Minutes
Sedimentary and Geochemical Processes Panel
College Station, Texas
March 5, 6 and 7, 1991

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Executive summary

The main topics of discussion during the 3-day meeting were *"Gas hydrates and ocean drilling"* and the ranking of proposals from all oceans for drilling beyond Leg 147. The first topic was the subject of a workshop, the proceeding of which will be reported separately but its recommendations are listed below. The ranking of drilling proposals was preceded by grouping them according to the five themes of SGPP as published in the panel's White Paper. The final ranking was by voting each time for one of the top-ranked proposals in each of the five thematic groupings.

A. SGPP final ranking

1	(335)	Gas hydrate
2	391	Mediterranean sapropels
3	DPG	Sedimented ridges II
4	348/A	New Jersey margin sealevel
5	380/A	VICAP
6	233/E	Cascadia margin II
7	354/A	Benguela Current
8	59/A	Sediment instabilities
9	DPG	East Pacific Rise II
10	337	New Zealand sealevel
11	360/D	Valu Fa sulfides
12	388	Ceara Rise
13	368	Return to 801
14	361	TAG hydrothermalism
15	340/B	NW Australian margin
16	330/A	Mediterranean Ridge
17	378/A	Barbados accretion
18	367/C	South Australian margin
19	275/E	Gulf of California
20	372	North Atlantic water mass evolution

B. Gas hydrate recommendations

1. Dedicated gas hydrate leg

The interaction of natural gas hydrates with the thermal and fluid regime of continental margins and in particular accretionary complexes, is the highest scientific priority of the SGPP. Likewise, the presence of gas hydrates has uniquely influenced safety deliberations by the PPSP in drilling deep margin holes. Hence, the participants of a gas hydrate workshop held in conjunction with the SGPP meeting recommend that a dedicated gas hydrate leg be planned and drilled similar to the one previously proposed for the Peru margin (355 A). The SGPP and the PPSP, outside proponents and investigators should design such a leg with drilling opportunities in the Atlantic or the Pacific Oceans. This planning process should take into account the relevant gas hydrate results expected from Legs 141(CTJ) and 146 (Cascadia).

2. PCS: Exchangeable pressure chamber

The pressure core sampler under development by ODP is a coring system capable of retrieving samples at bottom hole pressure, and hence is the key tool for pursuing several major objectives of SGPP, notably the behavior of fluids, gases and hydrates in accretionary prisms. The SGPP considers that successful completion of these objectives requires three exchangeable pressure core subassemblies and recommends that these be available for the upcoming legs 141 and 146. These assemblies should be used on a rotating basis with one chamber attached to the PCS system during sampling, while the contents of the second one are subsampled and analyzed aboard ship and the third one is being readied for a new deployment. This approach allows a complete downhole profile, as opposed to a single measurement per hole. It provides adequate turn-around time for close sample spacing downhole, eliminates the costly construction of an as-yet-unavailable transfer chamber, and ensures back-up in case of damage. If trace metal concentrations are of high priority, the multiple subassemblies are to be made of titanium; if gases, dissolved metabolites or major sea water ions are to be measured, the less costly stainless steel version is adequate.

3. PCS: "Harpoon" for extracting pore waters

For shipboard analyses of the pressurized samples obtained by the PCS system, the "harpoon" is presently the most suitable attachment for subsampling fluids. It utilizes the internal pressure of the sample chamber to self-squeeze pore waters from the center of the core thereby eliminating possible contamination by drilling fluid. This attachment has been constructed to be used in conjunction with the pressure chamber subassembly but has not been tested. SGPP concurs with the recommendations of the workshop participants that construction, testing and operation of the harpoon be completed with input from the shipboard geochemists of Legs 141 and 146.

4. PCS: Manifold for extracting free and hydrated gases

A gas sampling manifold is required to obtain the contents and composition of free and hydrate gases. The existing manifold assembly of the PCS tool appears to be inadequate -due to large internal volumes- to conduct the necessary experiments with gas hydrate contained inside the pressure chamber. The SGPP concurs with the recommendation of the workshop participants that a previous successful gas sampling manifold (Keith Kvenvolden; USGS Menlo Park) and a new but untested design (Jean Whelan; Woods Hole Oceanographic Institution) be perfected by ODP with input from both of these experts as well as future shipboard geochemists.

5. Predictive equation for depth of gas hydrate stability

The temperature and pressure regime below the seafloor determines the stability field of pure methane and mixed gas hydrates. The SGPP concurs with the recommendation by the workshop participants that an analytical equation be tested and substituted for the graphic method -used unchanged since the days of DSDP- and that a software package, allowing numerical solutions for any environment of gas hydrate stabilities, be developed for use aboard the JOIDES Resolution to improve safety measures.

C. Other recommendations

1. Wireline/packer water sampler

The SGPP considers the wireline-packer water sampling device an important development which is necessary for obtaining fluids from hard rock sites. The recent failure on Leg 133 should not be allowed to hinder the future development of this needed instrument. Notwithstanding the development of an ODP/TAMU water sampler, the SGPP understands that there are some commercial water/wireline packers available from Schlumberger. Their possible deployment and use drilling could be pursued as an alternative in legs such as the upcoming atolls and guyots (legs 143 and 144), but the wireline packer should be the only method for obtaining fluid samples in the future. The SGPP feels that the absence of this technology combined with the lack of suitable sediment samples from which to squeeze pore fluids will seriously impact the scientific results obtained from these legs. Pore fluids from the atolls and guyots drilling are needed to address questions of diagenesis and fluid circulation within these carbonate edifices, as mandated by the SGPP.

2. Sand sampling

As outlined in the SGPP White Paper, there is a strong need to be able to collect undisturbed cores of unconsolidated sands and other coarse-grained lithologies. In the immediate future, high-priority SGPP objectives on Sedimented Ridges I (Leg 139), Cascadia margin (Leg 146), and, if approved, Navy fan will require this capability. Two potential solutions have been pursued by ODP engineers for recovering the required sediments: a vibrating core and a break-away piston head within the APC coring system. Development of these tools however, has apparently stopped. We strongly urge PCOM to ensure that development of appropriate tools be given a high priority immediately, so that they will be ready when needed.

3. S-1 Navy fan

The first supplemental science proposal following the new PCOM policy is a request to drill the prograding fan off the California borderland to determine the time variability of turbidite deposits in relation to late glacial sealevel. This request addresses high priority objectives of the SGPP and the panel recommends the maximum of 4 days (PCOM policy) for drilling the Navy fan. S-1 should be carried out with an enhanced engineering staff on board that can ensure the successful operation of a sand sampling tool. Under these requirements drilling should take place at the beginning of Leg 147 (East Pacific Rise or Hess Deep) and not impact leg 146 (Cascadia margin).

MINUTES

The meeting started at 12:30 p.m. following a workshop on "Gas Hydrates and Ocean Drilling" on March 5 and 6. The minutes and the detailed recommendations of the workshop will be reported separately. Minutes taken and prepared by R.D. Flood and E. Suess.

Attendees

J.C. Alt
J. Boulegue
N. Christie-Blick
H. Elderfield
P. Farrimond (alternate for D. Stow)
R.D. Flood
M.B. Goldhaber (last meeting)
W.W. Hay
R.N. Hiscott
J.A. McKenzie
F. Prahl
F.L. Sayles (new member)
E. Suess (chairman)
P.K. Swart (new member)
R. Moberly (PCOM liason)
R. Zierenberg (LITHP liason)
M. Von Breymann (ODP liason)
M. Lyle (Borehole)
C. Fulthorpe (JOIDES Office)

Apologies

S. Dreiss
M. Ito
J. Mienert

Agenda

Reports:
- PCOM - Planning Committee Meeting
- NARM - North Atlantic Rifted Margins-DPG
- NAAG - North Atlantic Arctic Gateways-DPG
- A & G - Atolls and Guyots-DPG
- S. L. - Sea level-WG
- OHP - Ocean History panel
- DMP - Downhole measurement panel
- ODP-TAMU - Science Operator

Reviews
- Cumulative list
- Quick reference guide

Ranking
- All active proposals
- NAAG Group 1
- NARM Groups 1 & 2

Deep drilling
- Somali Basin
- Subduction zone drilling from island

Miscellaneous

Reports

PCOM: R. Moberly referred to the Executive Summary of the PCOM minutes previously distributed to all SGPP members and the published ship schedule. These additional items were specifically discussed: (1) There needs to be a recommendation from this panel about phase II of the Pressure Core Sampler (PCS). (2) There is a policy that proponents must be out of the room whenever there are discussions or rankings of proposals with which they are involved. (3)

A summary of the review process and how it leads to the FY93 plan and the 4-yr plan.

NARM-DPG: R. Hiscott reported on the group meeting, whereby "North Atlantic" refers to north of the Grand Banks - Gibraltar line. The objectives are mostly tectonic. There are some secondary SGPP objectives, but they are not very well developed. A summary of the NARM-DPG by R. Hiscott was distributed and is appended to these minutes. The Newfoundland Basin - Iberia transect appeared to be most likely. The group only looked at ranked proposals, but there are more in the system now.

NAAG-DPG: M. Lyle reported on the group meeting in place of D. Stow who was unable to attend. Highest priority: Neogene origin of ice caps in conjunction with climate information. The group suggested two potential legs from proposed sites (336/A; 320/A). One leg follows the northern sites, the other leg southern sites in Norwegian Sea and NE Atlantic. Potential SGPP interests in provenance of drift sediments to learn location of sources and of deep waters and to determine how the system is evolving.

A&G-DPG: R. Flood reported on the group meeting; the DPG constructed 2 legs from sites of proposals 202 and 203. There were many discussions about the best place to core the carbonate sequences to maximize recovery with the general conclusion that immediately behind the reef might be best. Of prime interest to SGPP are the sea level changes at several intervals in the Cretaceous and Eocene. SGPP also has strong interests in pore water sampling which do not appear to be met because of technical difficulties with the wireline packer water sampler. SGPP wants to make a strong statement in support of the development of the tools required for pore water sampling.

> **Recommendation**
> *Wireline/packer water sampler*
> The SGPP considers the wireline-packer water sampling device an important development which is necessary for obtaining fluids from hard rock sites. The recent failure on Leg 133 should not be allowed to hinder the future development of this needed instrument. Notwithstanding the development of an ODP/TAMU water sampler, the SGPP understands that there are some commercial water/wireline packers available from Schlumberger. Their possible deployment and use drilling could be pursued as an alternative in legs such as the upcoming atolls and guyots (legs 143 and 144), but the wireline packer should be the only method for obtaining fluid samples in the future. The SGPP feels that the absence of this technology combined with the lack of suitable sediment samples from which to squeeze pore fluids will seriously impact the scientific results obtained from these legs. Pore fluids from the atolls and guyots drilling are needed to address questions of diagenesis and fluid circulation within these carbonate edifices, as mandated by the SGPP.

SEA LEVEL: N. Christie-Blick reported on the working group meeting last weekend. The members spent the first portion of the meeting getting up to speed. They want to develop criteria by which to judge ODP proposals designed to study sea level variations. Technical issues that need to be addressed include (1) the need to recover carbonates and unconsolidated sediments, and (2) the fact that some transects include shallow water sites (<200 m water depth) that may require the use of an accessory platform. Several sea level sites (i.e., Legs 143 & 144 Atolls and Guyots) and proposals are currently in the system, but there is a need for

more proposals being submitted so that key sites can be selected for the time intervals of interest. A general strategy is in place, now we need to focus in on specific proposals.

OHP: P. Swart, the new liaison from SGPP, reported on the OHP meeting last week, where 1/2 day was spent discussing alternatives to the North Pacific transect. While many alternatives were discussed, there were no conclusions. The final ranking of all proposals for FY 93 by OHP is listed below. The next OHP meeting is scheduled for Oct. 1 - 3 in Japan.

1. 320/336 North Atlantic Arctic Gateways (two legs, alternate years)
2. 348 New Jersey Margin sea level
3. 354/339 Benguela Current
4. 388 Ceara Rise
5. 253 Shatsky Rise
6. 347 South Equatorial Atlantic
7. 229 Bering Sea
8. 386 California Current
9. 345 West Florida Sea Level
10. 363 Late rift/early drift
11. 296 Ross Sea
12. 313 Equatorial Atlantic

Unranked:
South Australia
Alboran Sea
Mediterranean sapropel

ODP-TAMU: M. von Breymann distributed summaries of upcoming legs (appended to these minutes) and discussed results of legs 134 and 135.

Liasons from SGPP

Following the rotation of two U. S. panel members the panel liaisons were discussed:

To OHP: Peter Swart, with the exception of OHP Japan meeting this fall. M. Ito may be able to act as liason from SGPP to OHP for that meeting.
To LITHP: J. Alt will be new liason as M. Goldhaber, present liason, is rotating off SGPP.
To TECTP: S. Dreiss remains SGPP liason.
To DMP: J. Mienert remains SGPP liason.
To SL-WG: N. Christie-Blick and R. Flood remain members.

Agenda for joint meeting SGPP/DMP

The SGPP meeting at Lamont on June 4-6 will include a one-day joint session with DMP on June 4. Items on the agenda will include the following questions for discussion:

1 What is the accuracy of geochemical logging tools including uses of new logging tools (e.g., C-O-tool) ?
2 What are the logging characteristics and log interpretation of gas hydrates ?
3 How to make maximum use of sealed bore holes and collect samples at in-situ temperature and pressure ?

4 What are the problems anticipated with the deployment of downhole tools in Cascadia and Barbados drilling ?

5 How to put together a special logging program for SGPP needs?

The last question will include discussion of wireline packers and hole stability and their effect on logging. We discussed the possibility of packers or other sampling tools being available in industry, and also suggested of inviting experts from Los Alamos and Schlumberger with interests in geochemical logging.

Review of proposals

E. Suess had distributed prior to the meeting a summary by category of proposals that served as a basis for the discussion prior to our ranking. This summary was supplemented by those proposals previously ranked high with regard to SGPP's interest. The categories represent the themes and respective chapters of the SGPP White Paper. The following proposals received extended reviews during the meeting:

1. SEA LEVEL

		Rating assigned	
*	367/C	4	South Australia margin
*	345/A	4	West Florida
*	381/A	-	Argentinian slope

2. MATERIAL CYCLING / SEDIMENTARY ARCHITECTURE

all	380/A	5	VICAP
*@	250/E & S-1	5	Navy Fan
@	59/A	4	Sedimentary instability
	341/A	4	St. Lawrence ice sheet
@	323-Rev	3	Atlantic-Mediterranean gateway
*	313/A	4	Equatorial Atlantic pathways

3. FLUIDS

	332/A	4	Florida Escarpment
*	355/A	5	Peru gas hydrate
all	378/A	4	Barbados Ridge
all*	330/A & Add	4	Mediterranean Ridge

4. HYDROTHERMALISM / METALLOGENESIS

*	275/E	5	Gulf of California
	360/D	5	Valu Fa sulfides
	361	5	TAG-hydrothermalism
	325/E	5	Endeavour Ridge
	284/E	5	Sedimented Ridges II

5. PALEOCEAN-CHEMISTRY/-HISTORY

Atlantic

all	372/A	4	North Atlantic evolution
@	389	2	Cretaceous Atlantic
@	391	4	Mediterranean sapropels
	354/A	4	Benguela

Pacific

*	386-Rev	3	Neogene California current

Proposals with secondary SGPP objectives

Atlantic

all	376/A	3	2/3 Boundary	(hydrothermalism)
all	369/A	3	MARK area	(serpentinization)
*	384/A	2	Aruba gap	(Mesozoic seaways)
*	382/A	1	Vema FZ	(no SGPP objective)
*	374/A	1	Oceanographer FZ	(no SGPP objective)
@	334-Rev	1	S-reflector Galicia margin	(margin evolution)
*	363/A	1	Late rift/early drift	(margin evolution)
@	365-Rev	3	Atlantic conjugate margins	(margin evolution)
@	392	1	Labrador Sea	(margin evolution)
@	393	1	SE Greenland margin	(margin evolution)
@	394	1	Hatton Rockall margin	(margin evolution)
@	395	1	Faeroe Bank margin	(margin evolution)
@	396	3	Faeroe Platform margin	(margin evolution)
Mediterranean				
*	383/A	1	Aegean Sea	(no SGPP objective)
*	379/A	(4)	New Mediterranean prospects	(ridge accretion)
*	364/A	1	Sardinian-African collision	(metamorphism)
Pacific				
@	390	-	Bering Sea	(immature proposal)
	368/A	4	Jurassic Pacific crust	(hydrogeology)
*	373/E	4	Site 505 stress	(ridge flank hydrother.)

all = proposal copy sent to all SGPP members November 1990
* = proposal copy and watch dog assigned October 1990
@ = new/revised proposal distributed to assigned SGPP members for College Station Meeting

Category 1: **Sea Level**

South Australia margin - 367:
Contains a relatively thin upper sediment layer with on-shore sediments of similar age. There may also be Cretaceous sediments within reach of the drill. May contribute to sea level story, as well as be good mid-latitude carbonate margin; immature proposal, cool water carbonate and sealevel objectives are of interest to SGPP; the existing seismic data is not good enough for sealevel objectives.
Rate as 4.

West Florida margin - 345:
Proponents have received a detailed letter from the SGPP chairman on previous discussions; our main concern remains with the apparently limited number of cycles developed and, in part, the erosion of important parts of the cycles by the loop current. SGPP received and acknowledged a letter from the proponents which generally answered our previous concerns; i. e. role of loop current, paleodepth and general timing; SGPP is of the opinion that this proposal is not driven by the phosphorite story and hence the geochemical objectives are of secondary nature.
Rate as 4.

Argentine slope - 361:
Present version of proposal is too immature to circulate, but it may have something to contribute to the sea level story. An up-dated version needs to be looked at.
No rating.

Category 2: **Material Cycling / Sedimentary Architecture**

VICAP-380:

This proposal will help to answer, among many others, the SGPP concerns of how does sediment come to be around a volcanic island. On its primary level, however, it deals with the physical and chemical evolution of the system "asthenosphere-lithosphere-seamount-volcanic island-sedimentary basin" within the well defined Gran Canaria. This is an enormous and over-ambitious objective. Integrated land studies exist, although in several instances drilling on land would be better than drilling at sea. SGPP feels that the "clastic sedimentology" is not optimally developed as well as the pore water chemistry; the panel wishes to see a convincing argument in favor of ocean drilling.
Rate as 4 (potential 5).

Navy Fan-S1:
This is the first "supplemental science" proposal submitted. Since submittal pre-dates PCOMs new policy on the request is for 6 days rather than the maximum 4 allowed. The S1-request is for 3 holes in the Navy Fan to sample environments related to prograding and to determine time variability of turbidite deposits in relation to late glacial sea level. A more extensive proposal will apparently be submitted at a later date. SGPP's previous comments on proposal 250 noted (1) lack of seismic data, (2) no discussion of age control, and (3) difficulties with sampling unconsolidated sands. The present proposal shows that seismic data is adequate and discusses sediment dating with C-14 (last 40 ky) and oxygen isotopes/forams (last 130 ky and earlier). R. Flood also noted success with single-foram O-18 stratigraphy on Amazon fan when sedimentation rates are about 100 cm/ky. Dating will be a challenge because fans are by definition reworked deposits. However, available dating techniques, when used with care and caution, will probably be adequate. ODP has been developing two tools that may be capable of recovering sandy sediments, although thick sand is expected in only one of the proposed sites. These sites may provide a good place to test these new tools.
Rate as 5.

Recommendation

S-1 Navy fan

The first supplemental science proposal following the new PCOM policy is a request to drill the prograding fan off the California borderland to determine the time variability of turbidite deposits in relation to late glacial sealevel. This request addresses high priority objectives of the SGPP and the panel recommends the maximum of 4 days (PCOM policy) for drilling the Navy fan. S-1 should be carried out with an enhanced engineering staff on board that can ensure the successful operation of a sand sampling tool. Under these requirements drilling should take place at the beginning of Leg 147 (East Pacific Rise or Hess Deep) and not impact leg 146 (Cascadia margin).

Following this discussion, SGPP was briefed by the ODP engineering staff on the status of sand recovery tools (vibro/percussive corer and break-away piston). The vibro/percussive tool was used on Leg 133, but it didn't appear to vibrate. The tool was disassembled and found to be rusted internally. The tool has been sent back to the manufacturer for quotes on repair, but there is no plan to work the tool back into the system. This tool, and the break-away piston, were developed under the auspices of a visiting engineer who has since left. No one is presently working on the tool. There has been some interest by the BGS and industry to use the corer for some of their projects but no details have been discussed. Based on this report, SGPP sees the need to make a strong statement in support of continued development of these tools.

Recommendation

Sand Sampling

As outlined in the SGPP White Paper, there is a strong need to be able to collect undisturbed cores of unconsolidated sands. In the immediate future, high-priority SGPP programs on Sedimented Ridges I (Leg 139), Cascadia (Leg 146), and, if approved, S1-Navy fan will require this capability. Two potential solutions have been pursued by ODP engineers for recovering the required sediments: a vibro/percussive corer and a break-away piston head. However, development of these tools has apparently stopped. We strongly urge PCOM to insure that development of appropriate samplers be given a high priority immediately so that they will be ready when needed.

Sedimentary instability Madeira abyssal plain-59:
SGPP discussed the addendum received that addresses earlier criticisms and suggests possibility of abyssal plain sites in other ocean basins. SGPP expressed interest in diagenetic packages associated with individual turbidites and in the potential of using these packages as an indicator of paleo-ocean chemistry. Sampling of turbidites in different portions of the basin would allow for determining the origins of individual layers and thus to determine a budget for the mass wasting deposits. SGPP found attractive the global applicability of the budgetary approach to sedimentary mass wasting and would like to ask the proponents to spell out what is really new; i.e. early vs. late diagenesis or can geochemical logging be useful? The panel was not quite clear if this proposal could also be done as a supplemental science proposal to one of the upcoming Atlantic legs.
Rate as 4.

Categories 3 and 4: **Fluids / Hydrothermalism / Metallogenesis**

Florida Escarpment-332:
SGPP has had no response following the lengthy letter written by the chairman after the Paris meeting.
Remains rated 4.

Peru gas hydrate-355:
Although gas hydrate objectives will be addressed in Cascadia margins (Leg 146) and perhaps in the Chile Triple Junction (Leg 141) drilling, SGPP still sees an overwhelming need to better understand all aspects of gas hydrates. These are summarized in the workshop report. A short version of the workshop recommendations on a dedicated gas hydrate leg and related developments of the PCS-tools follow below.
Rate as 5.

Recommendations

Dedicated gas hydrate leg

The interaction of natural gas hydrates with the thermal and fluid regime of continental margins and in particular accretionary complexes, is the highest scientific priority of the SGPP. Likewise, the presence of gas hydrates has uniquely influenced safety deliberations by the PPSP in drilling deep margin holes. Hence, the participants of a gas hydrate workshop held in conjunction with the SGPP meeting recommend that a dedicated gas hydrate leg be planned and drilled similar to the one previously proposed for the Peru margin (355 A). The SGPP and the PPSP, outside proponents and

investigators should design such a leg with drilling opportunities in the Atlantic or the Pacific Oceans. This planning process should take into account the relevant gas hydrate results expected from Legs 141(CTJ) and 146 (Cascadia).

PCS: Exchangeable pressure chamber
The pressure core sampler under development by ODP is a coring system capable of retrieving samples at bottom hole pressure, and hence is the key tool for pursuing several major objectives of SGPP, notably the behavior of fluids, gases and hydrates in accretionary prisms. The SGPP considers that successful completion of these objectives requires three exchangeable pressure core subassemblies and recommends that these be available for the upcoming legs 141 and 146. These assemblies should be used on a rotating basis with one chamber attached to the PCS system during sampling, while the contents of the second one are subsampled and analyzed aboard ship and the third one is being readied for a new deployment. This approach allows a complete downhole profile, as opposed to a single measurement per hole. It provides adequate turn-around time for reasonably close sample spacing downhole, eliminates the costly construction of an as-yet-unavailable transfer chamber, and ensures back-up in case of damage. If trace metal concentrations are of high priority, the multiple subassemblies are to be made of titanium; if gasses, dissolved metabolites or major sea water ions are to be measured, the less costly stainless steel version is adequate.

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Predictive equation for depth of gas hydrate stability
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gas hydrate stabilities, be developed for use aboard the JOIDES Resolution to improve safety measures.

Gulf of California-275:
This proposal remains of high interest to SGPP, but no new information was received.
Rating is 5.

Barbados Ridge-278:
The present version of this proposal, requesting 3 to 4 legs of drilling, discusses the problem only in a broad way with few specifics particularly for the geochemical objectives. This is unlike the earlier proposed studies. Two transects are proposed, a northern one with muddy sediments which includes somewhat better defined geochemistry objectives; the southern transect is sandy. Sites are mature in terms of geophysics but immature in terms of geochemistry and sedimentology. Suggest rewrite using new, primarily French, data (not included in this version), and in terms of legs with specific objectives. Suggest sequencing of legs in terms of a long-term drilling schedule. SGPP would like to see how the proponents will answer the fluid flow question and is concerned with the justification of the extraordinary large request for 3 - 4 drilling legs vis-a-vis other Atlantic drilling.
Rate as 4.

Mediterranean Ridge-330:
The addendum received includes coring on mud volcano and emphasizes fluid and geochemical objectives. The proponents need to give specifics of a hydrological model to identify flow paths and rates. At present they just talk about anomalies. Should explore the possibility that salts can be used as tracers. They also need to include heat flow numbers and new seismic data. Most attractive to SGPP is the fact that the site is located between two colliding continents; this represents an important end-member setting and hence an important type area of study.
Rate as 4.

Category 5: **Paleocean chemistry/history**

North Atlantic evolution-372:
SGPP generally likes this proposal because of potentially important objectives of paleocean chemistry of intermediate water masses. Proposal has a bit, but needs more emphasis on carbon cycle. Much better seismics (including 3.5 kHz) are required for sites, especially site 2 to clarify potential of slumping.
Rate as 4.

Equatorial Atlantic pathways-313:
SGPP reviewed this proposal previously; it appears better suited for category 2.
Rate as 4.

Cretaceous Atlantic-389:
The focus of this proposal is on biotic evolution and biostratigraphy and similar biological objectives, but will recover Cretaceous sediments and thus is of interest to SGPP. To get a higher ranking with this panel, the proposal needs to be directed towards carbon cycle, sediment mass balance and general themes published in the SGPP White Paper.
Rate as 2.

Mediterranean sapropels-391:

This proposal is aimed at comparing anoxic and high productivity origin of sapropels. It is very interesting to SGPP from a thematic point of view, but is quite immature at present; i.e. no sites are proposed. SGPP suggests U/Th for dating, include a depth plot, and expand rationale for drilling with JOIDES Resolution. Need to pick specific, optimum sites for sampling. Explain why longer time-series are needed. Also address potential problem in approach suggested with Br/I from bromides in ubiquiteous brines of the system. Organic geochemistry could be more developed; there is a problem with preservation of Mn-oxide spikes (as indicators for oxic environment) in subsequent anoxic sediments because they might not survive. SGPP has interest in heating effect on sapropels. OHP evidently had some serious criticisms of this proposal which SGPP finds puzzling.
Rate as 4.

Atlantic-Mediterranean gateway-323:
This revised version was in response to earlier SGPP criticism; panel feels that proponents have done their homework by adding "paleo" environmental objectives in relation to tectonic development of Alboran basin. Another emphasis is on contourite deposits outside the Mediterranean Sea. The paleoceanographic objectives include the history of the outflow. The region as an important one for studying of contourites in sandy sediments.
Rate as 3.

Environmental evolution of N. Pacific-247:
SGPP is unclear as to what extent these objectives are being drilled on the schedule Leg 145.
Rate as 4.

Neogene California current-386:
This revised proposal addresses the history of the California current, upwelling and productivity with plate deformation as a secondary objective. SGPP feels that these are first rate OHP-objectives; however, for it to attract SGPP's interest proposal needs to be directed towards carbon cycle, multiproxies for paleocean chemistry or similar themes.
Rate as 3.

Proposals with secondary SGPP objectives:
Atlantic

2/3 boundary-376:
The present version of this proposal does not address fluid circulation; also comments on metallogenesis and sources of metals are needed in order to concur with SGPP mandate. How are the objectives related to geochemical budgets? Is drilling justified or can much be accomplished by submersible work?
Rate as 3.

MARK area-369:
This proposal is to drill for fresh material to address petrologic/geochemical objectives related to partial melting and general structural setting. These are primarily tectonic and lithosphere objectives; it needs words about metallogenesis.
Rate as 3.

Aruba gap-384:
Covers primarily tectonic objectives related to the break-up of Pangea, intraplate deformation evolution of oceanic plateaus. Secondary objectives are those of ocean history, late cretaceous to neogene paleoceanography in particular the

effect of Panama closure. SGPP objectives apparently are third-order; Site 1 is suggested as a geochemical reference Site but the idea remains undeveloped; likewise current-controlled deposition in the Venezuela Basin is mentioned, but not further elaborated. Impressive geophysical and structure data and generally mature and well-prepared proposal.
Rate as 2.

Vema FZ-382: same area 376.
Rate as 1.

Oceanographer FZ-374:
Rate as 1.

S-reflector Galicia margin-334:
Rate as 1.

Late rift, early drift-363:
Rate as 1.

Ceara Rise-388:
This proposal requests a transect of 8 holes to study changes due to mixing of NADW and AABW water mass properties as the source for Indian and Pacific Ocean deep waters. It is most clearly within the OHP-mandate. Of SGPP interest is the resulting development of water chemistry, in particular carbonate saturation. This objective is recognized as an important one for carbonate preservation, but not developed. Likewise, the nutrient chemistry is mentioned but not developed. In addition this proposal could generate strong SGPP interest if it would address the chemical and sedimentological character of sediments from the Amazon River that dilute the paleontological paleocean chemistry record.
Rate as 4.

Atlantic continental margins-365:
This is a superleg proposal, where the priority 1 sites require 340 days of drilling. Overall drilling plan superseded by NARM-DPG report. SGPP interest in nature of overlying sediments, but a more specific rational, such as seismic sequence analysis, is needed. Also no comments about pore waters/fluid circulation and other SGPP themes. The SGPP objectives are to study sediment fluxes and sedimentary architecture in gateway positions between the northern and the central North Atlantic. The main time frame is the late Triassic to late Jurassic, and the time since the early Cretaceous. To SGPP three sites (NB1, NB6, NB2) are of interest: NB1 and NB6 are in a water depth of 1200 m (sed. thickn. 1600 m) and 4215 m (sed. thickn. 2200 m) to decode the int-rift and syn-rift shallow water sedimentation. The evolution from shallow to bathyal depth will be recorded in sites NB2 and NB6. NB6 is in a water depth of 3949 m (sed. thickn. 2060 m). The record of sediment fluxes may be related to eustatic sea level fluctuations. It may also be possible to study the sedimentary architecture below (fan style deposition) and above (current controlled sedimentation, sediment waves) seismic reflector A^u. The proposal has some potential for SGPP. Difficulties in drilling sediment thicknesses greater than 2000 m have to be resolved. Sites need to be organized in terms of legs with specific objectives and with sequencing of legs suggested.
Rate as 3.

Labrador Sea-392
SE Greenland margin-393
Hatton Rockall margin-394

Faeroe Bank margin-395
Faeroe Platform margin-396

The SGPP feels that this group of proposals on Atlantic volcanic margins addresses very interesting LITHP and TECP objectives, whereby sediments are considered as overburden to be drilled through. The exception is proposal 396 with some interest in sediment drifts. Proposal 392 with 5 sites could show entire sedimentary history of Labrador Sea; please develop. Also, proposal 395 has at least 1 site of possible interest to SGPP. All sites might be combined into a larger proposal; hopefully NARM-DPG will do that job. SGPP's sediment interests could be in provenance, mass balance, effects of hydrothermalism sea level (seismic stratigraphy), etc. Proposal 396 rate as 3, others rate as 1.

Proposals with secondary SGPP objectives
Mediterranean

Aegean Sea-383:
This proposal does not address SGPP interests; it is probably not possible to be modified to attract such interest.
Rate as 1.

New Mediterranean prospects-379:
This proposals is really two proposals in one, they should be separated. The Tyrrhenian Sea deep hole is to study 3 MY old peridotite, whereas the Mediterranean Ridge deep hole addresses geochemical fluxes and water flow. SGPP suggest that proponents get together with those of proposal 330 to make a joint proposal.
The second hole rate as 4.

Sardinian-African collision-364:
Rate as 1

Proposals with secondary SGPP objectives
Pacific

Bering Sea-390:
A proposal primarily of tectonic objectives; - at present immature.
No rating.

Jurassic Pacific crust-368:
Proposal to deepen hole 801C, including logging, permeability and a seismic experiment. SGPP needs to have information about work in progress before deciding on drilling deeper. Drilling would provide endmember of oceanic crust before subduction as valuable geochemical reference site.
Rate as 4.

Site 505 stress-373: This is a proposal to deepen hole to allow for stress measurement. Secondary objectives of interest to SGPP addresses the evolution of porosity and alteration of the crust near a ridge crest. However, there are no other sites nearby for comparison of such measurements. The proposal somewhat resembles objectives of other more extensive ridge crest drilling.
Rate as 3 or 4.

Ranking among themes

After completing the review of proposals the next step in ranking was to assemble all proposals into thematic categories and then rank them by consensus. The result of these deliberations are listed below with proposal number and rating vis-a-vis SGPP interest are in parenthesis.

Category 1: Sea Level
1 New Jersey margin sealevel (348, 5)
2 New Zealand margin sealevel (337, 5)
3 South Australian margin (367, 4)
4 West Florida sealevel (345, 4)
5 Marion Plateau (338, 4)

Category 2: Materials Cycling/Mass balance/Sediment Architecture
1 VICAP (380, 5)
2 Sediment instabilities Madeira abyssal plain (59, 4)
3 Navy fan (250, 5)
4 Atlantic-Mediterranean gateway (323, 3)
5 Argentine contourites and black shales (327, 4)
6 Equatorial Atlantic paleo chemistry (313, 4)
7 St. Lawrence ice sheet (341, 4)

Category 3: Fluids
1 Gas Hydrate ("335", 5)
2 Cascadia II (DPG, 5)
3 Return to 801 (368, 4)
4 NW Australian margin (340, 4)
5 Mediterranean Ridge (330, 4)
6 Barbados (378, 4)
7 New Mediterranean prospects (379, 4)
8 Florida Escarpment (332, 4)
9 Bransfield Strait (351, 4)

Category 4: Hydrothermalism and Metallogenesis
1 Sedimented Ridges II (DPG, 5)
2 EPR II (DPG, 5)
3 Valu Fa sulfide (360, 5)
4 TAG-hydrothermalism (361, 5)
5 Gulf of California (275, 5)
6 Endeavour Ridge (325, 5)

Category 5: Paleo-Ocean Chemistry
1 Mediterranean sapropels (391, 4)
2 Benguela upwelling (354, 4)
3 Ceara Rise (388, 4)
4 North Atlantic evolution (372, 4)
5 Neogene California Current (386, 3)

Supplemental Science Category
1 Navy Fan (S1, 5) -- Strongly supported, see previous discussion and recommendation.

Final Ranking

The final step in ranking was accomplished by voting each time on top-ranked proposals in each of the five categories.

1 Gas Hydrate
2 Mediterranean Sapropels
3 Sedimented Ridges II
4 New Jersey margin sealevel
5 VICAP
6 Cascadia II
7 Benguela current
8 Sediment instabilities-Madeira abyssal plain
9 EPR II
10 New Zealand sea level
11 Valu Fa sulfides
12 Ceara Rise
13 Return to 801
14 TAG-hydrothermalism
15 NW Australian margin
16 Mediterranean Ridge
17 Barbados accretion
18 South Australian margin
19 Gulf of California
20 North Atlantic water mass evolution

Deep Drilling

The SGPP had earlier noted possible deep drilling objectives for the Somali Basin and for a subduction zone from an island in the Aleutian chain. Due to time constraints during this meeting a discussion was postponed until the next meeting; SGPP considers requesting Mike Coffin and George Plafker to attend that meeting at Lamont to discuss deep drilling ideas and design detailed plan.

Staffing

The SGPP considered recommending co-chiefs for the Atolls and Guyots legs, but lack of effective geochemical sampling tools (wire line packer/water sampler) reduces desire to do this. The SGPP continues to support the nomination of M. Goldhaber for co-chief on the Cascadia I drilling (Leg 146) because of the high degree of interest that SGPP places on this leg, not the least being the implementation of the gas hydrate objectives. An important step towards implementing these objectives on Leg 141 (Chile triple junction) was the participation of designated co-chief scientist S. Lewis in the "Gas Hydrate Workshop". In general SGPP reiterates the Gas Hydrate Workshop recommendation that chemists with interests in gas hydrates be appointed as soon as possible so that the individuals can get design of PCS manifold underway and can think about the realities of PCS Phase II design, particularly construction of multiple pressure subassemblies.

Future meetings

Lamont, June 4, 5 and 6; R. Jarrard host; joint session with DMP
Zurich, November 5 - 6, J. McKenzie host; to follow Sea Level WG meeting in La Jolla, California on November 2 - 3.

Appendices

NARM-DPG	Report by R. Hiscott
Future ODP Legs	Summary by M. von Breymann
Pressure Core Sampler	Report by T. Pettigrew

North Atlantic Rifted Margins Detailed Planning Group Meeting
25-27/02/1991, Woods Hole
Proposal numbers considered: 310/311, 328, 334, 358, 363, 365, 366

Report to SGPP (OHP and SGPP concerns)

The proposals discussed by the planning group are essentially tectonic in their focus. Nevertheless, Mesozoic through Neogene sedimentary sequences will be drilled and, in some cases, these can be used to address questions that are important to SGPP and OHP. OHP has specific goals to monitor long- and short-term changes in water masses and in the exchange of water masses through constricted gateways. As a result, sites and groups of sites that will be of high priority to OHP must be selected by that panel from dedicated ocean history proposals. Information from sites selected to meet tectonic objectives will generally not help answer fundamental OHP questions, and may, in fact, be in locations where OHP objectives have already been met (e.g., Vøring Plateau). Nevertheless, some areas of OHP interest are very close to, or in the same place as, proposed NARM sites (e.g., proposal 328 deep site is below Arctic gateways Green 2 area off East Greenland). In these cases, proponents or DPG chairs should consult to determine if mutually useful sites can be selected. Other NARM proposed sites which are in areas of OHP interest are found in proposals 363 (NR1 has high potential for a "complete" section to monitor Late Cretaceous - Cenozoic deep-water changes) and 396 (Rockall and Iceland-Faroe Ridge). There is no strong OHP interest in proposals 310/311, 334, or 365 (unless sealevel story is more developed). SGPP is also interested in the development of contourite deposits (proposal 328 and Green 2 area).

SGPP has major interests in fluid movements through compacting and deforming sediments, hydrothermal circulation in areas of volcanicity, the sedimentary record of sealevel changes, and sediment mass balance information. No current proposals address the first two points, even though there should be an important story in young rifted margins, some volcanic. This is a disappointment. Proposal 365 (North Newfoundland Basin) makes an important step toward sealevel objectives by selecting sites near the wide Grand Banks "platform", that should contain coarser and finer deposits laid down at times of lower and higher sealevel, respectively (this is also a likely feature on the Iberia Abyssal Plain). Unfortunately, a major opportunity has been missed because a conventional, industry-type, seismo-stratigraphic analysis from basin to shelf, looking for unconformity-bounded sequences that could be tied to sealevel fluctuations, has not been attempted. SGPP would be more interested in this area as an opportunity for sealevel studies if the basinal deposits could be related to shelf-edge, low-stand unconformities and seismic sequences. In the Early Cretaceous, syn-rift deposits in this area may have been deposited near sealevel, and a record of rises and falls may be preserved, but this aspect is not well developed in proposal 365.

General conclusions and recommendations of the DPG

As first priorities, the DPG will probably recommend (1) drilling of one transect across the SE Greenland margin (proposal 310, conjugate to Leg 81) plus one new site (VM4) on the Voring Plateau at the toe of the dipping reflector sequence; (2) drilling of the N Newfoundland Basin - Iberia Abyssal Plain transect (proposal 365), and (3) drilling of the "S" reflector on the Galicia margin if and when deep drilling technology is available. With some reduction in the number of original sites, the total number of legs for (1) and (2), above, should be about 3 and 4, respectively. There will be a report from the DPG chair to PCOM that will more completely and correctly portray the views of the DPG membership.

Leg 140
Hole 504B/Hess Deep
September 16 - November 12, 1991

Co-Chief Scientists: Dr. Henry Dick (Woods Hole Oceanographic Inst., Woods Hole, MA)
Dr. Jorg Erzinger (University of Giessen, F.R.G.)

If Leg 137 succeeds in cleaning out the junk left in the bottom of Hole 504B during Leg 111, Leg 140 will be devoted to deepening the hole. A primary objective of JOIDES is to core as deeply as possible beneath the ocean floor to constrain seismic and petrologic models of the structure and evolution of oceanic crust. Drilling at Hole 504B addresses this objective, as this site represents a classic crustal profile and has significant drilling and downhole measurement efforts already invested. Hole 504B has penetrated more than twice as deep into oceanic basement as any other DSDP or ODP section, and is the only hole that reaches the sheeted dikes of Layer 2C. An oblique seismic experiment conducted during Leg 111 indicates that Layer 3 gabbros probably lie a few hundred meters below the present total depth of 504B (1287.8 meters into basement), within reach of the drill. Therefore, the primary goal of Hole 504B drilling is to core into Layer 3 and to conduct extensive downhole measurements in the newly cored section.

If Leg 137 is not successful in cleaning Hole 504B, Leg 140 will instead conduct operations at Hess Deep. Hess Deep is the deepest part of a westward propagating oceanic rift valley that is opening up the eastern flank of the equatorial East Pacific Rise in advance of the westward propagating Cocos-Nazca spreading center. Fault escarpments bounding the rift valley expose an extensive section of fresh crustal rocks. The eventual goal of Hess Deep drilling is to core a transect of sites across these fault escarpments to sample the complete section, from the lavas down to the upper mantle, of oceanic crust formed at the fast-spreading East Pacific Rise. General objectives of the drilling program are to study the igneous, tectonic, and metamorphic evolution of a fast-spreading oceanic crust, and to understand the process of rifting in young oceanic crust. The site occupied during Leg 140 (proposed site HD-2) would provide a continuous section of lower level plutonics and would drill across the Moho into shallow upper mantle.

Leg 141
Chile Triple Junction
November 17 , 1991 - January 13, 1992

Co-Chief Scientists: Dr. Stephen Lewis (U.S.G.S., Menlo Park, CA)
Dr. Jan Behrmann (University of Giessen, F.R.G.)

The region of the Chile Trench between 46°S and 47°S latitudes is the site of a ridge-trench collision, where the active Chile Ridge spreading system intersects the Chile Trench in a ridge-trench-trench triple junction involving the South American, Antarctic, and Nazca plates. Drilling in this region is aimed at understanding the processes active in the region of a ridge-trench collision, and to understand the geological expressions of these processes. These objectives will be addressed at five sites: three (SC-1, SC-2, and SC-3) along an east-west transect across the accretionary prism in the "pre-contact zone," and two more extending toward the south from the seawardmost site of the east-west transect along the toe of the prism to sample the "rift contact zone" (SC-4) and the "subducted rift zone" (SC-5).

Leg 142
Engineering, East Pacific Rise
January 18 - March 19, 1992

Chief Scientist: Dr. Roby Bodea (University of Hawaii, Honolulu, HI)
Ops Superintendent: Mr. Michael Storms (ODP, Texas A&M University, College Station, TX)

Scientific objectives for drilling on the fast spreading East Pacific Rise include (1) determining the compositional and physical structure of "zero age" oceanic crust; (2) characterizing the physical and chemical nature of the fluid/rock interaction immediately above the crustal magma chamber; (3) characterizing the physical and chemical nature of the fluid flow and fluid/rock interaction in the permeable portion of the crust where large quantities of heat are transported advectively; (4) determining the temporal variability of lava compositions to help constrain models of the physics of partial melt supply to, and storage in, crustal level magma chambers; and (5) providing calibrations for geophysical observations that can be made remotely, such as with seismic reflection and refraction and electrical resistivity methods. Two primary axial sites (EPR-1 and EPR-2) have been identified to address these objectives; they are located at ~9°30'N latitude, where the axis is locally simple and where the generally strong "axial magma chamber" reflector displays its greatest breadth and amplitude. A secondary site (EPR-3) is located roughly 7 km west of the axis, off the axial volcanic ridge.

Leg 142 is scheduled as a third engineering test leg for Phase II of the diamond coring system (DCS), currently under development by the ODP Engineering Department. Operations will concentrate on establishing a stable hole at EPR-1, with operations of the Phase II DCS to depths of 100-200 mbsf. A program of downhole measurements will be conducted, after which the hole will be left hydrologically sealed.

Legs 143 & 144
Atolls and Guyots I & II
Leg 143: March 24 - May 19, 1992
Leg 144: May 24 - July 19, 1992

Legs 143 and 144 are scheduled to drill atolls and guyots in the western Pacific both to assess the plate tectonic history of the Pacific plate and to derive an independent sealevel history untainted by tectonic complexities inherent in continental margin sedimentary records. Specific drilling objectives include (1) Early Cretaceous sealevel fluctuations; (2) causes and timing of mid-Cretaceous carbonate platform drowning; (3) extent, magnitude, and timing of regional uplift associated with massive mid-plate volcanism in the western Pacific; (4) Early Cretaceous Pacific plate latitudinal changes and plate kinematics; (5) fixity of hot spots; (6) longevity and stability of the "Dupal" anomaly in mantle composition; and (7) Cretaceous history of the South Pacific "Superswell" and the Darwin Rise. Two sets of drill sites have been proposed to address these objectives: eight sites have been proposed to address Cretaceous and early Cenozoic history of the Marshall Islands area by drilling guyots and adjacent aprons, and nine sites have been proposed to address the problem of simultaneous Cretaceous drowning of widely separated guyots of the northwest Pacific.

PCOM has established an Atolls and Guyots Detailed Planning Group that is charged with constructing a two-leg drilling plan to address the atolls and guyots drilling objectives at the proposed sites. This DPG will meet in February 1991; their recommendations will be discussed at the April 1991 PCOM meeting, where specific drilling targets for Legs 143 and 144 will be finalized. Co-Chief Scientists for this leg have not yet been named.

Leg 145
North Pacific Neogene Transect
July 24 - September 21, 1992

Drilling a transect of sites in the subarctic North Pacific Ocean will address both paleoenvironmental and tectonic objectives. Paleoceanographic objectives include (1) history of surface ocean and atmospheric circulation, and latitudinal magrations of the Subarctic Front; (2) variations in deep-water circulation and chemistry through the late Neogene; (3) timing and nature of the major shift from calcareous to siliceous sedimentation in the middle Miocene; and (4) history of continental climate derived from eolian material and ice-rafted debris. Tectonic objectives are aimed at better understanding the configuration and evolution of mid-Cretaeous Pacific plate boundaries. These objectives include (1) determining the age and paleolatitude of Detroit Seamount, in order to test spatial stability of the Hawaiian hotspot during formation of the Emperor Seamount chain; and (2) ascertaining the age and origin of the Chinook paleoplate, in order to resolve differences between existing theories for mid-Cretaceous plate reorganization in the Pacific.

Seven sites have been proposed for drilling during Leg 145: three on Detroit Seamount (DS-1, DS-2, DS-3), one of the Patton-Murray Seamounts (PM-1), and three in the northwest Pacific (NW-1A, NW-3A, NW-4A). As there probably is not time to drill all of these during Leg 145, the Ocean History Panel has been charged with contacting proponents to remedy weaknesses in the existing proposals and advise PCOM in putting together a final cruise plan.

Co-Chief Scientists for this leg have not yet been named.

Leg 146
Cascadia Margin
September 26 - November 21, 1992

The overall objectives of drilling during Leg 146 are to make an assessment of the fluid and chemical budgets of the Cascadia accretionary margin, and to install two downhole observatories with the potential of indicating the temporal variability of margin hydrogeologic processes, conducting long-term permeability experiments, and obtaining fully equilibrated temperatures. These objectives will be addressed by drilling two transects of sites, one across the Vancouver Island margin (VI sites) and one across the Oregon margin (OM sites). The VI transect [proposed sites VI-1, VI-2d, and VI-5 (alternate=VI-3)] will test and calibrate three techniques for determining progressive fluid loss through diffuse expulsion and focused venting and fluid mass balance across the accretionary prism, and test a new model for formation of hydrate bottom-simulating reflectors that depends on upward fluid expulsion. The OM transect (proposed sites OM-3, OM-4, OM-7, and OM-8) will define fluid venting focused by fractures; the objectives are to study synergism of fluid flow and structural evaluation and and evaluate how flow may affect the geochemical cycle. Reentry cones will be set at Sites VI-5 and OM-3 and will be plugged with instrumented borehole seals to monitor downhole temperatures and fluid pressures on a longterm basis.

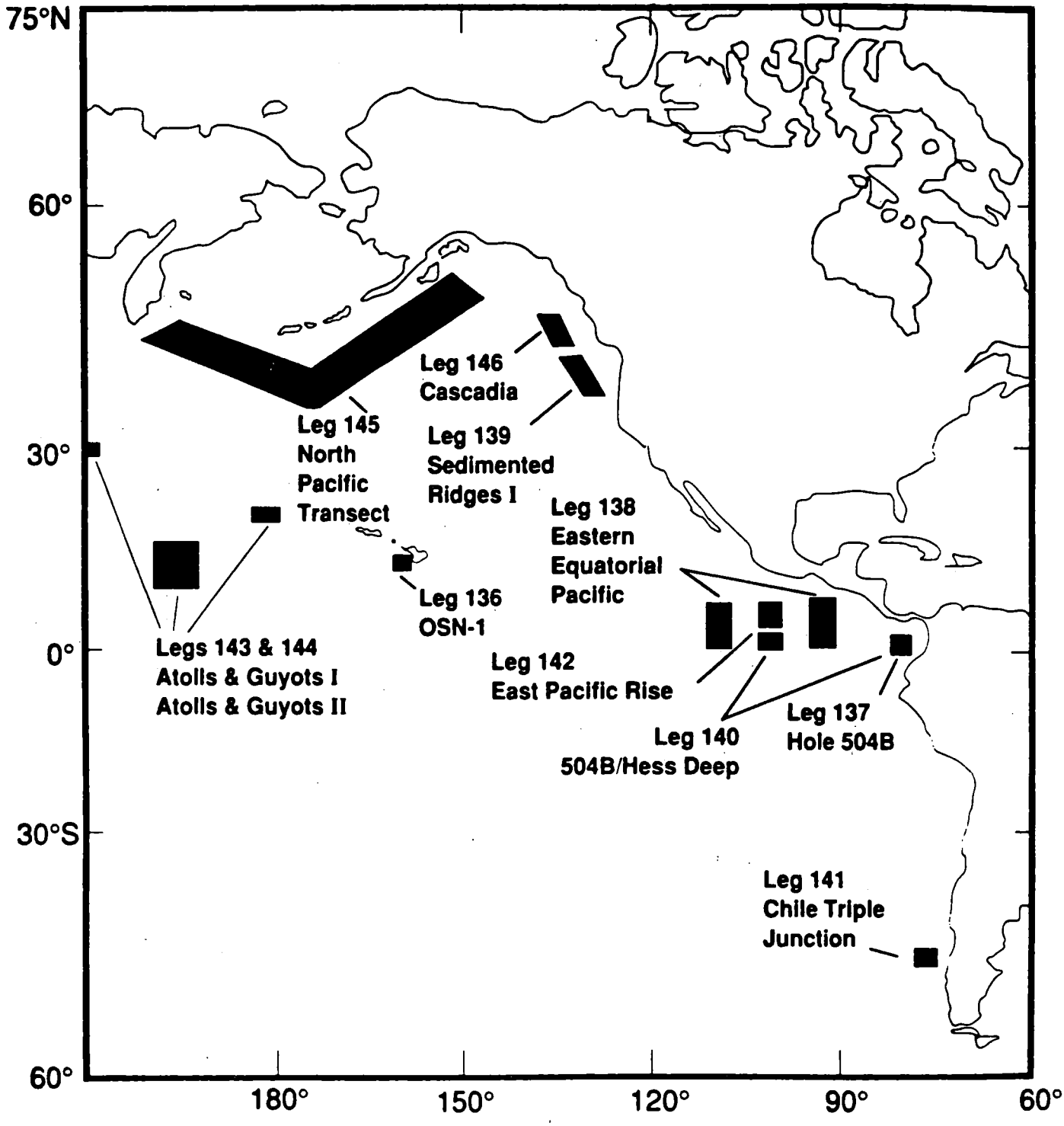
Co-Chief Scientists for this leg have not yet been named.

ODP OPERATIONS SCHEDULE

Leg		Departs		Arrives		Days at Sea *	In Port
		Location	Date	Destination	Date		
136	OSN-1 - Oahu Hole	Honolulu	3/ 3/91	Honolulu	3/20/91	17	3/20- 3/21/91
137	Engineering 3A 504B - Cleanout	Honolulu	3/21/91	Panama	5/ 1/91	41	5/ 1- 5/ 5/91
138	E. Equat. Pacific	Panama	5/ 6/91	San Diego	7/ 5/91	60	7/ 5- 7/ 9/91
139	Sed. Ridges 1	San Diego	7/10/91	Victoria B.C.	9/11/91	63	9/11- 9/15/91
140	Engineering 3B 504B*/Hess Deep	Victoria	9/16/91	Panama	11/12/91	57	11/12-11/16/91
141	Chile Triple Junction	Panama	11/17/91	Valparaiso	1/13/92	57	1/13- 1/17/92
142	Engineering, East Pacific Rise	Valparaiso	1/18/92	Honolulu	3/19/92	61	3/19- 3/23/92
143	Atolls & Guyots A	Honolulu	3/24/92	Guam	5/19/92	56	519- 5/23/92
144	Atolls & Guyots B	Guam	5/24/92	Honolulu	7/19/92	56	7/19- 7/23/92
145	North Pacific Transect	Honolulu	7/24/92	Seattle	9/21/92	59	9/21- 9/25/92
146	Cascadia	Seattle	9/26/92	San Diego	11/21/92	56	11/21-11/25/92
147	Engineering, EPR+/ Hess Deep	San Diego	11/26/92	Panama	1/21/93	56	1/21- 1/25/93

* If cleaning operations successful on Leg 137
+ If DCS Phase III System Ready

Revised 1/10/91


75°N
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Leg 146
Cascadia
Leg 145
North
Pacific
Transect
Leg 139
Sedimented
Ridges I
Leg 138
Eastern
Equatorial
Pacific
Leg 136
OSN-1
Legs 143 & 144
Atolls & Guyots I
Atolls & Guyots II
Leg 142
East Pacific Rise
Leg 140
504B/Hess Deep
Leg 137
Hole 504B
Leg 141
Chile Triple
Junction

PRESSURE CORE SAMPLER (PCS)
GENERAL DESCRIPTION

The Pressure Core Sampler (PCS) is a coring system capable of retrieving core samples at bottom hole pressures, under development by the Ocean Drilling Program (ODP). The PCS utilizes both current conventional oil field pressure coring technology and technology developed by the Deep Sea Drilling Project (DSDP). The PCS is completely compatible with the existing ODP bottom hole assembly (BHA) used for the Advanced Piston Core (APC), Extended Core Barrel (XCB) and Motor Driven Core Barrel (MDCB). The purpose of the PCS is three fold. First to be compatible with the APC-XCB-MDCB BHA. Secondly to retrieve a core sample while maintaining a bottom hole pressure of up to 689.7 atmospheres (10,000 psi) thus doubling the pressure capability of the earlier DSDP Pressure Core Barrel (PCB). And finally to retrieve a small core sample which can be transferred from the detachable sample chamber to a pressurized testing chamber while maintaining bottom hole pressure. This could not be done with the DSDP PCB. The core sample can then be accessed directly for scientific evaluation under bottom hole pressure and temperature conditions.

The PCS is a wireline retrievable, free fall deployable, hydraulically actuated pressure coring system. When the PCS is deployed, it lands and latches into the BHA and is rotated with the BHA during coring operations. It is fully interchangeable with the APC and XCB coring systems thus allowing a pressurized core sample to be taken at anytime from the mudline down to indurated formations and/or basement rock. The PCS recovers a nominal 42 millimeter (1.65 inch) diameter core samples, 0.86 meter (34 inch) long at pressures up to 689.7 atmospheres (10,000 psi).

The PCS is comprised of five main components or subassemblies; the latch, the actuator, the valve-accumulator, the ball valve and the detachable sample chamber. Each of these subassemblies is described in detail below (see Diagram A).

LATCH

The PCS Latch Subassembly is a modified XCB latch which serves five functions. First the latch subassembly contains the landing point for the PCS when deployed. The latch subassembly has a 4.000 inch outside diameter shoulder which can not pass the 3.82 inch inside diameter throat of the landing saver sub in the BHA, thus preventing the PCS from passing completely through the BHA. Secondly, by latching into the BHA, the latch subassembly transmits torque from the BHA to the PCS allowing it to trim the core to proper size for entry into the sample chamber. Thirdly, the latch subassembly holds a check ball sued in the actuation of the ball valve subassembly. When the latch subassembly is engaged by the wireline and an upward force is applied, ot automatically release the check ball allowing the ball to fall into the actuation subassembly. Finally, the latch subassembly diverts all flow through the PCS and provides a place for the wireline to automatically attach itself

during retrieving operations. The latch subassembly is attached to the PCS by a three lug quick release allowing for handling in the same efficient manner as the other ODP coring systems.

ACTUATOR

The PCS Actuator Subassembly serves two functions. First it catches the check ball when released by the latch subassembly and by doing so stops all flow through the PCS until it strokes. Secondly, when pressure is applied to the PCS and the check ball has been released, the actuation subassembly unlatches and strokes through itself pulling the core tube containing the core sample through the ball valve into the sample chamber. As the core tube is pulled into the sample chamber the ball valve is closed and the upper end of the core tube is pulled into a seal receptacle thus sealing the sample chamber at both ends and trapping the core sample at hydrostatic pressure inside the PCS. When the actuation subassembly reaches the end of its stroke it latches once again and opens a circulation path through the PCS.

VALVE-ACCUMULATOR

The PCS Valve-Accumulator Subassembly contains a pressure maintaining mechanism, safety pressure relief mechanisms, a sampling port, temperature and pressure monitoring devices and the core tube. The pressure maintaining mechanism is a built in accumulator that maintains the pressure inside the sample chamber as a small volume change occurs during sealing and in the event of any minor seal leakage. The safety pressure relief mechanisms include an adjustable pressure relief valve set to automatically vent pressure above 689.7 atmospheres (10,000 psi). Should the pressure relief valve fail to release pressure a burst disk will rupture at 862.12 atmospheres (12,500 psi) relieving all pressure from inside the PCS. An access port allows sampling of gasses or fluids directly from the PCS sample chamber. A built in thermistor and pressure transducer allows for the connection of monitoring equipment to constantly monitor the temperature and pressure inside the PCS sample chamber. The sample tube is a non rotating metal tube with integral core catchers used to contain the core sample. During coring operations the core tube is extended through the ball valve subassembly into the cutting shoe. When the actuator subassembly is activated, the core tube is pulled through the ball valve into the sample chamber.

BALL VALVE

The PCS Ball Valve Subassembly is the sealing mechanism on the bottom of the PCS sample chamber. It also is the connection point for the PCS cutting shoe used to trim the core sample to size. During deployment and coring operations the ball valve is open with the core tube extended through it into the cutting shoe. When the actuation subassembly is activated and the core tube has been pulled through the ball, the ball is rotated into the closed position sealing the lower end of the sample chamber. The ball valve subassembly also provides a means for connecting the

sample chamber to a pressurized testing chamber. This is done by removing the cutting shoe and using the threaded end to connect to the test

chamber. The ball valve subassembly also contains the pressure containing body of the sample chamber. The ball valve subassembly also contains the pressure containing body of the sample chamber and the seal receptacle used to seal the upper end of the sample chamber.

DETACHABLE SAMPLE CHAMBER

The PCS Detachable Sample Chamber is made of the ball valve and valve-accumulator subassemblies. It is 92.2 millimeters (3.75 inches) in diameter, 1.5 meters (5 feet) long and is attached to the PCS by quick release connections which allow the pressurized sample chamber to be removed from the rest of the PCS for easier handling. Since the valve-accumulator subassembly is an integral part of the detachable sample chamber, the pressure and temperature can be continuously monitored. Also, gas and fluid samples can be taken directly from the sample chamber.

CUTTING SHOES

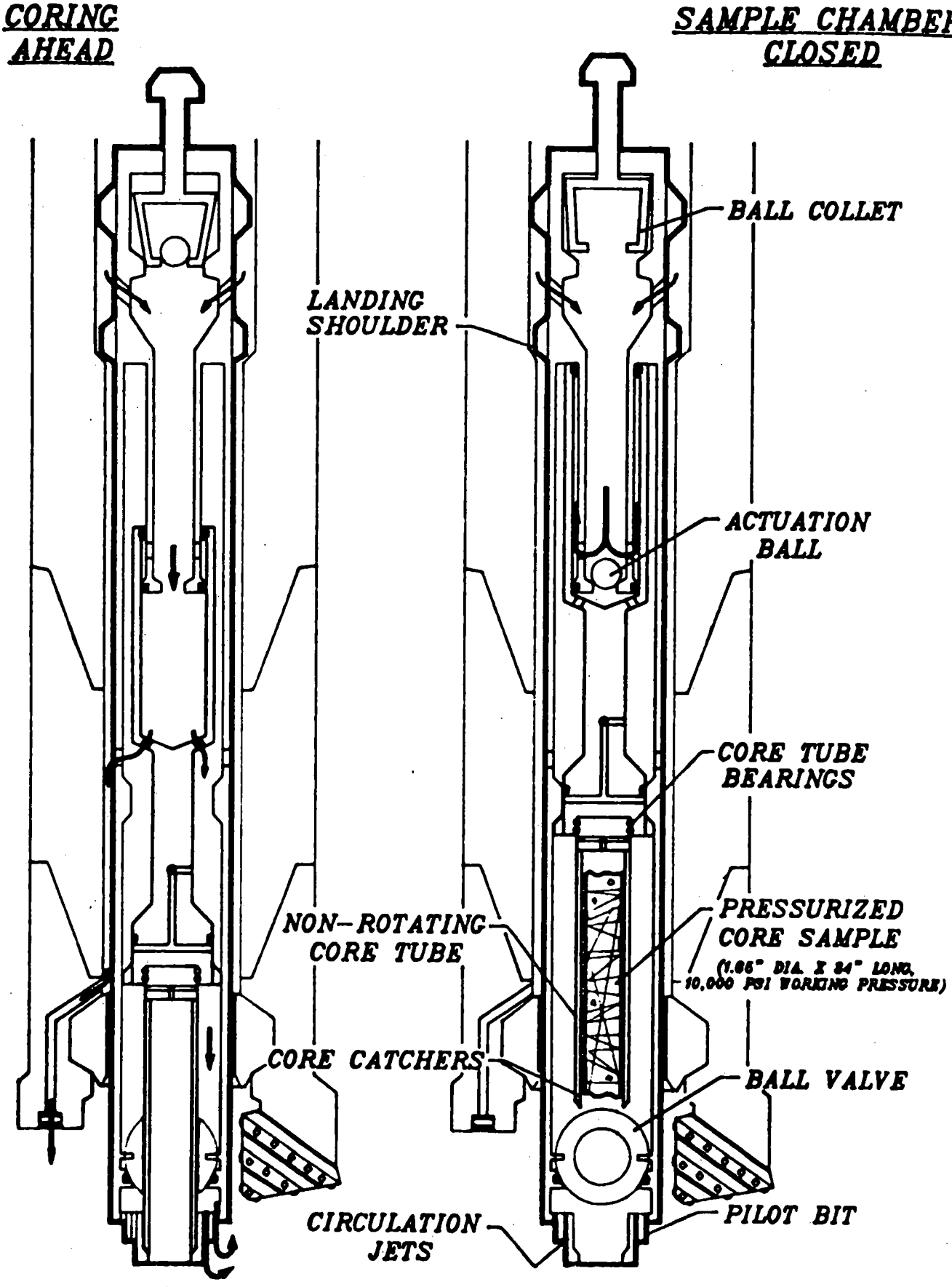
The PCS uses a specially designed pilot type cutting shoe. The available cutting shoe cutting structures for the PCS are both hard and soft matrix impregnated diamonds, surface set diamonds, geoset demands as well as standard hard facing.

The PCS is free fall deployable and therefore is dropped down the drillpipe and landed in the BHA. The PCS is rotated by the top drive via the latch and drill string-BHA. During coring operations the rig pumps maintain flow down the drill string to keep the hole open and to cool/lubricate the PCS cutting shoe. Once the core has been cut the rig pumps are secured, the wireline is attached to the PCS and an up strain is applied to the PCS latch to release the check ball. The wireline is then slacked off and the rig pumps are restarted slowly, letting the pressure build to activate the actuator and stroke the sample chamber closed. When circulation is once again established the sample chamber has been closed and the PCS is retrieved like any other wireline core barrel. Once on deck the detachable sample chamber is removed from the PCS, placed in a portable temperature controlling bath/safety shroud where temperature and pressure monitoring equipment is attached. The sampler chamber can then be safely moved off the rig floor for scientific evaluation.

OCEAN DRILLING PROGRAM
PRESSURE CORE SAMPLER (PCS)
DATA

Working Pressure	680 bar (10,000 psi)
Number of sample ports . .	2 - 1/4" NPT female
Core Diameter	42 mm (1.65 in)
Pressurized Core Length . .	86 cm (34 in)
Sample Chamber Length . .	1.7 m (66 in)
Sample Chamber OD	92 mm (3.75 in)
Actuation	Hydraulic
BHA Compatibility	APC/XCB/MDCB

PRESSURE CORE SAMPLER (PCS)
OPERATING SCHEMATIC



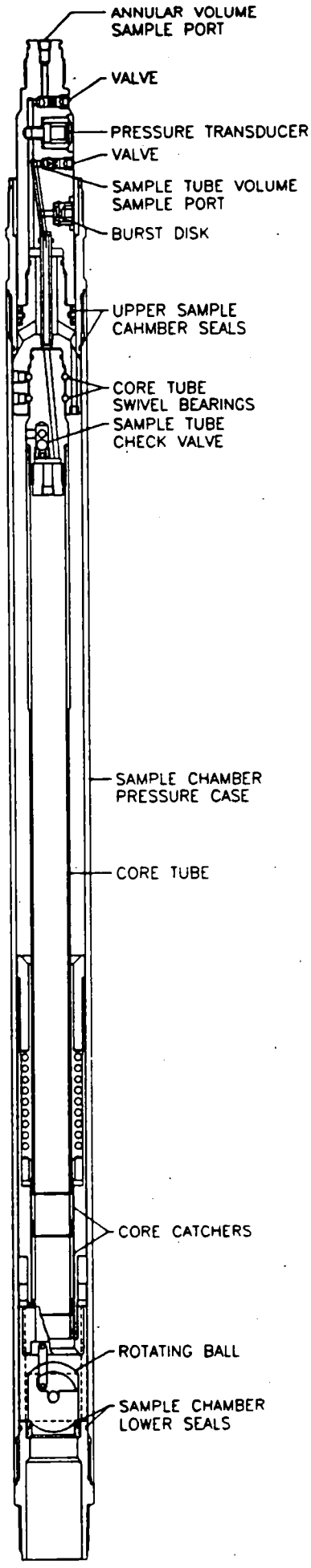
PRESSURE

CORE

SAMPLER

SAMPLE

CHAMBER



ODP

PRESSURE

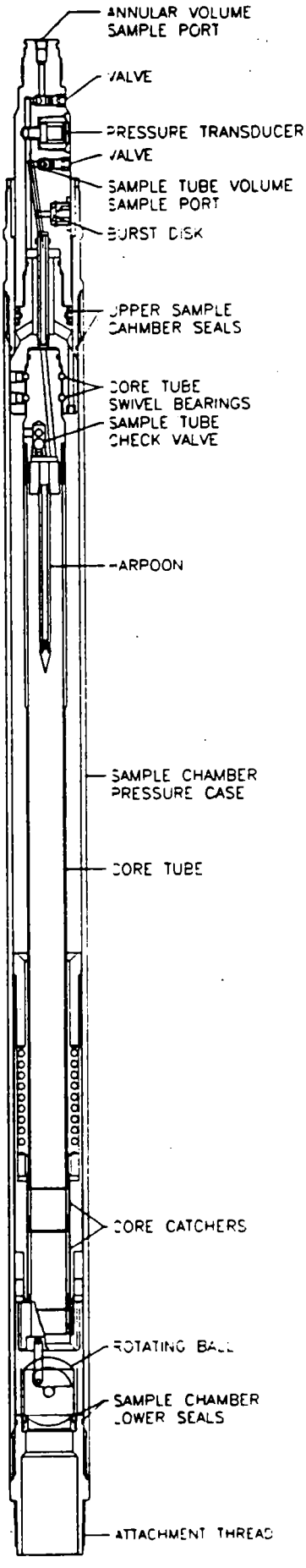
CORE

SAMPLER

W/HARPOON

SAMPLE

CHAMBER



OCEAN DRILLING PROGRAM
PRESSURE CORE SAMPLER (PCS)
DEPLOYMENT HISTORY

4 March 1991

1) Leg 124E, Hole 772

Water core taken at 1528 m, 100% hydrostatic pressure maintained.

2) Leg 124E, Hole 772

First coring attempt at 1678 m, 100% core recovery, 20% hydrostatic pressure maintained. Pressure loss attributed to sticking accumulator piston.

3) Leg 124E, Hole 773

Core cut at 1871 m, 100% core recovery, 100% hydrostatic pressure maintained.

4) Leg 131, Hole 808F

Coring attempted at 4753 m, 0% core recovery, 0% hydrostatic pressure maintained. Tool "sanded up" making the tool inoperable.

5) Leg 131, Hole 808G

Core cut at 4881 m, 80% core recovery, 5% hydrostatic pressure maintained. Full hydrostatic pressure was maintained when tool reached rig floor, pressure lost during 45 min cold storage. Pressure loss was due to partially damaged sample chamber upper seal of faulty cut off valve.

OCEAN DRILLING PROGRAM
PRESSURE CORE SAMPLER (PCS)
STATUS REPORT

4 March 1991

Only one PCS Phase I prototype tool exists.

Gas and fluid samples only can be collected under bottom hole pressure with the current PCS.

The PCS is currently in College Station for refurbishment and installation of high temperature seals for anticipated use on Leg 139, Sedimented Ridges I (10 July/11 Sept 1991).

The only sampling manifold that exists is a make-shift assembly of standard off-the-shelf high pressure plumbing including a high pressure back pressure valve.

Phase II PCS tentatively scheduled for use on Leg 146, Cascadia (25 Sept/21 Nov 1992).

Development of the "Lab Chamber" has not been resolved.

OCEAN DRILLING PROGRAM
PRESSURE CORE SAMPLER (PCS)
DEVELOPMENT PLAN

4 March 1991

PCS PHASE I

Objective - to develop and test a functional PCS concept.

Provide for gas and/or water samples under bottom hole pressure.

No capability of core transfer under pressure.

Status - Phase I has been completed.

PCS PHASE II

Objective - to develop and test a functional PCS tool.

Provide for gas and/or water samples under bottom hole pressure.

Provide for transfer of pressurized core samples while maintaining bottom hole pressure.

Status - tentative Phase II development schedule is to have a functional PCS ready for Leg 146, Cascadia (26 Sept/21 Nov 1992).

LAB CHAMBER (PHASE III?)

Objective - to develop a lab chamber capable of receiving PCS core samples and allow access to the core samples for scientific purposes while maintaining bottom hole pressure.

Status - development of the lab chamber has not been resolved.