MEETING OF JOIDES DOWNHOLE MEASUREMENTS PANEL

Sheraton Breakwater Hotel
Townsville
Queensland

11-13 October 1990

EXECUTIVE SUMMARY

1. Features of this third DMP meeting of 1990 were a shipboard tour of the JOIDES Resolution, with whose Townsville port call the meeting had been scheduled to coincide, and a joint session with the Shipboard Measurements Panel (SMP) to review the shipboard integration of core and log data.

2. DMP continues to encourage the shipboard acquisition of laboratory physical properties data that can be applied to the calibration of downhole measurements, especially compressional wave velocity and resistivity data.

3. The Lateral Stress Tool (LAST II) should be tested at sea by ODP at least two legs prior to its proposed scientific deployment, in order to allow adequate time for any residual modifications to be made.

[DMP Recommendation 90/16]

4. Since the wireline packer is not functional, at least in unstable overgauge holes, an urgent evaluation should be undertaken by LDGO of what is needed to make the wireline packer perform. LDGO should prepare such a report for the next DMP meeting. A rigorous test programme should be satisfactorily concluded before the tool is deployed for scientific purposes at sea. The first scientific deployment should be where hole conditions are good. In view of the doubts concerning sample integrity and tool robustness, LDGO should also examine alternative technology to prepare for the possibility that the wireline packer might not eventually achieve the status of an ODP functional tool.

[DMP Recommendation 90/17]

5. The approved guidelines for the deployment of third-party tools should be published in the JOIDES Journal.

6. LDGO are to be congratulated on their increased role as providers of logging data to the scientific community. The growing demand for log data is a testimony to the success of the logging programme and to an increased realization within the community of the scientific benefits that the data can bring.

Facilities should be established at LDGO for post-cruise processing of data acquired using both analogue and digital borehole televiewers.

[DMP Recommendation 90/18]

8. TAMU engineers are to be complimented on the successful and timely development of the new strengthened side-entry-sub.

9. DMP formulated the following recommendation concerning high-temperature logging technology in the short term.

   For high-temperature logging purposes, the efforts of ODP should be concentrated on the following three areas, listed in order of priority.

   (1) Temperature and fluid pressure
   (2) Fluid sampling
   (3) Formation resistivity

   For temperature and fluid pressure, funds should be provided for a back-to-back study of the available slimhole tools in a hot hole (c.300°C). The best performer(s) should be leased.

   A slimhole borehole-fluid sampling tool should be developed by modifying existing technology.

   Formation resistivity should be addressed by double-dewaring the LDGO ARCO tool, or an alternative tool; this objective falls away if there is insufficient funding for all three objectives to be progressed properly and concurrently.

10. To enhance the prospects of the Diamond Coring System (DCS) producing good core recovery, deployment of the DCS in a scientific leg should be under the direction of an experienced diamond-core driller.

[DMP Recommendation 90/20]

11. During Leg 136, the sonic log of the Oahu test hole should also be run in cement-bond (CBL) mode.

[DMP Recommendation 90/21]

12. During Leg 137 the Formation Microscanner (FMS) should be run in Hole 504B.

DMP Recommendation 90/22]

13. The Formation Microscanner should be a standard ODP logging tool for planning purposes, i.e. it should be run in all holes that are designated for standard logging.

[DMP Recommendation 90/23]

14. An ad hoc working group comprising engineers and scientists should be convened for a one-day meeting to review causes of hole instability in Nankai-type situations and to propose remedial action. This meeting should be scheduled to take place immediately prior to the next DMP meeting in College Station in January/February 1990.

[DMP Recommendation 90/24]

This date has been set as 6 February 1991, subject to PCOM approval.

15. The joint session with SMP encompassed a review of the recommendations of the JOI Workshop on ODP Shipboard Integration of Core and Log Data, held at the University of Miami on 29-30 August 1990. From these deliberations, an agreed listing was developed of user needs for integrated core and log data, and these were formulated into a joint recommendation.

The joint DMP/SMP Recommendation on the shipboard integration of core and log data presented a specification of user needs in the form of General Observations, General Requirements and Specific Requirements. The last item was subdivided into sections headed Reference Depth, Data Acquisition, Data Analysis and Data Availability.

[DMP Recommendation 90/25]

There was a general appreciation that the joint DMP-SMP meeting had been a great success, partly because of the groundwork done at the Miami Workshop. It was considered desirable for the two panels to meet at regular intervals, with the next joint meeting possibly taking place in 12 months' time.

16. The next meeting of the JOIDES Downhole Measurements Panel is scheduled for College Station, Texas, around late January/early February 1991. This meeting should be preceded by the working group meeting on hole stability.

The next DMP meeting has been set for 7-8 February 1991.

PAUL F WORTHINGTON
23 October 1990

MEETING OF JOIDES DOWNHOLE MEASUREMENTS PANEL

Sheraton Breakwater Hotel
Townsville
Queensland

11-13 October 1990

MINUTES

Present

Chairman:	P F Worthington (UK)
Members:	M Hutchinson (USA)
	D Karig (USA)
	P Lysne (USA)
	R Morin (USA)
	C Sondergeld (USA)
	D M Williams (USA)
	H Crocker (Canada/Australia)
	H Draxler (FRG)
	J P Foucher (France)
	O Stephansson (ESF)
	M Yamano (Japan)
Liaisons:	D Cowan (PCOM)
	A Fisher (TAMU)
	X Golovchenko (LDGO)
*Guests:	R N Anderson (LDGO)
	R Jarrard (LDGO)
	T Pyle (JOI)
	K Moran (SMP)
	E Scholz (Stanford Univ.)
Apologies	B Carson (USA)
	J Gieskes (USA)
	R Wilkens (USA)
	J McClain (LITHP)
	J Mienert (SGPP)

*Partial attendance

N.B. Item 15 was conducted in joint session with the JOIDES Shipboard Measurements Panel.

1. Welcome and Introductory Remarks

The meeting was called to order at 8.30 am on Thursday 11 October 1990. The Chairman welcomed Members, Liaisons and Guests to the first DMP meeting to be held in Australia, especially Yamano who was attending for the first time. Important features of this meeting were the joint session with the JOIDES Shipboard Measurements Panel (SMP) and the shipboard tour of the JOIDES Resolution which was making a port call in Townsville.

Review of Agenda and Revisions

Three additional items were proposed.

Item 12: Hole Stability

Item 13: Safety

Item 14: Panel Membership

The joint session with SMP is reported under Item 15: Shipboard Integration of Core and Log Data. With these modifications, the pre-circulated agenda was adopted as a working document for the meeting.

2. Minutes of Previous DMP Meeting, University of Washington, Seattle, 28-29 June 1990

The minutes were adopted with the following minor modification proposed by Foucher:

Page 8, Item 6(v), line 1;

Delete "Schlumberger" (the tool has been developed by Total and CEA and is being operated by Schlumberger).

A similar modification was made to the Executive Summary.

Matters Arising

Item 5(ii) had identified Karig or Villinger to attend the next meeting of SGPP in Paris in November 1990. Karig notified the Panel that the attendee would have to be Villinger.

[ACTION:VILLINGER]

3. PCOM Report

Cowan reported on the August 1990 meeting of PCOM with particular regard to the PCOM response to DMP Recommendations 90/10 - 90/15.

Rec. No.	Description	PCOM Response
90/10	Hole stability	Noted (see Item 5)
90/11	JAPEX high-temperature tools	Noted: action already undertaken by JOI Inc.
90/12	Oahu test hole: logging	Accepted
90/13	Oahu test hole: testing of seal	Accepted
90/14	TECP Liaison to DMP	Not accepted: liaison is not in the mandate of TECP
90/15	Logging input to DPGs	Accepted: DMP and/or LDGO are welcome to send guest representatives to DPG meetings

PCOM has established a strategy subcommittee to facilitate the ODP renewal process.

The next meeting of PCOM (November 1990) is very important because the six legs for FY92 will be formulated.

4. JOI Report

Pyle reported that ODP had published a long range plan together with an accompanying brochure for the layman.

JOI is co-producing a television film based on footage taken on Leg 105. The intention is that this film will be shown on cable networks in the USA.

There is still no formally approved budget for FY91. The budget is likely to be 1-2 million dollars short due to increased fuel costs. This is likely to negate the financial benefits of Soviet participation which is expected to be approved imminently.

5. Liaison Reports

i) Lithosphere Panel (LITHP)

LITHP is meeting at the same time as DMP: therefore no report from LITHP Liaison to DMP.

ii) Shipboard Measurements Panel (SMP)

DMP Liaison to SMP (Gieskes) had notified the Chairman two weeks previously of his non-availability for the SMP meeting in Townsville

on 9-10 October 1990. There had not been time formally to arrange an alternative but Crocker had attended part of the SMP meeting and was able to provide some feedback.

Issues of interest to DMP included:

- problems of excessively high susceptibility at the top of APC core sections, possibly due to rust particles from the pipe;

- the concept of mineralogy through infra-red spectroscopy, such as that offered by Core Laboratories through their MINERALOG service;

- core natural gamma to be added to the multi-sensor tool (MST).

The Chairman asked if the tour of the physical properties laboratory on the JOIDES Resolution had stirred any thoughts about additional measurements that might be made. Two issues were raised, the need to upgrade shipboard measurements of compressional wave velocity and the lack of continuous resistivity measurements.

DMP Consensus

Panel continues to encourage the shipboard acquisition of laboratory physical properties data that can be applied to the calibration of downhole measurements.

iii) Sedimentary and Geochemical Processes Panel (SGPP)

SGPP has not met since the previous DMP meeting: therefore no report from SGPP Liaison to DMP.

iv) Technology and Engineering Development Committee (TEDCOM)

The Chairman, as DMP Liaison to TEDCOM, reported on the TEDCOM meeting held in College Station on 27-28 September 1990.

An ODP Deep Drilling Workshop had been held on 26/9/90. An ODP goal is to penetrate 6000 m by the year 2000. The attainment of this objective will require new technology. The workshop had reviewed deep drilling on land in the USA, USSR, Germany and Sweden. This had been followed by a summary of the evolution of offshore drilling. The subsequent discussion had not answered the questions posed by PCOM concerning alternative technologies, development strategies, etc. It had been considered that such complex questions could not be addressed meaningfully through a one-off meeting. Future needs could best be satisfied by an iterative design process involving TAMU engineers and an ad hoc subgroup to be called together informally at strategic intervals. Planning for specific objectives would need to be initiated several years ahead of the proposed deployment of the design technology. Practically, the ODP/TAMU engineers would need to receive details of hypothetical drilling sites, typical of those that are to be drilled, in order to provide the facility for meeting the specific objectives. OPP/TAMU would respond with draft designs to be circulated for review among

oil company personnel, etc., and for consideration by the (TEDCOM) subgroup. No other semi-permanent working group had been considered necessary.

A review was presented of the Engineering Leg (132) on which the Diamond Coring System (DCS) Phase II was tested. The DCS was tested only in bare zero-age brittle rocks. The other target lithologies were not drilled because of time limitations. The deployment of slimhole logging tools in DCS holes was not accomplished because of difficulties in re-accessing the DCS hole. However, the handling technique for slimhole tools was evaluated. Core recovery from fractured basalts was 64%. Recovery from friable tuffs was sometimes as low as zero.

TAMU engineers noted that the planners had asked for the DCS to be deployed on the East Pacific Rise, one of the most hostile environments that might be encountered, within a relatively short time-frame. The planners had given the impression that they see the DCS as the saviour of the programme. This myth must be dispelled. The DCS is a working concept which needs much further development effort. Even then, it will constitute only one member of the ODP armoury. The conventional APC/XCB/RCB system is performing extremely well and will continue to be widely deployed. It is important that a true perspective be established.

It was noted that these comments have important implications for downhole measurements. The key question is whether ODP can justify developing high-temperature slimhole logging tools when (i) the DCS is not yet proven, (ii) when proven it will constitute a part, possibly the minority, of the overall drilling operations, and (iii) only a subset of its deployment would be in high-temperature environments. The correct approach is to design a coupled system to address each scientific objective. The system should comprise drilling, coring and logging, each of which should be dovetailed with the others in a way that maximises the prospects of achieving the scientific objective.

PCOM had asked TEDCOM to consider the question of hole stability in loose sands so that these might be logged. There are various commercially available additives that "cement" the borehole walls. Heavy mud additives routinely provide adequate hydrostatic pressure to hold up the hole. Although certain logs can be run through pipe, there is variable data degradation. Some tools cannot be run in pipe. For these reasons, a solution which avoids pipe is much more preferable from both data quality and data quantity standpoints. The various additive options are to be evaluated.

(v) KTB

Draxler reported that the large rig had been initiated and that the main hole was spudded on 6 October 1990. Target depth is 10 km with the option for negotiating a possible extension to 12 km. The logging programme is planned to occupy 151 days. Because the pilot hole has been fully logged and tested to the final depth of 4 km, only a limited logging programme is planned over the top 3 km of the

main hole. A complete logging coverage is planned from 3 km downwards, allowing a 1 km "overlap" of full logging data between the two holes.

The post-orientation of cores needs a clear-cut depth correlation. In this respect, the Formation Microscanner (FMS) is an important facility. Back-to-back tests have shown that the resolution of the ODP FMS tool is better than that of the standard Schlumberger FMS.

Expected bottom-hole temperature (at 10 km) is 300°C: this figure is based upon an extrapolation of data from the pilot hole.

An English-language summary report of results from the pilot hole is available as KTB Report 90/8.

6. Tool Monitor Reports

i) Geoprops Probe

Karig reported that two tools have been manufactured, at least one of which is at College Station awaiting testing in the TAMU experimental borehole. The tool is deployed in conjunction with the Motor-Driven Core Barrel (MDCB). The MDCB is due to be tested at sea during Leg 134. Karig has contacted the Co-chiefs of Leg 138 (Davis, Mottl) to discuss the deployment of the tool at Sedimented Ridges.

ii) BGR Borehole Magnetometer

Draxler reported that work is progressing on upgrading the tool.

iii) LAST

Moran reported that the LAST II tool is still in Houston awaiting offshore tests in the Gulf of Mexico. If successful, the tool will be scheduled for deployment in ODP, probably during FY92. A further field test on the JOIDES Resolution would be needed prior to scientific deployment.

DMP Recommendation 90/16

"The Lateral Stress Tool II should be tested at sea by ODP at least two legs prior to its proposed scientific deployment, in order to allow adequate time for any residual modifications to be made."

iv) Wireline Packer

Scholz described the deployment of the wireline packer during Leg 133 from his informed standpoint of the electronics technician responsible for the tool's operation. During Leg 133 there were two attempts to deploy the wireline packer. In both cases the succession comprised soft pelagic sediments overlying reef material. This situation gave rise to unstable overgauge holes.

The first attempt, at Site 812, failed on the rig floor. An attempt was made to assemble the tool horizontally but the tool flexed and the weakness of the quick disconnects caused breaks in the high-voltage feedthroughs. Efforts to repair the feedthroughs resulted in damage to other components. The attempt at deployment was then abandoned. Remedial action includes redesigning the quick disconnects to make them more reliable and assembling the tool vertically for which highly stable environments are needed.

The second attempt at deployment, in Hole 816C, did involve assembling the tool vertically. The packers could not be fully set against the borehole wall. The cause was believed to be silt suspended in the borehole fluid, which clogged the intake filter. The packers deflated satisfactorily in terms of the hydraulics but mechanical deformation prevented their complete collapse to less than the 4-inch drillpipe internal diameter.

Scientifically the exercise was fruitless but much was learnt about the shortcomings of the tool. For example, there is a problem with the design of the sampling bottles. The wireline packer uses a syringe type but a major drawback is the dead volume of fluid which is present before pumping begins. Even if distilled water is used, this can negate the scientific results unless it is tagged to allow the dead volume to be evaluated. Thus, at present, there is no prospect of a sample containing 100 per cent formation fluid. There will always be contamination. To overcome this, it will be necessary to take several samples at each depth location and determine their variation with time. This would require smaller syringe bottles to allow a greater number to be installed. A possible alternative strategy might be to use an evacuated type of bottle. Also a higher quality of inflow valves to the sampling bottles is needed. These are currently rated to 400 psi: they need to be rated to 10 000 psi. It was now apparent that the TAM engineer who designed the tool did not understand how critical it is to have good sample quality. The packer problem might have to be addressed by approaching a different manufacturer. In theory the packers are capable of expanding to 13 inches but the practical limit has probably been around 12 inches. Now it seems that a safer limit to avoid the packer deformation problem might be 10.75 inches.

In concluding his presentation Scholz emphasized that these comments were "hot off the press" and that a much fuller evaluation of the tool's performance by LDGO was needed before one could identify precisely what remedial action is required. At this stage it is not possible to state how much engineering work is needed to render the wireline packer a fully operational tool.

The Chairman thanked Scholz for taking the time to come and give such a frank and open briefing to the Panel. The subject matter focussed attention once again on those same key issues that had previously been of concern to the Panel. How good had the networking been between the logging contractor, the wireline packer subcontractor (Stanford University), and the manufacturers (TAM, Inc)? Why was the tool accepted from TAM as a working tool? Why

was the tool deployed without thorough and satisfactory land tests? Each time a problem is solved, a new one seems to arise. Initially it was the packers, then the motors; now it is sample integrity and tool robustness, with new doubts about the packers. The saga could not be allowed to continue indefinitely. At some point a critical evaluation would have to be made of the desirability of continuing with the wireline packer vis-a-vis some alternative technology.

Anderson responded by emphasizing that the wireline packer constituted new and ambitious technology that is not available anywhere else. It is one of the first examples of the ODP having to advance technology for its own specific purposes. These tasks have to be undertaken within the fiscal constraints imposed by ODP: these are rarely adequate for full and complete engineering to be effected. The difficulties are compounded by what the tool is required to do. Packers have to extend to four times their deflated diameter; there is an exceptionally long wireline (c.30 000 ft); and everything has to be compatible with the small diameter constraints imposed by the drillpipe. It is true that there has not been a systematic land test of the tool. However, the geochemistry community were keen to acquire the data that the tool should provide and pressure was strong for the tool to be run prematurely.

Lysne pointed out that the wireline packer is a subset of a much wider problem. Tool development is expensive but it can rarely be addressed in ODP with commensurate resources. Other examples are the Diamond Coring System and the Geoprops Probe, both of which appear to be supported at the critical level.

Key future deployments of the wireline packer are Hole 504B and Sedimented Ridges, the latter being an especially difficult environment. After much discussion, DMP formulated the following recommendation with the object of enhancing the prospect of appropriate data being acquired in these key areas, either by using the wireline packer itself or through alternative technology.

DMP Recommendation 90/17

"Since the wireline packer is not functional, at least in unstable overgauge holes, an urgent evaluation should be undertaken by LDGO of what is needed to make the wireline packer perform. LDGO should prepare such a report for the next DMP meeting. A rigorous test programme should be satisfactorily concluded before the tool is deployed for scientific purposes at sea. The first scientific deployment should be where hole conditions are good. In view of the doubts concerning sample integrity and tool robustness, LDGO should also examine alternative technology to prepare for the possibility that the wireline packer might not eventually achieve the status of an ODP functional tool."

v) Sediment Magnetometer

Foucher described briefly the two constituent, but separate, tools for measuring the modulus of the magnetic field (to within 0.1 nT) and susceptibility (to within 10^{-6} SI units). The latter can be

ombined with other Schlumberger tools. The tool has been specifically designed for ODP in terms of diameter, i.e. 3.75 inches. Another version has been built with a slightly larger diameter. The sediment magnetometer is scheduled for deployment on Leg 134, which was about to start. The tools are currently on board ship.

It is no longer proposed to record daily field variations on the sea floor. Instead a magnetometer will be placed on an island 100 km from the drillhole and these records will be compared with those from a second magnetometer on a dingy close to the borehole location.

It was noted that the University of Munich has a susceptibility tool with the same sensitivity as the above.

vi) Flowmeter Tool

Morin reported that approval was received one month ago from NSF for the flowmeter proposal to be pursued under their ODP equipment development programme. The purchase order is being issued imminently. The tool will be ready by the end of the calendar year with land tests scheduled at LDGO in January or February 1991. The tool is scheduled for use on Leg 137 at Hole 504B. If the tool functions properly at sea, it will be turned over to ODP for the Sedimented Ridges leg. The tool can be used in hot holes because it does not contain any rubber packer elements except for that positioned uphole in the casing which should be further cooled by the downflow of injected waters.

vii) Japanese Downhole Magnetometer

Yamano reported tht the Japanese downhole measurement group has started to make a new downhole magnetometer. Capabilities and specifications of this instrument are expected to be as follows:

Sensors:	Three components of the magnetic field and magnetic susceptibility
Digitizer:	16 bit A/D converter
Resolution:	To be determined Depends on selected dynamic range
Max. Depth:	6000 m
Max. Temp:	180°C (< 4 hours)
Pressure Case:	3 or 4 stainless steel cylinders Each case is 1.1 m long.
Diameter:	< 96 mm
Heat Insulation:	Combination of dewar bottle and heat sink material

Data Acquisition: Serial data transfer through the logging cable

Logging Cable: Four-conductor cable is necessary

The magnetometer will be completed by the end of June 1991 so that it can be available for use in Hole 504B on Leg 139, as a third party tool if possible. Yamano requested information on the specifications of the logging cable to be used on Leg 139 and details of when and how the tool should be shipped.

In thanking Yamano for his contribution, the Chairman noted that the German magnetometer is already earmarked for Leg 139. Another candidate is the refurbished University of Washington magnetometer. Clearly we need to sort out priorities. The Panel view was that we should follow rigorously the guidelines for third party tool development and deployment, which have been approved by PCOM, and that the tool which best satisfies these guidelines should be the premier candidate.

DMP Consensus

The approved guidelines for the deployment of third party tools should be published in the JOIDES Journal.

This action is to be progressed by Fisher who will be receiving appropriate copy from the Chairman.

[ACTION: WORTHINGTON, FISHER]

7. Logging Contractor's Report

Golovchenko reported that the LDGO Borehole Research Group now have four full-time log-analysis personnel for data processing, archiving and meeting data requests. The work load has increased greatly, especially since the FMS was introduced. During the past three months there have been 99 requests for data, an increase by a factor of two. The logging school recently held in Australia had been the 14th in the series: an updated version of the logging manual had been prepared for that school.

The Chairman congratulated LDGO on their increased role. The growing demand for log data was a testimony to the success of the logging programme and to an increased realization within the community of the scientific benefits that the data can bring.

Golovchenko continued by discussing training matters. LDGO has started to train two TAMU technicians who will fill the slot that is 50% dedicated to shipboard FMS processing and VAX station maintenance. One visiting scientist (from the UK) has also been trained in FMS processing.

FMS data are being presented in the Initial Reports (Part A) volumes in microfiche form. The VAX station for FMS processing has been shipped and is currently being installed on the JOIDES Resolution.

The upcoming leg (134) is also the first leg in which deployment of the German digital BHTV is scheduled. In response to a question, Golovchenko reported that there is no provision for processing BHTV data at LDGO. This is in marked contrast to the FMS situation: yet, these tools lend themselves to conjunctive use. The Chairman recalled that special funds had been provided to secure a back-up digital televiewer, that BHTV data are a prime input to one of DMP's thematic thrusts (Global Stress), and that the Tectonics Panel are strongly interested in breakout-related interpretation of BHTV images. The Panel saw the absence of a processing facility as inconsistent with this overall situation.

DMP Recommendation 90/18

"Facilities should be established at LDGO for post-cruise processing of data acquired using both analogue and digital borehole televiewers."

Golovchenko reported that the logging tools and truck donated by ARCO had been tested. For the most part they functioned well, although some minor problems need resolving. Money exists for at least one tool to be re-packaged for high-temperature deployment. There is also NSF funding for the development of a dipole shear-wave logging tool. This work is to be undertaken by LDGO (Goldberg) in collaboration with ARCO.

Leg 132 involved the attempted deployment of a slimhole gamma-ray caliper tool (borrowed from Zoback, Stanford University) in Hole 809F drilled with the DCS. The aim was to see if logging tools could be deployed with the DCS. Four different attempts were made to lower the tool below the pipe but this could not be accomplished due to an obstruction at the bit, believed to be basalts wedged above the bit throat. The test was therefore inconclusive: it has not yet been demonstrated that logging tools can be deployed with the DCS.

Yamano reported on the ONDO experiment using a long-term temperature recording system that was deployed in Hole 808E during Leg 132. Data retrieval has been attempted twice. The first attempt was made in July using a small boat, but nothing could be heard due to difficulties with the on-board data receiver. The site was re-visited in October, this time by a research vessel, but no answer was received from the system. A further attempt to recover the data will be made by lowering an acoustic data logger down to the sea floor near Hole 808E. In view of the rough seas that prevail around the Japanese Islands in Winter, this operation will be scheduled no earlier than April 1991.

Golovchenko reported that Leg 133 had broken all records. Twelve holes were logged with more than 5 km of logs being obtained. The seismic stratigraphic tool combination was always run, mostly as part of the quad combo. The FMS was run in most holes. The geochemical tool string was run in clay holes but not in pure carbonates. GLT precision was verified through excellent

repeatability. The excellent and comprehensive logging data are especially significant in view of the sometimes sparse core recovery.

Leg 133 also saw the first deployment of the new side-entry-sub. This is faster to deploy and is strengthened so that there is less risk to the drillpipe and the logging tool. The new SES was deployed in just one hole, 812B.

DMP Consensus

Panel wish to compliment TAMU engineers on the successful and timely development of the new strengthened side-entry-sub.

8. High Temperature Technology

The Chairman introduced this important topic by summarising the current situation. High-temperature logging technology will initially be required for Legs 139 (Sedimented Ridges) and 140 (East Pacific Rise). The latter will be drilled with the DCS, the former with conventional hole diameters. High-temperature slimhole tools will be needed for Leg 140 but larger diameter tools would suffice for Leg 139.

At present, the DCS is not established technology. The worst scenario is that it might prove impossible to drill at EPR; the second worst is that holes will be drilled but core recovery will be poor. The third scenario, which is the hoped-for target, is to drill DCS holes with very high core recovery. All of these scenarios are possible; their existence makes it very difficult to formulate a plan for high-temperature logging in slimholes.

The DMP position, which has been governed as much by fiscal constraints as by scientific considerations, is to concentrate on the high-temperature measurement in slimholes of those properties which cannot be measured on core. This philosophy pre-supposes good core recovery: if core recovery is poor, the strategy breaks down. Panel is aware of this potential outcome, but fiscal constraints prevent a more ambitious range of downhole measurements at this stage.

The situation had been eased somewhat by the announcement that JAPEX super-high-temperature tools could be leased to ODP. Some of the tools listed in the original descriptive publication (Itoh T., Miyairi, M. and Takeyama, T., 1985 "Super high-temperature geothermal well logging tools (450°C) and log interpretation", Int. Symp. on Geothermal Energy, Int. Vol., Stone, C. (Ed.), 471-479, Geothermal Resources Council, USA) as stand-alone tools are apparently not available, but a combination temperature-pressure-flowmeter tool is under development and this is to be offered to ODP.

Yamano provided the following account of tool status. The new slimhole PTF combination tool will probably be used on Leg 138 (Sedimented Ridges). The tool can measure pressure, temperature,

and flowrate, and can be operated at a temperature of up to 375°C for two hours. The diameter of the tool is 43 mm. The tool has just been completed, and the first test in a high-temperature borehole will be made in the middle of October 1990.

Since this tool is new, and in view of the fact that other technology is available, Panel considered that a back-to-back study should be undertaken in a hot slim hole on land with the object of establishing the reliability, precision and compatibility of the various pressure-temperature tools. Panel incorporated this view into the following recommendation, which also reflects the earlier stated priorities pertaining to fluid sampling (for geochemistry) and formation resistivity (for porosity in fractured media).

DMP Recommendation 90/19

"For high-temperature logging purposes, the efforts of ODP should be concentrated on the following three areas, listed in order of priority.

(1) Temperature and fluid pressure
(2) Fluid sampling
(3) Formation resistivity

For temperature and fluid pressure, funds should be provided for a back-to-back study of the available slimhole tools in a hot hole (c. 300°C). The best performer(s) should be leased.

A slimhole borehole-fluid sampling tool should be developed by modifying existing technology.

Formation resistivity should be addressed by double-dewaring the LDGO ARCO tool, or an alternative tool; this objective falls away if there is insufficient funding for all three objectives to be progressed properly and concurrently."

The above recommendation (90/19) relates to the short term: this technology will be required within the next 12 months. Panel reiterated that interactions between different scientific programmes are needed for long-term technological achievement.

Panel re-affirmed their awareness that drilling, coring and logging constitute a coupled system which must be designed to meet scientific objectives. An important prerequisite for DMP Recommendation 90/19 is that the DCS produces good core recovery. To enhance these prospects, an experienced diamond-core driller should direct the drilling operation.

DMP Recommendation 90/20

"Deployment of the Diamond Coring System (DCS) in a scientific leg should be under the direction of an experienced diamond-core driller."

9. Pacific Planning

i) Legs 134-140

Fisher reported on plans for the WPAC/CEPAC programme that comprises Legs 134-140.

Leg 134: Vanuatu

The sonic core monitor is to be tested with the rotary core barrel: a prototype already exists for the XCB. The aim is to orient cores by inscribing. No changes to the logging programme.

Leg 135: Lau Basin

The logging programme is virtually unchanged. A drillstring straddle packer deployment is scheduled for Site LG3.

Leg 136: Oahu

PCOM approved two days for conventional and BHTV logs together with testing of the borehole seal, as proposed by DMP. There will be no VSP. Panel considered that a key factor in the success of this hole is the bonding of the casing. A cement bond log (CBL) would indicate the presence of any potential leakage zones behind the casing. The sonic log should be run in two passes, one in conventional mode to provide seismic control and one in cement-bond mode to provide details of casing bonding.

DMP Recommendation 90/21

"During Leg 136, the sonic log of the Oahu test hole should also be run in cement-bond (CBL) mode."

Leg 137: 504B/Engineering 3A

No changes to the proposed logging programme but the FMS has been requested by one of the Co-chiefs. Panel considered that since the FMS is effectively a standard tool, it should be run in 504B in order to complete the already comprehensive logging data at this site.

DMP Recommendation 90/22

"During Leg 137 the Formation Microscanner (FMS) should be run in Hole 504B."

[Note: this Recommendation focusses part of DMP Recommendation 90/8 in which the schedule for deploying the FMS was left open.]

Leg 138: Eastern Equatorial Pacific

No changes to the proposed logging programme. This leg is a candidate for testing (at total depth) the LAST II tool.

Leg 139: Sedimented Ridges

No changes to the proposed logging programme but the spinner-flowmeter has been included. The pre-cruise meeting will take place in January 1991.

Leg 140: Engineering 3B

Programme depends on the results of Leg 137. Candidates are 504B or East Pacific Rise.

ii) FY 92 Pacific Prospectus

Fisher reviewed possible FY92 programmes. There are several candidates.

Atolls, Guyots and Aprons
Bering Sea
Chile Triple Junction (I and II)
Cascadia Margin
North Pacific Neogene
East Pacific Rise (I and II)
Sedimented Ridges II
Gas Hydrates
Hess Deep (4 legs)

Cowan advised that only six of these (fourteen) candidates could be accommodated within FY92. There would therefore be much redundancy if DMP were to invest time now in formulating a detailed logging programme for all of these proposals. It would be appropriate to address these issues in detail at the next DMP meeting, by which time the PCOM selection will have been made. The Chairman agreed to give FY92 planning the highest priority at the next DMP meeting.

[ACTION: WORTHINGTON]

Several topics of special interest to DMP were elucidated for information.

Cascadia

Carson tabled the following report in absentia, as the official panel representative to the Detailed Planning Group for Cascadia Margin Drilling.

That group met in mid-August and they recommended a drilling programme which includes holes off both Oregon and British Columbia. They unanimously endorsed the DMP resolution that precruise planning should include extensive meetings between scientific staff and the operations group to maximise the probability of successful logging. There was some considerable discussion prior to that endorsement. The group assembled had drilling experience on Nankai, Barbados, Peru-Chile, and Japan margins and were fully aware of the difficulties of logging in these convergent margin settings. They

were, nevertheless, more optimistic about the prospects for successful logging than was DMP at our last meeting. They noted, for example, the nearly full suite of logs obtained on the Japan Margin transect on Leg 57 which followed careful hole conditioning. They felt that because the proposed holes were relatively shallow and because the margin exhibits extensive carbonate cementation, the prospects for successful logging were good. They enthusiastically endorsed the notion, however, that detailed strategies for hole conditioning and logging procedures be worked out well in advance of the drilling programme. The number of holes proposed for the margin has been substantially reduced and representatives of the Borehole Research Group from Lamont and the Ocean Drilling Programme from TAMU had produced a revised logging programme that can be accommodated within a single drilling leg. It is accurate to report that DMP's concerns were carefully and conscientiously considered. The Planning Group produced a plan that provides for a logging programme that is now significantly different from that originally proposed for this margin.

Fisher added that the updated downhole measurements plan for Cascadia is extensive. Standard logs, including FMS, and the WSTP are scheduled for all holes: wireline packer, drillstring packer, VSP and BHTV are scheduled for selected sites. In all, 16.7 days of rig time have been set aside for downhole measurements.

Hess Deep

Fisher presented a synopsis of a possible four-leg programme. The objectives are to study the igneous, tectonic and metamorphic evolution of fast-spread oceanic crust and to evaluate the structure of the Hess Deep rift valley. No logging is discussed in the proposal but a repeat of 504B seems desirable.

Gas Hydrates

The proposal specifies the Peru Margin but it could equally be applied to Cascadia. The objectives are to quantify factors that control the formation of gas hydrates, to characterise them geochemically, physically and thermally, and to identify methane sources. Logging plans have not been formulated but they should be comprehensive.

The Chairman commented that the logging characteristics of (methane) hydrate have been addressed in the oil-industry literature. He would extract this information and present a brief synopsis at the next DMP meeting, if Gas Hydrates are scheduled by PCOM for FY92. This might guide the choice of logging programme.

[ACTION: WORTHINGTON]

Role of Formation Microscanner

Panel felt that the success and increased use of the FMS, together with the onset of a shipboard processing capability, require that it now be classified as a standard tool for the planning of logging

surveys for FY92 and beyond. The merging of the seismic-stratigraphic and litho-porosity tool combination into the "quad-combo" had effectively created a vacancy in the tripartite standard logging suite. Panel proposed that the FMS be allowed formally to occupy this slot.

DMP Recommendation 90/23

"The Formation Microscanner should be a standard ODP logging tool for planning purposes, i.e. it should be run in all holes that are designated for standard logging."

10. COSOD I Objectives

Golovchenko provided a list of COSOD I objectives but did not have a synopsis of how ODP downhole measurements have helped COSOD I objectives to be met. Golovchenko would prepare a summary and forward it to the Chairman for attachment to the Minutes. The Chairman noted that the minutes would have to be distributed quickly in order to be incorporated within the mailout for the PCOM Annual Meeting in November/December 1990.

[ACTION: GOLOVCHENKO]

11. ODP Renewal

Panel disussed actions that might be taken over the next 12 months to facilitate ODP renewal. Recent developments include the following:

i) Publication of thematic JGR volume focussing on ODP downhole measurements

ii) Publication of translated paper by Worthington et al. on "Scientific applications of downhole measurements in the ocean basins" in a Japanese earth science journal.

iii) Presentations by Chairman to NERC (UK) and Australian VIPs on "Technological achievements of ODP".

Future suggested actions are listed below:

i) Distribution of ODP film (see JOI Report, Item 4) to member countries.

ii) Chairman to write up an invited paper for "Reviews of Geophysics" on the evolution of logging technology from early industrial applications to the present advanced scientific uses.

iii) Development of a paper, possibly for "Geotimes", on the usage of ODP data, highlighting the growth.

12. Hole Stability

Karig commented on the aftermath of Nankai. The hole stability problem is being seen as one of swelling clays. In fact, a primary cause is believed to be that the sediments are not strong enough to withstand the prevailing horizontal stresses, and that these conditions have given rise to breakouts. This contention is supported by the fact that both the major hole and the tie hole were overgauge for much of their depths, a condition which cannot be attributed exclusively to sand sloughing. It is important that this issue be resolved for it has important implications for future drilling on accretionary margins (e.g. Cascadia).

The Chairman suggested that some focussed action was needed. Otherwise, there will continue to be uncertainty about the "loggability" of holes drilled in accretionary wedges. It is important to ascertain whether the underlying problem is one solely of stress-driven breakouts or of clay swelling (which could accentuate any prevailing tectonic effects).

DMP Recommendation 90/24

"An ad hoc working group comprising engineers and scientists should be convened for a one-day meeting to review causes of hole instability in Nankai-type situations and to propose remedial action. This meeting should be scheduled to take place immediately prior to the next DMP meeting in College Station in January/February 1990."

Panel observed that the working group meeting should be preceded by a study of the mineralogy and of the mud treatment at Nankai.

[ACTION: KARIG, SONDERGELD]

Fisher will arrange for details of the mud treatment to be provided.

[ACTION: FISHER]

Fisher and Karig will arrange the organisational details including the list of invitees. Interested members of DMP will be invited to attend.

[ACTION: FISHER, KARIG]

[N.B. The date for the working group meeting has been set as 6 February 1991, subject to PCOM approval]

13. Safety

A concern was expressed about the effects of H_2S if this were to be encountered during the Sedimented Ridges leg. H_2S can cause a hardening of the logging cable if the latter is not H_2S-proof. A precaution is to wait between logging passes to allow time for absorbed H_2S to escape. This, however, will slow down the logging

programme. The H_2S issue is being addressed by the Pollution Prevention and Safety Panel (PPSP). Chairman will make PPSP aware of DMP concerns.

[ACTION: WORTHINGTON]

14. Panel Membership

The Chairman reported that two panel members had asked to rotate off DMP in the near future. The Chairman would be writing to all DMP members asking for nominations for the US constituencies.

[ACTION: WORTHINGTON]

Cowan pointed out that PCOM wish to see two nominations for each slot so that they have a choice. The Chairman replied that he was unhappy with such an arrangement given that approval-in-principle now had to be sought from each nominee before PCOM was approached. It would be highly embarrassing if a person from industry secured the permission of his/her management and supplied a resume, only to be told later that the slot had been given to someone else nominated by the same panel chairman. A preferred approach, and one which involves considerably less work, is to submit to PCOM names that match the vacancies, and if PCOM find that any name is not acceptable, a fresh solicitation be made for the unfilled slot. This would still give PCOM a choice. The Chairman will solicit the views of other panel chairmen at their annual meeting.

[ACTION: WORTHINGTON]

15. Shipboard Integration of Core and Log Data

This issue was addressed through a joint session with the Shipboard Measurements Panel (SMP). The joint meeting was co-chaired by the DMP Chairman and the SMP Chairman (Kate Moran). The principal objectives were to review the recommendations of the JOI Workshop on ODP Shipboard Integration of Core and Log Data, held at the University of Miami on 29-30 August 1990, to develop from these an agreed listing of user needs for integrated core and log data, and to formulate a joint, composite recommendation for future action.

The meeting reviewed the workshop report and debated each specific recommendation. The following listing, presented here as DMP Recommendation 90/24 and duplicated within the Minutes of the SMP meeting held in Townsville during the period 9-11 October 1990, contains the agreed specification of user needs.

DMP Recommendation 90/25

"ODP Shipboard Integration of Core and Log Data, Specification of User Needs

(a) General Observations

i) Core and log data are the products of complementary measurements. Logs help to put core data in perspective; core data can be used to calibrate logs.

ii) Earth scientists are increasingly required to work with data measured at different scales and rooted in different subdisciplines. The integration of core and log data is an important component of the broader process of scale and subdiscipline integration in contemporary earth science.

iii) Computerized barrel sheets constitute a useful tool for integration and display of core and log data.

(b) General Requirements

i) Standard procedures are needed for the integration of core and log data.

ii) Integration procedures should be compatible with methods for subsequent correlation with seismic data.

iii) It is expected that a major part of the core-log correlation and definition of reference depth will occur shipboard. The procedures, however, should be sufficiently flexible to allow for review and changes at the first post-cruise meeting.

(c) Specific Requirements

Reference depth

* All core and log data should be referred and tied in to a common depth scale. These depths are to be known as the reference depth.

* The barrel sheet should have two depth columns. Core photographs and visual core description should be related to a core/section/interval depth column. All other plotted (core, log) data should be related to a reference depth column. The relationship between the two depth columns should be depicted graphically.

* Software (which runs on MacIntosh and IBM-PC compatible computers) for calculating reference depth and the core parameter file should be available on the file server on board ship. This software can then be accessed by shipboard scientists for including the reference depth in their core data files.

* The LDGO logging scientist should be responsible for copying the REFERENCE DEPTH logs to the file server. This does not include the FMS data which will be available only on the Vax station (in mbsf).

* Bottom of pipe should be used for tying logs to pipe depths.

Data Acquisition

* Standard, compatible ASCII tabular formats should be adopted for all core and log data. Drilling parameter data files should also be available in ASCII tabular formats.

* All discrete laboratory measurements should be accompanied by comments on lithology. Provision should be made in spreadsheets for a lithology comment column.

* Spreadsheet templates for laboratory data entry should be available for both MacIntosh and PCs. Data should be downloaded to the VAX at the end of each hole as a minimum so that error checks can be performed onboard in cooperation with the shipboard scientists.

* In order to achieve adequate spatial resolution, the recommended frequency of discrete laboratory physical properties measurements should be increased to a minimum of two measurements per section. Legs should be appropriately staffed in order to meet this requirement. Drilling in hard rock may necessitate an exception to this sampling frequency. In such cases, the number of samples taken can be reduced.

* To improve core data correlation, discrete physical property measurements should be selected at the same reference depths as all other core measurements.

* The physical properties laboratory should be upgraded; the mass and volume measurement devices should be connected to a PC.

* Natural gamma should be added to the MST for direct core-log integration.

* Magnetic susceptibility log acquisition (in the resolution range for sediment) should be added as part of the standard logging suite for direct core-log integration.

Data Analysis

* Processing/integration/interpolation software is needed (e.g. a modified version of CORPAC).

* Upgrades to graphics software/hardware should continue for shipboard labs. (To facilitate this and related recommendations, an additional computer person-year is recommended for science operations requirements).

* A core-log data correlation specialist should be identified within the scientific party of each leg. A key responsibility of this position is to determine the common reference depth. If necessary, additional persons to carry out physical properties measurements should be sailed to free a key staff member for this function.

* Core-log correlation involving FMS and/or BHTV data should be undertaken onboard where possible. If this cannot be achieved, then the task should be completed as part of the scientific investigations post cruise.

* Graphics must be sufficiently flexible to allow display in either leg-specific or topic-specific mode. The spreadsheet/graphics/correlation system should be sufficiently versatile to allow additional utilities to be incorporated as needed.

* A more substantial database of logs measured through pipe should be acquired and incorporated into an integrated data set for better interpretation of this data type. A calibration study of through-pipe logs should be initiated for a wide range of lithologies.

* An ad hoc specialist group should be inaugurated to review progress and to provide a forum for ongoing discussion of issues related to core-log data integration.

Data Availability

* All data must be copied to the file server for availability to all shipboard scientists. The logging scientists should be responsible for copying all standard log files in ASCII standard format and individual core laboratory scientists should be responsible for each respective core data set (physical properties, geochemistry, etc.)."

Requirements

Graham (ODP/TAMU) reviewed the equipment and software requirements for the above Recommendation to be effectively implemented.

Equipment

i) Sonic core monitor.
ii) Natural gamma (spectral) sensors within MST.
iii) Physical properties workstation.
iv) Networked magnetics laboratory workstation with discrete susceptibility data acquisition capability.
v) Core/log integration specialist workstation.
vi) Automated split core MST for digital imaging of core.
vii) High resolution magnetic susceptibility logging tool.
viii) Bottom-hole-assembly "log-pipe" marker.

Software

i) CORPAC or equivalent.
ii) Computerised visual core descriptions.
iii) Templates or macro for spreadsheet data entry.
iv) CSI "reference depth" programme.
v) Data representation on barrel sheets.

vi) Lithology comments field added to data sets.
vii) Analysis of present network system for impact on data flow and storage.

Follow-up

There was a general appreciation that the joint DMP-SMP meeting had been a great success, partly because of the groundwork done at the Miami Workshop. It was considered desirable for the two panels to meet at regular intervals, with the next joint meeting possibly taking place in 12 months' time.

16. Next DMP Meetings

The next meeting of the JOIDES Downhole Measurements Panel is scheduled for College Station, Texas, around late January/early February 1991. This meeting should be preceded by the working group meeting on hole stability. Fisher will investigate the accommodation situation and report back to the Chairman.

[ACTION: FISHER]

[N.B. The next DMP meeting has been fixed for 7-8 February 1991]

The subsequent DMP meeting, in late May or early June 1991, will take place at the Lamont-Doherty Geological Observatory, Palisades, New York. The May/June meeting is being seen as a possible opportunity for a joint meeting with the Sedimentary and Geochemical Processes Panel.

[ACTION: WORTHINGTON, MIENERT]

17. Close of Meeting

The Chairman thanked Panel Members, Liaisons and Guests for their contribution to what had been a difficult meeting because of the tough issues that needed to be addressed. He acknowledged the hospitality of the Australian ODP Secretariat, especially Tony Crawford who had made the arrangements. The meeting closed at 6.00 pm on Saturday 13 October 1990.

PAUL F WORTHINGTON
19 October 1990

ANNEXURE I

CONTRIBUTION OF DOWNHOLE MEASUREMENTS TO THE ATTAINMENT OF COSOD I OBJECTIVES

In 1981, COSOD I defined the major thematic objectives of the Ocean Drilling Program (ODP), to which the Wireline Logging Program of the ODP has made substantial contributions in the form of solutions to the problems within these themes. Wireline logging has become a critical component of the program because it provides fundamental observations of the physical and chemical state of the Earth's crust by making in situ acoustic, electrical and nuclear measurements in oceanic boreholes; it also provides the only continuous record of the wellbore.

Sedimentary History and Global Process Objectives

The geophysical and geochemical logs in ODP holes provide the only continuously recorded data which can be used for detailed examination of the impact of climate change on the sedimentological record of the past. Log data from high latitudes (Labrador and Weddell Seas), as well as temperate (Japan Sea) and tropical regions (NW Australia and Oman Margin), have shown that cyclical variations in the sedimentary record result from climate changes induced by short-period orbital changes. Log data have demonstrated these cycles in sediments as young as Plio-Pleistocene, and as old as Jurassic (Leg 129; Old Pacific Crust).

ODP well logs provide a record of sedimentologic changes caused not only by short-period climatic variations, but also by long period events. As an example, a full suite of log data from the Exmouth Plateau off NW Australia provided a continuous record of 7-12 million-year cycles that are still being evaluated in terms of eustatic changes.

Tectonics Objectives

Logs from sediments of the ocean floor record major tectonic events in a direct physical and chemical sense. Subsidence histories, over-and under-compaction, salinity and pore-fluid compositional changes, compression, and erosion all produce distinctive signals which, though often overprinting each other, can be deconvolved from the logging record.

The mechanism by which a continent is rifted apart to form a new ocean basin is of fundamental importance to the earth sciences. Logging data were critical in showing that certain margins (Tyrrhenian Sea margin) do not undergo uniform stretching, but instead follow a "saw-toothed" pattern of development. In another case, the logging data were instrumental in demonstrating that erosion rather than subsidence was responsible for the development of the margin (Straits of Florida).

Perhaps the major contribution well logs make to unravelling tectonic history is in calibrating reflection seismic records, i.e. tying the travel-time of reflections to depth and thereby to actual rock in the drill hole.

Lithospheric Objectives

Logging is an essential element of crustal drilling programs because it provides a complete record of physical properties in the borehole, in contrast to the usually sparse recovery of core material in hard rock. Logs have been instrumental in measuring the effects of fluid/rock interaction in zones of basaltic alteration, diagenesis, and ocean/crust interchange, as well as providing a direct record of the chemical composition of pore fluids in ODP holes. Patterns of fluid flow have been studied by carefully applying currently available logging and experimental technology in ODP holes to obtain reasonable estimates of vertical flow rates and the two critical, controlling properties, porosity and permeability.

Logs also provide the only mechanism for routine measurement of the orientation of the tectonic stresses that drive the surface plates of the earth. Both the Borehole Televiewer and Formation Microscanner have recorded the direction of maximum horizontal compressive stresses in boreholes in the Indian and Pacific Oceans by imaging the orientation of breakouts in the well.

The scientific accomplishments of the wireline logging program of the ODP are covered in detail in the ODP Wireline Logging Manual, first published in 1987 and recently revised.

X GOLOVCHENKO
22 October 1990