RECEIVED
NOV 0 5 1991
Ans'd............

EXECUTIVE SUMMARY

Panel discussions and recommendations were focussed on **review of each of the shipboard laboratories; upcoming legs**; an implementation plan for **core-log data integration (joint with DMP); discrete measurement of index properties**, and **panel membership.** In addition, the panel held a one day meeting on **core disturbance**. The following is a summary of SMP concerns and recommendations.

Shipboard labs review

J-P Valet reported that the paleomagnetics laboratory is now in very good shape; the cryogenic magnetometer is working very well and the software upgrades which TAMU have incorporated show major improvement. The major problem in paleomagnetics is core barrel magnetic overprinting. On Leg 138, the problem was so severe that the core barrel used could be identified in the magnetic signature of the sample. Consequently, **the panel recommends that (a) a core barrel de-magnetizer be constructed and available for shipboard use; and (b) a magnetometer for measuring the field inside the barrel be supplied for shipboard use (91-7: to TAMU).**

R. Wittebrood (Shell - Canada) presented a natural gamma core logger which his lab built and has successfully used. The panel agreed that this equipment is very feasible and reasonably priced for ODP shipboard use. The panel has previously recommended the acquisition of this equipment and emphasizes the need for its use as one of two possible direct core-log data integration tools. Based on the advice of Wittebrood, **the panel further recommends that a natural gamma core logging device be added to the multi-sensor track and, if the incremental cost of adding spectral gamma is low (on the order of 15% of the total cost), spectral gamma should also be included (91-8: to TAMU; BCOM).**

On Leg 138, a problem was identified with the GRAPE data. Shipboard scientists reported that the GRAPE was routinely measuring densities 10% too high on high porosity sediment. The error decreased with decreasing porosity, suggesting that the gamma ray attenuation coefficient was not appropriate for the sediment type. The findings on Leg 138 suggest that GRAPE data for all of ODP, starting with Leg 101, may be incorrect. **The panel recommends that an immediate review of the findings from Leg 138 take place and that appropriate attenuation coefficients be incorporated into the GRAPE software prior to Leg 143 (91-9: to TAMU).**

The panel has previously recommended that a micropalaeontological reference slide collection should be available for shipboard use with a duplicate at ODP/TAMU. No action has occurred. The panel agreed that **the reference slide collection is a critical and basic tool** in the micropalaeontologic laboratory. **The panel recommends that a reference slide collection for foraminifers, diatoms and nannofossils be acquired and maintained for shipboard use with a duplicate set available at TAMU (91-10: to TAMU; BCOM).**

The panel discussed the issue of technical support. Although PCOM has not yet discussed the panel's recommendations on requirements for additional technical support, SMP agreed that within the existing staff, additional basic training is required. **SMP recommends that some of the**

technical staff should specifically be trained in micropalaeontological sample processing for the four most commonly studied groups of marine microfossils: planktonic and benthic foraminifers; calcareous nannofossils; radiolarian; and diatoms (91-11: to TAMU).

M. Mottl reported on the results of the geochemistry survey. Based on the responses, the geochemistry community concurs with the PCOM decision to terminate routine OG sampling. However, non-routine OG sampling will certainly be required and therefore the facilities for sampling and storing should be maintained. In addition, the existing collection of frozen samples should be retained and kept frozen. **SMP recommends that the existence of the frozen core collection should be advertised to the scientific community so that sample requests can be made and that samples should be maintained frozen for a minimum time period (e.g., 10 years post collection) following which, they should be split and returned to the split core collection (91-12: to PCOM; TAMU).**

The panel reviewed the units used in reporting shipboard data. **SMP recommends that SI units be used in all laboratories (except geochemistry) for reporting shipboard-measured data (91-13: to IHP; TAMU).**

The panel once again reviewed previous recommendations regarding smear slides with J. Syvitski, a guest sedimentologist. Based on this review, the panel unanimously agrees that smear slide analysis is qualitative, not quantitative. By storing these data in the database as values gives these data a level of accuracy far greater than the current analysis yields. **Therefore, the evaluation of smear slides should not be recorded as absolute percentages; rather the percent composition should be represented by descriptive terms. As a guide to shipboard sedimentologists, ranges of percent composition should be identified with each term as follows (90-14: to IHP; TAMU)**

- **TRACE <1%**
- **RARE 1 - 10%**
- **UNCOMMON 10-30%**
- **COMMON 30-60%**
- **ABUNDANT >60%**

Upcoming Legs

The panel previously identified the Atolls and Guyots legs and the Cascadia leg as requiring special consideration. Procedures for elemental analyses using the XRF are required for calibration of the geochemical logging tool for both Atolls and Guyots legs and M. Rhodes is currently preparing some draft recommendations which will be presented at the port call prior to leg 143. In addition, core recovery may be very low at all sites on this leg if site locations remain at the Atoll/Guyot highs. **The panel encourages the program to expedite the acquisition of the natural gamma core logging tool so that the best possible core-log data integration tools are available for these legs.** The panel is still concerned that limited log data will be acquired on Leg 146 to Cascadia. **SMP emphasizes that physical property, structural geological and pore water geochemical core data have previously provided results which have been the backbone of major advancements in the study of active margins. The collection of these data coupled with downhole discrete**

measurements should be given highest priority. Highest priority means very high resolution sample intervals for these three data sets, of the same order as Leg 131 with appropriate time allocated to downhole tools.

Shipboard Integration of Core and Log Data (joint with DMP)

DMP and SMP met jointly on 17 October to review and prepare an implementation plan for core-log data integration. The panels agreed that routine shipboard integration of core and log data is a very high priority and that implementation should proceed immediately. **In addition to a review of required equipment, the panels prepared a list of critical tasks which must be addressed to successfully implement routine shipboard core-log data integration (91-16: to PCOM; TAMU) as follows:**

- **quantify methods of depth measurement for drillpipe and wireline**
- **refer all depths to the gamma log**
- **develop interactive graphics for depth matching**
- **establish a relational database with an adequate structure for shipboard and shorebased access of core and log data**
- **create the position of *Data Correlation Specialist* as a member of the shipboard scientific party**
- **disseminate data to the scientific party in a readily transportable format**
- **support related development work currently taking place at ODP/TAMU**

Discrete Measurement of Index Properties

Although improved recommended procedures for measurement of index properties have been prepared by the panel, sailing physical property specialists have had problems following the procedures. It appears that the panel, in developing these recommendations, has put too much choice in the hands of the sailing scientist. The panel will immediately review and upgrade the recommended procedures prior to Leg 141. In addition, the panel discussed the possibility of replacing the current direct methods for measurement of bulk density with an indirect method. The panel is encouraged by the potential application of CATSCAN technology which can potentially be used in all types of sediment/rock samples collected including those that have suffered from severe 'biscuit' disturbance. The panel will focus on this technology at the next meeting.

Shipboard Equipment Requirements (to BCOM)

Shipboard equipment needs were again reviewed. Equipment requirements, in priority order, are as follows:

- Natural gamma and MST upgrade
- Reference slide collection
- Computer workstation for core-log data integration
- Resistivity equipment for discrete core measurement
- Core barrel magnetometer
- Colour measurement instrument
- Carbonate autosampler
- New IC (replacement)

- Xerox for whole core imaging of hard rock samples

The panel is concerned that the navigation equipment, which had previously been approved for acquisition, has not yet been purchased. This equipment is still a high priority.

Core Disturbance Meeting

Following the SMP and joint DMP/SMP panel meetings, a subset of members from the panels and additional guests met to review core disturbance problems and recommend improvements. A report was prepared by R. Chaney; a summary of the meeting recommendations are as follows:

- The potential for incorporating accelerometer packages into the core barrels and in the BHA for post-coring assessment of sample quality should be investigated.
- A pipe maintenance/inspection program should be followed with emphasis on maintenance whereby re-coating of the pipes occurs frequently enough to significantly reduce rust contamination.
- In conjunction with pipe maintenance, evaluation of rust contamination should be included as part of the duties of the shipboard paleomagnetics specialist.
- A review and re-design of the APC cutting shoe should be made with the intention of optimizing the area ratio to reduce core disturbance. A design similar to the reduced area ratio cutter used on Leg 90 would be appropriate.
- A strong back tray should be used to carry the working split core from station to station in the core laboratory.
- The XCB sampling history should be documented. Included in this review should be XCB version, sediment type cored; and the type and extent of core disturbance.
- Sediment core disturbance from effective stress release should routinely be corrected using consolidation data rebound curves. Therefore, consolidation measurements should routinely be made in shorebased laboratories for each lithology per site.

Panel Membership

The panel discussed rotation of members. Both Richards and Whitmarsh will be rotating off the panel after their three year terms are complete (March '92). They will be replaced by nominations from ESF and the UK, respectively. To maintain continuity, the panel would prefer that a maximum of two members at one time be rotated. **The panel does not yet have representation in sedimentology and recommend the addition of one more panel member to fill this need (91-15: to PCOM).** The two names will be forwarded to the PCOM chair.

MINUTES

RECEIVED
NOV 18 1991
Ans'd...........

I Introduction

Members, liaison, guests, and observers were introduced. John King and Mike Rhodes were unable to attend.

J. Baldauf (ODP/TAMU liaison)
R. Chaney (member)
R. Current (ODP/TAMU liaison)
D. Graham (ODP/TAMU liaison)
K. Moran (member, chair)
M. Mottl (member)
D. Pechersky (alternate member)
A. Richards (member)
E. Thomas (member)
H. Tokuyama (member)
J.P. Valet (member)
R. Wittebrood (guest)
R. Whitmarsh (member)

II Minutes from the fifth meeting were approved with one change.

'Automated carbonate bomb system' should read 'Auto sampler for carbonate analyser'.

III Business Arising

Paleomagnetics

J-P Valet reported that the paleomagnetics laboratory is now in very good shape; the cryogenic magnetometer is working very well and the software upgrades which TAMU have incorporated show major improvement. The major problem in paleomagnetics is core barrel magnetic overprinting. On Leg 138, the problem was so severe that the core barrel used could be identified in the magnetic signature of the sample (Attachment 1). Two solutions can help this problem; (1) supply an appropriately sized magnetometer for measuring the field inside the core barrel and (2) build a large coil so that the core barrel can be de-magnetized on board as required. **The panel recommends that (a) a core barrel de-magnetizer be constructed and available for shipboard use; and (b) a magnetometer for measuring the field inside the barrel be supplied for shipboard use (91-7: to TAMU).**

The new paleomagnetics handbook is in draft form and is currently being finalized by L. Stokking. Software for the spinner upgrades was provided by D. Schneider and will be implemented during Legs 140 and 141. Contamination is still a problem and the problem is consistent with J. King's interpretation of rust coming from the inside of the drill pipe. This problem was discussed in detail at the core disturbance meeting (see Attachment 3). **The new handbook should also include routine procedures for the shipboard paleomagnetist to check core contamination (ACTIONS: J.P. Valet report on status of handbook; D. Graham report on recommendation 91-7; J. King report on status of workshop at next meeting).**

Physical Properties

A. Richards reported that he is still pursuing the possibility of a physical property workshop to be held through ESF or NATO in cooperation with GEOMAR. **(ACTION: A. Richards to report status at next meeting).**

M. Mottl reported that they borrowed J. Gieskes' old resistivity equipment with success on Leg 139. J. Baldauf reported that they are looking into the purchase of resistivity equipment for discrete core measurement through P. Jackson (BGS). K. Moran reported that the Univ. of Bremen had a small resistivity meter for core measurements which had successfully been used at a high resolution (5 cm) on the Arctic '91 expedition. There is currently no working shipboard system and SMP has placed a priority on acquisition of this equipment. **(ACTION: D. Graham to report on status of resistivity equipment).**

R. Wittebrood presented the natural gamma equipment which his lab has built and has successfully used on cores. They measure both total and spectral gamma on whole cores at a rate of 2-5 min/metre with a vertical resolution of 8 cm. For use as core-log correlation tool, they smooth their higher resolution core data to obtain a resolution equivalent to the downhole log. The main limitation to the equipment is the background radiation which determines the amount of shielding required (weight and size limits for shipboard use). He recommends that we should first determine the 'normal' shipboard background radiation. Care should be taken in the assessment of this background because it will vary with the amount of core stored in the laboratory. Wittebrood reported that the cost of their equipment was approximately $50k six years ago and he estimates that the cost may be as low as $30k now. The cost for total gamma alone, without the capability of spectral gamma would not be significantly lower. However, a cost review is necessary. Because the major objective for acquiring the equipment is to correlate cores to logs, the main requirement is to obtain total natural gamma. If the incremental cost for adding spectral gamma is low, then this option should also be included as part of the acquisition because it would provide additional compositional/geochemical data at a high vertical resolution. R. Current reported that they have put together a preliminary component list for total/spectral gamma. This preliminary design should be evaluated and compared with the working Shell design.

The panel has previously recommended the acquisition of natural gamma equipment and emphasizes the need for its use as one of two possible direct core-log data integration tools. Based on the advice of Wittebrood, **the panel further recommends that a natural gamma core logging device be added to the multi-sensor track and, if the**

incremental cost of adding spectral gamma is low (on the order of 15% of the total cost), spectral gamma should also be included (91-8: to TAMU; BCOM). ACTION: ODP/TAMU to write a letter to Shell Canada requesting a copy of the report on their gamma logging equipment.

On Leg 138, a problem was identified with the GRAPE data. Shipboard scientists reported that the GRAPE was routinely measuring densities 10% too high on high porosity sediment, although peak to peak relative changes could be correlated with discrete measurements as well as downhole log data. The absolute error decreased with decreasing porosity, suggesting that the gamma ray attenuation coefficient was not appropriate for the sediment type. The findings on Leg 138 suggest that GRAPE data for all of ODP, starting with Leg 101, may be incorrect. **The panel recommends that an immediate review of the findings from Leg 138 take place and that appropriate attenuation coefficients be incorporated into the GRAPE software prior to Leg 143 (91-9: to TAMU). ACTION: Moran and Baldauf to review and prepare recommendations during the week of the next PCOM meeting.**

Micropaleontology

The panel has previously recommended that a micropalaeontological reference slide collection should be available for shipboard use with a duplicate at ODP/TAMU. No action has occurred. The panel agreed that **the reference slide collection is a critical and basic tool** in the micropalaeontologic laboratory. **The panel recommends that a reference slide collection for foraminifers, diatoms and nannofossils be acquired and maintained for shipboard use with a duplicate set available at TAMU (91-10: to TAMU; BCOM).**

The panel discussed the issue of technical support. Although PCOM has not yet discussed the panel's recommendations on requirements for additional technical support, SMP agreed that within the existing staff, additional basic training is required. **SMP recommends that some of the technical staff should specifically be trained in micropalaeontological sample processing for the four most commonly studied groups of marine microfossils: planktonic and benthic foraminifers; calcareous nannofossils; radiolarian; and diatoms (91-11: to TAMU).**

J. Baldauf reported that computerization of the micropaleo lab has had some delay. The contract for software development was cancelled because the product which was to be delivered was not acceptable. The scope of the work is under revision and they are now looking at a minimum turn-around time of 8 months. **The panel is concerned with this delay, particularly because this software development will not only save time for the shipboard scientist, but will also automatically produce range charts, resulting in a significant publication cost savings. ACTION: J. Baldauf to report on the status of software development at the next meeting.** Since the panel will likely be at the ship's port call, it would be appropriate for some panel members to use the software, if available.

With the addition of the much needed computers in the micropaleo laboratory, the space available for each scientist working at a microscope has been reduced. Additional shelving and pull-out tables should be installed in the lab. Ideally, each scientist should have her/his own microscope. At the last SMP meeting, it was noted that on some legs, scientists have to stop working at the end of a shift punctually so that the next shift can use the microscopes. **Since shipboard scientists may not be aware of this situation prior to the leg, SMP suggests that the operator inform prospective micropaleontologists in the letter of invitation that they will be required to share a microscope on heavy micropaleo legs.**

There are requirements for use of a microscope in the thin section laboratory. To reduce the load in the micropaleo lab, a microscope should be installed in the thin section area.

ACTION: J. Baldauf to report on the status of microscopes/space in the micropaleo laboratory.

Petrology

Two agate grinders will be onboard the vessel for Leg 141. The operation of these grinders should be clearly stated so that samples which are too small are not used in the grinders. **Size requirements should be put in the handbook and it may also be appropriate to place a large sign above the grinders with a gentle warning regarding sample size and the potential damage that can occur. ACTION: J. Baldauf to report on handbook changes.**

There are two new XRF technicians. Both have been in training, one new technician has visited M. Rhodes laboratory for training.

The discussion of XRF sediment analytical methods was tabled until the next meeting so that M. Rhodes can report on it. **ACTION: M. Rhodes to report on XRF methods for sediment analysis.**

Computers

There was no core -log data integration report because B. Meyer has left the program. J. Baldauf reported that on Leg 138, core to core correlation was performed successfully with a Sun workstation (owned by OSU) and with two scientists working on the tasks.
ACTION: Moran to request invitation of Corepac representative at the next meeting.

The panel reviewed the units used in reporting and storing shipboard data. **SMP recommends that SI units be used in all laboratories (except geochemistry) for reporting shipboard-measured data (91-13: to IHP; TAMU).**

Sedimentology/Visual Core Description

J. Baldauf reported that the digital image scanner (DISC) has been onboard for Leg 138.

The shipboard scientists found that learning how to use the system was too time consuming. In addition, data collection had a large time investment with no direct benefit to the scientist (1/2 hour per core). In the current shipboard core processing scheme, the DISC does not fit well. However, SMP agrees that this technology may be most appropriate as an archive of the core image and for colour analysis as part of a future split core multi-sensor track.

J. Baldauf and J-P Valet reported that the OSU colour measurement system worked very well on Leg 138. Colour measurement is now a proven technology and should be included as part of routine shipboard measurement. H. Tokuyama was unable to bring along the Minolta colour scanner because it was in use at the time of the meeting, the demonstration will take place at the next meeting. A review of existing colour measurement devices will be part of the next SMP. **ACTION: Moran to request invitation of A. Mix to the next meeting.**

J. Syvitski reported on image analysis of smear slides. He reported that there are two basic options available commercially, which also include software. One option is direct imaging of the smear slide which can take anywhere from 15 - 20 minutes per slide. The second option is to image a photograph of the smear slide. The only limitation on the second option is that magnification of the image cannot be changed. With either of these images, post processing for composition, shape analysis, size analysis can be performed using existing software, some of which is public domain. These systems are only applicable for coarse fraction. These systems are also useful for detailed analysis for specific applications (e.g. analysis of a grain size/shape of a turbidite sequence); they are not time/cost efficient enough for use as a routine compositional analytical tool for shipboard use. B. Whitmarsh noted that one of the largest time constraints is the actual preparation of the smear slide, not in its visual evaluation. SMP agrees that the application of image analysis techniques is not yet appropriate for routine shipboard use, the panel will re-evaluate the application in future.

The panel once again reviewed previous recommendations regarding smear slides with J. Syvitski, a guest sedimentologist. Based on this review, the panel unanimously agrees that smear slide analysis is qualitative, not quantitative. By storing these data in the database as values gives these data a level of accuracy far greater than the current analysis yields. **Therefore, the evaluation of smear slides should not be recorded as absolute percentages; rather the percent composition should be represented by descriptive terms. As a guide to shipboard sedimentologists, ranges of percent composition should be identified with each term as follows (90-14: to IHP; TAMU)**

- **TRACE** **<1%**
- **RARE** **1 - 10%**
- **UNCOMMON** **10-30%**
- **COMMON** **30-60%**
- **ABUNDANT** **>60%**

The use of infrared for compositional analysis was tabled until the next meeting pending reporting by M. Rhodes. **ACTION: M. Rhodes to report on infrared methods at**

the next meeting.

R. Current reported that the x-ray system is now at TAMU and will be modified as per A. Richards' recommendations. The modifications will be completed so that the system will be onboard for Leg 143. **ACTION: D. Graham to report on X-Ray status.**

Geochemistry

J. Baldauf reported that the Geofina has been purchased and will be onboard for Leg 141.

M. Mottl reported that the lab is very cramped and the problem is aggravated by the fact that there are 8 different kinds of computers in the lab and not one of them is a Macintosh. It would be worthwhile at this time to replace the HP system with a new IC. The panel agreed that this replacement should be included in the equipment priority list.

M. Mottl reported on the results of the geochemistry survey (see Attachment 2). The survey had three groups of questions related to: OG samples; units for IW analysis: and new laboratory equipment. Based on the responses, the geochemistry community concurs with the PCOM decision to terminate routine OG sampling. However, non-routine OG sampling will certainly be required and therefore the facilities for sampling and storing should be maintained. In addition, the existing collection of frozen samples should be retained and kept frozen. **SMP recommends that the existence of the frozen core collection should be advertised to the scientific community so that sample requests can be made and that samples should be maintained frozen for a minimum time period (e.g., 10 years post collection) following which, they should be split and returned to the split core collection (91-12: to PCOM; TAMU).** On the issue of units for IW analysis, the general view is that the units should be stored in the database volumetrically and that the conversion to mmol/kg can be made by the scientist for publication purposes, but the method of conversion must be clearly stated in the volume. The only conversion method discouraged was using an algorithm which relates density to chlorinity. There was no consensus on the addition of new laboratory equipment, suggesting that the user community is fairly satisfied with the existing laboratory.

The panel agreed that the survey was an excellent tool for reaching the user community. We should use this mechanism more frequently.

M. Mottl reported that the new modified CHNS worked very well on Leg 139.

C. Mato sent a memo to SMP requesting guidance on interstitial water sampling policies, specifically: (1) is it desirable to archive some of the IW water for later work? and if archiving some water is desirable, then what volumes should be archived?; and (2) what volumes of water should be approved for each concentration or isotope analyses? The panel discussed the questions. the panel agrees that where practical, pore water should be archived, but it should not be required. It was noted that, in most cases, the intervals of most scientific interest usually turn out to be those with the least amount of pore water available. The panel specifically responded to question (1) but requires additional time to review the analyses referred to in question 2. SMP response to question (1) is as follows:

Archiving of 5-20 ml is desirable and should be encouraged where practical, i.e., when the volume of water squeezed from a whole-round ≤10 cm long is greater than is needed for shipboard and shore-based analyses proposed in approved sample requests.

A) It is not practical to squeeze > 10 cm whole-round because more sediment than this will not fit into the shipboard squeezers; a longer whole-round would require a second squeezing.

B) If, however, a 10 cm whole-round would allow archiving while a 5 cm whole round would not, the larger sample should be taken (provided that it is not needed for other purposes judged to be more important).

C) Scientists should be encouraged to use the minimum volume of water required to produce a high quality analysis, so as to leave the remainder for archiving.

Archive samples should be stored sealed in polyethylene tubing. The acidified alkalinity aliquot is acceptable for archiving, provided that it is not needed for other analyses.

ACTION: M. Mottl review and comment on Table 1 from C. Mato memo for next meeting.

Underway Geophysics

J. Baldauf reported again that the navigation equipment had not yet been purchased, however, the RFP will be going out this week. **ACTION: R. Whitmarsh to review RFP. Panel members expressed their concern over the delay and suggested prompt action on the acquisition of this much needed equipment.**

There has not been an opportunity for the program to borrow a high speed streamer for testing since our last meeting. The possibility still exists and ODP/TAMU will continue to pursue this avenue for trial tests on an opportunity basis.

Extended lateral booms have not yet been tried for moving the streamer cable out of the ship's wake. R. Current reported that tests will be performed during the long transit prior to Leg 141. **ACTION: ODP/TAMU representative to present status of evaluation.**

ODP Sampling Tools

R. Current reported that the new Adara heat flow shoe for the APC was used on Leg 139 with very good success.

At the last meeting, SMP recommended that the core liner handling be improved by getting additional people on the catwalk to carry the liner from the core barrel to the cutting rack. This proved to be a successful method on Leg 138 where a minimum of 6 people carried the core liner at one time.

IV PCOM Report

DMP's liaison, K. Becker, gave a brief summary of the last two PCOM meetings. In particular, he reviewed the potential legs from which the first year of Atlantic drilling will be selected. There were no specific requests from PCOM to SMP. Panel members discussed their concern about not having a PCOM liaison for the past two meetings.

V Upcoming Legs

The panel previously identified the Atolls and Guyots legs and the Cascadia leg as requiring special consideration. Procedures for elemental analyses using the XRF are required for calibration of the geochemical logging tool for both Atolls and Guyots legs and M. Rhodes is currently preparing some draft recommendations which will be presented at the port call prior to leg 143. In addition, core recovery may be very low at all sites on this leg if site locations remain at the Atoll/Guyot highs. **The panel encourages the program to expedite the acquisition of the natural gamma core logging tool so that the best possible core-log data integration tools are available for these legs.** The panel is still concerned that limited log data will be acquired on Leg 146 to Cascadia. **SMP emphasizes that physical property, structural geological and pore water geochemical core data have previously provided results which have been the backbone of major advancements in the study of active margins. The collection of these data coupled with downhole discrete measurements should be given highest priority.** Highest priority means very high resolution sample intervals for these three data sets, of the same order as Leg 131 with appropriate time allocated to downhole tools.

R. Chaney recommended that additional measurements of sediment stiffness; modulus; and damping be collected on Leg 146 for input to earthquake attenuation studies. The most appropriate equipment for these measurements is the resonant column apparatus which cannot be used shipboard because of excessive vibration. **SMP encourages this type of add-on science to the program and suggests that sample requests of this nature, although not directly related to Leg 146 scientific objectives, should be accepted for their benefits to the wider scientific/engineering community.**

At the last SMP meeting, the panel discussed the need to communicate directly with the co-chiefs on legs where special procedures or laboratory needs are required. At that time, it seemed appropriate to invite one co-chief scientist to an SMP meeting. However, given that there is a pre-cruise planning meeting for each leg which is attended by our ODP/TAMU liaison, it is more appropriate for the liaison to communicate any specific SMP concerns/recommendations to the co-chief scientists. **ACTION: J. Baldauf to discuss Leg 143-144 and 146 SMP recommendations and suggestions at the pre-cruise planning meetings.**

VI Discrete Measurements of Index Properties

Although improved recommended procedures for measurement of index properties have been prepared by the panel, sailing physical property specialists have had problems following the procedures. It appears that the panel, in developing these recommendations, has put too much choice in the hands of the sailing scientist. **ACTION: The panel (K. Moran and R. Chaney) will immediately review and upgrade the recommended procedures prior to Leg 141.** In addition, the panel discussed the possibility of replacing the current direct methods for measurement of bulk density with an indirect method. The panel is encouraged by the potential application of CATSCAN technology which can possibly be used in all types of sediment/rock samples collected including those that have suffered from severe 'biscuit' disturbance. The panel will focus on this technology at the next meeting. **ACTION: R. Chaney to compile information on the application of CATSCAN for review at the next panel meeting.**

Several panel members received a letter from David O'Brien, Leg 122 physical properties specialist, expressing his concern regarding the discrete measurement of index properties. He compared shipboard bulk density data with shorebased bulk density data which was measured sometime post-cruise. He attributes the difference in the values to faulty wet volume measurements in the pycnometer. Moran noted that the errors he found could also be partially attributed to the method used for drying (non-standard freeze-drying) and due to the method of sample storage post cruise. It is clear that from this letter and other 'complaints' that are still heard within the community of physical property specialists a workshop is required to review the new shipboard procedures. **ACTION: Moran to respond to D. O'Brien's letter.**

VII Implementation Plan for ODP Shipboard Integration of Core and Log Data (Joint with DMP)

DMP/SMP met jointly to review progress and prepare an implementation plan for the shipboard integration of core and log data. Both panels agreed that routine shipboard integration of core and log data is a very high priority and that implementation should proceed as a matter of urgency. Based on the trial efforts on Legs 134 and 138, it is clear that the technology exists to achieve shipboard integration of core and log data. In addition, on Leg 138, the scientific party agreed to support one individual among them to work as the core-log data correlation specialist. Therefore, it is clear that the scientific community is supportive and ready for the proposed integration plan. both DMP and SMP unanimously support this effort. Moran reviewed the DMP/SMP recommendations from the joint meeting in Townsville in October, 1990. A key recommendation was to adopt the merged wireline depth as the reference depth. thus core data should be matched to log data. this will involve several steps. The Sonic Core Monitor (SCM) will be used to correct core sample depths within the barrel. Points on the core then need to be tied to points on the log, a procedure which is in need of refinement. also the log depths should be tied to the bottom of the drill pipe.

Previous recommendations have also included the acquisition of a core natural gamma sensor and the running of a magnetic susceptibility tool as part of the standard logging suite. The core gamma facility is in hand. The magnetic susceptibility tool has not been acquired, primarily because of financial constraints. Tool resolution should ideally be within the range 3-10 cm, according to the needs of each particular leg. The French high resolution magnetic susceptibility tool has a spatial resolution of about 1 m a new tool with a vertical resolution of a few tens of centimetres should be developed within a few months. Future plans provide for a target resolution of a few millimetres.

The primary goals of this joint session were to refine the basic requirements for effective core-log integration on board the ship and to identify steps towards their implementation. Legs 134 and 138 saw the first real attempts to integrate core data in near real time.

Janecek reported on Leg 138. Efforts had been directed at the integration of different core data. There had been no time to consider core-log integration. However, Leg 138 was exceptional in that it was a paleoceanographic leg which set a new record for core recovery (>99%). A more typical leg would not suffer the same time constraints. The strategy for integrating core data involved two stages, data synthesis and the creation of composite sections. Data synthesis drew upon specific laboratory data (e.g. GRAPE, susceptibility): future data will include natural gamma; colour reflectance and SCM. these data were combined in summary tables in ASCII format files which were available to the science party on the fileserver.

Composite sections were built on the most complete data section at each site. The first step was the correlation of whole and split core data, involving the depth adjustment of whole cores and of pieces within a core. The creation of composite sections involved merging data from other holes at the site with the most complete section already identified. With this procedure it is necessary to present for each core ODP depths, composite depths, and an explanation/algorithm linking one to the other.

Multisensor track (MST) data were the basis for core depths. They were merged by linear shifting: no data stretch or expansion was assumed, even though it was known to exist. GRAPE and susceptibility data were used to develop composite sections. It was assumed that there were no lateral changes between the holes at a site, which were typically 20 metres apart. No generic reference depth was identified. This can be expected to vary from leg to leg, and we need to know how to specify it for different situations.

Janecek was congratulated on a very good effort which had greatly advanced the data-integration cause. Several further points emerged during the discussion.

A) Which hole is to be adopted as the core reference at a multi-hole site? It will be the hole that is logged. This will not necessarily be the hole with the most complete core data at each site,unless there is a change of logging policy.

B) How do we handle "excess" core recovery due to expansion? The answer might be to correlate major features with those in the depth corrected logs and to collapse the core accordingly. We should develop the tools to do this but these tools may not be applicable on all legs.

C) We must have a data correlation specialist as a designated member of the shipboard party. This person and their role need to be clearly defined. On paleoceanographic legs, one specialist may not be sufficient. For example, on Leg 145, it is proposed to sail one full-time and one half-time data correlation specialist.

D) The installation of a laboratory natural gamma sensor is primarily targeted at APC whole core, usually obtained over the upper 200 m of the sediment column. Laboratory gamma ray data are intended to facilitate core-log integration. Yet, logs are not usually run through the cased-out upper soft sediment and therefore the degree of potential overlap between core and log gamma data is reduced. since we are interested in shape matching rather than absolute values of the gamma count, in-casing gamma logs would be useful.

E) At multi-hole sites, logging is carried out at the last hole for drilling logistics reasons. In fact, where appropriate, logs should be run in an intermediate hole, to allow additional time for processing. Such a strategy would improve the prospects for core-log integration in real time. Further, the core reference hole, i.e. the hole with the best APC recovery which should ideally be the logged hole, may not be the last one to be drilled. All this points to the need for on site flexibility concerning which hole is to be logged at multi-hole sites during paleoceanographic legs.

F) A core-log integration workstation is already in the ODP budget.

G) Data handling on board ship needs to be enhanced generally, not just in the context of core-log integration. An increase in computing power is needed.

Worthington explained that there was now a need to progress the core-log integration initiative further. It is an important issue; one which could put ODP at the leading edge of technical achievement. The panels agreed that four key issues needed to be addressed in order to advance the initiative. These are:

Integration Philosophy and Personnel
Equipment
Reference Depth
Data Handling

Syndicate and reporting sessions, directed at examining these key issues, led to the formulation of the following **DMP/SMP consensus on Shipboard Integration of Core and Log Data.**

Shipboard Integration of Core and Log Data

There are four important areas of activity which have to be optimised if the shipboard integration of core and log data is to be progressed: (1) Integration Philosophy and Personnel; (2) Equipment; (3) Reference Depth; and (4) Data Handling.

(1) Integration Philosophy and Personnel

Key factors are **motivation, correlation specialist, approach to integration and leg scenarios.**

(a) Motivation
The motivation for using the core-log system lies in the recognition of the opportunity provided by the benefits of shared information. Potential impediments are time limitations on board ship and competition among the shipboard party either with each other generally or with the data correlation specialist in particular. Solutions are to make the data available to the shipboard party as soon as possible in formats that are compatible with standard shipboard and shore-based hardware (MAC/PC or workstation), and to provide a data set as a manipulatable product that is transportable. Further, the co-chiefs will need to be able to sell advantages to the scientific party. In

particular, the correlation specialist should be promoted as a facilitator.

(b) Correlation Specialist
The correlation specialist serves the scientific party and, as such, should be a member of that party. The position of data correlation specialist should be identified in the shipboard manual and should be filled by the co-chiefs in the usual way. ODP should offer a training course/workshop in the philosophy and methodology. Data smoothing software should be applied where appropriate, especially to core data in order to harmonize the different resolutions of core and log measurements.

(c) Reporting of Data
Data should be reported in consistent (SI) units. The reporting process should take account of the bias associated with different measurements. There should be an agreed set of standard definitions and agreed nomenclature to promote compatibility. documentation of the above should be produced, especially a glossary of terms and a summary of procedures.

(d) Leg Scenarios
The culture for core-log integration must take account of all the different leg scenarios that might be brought into play. These include paleoceanographic legs, tectonic legs, basement legs (conventional coring) and basement legs (DCS).

In summary, a system is required that will alleviate the shipboard problems of time and competition rather than aggravate them. It must be simple and flexible, easy to use, and capable of demonstrating its value at an early stage of an interactive interpretation exercise.

(2) Equipment
The following additional equipment was considered necessary to implement the approach outlined above.

(a) Natural gamma equipment for measurement of cores[1] (Leg 145)
(b) Magnetic susceptibility downhole logging tool (req'd as soon as possible- acquisition date unknown)
(c) Sonic core monitor (Leg 141)
(d) Automation of the physical properties laboratory[1] (March 1993))
(e) Core/log data integration workstation[1] (Feb 1992)
(f) Resistivity imaging equipment (acquisition date unknown)

(3) Reference Depth

Key factors in developing a reference are the need for a **reference datum**, knowledge of the **length of pipe**, defining a **log-to-pipe tie-in**, establishing a **core-log correlation**, and the flexibility to handle **other scenarios**.

(a) Reference Datum
A working datum is the rig floor. A more permanent datum is sea level. Therefore there is need to measure and document the rig floor above sea level, which means that

---

[1] previous SMP recommendation

a reference height can change during the course of the leg.

(b) Length of Pipe
Errors are possible in counting the lengths of pipe that have been added to the drill string. Modern sensing facilities can do this automatically, e.g. an automated pipe counter. It is known that drillpipe stretches but it should be possible to compensate for this effect by making measurements of the pipe length under tension and using these to calculate total pipe length for any hung vertical deployment.

(c) Log-to-Pipe Tie-In
To accomplish this, a marker should be placed in the pipe that can be sensed by the gamma ray log, e.g. a weak gamma ray source near the base of the pipe. Thus the pipe and log depth should be correlated when the tool is pulled up into the pipe. It is proposed to introduce the magnetic susceptibility log as a second core-log correlation facility: this tool should respond to drillpipe naturally.

(d) Core-Log Correlation
The approach should be to define a single (composite) trace for each site using the MST data, specifically GRAPE and magnetic susceptibility. Each trace should be smoothed to provide an equivalent resolution to that of the log with which it is to be correlated. Note that different logs have different vertical resolutions. The logs will already have been depth-merged with each other and tied to pipe. The smoothed core data can then be stretched or compressed to match the logs.

(e) Other Scenarios
If logs have not been run, core has to be tied to pipe only. In cases where the pipe is not vertical in the water, pipe depth will depart from true depth. Although pipe verticality can be measured using an inclinometer, it varies with time and it is unlikely that sufficient measurements can be made to define the vertical. Another possibility might be to calculate pipe length through water using one tie-in inclinometer measurement together with data from the dynamic positioning system.

(4) Data handling

Three key areas were defined under this requirement: **data structure, software requirements, and hardware.**

(a) Data Structure
Data need to be input to a data structure. The data structure should accept data in a wide variety of formats including both core and log formats. The database framework is currently being planned at ODP/TAMU. This framework is seen as a longer term goal but we must develop and/or acquire software packages on the assumption that a global framework will exist.

(b) Software Requirements
Software needs can be described in terms of a set of modules each of which has its own specific function. Software modules are required for: vertically adjusting two or more data sets so that they match; stretching and squeezing two or more data sets to match; interpolation of data from sparse data sets to output a complete data set; averaging,

smoothing and regression to facilitate correlation; providing scientists with output data from the data structure in several different formats; generating graphics of various types; interrogating the database, e.g. for a particular lithology; calling in all data that pertain to a particular reference depth or depth range.

Although these modules are discrete, there bounds should be transparent to the scientific user.

(c) Hardware
We must define the hardware that meets the requirements for the software and data sizes listed above. The first requirement is for a networked group of workstations on the ship. To choose the hardware, first assess software availability and then select the best hardware option to match the software.

The immediate goal is a set of data with a common depth reference. The long-term goal is a complete relational database that would allow, for example, interrogation of reference levels and then cross-referencing between wells.

A summary list of critical tasks which must be addressed to successfully implement routine shipboard core-log data integration (91-16: to PCOM; TAMU) is as follows:

- **quantify methods of depth measurement for drillpipe and wireline**
- **refer all depths to the gamma log**
- **develop interactive graphics for depth matching**
- **establish a relational database with an adequate structure for shipboard and shorebased access of core and log data**
- **create the position of *Data Correlation Specialist* as a member of the shipboard scientific party**
- **disseminate data to the scientific party in a readily transportable format**
- **support related development work currently taking place at ODP/TAMU**

VIII Lab Equipment Priorities

Shipboard equipment needs were again reviewed. Equipment requirements, in priority order, are as follows:

- Natural gamma and MST upgrade
- Reference slide collection
- Computer workstation for core-log data integration
- Resistivity equipment for discrete core measurement
- Core barrel magnetometer
- Colour measurement instrument
- Carbonate autosampler
- New IC (replacement)
- Xerox for whole core imaging of hard rock samples

The panel is concerned that the navigation equipment, which had previously been approved for acquisition, has not yet been purchased. This equipment is still a high priority.

IX IHP Report

A. Richards prepared the following report and reviewed IHP issues relevant to SMP.

1) Information Items

(a) Physical property requests of the ODP data base group have been steadily increasing since 1985. In 1991, they were second in number only to request for photographs.

(b) The question was raised, "What is to be the priority function of science on the Resolution?" Is it the acquisition of quality data or is it something else? SMP comments would be appreciated.

(c) A 4/6/91 memo from Audrey Meyer et al. to Tim Francis et al. "requesting funds from OPCOM for core-log integration project" contains information relevant to SMP interests. It was understood that a copy was sent to the DMP chair, but not to SMP. A principal Computer Science Group concern is how to develop algorithms and how to identify the hierarchical steps that will be necessary to provide primary information from instruments for algorithm input.

(d) Dr. Michael S. Loughridge (NOAA Nat. Geophys. Data Center) made available to IHP members floppies in the Macintosh format to access the CD-ROM DSDP Cumulative Index. Mike mentioned that he would be glad to assist any JOIDES panel member to obtain floppies or data from the center that is relevant to panel activities.

2) Action items

(a) SMP Action: IHP requests SMP to review information presented on the barrel sheets with the goal of increasing quantitative information and reducing wasted space. Specifically, too much space is used for colour. IHP is negative to qualitative data, which was labelled "Victorian" during the meeting.

(b) ODP Action and SMP information: Notice and concern was expressed about the frequent lack of interstitial water for ODP archives . Russ Merrill was requested to have a report prepared for submission to SMP (see pages 10-11).

(c) PCOM action and SMP information: IHP recommendation 1 follows: "that PCOM establish a working group with participants from IHP, SMP and DMP and advised by an external consultant to undertake an in-depth external review of hardware and software systems (both ship and land based) with a view to determining the best possible future direction for ODP computing and data handling consistent with objectives of the long-range plan". It was noted that the ODP has no professional programmers and does not appear to have a satisfactory long-range development plan.

(d) PCOM Action and SMP information: IHP recommendation 2: " IHP again stress the desperate need for a second shift of shipboard system operators to provide 24-hour coverage and to improve the functioning of shipboard science.

SMP discussed the barrel sheet and recommend the following changes to IHP:

1. move Munsell colour to the description column
2. the sample information column can be narrower or moved to the section column

3. add an extra column for microfossils
4. reduce graphic lithology to codes
5. maintain space for quantitative logs, but maintain flexibility, the scientific party should select the most appropriate data sets for each leg

SMP endorses IHP recommendation #1. ACTION: K. Moran to investigate results of IHP recommendation #1

X Other Business

Two new issues were raised. A. Richards pointed out the additional requirement that the drill hole data, which includes both sample and downhole log information must ultimately be tied to the geophysical record. The panel unanimously agreed. The panel has discussed, in the past, the requirement for vertical seismic profiles (VSP) which have not yet been included as a routine shipboard procedure at all sites. However, it was agreed that this issue should be kept in the forefront during the development of an implementation plan for core-log data integration.

The second issue raised was a question related to standard shipboard procedures, specifically, why do we need an entire core half for archive? The panel agreed that it was a good question and J. Baldauf suggested that he could investigate the original reason for setting up these standard procedures for discussion at the next meeting. **ACTION: J. Baldauf.**

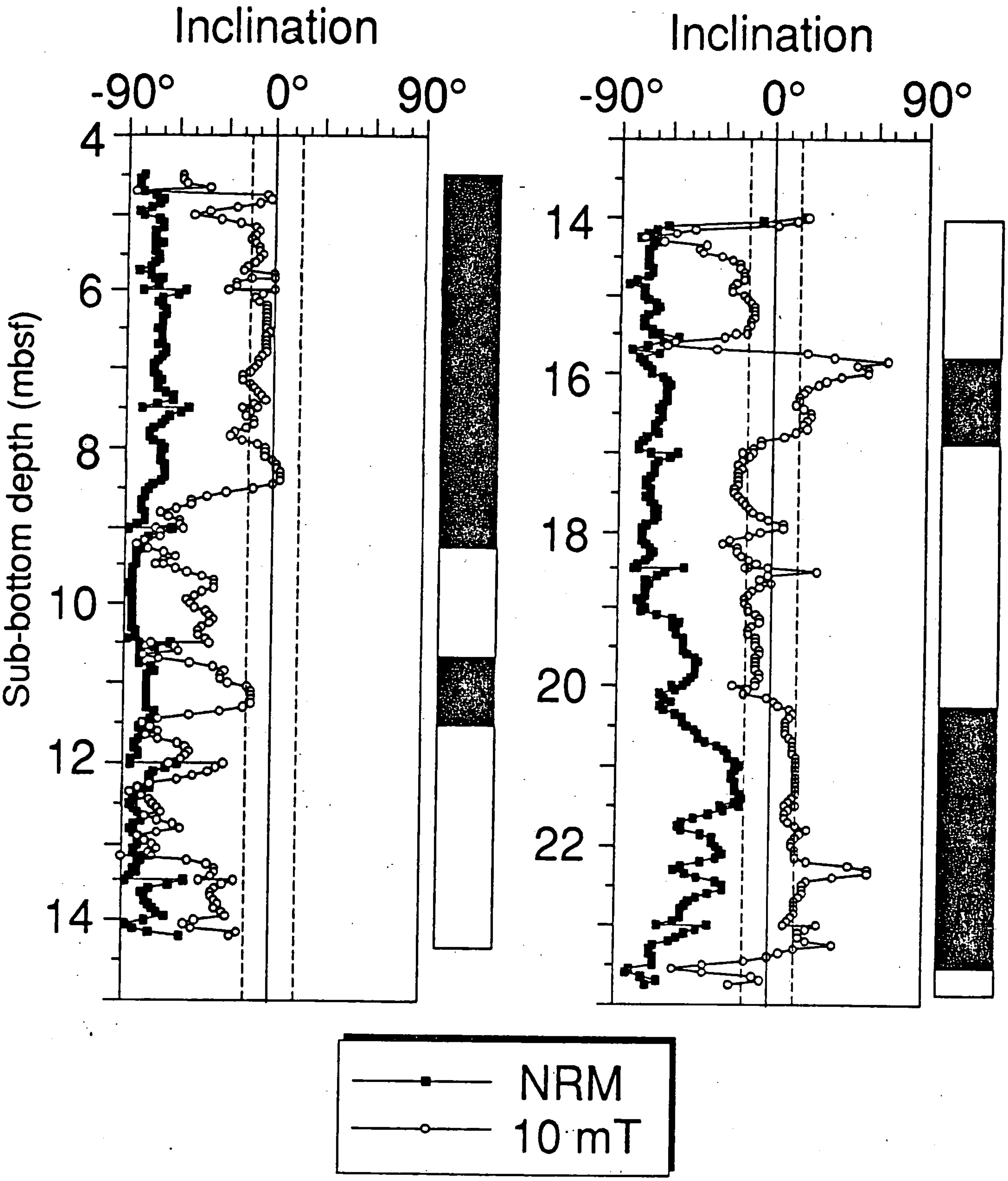
XI Panel Membership

The panel discussed rotation of members. Both Richards and Whitmarsh will be rotating off the panel after their three year terms are complete (March '92). They will be replaced by nominations from ESF and the UK, respectively. To maintain continuity, the panel would prefer that a maximum of two members at one time be rotated. **The panel does not yet have representation in sedimentology and recommend the addition of one more panel member to fill this need (91-15: to PCOM).** The two names will be forwarded to the PCOM chair.

XII Next Meetings

The proposed location of the spring meeting of SMP is Honolulu to coincide with a RESOLUTION port call, 21-23 March, 1992. M. Mottl has agreed to host the meeting. The planned schedule will be a one day visit to the ship on 21 March, followed by two days of meetings. It is expected that the panel meeting will take two full days.

Panel members agreed that another joint meeting with IHP would be appropriate in the spring of '93, so that meeting is tentatively planned for March, 93 in College Station. The fall meeting of SMP will either be at the Nat. Geophysical Data Center, Boulder, Colorado (dependant on host) or at Humboldt State University, California (R. Chaney, host).


Inclination
-90°
0°
90°
Sub-bottom depth (mbsf)
4
6
8
10
12
14
Inclination
-90°
0°
90°
14
16
18
20
22
NRM
10 mT

Report of Geochemistry Survey
(19/45 respondents - 42%)

I. Routine frozen OG samples:

A. Community concurs with PCOM decision to terminate routine OG sampling.[1]

B. Non-routine sampling may still require facilities for shipping and storage, both aboard ship and ashore, of frozen samples.[1]

C. Frozen samples collected through Leg 134 should be retained and kept frozen, pending the results of (a) degradation studies and (b) advertising.[1]

D. The existence of this collection should be advertised as widely as possible to the community. ODP should consider cataloguing these samples along their lithologies and C_{org} contents, as interpolated from adjacent core, and making this catalog widely available.[1]

E. Cataloguing and advertising the collection should increase the number of sample requests. If not, the frozen samples could be discarded after some minimum time period, perhaps 10 years from the time of collection.

F. If necessary due to space limitations, the samples could e sorted by some criteria yet to be established (e.g. C_{org} content), and the less valuable samples discarded.

II. Use of units for IW analysis:

A. Use of mmol/litre in the database, as shipboard analyses are performed volumetrically.

B. Either mmol/litre or mmol/kg may be used in print, at the discretion of the shipboard geochemist. Method of conversion from mmol to mmol/kg, if used, should be noted.

C. Conversion assuming constant density is acceptable, as long as the method and value are noted.

D. conversion via an algorithm relating density to chlorinity is discouraged, as (a) it is complicated (unlike C), and (b) density usually varies more as a function of SO_4 than of Cl.

E. Algorithm relating density to composition, using partial molal vols., would be best, but it is not necessary for ODP to develop such an algorithm. This is better left to interested individuals.

---

[1] Recommendation agrees with those of the ODP Geochemistry Workshop, Jan., 1990.

III. Addition of new equipment to the Chem Lab:

A. ICP of DCP is not advisable at this time: unnecessary and too complicated.

B. ICP/DCP could not replace XRF:
(a) too much sample prep; requires acid dissolution
(b) too low precision
(c) requires drift correction and hence more standardization
(d) less reliable to automate

C. No consensus about other instruments (none mentioned by more than one respondent).

DRAFT SMP Special Core Disturbance Meeting Report
18 October 1991

K. Moran[1], R.Chaney[1], J. Gieskes[2], J. King[1] and J.C. Marsters

INTRODUCTION

The panel met with other participants to review existing core disturbance problems and to recommend, if possible, changes to current procedures to improve core quality. The meeting was broken into two parts, a morning session where presentations were made on specific issues and an afternoon session of discussion which focussed on the problems identified during the morning presentations. Based on these discussions, recommendations were made to reduce core disturbance.

PRESENTATIONS

Presentations were made on four different topics related to core disturbance: **mechanical disturbance** which occurs directly from the coring process and sample handling; disturbance related to **contamination**; and disturbance related to **sample pressure relief**. In addition, a presentation was made on recent advances in coring instrumentation developed at the Bedford Institute of Oceanography.

Mechanical Disturbance

Dave Huey (ODP/TAMU) reviewed mechanical disturbance of the core from the coring processes, specifically, from the APC and XCB. During APC operation, core disturbance occurs from a number of different effects which include: (1) the basic design of the cutting shoe, normally quantified using the Hvorslev parameters; (2) partial stroke which can result in flow-in; and (3) core liner failure. Different cutting shoe designs were tried and were on board the ship from Leg 90 to early in ODP. These cutting shoes were taken off the ship because of lack of interest from the scientific community. Partial stroke of the core still occurs and there is no mechanism in place yet which can lock the piston in position so that flow-in cannot occur. The engineering group has developed prototype break-away pistons to address this issue, but PCOM has told the group to put this development on hold indefinitely. Core liner failure has essentially been eliminated by a design improvement which was incorporated during DSDP. This design improvement seals the liner to the core

[1] JOIDES SMP Member

[2] JOIDES DMP Member

barrel so that the core liner transfers these failure stresses to the barrel and prevents liner failure. In summary, the improvements which can be made to the APC to reduce mechanical coring disturbance are:

(1) an improved cutting shoe with optimal Hvorslev parameters
(2) development of the break-away (split) piston

The XCB coring tool has seen many changes since its initial use on the drill ship. The tool typically causes severe mechanical disturbance of the core by shearing small pieces of sediment into 'biscuit' sized pieces, hence the term 'biscuited' core sample. Although the recovery of biscuited material is much preferred over completely re-worked sediment which is recovered using standard rotary coring in sediment, considerable improvement can be made to reduce core disturbance in the XCB. The major problem with the XCB is that the cutter shoe jets plug. The XCB has recently been upgraded to address this problem with the incorporation of a 'smart' flow control valve which detects flow and appropriately changes the flow path. This new version will soon be tested. Several other improvements have been made to the tool in the past, but documentation of the resulting improvement to core quality with each change has not yet been done. Improvements to this coring tool are still required to significantly reduce mechanical coring disturbance.

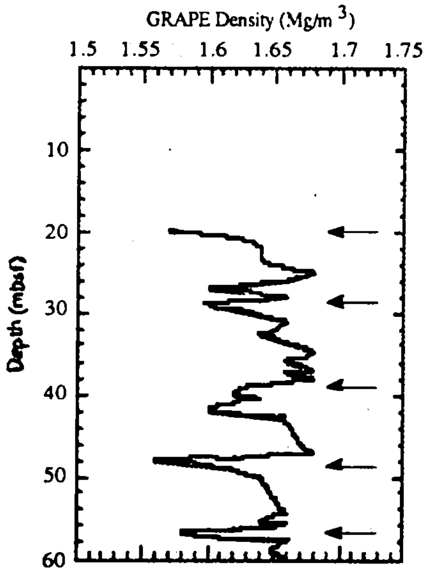


Fig. 1 GRAPE bulk density profiles in the upper 60 m of Hole 808C (modified from Kroenke et al., 1991)

Dave Huey also discussed the development of the vibro-percussive core tool. This tool was developed by a visiting engineer from BGS, Jack Pheasant. The tool has been tested on the ship, but is now in the dormant project status. This tool can potentially recover coarse sediment and shallow water carbonates, which cannot be sampled with the other coring tools.

Randy Current summarized core laboratory processes that cause disturbance to the sample. These are: **core handling, core splitting,** and **sampling.** Core handling causes disturbance when the liner is allowed to bend when moving from the core barrel to the cat walk and when moving the cut core from station to station within the core laboratory. When splitting the core, mechanical disturbance occurs due to twisting of the liner while splitting the sediment sample and contamination occurs when 'drill' water is used to clean the surface of split cores. The most severe disturbance occurs when the split core is sampled. A new method of sampling the core will shortly be incorporated using scoops to remove material from the side of the split core, closest to the liner.

Kate Moran presented evidence of mechanical core disturbance compiled by Janice

Marsters, a physical property scientist who sailed on Leg 130. Based on low GRAPE density within the top section of APC cores, the results suggest that remoulded sediment is smeared along the outside of the core sample and the amount of smeared material deceases with depth in each core (Fig. 1). The arrows mark the position of the top section of each core. Deeper sections of each core are also affected as seen by the gradual increase of bulk density over several metres below the top of the core. Given this disturbance, the peak strength values measured in the upper sections should be lower than in deeper sections. However, examination of peak strength data on a core by core basis indicates that shear strength in the top section of each core is consistently higher than deeper sections (Fig. 2). Visual examination of the upper section of each core explains the apparent contradiction. At least the upper 50 cm to 1 metre of each first section contains water and remoulded mud between the recovered sample and the liner. It appears that water trapped between the piston and the sediment surface has been forced between the cored sample and the liner while at the same time, this force compresses the centre of the sample. The water between the liner and the sediment explains the low GRAPE density values and compression of the sediment in the centre of the core (where the vane shear measurement is made) results in an increase in the frictional component to of the shear strength, which dominates over cohesion in these coarse-grained carbonates.

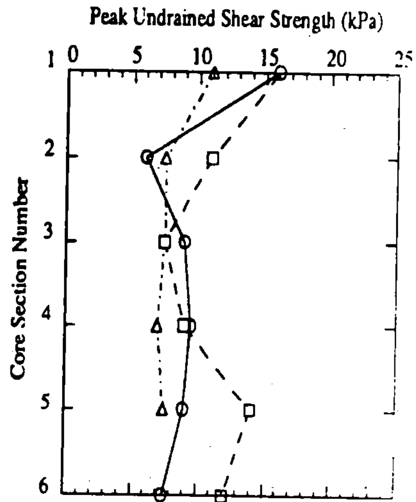


Fig. 2 Vane shear strength vs. section number for Cores 130-803D 9-11. Note consistently high strengths at the top of each core.

Contamination

Kate Moran presented the results of John King's study on contamination of the core from rust which was initially detected in the magnetic susceptibility records. This contamination is seen in sediments of low magnetic susceptibility (e.g. carbonates) and more extensively in the top 5-7 APC cores of each hole (Fig. 3). The contamination is caused by the smearing of rust-contaminated sediment along the outside of the core. The contamination is most severe in the top section of the core. However, the contamination probably occurs in **all** APC cores to some unknown extent. The problem has been compounded for ODP over DSDP because full string pipe losses were relatively frequent during DSDP and have essentially not occurred for ODP. Consequently, new pipe is not replaced all at once and the current string is old and rusted. A study of the rust contamination problem was undertaken by John King. The major goal of the study was to determine the source of the rust and the process by which it is introduced into the APC cores. Previous investigators felt that the source of the rust was the outside of the APC BHA drill pipe. To test this, samples were taken from the inside and outside of the drill pipe on the *Resolution* during the SMP meeting at the Townsville port call. Samples were also taken from core 707A-5H (Fig. 3). Rock magnetic studies were done on the four core samples and on the samples taken from the inside and outside of the core pipe. XRD analyses were performed on the two drill pipe rust samples and the on a magnetic separate made from the most disturbed section of the core samples. The results show that the samples from the core consist of magnetite or maghemite mixed with calcium carbonate. Sample from the core is most similar to the rust from the inside of the pipe and both are dissimilar to rust from the outside of the pipe. Therefore, the rust contamination is probably from the inside of the drill string. This core contamination is most severe on sediment of low magnetic susceptibility.

Joris Gieskes presented a thorough summary of contamination of pore water chemistry. Sample validity for pore water chemical studies has been a long-standing concern during DSDP and ODP. This concern resulted in a number of early studies. During Leg 15, Wally Broecker and Joris Gieskes carried out a dye experiment to evaluate the severity of fluid contamination into the sediment samples. They found relatively severe contamination in chloride (17.2 g/Kg vs. 19.3 g/Kg); some contamination in magnesium; and only small contamination in calcium (Gieskes, 1973; Hammond, 1973). Unfortunately, this experiment was complicated by the use of fresh water rather than sea water, which probably compromised the experiment through imposed osmotic effects. Pore water chemistry contamination in rotary drilled holes can be considerable, but evidence suggests that mixing occurs lengthwise in the core through smearing, not through total mixing of the sediment as it enters the core barrel. Simple precautions which have normally been performed to ensure an uncontaminated sample are (1) removal of the outside 1 to 2 cm of sediment from the whole round, (2) followed by visual inspection of the sample to be squeezed. In core samples collected using the APC and XCB, the latter precaution will normally suffice. Joris presented several examples of pore water chemistry from DSDP to ODP, spanning Legs 25 to 131.

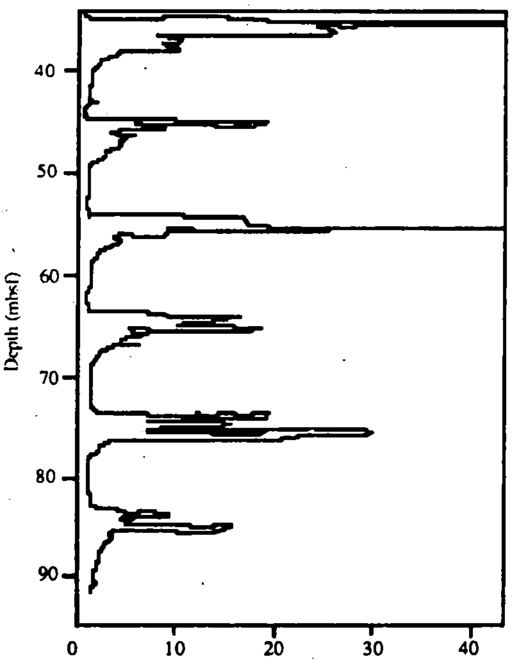


Fig. 3 Whole core magnetic susceptibility for HOle 707A, between 40 and 100 mbsf showing the characteristic "sawtooth" motif associated with contamination by ferrous metal artifiacts at the top of APC cores and the subsequent smearing of contaminants around the exterior of the sediment sample (modified from Sager, et al., 1986).

DSDP Leg 25

At approximately 150 mbsf (Fig. 4), a 'wiggle' in the sulphate profiles suggests seawater contamination, but this is less evident from the calcium and magnesium profiles. Samples from 550 mbsf and deeper had little volume, thus affecting the sulphate determinations in use at that time. However, the smoothed dashed line through the magnesium concentrations is probably representative of the concentration-depth trend.

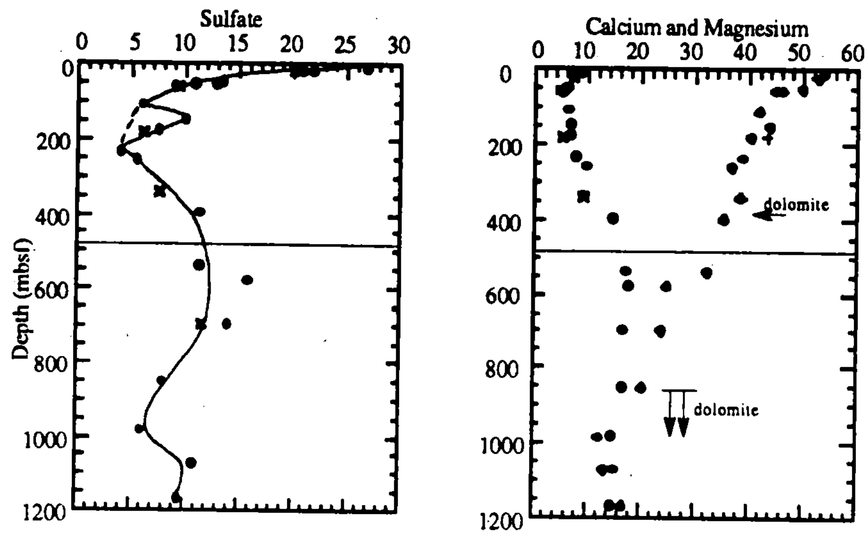


Figure 4. Interstitial water data Site 241. Solid circles (Sulphate) are measurements from squeezed samples at 23° C and X 's are measurements from *in situ* water samples at 5° C. Note 'wiggly' behaviour of sulphate at ~ 150 mbsf. This is most probably due to sea water contamination (from Gieskes, 1974).

DSDP Leg 64

In the deeper parts of site 477, samples consisted of chunks of hydrothermally altered materials which were sandy. Despite efforts to clean the samples with a razor blade. magnesium concentrations were variable. If extrapolated to zero magnesium as expected for this situation, all other data lost their scatter in the concentration depth curves, and the data adjusted from calculations of sea water contamination showed trends in agreement with data obtained from hydrothermal vents in this area of the Gulf of California (Gieskes, et al., 1982).

ODP Leg 110

Tests were made using sequential squeezing of samples at two pressures. Data agreement is generally quite good, but there is some evidence that the second portion gives slightly larger changes in concentration when compared to sea water (Fig. 5). This could be due to the expulsion of a slight amount of contaminant sea water at the beginning of the squeeze operation. Note that the sample at 120 mbsf shows signs of contamination in sulphate and magnesium, but much less in calcium. Similarly, the 'peelings' of the outside of the whole round core sample indicate severe contamination in the sulphate and magnesium data, and much less in the calcium data. Generally, however, the data suggest good reliability.

ODP Leg 131

Sulphate data at Site 808 (Taira, Hill et al., 1991; Gieskes et al., 1992) suggests that the lower porosity sediments (near 365 mbsf and near the base of hole 808C) suggest that some contamination by sea water has occurred. Nonetheless, clear trends in the composition of magnesium, calcium and chloride are not obscured by this contamination, which amounts usually to less than 5%. The data quality of the samples was enhanced by the conscientious inspection of all samples. However, as samples were squeezed at room

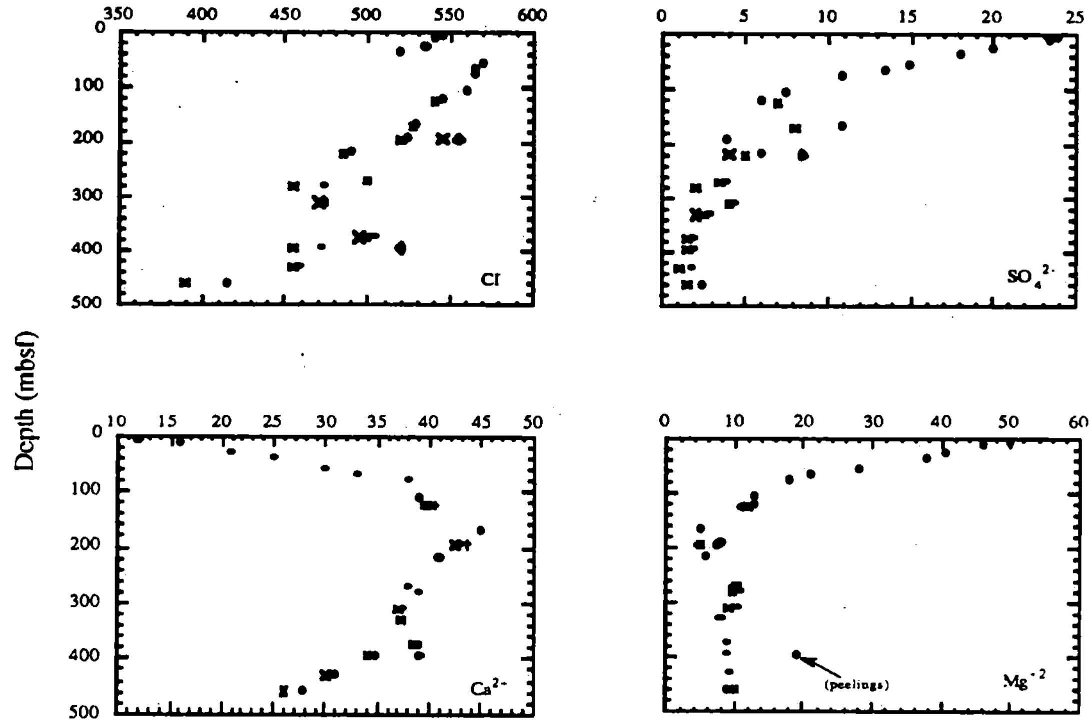


Fig. 5 Interstitial water data Site 674. Tests were performed on sequential samples at two pressures (solid circles, X's and crosses). 'Peelings' were also tested and are plotted as diamonds (from Gieskes, et al., 1990).

temperature, and *in situ* temperatures at 800 mbsf exceeded 80° C, it is possible that severe artifacts as a result of temperature difference may have occurred. For some components, however, this problem is nonexistent as their pore water concentrations are essentially zero at depths below 800 mbsf (see Gieskes, 1973; Gieskes, 1974; Sayles, et al., 1973).

In general, with appropriate precautions, good results on pore water compositions can be obtained, even from severely mechanically disturbed cores, there will always be some concerns about the veracity of the data. These concerns include: artifacts induced from the temperature of squeezing; and *in situ* sampling.

Temperature of Squeezing Artifacts

Under 'normal' geothermal gradient conditions, these effects cause only minor changes in concentration depth trends and certainly has not hampered conclusions drawn from available data.

In situ Sampling

During Leg 47B, the first successful attempt at *in situ* sampling was carried out using the Barnes tool (Barnes et al., 1979). Subsequently, this tool has been used on many occasions, with the specific goal to compare shipboard squeeze data, obtained at a relatively high vertical resolution, with widely spaced *in situ* samples. Typically, there is good agreement between squeeze sample measurements and measurements made on *in situ* water samples (Fig. 6).

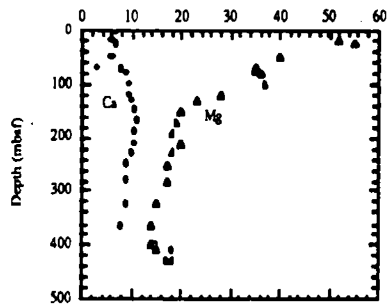


Fig. 6 Selected interstitial water data from Site 479, Guaymas Basin, Gulf of California. Closed symbols are squeezed data and open symbols are *in situ* data.

However, *in situ* sampling can also be subject to artifacts, especially when pressure is of importance, e.g., carbonate dissolution or gas hydrate decomposition. The latter was studied at Site 568, Leg 84 (Hess et al., 1985). At Site 568, dissolved chloride decreased as a result of decomposition of hydrate in the samples. Good agreement to 300 mbsf with the *in situ* data suggests that similar artifacts have affected the *in situ* samples, probably due to sampler-induced pressure gradients in the sediment which results in flow of pore water toward the *in situ* sampling tool. At the base of site 568, the *in situ* tool sampled water that was contaminated with surface sea water, probably due to cracking of the formation (gas hydrate ice).

Sample Pressure Relief

Kate Moran presented consolidation test results from Leg 110 and 131 showing the elastic response of sediment as a function of stress (Fig. 7). Sediments expand elastically when effective stress is removed during the sampling process. This effect is well known and Hamilton (1976) has published approximate corrections for different marine sediment types. However, each sediment type has a unique rheology and therefore the elastic response is unique. It is becoming necessary on many legs to correct the data back to the *in situ* porosity in order to calculate accurate mass accumulation rates, link the cores to the log data, and to compute synthetic seismograms for correlation of the hole with the seismic record. Consequently, an improvement to the current shipboard procedure would be to correct each lithology sampled with elastic response data as measured from consolidation tests.

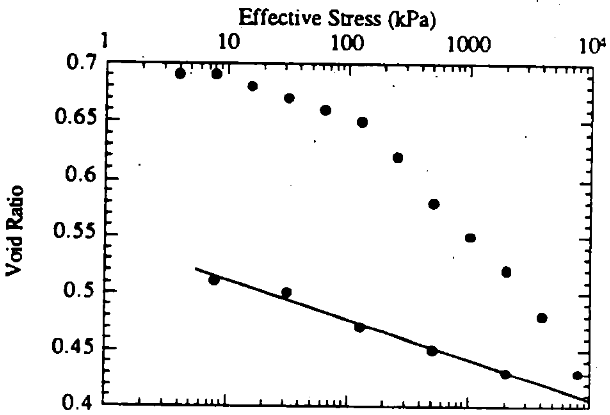


Fig. 7 Consolidation test results from Hole 808C Core 77R Interval 109-114 cm. The line represents elastic rebound of the sediment.

RECOMMENDATIONS

The meeting participants agreed on a number of improvements which can be made to existing operations at relatively low cost. These improvements are listed in three categories: downhole operations and tools; shipboard laboratory operations; and additional shore-based operations.

Downhole Operations and Sampling Tools

1. The meeting participants agreed that the placement of an accelerometer in the piston of the APC in conjunction with mud pressure monitoring would be very useful in the evaluation of sample disturbance.

2. If still available, the slim nosed APC cutter shoe should be use instead of the currently used blunt-nosed cutter shoe. The slim nosed design reduces sample disturbance. In addition, the engineering group should modify the cutter shoe design to follow the recommended Hvorslev parameters.

3. The meeting participants were pleased to see the proposed improvements to the pipe maintenance program. They endorsed coating the inside of the drill pipe along with the development of a regular maintenance and rotation plan to eliminate the rust contamination in APC core.

4. Design work on the break-away piston should continue to prevent flow-in in cases of partial penetration.

5. The participants strongly encourage improvements to the XCB. An evaluation of the track record of the XCB in terms of sample quality would provide a good base for design improvements. This type of study should be conducted and should include an operational evaluation of the XCB, the XCB version used, and the type of sediment sampled in terms of engineering classification.

Shipboard Laboratory Operations

1. Sampling and measurement of sediment should not be performed at the edge of the core sample, adjacent to the liner. The edge of the core sample is composed of smeared sample. Therefore, scoop-type samplers may not be an improvement over the plug-type samplers if they are used at the edge of the core. In addition, the laboratory miniature vane shear device should only be used in the centre of the slit core.

2. A support or strong-back should be used to move the working split half from station to station in the laboratory.

3. High resolution (3/section) density and shear strength determinations should be made on selected APC holes for Leg 145 to better assess mechanical disturbance. SMP requests the physical properties specialist to measure shear strength in two different directions: at one end of selected unsplit sections and then at several intervals along the split core section.

4. The participants encourage the study of the effect of core handling (including bending) on stress-strain properties.

5. When splitting core liner which contains soft material, the following procedure is recommended:
   (a) split core liner with the blades, but with no wire; and
   (b) turn the core 90° and run wire quickly through the sediment while simultaneously pulling the split sections apart.

6. After splitting the core, the archive half should be washed using filtered seawater. The working half should not be washed.

7. To obtain good quality pore water geochemistry, the following precautions should be taken:
   (a) omit the outer 1-2 cm of the whole round sample;
   (b) inspect the sample for zones of contamination, e.g., the detection of excessive amounts of water in pockets (soft sediment) or in sediment cracks (hard sediments);
   (c) in 'biscuited' material, real *in situ* sediment must be isolated, and if necessary, scraped off with a spatula or a razor blade prior to placing it into the squeezer;
   (d) pore water chemists should be contiunously aware of the fact that a very small sample of good pore water is vastly prefereable to large samples of much more dubious nature.

Shore-based Operations

1. Consolidation tests on representative whole-round samples from each lithology at a site should routinely be run for stress relief corrections.

REFERENCES

Barnes, R.O., Gieskes, J.M., Horvath, J. and Akiyama, W. (1979). Init. Repts., 47: Deep Sea Drilling Project, p. 497.

Gieskes, J.M. (1973). Init. Repts., 20: DSDP, p. 813.

Gieskes, J.M. (1974). Init. Repts., 25: DSDP, p. 361.

Gieskes, J.M. and Johnson, J. (1981). Init. Repts., 60: DSDP, p. 749.

Gieskes, J.M,. Elderfield, H., Lawrence, J.R., Johnson, J., Meyers, B. and Campbell, A. (1982). Init. Repts., 60: DSDP, p. 749.

Gieskes, J.M., Blanc, G., Vrolijk, P., Elderfield, H., and Barnes, R. (1990). Proc. ODP, Init. Repts., 110: College Station, TX, Ocean Drilling Program, p. 155.

Hamilton, E.L. (1976). Variations of density and porosity with depth in deep-sea sediments, Journal of Sedimentary Petrology, v. 46, p. 280-300.

Hammond, D.E. (1973). Init. Repts., 20: DSDP, p. 831.

Hesse, R., Lebel, J. and Gieskes, J.M. (1985). Init. Repts. 84, : DSDP, p. 727.

Kroenke, L. W., Berger, W.H., Janecek, T.R. et al.(1991). Proc. ODP, Init. Repts., 130: College Station, TX, Ocean Drilling Program.

McDuff, R.E. (1978). Ph. D. Thesis., Univ. of California, San Diego.

Sager, W.W. (1986). Proc. ODP, Init. Repts., 101: College Station, TX, Ocean Drilling Program, p. 39-45.

Sayles, F.L., Manheim, F.T. and Waterman, L.S. (1973). Init. Repts., 20: DSDP, p. 783.

Taira, A., Hill, I. and Firth, J., et al. (1991). Proc. ODP, Init. Repts., 131: College Station, TX, Ocean Drilling Program.