ~650 SEK/night
  - ($100, CNY 680, €80, ¥95), breakfast included;
- Meeting venue: Kulturens hus (5 minutes walk) or LTU (10 minutes bus ride)

Conference, Brändö (25 km N of Luleå

- Everything in same place
- 3 day conference, 2890 SEK/person, lodging & food included
  ($345, CNY 2381, €272, ¥322)

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Introduction of Sendai, Japan
EDP #10 meeting location
PLAN: 13(Wed) - 15(Fri), Jan., 2010

Host:
Hiroshi Asanuma
Graduate School of Environmental Studies
Tohoku University
asanuma@ni2.kankyo.tohoku.ac.jp

Outline

Population: approx. 1 million
(12th largest cities in JPN)
Weather in January:
Max. 10℃
Min. -5℃
Possible snow
and strong wind
Currency: Yen
1USD=95Yen
(BigMac Meal=600Yen)

***Credit cards issued outside Japan may not be accepted in small shops.**
***VAT: 5%**
***no tips**

Transportation

From Tokyo (Narita)

-2 ANA (Star alliance) flights/day
(morning and evening, 1 hour, SMALL aircraft!)
-JR railway (Super Express Shinkansen
3 hours, one transfer at central Tokyo Stn.)

From Nagoya (Centrair)

-5 ANA and 2 JAL (Oneworld) flights/day

From Sendai Airport to downtown

-Local railway (25min., 600 JPY)
-TAXI (40min., 5,000-6,000 JPY)
-Shuttle service will be considered

Item	Type	Title	Statement	Respon-sibility	Status
0807-01	C	Approval of Agenda	The EDP approves the agenda for EDP Meeting #7	EDP	**Closed.**
0807-02	C	Approval of EDP Meeting #6 Minutes	The EDP approves the minutes from EDP Meeting #6.	EDP	**Closed.**
0807-03	C	EDP SPC Representative	EDP designates Bill Ussler as the EDP representative at the next SPC meeting to be held in August 25-28, 2008 in Sapporo, Japan.	EDP	**Closed.**
0807-04	C	EDP SSEP Liaison	EDP designates Bill Ussler as the EDP representative at the next SSEP meeting to be held November 10-13, 2008 in San Francisco, USA.	EDP	**Closed.**
0807-05	C	EDP Meeting #8	EDP recommends that EDP Meeting #8 be held in Shanghai, China from January 14-16, 2009.	IODP-MI / Ying Ye	**Closed.**
0807-06	C	EDP Meeting #9	EDP recommends that EDP Meeting #9 be held in Sweden, tentatively from July 15-17, 2009, in Luleå.	IODP-MI / Maria Ask	**Ongoing**. Planning is underway
0807-07	C	Pool of Qualified Alternates for Filling Vacant Positions on the EDP	The EDP desires to maintain full membership of 14 voting members at every regularly scheduled panel meeting. The EDP requests that a pool of qualified alternates to the EDP be established to fill vacancies that occur on the panel resulting from pre-mature resignation, illness, or prior commitments. This pool might comprise previous EDP members or nominees to the EDP that have not yet joined the panel.	PMOs / IODP-MI	**Ongoing**. Past members identified as alternates. Continue to update list as candidates are identified.
0807-08	C	Microbial Contamination of Core	EDP responds to STP Consensus 0802-06 by establishing a Microbiology Contamination Working Group (Holloway, Ussler, Tamura, and Thorogood) to investigate technologies and strategies for reducing microbial and drilling fluid contamination of cores.	Working Group	**Ongoing.** Working Group to report back to EDP at the EDP #8 Meeting
0807-09	C	Comments on DSS-RMM Report	The EDP recommends that the DSS-RMM Project be suspended immediately. The EDP recognizes that WOB and TOB data from the end of the drillpipe would provide key information for better controlling drillstring stability, however this current project has enough deficiencies that successful completion of a functional tool is improbable.	IODP-MI / TAMU	**Closed**. This development has been put on hold.
0807-10	C	Ultra Deep Boreholes	The EDP recognizes that drilling ultra-deep boreholes is a new technical domain for the IODP that is potentially beyond the capacity of the current program. Developing expedition plans for ultra-deep drilling targets is a complicated effort that will require substantial resources that are outside the scope of the EDP and current planning process of the IODP.	NA	**Closed**. Forwarded to SSEP and SPC.
0807-11	C	Ultra-deep Drilling Scoping Study	The EDP recognizes SPC's interest in understanding the technological challenges associated with a future Moho drilling project (in reference to SPC Consensus 0708-30). and has initiated discussions about this problem that will continue at future panel meetings. EDP requests that IODP-MI prepare a draft scoping study on ultra-deep drilling to be reviewed at the January 2009 EDP meeting.	IODP-MI	**Ongoing**. IODP-MI has created a draft of this document open for discussion at EDP 8

0807-12	C	Engineering Testing Time on IODP Platforms	At-sea engineering testing is part of any Engineering Development project in the program, whether it is a 3rd party tool development, or an internal engineering project conducted by the IOs. Allocation of engineering testing time is critical for proper engineering development and must be included in future operational planning on an as needed basis. We endorse IODP-MI efforts to develop a means for accepting formal requests for engineering testing time at sea. The EDP is willing to review requests for at sea testing forwarded by IODP-MI.	IODP-MI	**Ongoing**. GM to report on this at EDP #8.
0807-13	C	EDP Liaison to the STP	Although the STP and EDP have distinct mandates and non-overlapping areas of responsibilities, the EDP recognizes common technological interests exist between the STP and EDP. The EDP requests permission to send an EDP liaison to each regularly scheduled STP meeting beginning at the early 2009 STP meeting.	PMOs / IODP-MI	**Closed**. Request granted.
0807-14	C	Coordination of Technology Roadmaps between the STP and EDP	The EDP will send version 2.0 of the EDP Technology Roadmap to the STP for use in developing their own Technology Roadmap. The EDP will follow the development of STP's Technology Roadmap and will identify opportunities for interconnectivity of the two documents through dialogue between the panel members.	EDP	**Ongoing**. STP Roadmap has circulated to EDP members and will be discussed at EDP #8.
0807-15	C	EDP Technology Roadmap Working Groups	The EDP has established 3 working groups to review draft version 3.0 of the Technology Roadmap to identify technological interdependencies and to show their hierarchical relationship. Working groups are: (A) Sampling/Logging/Coring – Holloway (lead), Asanuma, Ask, and Wohlgemuth; (B) Drilling/Vessel Infrastructure – Thorogood (lead), Tamura, and Watanabe; and (C) Borehole Infrastructure – Ussler (lead), Miyairi, Person, and Fukuhara.	EDP	**Ongoing**. Flow chart of roadmap has been created to be reviewed at the EDP #8.
0807-16	C	EDP Technology Roadmap	The EDP re-affirms version 2.0 of the Technology Roadmap and its prioritization as the current version of the roadmap.	EDP	**Closed.**
0807-17	C	Outgoing EDP members	The EDP thanks Hideyuki Suzuki and Jack Germaine for their service to the panel.	EDP	**Closed.**

Science Planning Committee (SPC)

SPC Meeting

Science Planning Committee (SPC) Meeting
August 25-27 Sapporo, Japan

1. Report on Nantroseize
2. Detailed Planning Group (DPG) on Asian Monsoon
3. Complementary Project Proposals
4. Proposal Ranking
5. Plans for IODP Renewal (SASEC activity)
6. EDP issues
7. SAS Panels

1

1. Report on Nantroseize

Stage I
- Successful completion of 8 non-riser sites
  - Expeditions 314, 315, 316 in 2007-2008

Stage II
- Planned riser drilling at NT2-11
  - and non-riser input sites in 2009

Stage III
- Planned riser drilling at NT2-01
- Installation of observatory components

Stage IV
- Long-term monitoring

2

1. Report on Nantroseize

Scheduling difficulties for Chikyu at Nantroseize because of damaged thrusters, Kurashio, fisheries.

Project Management Team (PMT) set project priorities

(1) drilling to the plate boundary in seismogenic zone
(2) installing up to three upper-plate observatories
(3) sampling inputs to the subduction zone
(4) drilling to intermediate depth into the fault zone.

3

2. DPG Report on Asian Monsoons

This group evaluated current proposals addressing climate changes (Asian Monsoon) associated with uplift of Himalayas

DPG recommended that the first priority is the drilling objectives of Proposal 552-Full3 (Bengal Fan).

Coring of sites on the southeast Asian margin to obtain late Miocene to present sedimentary records to develop regionally-coherent data sets characterizing erosional and hydrologic dynamics in response to the onset and intensification of the Asian Monsoon.

4

3. Complementary Project Proposals (CPP)

Mechanism for conducting scientific drilling
(a) with substantial third-party financial support
(b) on IODP platforms
(c) under the auspices of the IODP.

The SPC support a streamlined mechanism for evaluating CPP's within the SAS framework.

Information about submissions on IODP webpage for April proposal submissions.

5

4. Proposal Ranking

In March 2010 SPC will rank about 30 proposals

(1) new proposals forwarded by the SSEP,
(2) existing proposals residing with the SPC, and
(3) the Tier 2 proposals that have been residing with the OTF and that are not on an approved schedule

6

4. Proposal Ranking

Tier 1/Tier 2 Designations

Tier 1
- Highest priority proposal for an ocean basin
- Important to complete by 2013
- Ready for drilling

Tier 2
- High priority proposal for an ocean basin
- Evaluated at each ranking meeting
- Ready for drilling
- Resides at OTF for 2 years

7

5. IODP Renewal Process (SASEC Activity)

INVEST (IODP New Ventures in Exploring Scientific Targets)

Large meeting to discuss science plan for IODP renewal in 2013

September 22-24, 2009
Bremen, Germany

Steering Committee
Christine Ravelo, Wolfgang Bach (co-charis)
Jan Behrmann, Bob Duncan, Katrina Edwards,
Sean Gulick, Fumio Inagaki, Heiko Palike,
Ryuji Tada, Gilbert Camoin,
Yoshi Tatsumi, Gerold Wefer,
Hans Christian Larsen

8

5. IODP Renewal Process (SASEC Activity)

Timeline for IODP Renewal Process

INVEST renewal conference	Sept. 2009
Proceedings of INVEST published	early 2010
Transforming INVEST into the science and implementation plan	
New science plan (1st draft)	late 2010
Internal and external review of science plan	
New science plan fully completed	2011
Approval by national science boards (US/JP/EU)	2011/2012
Science/program plan, funding agencies approval	2012

At August SPC meeting it was reported that MEXT and NSF have started planning for renewal after 2013

9

6. EDP Issues

SPC Consensus 0808-16:
The SPC accepts EDP Action Item 0807-08 on establishing a Microbiology Contamination Working Group.

SPC Consensus 0808-17:
The SPC accepts EDP Consensus 0807-11 on the preparation of a draft scoping study on ultra-deep drilling.

SPC Consensus 0808-18:
The SPC accepts EDP Consensus 0807-12 on developing a mechanism for evaluating engineering testing time on IODP Platforms.

SPC Consensus 0808-19:
The SPC receives EDP Consensus 0807-13 on regularly sending an EDP liaison to each Scientific Technology (STP) meeting.
The SPC supports liaisons between the two panels.

('receives' means that the support to send liaisons is the decision of the program member offices)

10

6. EDP Issues

SPC would appreciate comments from the EDP chair about technical issues during the discussion of proposals at the March SPC meeting. There will be detailed discussions about the proposals to be ranked, and also a discussion about the current riser proposals that currently reside at SPC and OTF

11

7. SAS Panels – chair rotations

Site Survey Panel (SSP)
- Chair Jin-Oh Park
- Vice-Chair Gilles Lericolais

Scientific Technology Panel (STP)
- Chair Clive Neal
- Vice-Chair Saneatsu Saito

Environmental Protection and Safety Panel (EPSP)
- Vice Chair Manabu Tanahashi

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7. SAS Panels

SPC Consensus 0808-20:
The SPC thanks the Industry-IODP Science Program Planning Group (IIS PPG) for its role in promoting industry-IODP interactions and for suggesting the formation of an Industry Task Force. The IIS PPG has successfully advanced IODP interests with new constituencies. The SPC is grateful to the IIS PPG members for their time, energy, and expertise, and to Ralph Stephen for his leadership of the PPG.

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SSEP Report to the EDP

Bill Ussler

January 14, 2009

SSEP #11 Meeting

- San Francisco - 4 days
- Reviewed 34 proposals
  - 9 new proposal in system
  - 11 proposals at SPC/OTF assigned star ratings
  - 2 proposals routed to EDP for technical review

Impediments to Achieving Microbiological Objectives

1. Contamination: JR and Chikyu microbiology labs - substantial investment in state-of-the-art microbiology labs; but if cannot get appropriate uncontaminated samples, then the labs are of little use
   - Swamp the signal of the indigenous population with exotic microbes or DNA from seawater or drilling muds
   - Chemical changes caused by drilling muds affects incubation of indigenous microbes (inadvertently creates ‘enrichment cultures’)

Microbiology continued

2. Poor core recovery: in hard rock, if sample is very small and fractured (young basaltic crust, not silica cemented), it is very hard to define the sample and obtain useful information on indigenous microbial populations
3. Twenty-eight drilling legs in the proposal stream would benefit from technological improvements:
   - OTF: (12) 477, 505, 522, 537A/B, 545, 595, 601, 603, 633, 662, 677
   - SPC: (8) 547, 549, 553, 555, 557, 584, 589, 637
   - SSEP: (8) 569, 635, 673, 696, 701, 715, 733Pre, 739APL

Ultra-deep Drilling

- SPC has requested EDP study technological issues associated with ultra-deep drilling (Moho) (STP Consensus 0708-30)
- At July 2008 meeting, EDP examined proposal 698-Full2 (IBM 8km borehole)
- Compared drilling statistics to obtain a context for conducting ultra-deep drilling during the present IODP and post-2013
- Lesson from the KTB, state-of-stress in the crust needs to be better known - borehole breakouts; area of technological development
- Planning process will be lengthy and needs to start early - 10 year time-scale; identify technology gaps

Technology Roadmap Prioritization

- TR and its prioritization provides guidance to IODP-MI
- On the IOPD website: www.iodp.org/eng-dev
- Various prioritization schemes have been investigated; some needs are obvious, but cannot do everything
- Currently exploring two new schemes:
  1. Proposal driven - number and maturity (i.e., at OTF/SPC versus SSEP)
  2. Critical path driven - what is essential for providing improvements to core functions on all three platforms (Chikyu, JR, and MSP) - i.e., drill string stabilization - more; better; deeper

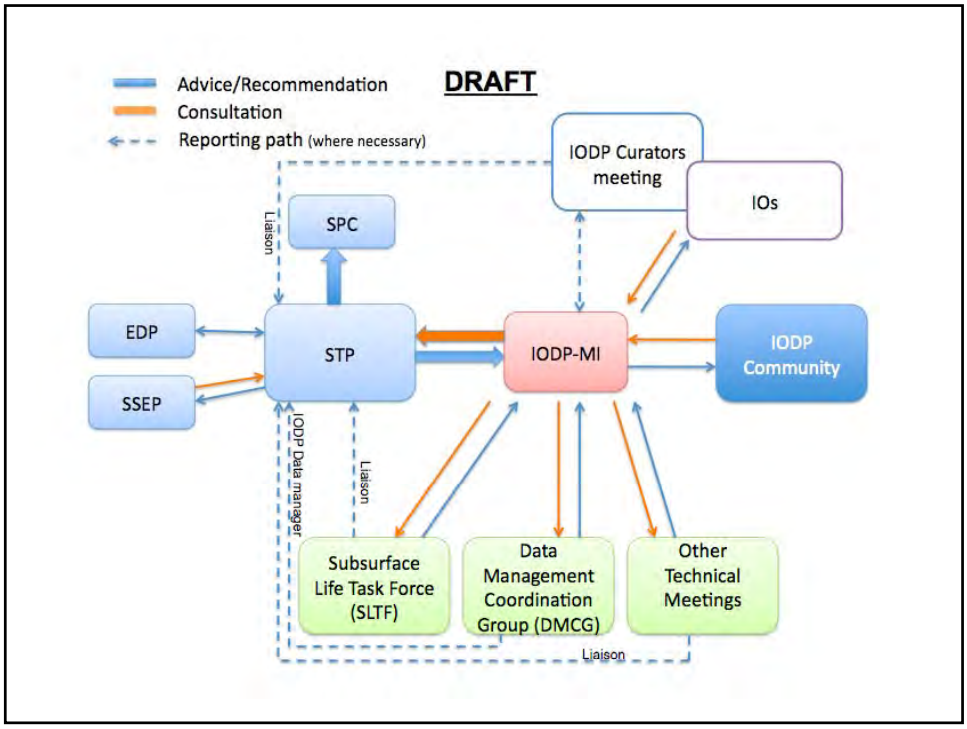
#8 EDP Meeting DAY 1

STP Report

Clive Neal and Sanny Saito

Scientific Technology Panel (STP)

- A SAS panel reports to Science Planning Committee (SPC) & IODP-MI
- **Mandate**: Contribute information and advice with regard to handling of IODP data and information, methods and techniques of IODP measurements, laboratory design, portable laboratory needs, downhole measurements and experiments, and observatories.
- 17 members
  - 5 Japan, 5 USA, 4 ECORD
  - 1 China, 1 Interim Asian Consortium, 1 ANZIC



STP Biannual Meetings

- SciMP #2 - Boston, MA (June 23-25, 2004)
- SCiMP #3 - Honolulu, HI (Feb. 8-10, 2005)
- STP #1 - Bremen, Germany (July 11-13, 2005)
- STP #2 - Kochi, Japan (Jan. 28-Feb. 1, 2006)
- STP #3 - Helsinki, Finland (June 26-28, 2006)
- STP #4 - San Francisco, CA (Dec. 7-9, 2006)
- STP #5 - Beijing, China (Aug. 20-23, 2007)
- STP #6 - Sendai, Japan (Feb. 18-20, 2008)
- STP #7 - Edmonton, Canada (July 28-30, 2008)
- STP #8 - Honolulu, HI (March 6-9, 2009)
- STP #9 - Korea

#7 STP Meeting Report

- Dates: July 28-30, 2008
- Venue: Univ. of Alberta at Edmonton, Canada
- 10 recommendations
  - 1 EDP-related recommendation
- 16 consensus statements
  - 2 EDP-related consensus statements
- 1 action item (EDP-related)
- Approved next STP meeting
  - Dates: March 6-9, 2009
  - Meeting venue: Honolulu, Hawaii
  - Local host: Roy Wilkens, University of Hawaii

#7 STP Report

STP Recommendation 0807-16: EDP Microbiology Contamination Issues

STP thanks EDP for their Action Item 0807-08: Microbial Contamination of Core, establishing a Microbiology Contamination Working Group. STP agrees this is a necessary measure and recommends Rick Colwell as STP (electronic) liaison to the Working Group.

Background to STP Recommendation 0807-16:

EDP Action Item 0807-08: Microbial Contamination of Core. EDP responded to STP Consensus 0802-06 by establishing a Microbiology Contamination Working Group (Holloway, Ussler, Tamura, and Thorogood) to investigate technologies and strategies for reducing microbial and drilling fluid contamination of cores. The EDP was responding to STP Consensus 0802-06 and the presentation by Rick Colwell on Microbial contamination of Core.

Contamination is a major issue in the quality of microbiology samples. It is critical to maintain continued dialogue with EDP. Having a panel representative with a microbiology specialty allows EDP to have immediate answers during discussion and aids in moving forward on potentially resolving these engineering issues.

#7 STP Report

STP Consensus Statement 0807-19: STP Liaison to EDP
STP notes that the development of the EDP and STP Roadmaps will inevitably contain some overlap. In order to ensure that progress is made in an efficient way, we suggest that STP send a liaison to the EDP meetings on a case-by-case basis after consultations between the chairs on the meeting agenda. STP would welcome a liaison from EDP as and when appropriate.

Voting record: 13 For, 0 Against, 0 Abstentions, 3 Absent (Colwell, Gorin & Christensen)

Priority: High

STP suggests this be forwarded to SPC and/or IODP-MI

Background to STP Consensus Statement 0802-19:
This discussion took place as a result of the report from the previous EDP meeting where Rick Colwell attended as STP liaison.

#7 STP Report

STP Consensus Statement 0807-20: STP Roadmap
STP recognizes the significant overlap of some issues on the EDP and STP roadmaps, but that there are many others that do not. STP suggests that both EDP and STP continue to develop their roadmaps and collaborate on those issues where there is significant synergy.

Voting record: 13 For, 0 Against, 0 Abstentions, 3 Absent (Colwell, Gorin & Christensen)

Priority: High

STP suggests this be forwarded to SPC and/or IODP-MI

Background to STP Consensus Statement 0802-19:
This discussion took place as a result of the report from the previous EDP meeting where Rick Colwell attended as STP liaison.

#7 STP Report

Action Item 0807-27: Scientific Technology Roadmap
STP members will continue to develop the Scientific Technology Roadmap, taking note of the need to liaise with EDP on matters of common or complementary interests and/or expertise. This will be coordinated by Saito and Neal.

Action by: All Panel Members. Neal and Saito to coordinate responses.

When: Review progress by mid-November 2008.

Proposed next STP meetings:
January 2009; Location: USA

Accepted next STP meetings:
6-9 March 2009; Location: Honolulu, USA

#7 STP Report

STP Roadmap Activities (overview)

- STP #6 (Feb. 2008)
  - Defined roadmap concept
  - Used the established 3 WGs for developing the roadmap (Geochemistry & Microbiology; Petrophysics; Core Description)
- Seek inputs from science communities
- STP #7 (July 2008)
  - Categorization of 61 items
  - Prioritization
- Interaction between EDP and STP
- STP #8: Complete/Release STR v. 1.0

Engineering Development Panel
IODP-MI Report

Shanghai, China
January 14-17, 2009

Greg Myers
IODP-MI

INTEGRATED OCEAN DRILLING PROGRAM
MANAGEMENT INTERNATIONAL

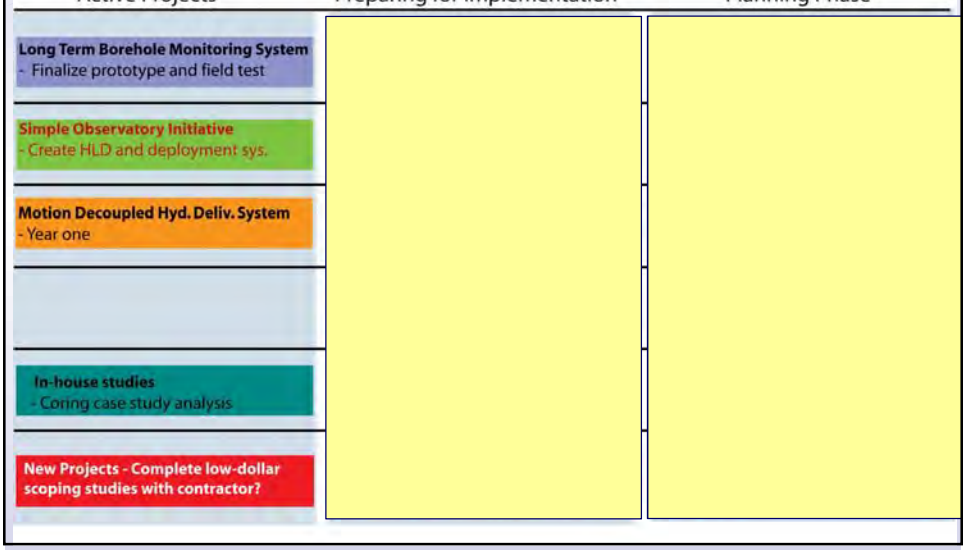
3 Year Engineering Time Horizons

FY2009	FY2010	FY2011
Active Projects	Preparing for Implementation	Planning Phase
Long Term Borehole Monitoring System - Finalize prototype and field test		
Simple Observatory Initiative - Create HLD and deployment sys.		
Motion Decoupled Hyd. Deliv. System - Year one		
In-house studies - Coring case study analysis		
New Projects - Complete low-dollar scoping studies with contractor?		

Submitted FY2009 IODP APP

1. **Long Term Borehole Monitoring System**
   - Final year of development – complete and field test proto.
2. **Simple Observatory Initiative:**
   - SCIMPI High Level Design
   - S-CORK High Level Design ($0)
   - Simple Observatory Common Deployment System
3. **Motion Decoupled Hydraulic Delivery System**
   - Year one of two
   - Over $100K of cost sharing provided by Univ. of Texas
4. **Continuation of in-house coring study**

3 Year Engineering Time Horizons



FY2010 Draft Engineering Plan

- New Project
  - Multi-sensor Magnetometer Tool
    - Year one of three
- Continuing Projects
  - Motion Decoupled Hydraulic Delivery System
    - (year two of two)
  - Simple Observatory development
    - One observatory design to be selected and fully funded
    - Selection criteria to be created this fall and selection made in spring 2009

Multi-sensor Magnetometer Module

LDEO proposes to build a new downhole magnetometer tool to:

•Produce continuous records of the magnetic field in the borehole from which magnetization and polarity of the rocks surrounding the borehole can be calculated

•This tool will measure a wide range of rock types from highly magnetic basalts to weakly magnetized sediments

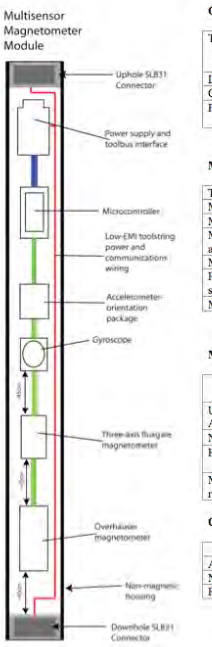
•Three year project with the tool being delivered at the end of Year 2. Third year for testing and documentation

Addresses two ISP initiatives:

1) Environmental change, processes and effects

2) Solid Earth cycles and geodynamics

Tool Specifications



General

Telemetry compatibility	LDEO and Schlumberger telemetry systems
Logging cable required	7-conductor
Calibration Interval	1 year
Power Requirements	250VAC from toolstring, 75mA max

Mechanical

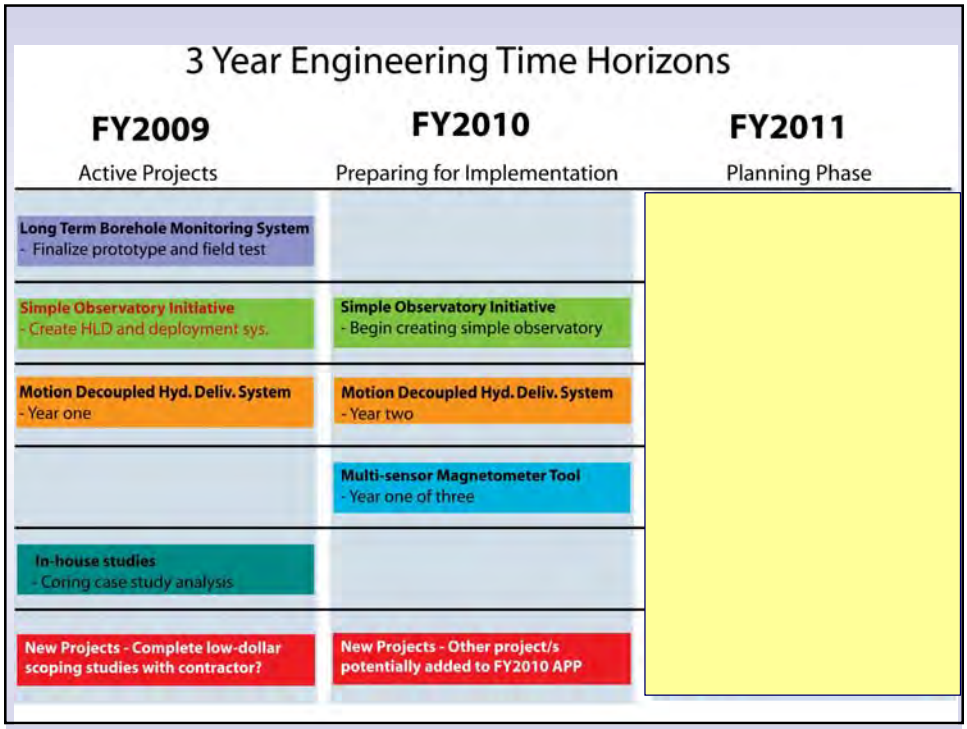
Tool diameter (max)	8.57 cm
Max operating temperature	50°C
Max operating pressure	69 MPa
Max water depth (seawater as drilling fluid)	6400 m
Max borehole size	35.6 cm
Recommended logging speed	275 m/hr
Max logging speed	550 m/hr

Magnetometers

	Fluxgate magnetometer	Overhauser Magnetometer
Uncorrected Accuracy	±0.5% field strength	±0.2 nT
Noise	<0.5 nT	0.01 nT/√Hz
Range	±100,000 nT	15,000-120,000 nT
Measurement rate	4/sec	4/sec

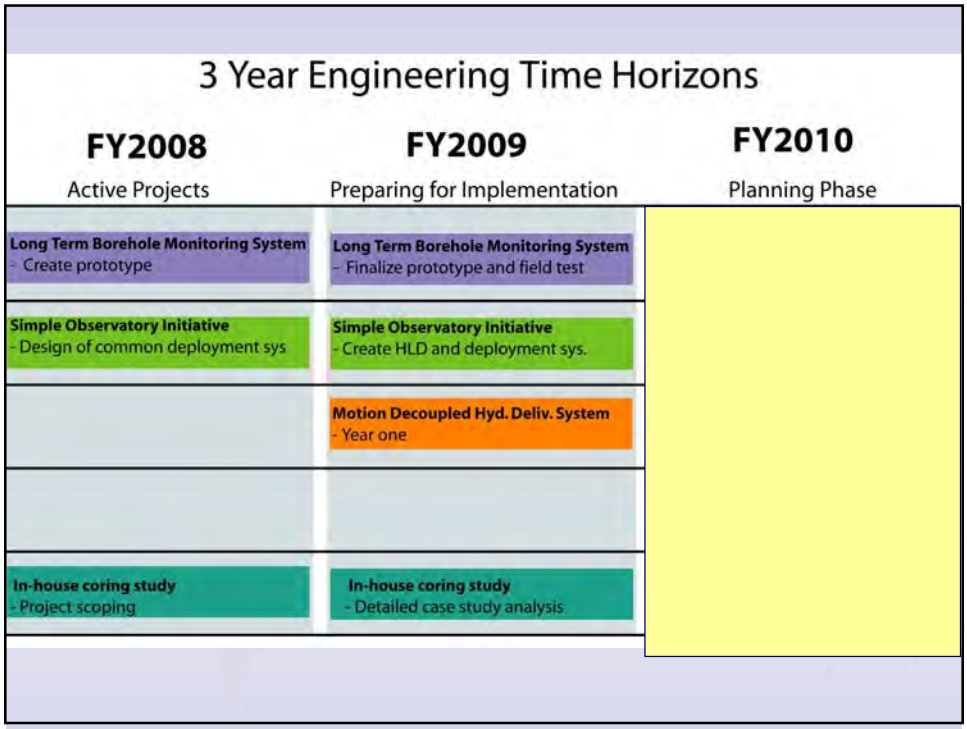
Orientation

	Accelerometer	Gyroscope
Accuracy	± 0.15 m/s^2	±0.01 deg/s
Noise	$2x10^{-3}$ m/s^2	0.01 deg/s
Range		±60 deg/s



Proposal Sequence

- April 15th - Engineering proposals submitted
- April 27-28 - Proposals reviewed by ETF
  - 3 Proposals received, 3 forwarded to EDP
- April 30 – ETF reviews sent to proponents, and proponents respond
- May & June - Preparation for EDP
  - Proponents create presentation for EDP
  - Watchdogs selected and proposals forwarded to EDP
- July 15-17th - Proposals reviewed by EDP and star ratings assigned


3 Year Engineering Time Horizons
FY2008
Active Projects
FY2009
Preparing for Implementation
FY2010
Planning Phase
Long Term Borehole Monitoring System
- Create prototype
Long Term Borehole Monitoring System
- Finalize prototype and field test
Simple Observatory Initiative
- Design of common deployment sys
Simple Observatory Initiative
- Create HLD and deployment sys.
Motion Decoupled Hyd. Deliv. System
- Year one
In-house coring study
- Project scoping
In-house coring study
- Detailed case study analysis

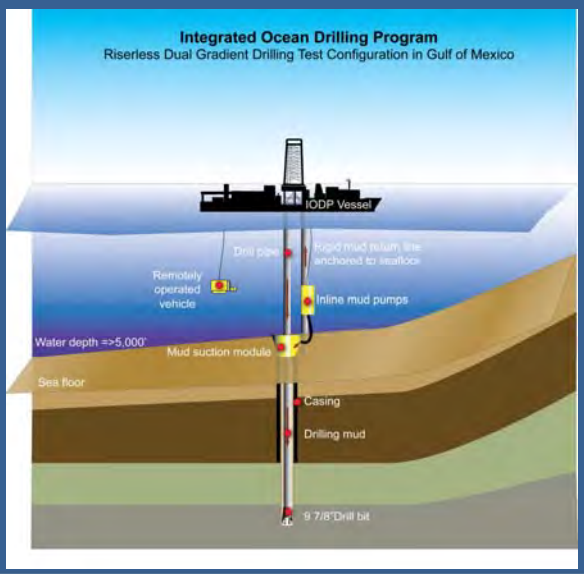
Project Overview

IODP-MI has entered into a contractual relationship with the DeepStar consortium to conduct engineering feasibility studies and planning for a sea trial of emerging mud control technology.

The plan will include the requirements for deploying AGR Drilling Services' Riserless Mud Recovery system at ultra-deepwater (between 5,000ft and 12,000ft) sites in the Gulf of Mexico aboard the *JOIDES Resolution*.

If warranted by the feasibility studies, sea trials would be targeted for early to mid FY2011 at location/s in the Gulf of Mexico

A successful test would provide the impetus for lower cost drilling and exploration in water depths up to 12,000 feet



IODP-MI

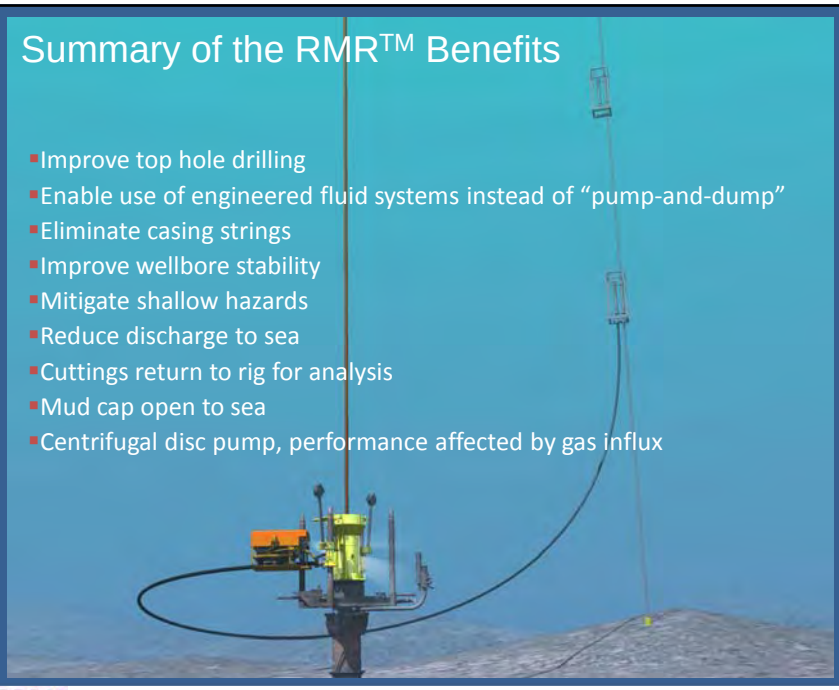
Project Value

- o Less risk to borehole installation:
  - Continuous use of engineering mud
  - Early gas kick detection
- o Lower costs per well:
  - Mud volume reduction, fewer casing strings, use of smaller rig
- o Increased capability:
  - Eliminates need for frequent mud resupply
  - Higher quality borehole

IODP-MI

Summary of the RMR™ Benefits

- Improve top hole drilling
- Enable use of engineered fluid systems instead of “pump-and-dump”
- Eliminate casing strings
- Improve wellbore stability
- Mitigate shallow hazards
- Reduce discharge to sea
- Cuttings return to rig for analysis
- Mud cap open to sea
- Centrifugal disc pump, performance affected by gas influx



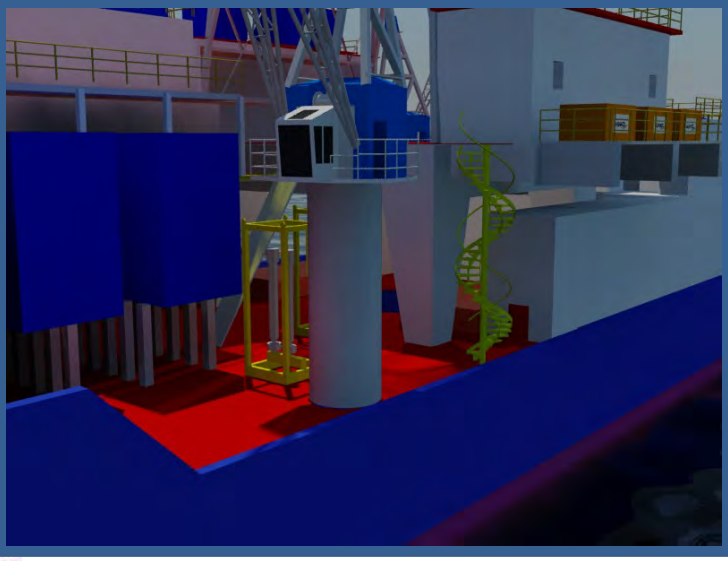
IODP-MI

Deepwater RMR Pump Skid

3 Stage deepwater JIP pumps following dock side test in Norway

IODP-MI

JOIDES Resolution port side forward of moon pool

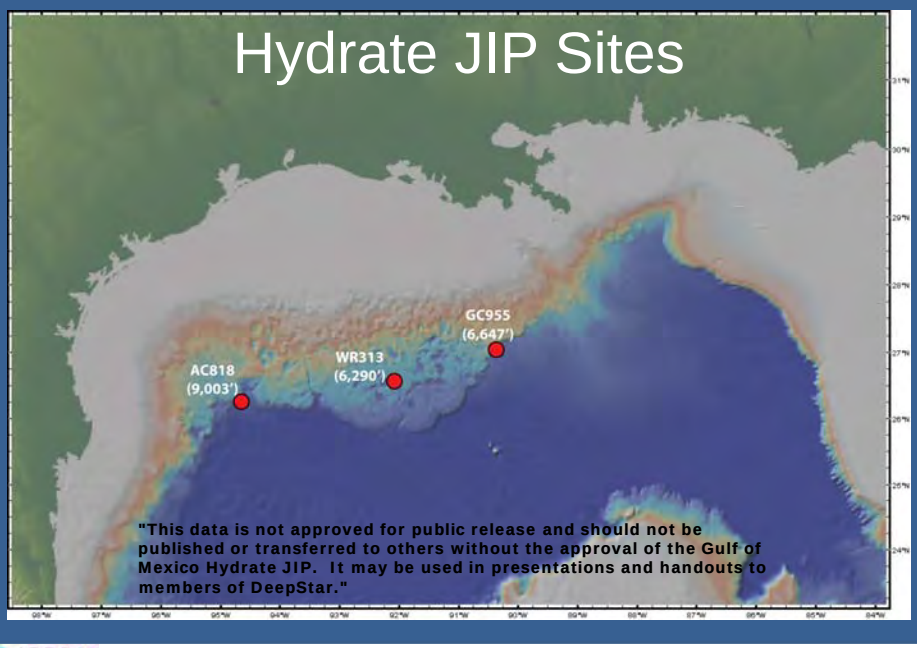


IODP-MI

Movie

IODP-MI

Hydrate JIP Sites

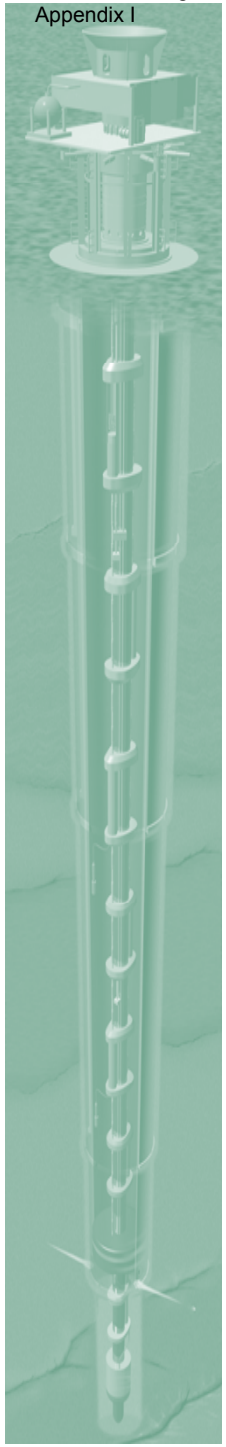


IODP-MI

Summary

- Project progressing well
- Building on RMR DEMO 2000 Deepwater JIP project field trial success
- *JOIDES Resolution* appears to be feasible for demonstrating the capabilities
- AGR Riserless Mud Recovery system is maturing to meet the industry needs
- Teaming underway to bring together multiple projects

IODP-MI



Update on Development of Telemetry System for Long Term Borehole Monitoring System

Nori KYO (kyom@jamstec.go.jp)

C*enter for* **D***eep* **E***arth e***X***ploration*

J*apan* **A***gency for* **M***arine-earth* **S***cience and* **TEC***hnology*

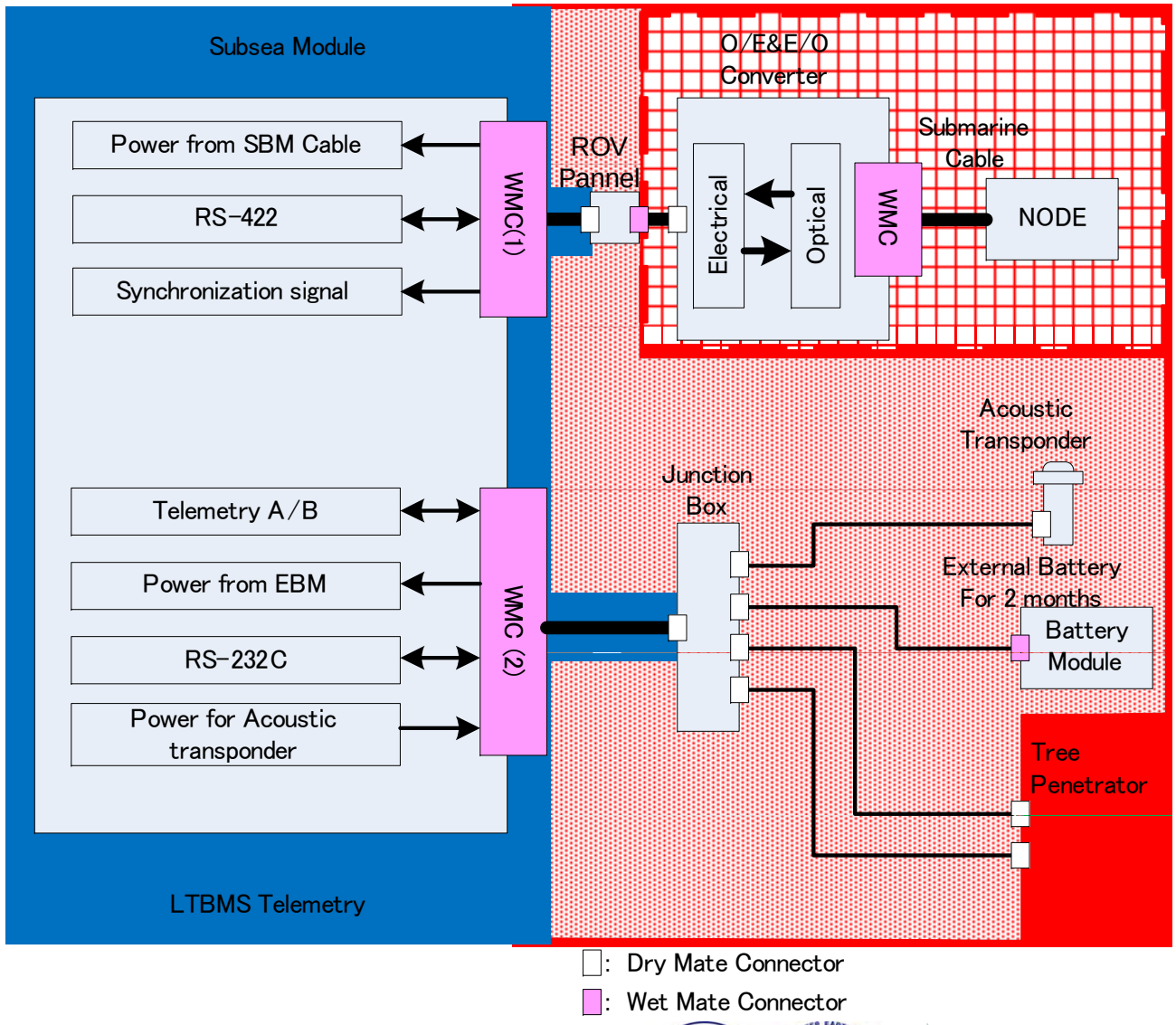
Modifications on specifications

- Remove all of analog signal inputs in a subsea module.
- Reduce one fast ADC channel (from 4ch to 3ch).
- Increase the upper limit of sampling rate of low speed signal inputs in downhole modules (from 20 sps to 160 sps).
- Increase one serial channel (9600 bps @500 Hz or higher sampling rate) at the same time (from 1ch to 2ch).
- Remove digital inputs for Serial Peripheral Interface (SPI) in downhole modules.

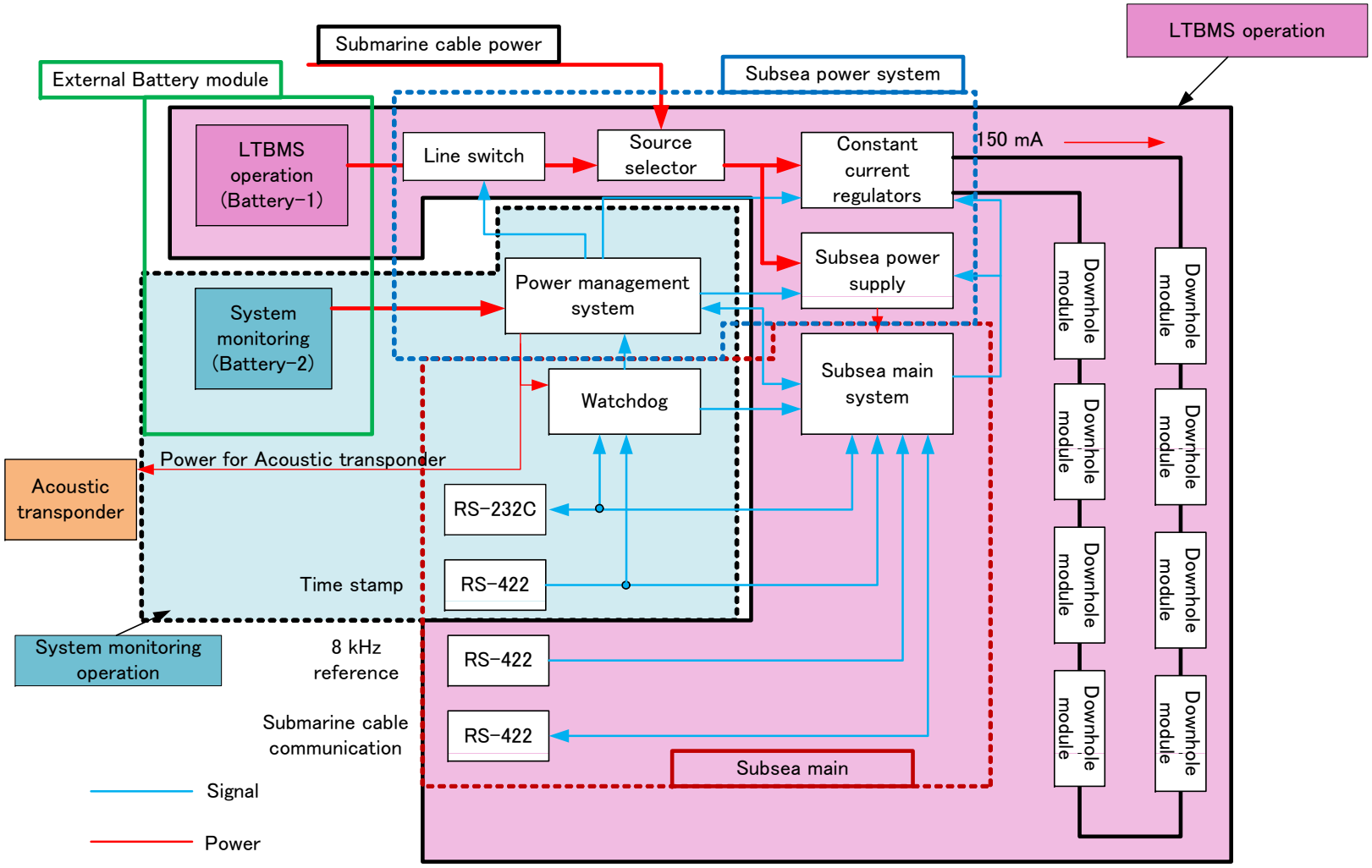
Deliverables of FY08

- Detailed system design document.
- Manufacturing plans of the EXP and the system integrated mock-up for environmental life test.
- Environmental life test plan.
- System control software specification document.
- Draft document of operation procedure for the EXP deployment by.
- Field Test Requirements.

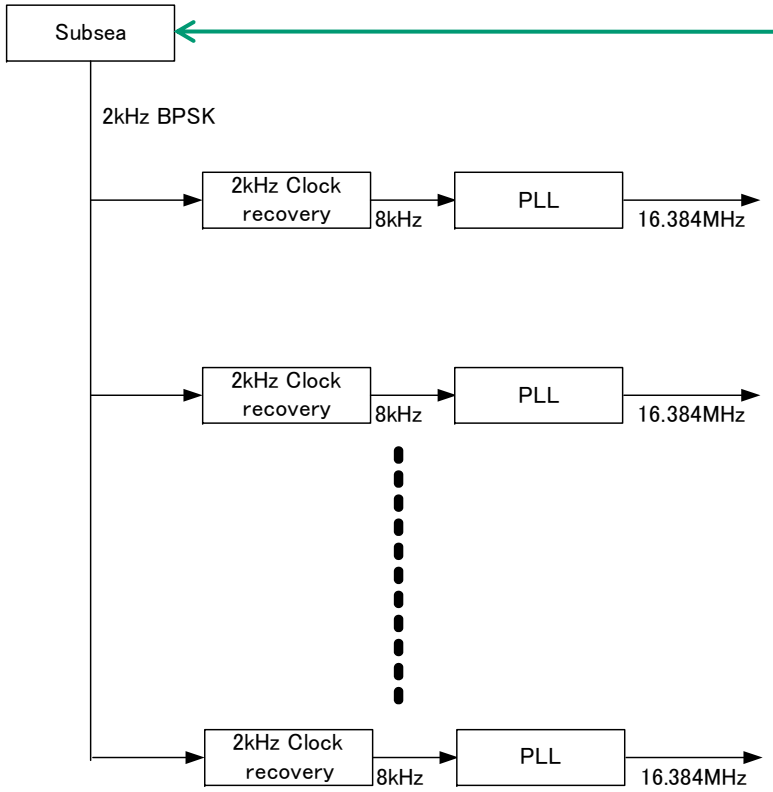
Hardware design



Power management design



Synchronization design

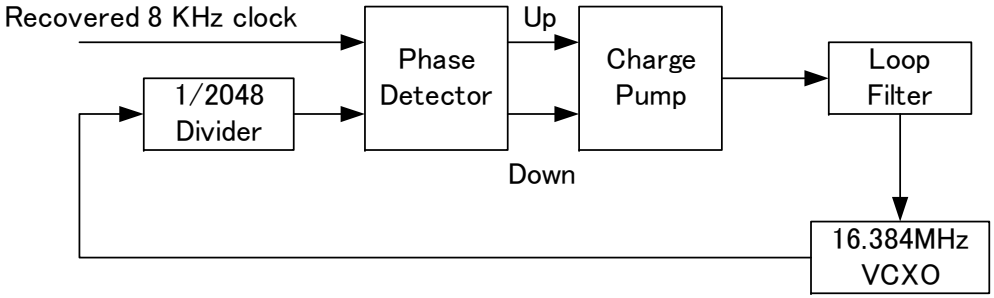


External reference synchronization

- Reference frequency: *8 kHz*
  Square wave
  50% duty
- Time stamp: *250Hz*
  4 byte

Required specification

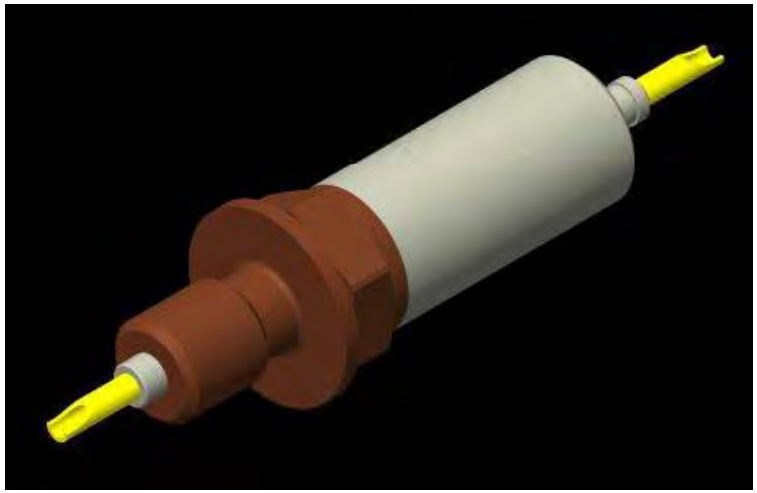
- Required accuracy: *10 μs*



Component evaluation

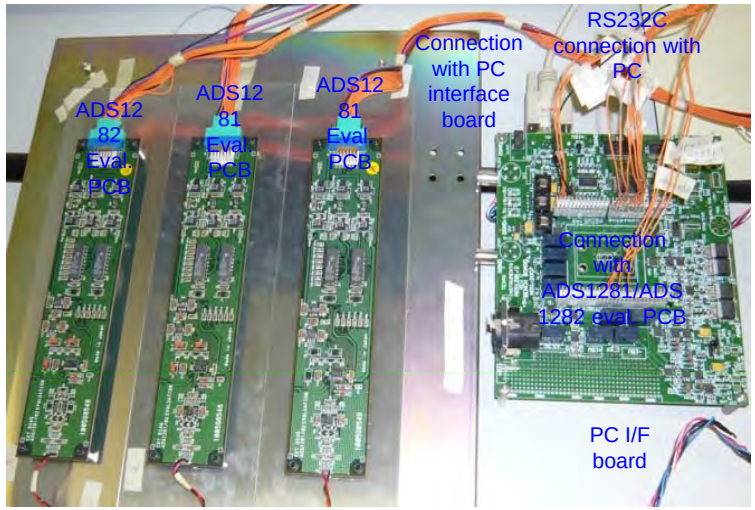
Mechanical parts

- Upper and lower head welding test
- Bulkhead welding test (FY09)
- Housing pressure Test (FY09)



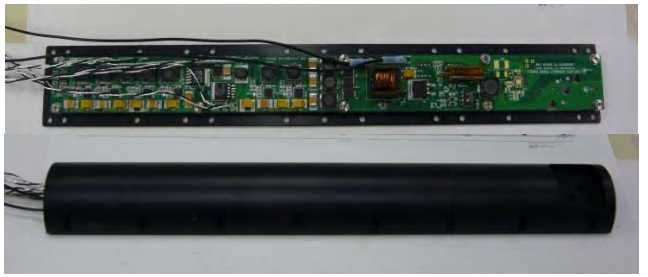
Electrical parts

- Fast sampling ADC
- Slow sampling ADC
- Voltage reference IC
- Voltage controlled crystal oscillator
- Fault recover unit



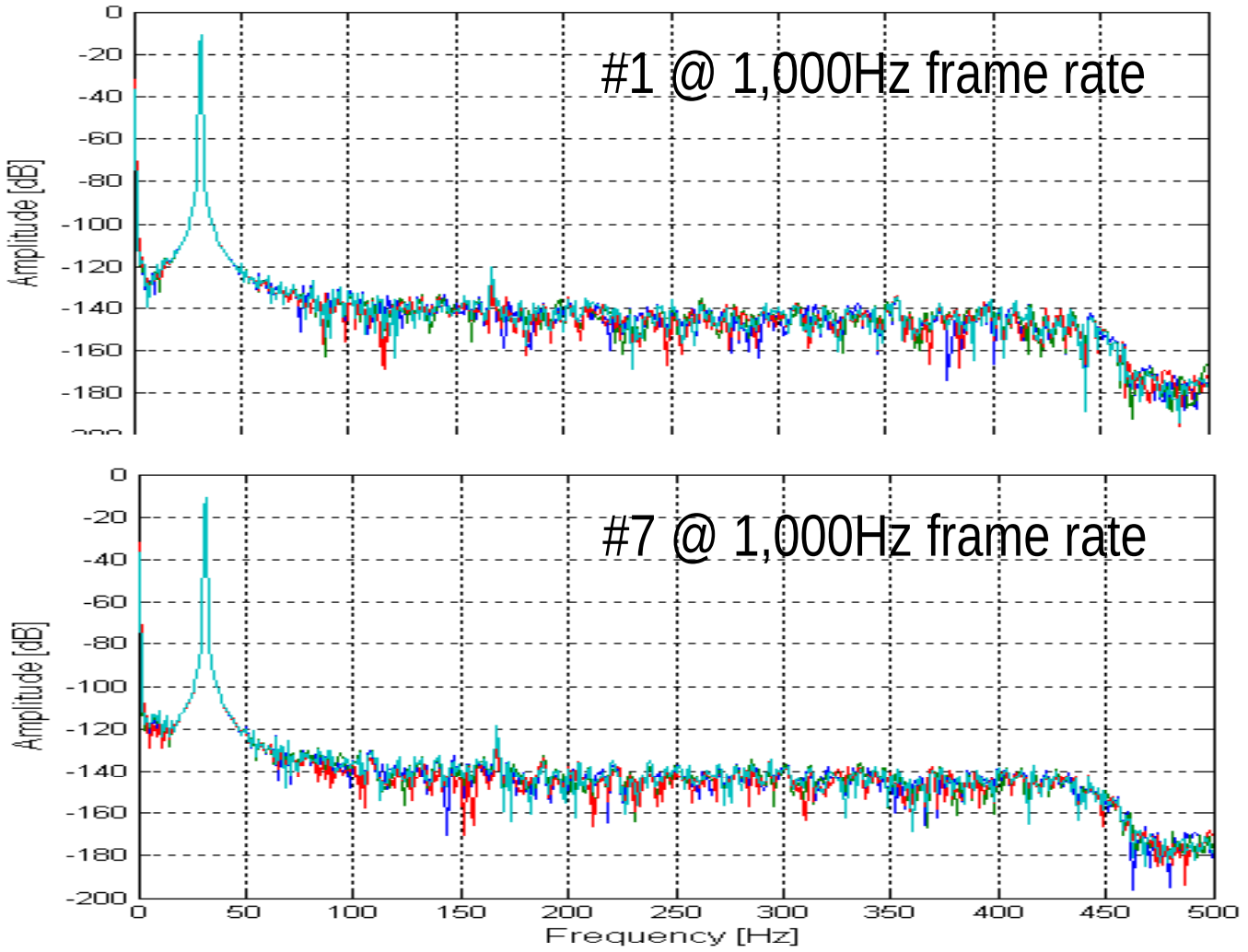
Unit integration test

- Multiplex data
- Low power consumption
- Real time monitoring
- Various sensor I/F
- Accurate synchronization



JAMSTEC CDEX JAMSTEC IODP INTEGRATED OCEAN DRILLING PROGRAM

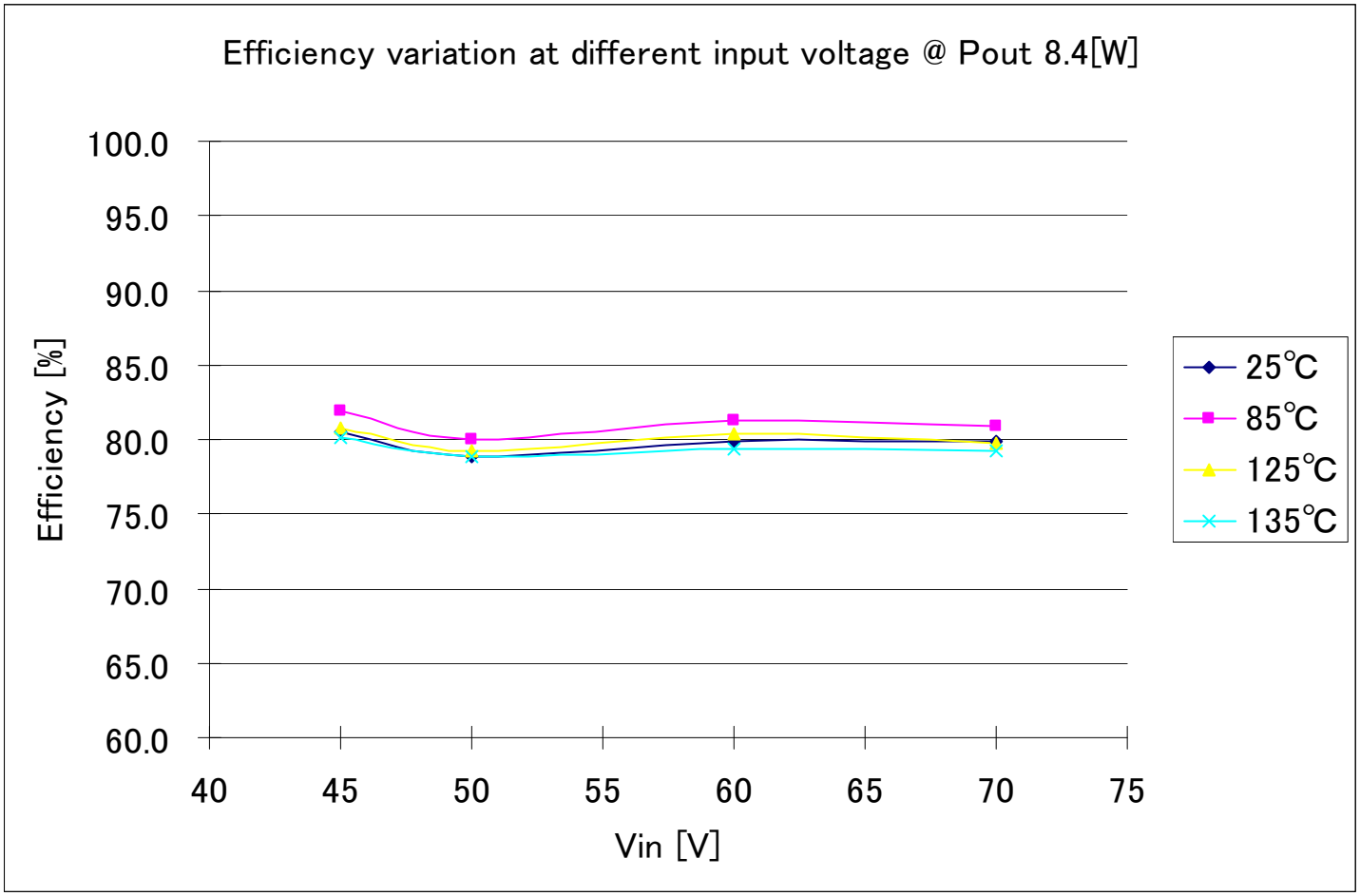
Result on fast sampling ADC



Result on synchronization error

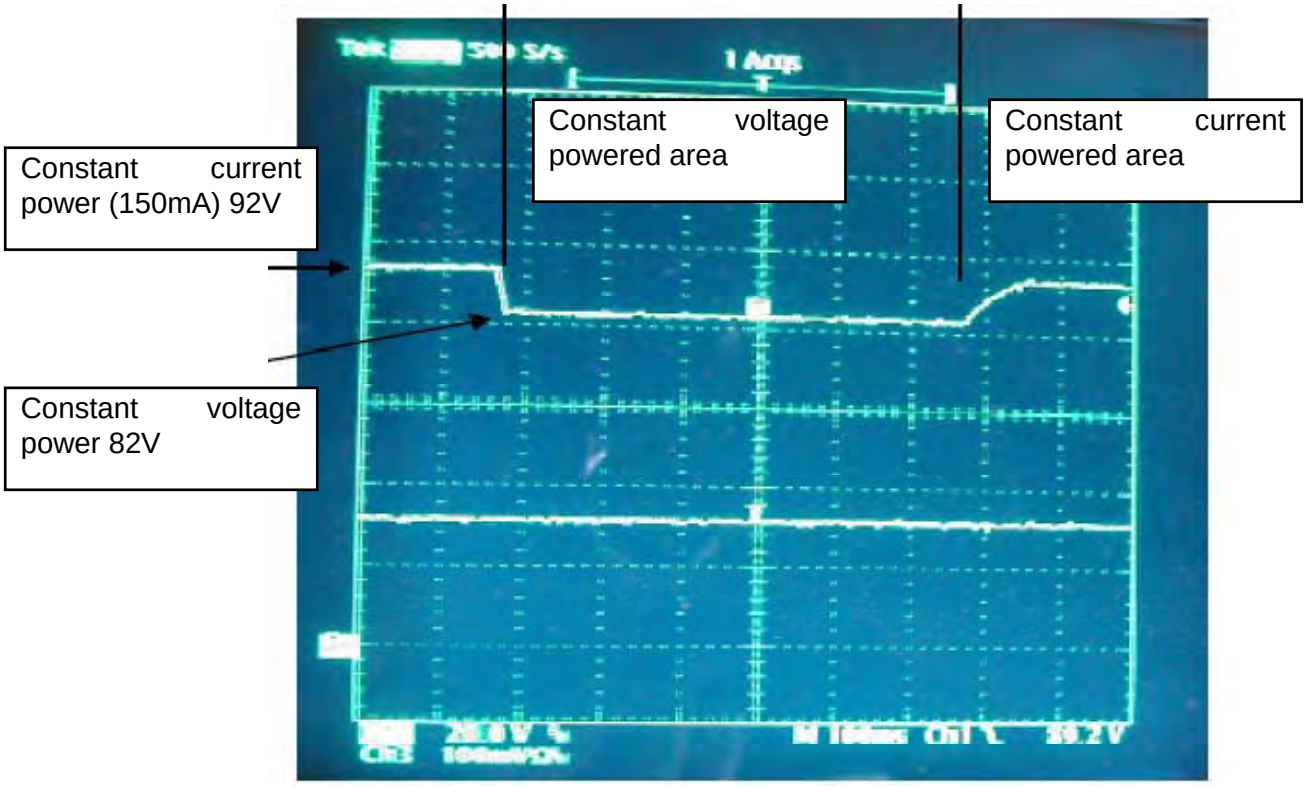
	Error
Downhole module 8	128 ns
Downhole module 7	212 ns
Downhole module 6	291 ns
Downhole module 5	446 ns
Downhole module 4	586 ns
Downhole module 3	722 ns
Downhole module 2	924 ns
Downhole module 1	1060 ns

Result on efficiency of DC/DC converter

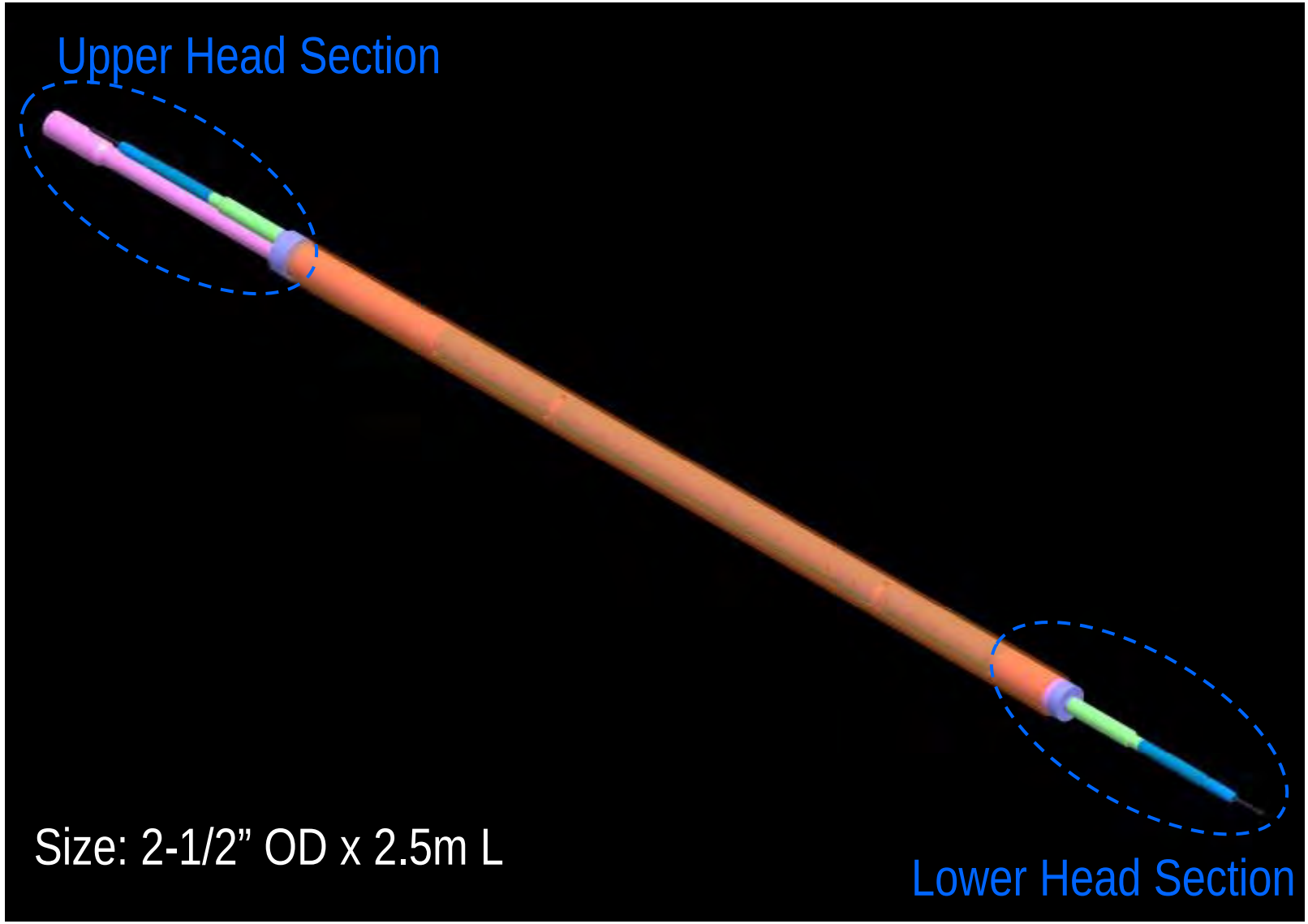


Result on power transition

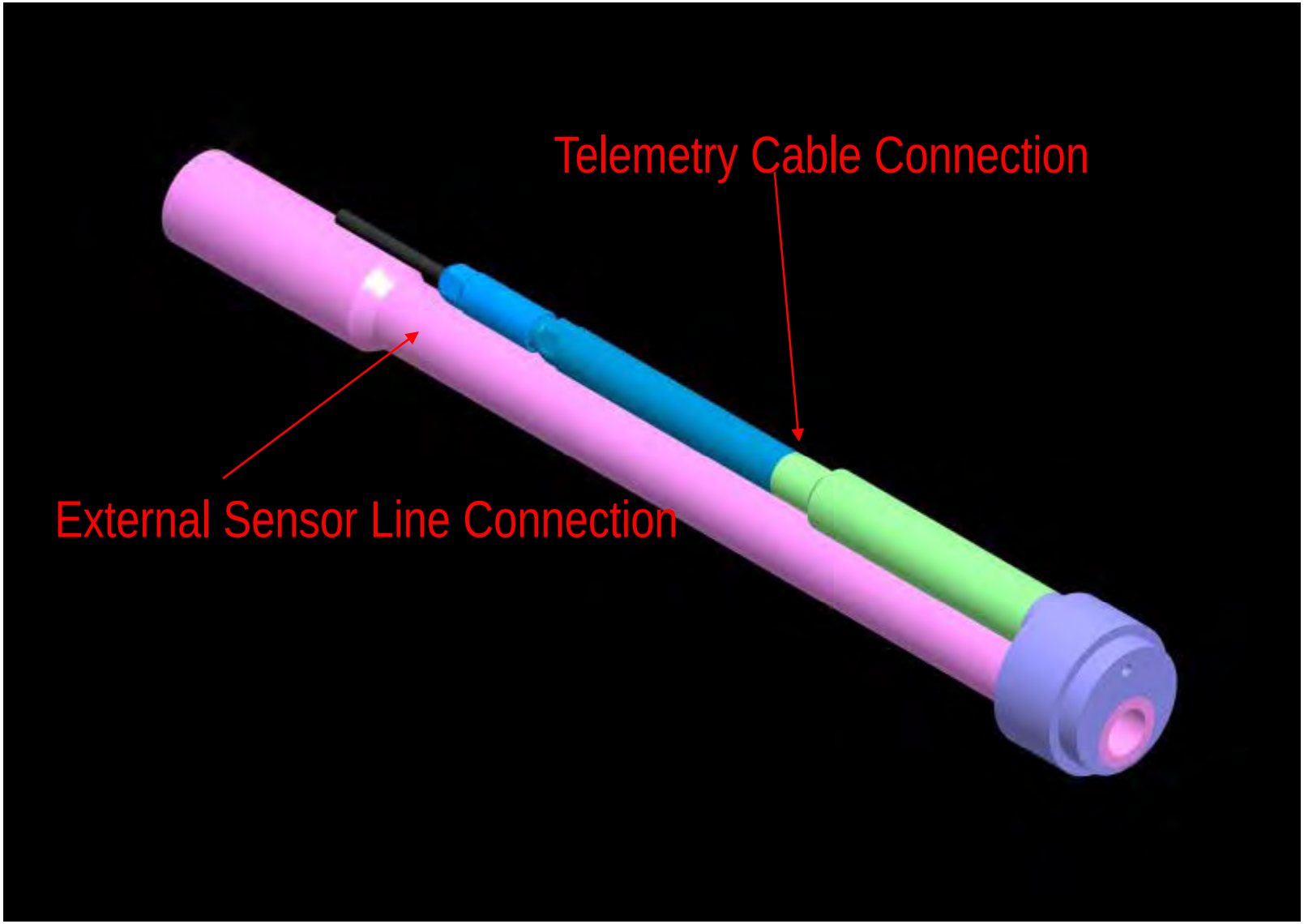
- Zener volage: 92 V
- Electrical load: 130 mA
- Constant current source: 150 mA
- Constant voltage source: 82 V



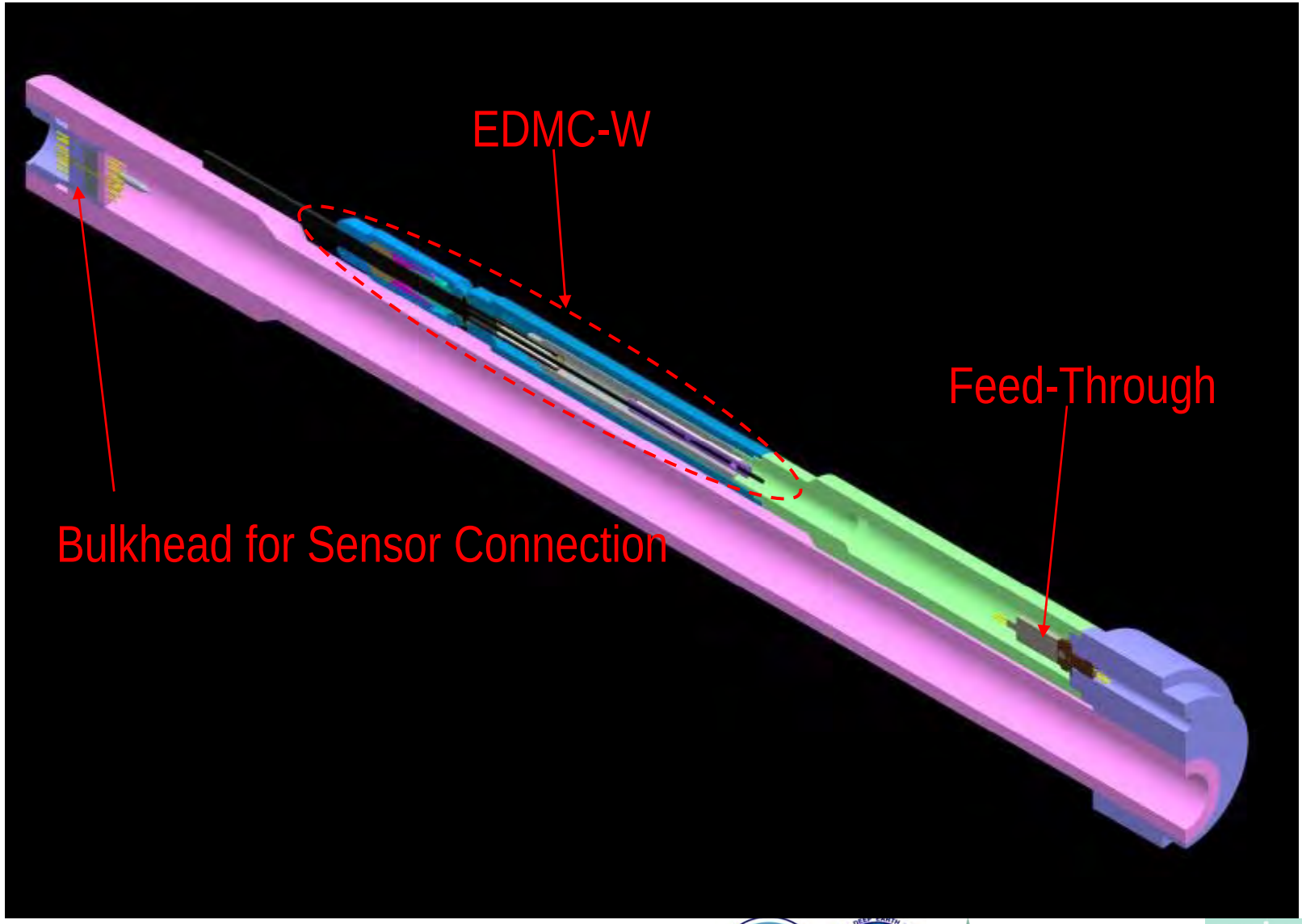
Downhole module (overall view)



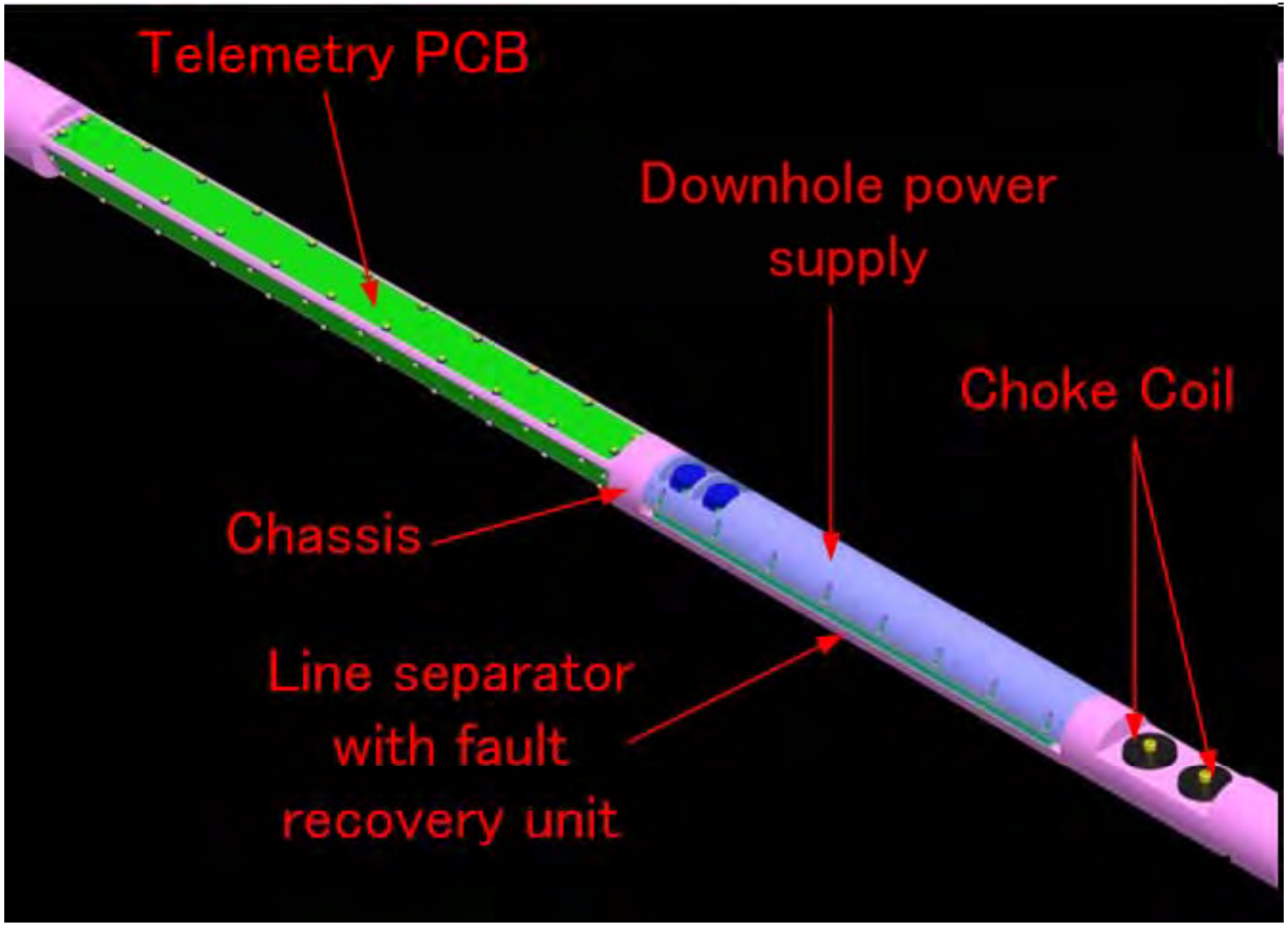
Head section (Overall View)



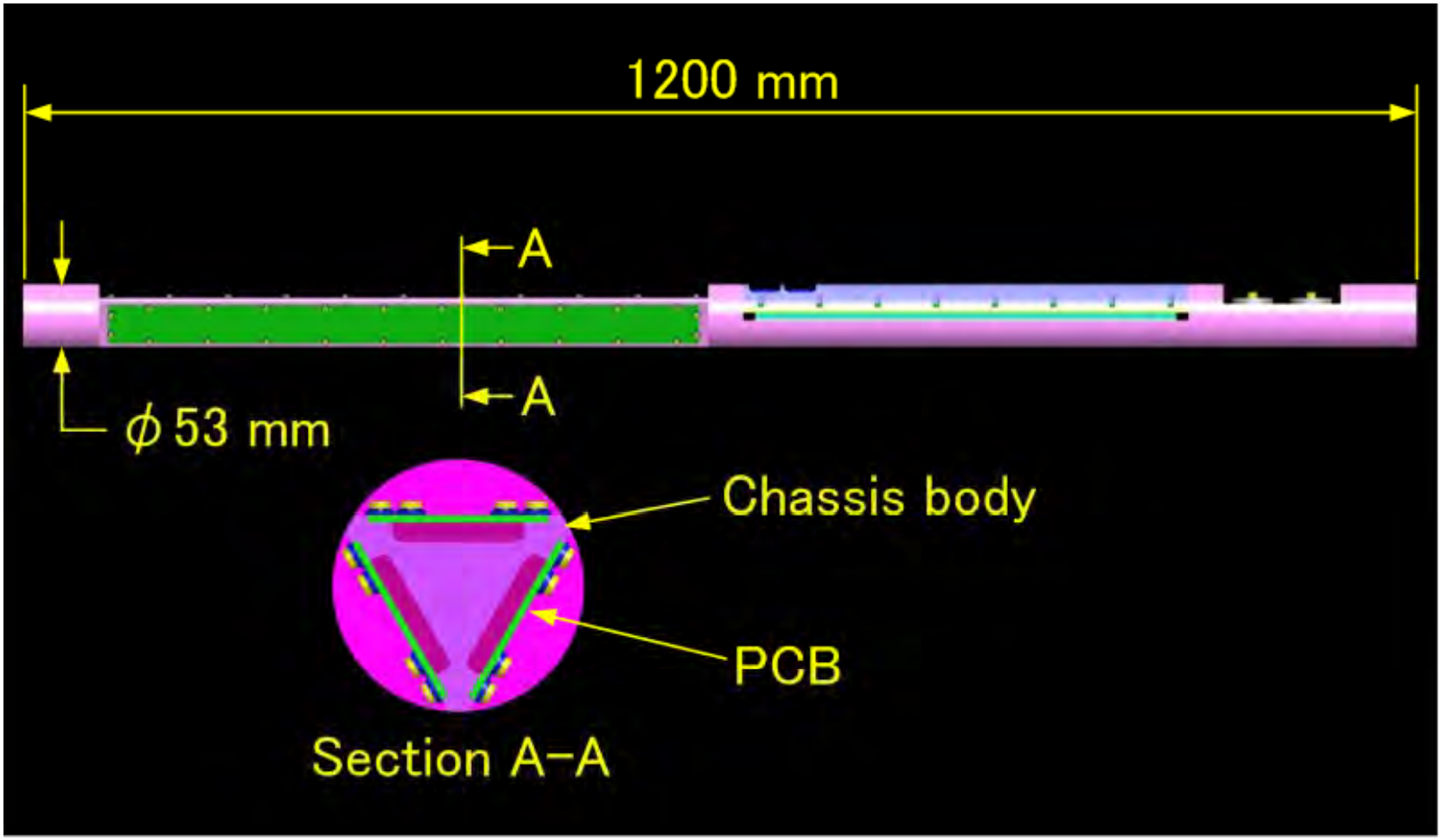
Head section



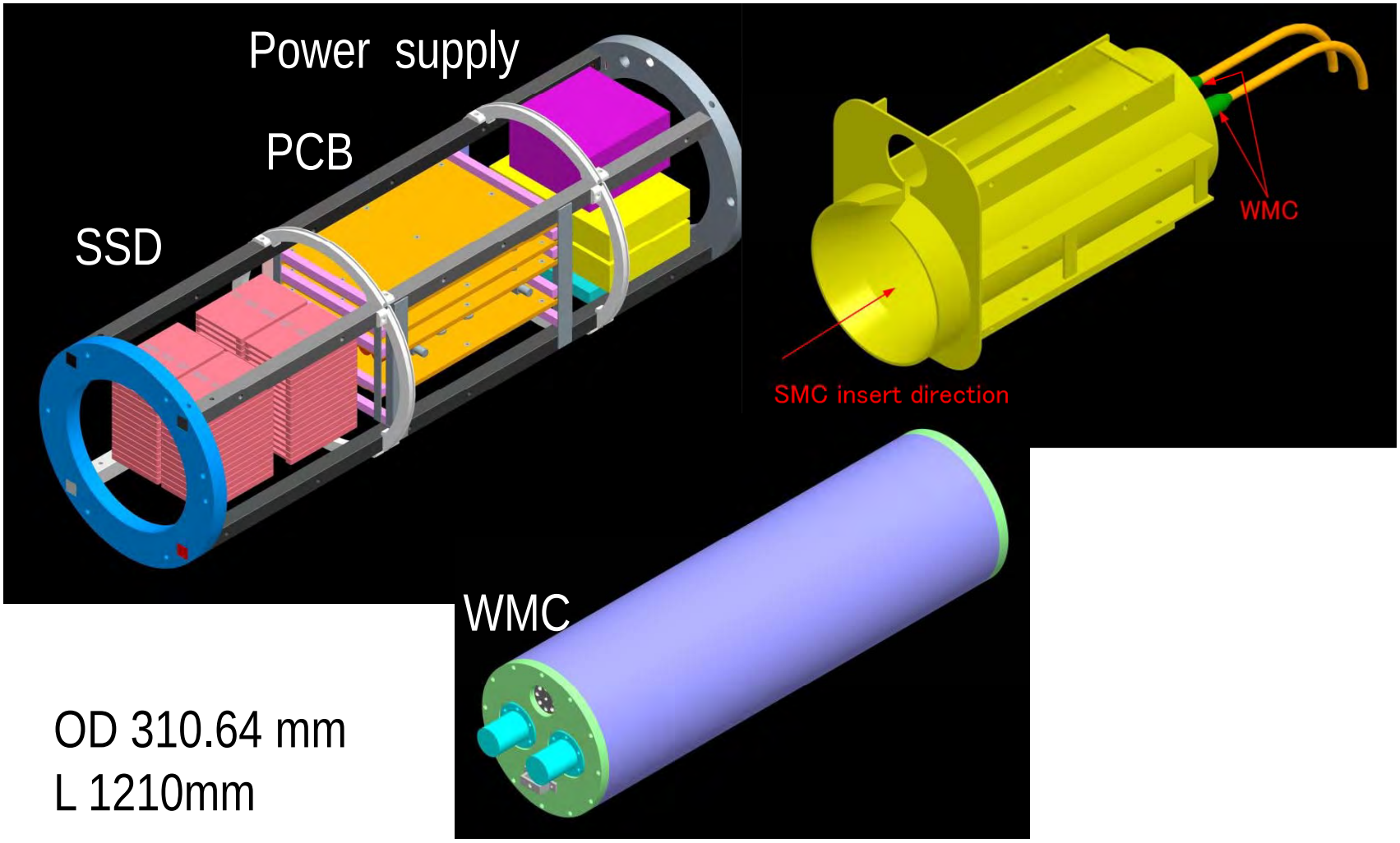
Downhole electrnics



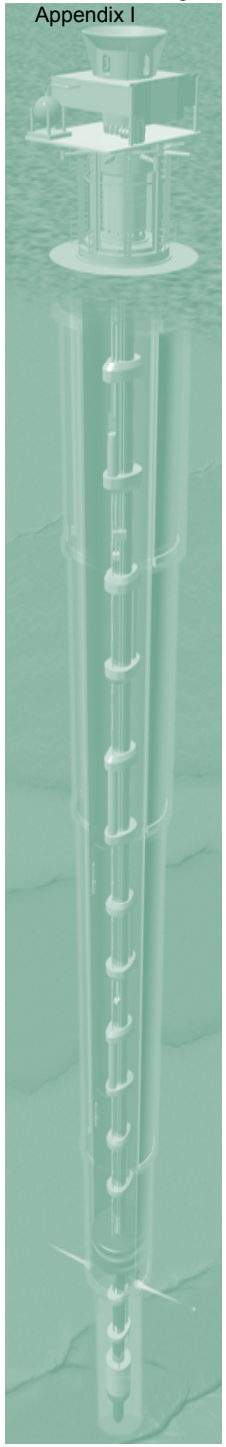
Downhole module electronics



Subsea module



OD 310.64 mm
L 1210mm



Deliverables of FY09

- EXP system integration test report
- Environmental life test report
- Documents on EXP telemetry system for field test
- EXP field test report
- Action items for engineering prototype (ENP)

FY09 schedule

Activity	USFY2008												USFY2009											
	2007			2008									2009											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
EXP Detailed Design Work																								
Subsea Module Electorical Design																								
Harware design iteration/Concept validation																								
EXP specification and design																								
Unit integration test with mock-up																								
Downhole Module Electorical Design																								
Hardware design iteration/Concept validation																								
Component evaluation																								
Mock-up specification, design and fabrication																								
Unit integration test with mock-up																								
EXP specification and design (design modification)																								
Software requirement																								
Software specification																								
Software development																								
Downhole Module Mechanical Design																								
I/F detail design																								
Packaging design																								
Components design																								
Subsea Module Mechanical Design																								
I/F detail design																								
Packaging design																								
Components design																								
Environmental Life Test (w/ EXP mockup)																								
Finalize test plan																								
Build test mockup																								
Pressure Test																								
Shock Test																								
System integration test																								
System life test																								
Environmental life test report																								
EXP Fabrication																								
Parts procurement																								
Assembly																								
System integration test																								
EXP Field Test																								
Field test requirements																								
TC review																								
Field test plan																								
Finalize field test plan																								
Field test																								
Field test report																								
LTBMS EXP Study Report																								
Draft																								
TC review																								
Finalization																								

DESIGN

ELT

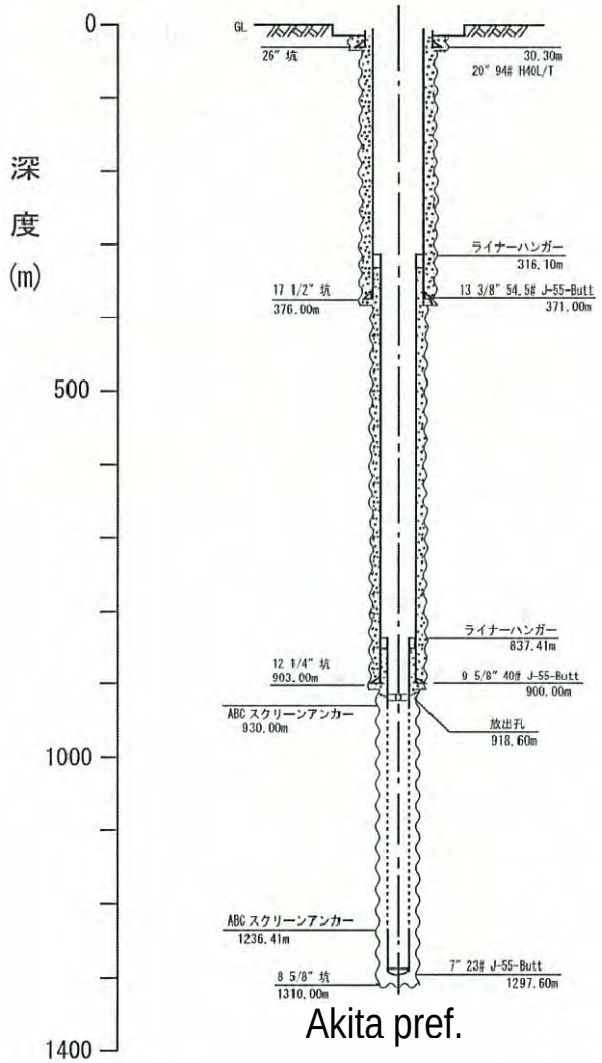
EXP/SIT

L
T

IODP
INTEGRATED OCEAN DRILLING PROGRAM

Land test site

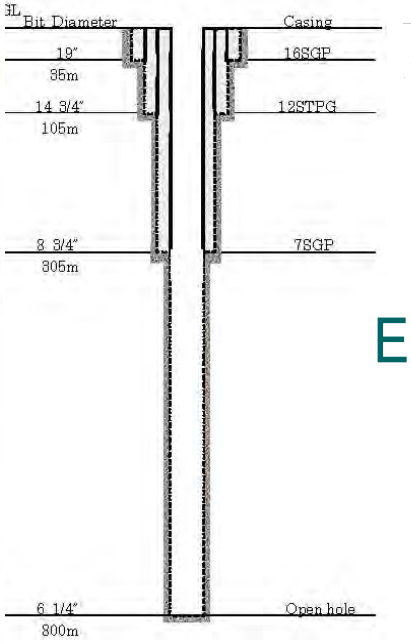
7”/1300m, 9-5/8”/900m



Akita pref.

E W C T F P

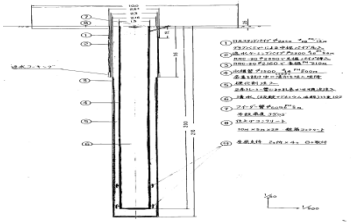
7”/305m



JAMSTEC

E W C T F P

1.5m/240m



AIST

E W C T F P

Evaluation items

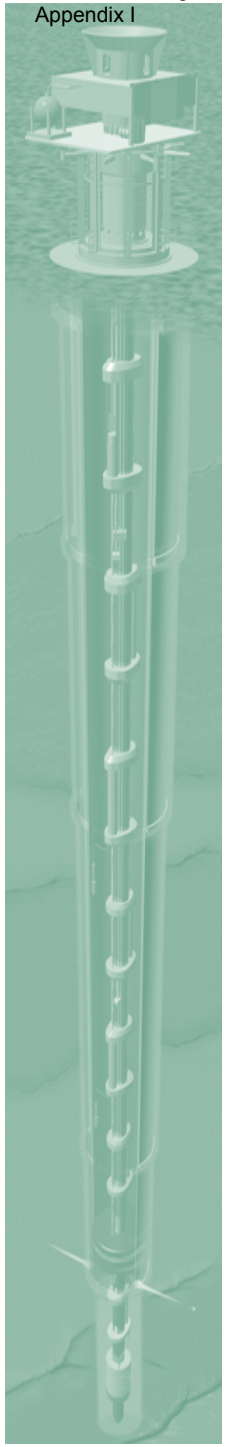
- E: Electricity
- W: Water
- C: Communication
- T: Transportation
- F: Field
- P: Permission

Environmental life test

Prepare EXP mockups to apply to
- shock test (250 G, 2 axis)
- pressure test
(16000 psi in 135 °C for 1 hour)
- long-term operational test under high temperature
(10.9 months in 150 °C)

Major test items;
- System level anti-shock packaging design
- Pressure tight housing
(cylindrical and head section junction boxes)
- System reliability under high temperature
(with electrifying the system)

JAMSTEC CDEX JAMSTEC IODP INTEGRATED OCEAN DRILLING PROGRAM



Plan change on environmental life test

Original

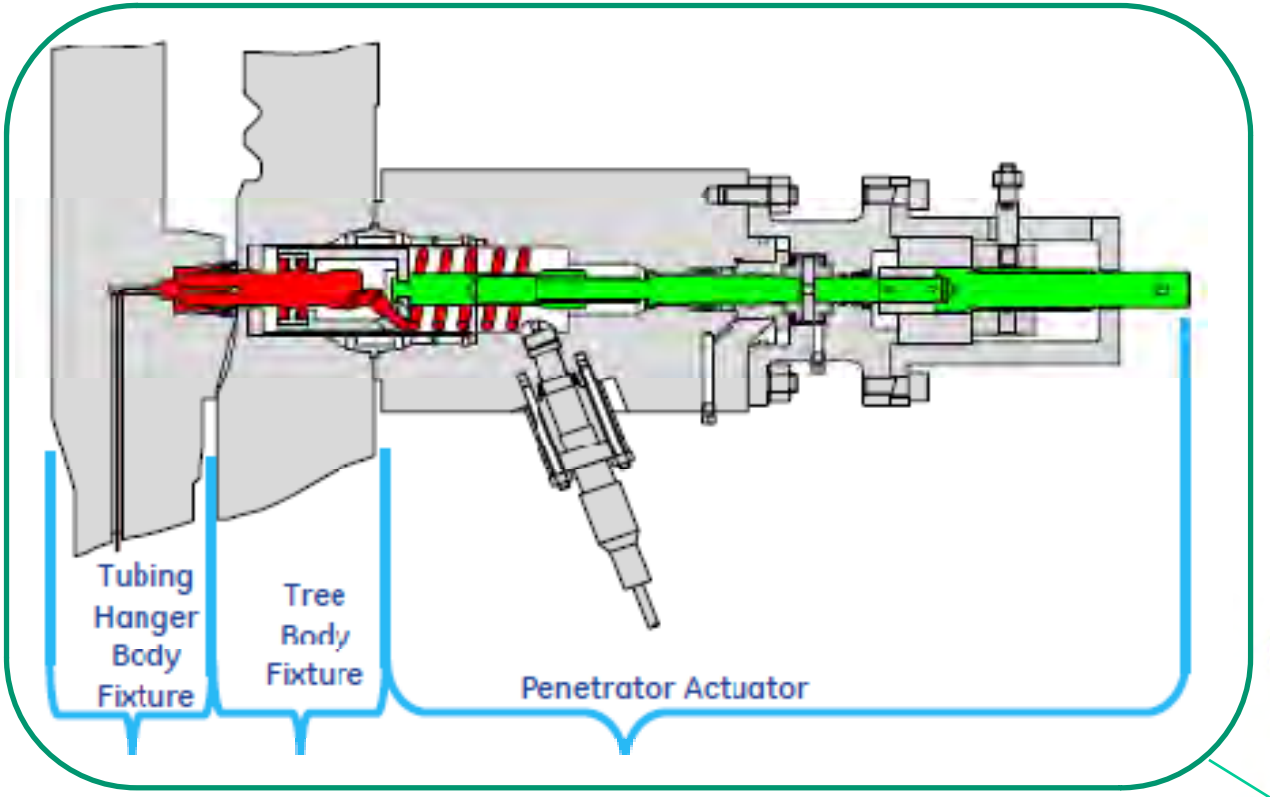
Activity	USFY08				USFY09											
	2008							2009								
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Finalize Test Plan	■															
Built Test Mockup		■	■	■												
Pressure Test						■	■									
Shock Test						■	■									
SIT w/ EXP mockups					■											
System Life Test						■	■	■	■	■	■	■	■	■	■	■
Test Report															■	■

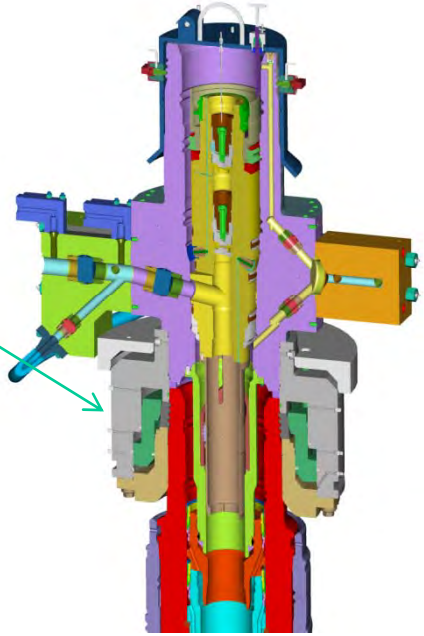
Revised

Activity	USFY08				USFY09												USFY10		
	2008							2009											
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Finalize Test Plan	■																		
Built Test Mockup		■	■	■	■	■	■												
Pressure Test									■	■									
Shock Test									■	■									
SIT w/ EXP mockups								■											
System Life Test									■	■	■	■	■	■	■	■	■	■	■
Test Report															■	■			
Test Report Update																			■

IODP INTEGRATED OCEAN DRILLING PROGRAM

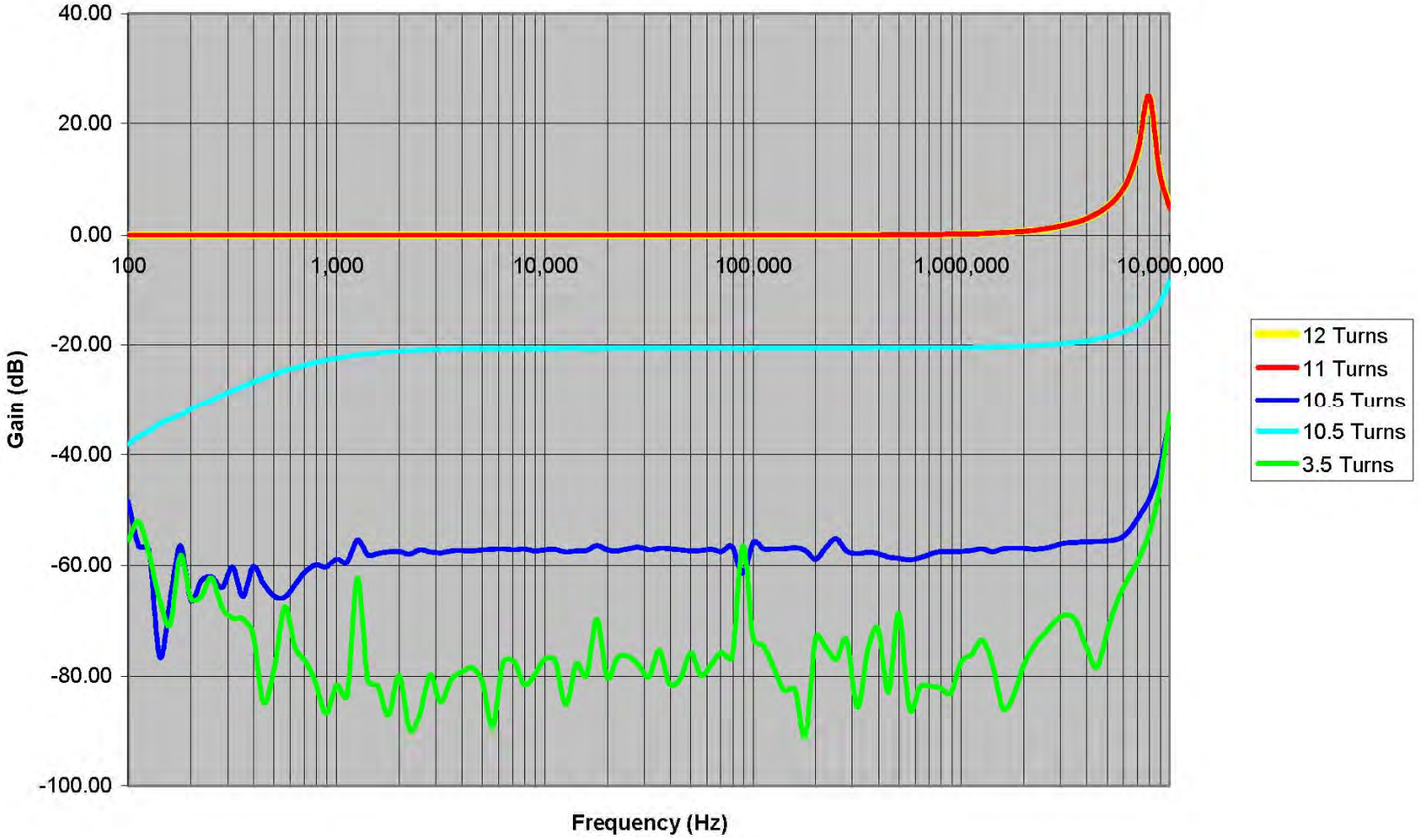
Xmas tree penetrator test





JAMSTEC CDEX JAMSTEC IODP INTEGRATED OCEAN DRILLING PROGRAM

Result on penetrator measurement



IODP
INTEGRATED OCEAN DRILLING PROGRAM

EDP Meeting
Shanghai
14th-16th January 2008

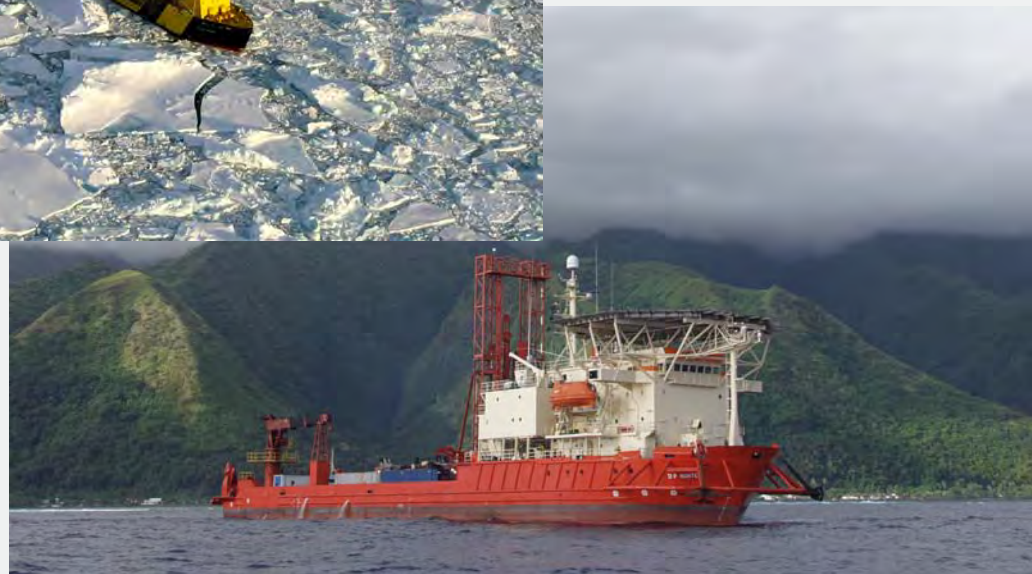
NJ Drilling 2009 IODP-313
GBR Drilling 2009 IODP-325
Update

Dave Smith
ESO Operations Manager

ECORD Science Operator

IODP Mission Specific Platforms

2004 Lomonosov Ridge IODP-302
2005 Tahiti Sea-level IODP-310
2009 New Jersey IODP-313
2009 Gt Barrier Reef IODP-325



IODP-313 New Jersey 2009

90 day project
May – August weather window
Up to 1 x LWD borehole to 800m
Up to 3 x borehole coring to 750m

Platform – Lift Boat
Drilling Rig – Land based coring
Scientific infrastructure – 9 ISO 20ft containers
- 3 offices – including IT/LAN, database, sat comms/email etc.
- 1 Petrophysics
- 1 core laboratory
- 1 core curation
- 2 refrigerated core storage
- 1 general spares/logging

Slimhole wireline logging and VSP

IODP-313 New Jersey 2009

Current status:

Contract should be signed this week

LWD drilling - amendment

Start Date:

1st May on site

ECORD Science Operator

IODP-325 Great Barrier Reef 2009

Up to 45 day project
Oct-Dec weather window
Water depth 40-100m
No. of sites: up to 45
Possible APL in PNG

Similar project to Tahiti sea level change
Platform – DP based vessel
Drilling Rig – Heave compensated
Scientific infrastructure – 8 ISO 20ft containers, depends on vessel facilities
- 3 offices
- 1 Petrophysics
- 1 core laboratory
- 1 core curation
- 1 refrigerated core storage

Slimhole wireline logging

IODP-325 Great Barrier Reef 2009

Current status:

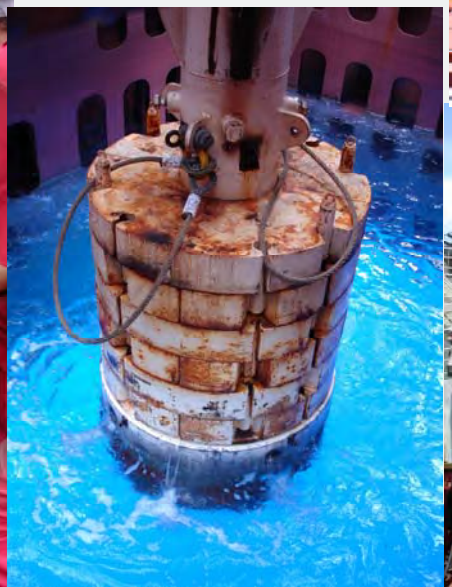
Suitable vessel sourced thro tendering

Finalising Contract

Start date – Sept/Oct 2009

Australian crew issues

Differences – Tahiti/GBR



ESO Projects 2010-2013

Future:

IODP-313 NJ shore party Nov 2009

IODP-325 GBR shore party spring 2010

ECORD aims – to run an MSP each year until 2013

Operations: No MSP in 2010

Funding issues to meet ECORD aims

Magellan Meeting - Sept 08

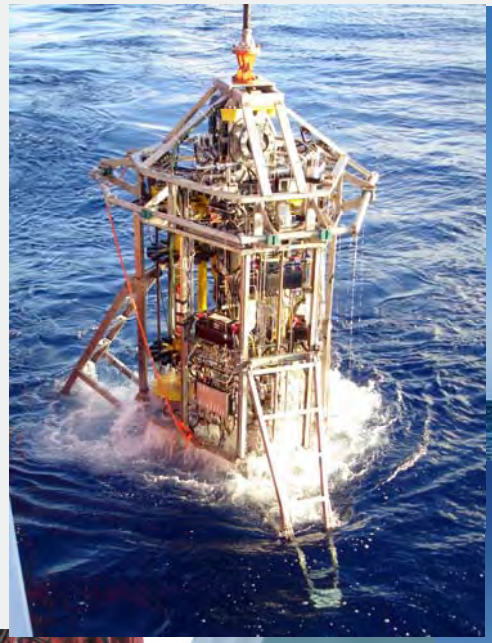
Deep water proposals utilising MSPs

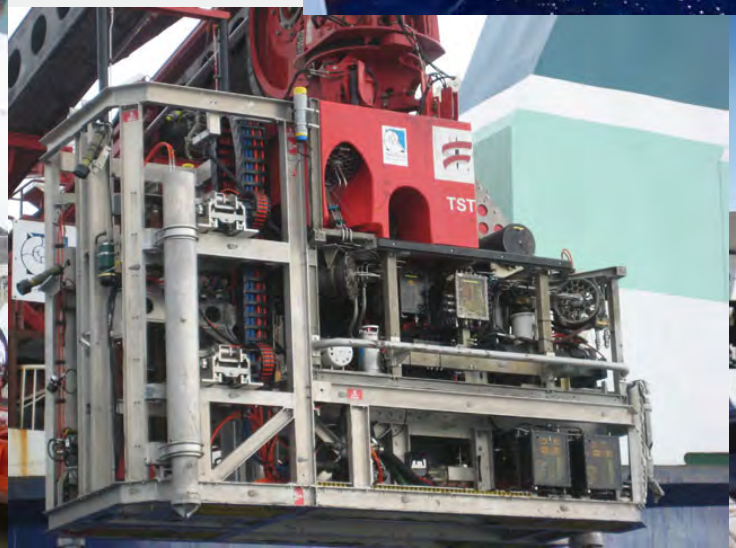
EGU April - 3 Presentations

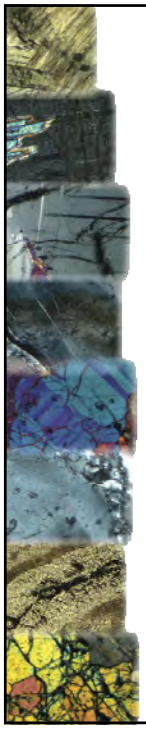
BGS/ESO – MSPs & Seabed Drilling Technology

Bremen/ESO – MeBo Seabed drill

Cardiff/Chris MacLeod – Scientific







IODP-USIO

Engineering Update

EDP Meeting

Shanghai, 16-18 January 2008

IODP
Integrated Ocean Drilling Program
United States Implementing Organization

Overview

- **SODV status**
- **Sea Trials**
- **FY09 Expedition Schedule**
- **Project updates**
- **Other Activities**

IODP

In Memoriam

Gene Pollard

Sep. 1945 – Dec. 2008

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Eugene C. Pollard Jr. died December 7, 2008, after a courageous battle with leukemia. He was born Sept. 10, 1945, in Conroe, Texas, to Eugene and Mamie Pollard.

Gene grew up in Odessa, graduated from Texas A&M in 1968 with a BS in Mechanical Engineering. He was drilling superintendent for 13 years for Amoco Oil in Wyoming, Louisiana, Pakistan, Iran, Egypt, Trinidad and other locations. As drilling manager for Leede Oil in Midland, he drilled the 2nd and 4th deepest producing wells in the world. He was drilling manager for TransAmerican oil in Laredo, and then a drilling consultant in Houston in the Congo and Ghana.

Gene joined the Ocean Drilling Program at Texas A&M in 1988 as a drilling superintendent and drilled the deepest hole in the oceanic volcanic crust. He served as drilling engineer for the Continental Scientific Drilling Program and participated in worldwide scientific drilling.

SODV Status

- **Shipyard work is completed and commissioned**
  - Work continues on Punch list items
- **Harbor trials successfully took place 9-11 January**
- **Harbor trials ended in Loyang**
  - Bulk loading, pipe loading, voyage preparation
- **Installation and acceptance testing of shipboard analytical systems is in progress**

JR Sea Trials and Readiness Assessment

- **Departure from Singapore scheduled for 25 January**
- **1-day portcall in Guam scheduled for ~5 February**
  - Pick up Readiness Assessment Team scientists
  - Other staff exchanges
- **Sea trials at Leg 130, Site 807 (Ontong Java Plateau)**
  - ~11 days of drilling/coring, formation temperature measurements, wireline logging, shipboard analysis of cores
- **Transit to Honolulu**

2009 Expedition Schedule

IODP-USIO *JOIDES Resolution* Operations Schedule

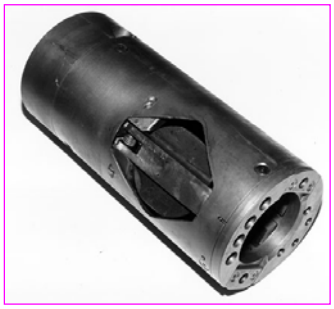
Expedition Name (see map)	Exp #	Port of origin	Dates[1,2]	Total days (port/ sea)	Days at sea[3] (transit /ops)	Co-Chief Scientists (contact info)	USIO contacts[4] (contact info)
Sea trials, transit[5]	N/A	Singapore	25 Jan–5 Mar'09	39 (1/38)	27/11	N/A	Jay Miller
Pacific Equatorial Age Transect	320	Honolulu, Hawaii	5 Mar–5-May	61 (5/56)	12/44	H. Pälike H. Nishi	A. Klaus* H. Evans^
Pacific Equatorial Age Transect[6] & Juan de Fuca	321	Honolulu, Hawaii	5 May–5-Jul	61 (5/56)	20/36	M. Lyle, I. Raffi	K. Gamage* A. Malinverno^
Bering Sea Paleoceanography	323	Victoria, Canada	5 July–4-Sep	61 (5/56)	17/39	C. Ravelo, K. Takahashi	C. Alvarez-Zarikian* G. Guerin^
Shatsky Rise Formation	324	Yokohama, Japan	4 Sep–4-Nov	61 (5/56)	18/38	W. Sager, T. Sano	J. Geldmacher* G. Iturrino^
Canterbury Basin Sea Level	317	Townsville, Australia[7]	4 Nov–4 Jan'10	61 (5/56)	8/48[7]	C. Fulthorpe, K. Hoyanagi	J. Miller* A. Slagle^
Wilkes Land Glacial History8	318	Wellington, New Zealand	4 Jan–9-Mar	64 (5/59)	16/43	C. Escutia, H. Brinkhuis	A. Klaus* T. Williams^

Projects Update

- **Rig Instrumentation System (RIS)**
  - Canrig completed installation of RIGWATCH 8 system (Transocean project)
    - Ability to collect and monitor over 100 data inputs at 1 Hz
    - New rig instrumentation sensors
    - Data from third party systems can be added
  - A number of issues need to be followed up by the USIO
    - Install load pins for better WOB measurements
    - Potential of adding crown encoder (in addition to draw works encoder)
    - Add better system to measure heave stroke (laser?) for better accuracy in the depth calculation
    - Add formula for Mechanical Specific Energy
    - Potential use of RigReport (Canrig) to collect and report standard operations information
    - Capture of data from Transocean network and store it in IODP data base
    - Potential use of MyWells (Canrig) for real time RIS data capture and storage in a hosted database in Houston with a rich array of configurable reporting options.

Projects Update

- **Lockable Flapper Valve (LFV)**
  - Testing was performed at Schlumberger to evaluate performance of LFV.
  - Testing was unable to repeat failure under controlled conditions.
  - Testing indicated a need to change project focus and approach.
  - We were able to determine cause of logging cable damage.
  - Redesign of flapper to allow cable-head to push valve open during retrieval.



Background:

- Flapper valve prevents backflow into the drillstring
- Used with APC and XCB
- 3.80 ID restriction
- Requires a LFVA (go-devil)

Project Update

Lockable Flapper Valve Solution (Continued):

Projects Update

- **Tool upgrades scheduled for FY09:**
  - Sediment Temperature/ Pressure Tool (SETP)
    - Replacement tool for DVTP/P
    - Incorporate Common Data Acquisition System (CDAQ) into tool
      - Modifications to hardware of existing tool
      - Modifications to firmware of CDAQ for additional inputs
    - Investigate probe tip design
      - Reduce disturbance when inserted into formation
  - Sediment Temperature Tool (SET)
    - Replacement for DVTP
    - Complete build of tools scheduled for deployment on Chikyu

Projects Update

- **Wireline Heave Compensator (WHC)**
  - DeepDown WHC installed during shipyard period.
  - Initial testing completed successfully.
  - SLB Data Acquisition installed.
  - Preparing for Sea trials testing and acceptance testing.

Projects Update

- **Data Analysis of WHC Efficiency**
  - Uphole heave motion with Motion Response Unit (MRU)
  - Downhole toolstring motion with General Purpose Inclinometer Tool (GPIT)

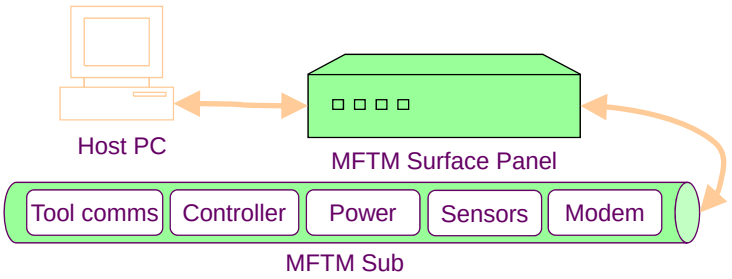
Features:

- Low cutoff frequency determination
- Real-time displacement calculation
- Real-time evaluation and display of compensator efficiency
- Post-logging check of compensator efficiency with FMS image data.

QuickTime™ and a decompressor are needed to see this picture.

Projects Update

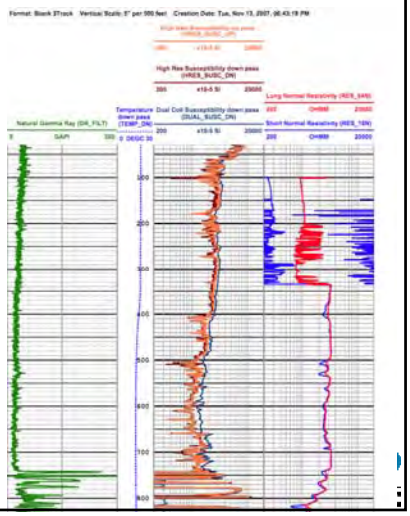
- **Multifunction Telemetry Module (MFTM)**
  - Replacement for UDTM => Universal Data Telemetry Module
  - Standardized Downhole Telemetry Interface
  - Operating Configurations
    - Standalone LDEO Telemetry Mode
    - Schlumberger Mode (completed)-- Will be tested during Sea Trials
    - MDHDS Mode => Motion Decoupled Hydraulic Delivery System (MDHDS)



Projects Update

- **Magnetic Susceptibility Sonde (MSS)**
  - The MSS is designed to provide high quality magnetic susceptibility measurements of sediments and sedimentary rocks at high spatial resolution (~10 cm).
  - High resolution and low resolution measurement sensors.
  - Field testing
    - LDEO Test Well (completed)
    - SLB Blanco test facility (completed)
- Sea-Trial Engineering testing
  - Will piggy back on fourth logging run of acceptance testing.

QuickTime™ and a
decompressor
are needed to see this picture.



Projects Update

Multisensor Magnetometer Module (MMM)

Status: Proposed to ETF, reviewed by EDP, part of draft FY2010 engineering plan presented to SPC, August 2008. Lead PI Helen Evans.

Sensors in proposed tool:

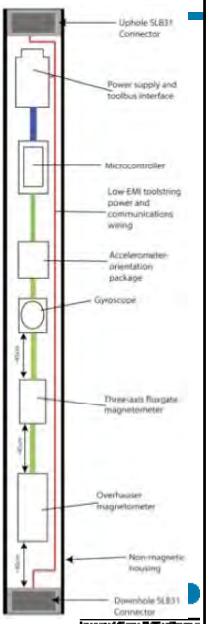
Total field magnetometer (0.2 nT resolution)

3-axis fluxgate magnetometer

Inclinometer / 3-axis accelerometer

1-axis optical gyroscope

- Will use modern off-the-shelf components.
- Will be integrated with Schlumberger acquisition, like the MSS



Projects Update

- **Simulated Borehole Test Facility (SBTF):**
  - Project On Hold
  - Facility is essentially completed, pending the final stage of acceptance testing
    - Broken linear encoder fixed and re-installed
    - Facility has never been used for experiments as intended
    - Facility was intended for testing of down hole pressure and temperature tools in an in-situ environment
    - Essential in development of new water sampler probe tip design
  - Current Plan
    - Complete associated acceptance testing and mothball until personnel available for permanent assignment to project
    - Estimated man hours to complete acceptance testing – 240

Projects Update

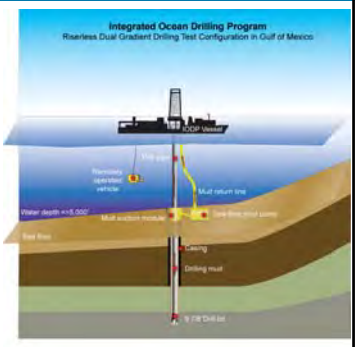
- **Instrumented Water Sampler (IWS):**
  - Would replace Water Sampler Temperature Probe (WSTP)
  - Project On Hold
    - Design completed
    - Fabrication drawings ~70% completed
    - Estimated man hours to complete drawings - 160
    - Estimated cost to purchase one complete tool - $70,000
    - Estimated man hours to complete initial assembly and testing – 480
  - Current Plan
    - Complete mechanical drawings as time permits
    - Purchase prototype tool when/if funds become available
    - Test tool in SBTF to determine best probe tip/filter design

Projects Update

- **Drilling Sensor Sub (DSS)**
  - A land test could not be executed as scheduled at Schlumberger Test Facilities at the end of FY08 due to facility closure.
  - Departure of staff and priority of other projects (SODV; DeepStar) did not allow for a comprehensive response to the EDP recommendation at this time.
  - USIO will respond to EDP Recommendation prior to next EDP Panel Meeting.

Other Engineering Activities

- **Dual gradient drilling feasibility study (DeepStar project) completed Dec.'08**
  - USIO established feasibility to deploy current AGR "Riserless Mud Return System" (RMR) on RV JOIDES Resolution.
  - This is a separately funded project (DeepStar Consortium)
  - IODP-MI manages contract with DeepStar
  - TAMU and AGR subcontract to IODP-MI



Other Engineering Activities

- **Dual gradient drilling feasibility study (DeepStar project) completed Dec.'08**
- **Project Scope**
  - Determine feasibility of using a riserless mud return system on *JR* for water depths of 6,000, 9,000 and 12,000 ft.
  - Determine costs and effort associated with installing mud return system
- **Additional equipment**
  - Solids return system
  - ROV capabilities
  - Infrastructure for RMR system and components
- **Other issues**
  - Pipe storage capacity
  - Depth capacity for ROV
  - Mud design
  - Mud storage capacity

Other Engineering Activities

- ***Aurora Borealis* consulting project**
  - USIO is providing advice to *Aurora Borealis* design team based on *JR* experience
  - Funded by Alfred Wegener Institute
  - Two meetings in Singapore and one meeting in College Station so far.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Microbial Contamination and Drilling Muds

Bill Ussler

January 14, 2009

Impediments to Achieving Microbiological Objectives

1. Contamination: JR and Chikyu microbiology labs - substantial investment in state-of-the-art microbiology labs; but if cannot get appropriate uncontaminated samples, then the labs are of little use
   - Swamp the signal of the indigenous population with exotic microbes or DNA from seawater or drilling muds
   - Chemical changes caused by drilling muds affects incubation of indigenous microbes (inadvertently creates 'enrichment cultures')

- Know that contamination occurs using tracers; contamination is pervasive

Contaminants

- Chemical
  - Food for microbes (skew structure of microbial population)
  - Inhibit DNA extraction in lab (DNA binding)
  - Cause ‘enrichment’ of microbial cultures (bias by missing rare species)
  - Rupture cells causing DNA loss (change in osmotic pressure)
- Exotic DNA from manufacturing of additives
  - Swamp DNA signal
  - xanthan gum example
- Exotic DNA from surface microbes

Function of Mud Constituents

- Increase fluid density
  - Control greater than hydrostatic pressures
  - Deter borehole collapse
- Increase fluid viscosity
  - Carry cutting/chips
- Lubrication
- Swelling inhibitor (clay fragmentation)
- Inhibit corrosion (pH control)
- Reduce infiltration (fluid loss to formation)
- Inhibit gas hydrate formation

Microbiology continued

2. Poor core recovery: in hard rock, if sample is very small and fractured (young basaltic crust, not silica cemented), it is very hard to define the sample and obtain useful information on indigenous microbial populations

    - if better core recovery, better chance for uncontaminated sample

    - seal sample prior to coring with a coating or latex/epoxy injection to prevent contact with drilling muds?

What are the options?

- Can a group of mud additives be identified with less chemical impact?
  - Anoxic environment, thus reduced chemical compounds are more likely energy sources
  - No change in osmotic potential
- Can exotic DNA be removed during manufacturing?
- Are there substitutes for xanthan gum etc?
- Squirt-ahead sealing compounds?
- Gel coating--probably not viable

EDP Consensus 0807-12: Engineering Testing Time on IODP Platforms

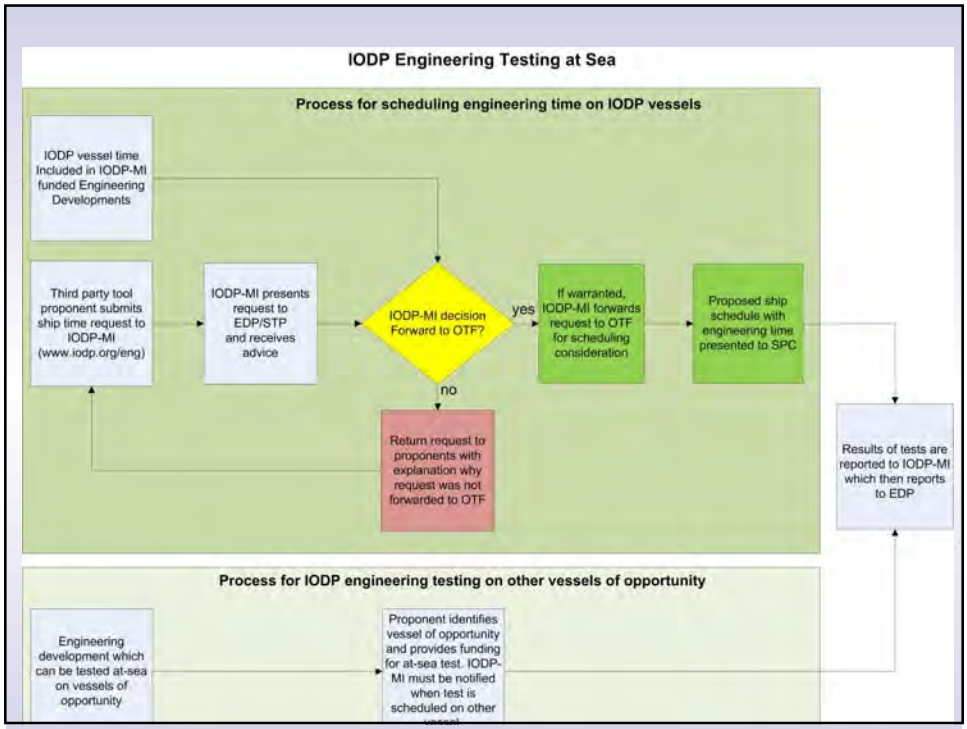
- At-sea engineering testing is part of any Engineering Development project in the program, whether it is a 3rd party tool development, or an internal engineering project conducted by the IOs. Allocation of engineering testing time is critical for proper engineering development and must be included in future operational planning on an as needed basis. We endorse IODP-MI efforts to develop a means for accepting formal requests for engineering testing time at sea. The EDP is willing to review requests for at sea testing forwarded by IODP-MI.
- Also SPC Consensus 0808-18 – SPC accepts EDP Consensus 0807-12

Field Trial Time on IODP Platforms

- No adopted engineering ship time policy in existence
- Ship time is required to complete engineering process for new developments

We suggest:

1. Field trial requests will be coordinated though IODP-MI. IODP-MI will work with proponents and operators to generate acceptable deployment plan
2. Deployment plan will be vetted through EDP
3. Field trial requests and associated deployment plans will be forwarded to OTF for potential scheduling
4. OTF will include field trials in annual expedition schedules that are to be approved by SPC


IODP Engineering Testing at Sea
Process for scheduling engineering time on IODP vessels
IODP vessel time Included in IODP-MI funded Engineering Developments
Third party tool proponent submits ship time request to IODP-MI (www.iodp.org/eng)
IODP-MI presents request to EDP/STP and receives advice
IODP-MI decision Forward to OTF?
yes
no
If warranted, IODP-MI forwards request to OTF for scheduling consideration
Proposed ship schedule with engineering time presented to SPC
Return request to proponents with explanation why request was not forwarded to OTF
Results of tests are reported to IODP-MI which then reports to EDP
Process for IODP engineering testing on other vessels of opportunity
Engineering development which can be tested at-sea on vessels of opportunity
Proponent identifies vessel of opportunity and provides funding for at-sea test. IODP-MI must be notified when test is scheduled on other

USIO-LDEO At-sea Testing Time Request

Bill Ussler

January 14, 2009

Background

- Letter from Dave Goldberg, Director of USIO-LDEO-BRG
- General and specific requests for at-sea testing time for engineering development
- No established policy; EDP asked IODP-MI to create a policy by EDP #8 meeting

LWC Background

- Proof of concept tested on Leg 204 (Hydrate Ridge)
- Allows precise core-log depth calibration (TR ED item)
- Allows core orientation (TR ED item)
- Poor results on Leg 209 - mechanical misfit between MDCB and RAB
- Developed a plan to rectify mismatch that was presented to EDP at the Nice meeting
- USIO designed and land-tested 2 fixed cutter PDC bits (soft and hard rock)

Specific Testing Objectives

- Previously cored site (sediment and basement)
- Metric for success - LWC core recovery greater than that for standard rotary coring in both environments AND simultaneous acquisition of geophysical logs
- Shallow water with 100-150 m consolidated sediment over hard rock
- Propose a mini-cruise - 5 to 10 days
- $20K precruise; $75K to $180K at-sea costs

EDP Questions

- Is the RAB-LWC system ready for at-sea testing?
- Is the metric for success appropriate?
- How will the quality of the logs be assessed?
- What is the additional cost of running the LWC?
- What is the cost-benefit ratio of LWC use on expeditions prior to 2013?

IODP INVEST Meeting

Bill Ussler

January 15, 2009

INVEST Meeting

- IODP New Ventures in Exploring Scientific Targets (INVEST)
- http://www.marum.de/iodp-invest.html
- September 23-25, 2009, Bremen, Germany
- Science planning for next phase of scientific drilling (2013-2023)
- Registration - April 4, 2009

Steering Committee

- Chris Ravelo (co-chair)
- Heiko Palike
- Katrina Edwards
- Fumio Inagaki
- Bob Duncan
- Wolfgan Bach (co-chair)
- Tada Ryuji
- Jan Behrmann
- Sean Gulick
- Gilbert Camoin

Goals of INVEST

- Synthesize and summarize the state of knowledge across major interdisciplinary geoscience themes
- Identify emerging science fields
- Develop new research initiatives and recommend scientific implementation strategies
- Address societal relevance of future drilling
- Outline fiscal and *technological needs*

Steering Committee has requested the EDP to:

- Assemble a white paper that summarizes the technological developments needed to support future scientific ocean drilling.
- Review the draft INVEST report at an early stage to comment on any special technological needs that would support the *new* science that will be proposed.

Complexion of Phase II Program: Major Initiatives and Approaches (my best guess)

- Societal relevance is key:
  - Climate Change - high resolution records, proxies, identify forcing functions
  - Geohazards - seismicity (deep drilling/coring), submarine landslides, volcanism, tsunamis
  - Microbes - novel organisms and enzymology, pharmaceuticals and fine organic chemical manufacturing (high P, T)
- Science shift - further shift from exploratory to hypothesis-driven inquiry
- More integrated experiments (additional assets) - auxiliary ships (3-D VSP walk-away; sample transfer to shore), submersibles, cabled networks
- Post-drilling experiments (value-added) - long-term observatories, manipulative borehole experiments

General Comments About Role of Engineering Development in Scientific Ocean Drilling

- EDP take a proactive approach
- Identify technological gaps
  - Facilitate drilling efficiency/effectiveness
  - Achieve better science/more science return
  - Attain goals sooner (ED in parallel with developing science goals - proactive, not reactive)
  - Lower costs
  - New frontiers [extreme drilling targets]
    - high latitudes
    - ultra-deep drilling/coring (Moho)
    - subsurface biosphere

EDP Approach to White Paper

- At the Shanghai meeting:
  - Create a list of high priority technical needs that support future scientific ocean drilling regardless of science theme (derived from our TR)
  - Identify a working group to assemble a draft white paper before next meeting
- At the July 2009 meeting:
  - Review the draft white paper
  - Revise and finalize the draft white paper
  - Approve final report by consensus; forward to INVEST SC
- At the January 2010 meeting or later:
  - Review draft INVEST report, when available
  - Write an addendum to white paper addressing newly identified technological needs/gaps
  - Approve addendum by consensus; forward to INVEST SC

Development of

The Deep Rock Stress Tester (DRST)

M.TAMURA

Lead watchdog

Proposal rationale

(Presented at the last EDP meeting in SLC)

- Essential problem in the conventional method for in-situ stress measurement: Failure in measuring the maximum horizontal stress
- Proposed solution: Minimizing the compliance of a hydraulic fracturing system
- Alignment with the ISP of Seismozenic Zone and the Technology Roadmap on strategies for cleaning cuttings, managing breakouts, casing and cementing (e.g., ED C-8)
- Benefits afforded by the proposed development
  - Getting a desired new capability to measure the maximum horizontal stress at deep depths
  - Saving cost by saving time for measurements
  - Reducing risk of troubles occurring in boreholes such as the tool getting stuck

There is the scientific need and the proposal will overcome the problem.

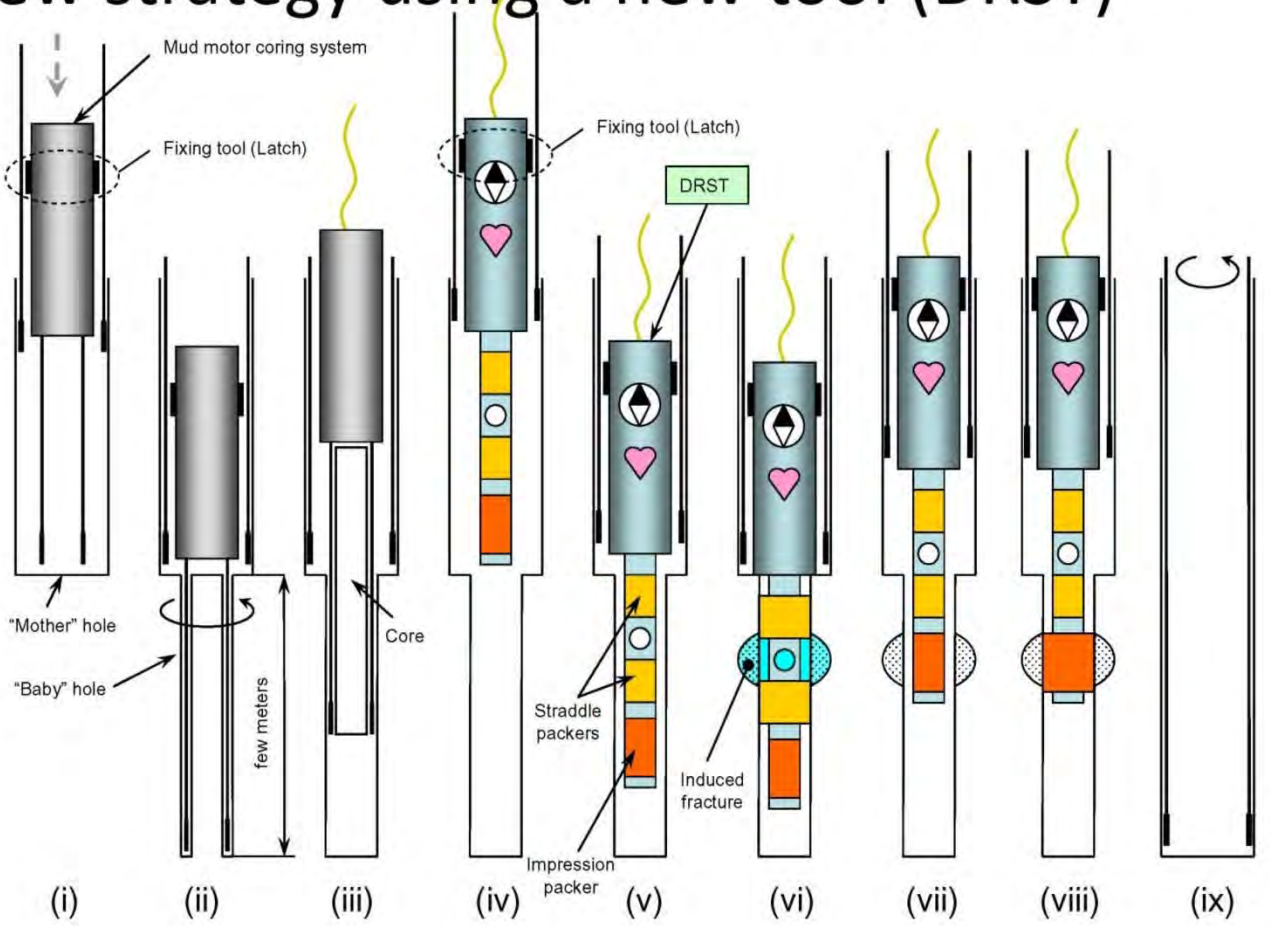
Overview

(Presented at the last EDP meeting in SLC)

- Development of a new logging tool for in-situ stress measurements at deep depths
- Project cost of $635,000 in total for 3 years (The cost will be reduced by using existing telemetry system)
- Objective of the proposal
- Development of an experimental prototype tool
- Verification of the tool in laboratory & field tests using an onshore borehole of about 800m deep and 80 deg C at bottom
- Expected project timing: NanTroSEIZE riser drilling and other IODP/ICDP drilling

Technical Content

- A new strategy using a new tool (DRST)



Background information

- In July 2008, Reviewed the proposal and assigned the grouping number of 3.
- IODP-MI summarized discussion with two major concerns, seven minor concerns and four questions/comments.
- In August 2008, Received first PRL
- In September 2008, Sent additional comments through IODP-MI.
- In December 2008, Received second PRL
- Reviewed both PRLs

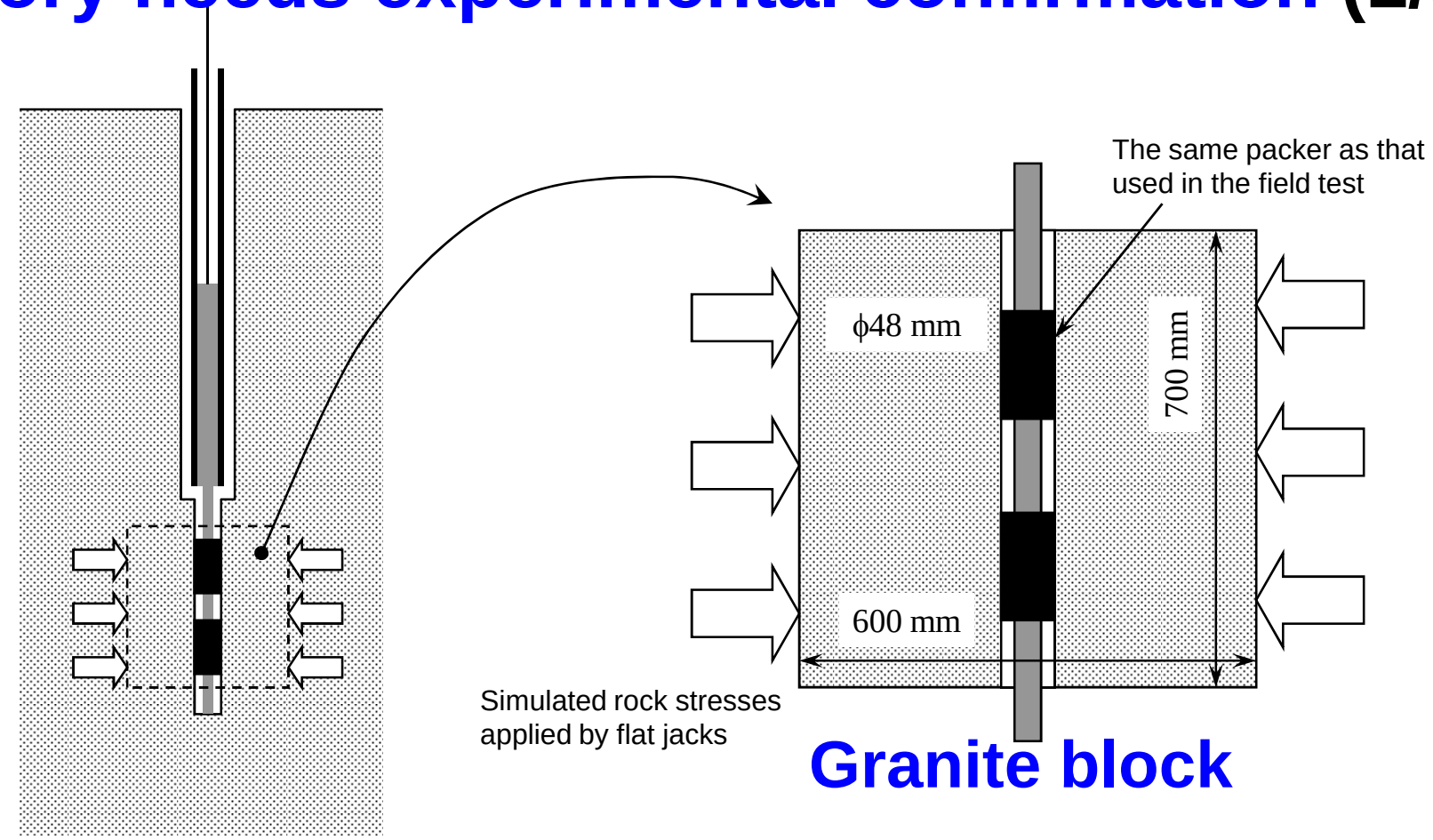
Concerns / Questions & Comments

From the last EDP meeting in SLC

- Two Major concerns
  - Theory needs experimental confirmation
  - Outside annulus may not be preserved
- Seven Minor concerns
  - Only capable of measuring the major horizontal stress
  - Heave compensation
  - Other technology to measure intermediate principal stress
  - Operational complexity
  - The method depends on motor coring system of which size need to be changed
  - Verification of elements location
  - BHA for XCB system vs RCB system
- Four questions and comments
  - Data acquisition system
  - Land based testing prior to the complex design
  - Fracture orientation measurements with imaging technology
  - Hole cleaning

Major concerns

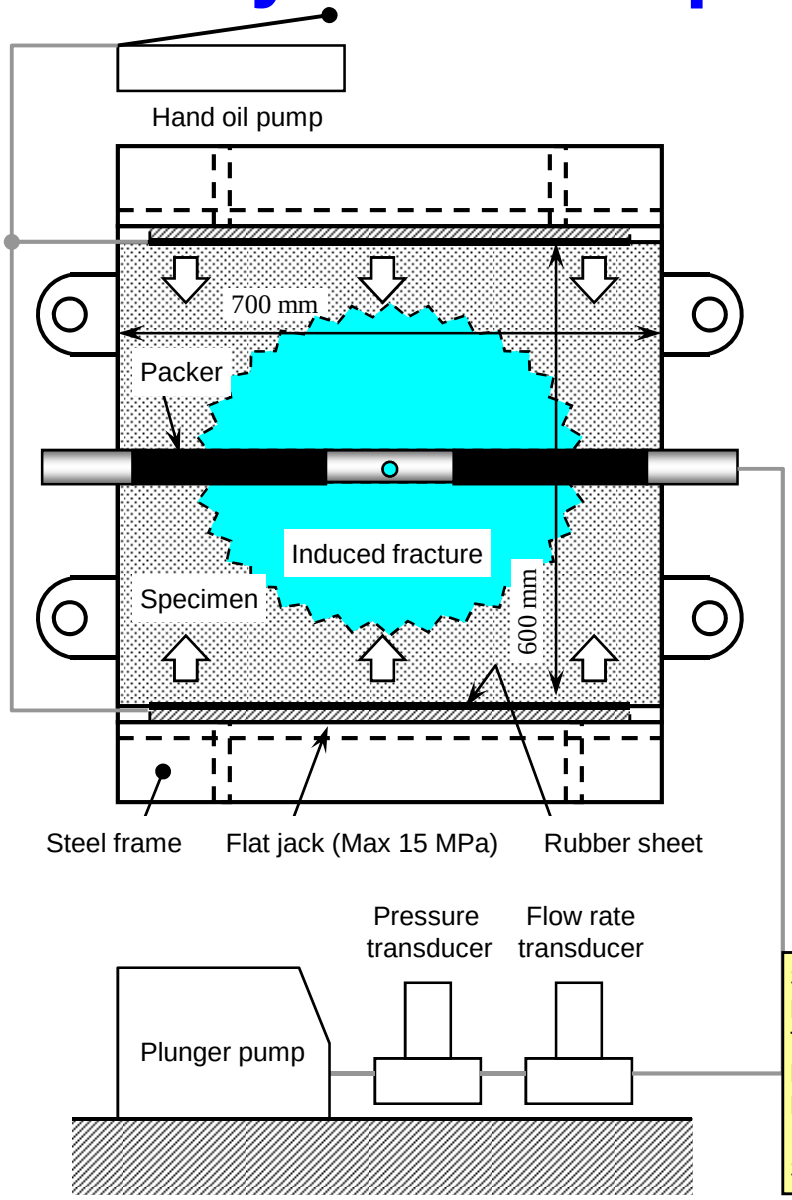
Theory needs experimental confirmation (1/3)

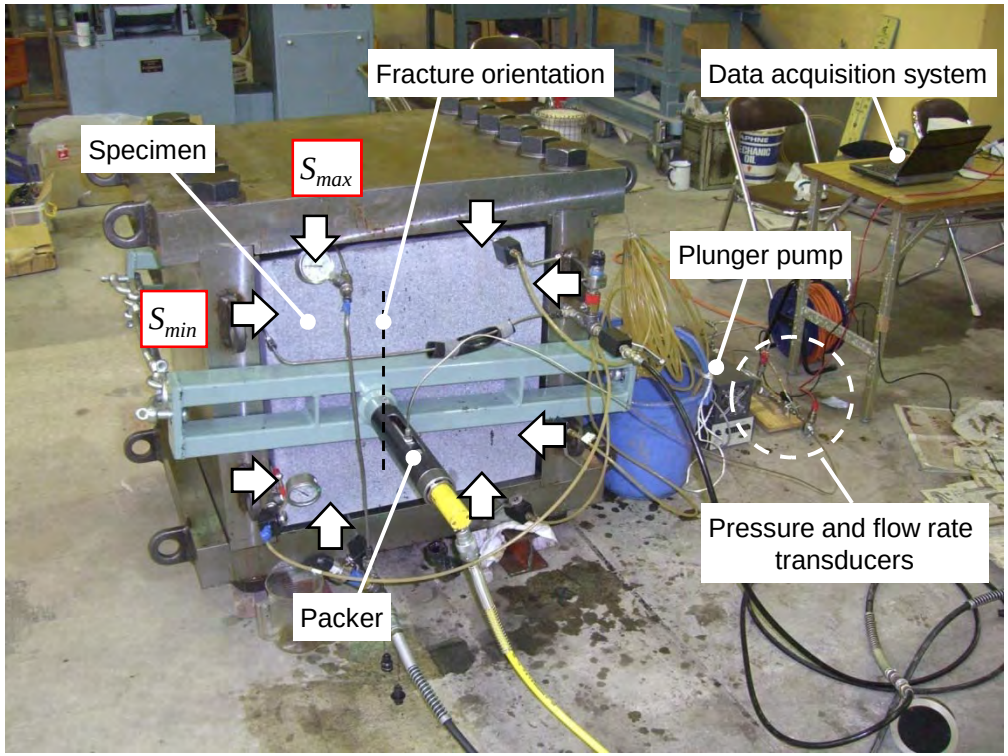


Lab test has been conducted

Major concerns

Theory needs experimental confirmation (2/3)



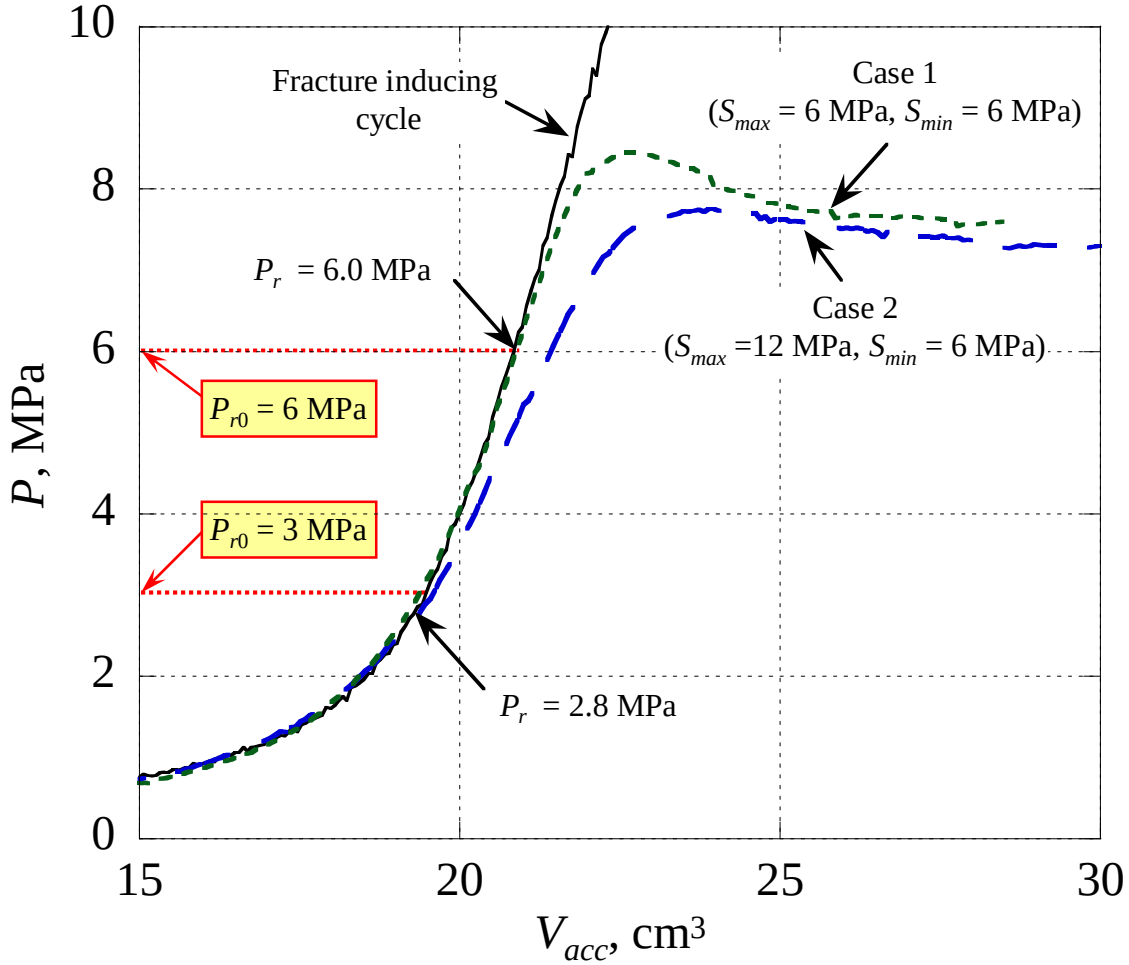


Specimen: Granite
Borehole size: ϕ48 mm
Test section: about 0.2 m
Packer length: about 0.2 m
Fracturing fluid: Water
Injection flow rate: 100 cc/min
System compliance: 0.39 cc/MPa

Setup of lab test

Major concerns

Theory needs experimental confirmation (3/3)



The predictions from the theory agreed well with the results of lab experiments

Theory: $P_r = \frac{1}{2}(3S_{\min} - S_{\max}) \equiv P_{r0}$

Major concerns

Outside annulus may not be preserved

The overcoring is not planned in proposal.

Seven Minor concerns

- **Only capable of measuring the major horizontal stress**

The tool can measure both max and min horizontal stresses.

- **Heave compensation**

The tool alignment will be controlled by landing and pressing the main body of DRST on the shoulder of baby hole with WOB.

- **Other technology to measure intermediate principal stress**

The vertical principle stress can be estimated by integration of water and rock densities from sea level to the depth of interest as usual..

- **Operational complexity**

The proponent will specify the protocols at an early stage of the project with the help of IOs and specialists.

- **The method depends on motor coring system, of which size need to be changed**

The core size is changed with the new motor coring system, the packer system can be modified easily and accordingly.

- **Verification of elements location**

The absolute location of elements can be determined combining the relative location and the depth of the shoulder.

- **BHA for XCB system vs RCB system**

No limitation on diameter of baby hole.

Four questions and comments

- **Data acquisition system**

USIO is upgrading MFTM (Multi Functional Telemetry Module which has sufficient performances and will be adapted to the DRST.

- **Land based testing prior to the complex design**

It is planned.

- **Fracture orientation measurements with imaging technology**

It is possible, but too complicated to install these function into DRST.

- **Hole cleaning**

The drilling condition should be good for applying the proposed method where the hole condition should be stable as well. Also, the baby hole has excess length and the tool will be designed to allow circulation while running.

Conclusions and Recommendations

The proponent submitted appropriate responses for EDP concerns/Questions and Comments.

As it is clear that there is the scientific need and the proposal has been strengthened, it is recommended to raise the groping number from 3 to 4.

#8 EDP Meeting DAY 2

IODP Scientific Technology Roadmap

- Purpose
  - Sharing two roadmaps
  - Identify common elements

Concept of Scientific Technology Roadmap (STR)

- Identify and prioritize scientific technologies, those have not been adopted by IODP, from the view point of impact to the IODP sciences.
- Relation to the Technology Roadmap
  - TR: A roadmap for new technology development that support IODP sciences, Guideline for the ED Proposal.
  - STR: A roadmap to adopt existing / developing technologies to IODP. Emphasize impacts to the IODP sciences.

STP Roadmap Activities since 2008

- STP #6 (Feb. 2008)
  - Define roadmap concept
  - Used the established 3 WGs for developing roadmap
- Seek inputs from science communities
- STP #7 (July 2008)
  - Categorization of 61 items
    - Petrophysics
    - Core Description
    - Microbiology/Geochemistry
  - Prioritization
    - 1:Transformative > 2:Incremental > 3:Deleted
  - Identification of EDP link
- Interaction between EDP and STP
- STP #8: Complete/Release STR v. 1.0

Scientific Technology Roadmap

13 items as Rank 1 by single WG

- Petrophysics WG
  - EDP-linked
    - ST-1: Sediment compressive/shear strength (ED A-2)
    - ST-13: Pore pressure measurements (ED A-22)
    - ST-19: Downhole magnetometer (EDP Submitted)
  - No link
    - In situ stress measurements
    - Long-term borehole sensors in high-T environment
    - Slim line logging tools

Need consideration

Important (On-going JAMSTEC Project)

Technology exists

Scientific Technology Roadmap

13 items as Rank 1 by single WG

- Core description WG
  - EDP-linked
    - ST-2: Oriented cores (ED A-12)
    - ST-8: Logging-while-coring (ED B-9, 10, and 11)
- Microbiology & Geochemistry WG
  - EDP-linked
    - ST-29: Real-time contamination assessment (ED A-21 and C-7)
    - ST-25: Pressurized coring with temperature control (ED A-16?)
  - No link
    - ST-26: Real-time gas monitoring — Need consideration
      - CH4, C2H6, H2, He, NH3, H2S, CO2, CO, Ar, Ne, Rd
      - Isotopic ratio of O, H, C, N, He, S
    - ST-27: Membrane-inlet MS — Commercially available?
      - Determine in situ dissolved gas concentration
    - ST-61: Onboard carbon isotope measurement — Commercially available

Scientific Technology Roadmap

5 strong items as Rank 1 by multiple WGs

- Linked to EDP
  - ST-31: Deep hole penetration technologies (ED B-21, 22, 26,27, and 29)
  - ST-4: Enhanced core recovery (ED A-1,3, 4, 5, 9, 13, 14, 16, 24, and 30)
  - ST-33: Coring without disturbance (ED A-1, 14, and 20)
  - ST-18: Large diameter drill pipe (ED A-7 and B-1)
- Should be integrated with EDP
  - ST-42: Motor-driven core barrel (to enhance geochemistry/ microbiology on hard rock as well as chert /shale) (ED A-10?)

Core Recovery issue

- Average core recovery or Critical intervals?
- Strong demands from science communities based on specific science target
  - Fault zones (Seismogenic zone)
  - Turbidite/ siliciclastic sequences (Sea level change)
  - Porous reef limestone (Quaternary environment change)
  - Chert / shale interbeds (Cretaceous global warming & anoxic events)

Low recovery of Cretaceous interval

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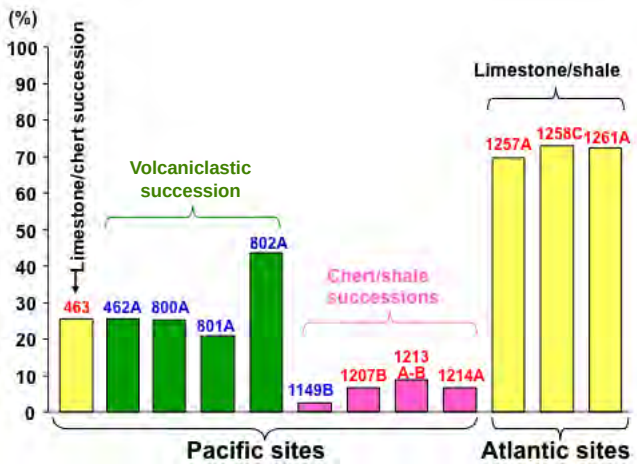

Core recovery from Cretaceous (Aptian~Turonian) sediments
Sites by blue letter --- Abyssal basin
Site by red letter --- Platform, Plateau, or Seamount

Core quality issues

- Core disturbance to soft sediments
  - ST-33 (ED A-1 ,14, 20)
- Contamination
  - ST-29: Real-time onboard evaluation (ED A-21 C-7)
- Magnetic properties: Secondary magnetization
  - ST-5: Non-magnetic core barrel (ED B-16, 17, 18)
- Core orientation
  - ST-2 (ED A-12)

Coring Biscuits

Photograph of typical "coring biscuits" by XCB coring (interval 186-1150A-47X-3, 50-100 cm).

http://www-odp.tamu.edu/publications/186_IR/chap_04/c4_f10.htm

Coring disturbance

Poorly lithified coarse sand of Section 190-1175A-44X-1 (406.86 mbsf) exhibiting apparent web structure. Note, however, that the thick, convex-upward horizontal bands are interpreted as induced by XCB coring.

http://www-odp.tamu.edu/publications/190_IR/chap_06/c6_f13.htm

Highly disturbed interval caused by XCB coring.

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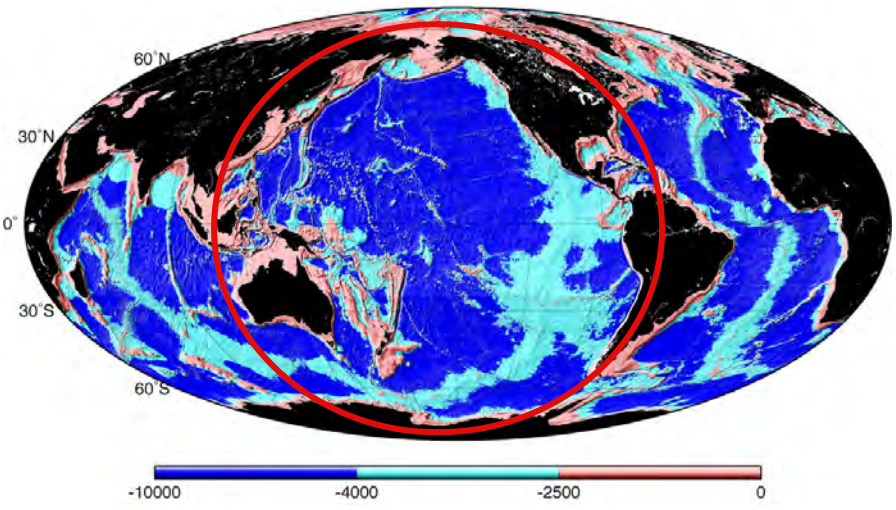
The harder drilling biscuits (e.g., 96-97.5 and 102-105 cm) are composed of fine-grained, indurated silty clays. The biscuits are surrounded by softer, relatively coarser material that was washed in by coring, resulting in "false bedding" (interval 180-1109C-35X-3, 96-110 cm).

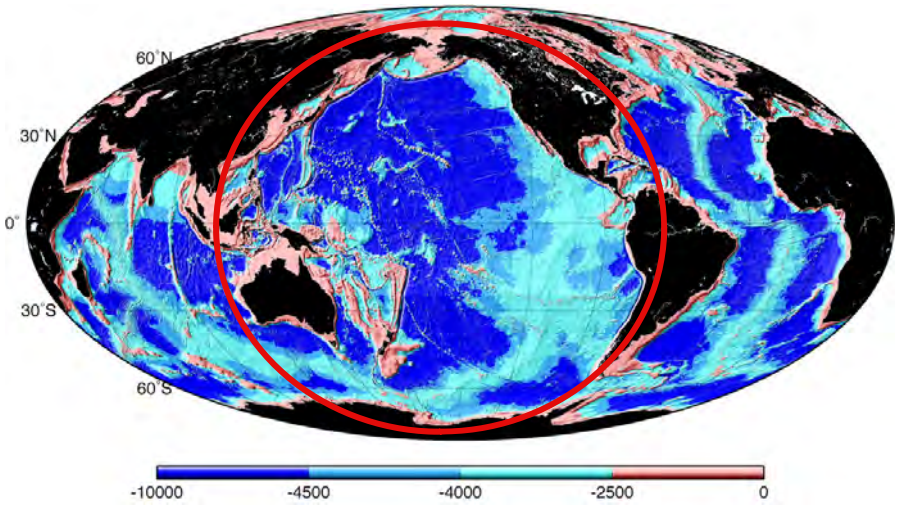
http://www-odp.tamu.edu/publications/180_IR/chap_06/ch6_f16.htm

Importance of deep water drilling for the MOHOLE



< 4,000 m

Importance of deep water drilling for the MOHOLE



< 4,500 m

Scientific Technology Roadmap

5 strong items as Rank 1 by multiple WGs

- Linked to EDP
  - ST-31: Deep hole penetration technologies (ED B-21, 22, 26,27, and 29)
  - ST-4: Enhanced core recovery (ED A-1,3, 4, 5, 9, 13, 14, 16, 24, and 30)
  - ST-33: Coring without disturbance (ED A-1, 14, and 20)
  - ST-18: Large diameter drill pipe (ED A-7 and B-1)
- Should be integrated with EDP
  - ST-42: Motor-driven core barrel (to enhance geochemistry/ microbiology on hard rock as well as chert /shale) (ED A-10?)

Drilling Proposal Review

- SSEP Identified two drilling proposals needing technological review by EDP. 698, 734
- Confidential drilling proposal has been released to EDP
- EDP review and provide technological comment on the drilling proposal addressing…
  - Is it feasible? What is needed to determine feasibility?
  - What are key technological issues?
  - Recommendations on how proposal could be drilled
- 698 – my suggestion is to build on the partial review started at the last meeting.
- APL - 734

698

- Deep Hole into seafloor crust
- Total Depth is 8000 meters
  - Proponents still include 8000 meter hole request
- New seismic information indicates that science target may be reached at 3000 meters

734 APL

- Plan to re-instrument Hole 889C in the outer Cascadia accretionary prism for long-term hydrologic monitoring. This hole was equipped with a CORK hydrologic observatory in 1992 during ODP Leg 146. Lithology is soft
  - 1315 meter WD, 384 meter HD
- Instability of the formation allowed sediment to be squeezed either through the perforations or up into the bottom of the liner and the old CORKs never worked. (16 years old)
- For the New installation, there will be a new CORK design and a link to Neptune

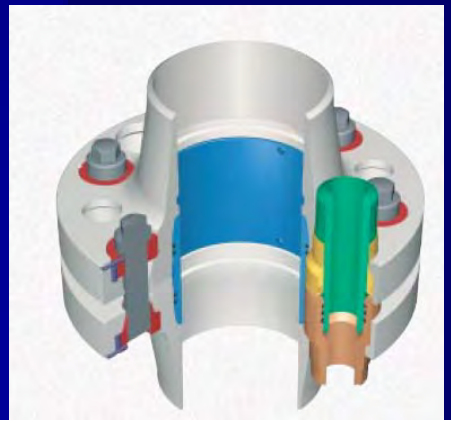
Chikyu Riser Drilling Exercise

CDEX Operation

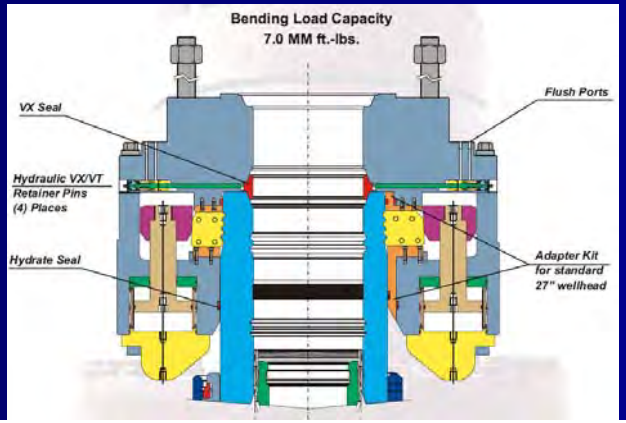
Drilling Vessel Chikyu

- Chikyu is a state-of-the-art 5th generation drilling ship with the latest drilling equipment.
- Exclusive Equipment in addition to standard 5th generation is enlarging Chikyu's riser drilling capability in Harsh / Deep Environment.
  - Heavy Duty Subsea System:
    - Special made heavy duty riser: 90ft 1.15" WT Cameron Load King 4.0 / 4MMlbs
    - Heavy Duty BOP Wellhead Connector: Super HD H-4 / 7MMftlbs bending stress with Vetco Gray SMS-700 30" wellhead.
  - Heavy Duty Drill Pipe:
    - Special made heavy duty drill pipe: NKK DSTJ S150 / S140 Non API Drill Pipe
    - Enable to drill down to 9000m WD

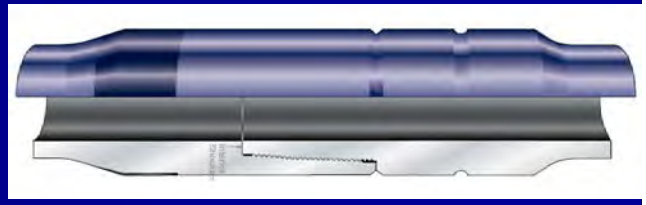
Cameron Load King 4.0
Riser Connector

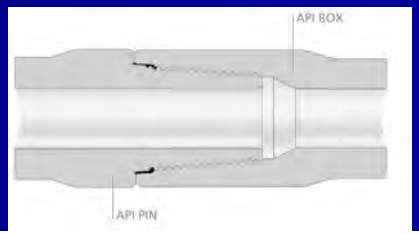


Vetco Gray Super HD H4
Wellhead Connector

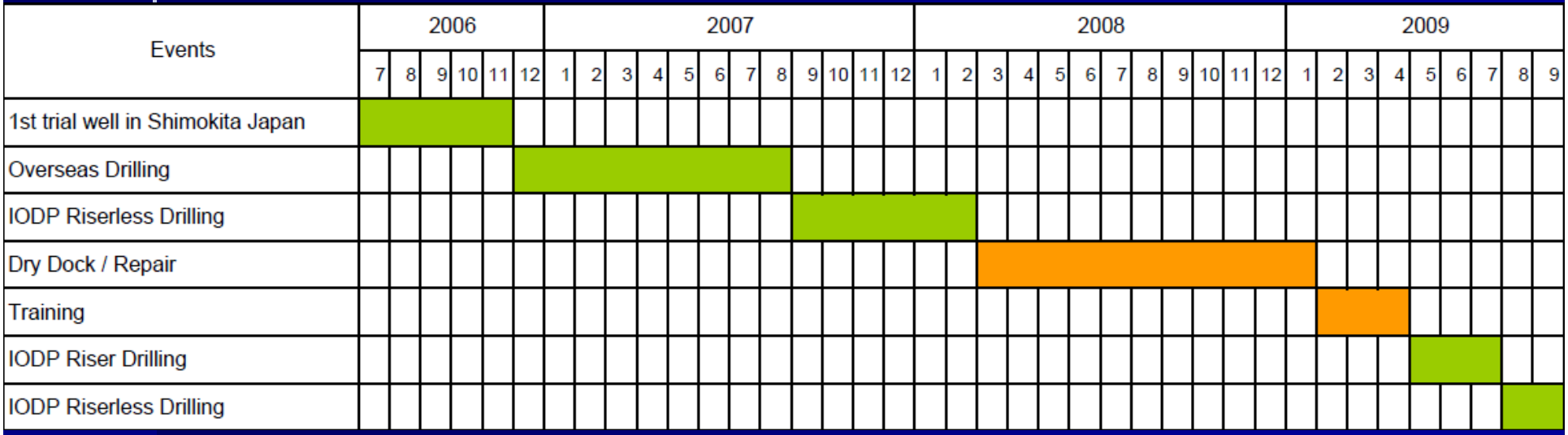


NKK DSTJ



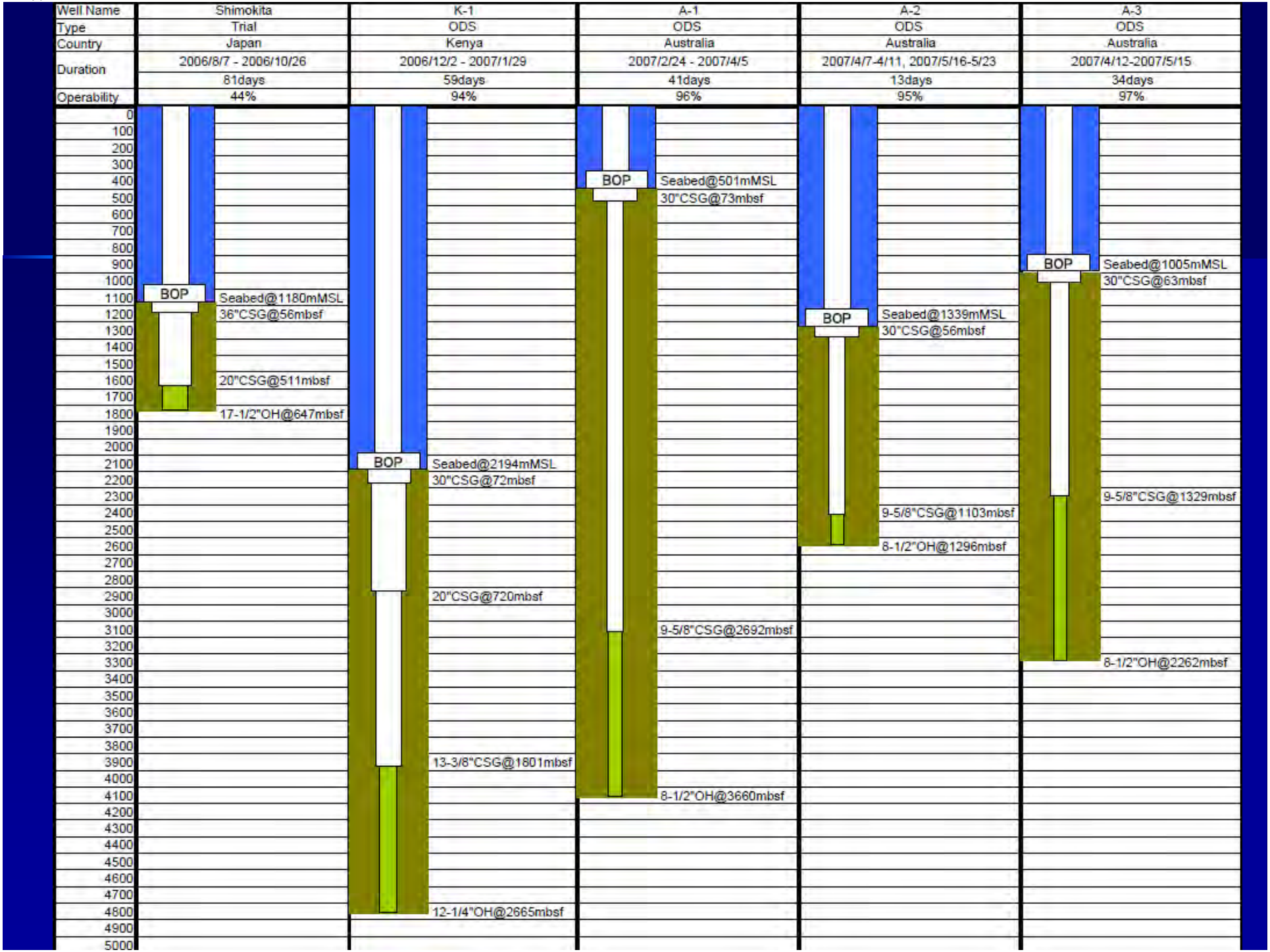


Chikyu Operation History & Plan



Riser Drilling History

- 1st Trial Well (Aug - Nov 2006)
  - Shimokita Japan: 1 well
    - 1180mWD / TD 647mbsf / Operability 44%
    - Down time due to Subsea/DPS/Drilling Equipment
    - Standby in storm: 8-10m total heave
- Overseas Drilling Campaign (Nov 2006 - Aug 2007)
  - Kenya: 1 well
    - 2210mWD / TD 2665mbsf / Operability 93.5%
    - Operation under 2.0-3.0knots surface current
  - Australia: 3wells
    - 501mWD / TD 3660mbsf / Operability 96.2%
    - 1339mWD / TD 1296mbsf / Operability 96.6%
    - 1005mWD / TD 2262mbsf / Operability 95.4%
- Total Drilling Footage: 10529mbsf
- Total Drilling Days: 228days


Well Name
Type
Country
Duration
Operability
Shimokita
Trial
Japan
2006/8/7 - 2006/10/26
81days
44%
K-1
ODS
Kenya
2006/12/2 - 2007/1/29
59days
94%
A-1
ODS
Australia
2007/2/24 - 2007/4/5
41days
96%
A-2
ODS
Australia
2007/4/7-4/11, 2007/5/16-5/23
13days
95%
A-3
ODS
Australia
2007/4/12-2007/5/15
34days
97%
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400
4500
4600
4700
4800
4900
5000
BOP
Seabed@1180mMSL
36"CSG@56mbsf
20"CSG@511mbsf
17-1/2"OH@647mbsf
BOP
Seabed@2194mMSL
30"CSG@72mbsf
20"CSG@720mbsf
13-3/8"CSG@1801mbsf
12-1/4"OH@2665mbsf
BOP
Seabed@501mMSL
30"CSG@73mbsf
9-5/8"CSG@2692mbsf
8-1/2"OH@3660mbsf
BOP
Seabed@1339mMSL
30"CSG@56mbsf
9-5/8"CSG@1103mbsf
8-1/2"OH@1296mbsf
BOP
Seabed@1005mMSL
30"CSG@63mbsf
9-5/8"CSG@1329mbsf
8-1/2"OH@2262mbsf

Challenges for riser drilling in Nankai Trough

- Voltex Induced Vibration
  - Extreme Current: 4.0-5.0knots in center of main stream
  - Consumes riser fatigue life very quickly in main stream within a few months even with riser fairing countermeasure.
  - Severe vibration was observed on drill string in riserless drilling
- BOP Running / Landing Difficulty
  - Current dragging force will require vessel drifting during BOP running.
    - Centralization of buoyancy riser though rotary table.
    - Minimize the riser contact force against riser.
  - BOP running slows down due to fairing application
    - Installation requires 2hours / joints (24hrs).
  - Irregular seabed nearby the site disables drifting
    - Deployment length is limited by height of seabed obstacles like ridge.
- Full Riser Analysis with Stress Engineering Services Houston
  - Deployment Analysis
  - Tension Offset Analysis
  - VIV Analysis
  - Recoil Analysis
  - Drift Off Analysis
  - Storm Hangoff Analysis

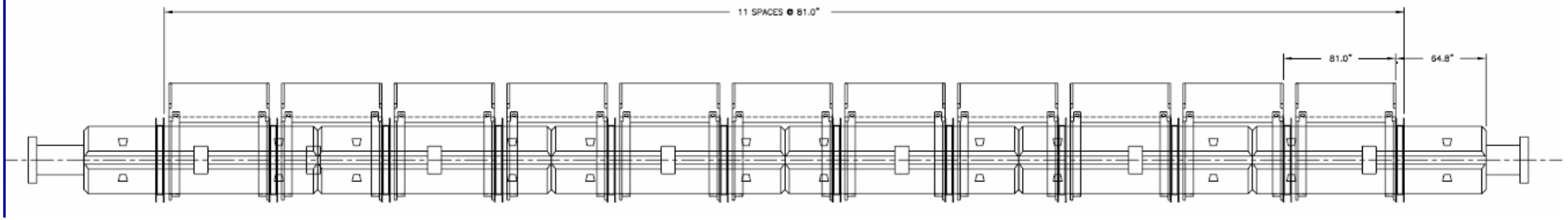
Key of VIV countermeasure
Riser Fairing / RALS Can

Riser Fairing:

11sets / buoyancy joint
Unit weight:
28.4kg in water
104.6kg in air
Weight / joint:
312kg in water
1255.6kg in air

- RALS Cans:
  - It contains tri-axial accelerometer.
  - 6 ea x RALS cans will be installed along the riser during whole the riser project.
  - These will correct the riser angle / movement during high current situation.
  - The data will increase the accuracy of VIV analysis.

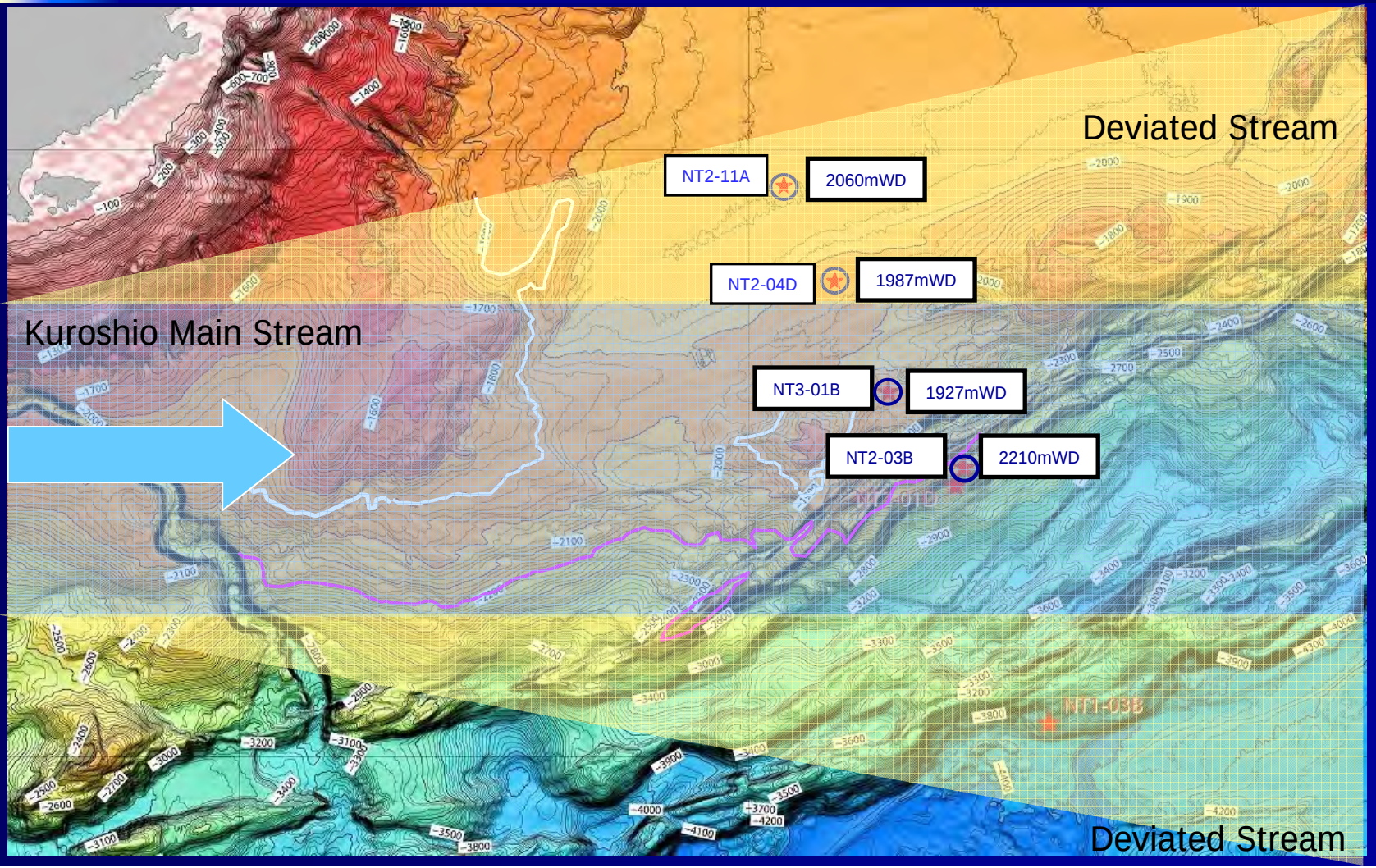
RALS Can



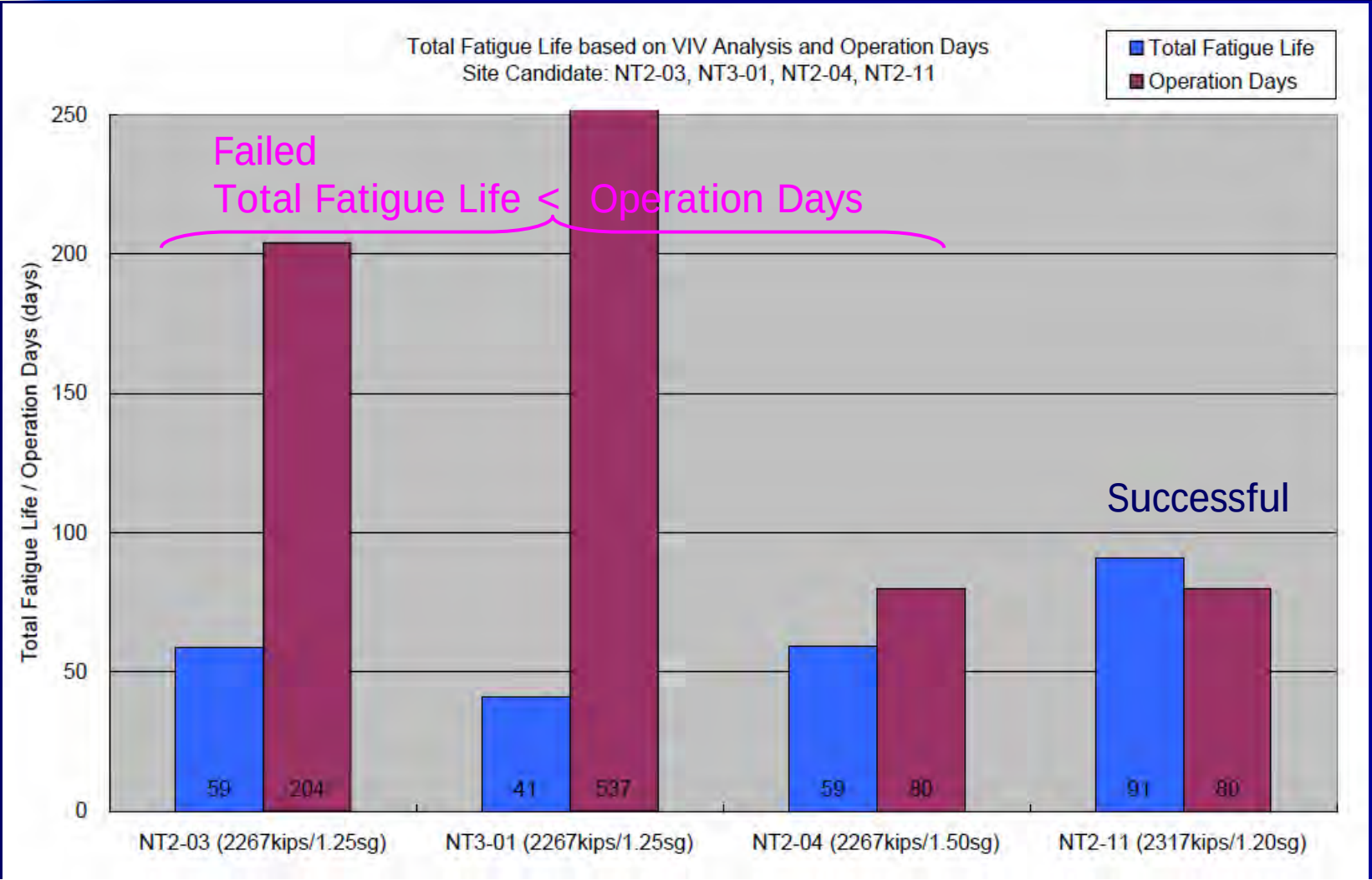
High Current Site in World

- Nankai Trough is the “deepest” high current site in the world.
  - All sites are >1900mWD
- Known high current projects.
  - Project #1
    - Vessel: Deep Water Pathfinder / DP Drillship (Several years ago)
    - Location: Gulf of Mexico / 600mWD
    - Current: Loop Current, Short Periodical Current
    - Current Speed Limit for Drifting: 3.0knots, not above 3.0knots.
    - Riser Fairing: Not installed
    - VIV issue: Significant / Operator set the current speed limitation.
  - Project #2
    - Vessel: Global Santafe with BP (2004)
    - Location: Brazil North Coast / 760mWD
    - Current: 2-4knots in actual current
    - Fairing: Installed
  - Project #3 (OTC#4316)
    - Vessel: SEDCO 472 / DP Drillship with Exxon (1982)
    - Location: Brazil North Coast / 430mWD
    - Current : 2.7knots in Actual Max.
    - Fairing: Installed

Candidate Sites

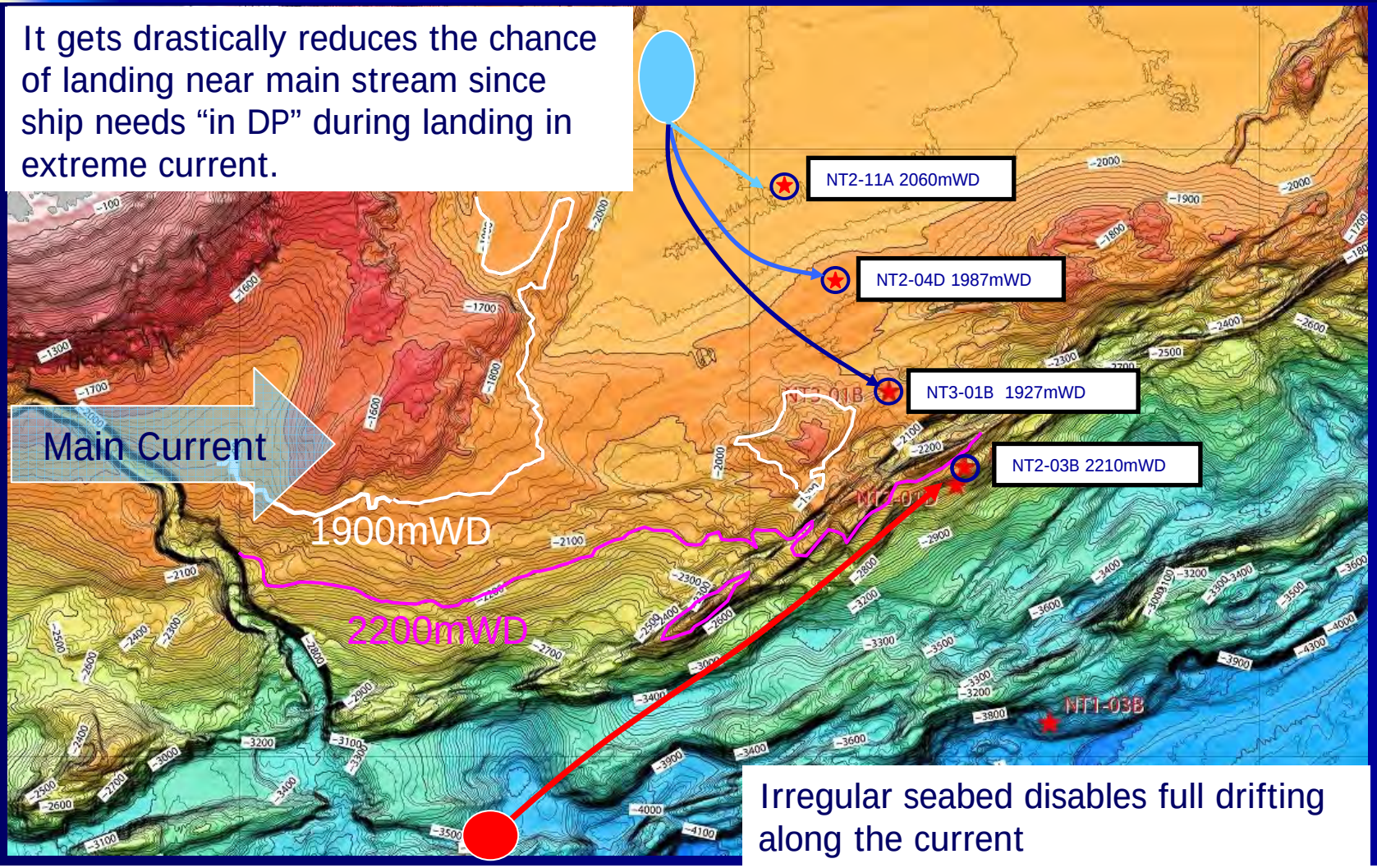


Fatigue Life Evaluation from VIV analysis



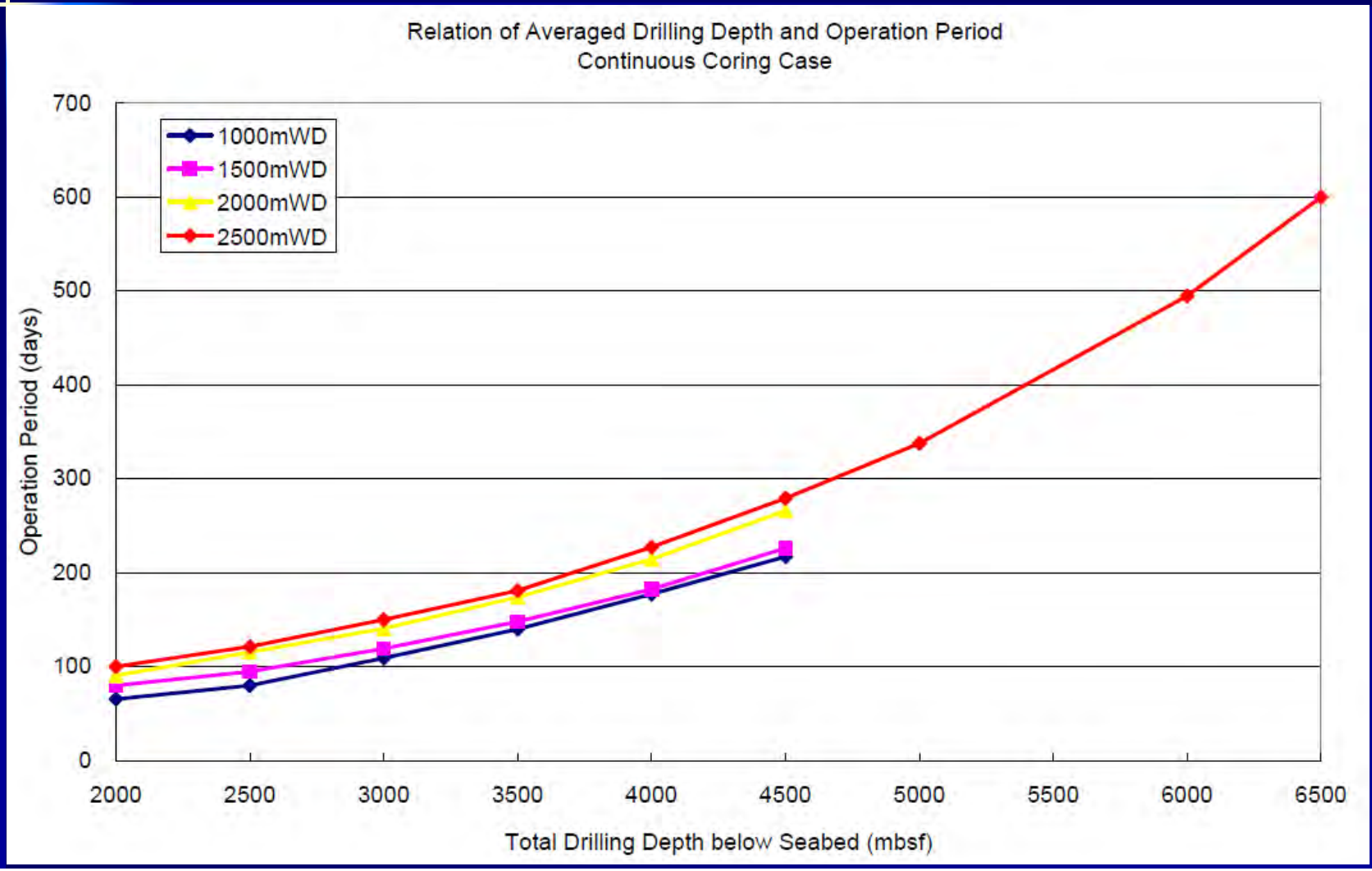
Seabed Evaluation for Vessel Approach

It gets drastically reduces the chance of landing near main stream since ship needs “in DP” during landing in extreme current.



Irregular seabed disables full drifting along the current

Averaged Riser Drilling Period -Full Coring Case



Drilling & Logging

Operations Time Breakdown (Draft)

Case: No Coring

Water Depth: 2,600m
Drilling: 6,600m
Sedimentary rock: 200m
Igneous rock: 6,300m

Operations / Riser Drilling					Days	Sub Total	Total Days
1 Drill Hole A	Hole A						
Cut Core w/ 11-7/16" Bit	0 - 200m	200m	100 m/day		2.0		
Run Wireline Log #1					2.0		
Abondon Hole A					0.5	4.5	4.5
2 Hole B / Set 30" Casing	Hole B						
Offset the rig to Hole B					0.5		
Jet In 42" Conductor	0 - 60m	60m	40 m/day		1.5		
Drill 17-1/2" Pilot Hole	60 - 200m	140m	280 m/day		0.5		
Open to 36" Hole	60 - 200m	140m	280 m/day		0.5		
Run & Cmt 30" Casing	30" @200m				2.0	5.0	9.5
3 Set 20" Casing							
Drill 12-1/4" Hole	200 - 1,000m	800m	266.7 m/day		3.0		
Run Wireline Log #1					3.0		
Open to 17-1/2" Hole	200 - 1,000m	800m	266.7 m/day		3.0		
Open to 26" Hole	200 - 1,000m	800m	266.7 m/day		3.0		
Run & Cmt 20" Casing	20" @1,000m				2.0		
Run BOP & Marine Risers					5.0	19.0	28.5
4 Set 16" Casing							
Drill 17-1/2" Hole	1,000 - 2,000m	1,000m	166.7 m/day		6.0		
Run Wireline Log #2					3.0		
Open to 20" Hole	1,000 - 2,000m	1,000m	250 m/day		4.0		
Run & Cmt 16" Casing	16" @2,000m				5.0	18.0	46.5
5 Set 13-3/8" Casing							
Drill 12-1/4" Hole	2,000 - 3,000m	1,000m	100 m/day		10.0		
Run Wireline Log #3					3.0		
Open to 17-1/2" Hole	2,000 - 3,000m	1,000m	100 m/day		10.0		
Run & Cmt 13-3/8" Casing	13-3/8" @3,000m				6.0	29.0	75.5
6 Set 11-3/4" Casing							
Drill 12-1/4" Hole	3,000 - 4,000m	1,000m	50 m/day		20.0		
Run Wireline Log #4					3.5		
Open to 14" Hole	3,000 - 4,000m	1,000m	100 m/day		10.0		
BOP Test (1 Time)					1.5		
Run & Cmt 11-3/4" Casing	11-3/4" @4,000m				7.0	42.0	117.5
7 Set 9-5/8" Casing							
Drill 8-1/2" Hole	4,000 - 5,000m	1,000m	30.3 m/day		33.0		
Run Wireline Log #4					4.0		
Open to 12-1/4" Hole	4,000 - 5,000m	1,000m	30.3 m/day		33.0		
BOP Test (2 Times)					3.0		
Run & Cmt 9-5/8" Casing	9-5/8" @5,000m				7.0	80.0	197.5
8 Set 7" Liner							
Drill 8-1/2" Hole	5,000 - 6,600m	1,600m	16 m/day		100.0		
Run Wireline Log #5					4.0		
BOP Test (3 Times)					4.5		
Run & Cmt 7" Liner	7" @6,600m				3.0	111.5	309.0
9 Deploy Downhole Measurement Tool					3.0	3.0	312.0
10 Retrieve BOP and Risers					5.0	5.0	317.0
Contingency							
Mechanical Failure Operation days x 10%					32.0		
Wait on Weather Operation days x 7%					23.0		
Typhoon Evacuation 3times x 10days					30.0	85.0	402.0

Full Coring (1000m-6500mbsf)

Operations Time Breakdown (Draft)

Case: Coring 1000-6500mbsf

Water Depth: 2600m
Drilling: 6,600m
Sedimentary rock: 200m
Igneous rock: 6,300m

Operations / Riser Drilling					Days	Sub Total	Total Days
1 Drill Hole A	Hole A						
Cut Core w/ 11-7/16" Bit	0 - 200m	200m	100 m/day		2.0		
Run Wireline Log #1					2.0		
Abondon Hole A					0.5	4.5	4.5
2 Hole B / Set 30" Casing	Hole B						
Offset the rig to Hole B					0.5		
Jet In 42" Conductor	0 - 60m	60m	40 m/day		1.5		
Drill 17-1/2" Pilot Hole	60 - 200m	140m	280 m/day		0.5		
Open to 36" Hole	60 - 200m	140m	280 m/day		0.5		
Run & Cmt 30" Casing	30" @200m				2.0	5.0	9.5
3 Set 20" Casing							
Cut Core w/ 10-5/8" Bit	200 - 1,000m	800m	53.33 m/day		15.0		
Run Wireline Log #1					3.0		
Open to 17-1/2" Hole	200 - 1,000m	800m	200 m/day		4.0		
Open to 26" Hole	200 - 1,000m	800m	200 m/day		4.0		
Run & Cmt 20" Casing	20" @1,000m				2.0		
Run BOP & Marine Risers					5.0	33.0	42.5
4 Set 16" Casing							
Cut Core w/ 10-5/8" Bit	1,000 - 2,000m	1,000m	38.46 m/day		26.0		
Run Wireline Log #2					3.0		
Open to 20" Hole	1,000 - 2,000m	1,000m	142.9 m/day		7.0		
Run & Cmt 16" Casing	16" @2,000m				5.0	41.0	83.5
5 Set 13-3/8" Casing							
Cut Core w/ 10-5/8" Bit	2,000 - 3,000m	1,000m	28.41 m/day		34.0		
Run Wireline Log #3					3.0		
Open to 14-3/4" Hole	2,000 - 3,000m	1,000m	100 m/day		10.0		
Run & Cmt 13-3/8" Casing	13-3/8" @3,000m				6.0	53.0	136.5
6 Set 11-3/4" Casing							
Cut Core w/ 10-5/8" Bit	3,000 - 4,000m	1,000m	24.38 m/day		41.0		
Run Wireline Log #4					3.5		
Open to 14" Hole	3,000 - 4,000m	1,000m	100 m/day		10.0		
BOP Test (2 Times)					3.0		
Run & Cmt 11-3/4" Casing	11-3/4" @4,000m				7.0	64.5	201.0
7 Set 9-5/8" Casing							
Cut Core w/ 8-1/2" Bit	4,000 - 5,000m	1,000m	19.61 m/day		51.0		
Run Wireline Log #4					4.0		
Open to 12-1/4" Hole	4,000 - 5,000m	1,000m	30.3 m/day		33.0		
BOP Test (3 Times)					4.5		
Run & Cmt 9-5/8" Casing	9-5/8" @5,000m				7.0	99.5	300.5
8 Set 7" Liner							
Cut Core w/ 8-1/2" Bit	5,000 - 6,600m	1,600m	10 m/day		150.0		
Run Wireline Log #5					4.0		
BOP Test (5 Times)					7.5		
Run & Cmt 7" Liner	7" @6,600m				3.0	164.5	465.0
9 Deploy Downhole Measurement Tool					3.0	3.0	468.0
10 Retrieve BOP & Marine Risers					5.0	5.0	473.0
Contingency							
Mechanical Failure Operation days x 10%					47.0		
Wait on Weather Operation days x 7%					33.0		
Typhoon Evacuation 4times x 10days					40.0	120.0	593.0

Chikyu's Riser Drilling Capability under "Normal" Environment

- Maximum Water Depth: 2500mWD
  - System can be upgraded to 3000mWD.
  - Critical path is riser yield strength and ROV / BOP working depth.
- Maximum Total Drilling Depth: 9000mWD
  - Critical path is drill pipe yield strength.
- Rough Estimates for Drilling Period (2500mWD / 6500mbsf)
  - Full Coring from Seabed: 600days
  - No Coring with Seabed: 400days

Conclusion

- Chikyu is a state-of-the-art 5th generation drilling ship with the latest drilling equipment.
- Exclusive equipment is enlarging the durability of riser drilling in harsh / deep environment.
  - Heavy Duty Subsea System:
    - Special made heavy duty riser: 90ft 1.15" WT Cameron Load King 4.0 / 4MMlbs
    - Heavy Duty BOP Wellhead Connector: Super HD H-4 / 7MMftlbs bending stress with Vetco Gray SMS-700 30" wellhead.
  - Heavy Duty Drill Pipe:
    - Special made heavy duty drill pipe: NKK DSTJ S150 / S140 Non API Drill Pipe
- Chikyu has drilled riser wells in world wide.
- Chikyu has proven stable DP capability in extreme high current (3-5knots) in Nankai trough.
- Chikyu is a rare new drill ship with many harsh environment riser drilling experience.
  - Shimokita: Extreme standby in storm condition / Heave Amp 4-5m (8-10m in total)
  - Kenya: 2.0-3.0 knots high current environment
  - Nankai Trough (Plan): 1.5-4.0knots / 2060mWD
- Chikyu is capable to drill down to 9000mWD.
  - 2500mWD / 6500mbsf
  - Drilling with Logging: 400days
  - Full Coring: 600days

It is waste of money to use this treasure boat for riserless drilling only!!

#8 EDP Meeting

CDEX Technology Development Plan

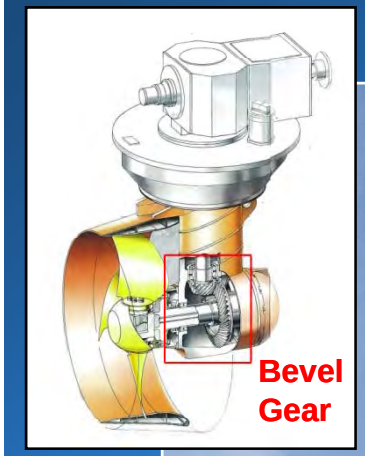
January 15th, 2009

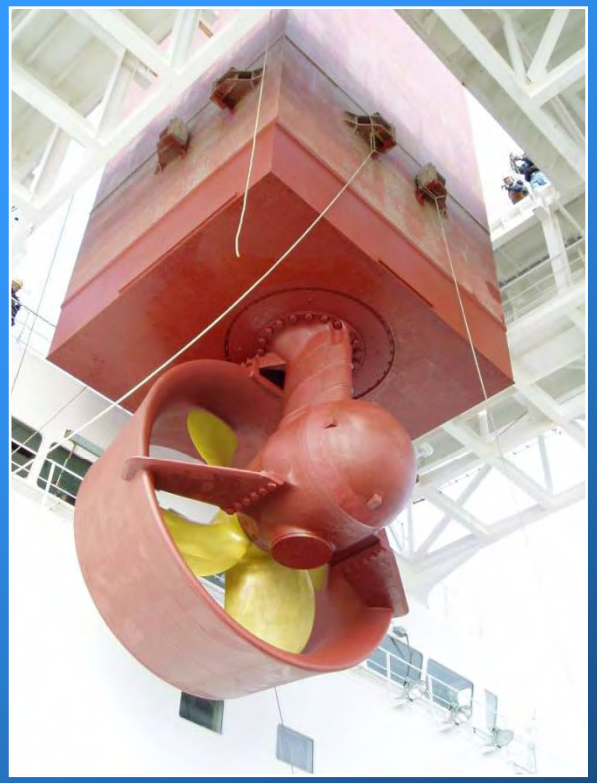
Yoshio Isozaki

Director, Engineering Department

CDEX, JAMSTEC

Thruster Repair Works



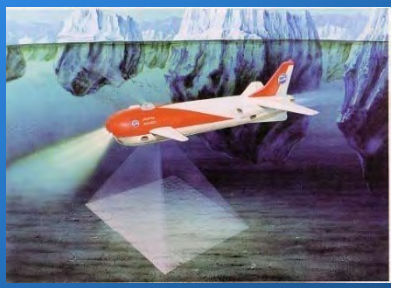


Technologies for Next-Generation Ocean Exploration

Next-Generation Ocean Exploration

Technology Development in Deep-sea Drilling with World's Latest Riser Drilling Vessel *Chikyu*

Next-Generation Deep-sea Exploration



Deep-sea Cruising Vessel
(Autonomous Underwater Vehicle)

Deep-sea Unmanned Research Vessel
(Remotely Operated Vehicle able to dive 7000 m)

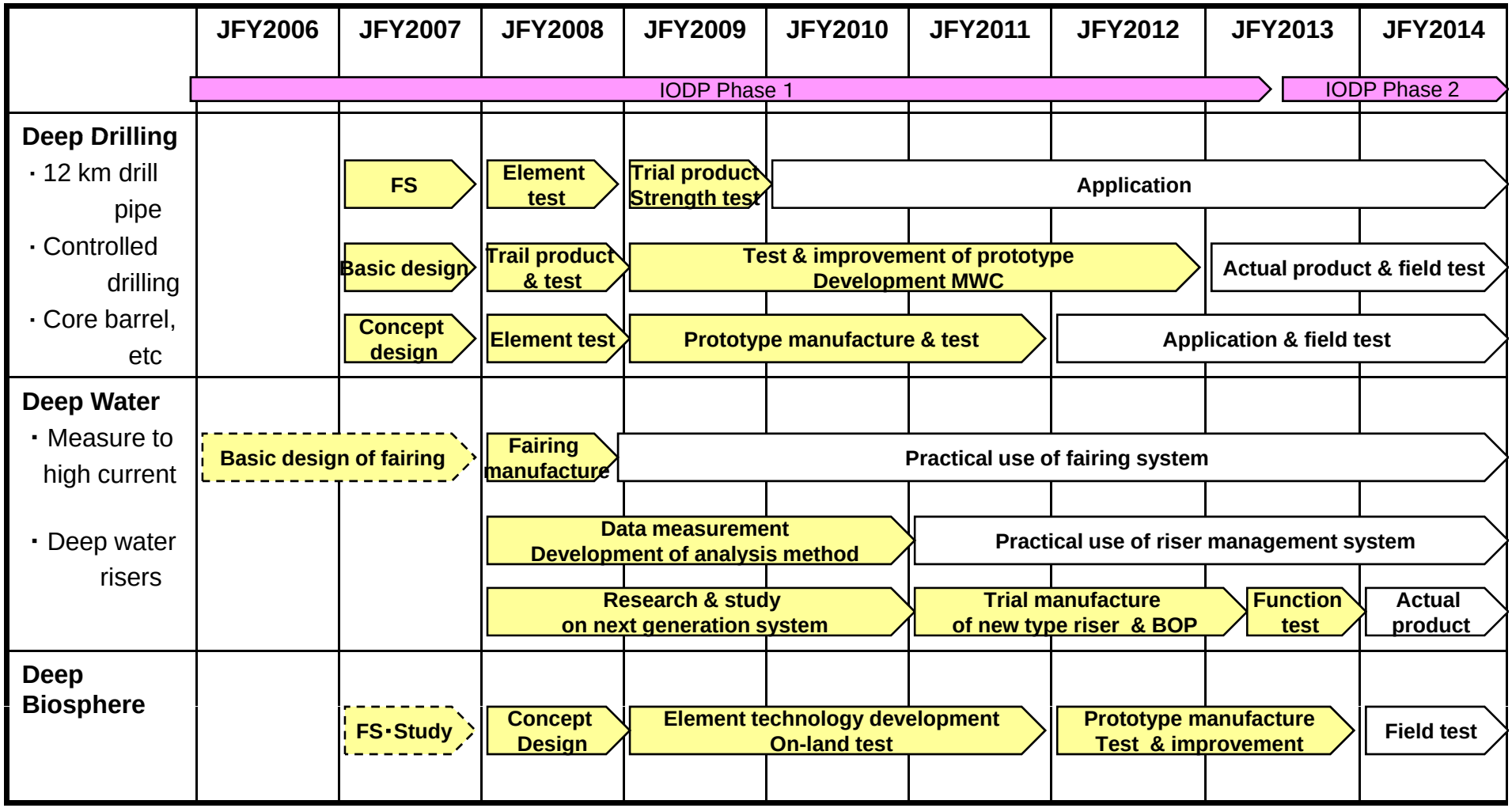
Technology Development in Deep-sea Drilling with World's Latest Deep-sea Riser Drilling Vessel *Chikyu*

Priority Objectives

- Ultra deep hole drilling
  (Target depth : 7,000mbsf)
- Drilling in ultra deep water
  (Target water depth : 4,000m)
- Core sampling of seismogenic zones
- Sampling of microbes and organisms with maintaining their original environments

Technology Development in Deep-sea Drilling / Planned Schedule

●Deep Drilling・・・Systems for high temperature & high pressure conditions under deep sea floor to be developed by start of actual application & field test in deep drilling (approx. 6,000m) , by approx. 2012.
●Deep Water Riser・・・For stabilized drilling under high current, improvement of DPS and manufacture of riser fairing are accelerated. Next generation system for deep sea drilling over 4,000m to be developed by IODP phase 2.
●Deep Biosphere・・・Development to be completed to meet next scientific proposal after Nankai-Trough drilling, by start of IODP phase 2.



Technology Development in Deep-sea Drilling with World's Latest Riser D/V *Chikyu*

(1) Development of Deep Drilling Technology

Objectives

Our mission is to contribute to the search for new resources & elucidate seismogenic mechanisms by high quality core sampling from the complex stratum of the oceanic crust at deeper depths than conventional drilling allowed.

1) Deep Drill Pipes

Development of drill pipes that can collect core samples from deep target strata.

2) Technology for Controlled Drilling

Development of controlled drilling technology to drill as vertically as possible while core sampling.

3) Core Barrels for Deep Drilling

Development of extreme temperature core barrels & high speed rotary core barrels for high quality core sampling.

4) Highly Stable and Efficient Active Heave Compensator

Development and evaluation of new control technology for a high strength efficient active heave compensator (AHC) for stable coring operations.

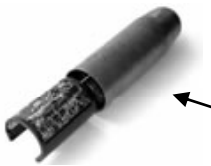
5) Casing Pipes for Deep Drilling

Development of large scale, high strength casing pipes that can be expanded within the diameter allowance to prevent collapse of the borehole under deep-sea pressure.

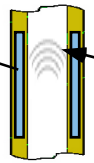
6) High Temperature Drilling Fluid

Development of drilling mud/fluid to be applied under high temperature conditions without loss or dispersion.

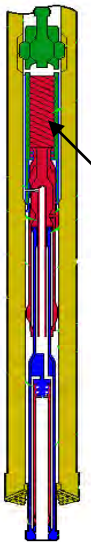
Development of Deep Drilling Technology



Sensor inside Pipe



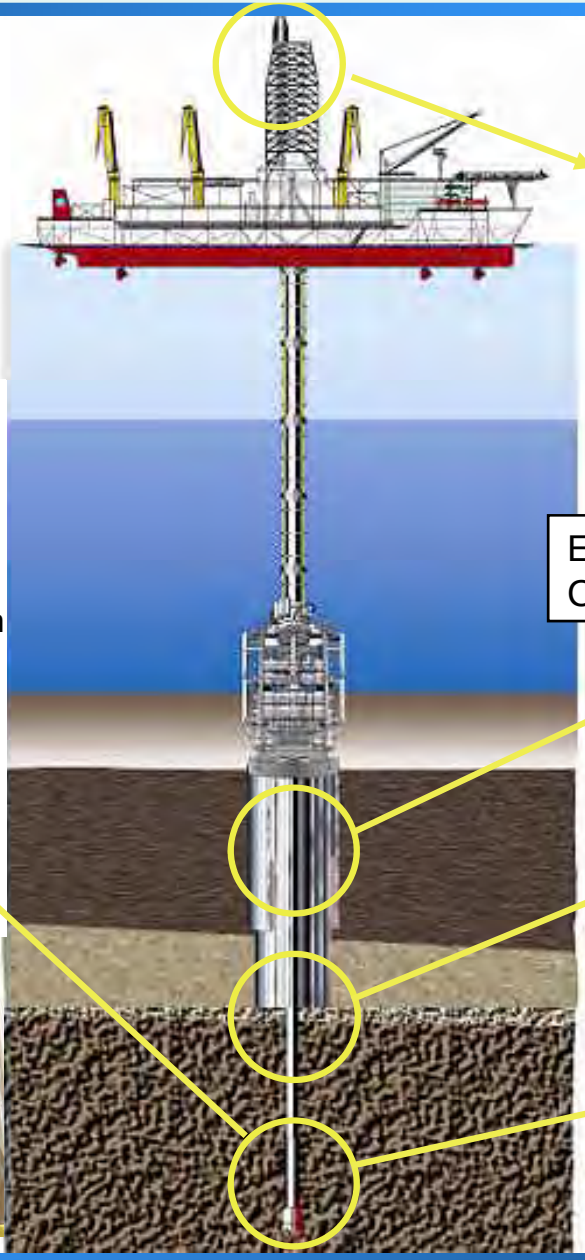
Data Transfer by Mud Pulse



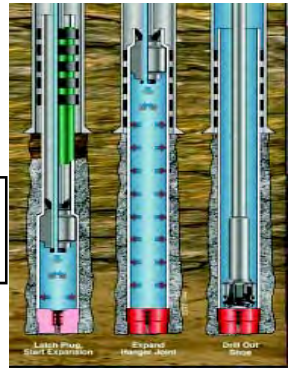
Mud Driven Motor

Mud Driven Core Barrel

Bit for Ultra-Hard Layer



Active Heave Compensator



Expandable Casing

Deep Drill Pipes

Controlled Drilling (Downhole Motor)

Technology Development in Deep-sea Drilling with World's Latest Riser D/V *Chikyu*

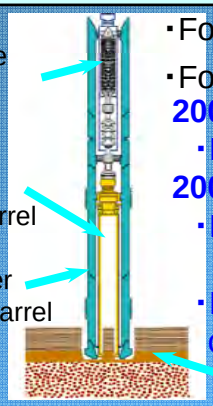
(1) Deep Drilling Technology

Projects Timeline

	2009	2010	2011	2012	2013	2014 ～
IODP Schedule	IODP Phase 1（2003～）					IODP Phase 2
Deep Drill Pipes	Strength and Durability Trials		Test runs			
Controlled Drilling	Tests & Improvement of Downhole Motor Prototype Performance				Application & Feasibility Testing	
	Development of Measurement-While-Drilling/Coring Systems					
Deep-sea Core Barrels	High Temperature-Resistant Core Barrel Prototype Design & Tests		Application & Feasibility Testing		Test runs	
	Development of motor-driven core barrel		Prototype Design & Testing		Application & Feasibility Testing	
Active Heave Compensator	Data Logging & Analysis While Drilling		Refining & Testing of New Control Systems		Test runs	
Deep-sea Casing Pipes	Design & Application of Expandable Casing Pipes		Prototype Design & Testing		Application & Feasibility Testing	
			Prototype Design & Testing			
Borehole Drilling Fluid	Development of High Temperature Mud		Waste Mud Treatment & Cuttings Disposal		Test runs	

Development of Deep Drilling Technology

Controlled Drilling Systems
（Downhole Motor Design）

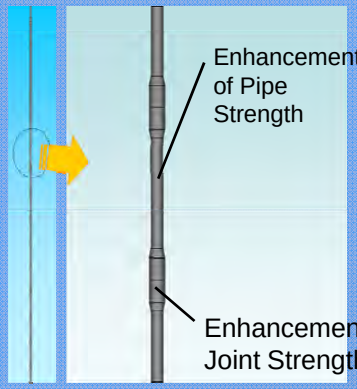


・For use up to depths of 7000 m
・For continuous controlled drilling

2007
・Basic design

2008
・Detailed design & element tests
・MWC・LWC telemetry system conceptual design

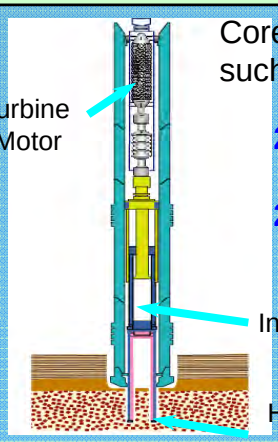
High-grade Deep Drill Pipes



2007
・Basic plan for 12 km drill pipe
・Manufacturing process assessment

2008
・Trials & element tests

New types of Core Barrels
（Motor-driven Core Barrel Design）

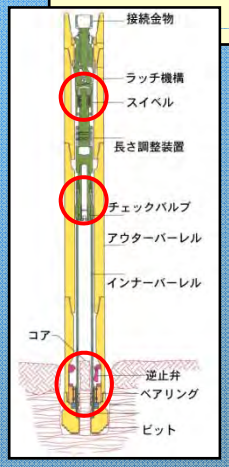


Core sampling in hard strata such as thermal deposits

2007
・Conceptual design

2008
・Detailed design & Element evaluation

High Temperature Core Barrels



2007
・150℃ heat resistance trials

2008
・150℃ heat-resistant model performance trials Confirmation trials
・300℃ heat resistance & elemental properties assessment

Technology Development in Deep-sea Drilling with World's Latest Riser D/V *Chikyu*

(2) Development of Deep-sea Riser Drilling Technology

Objectives

•A riser drilling system enables safe deep-sea and deep seafloor drilling even in strata containing hydrocarbon gases or liquid as well as in complex or unstable strata.
•*D/V Chikyu* is the world's first riser-type drilling vessel for scientific research and exploratory drilling in open sea depths exceeding 2,500 m in the first stage as well as for the development of element technologies in extreme deep-sea conditions.
•By integrating these technological advances, D/V *Chikyu* aims to reach where no man has ever gone before – the earth's mantle.

1) Improving the Safety of the Deep-sea Riser in Stand-by/Hang-off Position

•Appraisal of the riser strength evaluation method by optimizing the accuracy and precision of actual measurement data in order to maximize the safety & efficiency of riser drilling operations.
•Verification of deep-sea drilling depths by innovations in the riser system.

2) Maximizing Safety in Riser Drilling in Strong Current, Open Sea Conditions

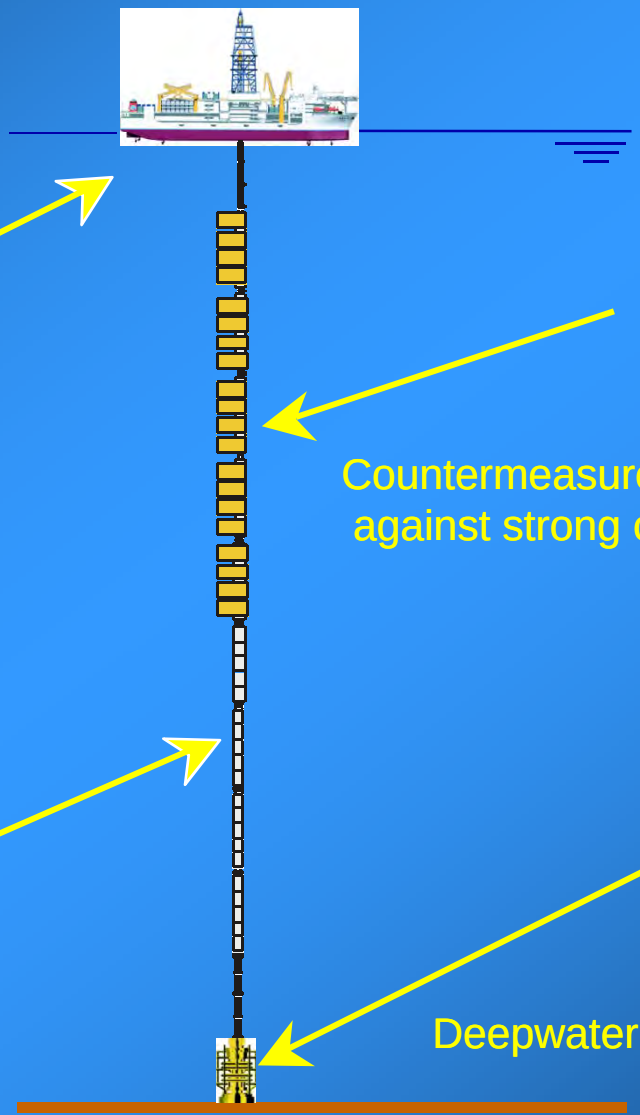
•Validating riser VIV fatigue life predictions by collecting actual measurement data.
•Quantification and calibration of the VIV mitigation effect by employing a fairing device.
•Integration of these technologies for riser management system.

3) Development of 4000 m Riser Drilling System

By incorporating new product designs & techniques for a light-weight riser constructed of new materials as well as new borehole fluid circulation & surface BOP systems, we aim to develop the next-generation riser drilling system for the *D/V Chikyu*.

Development of Deep-sea Riser Drilling Technology

Dynamic Positioning System



Countermeasure against strong current

Light / small risers

Deepwater BOP

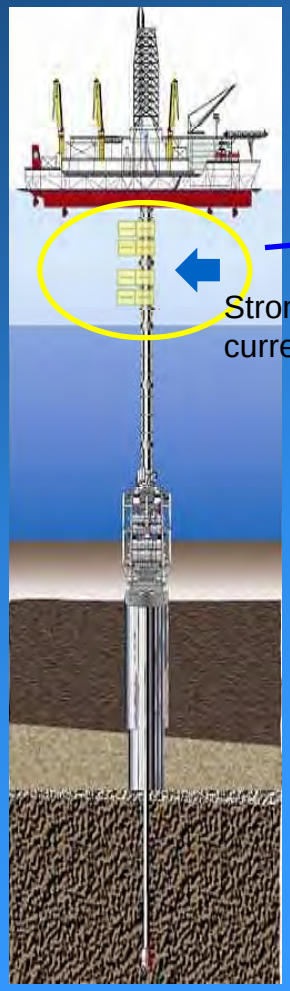
Technology Development in Deep-sea Drilling with World's Latest Riser D/V *Chikyu*

(2) Deep-sea Riser Drilling Technology

Projects Timeline

	2009	2010	2011	2012	2013	2014～
IODP Schedule	IODP Phase 1（2003～）					IODP Phase 2
Improvement of Safety of Deep-sea Riser in Stand-by & Hang-off Condition	Analysis of Performance of Hang-off Riser Actual Data Measurement -Improvement of Strength Evaluation Method of Risers in Stand-by & Hang-off Conditions -Verification Drilling Water Depth		Development of Strength Evaluation Method of New Type Riser			
Improvement of Safety of Riser Drilling in Strong Current Area	Actual Data Measurement of Riser Performance in Current	Improvement of Fatigue Life Prediction	Integration for Riser Management System			
Riser System over 4,000m	Research of Technology Development in Oil Industry & Study	Planning of New Type Riser	Prototype Riser Design & Product Prototype BOP Design & Product	Tests		Actual Production

Development of Deep-sea Riser Drilling Technology



Riser System against Strong Current

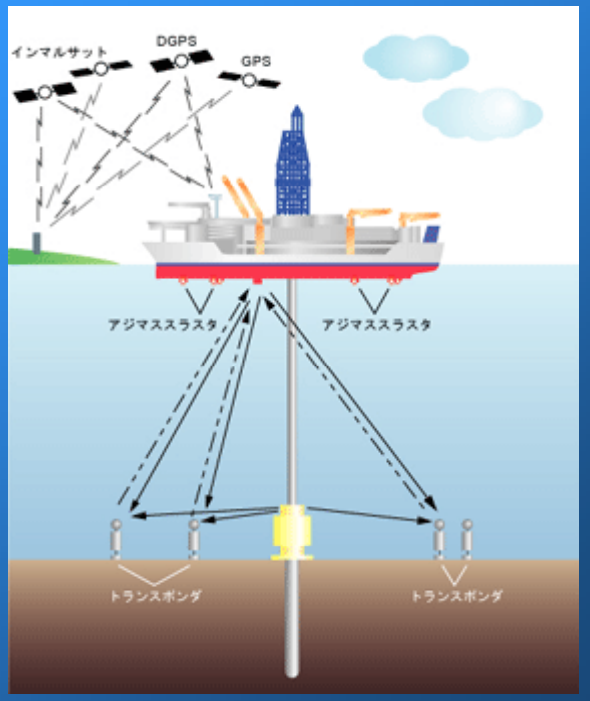
2007
- Basic study of fairing System
- Model test

2008
- Manufacturing riser fairing
- Field test

Improvement of DPS

2007
- Improvement of position measurement system

2008
- Application of improved position measurement system



Technology Development in Deep-sea Drilling with World's Latest Riser *D/V Chikyu*

Objectives

(3) Development of Deep Biosphere System

In order to carry out exploratory research into deep-sea microorganisms collected live from the earth's oceanic crust and to isolate useful materials, technologies that enable their cultivation by creating the same extreme deep-sea environment in which they thrive even on land are being developed. It will, thus, be important to develop systems that can prevent these deep-sea microorganisms from being contaminated by land or air microorganisms and to study their natural ecology.

1) Anti-contamination technology

To prevent contamination by surface microorganisms mixed in the drilling mud circulating from the vessel surface to the borehole bottom, anti-contamination techniques such as encapsulation of the microorganisms within chemical compound gels are being developed to keep the risk of contamination at less than 1%.

2) Extreme environment sustaining technology

Techniques to collect microorganisms live from the deep-sea oceanic crust and to replicate the extreme environmental conditions in which they thrive despite great temperature and pressure changes are being developed.

3) Environment monitoring techniques

In order to research deep-sea microorganisms collected live, a measurement system which can sustain such life forms on land at the same extreme environmental conditions of temperature, pressure, chemical compounds and pH is being developed.

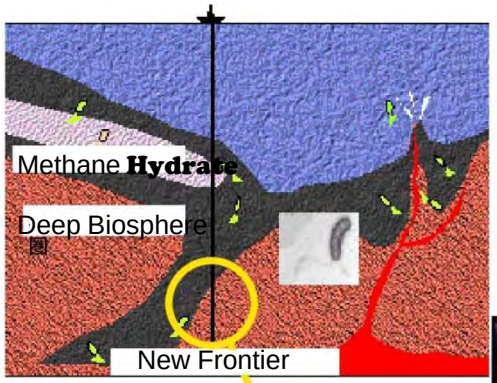
4) Site-specific environment simulation technology

Modeling, simulation and control technologies that can stably replicate extreme environments of temperatures up to 200° C and atmospheric pressures of up to 100 MPa to cultivate and sustain such micro-organic life forms are being developed.

5) Continuous cultivation methods

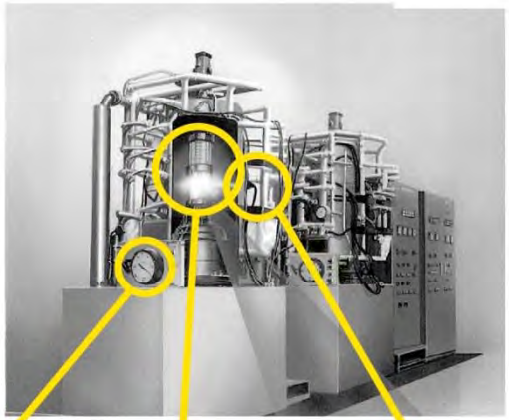
New tools to elucidate the ecology of microorganisms as well as to enable them to thrive through an automatic nutrient supply system within a temperature and pressure controlled aquatic culture tank are under development.

Development of Deep Biosphere System



Core
Coated with Gel

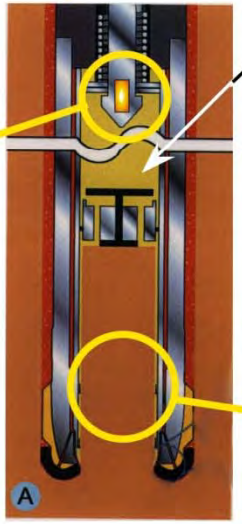
On board
Cultivation



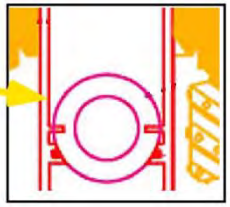
Medium
Transfer

In-situ
Measurement

In-situ
Sensor



Pressure
Retaining
Valve



Retaining
Pressure/
Temperature

Technological Development in Deep-sea Drilling with World's Largest Riser *D/V Chikyu*

(3) Deep Biosphere System

Projects Timeline

	2009	2010	2011	2012	2013	2014 ～
IODP Schedule	IODP Phase 1（2003 ～）					IODP Phase 2
Anti-Contamination Technology		Detailed design & Surface Trials		Prototype Design & Test Runs	Application & Feasibility Testing	
Extreme Environment Sustaining Technology	Element Technology	Test Device Manufacturing & Trials		Prototype Design & Test Runs	Application & Feasibility Testing	
Environment Monitoring Systems	High Temperature & Pressure-Withstanding Sensor Systems Design		Methane & Chemical Sensor Prototype Design		High Temperature Withstanding Systems	Application & Feasibility Testing
Site-Specific Environment Simulation Technology		Element Technology Development		Prototype Design & Test Runs		Application & Feasibility Testing
Continuous Cultivation Methods		Element Technology Development		Prototype Design & Test Runs		Application & Feasibility Testing

EDP_9_draft_Agenda_01_08_09

EDP Meeting #9 Agenda

July 15-17, 2009

Luleå, Sweden

DAY 1: Wednesday, July 15 (8:30-5:30)

1. Welcoming remarks; meeting logistics, safety, introduction, Robert's Rules (Miyairi)	08:30 – 09:00
2. Approval of meeting agenda (Miyairi)	09:00 – 09:15
3. Quorum discussion (Miyairi)	09:15 – 09:20
4. Approve minutes from EDP Meeting #8 (Miyairi)	09:20 – 09:30
5. Preliminary discussion of next 2 meeting locations and times	09:30 – 09:45
a. EDP #10 – Japan (Asanuma)	
b. EDP #11 – USA (TBN)	
6. Review status of previous meeting action items and recommendations (IODP-MI)	09:45 – 10:15
COFFEE	10:15 – 10:30
7. SPC Report (Mori)	10:30 – 11:00
8. SSEP Report (TBN)	11:00 – 11:15
9. STP Report (TBN)	11:15 – 11:30
10. Technical Review Process for Engineering Development Proposals (Myers)	11:30 – 12:00
LUNCH	12:00 – 01:15
11. Operator Reports and status of FY10 Engineering Developments (including 3rd party tools)	01:15 – 02:30
a. CDEX (45 minutes)	01:15 – 02:00
b. ESO (15 minutes)	02:00 – 02:15
c. USIO (15 minutes)	02:15 – 02:30
12. FY11 Engineering Development Proposals – Session I (EDP Watchdogs)	02:30 – 03:00
COFFEE	03:00 – 03:15
13. FY 11 Engineering Development Proposals – Session II (EDP Watchdogs)	03:15 – 04:45
14. INVEST White Paper – status and discussion (Ussler)	04:45 – 05:30

Day 2: Thursday, July 16 (8:30-5:30)

15. Microbiology Contamination Discussion (working group)	08:30 – 09:30
16. INVEST White Paper – group discussion/status	09:30 – 10:00

EDP_9_draft_Agenda_01_08_09

COFFEE 10:00-10:15	10:00 – 10:15
17. INVEST White Paper – breakout sessions and writing	10:15 – 12:00
LUNCH	12:00 – 01:15
18. INVEST White Paper - continue	01:15 – 03:00
COFFEE	03:00 – 03:15
19. Compile Technology Roadmap (Ussler) a. Status b. Prioritization	03:15 – 04:00
20. Preliminary Agenda for EDP Meeting #10 (Miyairi)	04:00 – 04:15
21. Next Meeting Location and Time (Miyairi/Asanuma)	04:15 – 04:30
EXECUTIVE SESSION (4:30 – 5:30) 22. FY11 Proposal Review (grouping number discussion; Miyairi/EDP)	04:30 – 05:30

DAY 3: Friday July, 17 (8:30 – 12:00)

23. Finalize INVEST White Paper	08:30 – 09:30
24. Status and Discussion of Scoping Studies (IODP-MI/EDP)	09:30 – 10:00
COFFEE	10:00 – 10:15
25. Review Consensus Items, Recommendations, and Action Items a. Phrasing b. Routing c. Background	10:15 – 12:00
LUNCH	12:00 – 01:15

DAY 3: Friday, July 17 (1:15 – 5:30) EXECUTIVE SESSION

26. Complete FY11 Proposal Reviews (Miyairi/EDP)	01:15 – 02:15
27. TR Prioritization	02:15 – 03:00
COFFEE	03:00 – 03:15
28. Finalize Consensus Items and Recommendations (Miyairi/Ussler)	03:15 – 05:00

EDP_9_draft_Agenda_01_08_09

29. Parting Comments (Miyairi) 05:00 – 05:30

Scoping Study Topics

- These scoping studies will provide valuable reference for the INVEST white paper
- Integrated downhole coring systems: Build on coring performance study to develop a platform-independent map of downhole coring applications showing how the different systems relate to each other and where future developments are required to overcome quantified performance shortfalls. (Leon, John Thorogood, John Tauxe, Maria, Lothar, Bill, Kevin, Nori, Sumio, David)
  - Use coring study as starting point
  - Contractor should be familiar with IODP needs and tools
    - John Thorogood will help locate key personnel to help
    - Marshall Pardee (sp) could also be useful to help, he was involved in ICDP projects
    - Lothar will contact European experts (Bernd W.)
    - Alister Skinner would be very helpful
  - Complete coring study first, then move on to integrated surface drilling systems.

Scoping Study Topics

- Integrated Surface Drilling Systems: Build on coring performance study to develop a platform-independent map of the drilling systems performance requirements, from the mudline upwards to ensure most effective functioning of whichever downhole coring system is in use. Part of the output should include platform-specific performance requirements.
  - NOV would be useful to help

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EPC slimline borehole geophysics

- EPC Context
- Mission Specific Platform (MSP) Expeditions
- Slimline Logging Equipement in Montpellier
- Future MSP Expeditions

Simon BARRY

Geosciences Montpellier

cnrs ume2 UNIVERSITÉ MONTPELLIER 2 Geosciences Montpellier ECORD Science Operator IODP INTEGRATED OCEAN DRILLING PROGRAM

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within IODP / ECORD

EPC provides ESO with staff and facilities for the acquisition, management and distribution of :

- **core petrophysical measurements**
- **downhole petrophysical measurements.**

With Lamont (BRG), EPC is part of the **International Scientific Logging Consortium** providing staff for :

- **IODP Non-Riser expeditions (Joides Resolution)**
- **ECORD Mission Specific Plateformes (MSP)**

It involves :

3 European universities undertaking petrophysical research, particularly in borehole geophysics:

↗ **Leicester** *(UK)* – Lead Organisation
↗ **Aachen** *(Germany)*
↗ **Montpellier** *(France)*

cnrs ume Geosciences Montpellier ECORD Science Operator IODP Integrated Ocean Drilling Program

Staff in EPC

Leicester (UK) – lead organisation

Sarah Davies	*EPC Coordinator*
Jenny Inwood & Louise Anderson	*Research Associates*
Janette Thompson	*Administrator*

Montpellier (France)

Philippe Pezard	*Head Research Scientist*
Johanna Lofi	*Research Associate*
Joëlle Gastambide	*Administrator*

Aachen (Germany)

Frank Bosch	*Research Scientist*
Annick Fehr	*Research Associate*

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Mission Specific Platform Expeditions (MSP)

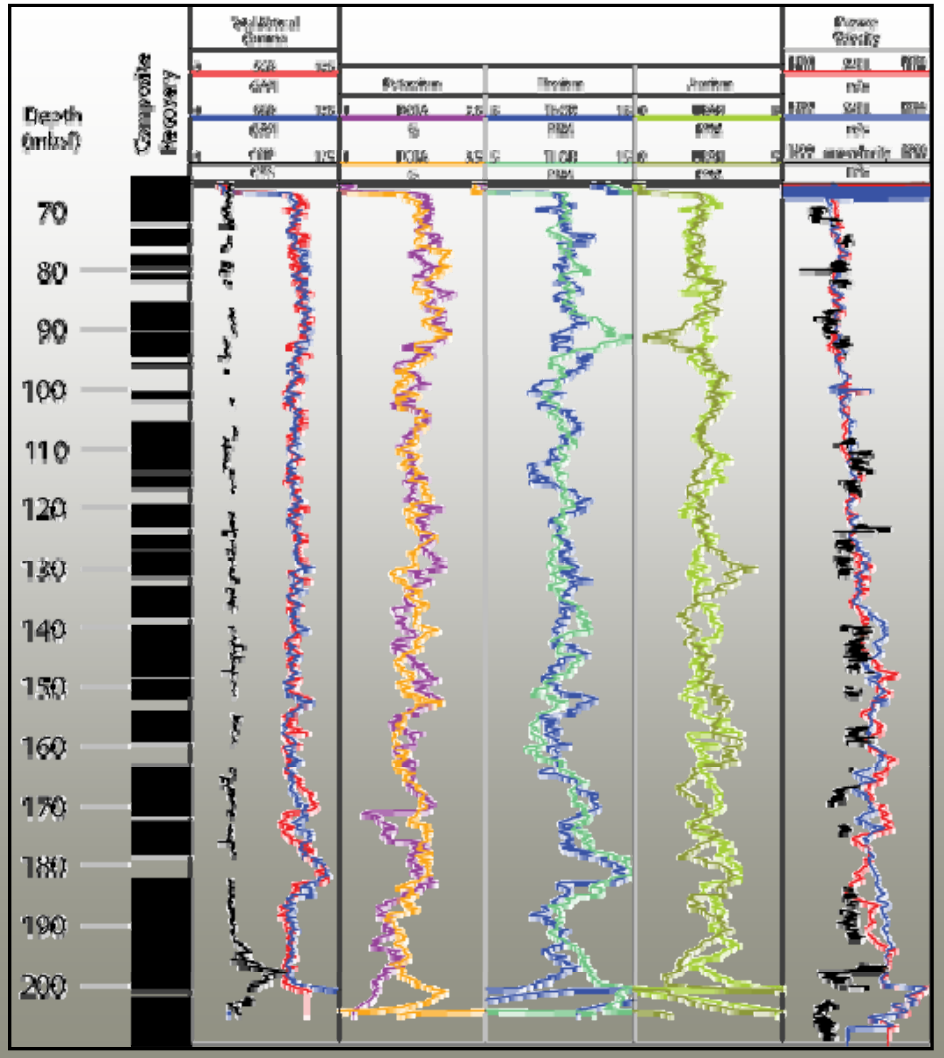
MSP Expeditions – ACEX

- **The Arctic Coring EXpedition was**:
  - 1st MSP expedition managed by ESO (in 2004)
  - A huge logistical challenge due to drill ship stability preservation over the drill site

MSP Expeditions - ACEX

- **Schlumberger logging tool suite (conventional)**
  - QAIT - induction resistivity
  - HLDS - lithodensity
  - APS - accelerator porosity
  - HNGS - natural gamma
  - SGT - scintillation gamma
  - BHC - compensated sonic
  - FMS - formation micro-resistivity imaging

in IODP Hole M0004B



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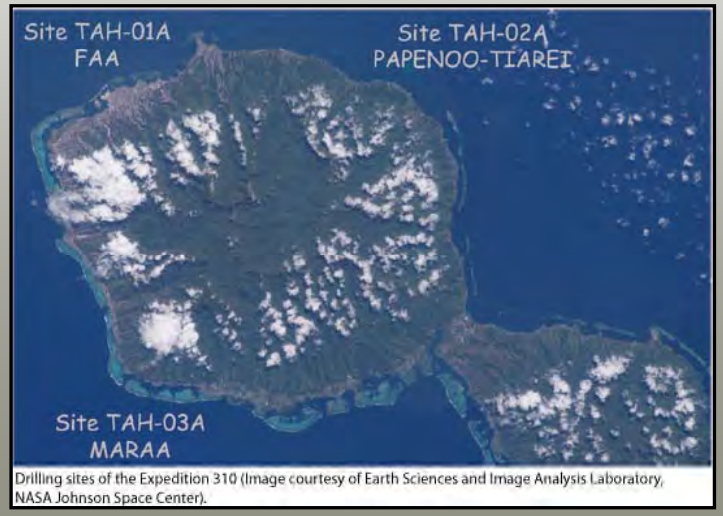
MSP Expeditions - Tahiti

- **Scientific objectives of the mission** (slimline coring)
  - Establish the course of postglacial sea level rise at Tahiti
  - Define SST variations for the region over 20 ky to 10 ky
  - Analyze the impact of sea level changes on reef growth



Drilling sites of the Expedition 310 (Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center).

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France

at GEOSCIENCES Montpellier

Philippe Pezard *(Head Research Scientist - Geophysics and petrophysics)*

Johanna Lofi *(Research Scientist - Sedimentology & petrophysics)*

Bernard Célérier *(Research scientist - Tectonics, stress & borehole stability)*

Simon Barry, **Gilles Henry, Denis Neyens, Gérard Lods, Richard Leprovost** *(Engineers)*

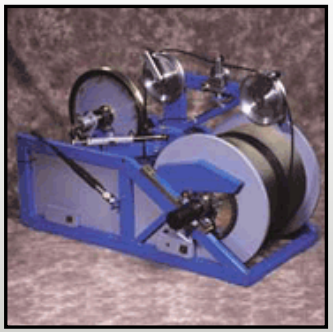
Charlotte Garing, Vanessa Hébert, Marie Violay *(PhD students)*

Joëlle Gastambide *(Administration)*

Logging Resources

- **Surface set-up:**

6 winches



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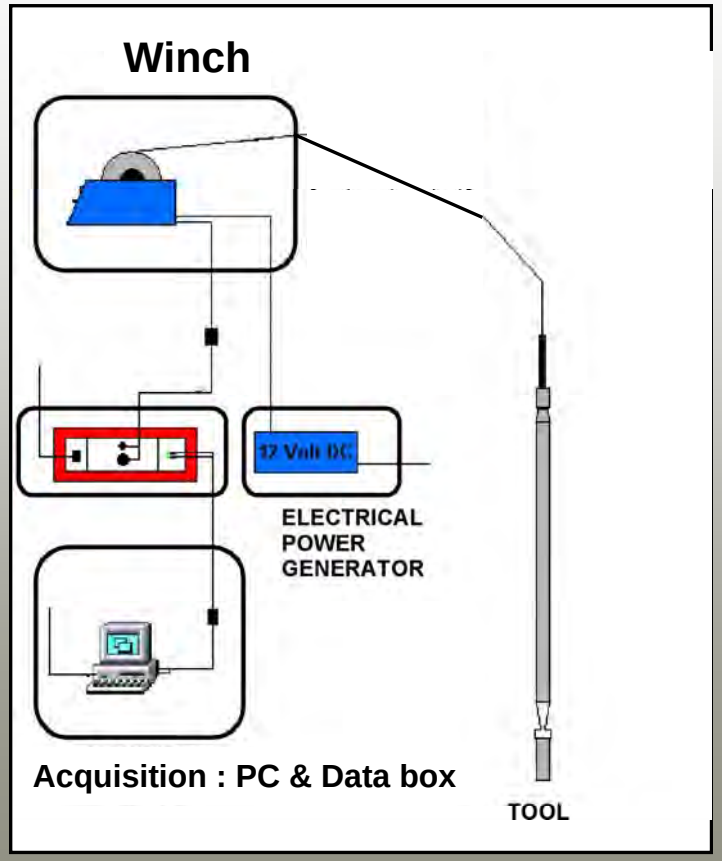


25 Logging probes

MSP Expeditions - Tahiti

- **Borehole geophysics program** = 7 runs/hole (x10)
- **Logging probes** :
  - Optical images (*for mm-scale geological description*)
  - Acoustic images (*for cm-scale impedance and mesoscale porosity*)
  - Spectral gamma logging (*for U, Th, K and red algaes*)
  - Acoustic velocity logging (*for Vp and Vs at 10 to 20 kHz*)
  - Induction resistivity logging (*for pore fluid salinity and porosity*)
  - Hydrogeochemical borehole fluid logging (*with p, T, pH, Eh, SP and Cw to identify fluid circulations*)
  - Borehole geometry (caliper) (*for more precise data analyses*)

MSP Expeditions - Tahiti

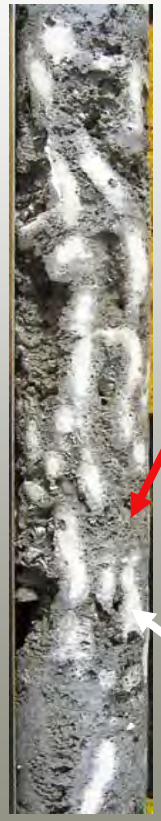
- **Logging conditions (slimline coring)**

Adverse borehole conditions with caves, instabilities, and unconsolidated rocks (no tool loss)

Adverse logging conditions (winch located on the small rooster deck for heave compensation): to be improved in the future, if possible

MSP Expeditions - Tahiti

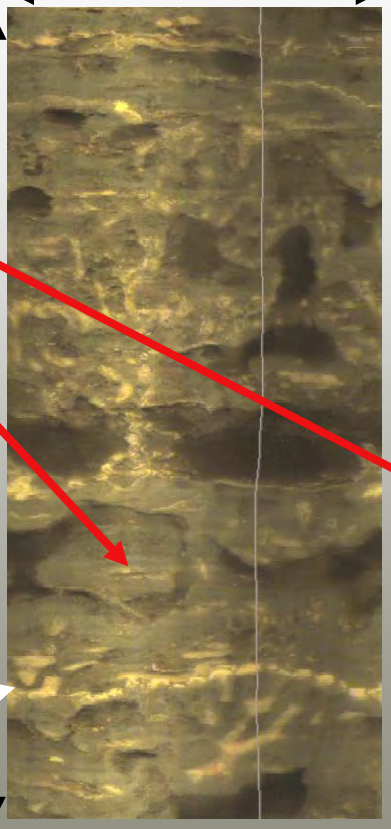
- Scientific advances achieved through borehole data analysis



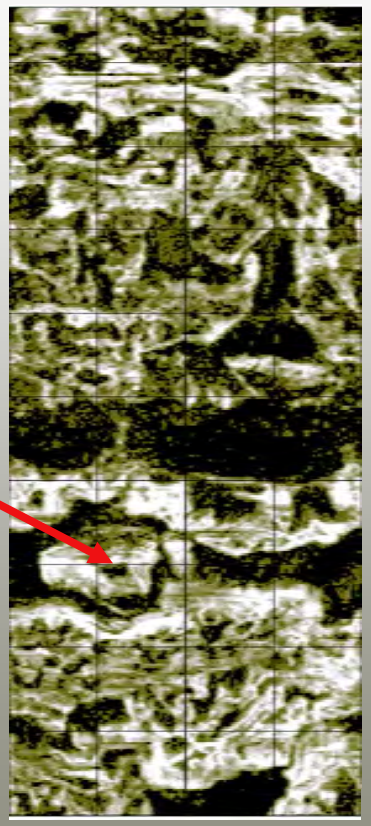
Microbialithes
(grey material)

Pocillopora
(white framwork)

Core photo



Optical Image



Acoustic Image

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Slimline logging equipement in Montpellier

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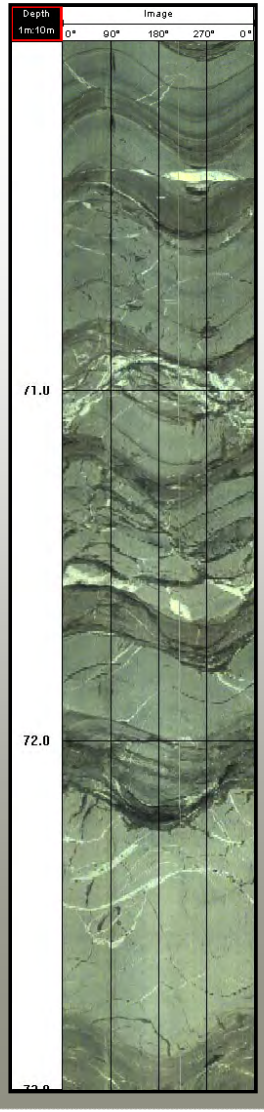
Geosciences Montpellier
ECORD Science Operator
IODP INTEGRATED OCEAN DRILLING PROGRAM

Logging Equipment

- **Borehole wall images**
  - Optical images
    - Combination of a CCD camera and a conic mirror → Continuous 360° image
    - Tri-axial accelerometers and magnetometers → Orientation of the image relative to magnetic North
    - Analysis: Identification and Orientation
      - Sedimentology (Lithology,…)
      - Structures (Fractures, faults...)
      - Strain and stress (*at a greater depth*)



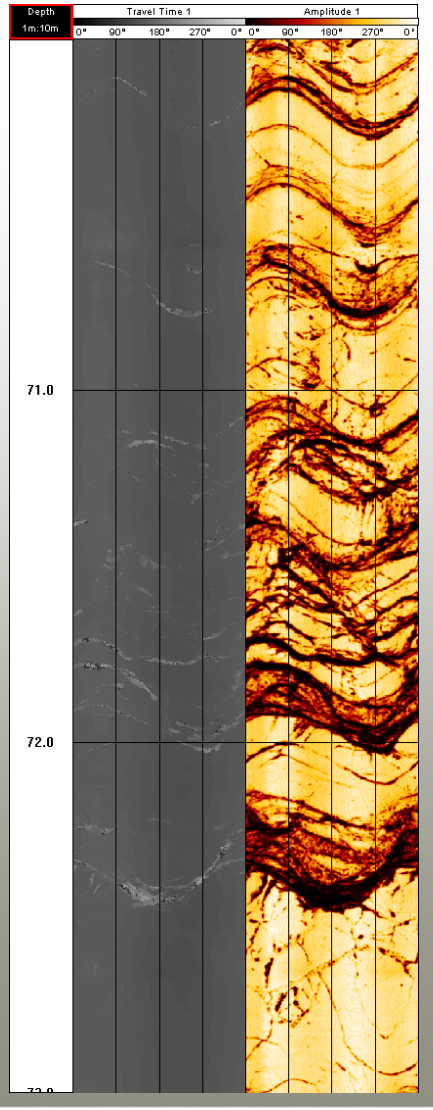
Logging Equipment

– Acoustic images
  - Based on the reflexion of the emitted wave at 500 kHz
  - Measures Travel time and Amplitude of the received wave

↓ ↓

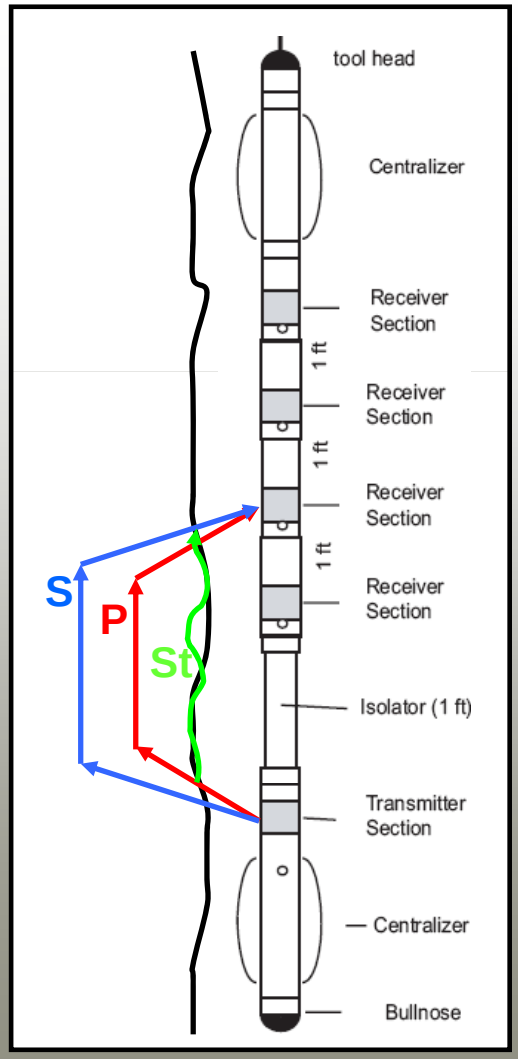
Geometry Lithology *(from impedance)*

  - Analysis:
    – Lithological structures
    – Fractures
    – Borehole breakouts



Logging Equipment

- **Acoustic instrument**
  - Full Waveform Sonic (FWS)
    - Up to 4 receivers at distances up to 2 m
    - Transmitted frequencies: 1 to 30 kHz
    - 2 modes : monopole (Tahiti) and dipole
    - After probing the formation, the P, S and Surface waves are collected and measured.
    - Detailed waveform analysis requires 3 arm caliper measurements
    - Data Analysis:
      - Elastic properties of the formation
      - Porosity
      - Lithology
      - Fractures

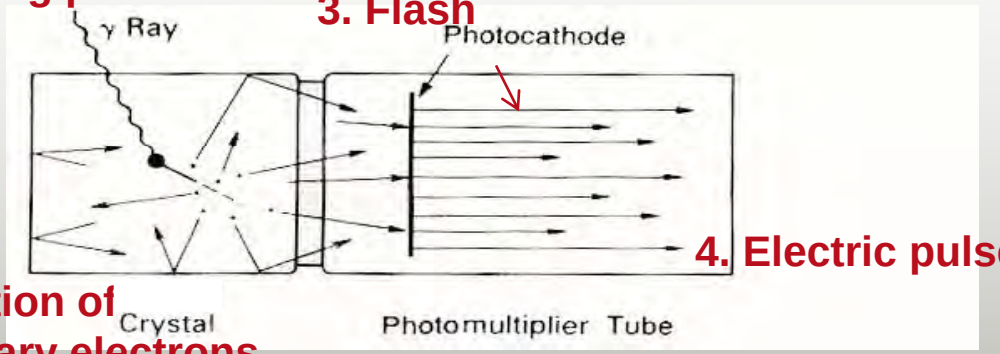


Logging Equipment

- **Passive Nuclear Measurement Instrument**
  - Natural Spectral Gamma Ray Probe

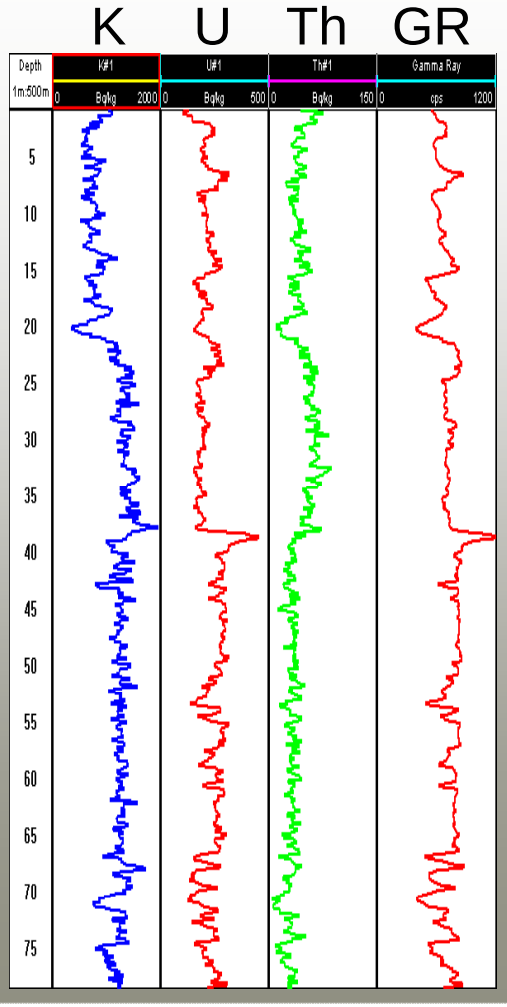
1. Ionising particle

3. Flash



4. Electric pulse

2. Creation of secondary electrons



- Data Analysis:
  - Clay content of lithological layers
  - Depositional environments
  - Presence of organic matter

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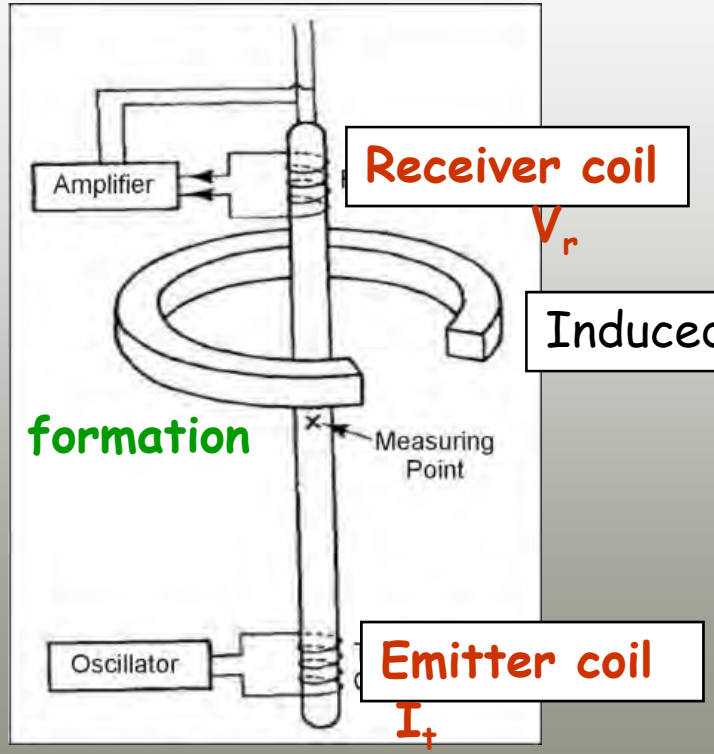
Logging Equipment

- **Electro-Magnetic Conductivity Probe**
  - Induction



- Advantages:
  - Electrical conductivity of saturated formation with air in borehole
  - Measurements through PVC tubing, if necessary
- Data Analysis:
  - Sedimentology (Lithology,…)
  - Structures (Fractures, faults...)
  - Porosity and pore fluid salinity

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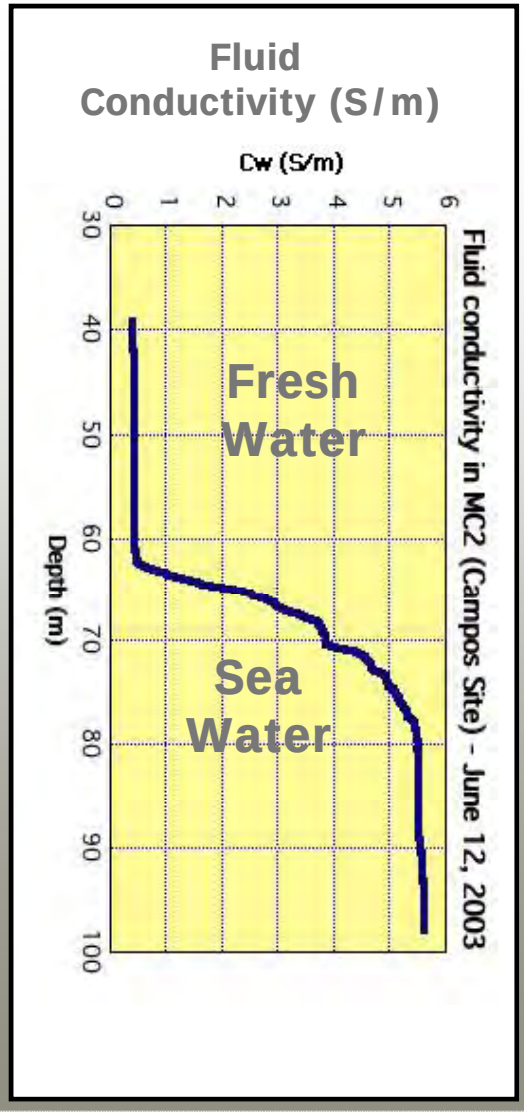
Logging Equipment

- **Multi-parameter groundwater investigation probe**
  - 5 parameters : p, T, Cw, Eh,pH
  - Caracterisation of borehole fluids

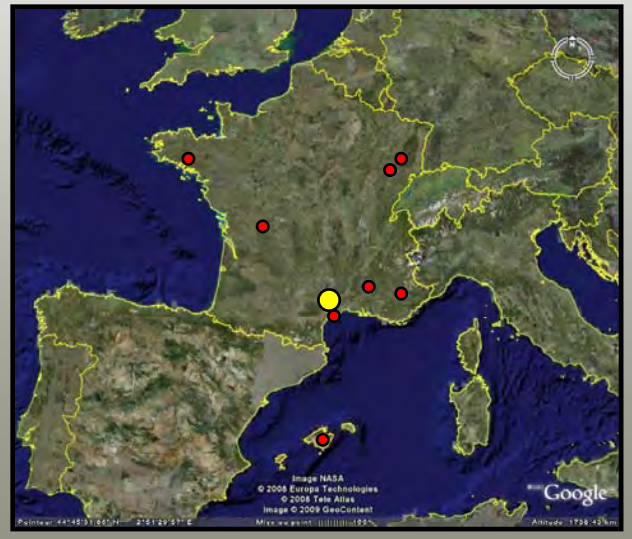


Logging Equipment

- **Lavalette experimental site (CEEL)**

– Logistics base for logging operations, testing, calibration of tools, as well as, new tools design and construction

– 5 boreholes ~ 100 m in depth (including one fully cored)



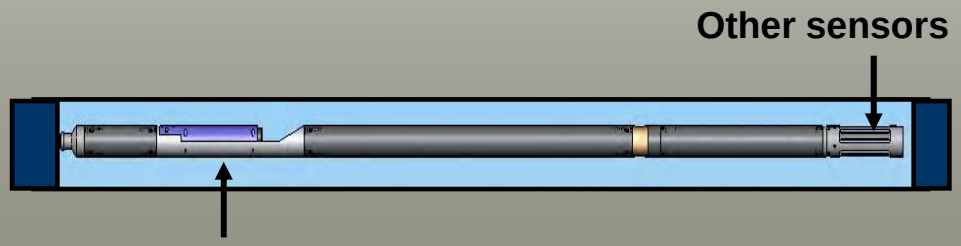
So far, 9 experimental sites

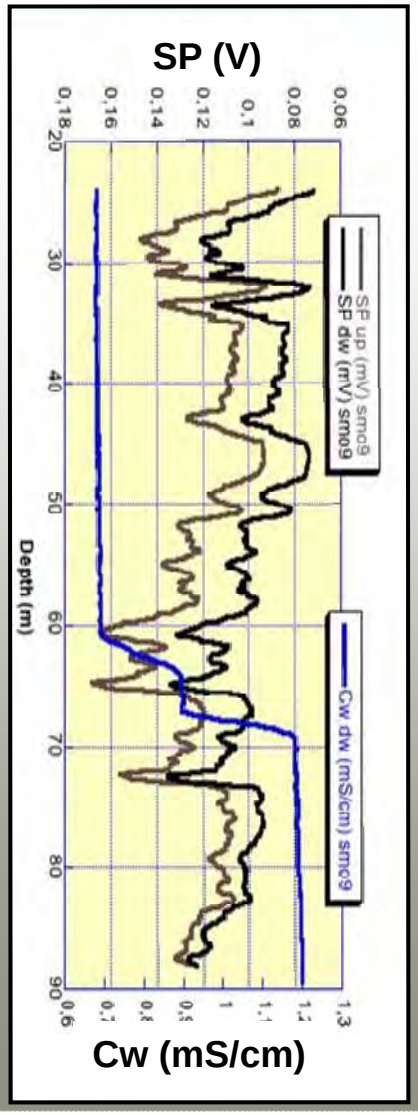
Logging Equipment

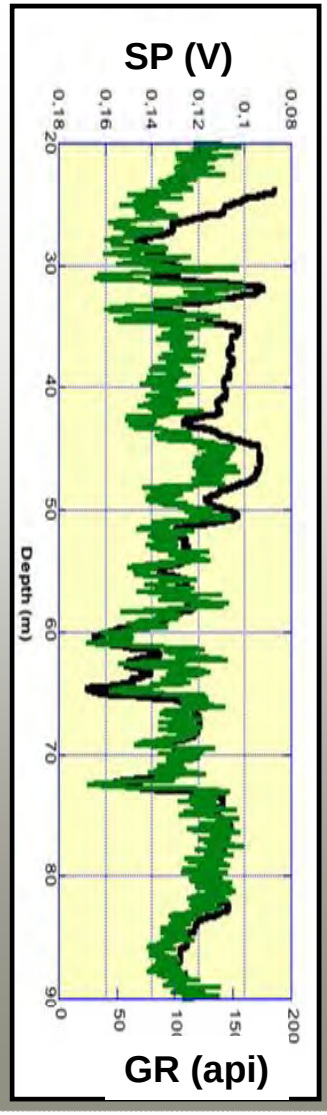
- **Newly developed tools**
  - European projects → tight collaboration between research and industry
    - ALIANCE (EC FP5) - new geophysical instruments to investigate salt water intrusion in coastal reservoirs
      - **MUSeT** (ALT)
      - **SHyFT** (ELOG)
      - **COFIS** (CNRS)
    - HiTI (EC FP6) - new high temperature instruments for high temperature geothermal applications (IDDP, Iceland)
      - **DLL HT** (CALIDUS) / 300°C and 20 000 psi
      - **ABI HT** (ALT) / 300°C and 20 000 psi
      - **GR HT** (ALT) / 300°C and 20 000 psi

Logging Equipment

- **MUSeT**
  - Downhole spontaneous potential (SP) in conjunction with p, T, Cw, Eh,pH
  - SP interpretation:
    - Fluid flow
    - Clay layer identification

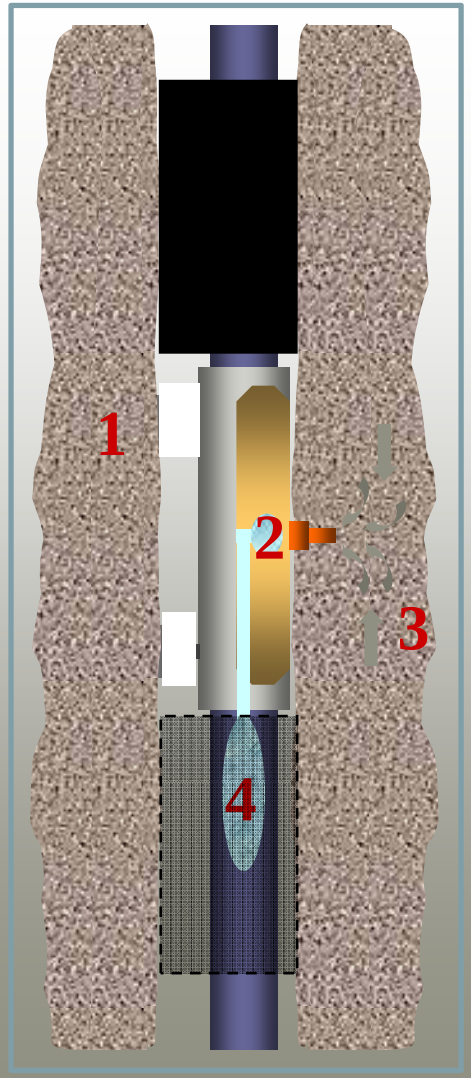






Logging Equipment

- **SHyFT**
  - In situ sampling of fluids and determination of formation permeability
    - Fluid sampling:
      - between packers (1 litre sampling bottle)
    - Permeability measurement:
      - Simultaneous measurement of fluid temperature and electrical conductivity during testing, using 4 possible sampling rates

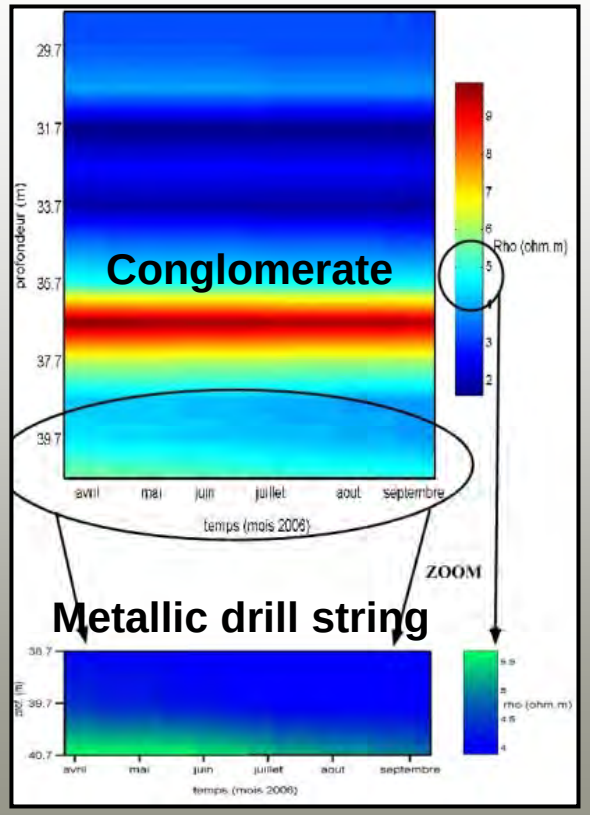


Geophysical Observatory

- **Automated downhole resistivity observatories**
  - Daily autonomous measurements with a meter scale downhole array
  - Detects small changes in pore fluid nature in the close vicinity of the borehole

Deployment…

…and surface set-up



Resistivity Image : R = f (z,t) (april - september 2006)

EPC
European Petrophysics Consortium

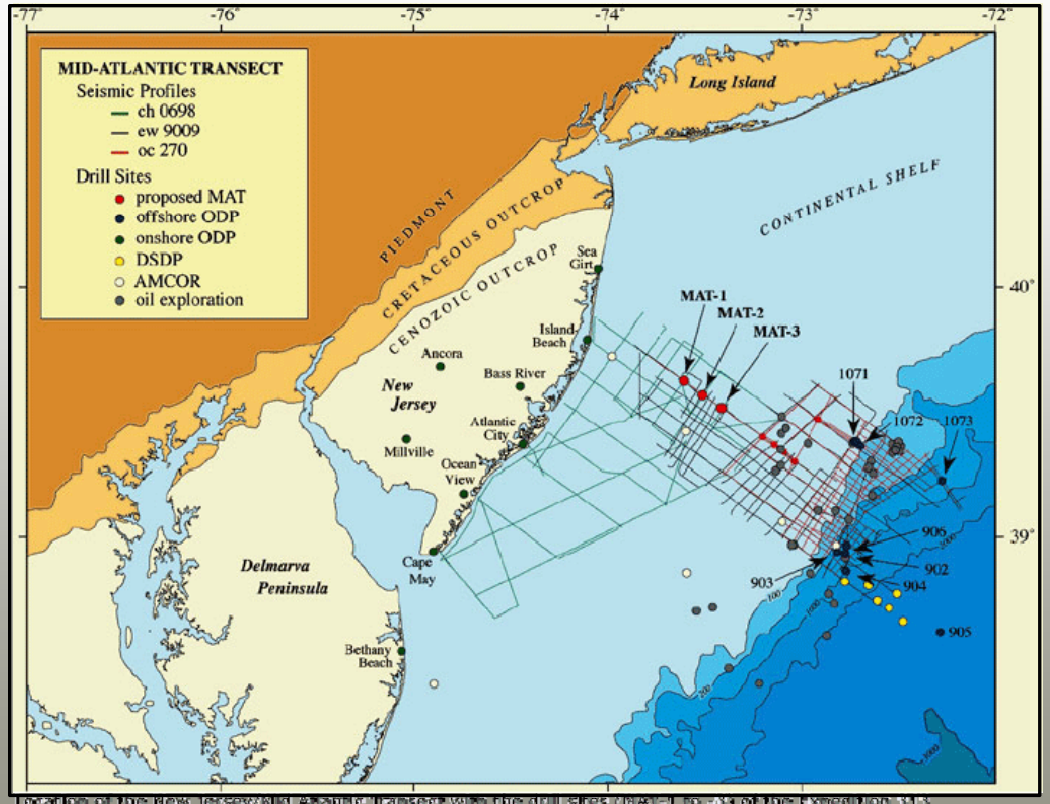
Future MSP Expeditions

cnrs
UMR UNIVERSITÉ MONTPELLIER 2
Geosciences Montpellier
ECORD Science Operator
IODP INTEGRATED OCEAN DRILLING PROGRAM

Future MSP Expeditions

New Jersey (Expedition 313)

- **Scientific objectives of the expedition**
  - Obtain cores and logs of clastic sequences on a modern continental shelf in order to
  - 1) date major icehouse sequences
  - 2) estimate mechanisms of sea level change



Location of the New Jersey/Mid-Atlantic Transect with the drill sites (MAT-1 to -3 of the Expedition 313 (Mountain et al., 2005 - IODP Proposal 561-Full2).

Future MSP Expeditions

New Jersey (Expedition 313)

- **Proposed Borehole geophysics program** = 2 to 3 boreholes of 750 m in depth; 7 runs/hole, depending on casing vs open hole
- **Logging program options**:

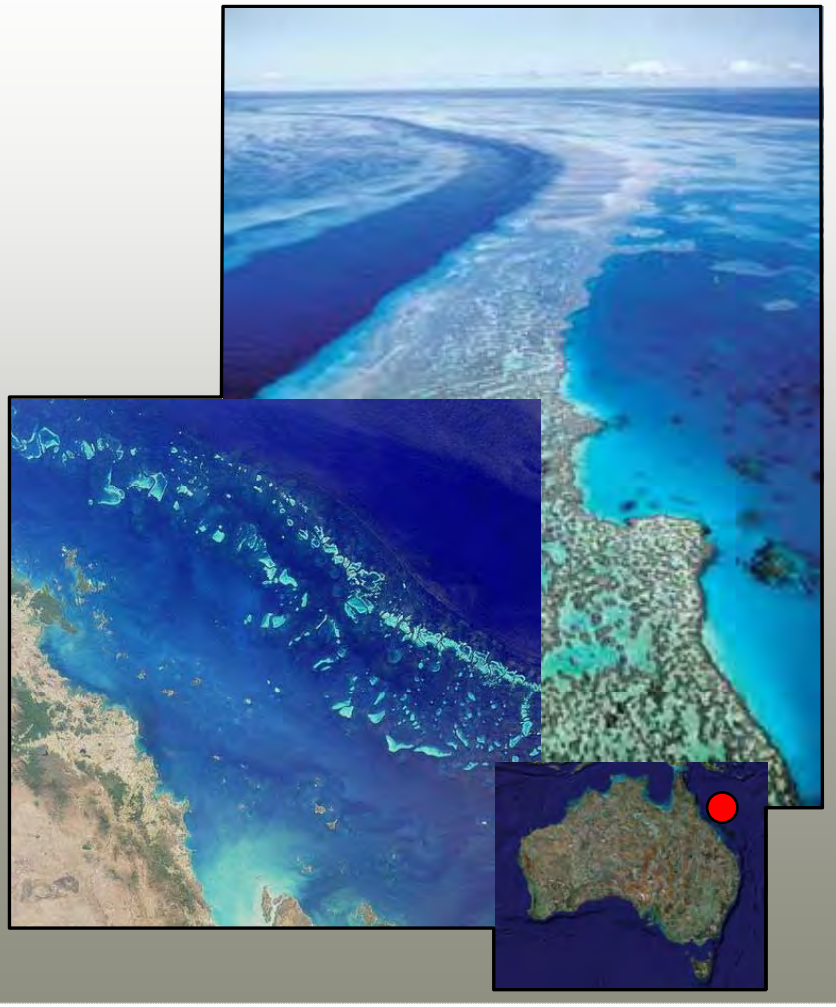
Tools / Casing	Acoustic Image	Spectral Gamma Ray	Induction Resistivity	Hydro-chemical	Sonic	Caliper	Magnetic Susceptibility
Metallic Casing	✗	✓	✗	✗	✗	✗	✗
PVC Casing	✗	✓	✓	✗	✗	✗	✓
Open Hole	✓	✓	✓	✓	✓	✓	✓

Future MSP Expeditions

Great Barrier Reef (Expedition 325)

- **Scientific objectives of the expedition**
  - Establish the course of sea level rise during the last deglaciation
  - Reconstruct the nature and magnitude of climate variability and its effects on oceanic waters
  - Determine the biological and geological response of the GBR to rapid sea level changes

- **Logging program similar to that of Tahiti** (details tbd)



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Thank You

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