

Minutes of JOIDES Downhole Measurements Panel Meeting
 at Woods Hole Oceanographic Institution
 Woods Hole, Massachusetts
 22-23 July 1986

Panel Members Present

M.H. Salisbury (Chairman)
 R.N. Anderson (ex-officio)
 K. Becker
 N. Fujii (alt.)
 J. Hovem
 E. Howell
 A. Jageler
 R. Jung
 S. O'Connell (TAMU liaison)
 G. Ohloeft
 J. Pozzi
 F. Sayles
 R. Stephen
 T. Timur
 R. Traeger
 R. von Herzen
 P. Worthington

Absent

S. Bell

Visitors

J. Cann
 H. Dick
 R. Jarrard
 T. Mayer

1. Introductory Remarks (Salisbury)

Two new members (Jens Hovem and Ralph Stephen) were welcomed to the Panel and appreciation was expressed to Dan Georgi, who just retired from the Panel, for his past help.

2. Past Minutes (January, 1986)

Approved.

3. LDGO (Jarrard, Anderson)

Schlumberger Operations.

Since the beginning of ODP, about 60% of all available hole has been logged. This increase is due to the 400 m rule and the fact that many shallower holes are being logged as well. The bad news is that the full suite of tools is seldom run: at 40% of the sites drilled, only 1 combination tool was run and both tools were run at only 12%. Even when logs are deployed, major intervals in some holes are not logged

because of pipe (16%) or bridges caused by swelling clay and sloughing (29%; of which 23% is in the sediments and 6% is in basement). The best results have been in basement because there are fewer cavings and because most basement logging has been conducted on dedicated minilegs or parts of legs set aside for borehole geophysics.

A long discussion by Jarrard, Ohloeft, Howell and Timur followed on how to improve the percentage of section logged. As an immediate step, it was recommended (Recommendation 12, Appendix 1) that the nuclear tools, including the ACT, be run through the pipe as they are brought up to the mudline. The data will be degraded but still quite useful and will take almost no additional time to acquire.

A second step is to prevent bridges from forming. In the past, ODP and DSDP used fresh water muds to condition the hole and lift cuttings. This can cause serious swelling problems. At a recent "mud meeting" held at TAMU with representatives from LDGO and industry, it was recommended that the pore water salinity should be checked periodically with a capillary suction tool and the drilling mud spiked with KC1 to match the pore water salinity and prevent shock. KC1 and polymer (Drispac) additives are being tried on Leg 110 but bridges are developing anyway.

Discussion. (Ohloeft) Additives can really screw up logs. (Howell) A good mud program can be very difficult and expensive, especially in an open hole. Another approach might be to case off problem areas with flexitube. The Panel felt that the present approach should be given a chance but recommended if it didn't work, to convene a full-blown meeting with drilling engineers, clay chemists, geochemists and geotechnical specialists from industry to discuss the problem (Recommendation 16). Timur suggested that Mitchell (M.I.T.) should be invited to attend.

A third approach which is being taken is to modify the IFP (Simphor) sidewall entry sub/wet connect system to allow simultaneous pipe handling and logging. Thus if a bridge is encountered during logging, the tool can be raised into the pipe and the pipe extended to break through the bridge before the resumption of logging. This will also allow high temperature logging because it will be possible to circulate while logging. It would still be wise, however, to attach an AMS sub to all tools to monitor the temperature. After a successful rigging test on Leg 108, the sidewall entry sub was redesigned for use on Leg 110 at a cost of \$50K but could not be used because it failed to meet specs. It is now being re-tempered for use on Leg 111 with an AMS sub. It is estimated that use of the sidewall sub will increase logging (rigging) time by 1 hr/tool.

The wireline heave compensator is now in routine use. The bad news is that we still don't really know how well it's working since the only borehole accelerometer (GPIT) test of the compensator was made with a pad tool. This test suggests that compensation is affected by logging speed. After a brief discussion, the Panel strongly recommended (Recommendation 14) that a proper test of the wireline heave compensator be conducted with a high resolution tool such as the ACT or digital sonic tool. This means that LDGO will have to obtain permission from Schlumberger to hang the accelerometer on one of their tools. If the heavecomp is not doing the job, LDGO will have to build or rent from Schlumberger, a downhole accelerometer which can be used with every tool to correct the data itself.

The ACT was put on board for Leg 109 and will remain through Leg 112 in a joint effort with Schlumberger to develop a set of case histories in which the compositions determined by the tool are compared with compositions determined on

samples using XRF and XRD. Timur suggested and the Panel concurred (Recommendation 13) that LDGO conduct a full-blown test of the ACT (slow logging speeds, multiple repeat runs, open and cased hole) to determine its resolution and the optimum strategy for its use. Ohloeft suggested that Frank Senfli (U.S.G.S., Reston) should be asked to help calibrate the tool.

Specialty Tools

Wireline Packer (Anderson, Jageler)

The wireline packer project has gotten de-railed again, not because of financial or technical problems this time, but because of a misunderstanding in EXCOM. Since our last meeting, AMOCO has bench-tested and patented the key components of their new wireline packer and TAM has obtained a license from AMOCO to manufacture and sell the tool using their new (also patented) large volume packer which inflates from an initial 3" diameter out to 12". TAM has proposed to build us a simplified version of the tool (no filtration system, slower motor) which would isolate a 1 m section of the hole. This would be the first of these new tools actually built by TAM because we are first in line. Later versions will be built to withstand higher temperatures (210 and 300°F). The problem arises because AMOCO and TAM consider the tool design proprietary whereas the partner countries, under the terms of the MOUs, feel they should have access to any new technology developed using co-mingled funds.

The Panel, in a brief discussion, concluded that JOIDES had no rights in the matter since the tool was designed and developed without any co-mingled funds and since miniaturization for ODP use would involve no further patents. The Panel reiterated again the scientific need for a wireline packer and recommended again (Recommendation 15) that the tool be acquired as soon as possible. Salisbury was instructed to write a clarifying letter to EXCOM via PCOM to get this back on track.

BHTV (Anderson)

The BHTV, which has only been deployed three times during ODP is primitive (analog) and unreliable. Backup tools costing \$40K apiece are needed to make BHTV operations more reliable. In addition, LDGO entered into a contract with WBK in West Germany last year to convert two tools to digital operation (\$80K) but had to break the contract due to fiscal constraints. Thus the BHTV situation (like the wireline packer situation) remains unchanged since the beginning of the program.

Formation Microscanner (FMS) - i.e. Dipmeter

Schlumberger has developed a new 4 pad, multibutton microresistivity tool which presents a resistivity image of the borehole wall with much greater resolution than their earlier dipmeter. LDGO's attempt to get the U.S. Navy to fund the tool (\$200K) was unsuccessful. To get a cheaper tool will require talking Schlumberger into giving us a better price (\$200K seems high for a cost-only quotation) or going to a simpler version of the tool (an LDT with 1 instead of 4 multibutton pads for a price of \$50K).

VSP (Anderson, Stephen)

Experiments requiring the use of a borehole seismometer (VSP, OSE) have been funded by NSF and run on two legs (102, 104) and USSAC has just funded a single component

VSP experiment for Leg 111. Since these tools are seeing increasing use, the question arises, should a single component or better, a 3-component seismometer be made routinely available? This could be done by renting a tool from Schlumberger (\$15K/leg for a single component tool; \$100K for 3 components). Alternatively, USSAC is considering buying a 3-component tool for the program. At present, VSP and OSE operations only occur on a leg-by-leg basis in response to unsolicited or solicited proposals. The routine availability of such a tool would make it possible to run VSP on request but would require additional arrangements to process the data.

Temperature

ODP is entirely dependent on individual investigators to run temperature logs since a high resolution temperature tool is not included in the current Schlumberger tool inventory.

Budget Considerations

LDGO's 1987 budget is \$2.75M, of which only \$134K is earmarked for permanent equipment, including \$100K for the wireline packer (the rest being for tape racks, disc drives and spare parts). Additional equipment can only be purchased or rented if the budget is enhanced through more countries joining the program. The Panel was asked to prioritize the tools discussed above for acquisition under the enhancement budget, with the understanding that our recommendations might be re-prioritized at the next PCOM/Panel Chairmen meeting in January. After a lengthy discussion, the Panel ranked the tools as follows (Recommendation 15):

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|---|----------|
| Priority 1 (after wireline packer) | |
| <u>BHTV</u> . Backup analog tool from Simplec, then rent Schlumberger's new digital BHTV the following year. If it is not available by then, upgrade one of the Simplec tools with WBK digital electronics. | - \$40K |
| | - \$80K |
| Priority 2 <u>4-pad FMS tool</u> . | - \$200K |
| The \$50K single pad option, though viable, is much less attractive. | |
| Priority 3 <u>High Resolution Temperature tool</u> | - \$10K |
| Acquire French or German tool used on Legs 109 and 111. | |

The rationale for this ranking is that the BHTV and FMS tools will provide much-needed information on structure (dip and strike of beds, joints and faults), the BHTV will, in addition, indicate the direction of insitu stress and the temperature log will give information on heat flow and water circulation. The borehole seismometer, though extremely valuable, was not ranked for LDGO acquisition because it is unlikely to be used on every leg. The donation of a seismometer by USSAC, however, would be very welcome.

Other Operational Concerns (Jarrard)

In addition to the issues already discussed, a number of concerns have arisen over the past year which need discussion or DMP blessing:

- 1) Can TAMU be asked to set the pipe shallower, allowing more open-hole logging?
- 2) In unstable holes, shouldn't it be general policy to swab bridging intervals with multiple pipe runs?
- 3) In holes with bridges, shouldn't it be general policy to log the intervals between bridges as discrete increments, from the bottom up? (This will increase the amount of hole logged but increase logging times as well.)
- 4) Does the "standard suite" need to be redefined?
- 5) We have been providing shipboard parties with estimates of logging time to aid in planning; as a result, when 'time's up', logging is often terminated whether the suite has been completed or not. Should we be defining a logging program in terms of successful runs, not time?
- 6) Shouldn't it be acknowledged in planning that basement logging requires more time?
- 7) Should we establish a minimum tool weight to help with the bridging problem?
- 8) LDGO doesn't have enough travel money to send a liaison to all Panel Meetings. Can DMP representatives from member countries serve as liaisons (or at least attend) all non-U.S. meetings?
- 9) The neutron tool remains uncalibrated for hard rock holes. What can we do about it?
- 10) Should we establish a "VSP policy"? (All legs have the capability? All holes over a certain depth?)
- 11) Similarly, should we establish a temperature probe policy?
- 12) Should we encourage JOI to issue an RFP for a DSDP logging/physical properties synthesis?

The Panel considered items 1, 2, 3 and 7 as operational matters to be left to the discretion of LDGO and TAMU; discussion of 4 and 8 was postponed. Item 5 has been discussed at length in earlier meetings; our intent is to get good data. We only give time estimates as an aid; if these are inadequate, LDGO should build contingency time into the estimates based on actuals. Item 6 is done in fact, if not in theory, when we design our basement operations. Item 10 has been partially addressed above; the sense of the Panel is that VSP operations should be driven by proponent or co-chief demand, not DMP decree. Item 11 was only briefly discussed but the feeling was that HPC-T probe measurements should be taken routinely since they add considerably to the data base and take so little time. Item 12 - yes.

Item 9 (neutron log calibration) was discussed at more length by Timur, Traeger and Anderson. The problem is that the neutron log (e.g. CNG-T) can be off by as much as 15% in hard rock. Several approaches can be taken: the tool can be recalibrated if

Schlumberger will give us their (proprietary) design specs and the data from the recalibrated tool compared against sample data. Alternatively, a variable-spacing tool can be built and the specs kept in the public domain, as proposed by Lisne. In either case, a systematic study of neutron absorption coefficients should be done on a variety of igneous rock types (Chevron is equipped to do this; Lisne has proposed to do it using a pile in Utah). The Panel asked LDGO to ask Schlumberger for the CNT-G calibration and design (spacing) specs, endorsed the sample and tool calibration studies proposed by Lisne and suggested that he apply to USSAC for funds.

4. Recent Results

Leg 105 - Baffin Bay/Labrador Sea (Jarrard)

Detailed analysis of the Leg 105 logs shows that Milankovich cycles with periodicities of 19-23 ky, 41 ky, 95 ky, 410 ky and longer can be seen in the natural gamma, sonic and porosity data. The cyclicity in the data is due to changes in porosity which reflect glacial-interglacial changes in sediment grain size and organic content.

The Panel noted that the detection of cyclicity using logs is an exciting new research direction which should be pursued. The potential exists to use cyclicity in sediment logs to determine sedimentation rates and ages but multiple-pass ACT runs should be made at selected sites to determine the lithologic carriers of the cycles and detailed micropaleontologic and magnetostratigraphic studies should be made to determine their exact timing. The best candidates for such studies would appear to be carbonates deposited at high sedimentation rates (35 m/my or more). It was suggested that a proposal should be drafted with SOHP input to drill specifically for the purpose of Milankovich cycle logging. In the meantime, it was recommended (Recommendations 3 and 4) that such studies be piggy-backed on existing legs, where appropriate.

Leg 106 - MAR Bare Rock Drilling: No logging attempted.

Leg 107 - Mediterranean (Anderson)

GST logging in the synrift sediments at Site 652, the deep basin site in the Tyrrhenian Sea, showed Si and Fe kicks in turbidites thought to correspond to rifting episodes. Since the recovery was poor, the logs gave a better record of sedimentation history than the core. At Site 652A, K/Th data suggests a 200,000 year cyclicity in volcanic activity in Italy and makes it possible to identify and time the input from specific volcanoes.

Leg 108 - Logging was very disappointing because of bridging and tool failures.

Leg 109 - MAR Bare Rock and 395A (Becker)

An excellent suite of logs was run in basement at Site 395A, including the standard Schlumberger suite, the ACT and MCS tools, the German and Japanese magnetometers, the German susceptibility tool, the large scale resistivity log, the packer and a high resolution temperature probe. The results of these measurements indicate that water is still flowing down the hole at about 1000 l/hr, that it is reaching greater depths than on Leg 78B, that the resistivity (and thus the porosity) at the bottom

of Hole 395A matches that at the bottom of 504B when corrected for differences in temperature and that the permeability in the upper levels of Hole 395A (50 millidarcys, 2 stations) is orders of magnitude greater than in the bottom of the hole (microdarcys). The ACT, which was run for the first time on this leg, gave an excellent indication of alteration vs. depth. Unfortunately, part of the German magnetometer was lost in the hole (with the result that only the vertical field component could be measured) and the BHTV couldn't be run because of time constraints.

Leg 110 - Barbados (Jarrard)

Leg 110 was in progress during the meeting. Reports from the ship indicated that bridges were impeding logging and that the rotating packer had inflated prematurely and torn up. The effort to modify Schlumberger's RFT-TN for use on 110 was unsuccessful (the scissor jack bent during engineering tests). Thus the only means available to the shipboard party for collecting pore water remains the Barnes/Uyeda tool. The modified tool should be available in 6 months to one year.

5. Short Term Planning

Leg 111 - 504B Preview (Becker)

Leg 111 will depart on 28 August for 43 days of drilling and experiments at Site 504B plus 5 days of HPC coring at high and low heat flow sites in the area for geochemical studies. It is unlikely that the Layer 2/3 boundary will be reached on this leg since it appears from the results of the OSE run on Leg 92 to be another 1 km into basement. The present scenario for the leg is as follows:

- 4-5 days - Experiments:
 - French T tool - before washing
 - H₂O sampling using RFT or Kuster Tool at 80, 120, 140, 160°C
 - ACT/GST
 - MCS/Japanese magnetometer
- 30 days - Deepen hole 300-500 m using rotary and diamond drilling, heave compensator; run packer tests in dikes
- 9-10 days - Logging and Experiments:
 - Schlumberger suite
 - straddle packer with high T elements
 - USGS high temperature BHTV
 - French and USGS T tools
 - large scale resistivity
 - MCS
 - VSP using WST seismometer
 - Japanese magnetometer
- 5-3 days - HPC coring

Several provisions are being made for high temperature logging: the sidewall entry sub will allow the hole to be cooled by pumping, a high temperature (teflon) logging cable will be on board and several of the tools are rated for high temperature.

Recommendation 1. The Panel approved the plans outlined above and made no further changes.

Leg 112 - Peru/Chile (O'Connell)

The site survey for the leg has just been completed and the drilling plan is still being designed. The Panel reviewed its previous deliberations (14-16 Jan 1986) and recommended (Recommendation 2) that 12 hours of time be set aside for borehole geotechnical studies at one of the shallow water sites if suitable equipment is available. Leg 112 represents an unusual opportunity for the geotechnical industry to become involved in ODP: borehole geotechnical equipment is needed to measure the changes in mechanical properties of sediments at convergent margins and many of the sites are shallow enough to meet current tool depth limitations. It was also suggested that sonic and gamma density logs be run (ACT if the hole is poor) in support of the geotechnical studies.

Leg 113 - Weddell Sea (O'Connell)

The drilling plans for Leg 113 have changed. A 500 m hole to basement (W1 or W2) is planned on the Antarctic margin at the eastern end of the basin to study the carbonate sequence. W4 is now being planned not as a single, 1 km deep hole, but as a series of pogo holes up the wall of a failed rift discovered during the site survey. The objectives are to study the dipping reflector series and the history of rifting. W5 is still planned as a single deep hole to basement; a thick turbidite sequence is expected at the top of the section. Sites W6-8 are still planned as a transect of 500 m sites up the Scotia Ridge to study paleoenvironmental problems.

A working group led by Worthington revised our earlier recommendation (and the Panel approved) the revision as follows (Recommendation 3).

W1 or 2 should be logged for Milankovich cycles using the LDT/GST/ACT tool if a 50 m (or more) sediment sequence laid down at a rate equal to or exceeding 35 m/my is recovered. This could be done on a time-available basis (for ex., while waiting for icebergs or weather to clear at site W4).

The Panel recommended that site W4 be drilled and logged as a deep re-entry hole with the LSS and LDT/GST/ACT tools in order to tie core to seismic stratigraphy, especially the dipping reflector series. This is regarded as particularly important in view of the expected low recovery at the site. If site W4 is drilled as a series of shallow holes, the Panel does not recommend logging.

W5 should be logged with the LSS and LDT/GST/ACT tools. Since the turbidite sequence is likely to be monotonous, it might be washed, spot-cored and logged, with the logs filling in for spot coring.

The Panel recommended that sites W6-8 be logged with the same tools on a time-available basis (i.e. as a back-up program).

It was also suggested that Dick Merkel or Skip Snider be approached to go out as the logging scientist on the leg.

Leg 114 - S. Atlantic (O'Connell)

The site survey for Leg 114 will not be completed until December thus drilling is still being planned. The general plan, however, is to drill a series of 500-800 m holes across the MAR, plus one site on the Georgia Rise to study subduction and accretion, two sites respectively on Great Meteor Seamount and Islas Orcadas to study paleoenvironmental problems, and two high latitude sites to study migration of the Polar Front.

The Panel postponed a detailed discussion until the next meeting but recommended (Recommendation 4) that the LSS and nuclear combination tools be run at the 400+ m sites and that selected sites might be considered for detailed cyclicity (ACT) logging.

Leg 115 - Southwest Indian Ridge (Dick)

The Southwest Indian Ridge is probably the best location in the world in which to examine mantle rocks, fabrics, properties and processes in situ. In plan view, about 50% of the sea floor consists of fracture zones and recent dredging results indicate that the fracture zones are floored largely (60%) by strongly depleted ultramafics. Three fracture zones are under consideration for drilling: the Melville and Atlantic II fracture zones (the latter being the most probable) and the Galieni fracture zone which is the best (simplest) but is the furthest south and thus has the worst weather.

Since the site surveys have not been completed, the drilling and logging plans were discussed and are presently below only in generic terms. The principle objective of the leg will be to drill and log a deep (300+ m) hole into the mantle (SWIR 2). Other objectives include drilling an array of pogo holes in the sediments and uppermost ultramafics along and across the floor of the fracture zone to determine the age and deformation history of the sediments and to select the best site for deep drilling; a bench site on a transverse ridge to study stratigraphy (SWIR 3); a hole in the nodal basin (SWIR 4); a site near the crest of a transverse ridge to study uplift history (SWIR 5); a site in the fracture zone which has not passed through the transform fault zone (SWIR 6); and a bench site on the old wall of the transform near the transform-ridge crest intersection to study heat flow and hydrothermal processes.

After a long discussion, the Panel strongly recommended that a major downhole experiments program be conducted in SWIR 2 in order to study mantle and fracture zone properties in situ (Recommendation 5). This program should include:

- a) conventional, MCS And BHTV logging.
- b) HPC-T and HRT logging to study heat flow and thermal conductivity in fracture zones.
- c) permeability studies using the RFT and wireline and straddle packers to test the hypothesis that fracture zones are self-sealed by serpentinization.
- d) susceptibility and magnetometer (preferably gyro-oriented) logs to determine the magnetic content, magnetic properties

and degree of serpentinization of fracture zone rocks.

- e) complex resistivity logs to study on-going alteration reactions (the introduction of water during drilling may accelerate serpentinization).
- f) studies of formation water chemistry using samples collected with the RFT, wireline packer and Barnes sampler.
- g) circumferential acoustic logging to study anisotropy.
- h) large scale resistivity logging to study formation porosity.
- i) oriented hard rock coring.
- j) a full-blown oblique seismic/VSP experiment, perhaps using a borehole seismometer array similar to that now used by Prakla or Los Alamos, to study V_p and V_s vs. depth and azimuth around the hole, lateral heterogeneity and to test for the presence of serpentine in Layer 3.

In order to accomplish these objectives, the Panel also recommended that Leg 115 be restored to a full 60-day leg, that a cone be set at the prime deep drilling site and that a geophysicist (Gary Ohloeft, Dick von Herzen or Ralph Stephen) be appointed co-chief scientist in order to manage the downhole measurements program. The Panel did not recommend setting a barerock guide base on the leg because it was considered time consuming and unnecessary in view of the likely sediment cover. The Panel also discussed the possibility of needing high temperature logging equipment but concluded that a high temperature hole in ultramafics could not be logged because swelling induced by serpentinization would close the hole.

6. Intermediate and Long Range Planning

The Panel conducted an overview of the Indian Ocean and Western Pacific Drilling Programs. Since the surveys for many legs are still underway and the plans are quite tentative, the Panel postponed detailed planning for most legs until the next meeting. The Panel did conduct a preliminary review of several "problem" legs and reiterated its plans to log all holes over 400 m deep using the sonic and nuclear combination tools.

Red Sea (O'Connell for Cochran)

Drilling is being planned in the Red Sea to study zero-age crust, ridge propagation, metalliferous sediments, sapropels and ultramafics (the latter exposed in shallow water off Zeberged Is.). A further major objective is to drill a 200 m hole for an observatory in the basement underlying the brines in the Nereus Deep. Drilling is tentatively scheduled for July-September 1987, but the leg may be shortened or cancelled because permission has not yet been obtained either to survey or drill in the area.

If the leg does take place, the Panel recommended (Recommendation 6) that an extensive series of hydrogeologic experiments, including packer tests, water sampling and hostile environment (HEL) logging be conducted in the Nereus Basin

hole. Since the borehole environment will be corrosive (80-110°C, saline), it was also recommended that the hole be outfitted with a corrosion-resistant cone.

In addition to the question of drilling permits, three questions of concern to DMP remain to be answered: 1) What downhole measurements are required by LITHP and the Red Sea Working Group to meet their scientific objectives. (Cochran was scheduled to brief DMP on Working Group plans but had to cancel at the last minute. Becker will raise the question at the next LITHP meeting and report back to DMP.) 2) Both LITHP and the Red Sea Working Group have pointed out the desirability of establishing a borehole observatory in the Nereus Deep but no investigator has volunteered to do it and the technology is not in place, particularly for hostile environments. 3) Is flashing possible?

Macran (O'Connell)

A seven site drilling transect analagous to that drilled on the Barbados accretionary prism is planned for the Macran margin off Pakistan. The objectives are to study the history and mechanisms of deformation and the role of pore water in sediment deformation and the development of regional structures. The Panel was enthusiastic about the proposed drilling and recommended (Recommendation 7) that the Macran program be given high priority in the Indian Ocean Program and that an extensive series of borehole measurements, including packer tests, water sampling and geotechnical studies, as well as conventional logging, be conducted on the leg. The Panel also endorsed the proposal by Von Huene and Wang to model the role of pore pressure on active margins.

Intraplate Deformation (O'Connell)

Recent surveys at the distal end of the Bengal Fan have revealed the presence of 200 km wavelength folds involving basement and the overlying sediment column. The presence of young reverse faults and the association of these structures with active earthquakes and high heat flow suggest that these folds are due to mid-plate compressive stresses associated with the collision of India and Asia. Six sites are proposed to study the history of deformation and to study variations in heat flow and pore water chemistry across these structures. The Panel was enthusiastic about the problem and recommended (Recommendation 8) that packer, BHTV, dipmeter, heat flow, high resolution temperature, water sampling and conventional logging equipment be run in the deeper holes both on and off fault structures to study neotectonic processes in the sea floor.

Neogene Package (O'Connell)

It has been proposed to drill a transect of holes in the Arabian Sea in order to study the history and affects of the monsoon. Targets include varved sediments deposited in the oxygen minimum/upwelling zone off Oman, two holes to basement on the Owen Ridge to sample pelagic and eolian sediments and two holes on the Indus Fan to study the depositional history of sediments eroded from the Himalayas. Two additional sites have been proposed in the Gulf of Aden to study Quaternary climate history in East Africa for comparison with hominid and mammalian evolution. The shallow water sites off Oman will probably be deleted because recent surveys failed to recover varved sediments. Although detailed recommendations were postponed until the next meeting, a recommendation was made to adhere to the 400 m rule and to conduct geotechnical studies at the shallow water sites (if drilled).

Kerguelen/Prydz Bay (O'Connell)

An extensive, two-leg drilling program is planned in the southern Indian Ocean to determine the nature and history of the Kerguelen Ridge and to study southern ocean paleoceanography. On the first leg, several shallow holes and a re-entry hole to basement will be drilled on N. Kerguelen; drilling on the second leg will be conducted on S. Kerguelen and on a spectacular dipping reflector series on the Prydz Bay margin of Antarctica. The Panel recommended routine logging on both legs and VSP logging in the dipping reflector hole (Recommendation 9).

90 East Ridge/Broken Ridge (O'Connell)

An array of holes is planned to study oceanic basement, paleoceanographic gradients, and plate motions and consequences in the eastern Indian Ocean. Detailed logging recommendations were postponed until the next meeting.

Argo/Exmouth (O'Connell)

an array of holes including a 2 km deep re-entry hole is planned in the Argo Basin to study the early Cretaceous/Jurassic history of the Indian Ocean; a second array is planned on Exmouth Plateau to study sea level change and passive margin development off N.W. Australia. A preliminary recommendation (Recommendation 10) was made to conduct temperature measurements in the Argo Basin and VSP in the re-entry hole.

Japan Legs (Fujii)

Of the 10-1/2 WESPAC legs tentatively approved for drilling, DMP only reviewed the four planned around Japan. These were singled out for preliminary review because of unusual downhole measurements requirements. None will be drilled before 1989.

Japan Sea

One leg is planned in the Japan Sea to study the nature of the seafloor and the rate and timing of back arc spreading. The Panel recommended (Recommendation 11) that the Oblique Seismic Experiment be run in order to study basement velocity structure.

Bonin-Marianas

Two legs worth of holes have been proposed for the Bonin-Marianas. These include two back arc sites (BON1, 2) to study uplift, rifting and volcanism associated with back arc spreading; four sites (BON3-6) on the forearc to study uplift and subsidence, basement deformation and sediment stratigraphy; three sites (BON7, MAR2, 3) on forearc diapiric structures to determine their compositions (serpentinite?) and to study dewatering phenomena; and one site (BON8) on the Pacific plate to serve as an oceanic reference site. Two holes (BON1 or 2 and 8) are planned as re-entry holes.

The Japanese plan to install a long term observatory in BON1 or 2 to measure temperature, tilt, strain, seismicity (initial pulse) and magnetic field variations. The observatory is being designed to operate continuously for one year before being replaced. Approximately \$200K/yr has been allocated for design and construction.

The temperature and magnetic field modules, which are similar to those used on Leg 109, have already been built; the tilt, strain and seismometer components are currently being designed.

The Panel applauded the Japanese efforts to develop an observatory capability and requested that they make a more detailed presentation at the next meeting. In view of this development, the Panel recommended that at least one of the Bonin holes be equipped with a re-entry cone for observatory installation and servicing (Recommendation 11). The Panel noted that a major effort would still be required to develop a high temperature observatory capability and urged that other countries such as the U.S. get involved. To this end, the Panel recommended that John Delaney be invited to the next meeting to give a presentation on LOBO (Long-term Ocean Bottom Observatory) development plans in the U.S. (Recommendation 23).

Nankai Trough

A drilling leg is planned in the Nankai Trough to study accretionary processes. The Panel recommended (Recommendation 11) that an extensive hydrogeologic program (packer tests, water sampling, temperature measurements) be conducted on the leg and that one site be equipped with a re-entry cone for post-cruise observatory installation.

Zenisu Ridge

Several holes are planned on Zenisu Ridge to study the tectonic history and dewatering processes associated with the formation of an intraplate thrust seaward of the Nankai Trough. The Panel recommended that routine logging, dipmeter tests and hydrogeologic testing (packer, water sampling, temperature measurements) be conducted on the leg and that each hole be drilled into basement (Recommendation 11).

Discussion (Timur). The Panel has taken a great deal of time during its meetings to review the objectives of each leg and to generate from scratch, a recommended program of downhole measurements for each site. While this has proven an effective way to get downhole measurements incorporated in ODP planning, it's a poor use of the Panel's time. It would be more efficient if summary sheets listing the objectives and a strawman logging program could be prepared in advance for each site and then modified and endorsed (rather than generated) at Panel meetings. This procedural modification was enthusiastically accepted by the Panel and Jarrard and O'Connell agreed to prepare these sheets for the Indian Ocean and Western Pacific legs for the next meeting.

7. Other Business

Wireline Re-entry (Pozzi)

The French have built a submersible (Nadir)-assisted wireline re-entry vehicle and are planning a full-scale test on a 20 day leg to Site 396 in January 1987. An invitation was extended for an observer from DMP to participate on the cruise. Though no one from the Panel was able to go, Traeger indicated that he might be able to look at the vehicle while in Marseilles before the cruise.

The Panel strongly endorsed on-going efforts to develop a wireline re-entry capability (Recommendation 18) and expressed its appreciation to the French for the invitation and for keeping ODP informed about their progress. The Panel urged again (Recommendation 19) that all potential users of DSDP/ODP holes obtain clearance (as the French have done) before re-entering any specific hole. This will prevent re-entry from being attempted in holes with bridges or in which further drilling is planned.

Physical Properties Workshop (Salisbury)

A workshop was held at Cornell in July to discuss the ODP physical properties program and to make recommendations for upgrades. A major shortcoming which was identified was the failure to integrate the laboratory physical properties and downhole measurements programs. In particular, a number of basic laboratory measurements needed to calibrate the logs are not run and no continuous measurements other than GRAPE are made on core material for comparison with logs. To rectify this, the workshop recommended that grain density, pore water resistivity, cation exchange capacity, differential thermal analysis (DTA) and strain relaxation measurements be performed routinely on core material and that a multifunction core logger be built to make continuous GRAPE, magnetic susceptibility, neutron activation and natural gamma (K, U, Th) measurements. The workshop participants also recommended establishing a physical properties working group under DMP auspices to assist ODP in augmenting these (and other) recommendations and ensure that they are actually pursued.

The Panel endorsed these suggestions and recommended that a Physical Properties Working Group reporting to DMP be set up for one year (Recommendation 17). It was further suggested that Karig and Salisbury (the Workshop convenors) draft the terms of reference and provide PCOM with a list of potential members.

Panel Rotation (Salisbury)

When the JOIDES advisory panels were set up at the beginning of ODP, PCOM set up a rotation scheme whereby 1/3 of each panel would rotate off each year, beginning with the third year. Although the service panels, including DMP, were not required to adhere to this policy, it was thought advisable to do so in order to introduce new blood. In keeping with this policy, Dan Georgi rotated off at the last meeting, Turk Timur and Al Jageler volunteered to step down after this meeting and the next, respectively, and it was recommended in absentia that Dick Goodman be dropped from the Panel since he has only attended one meeting. In keeping with PCOM's new policy that no one may be a member of two panels, Becker has been transferred to LITHP but will serve as liaison to DMP.

The Panel considered many candidate replacements including (in no particular order):

- Rick Wendlant - EXXON; neutron activation and electrical logging specialist
- Pete Vail - Rice; seismic stratigraphy
- Wendel Givens - Mobil; nuclear logging
- John Doveton - Kansas; log processing (wrote Terralog)
- Harold Vinegar - Shell
- Jeff Daniels - Ohio State
- Carl Sondergeld - AMOCO; physical properties, rock mechanics

Ralph Wiley - AMOCO; nuclear logging, quality control
 Adrian Richards - FUGRO; geotechnical studies
 Nafi Toksoz - MIT; log analysis
 Arthur Cheng - MIT; velocity logging
 Roger Turpenning - MIT; VSP

After considerable debate (revolving principally around the need to fill existing or anticipated gaps in Panel expertise), the Panel recommended (Recommendation 21) that PCOM consider the following candidates for DMP (again, in no order):

Wendell Givens
 Carl Sondergeld
 Ralph Wiley
 Adrian Richards
 and one of:
 Nafi Toksoz
 Arthur Cheng
 Roger Turpenning

DMP Chairman (Salisbury)

Salisbury has served as DMP Chairman and is due to step down. The Panel felt it advisable that the new chairman be picked from within the Panel to ensure continuity and recommended

Keir Becker - RSMAS
 Gary Ohlcoft - USGS
 Paul Worthington - BP

(in alphabetical order) for the position (Recommendation 20). Salisbury agreed to stay on as Chairman to early Spring 1987 to chair the next meeting and present the Panel's recommendations to the January meeting of PCOM.

Panel Liaisons (Salisbury)

As a result of discussions at the last Panel Chairmen's meeting, PCOM is asking the panels to establish a formal liaison network between panels. In the case of DMP, this will require that designated panel members attend one meeting of another panel once a year. The Panel decided to postpone making liaison assignments until PCOM has approved its recommendations for rotation but made the following immediate liaison assignments (Recommendation 22) to cover upcoming meetings:

TEDCOM - Al Jageler
 SOHP - Turk Timur
 SOP - Eddie Howell
 TECP - Matt Salisbury
 (LITHP - Keir Becker)

Propaganda

It was pointed out by Joe Cann that many people in the JOIDES community remain to be convinced of the success or relevance of logging. Anderson pointed out that the situation has improved a great deal since DSDP, and that the distribution of Part 2

of the ODP Logging Manual, which is now being prepared and which shows numerous examples of exciting ODP/DSDP logging results, should help. In addition, LDGO held a logging seminar for PCOM last January and is arranging logging seminars in Japan (November 1986) and in France, Germany and the U.K. (all in January). Timur suggested that a couple of short, snappy articles in the JOIDES Journal which integrated core and logging results would also help.

DOSEC (Ohloeft)

The U.S. Continental Scientific drilling program has now approved drilling a 5 km well in Cahon Pass to study the heat flow paradox and insitu stress in the vicinity of the San Andreas fault. Several other holes are under consideration, including one on Katmai and three deep holes in the Appalachians, Illinois and Hawaii.

DOESC would like to coordinate their activities with ODP. For example, they might use a common data base management system, share engineering staffs, hold joint workshops and conduct joint onshore/offshore drilling transects.

The Panel felt that a joint workshop on logging might be very useful and suggested 1) that the DOSEC and ODP DMP chairmen attend each other's meetings and 2) that future meetings might be co-located with a day of overlap so that the two panels could discuss mutual concerns. Traeger pointed out that DOSEC's upcoming sampling workshop might be of interest to ODP.

Miscellaneous (Meyer)

Toward the end of the meeting, Tony Meyer briefed the Panel on several recent developments of interest to DMP:

- 1) The JOIDES office is moving to OSU where Nick Piasias will assume the duties of PCOM Chairman.
- 2) The NSF external review committee was very positive about the downhole measurements program in ODP.
- 3) Recent legislation introduced at the Law of the Sea Conference may inadvertently preclude the use of nuclear tools in the seafloor, even for research. (This sparked a brief discussion by the Panel but the representatives from industry, who are aware of the issue and have looked at it more closely, indicated that there is no cause for concern.)
- 4) Becker's information paper on packers was recently published in the JOIDES Journal and has been well received. The Panel's interests might be well served by publishing other articles, for example, on BHTV and FMS technology.

Meyer also pointed out that several issues remain to be discussed by DMP:

- 1) COSOD II will be held in Strasbourg during the first week of July 1987. DMP should prepare a white paper for the meeting.
- 2) There is some discussion in PCOM of inserting a leg on the Juan de

Fuca Ridge or the East Pacific Rise early in the Pacific drilling program in order to get a head start on high temperature or bare rock drilling problems. If DMP agrees with this approach, it should make its wishes known.

The Panel postponed discussion of these items to the next meeting.

Next Meeting (Salisbury, Fujii)

The Japanese have invited DMP to hold the next meeting at the Ocean Research Institute in Tokyo. The Panel accepted pending JOIDES approval and recommended that the meeting be held on 7-8 November in conjunction with the LDGO logging school scheduled for 5-6 November. The Panel also recommended that representatives from JAPEX and NEDO be invited to give presentations on their high temperature logging capabilities (Recommendation 23).

JOIDES Downhole Measurements Panel
Woods Hole Oceanographic Institution
July 22-23, 1986

Summary of Recommendations

Leg-by-Leg Recommendations

The Panel reviewed the updated plans for Legs 111 through 113 and the tentative plans for Legs 114 and 115 and made the following recommendations:

1. Leg 111 504B

No change from recommendations of Jan. 14-16, 1986.

2. Leg 112 Peru Margin

Add 12 hours of borehole geotechnical studies at selected shallow water site to recommendations of Jan. 14-16.

3. Leg 113 Weddell Sea (revised from Jan. 14-16 recommendations):

W1	LDT/GST/ACT combination	8 hrs.
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If a 50m section deposited at a rate of 35 m/my or more is recovered, run nuclear logs on a time - available basis (for example while waiting for weather or bergs to clear at W4) to test for Milankovich cycles.

W4	LSS combination	4 hrs.
	LDT/GST/ACT combination	<u>11 hrs.</u>
		15 hrs.

Set minicone and log deep hole to tie core to dipping reflector series. Do not log if hole pogo-drilled.

W5	LSS combination	6 hrs.
	LDT/GST/ACT combination	<u>13 hrs.</u>
		19 hrs.

W6,7,8	LSS combination	4 hrs.
	LDT/GST/ACT combination	<u>8 hrs.</u>
		12 hrs./ site

Run on time available basis.

4. Leg 114 S. Atlantic

Preliminary recommendation: sonic and nuclear/combo logging at 400m⁺ sites, plus detailed cyclicity detection (ACT) logging at selected sites.

5. Leg 115 S.W. Indian Ridge

SWIR 2 (deep mantle re-entry hole)

Pipe trip	12	hrs.
T/H ₂ O samples	12	
German/French HRT	12	
Schlumberger suite	37	
BHTV	11	
MCS	11	
Large scale resistivity	8	
Gyro magnetometer	15	
Magnetic susceptibility	8	
Packer (including pipe trip)	48	
RFT/wireline packer	8	
Complex resistivity	12	
CAT (circumferential acoustic)	12	
	8.6	days
Oblique Seismic Experiment	10	days
Total	18.6	days

A deep fracture zone hole represents a once-in-a-lifetime chance to examine mantle rocks, fabrics, properties and processes in situ. to take advantage of this opportunity, the panel recommends:

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- b) re-entry cone deployment at the prime site;
- c) a downhole measurements co-chief:

Gary Ohloeft (USGS)
Dick Von Herzen (WHOI)
Ralph Stephen (WHOI)

Intermediate and Long Range Planning (Indian Ocean, Western Pacific)

Preliminary recommendations (to be refined at November meeting when drilling plans more refined): sonic and nuclear combination logging at 400m⁺ sites plus the following special programs:

6. Red Sea

Hydrogeology
Water sampling (intermediate T)
Hostile Environment Logging (HEL)

Note: corrosion - resistant cone needed for long-term observations.

7. Macran

Hydrogeology
Water sampling
Borehole geotechnical studies

8. Intraplate Deformation

Hydrogeology
Water sampling
HRT/HPC-T
Dipmeter
RHTV

9. Prydz Bay

VSP at dipping reflector site

10. Argo/Exmouth

VSP in deep hole

11. Japan Legs

Japan Sea: Oblique Seismic Experiment

Bonin Arc: Long-term observatory installation

Note: Re-entry cone(s) required for cruise and post-cruise observatory installation.

Nankai: Hydrogeology
Water sampling

Note: Re-entry cone required for post-cruise observatory installation.

Zenisu: Hydrogeology
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LDGO

12. Logging Through Pipe

In addition to conducting open hole logging in all holes over 400m deep, the panel recommends running nuclear logs through the pipe in the upper part of each hole as the tool is brought to the surface. This will add significantly to the logging data base and cost very little in terms of extra logging time.

13. Repeat ACT test

The Panel requests that LDGO conduct a multiple repeat test of the ACT tool.

14. Wireline Heave Compensation Test

The Panel recommended that LDGO run Schlumberger's downhole accelerometer in conjunction with a high resolution logging tool in order to test the performance of the wireline heave compensator. If the heave comp does not meet specifications, the accelerometer (or one built for the purpose) should be run with every tool so that the data can be corrected for heave.

15. Tool Recommendations

Wireline Packer. The Panel reiterates again the need for a wireline packer and regrets that EXCOM, acting on misinformation regarding patent rights, has delayed acquisition (see attached letter).

Enhancement Budget Priorities. In addition to the wireline packer, which is already included in the base budget, the panel made the following recommendations for new tool acquisition:

Priority 1) Backup analog BHTV (\$40 K)
Upgrade to digital tool following year.

Widely known as the "geologists' log"; provides visual/acoustic image of borehole wall, stress data.

Priority 2) Formation Multiscanner (FMS) (\$50K-200K depending on configuration and negotiations with Schlumberger)

Multipad micro-resistivity sensor; provides visual/resistivity image of borehall wall.

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LDGO/TAMU

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The recommendations of the "Mud Meeting" have not solved the swelling clay (bridging) problem. The Panel recommends that LDGO

and TAMU hold a second mud meeting with mud specialists, clay chemists and geotechnical engineers from industry to address this problem in greater detail.

PCOM

17. Physical Properties Working Group

Per the recommendations of the Physical Properties Workshop held at Cornell (July, 1986), The Panel requests that a small Physical Properties Working Group be formed under DMP auspices to monitor and upgrade the shipboard physical properties program and to make the recommendations for special sampling.

18. Wireline Re-entry

The Panel strongly endorses current efforts to develop a wireline re-entry capability within the oceanographic community as a means of conducting downhole experiments and for servicing, repairing and exchanging long-term borehole observatory instrument packages in the absence of the drillship.

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Although no formal mechanism exists for controlling access to re-entry holes, the Panel urges that all potential users obtain clearance from JOIDES before re-entering a specific hole. This will prevent re-entry attempts in impassable holes and will also prevent instruments from being inadvertently drilled out in subsequent ODP operations.

DMP

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Recommendations in alphabetical order:

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New chairman to take office in early Spring, 1987.

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