



Meeting of the Sedimentary and Geochemical Processes Panel
University of California, Santa Cruz, U.S.A.
14-16 January 1990

Executive summary

The main focus of the meeting was (1) the ranking of all proposals received by SGPP towards a post-1991 drilling schedule; secondary tasks were (2) yet another revision and expansion of the SGPP white paper, (3) the status of position papers on technology and sampling issues.

Ranking of drilling proposals

SGPP considered more than 50 proposals for post-1991 drilling; these were initially grouped into and prioritized within the five SGPP themes: (1) **Sea level**; (2) **Fluids & gases**; (3) **Metallogenesis & hydrothermalism**; (4) **Sediment & mass balances**; and (5) **Paleocean-chemistry/paleoceanography**.

Fourteen proposals remained for the final discussion; these were ranked by comparing the thematic objectives of the top proposals among each of the five themes while maintaining the priority within each theme. This procedure resulted in the following ranking:

- 1 Cascadia margin: #233, #237/E, 317/E rev
- 2 Chile Triple Junction: #318/E, 362/E rev
- 3 Atolls and Guyots: #203/E, #335/E rev
- 4 Sedimented ridge crests-II: #272/F, #284/E, #290//E
- 5 New Jersey margin: #348/A
- 6 Peru gas hydrates: # 355/E
- 7 East Pacific Rise bare-rock: #321/E, #357/E rev
- 8 Gulf of California hydrothermalism: #275/E rev
- 9 New Zealand margin: #337/D
- 10 Barbados accretion: #342/A
- 11 TAG area hydrothermalism: #361/A
- 12 Northern Juan de Fuca bare-rock: #325/E
- 13 Nankai-II: #314/D
- 14 Valu Fa Ridge: #360/D

Other proposals which are not presently included in the ranking because of deficiencies but are very likely to be ranked high include:

- #330 Mediterranean Ridge
- #332 Florida Escarpment
- #250 Navy fan
- #340 North Australian margin
- # 252 Loihi Seamount
and Bering Sea.

Rationale for prioritization and final ranking are detailed in the minutes which follow.

Sedimentary and Geochemical Processes Panel
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Minutes

In attendance were:

Name	Representing	E-Mail/ FAX
Erwin Suess, chairman	SGPP, GEOMAR, Kiel	E. Suess (494317202-293)
Jacques Boulegue	SGPP, U. P&M Curie, Paris	(33-143544097)
Nicholas Christie-Blick	SGPP, Lamont	(914-359-5215)
Shirley Dreiss	SGPP, UCSC	FRGSJD@UCSCD.BITNET (408-429-0146)
Roger Flood	SGPP, MSRC, SUNY	(516-632-8820)
Philip N. Froelich	SGPP, Lamont	P.Froelich (914-365-2312)
Martin Goldhaber	SGPP, USGS, Denver	(303-236-3200)
William W. Hay	SGPP, U. Colorado	(303-492-2606)
Makoto Ito	SGPP, Chiba U., Japan	(81-472518373)
Steve Macko	SGPP, Quebec U., Montreal	C1072@UQAM (514-987-3635)
Judith McKenzie	SGPP, ETH, Zürich	Sediment@CZHETHSA (004112527008)
Jürgen Mienert	SGPP, GEOMAR, Kiel	(49-431725391)
Dorrik A. V. Stow	SGPP, Southampton U., UK	(44-703593939)
William Normark	USSAC, USGS, Menlo Park	(415-329-5110)
Garry Brass	ODP, RSMAS, Miami	GW Brass (305-361-4632)
Marta von Breymann	ODP, Science, TAMU	MARTA@TAMODP (409-845-0876)
Margaret Delaney	OHP, UCSC	M.Delaney (408-429-0146)
John Ladd	NSF, Washington	(202-357-7621)
Mitchell Lyle	Borehole group, LDGO, N.Y.	M.Lyle
Ralph Moberly	PCOM, JOIDES Office	Joides.Hig (808-949-0243)
John Parks	Bristol U.	(44-272253385)
Tom Pettigrew	ODP, TAMU	(409-845-7845)
Graham Westbrook	TECP, U. Birmingham	(44-214143971)
<i>SGPP members absent:</i>		
Jeffrey Alt	SGPP, U. Michigan	(313-763-4690)
Henry Elderfield	SGPP, Cambridge U.	H. Elderfield (44-223334748)
Frederick Prah	SGPP, OSU	(503-737-2064)

Welcome

The first day of the meeting was called to order at 8:30 AM, January 14, 1990. The panel members and visitors were welcomed to Santa Cruz by Erwin Suess for the SGPP meeting hosted by Shirley Dreiss. The agenda for the three days was discussed with mention made of special topics of interest to SGPP: microbiological sampling, pressurized core barrel and drilling of coarse-grained sediments. These topics will be addressed by special guests attending the meeting. The minutes of the previous meeting at GEOMAR in Kiel, Germany, were discussed and approved. A comment was added that in the future reports to proponents of drilling proposals, more information would need to be provided on SGPP priorities.

Reports

Planning Committee

Ralph Moberly reported on the needs for PCOM upcoming meetings: Schedule of drilling for FY 1991 and preparation of a perspective on drilling in the Indian Ocean. It usually takes somewhere between 8 and 12 months to work such a plan through the system. The West Pacific program: drilling off NE Australia, Vanua Tu and the Lau Tonga back arc. This will be followed by an Engineering leg with two parts: the clearing of Hole 504B to prepare for future drilling at this site and the setting of bare-rock guidebases at two sites on EPR. The calendar year 1991 will likely include a first leg of Hydrothermal processes, followed by Sedimented Ridges I, a Neogene transect on the east equatorial Pacific and the drilling at 504B. If the latter proves impossible (as would be determined during the Engineering leg), the EPR leg will be substituted. Additional legs, with emphasis on post-1991 will be discussed at the PCOM meeting in April, 1990. A general direction for the next 4 years will be decided which will likely include: (1) two legs on the Chile triple junction, (2) a leg on the East Pacific Rise (if this does not replace the 504B drilling as described above), (3) a Cascadia Accretionary Prism I leg, (4) a second Sedimented Ridge Crests leg and (5) Juan de Fuca.

The participation of the Soviet Union in ODP was discussed with the note that NSF will "keep on trying" to have this accomplished. Apparently there had been a "positive recommendation" and formal approval by the State Department been sought.

Two working groups have been established: an EPR Working Group and a Cascadia Detailed Planning Group. A sea level working group has been requested but has not presently been established. Three new drilling proposals have been received which are revisions of older proposals. A deep drilling meeting will be held in February, 1990, with long-range planning to be discussed. A representative from SGPP (Dorrik Stow) will attend that meeting.

Ocean History Panel

Margaret Delaney reported on the last meeting of the OHP which was involved with setting of panel priorities. It has been suggested that sea level may be a separate panel priority. The Neogene equatorial Pacific is the highest new priority for OHP. There has been a ranking by themes, which include the Neogene, Paleogene, Mesozoic, upwelling and sea level. At the next meeting there will be a discussion and ranking of the following proposals: 203, Guyots; 271 California Current; 305, Arctic; 320, Arctic; 326, NW Africa; 329, Cretaceous Atlantic paleocommunication; 313, Evolution of oceanic pathways; 335, Atolls; 336, Arctic; 337, Sea level architecture; 338, Sea level fluctuations; 347, South Atlantic; and 348, Mid-Atlantic. Proposals for the Somali Basin, Bering Sea, and Deep Stratigraphic Tests were received but none for the Antarctic; also there may need to be a working group established for accretionary prisms.

Tectonics Panel

Graham Westbrook reported on the last panel meeting with an update on the proposals receiving interest. Passive continental margins have been discussed with consideration being made on type and development. There is support for the Chile Triple Junction. The Cascadia prism off Oregon seems to have better fluids objectives whereas the proposal to drill the Vancouver margin has better structural aspects. Pacific seamounts also have had interest in the panel. A preliminary ranking of proposals by TECP would be:

- 1) Chile Triple Junction (one leg)
- 2) Cascadia Leg I
- 3) East Pacific Rise
- 4) Sedimented Ridge Crests I
- 5) Cascadia Leg II
- 6) 504B
- 7) Sedimented Ridges II
- 8) North Pacific Neogene

Special Reports

John Ladd of NSF reported on some recent developments:

- 1) Details on a request for membership of the Soviet Union to ODP are being worked on.
- 2) There is initial work now being done on the post-1993 proposal for continuation of ODP. A long range plan of earth and ocean circulation systems will include fluid circulation, structure and composition of the crust and mantle, dynamics and deformation of the lithosphere, and variability of climate. It takes 5 to 6 years to develop a program, hence long-term planning is needed.
- 3) Issues which are receiving attention by NSF include tool development, new capabilities, i.e. Arctic and shallow water drilling, long-term experiments, and interaction with other programs. There is a need to develop interactions with major international programs.

Marta von Breymann of ODP/TAMU gave a short report on recent JOIDES Resolution drilling. The ship is finishing Leg 129 which had 3 sites, and has recovered material from the middle Jurassic. The logistics of doing radiotracer experiments in conjunction with microbial experiments on board are being considered; the possibility exists for having the ship votively and professionally checked for radioactive contamination (SWAP).

Mitchell Lyle of the Borehole Research Group gave a report on wireline logging which included the following highlights:

- 1) Wireline packer will be tested on Leg 131.
- 2) Borehole sampling will be attempted with the new tool.
- 3) Use of flowmeters was commented on in order to understand the dispersive properties and transport in hydrological settings. Two manuscripts on meters used in such research were distributed and are available from E. Suess upon request.
- 4) Work is being done on hot hole sampling with viewers, meters and tools to be tested. The possibility exists for sharing the tool with other groups apart from ODP.
- 5) Slim hole sampling has also progressed with ARCO donating tools which are to be tested on 132E.
- 6) Problems of determining magnesium by geochemical logging was discussed; the problems stem in part from the facts that oxidation states of other elements are not known, sensitivity is a problem and the geochemical data are made to add up to 100%.

Tom Pettigrew of ODP gave a report on the diamond coring system (DCS) to be used on LEG 132. The guidebase will be checked during a land test in Utah. It will then be tested on three drill sites during Leg 132. A "sacrificial" bottom hole assembly will be evaluated for bare-rock drilling.

Erwin Suess of SGPP repeated the annual panel report presented to PCOM. In summary some of the obligations of SGPP had been well-fulfilled, while others remained essentially untouched: (1) general operation of SGPP (about 80% accomplished) with regard to membership, proposal reviews and technology issues; (2) thematic reports (about 60% completed) on sand recovery, (3) the SGPP white paper (50% complete), fluid sampling, sea level and radioisotope use on the ship; (4) long-term planning (0%

completed) with work needed on topics of flow experiments, metamorphism, superlegs, and instrumented holes. Panel concerns were about final selection of drill sites in the Pacific and use of the pressurized core barrel Phase II. Strong SGPP interest were included in planning for Sedimented Ridge Crests and the Cascadia Accretionary Prism. Details of the panel report were as follows:

OPERATION: 50% of the proposals received are of interest to SGPP (56 total proposals). Of these, 25% are ranked in group 1, 10% are ranked in group 2, 15% are in group 3 and 25% are in group 4. Panel expertise has been greatly increased by new members added as requested. Refinement of technical requirements (sand drilling, pore water protocol, pressurized core barrel-Phase II) are still on the agenda.

Improved sand recovery affects many groups and hence stirs a lot of interest; SGPP learned about developments. Fluid sampling is a high priority, SGPP needs to assure optimal analytical and sampling procedures. Sampling of high temperature fluids and use of instrumented holes needs to be addressed without further delay. The pressurized core barrel and avoidance of artifacts during porewater recovery need further treatment; options needed for this include controlled sampling, P-T stability, microbial experiment capability, titanium construction, record of thermal history, self-squeezer option, internal imaging possible.

The topic of sea level change is of multi-panel and multi-thematic interest; it ties ODP into Global Change and IGBP programs. A radioisotope policy needs to be established; SMP and DMP need to come up with one that considers experiments endorsed by SGPP including microbial studies and fluid flow measurements.

WHITE PAPER: The white paper received extensive discussion which ended with the conclusion that much of what the present version contains represents mandate and priorities. No drastic change is needed. Some overall introductory statements, clarifications and polishing are needed and will be incorporated prior to its release. Expansion of sections on budgets, fluxes, and technology issues received much attention as to the needs for corrections. These were worked on during the morning of day 2 of the SGPP meeting. A "new" version will be distributed by E. Suess after incorporation of all inputs.

CEPAC/DPG was reported on by Martin Goldhaber. Bare rock drilling and the Cascadia DPG were discussed. Both Cascadia proposals were commented on as to their scientific merits. The creation of the Cascadia DPG will sort these out and make suggestions to PCOM. The DGP should be composed of proponents of each proposal as well as a neutral group which would look out for SGPP interests. That group should have a SGPP member, who will see to the panel's interest including the geochemical objectives, the flow objectives, and the key experiments which will be proposed. The nature of the experiments should address the chemistry pathways and source of fluids. The Vancouver margin has a relatively simple flow regime with broad dewatering of the prism, not localized. No coring has been done there; the proposal contains a specific hypothesis to be tested. The Oregon margin has specific tectonic elements and a more complex fluid flux regime. The fluid flow is tied to specific parts of the system. Further comments and justification for drilling at these sites and the EPR are attached. Objectives and comments to PCOM for the DPG include:

- 1) Water budgets, lateral vs. episodic flow and transport regimes indicate that the DPG could develop a set of experiments to support the objectives which include open holes, sealed holes and reopened holes which have equilibrated.
- 2) Biological/geochemical consequences of cementation and lithification; use of tracers for rates of flow and depths of source including helium, methane, carbon dioxide, hydrogen sulfide, nitrogen and total dissolved mass; also use of isotopes of strontium, carbon, hydrogen, helium, oxygen.
- 3) Effects of clathrates on flow.
- 4) Overall geological framework which should include a model, the sediment types and structural types present.

5) DPG membership should include panel interest (S. Dreiss, J. Boulegue, M. Goldhaber); others who could be included are Kvenvolden and Voss for unbiased perspectives.

N. Christie-Blick of SGPP reported on the Sea Level WG. In summary:
A SLWG will be created following the release of a sea level workshop report. This WG should have in its objectives:

- a. Timing of sea level change.
- b. Amplitudes of sea level change.
- c. Effects of sea level change.
- d. Why sea level change occurs.

The group would draw the research to focus on the Neogene/late Paleogene; Oligocene/Miocene; and Cretaceous sea level changes. The WG should devise the strategies for the research-seismic; use of passive margins; siliclastic sediments; atolls and guyots; indirect measurements including oxygen isotope record. Is the JOIDES Resolution the best way to do these studies?

WG also needs to consider sites which are influenced by strategies and should have geographic breadth. It should also have a membership which includes SGPP and OHP panel representatives (i. e. SGPP persons could include N. Christie-Blick, R. Flood, D. Stow, M. Ito, J. McKenzie). Other members of the WG should include an objectives person, a strategies person, a technology person and someone connected with IGBP/Global Change.

T. Pettigrew of ODP/TAMU reported on technology issues. The description of the Vibra-Perussive Corer which was distributed previously contains the following highlights:
1) Rubber sleeve use was a possibility, but the prospects for use by ODP are slim; in the petroleum industry these are seen to be quite difficult to get recovery, and the best prospect seems to be the vibracorer with the added double hammer. Other modifications including out-of-round barrels and oscillation are being attempted but could create disturbances. Some panel members felt that undisturbed fabric was as important as getting the core. Both the out-of-round and oscillation could drastically affect the fabric.
2) An element is in production, and will likely be finished in February, 1990; it will undergo sea trials about May of 1990.

The second day of the meeting was called to order at 10:30 AM, January 15, 1990, following approximately two hours of small-group-work on the SGPP white paper. The present white paper contains a preface and highlights which replaced the original introduction. The chapter on the sediment fluxes and depositional architecture have been modified to have similar format to other sections. A section on budgets and mass balance has been added with modifications being done on the paleocean chemistry section. Sea level change and fluid circulation in the lithosphere are essentially unchanged.

After a brief discussion and introduction by E. Suess, the meeting got underway. Moberly commented that approaches to "hostile" environment drilling may face budgetary constraints and could restrict solving problems associated with drilling those environments. Suess furthered the discussion by stating that all would benefit from having those objectives solved, not only SGPP requests. Already there are sites which have been assigned which will utilize the coarse sediment technology. SGPP urges the development of this technology. There exist environments other than sands which will require the development of the technology for the recovery of coarse-grained sediments. A formal document on this is forthcoming.

Special Reports (continued)

John Parkes, microbiologist from the Scottish Marine Biological Association, reported on work associated with ODP drilling during which he was able to accomplish microbiological measurements at depth. Bacteria are ubiquitous; there are lots of questions on biogeochemistry which can be asked to address investigations of marine environments.

His work utilized a suite of techniques (direct counts, activity with radiotracers, DNA stains, sulfate and nitrate reduction). Such techniques had been used on Leg 112, Site 681. Changes in populations of bacteria are usually observed in the upper 10 m or so of sediment; this maximum depth has been disputed. It appears that bioavailability of organic matter is the key. In the Japan Sea, Leg 128, the initial work of Leg 112 was repeated, and it was observed that low but repeatable rates existed below 10 m. There is a need to look at more environments and to examine and grow organisms at in situ pressures and temperature. There is lots of promise for new perspectives but at present, no radiotracer studies can be done on board the JOIDES Resolution.

There followed a general discussion of the idea of doing tracer work -both radioactive and stable isotope- on the JOIDES Resolution as well as concerns about shipboard contamination. An operation SWAB could be a way of keeping contamination minimized. Radiotracers can be tested for quite easily in a matter of days but it is unclear how one can get at the stable isotope contamination problem? Working near land bases and on an associated ship may be the best solution. In the UNOLS fleet, some vessels are "clean", and hence tracer work can be done.

Tom Pettigrew of ODP/TAMU presented information on the pressurized core barrel (PCB) and its deployment. Priorities for its use are the recovery of fluid and gas samples for work up to 400 °C and the possible collection of a gas hydrate. At present any method of extraction of a core will greatly disturb the fabric of the sample. There is a need to have this instrument ready soon, so that the highest priority should be to collect gases, possibly without transfers. Considerable enthusiasm was expressed over the prospect of doing radiotracer experiments in conjunction with the pressurized core barrel; the microbiologists need to come forward with their requirements as well as physical properties people.

ACTION: A document which details the concerns on artifacts, and a wish list for the PCB is in draft form now by SGPP.

ACTION: A document on radioisotope use should be prepared- the users should be questioned about alternative uses on the JOIDES Resolution. Radioactive and stable isotope tracers are useful to ODP work; avoiding contamination should be the major concern for SMP; SGPP will flag future proposals requesting such uses.

Proposal review and ranking

There were 50 proposals which needed to be discussed and which included 2 new ones (hand-carried by Ralph Moberly), 12 which were received between the Kiel meeting of last September and the Santa Cruz meeting, 6 proposals were holdover because they only received preliminary discussion at the Kiel meeting, and 30 proposals from the first and second SGPP meeting. Also discussed were even older proposals which were part of the SOHP-package were submitted prior to the existence of SGPP. Several of these were of high panel interest. A ranking requested by PCOM would be used toward the next 4 years of drilling and could be updated as new proposals came in and others were modified. Included in the ranking are the Cascadia I, EPR, SRC II and the Chile Triple Junction proposals.

Proposal 352: Drilling into Layer 3 of EP crust. Presented by J. Boulegue. The number of sites chosen and depth of penetration envisioned are reasonable. Mostly a LITP proposal; metamorphic geochemistry is of interest to SGPP if the nature of gases and extent of alteration were included; A focus on this topic could be brought to the proposal and would improved it. Ranking 2A.

Proposal 353: Antarctic Peninsula Pacific Margin. N. Christie-Blick presented the details of the proposed drilling of a colliding plate boundary in an attempt to look at both the plate

boundary and at the glacial history of Antarctica. Dating the sediments seems problematic. There are technical problems with the proposal: 70 days on site; could stratigraphic resolution be improved over that of the present oxygen isotope data which exists? The time of collision was a time of major sea level rise. Proposal somewhat parallels the one on the Chile Triple Junction. Is there value in separation of the ice sheet information for timing? OHP should look at this. Perhaps 351, Bransfield Strait, could be merged with this one for a better perspective. Ranking 2A.

Proposal 354: Late Cenozoic History of Angola/Namibia. J. Mienert presented the details of this proposal which involves study of the mechanism of climate change. The relationship to upwelling is also brought into the research. The proposed work would yield information on the history of upwelling of Angola, and on sea level changes. There are 4 transects with a total of 15 drill holes in Neogene sediments. No detailed seismic exists as yet. There is an indication of slumping in some areas. It is not clear how the land-to-sea sections are tied in or how sea level changes are to be reconstructed. Definitely with SGPP interest, but needs statement on sea level, fluid circulation and organic diagenesis. Is the targeted age (max. 4 million years) appropriate? Could be a prime example of a one glaciated pole. Good biomarkers are present, on a passive margin, with global significance. Metals could be mentioned; clathrates could exist. Needs broader interest and time frame. We encourage proponents to get good seismic. Rank 2A-3.

Proposal 355/A: Formation of a gas hydrate. M. Goldhaber presented the details of this proposal. Most (75%) of the focus is on the formation of a gas hydrate. The area of study is near Leg 112 on the Peru margin. New seismic exists which is reprocessed. The strategy is to drill to the basement and do a detailed physical and chemical properties study of the properties of a hydrate. Proposal also contains a paleoceanographic component: landward migration of the upwelling signal in Lima Basin; this is of interest to OHP. Ranking 4.

Proposal 272/E/revision 2: Neogene upwelling and the history of the California Current. S. A. Macko presented details of this proposal. The proposal is to look at 8 sites from near the EPR, near the area drilled during DSDP legs 18 and 63. SGPP interest is in evolution of climate, stratification of water masses, sedimentology and causes of anoxia but overall it falls mostly into OHP mandate. OHP had queries on the geochemistry objectives; none are proposed. The proposal needs some preliminary model to be tested. In view of newly proposed sites, what is the status of the seismic? Ranking 2A.

Proposal 356/A: Denmark Straits. J. McKenzie discussed the details of this proposal. The proponents want to drill 9 holes to obtain high quality data for paleoclimate research. No cores from previous drilling are available because of poor recovery. The Global Circulation Maps being developed by the proponents need more data. An understanding of climatic effects on circulation would result. Where sites are located is not detailed on maps. A bit immature and somehow cumbersome to follow what exactly proponents wish to accomplish by drilling. Ranking 1, (not within mandate).

Proposal 357: Axial and off-axial drilling on the EPR. J. Boulegue presented the details of the proposal to drill 9 Holes. There is good information on the drill sites and general location; extensive surveys exist of the hydrothermal vents. The temperature range encountered is 15°C to 330 °C. What are the relationships between vent temperature and temperature of alteration? It is a well-studied area for biological input. It attempts to identify a well-developed seismic reflector, and the role of a seamount in the area. Related to proposals 321 and 325. Ranking 4.

Proposal 317 addendum: Northern Cascadia margin (Vancouver). M. Goldhaber presented the addendum. Previously fluid flow, geochemistry, sedimentology were not developed enough,

and this addendum builds up on those deficiencies the use of clathrates as an indicator for flow is nicely developed. Ranking 4.

Proposal 286/E: Drilling layer 2/3 transition at Hole 504B. P. Froelich presented this new information. Problems are anticipated with the hole restart (engineering problems). SGPP would like to see a temperature log of the well and acquisition of water samples from the hole. THIS HOLE WILL BE DONE; no ranking needed.

Proposal 221/E: Eastern Equatorial Pacific Neogene. J. McKenzie presented new information on this proposal. The sites have been selected. The fluid movement in the upper crust could be addressed and detailed by pore water chemistry. THIS SITE IS IN THE PROGRAM; no ranking needed.

Proposal 358: Formation of Volcanic Rifted Passive Continental Margin. Ranking 1; not in SGPP interest.

Proposal 360/D: Metallogenesis at Valu Fa Ridge. M. Goldhaber presented the details of this proposal. In terms of ore deposits it presents a very interesting idea. Study of massive sulfides forming in a back-arc basin at 2 sites (40°C and 340°C) is proposed. Problems may be the high temperature and low pH (2). Leg 135 will be in the area, but this proposal was rejected by the WG on Lau. It could not fit in or replace sites, although it seems to be an important location. Ranking 4.

Proposal 329/A: Cretaceous paleocommunication between North and South Atlantic. S. A. Macko presented the details of the proposal. The principal aims are to explore the way in which the Atlantic Ocean evolved by clarifying geochemical, sedimentological, stratigraphic and tectonics arising from the invagination of the ocean. Recoveries at one of the locations had been poor previously (8%). Is this within the primary goals of SGPP? Proponents should communicate with the 313 group. Whereas we would encourage the proponents, the proposal appears more within the OHP mandate with some input by SGPP. Ranking 2A.

Proposal 326/A: Cooling of Northern Hemisphere. M. Ito presented the details of the proposal. It is similar to 356/A, the development of paleoclimate with formation of a gateway. Six sites are proposed for the Fram Strait. The development seems to fall within the OHP mandate. Target areas for ice margin processes evident. Why were the sites chosen? Could be combined with 320. Together these proposals would make a stronger package, including porewater geochemistry-sedimentary geochemistry. Ranking 2.

Proposal 329: History of the Benguela Current. J. McKenzie presented the summary of this proposal which would look at regional paleoclimatology, reorientation of the Benguela Current and sea level change. It would distinguish terrestrial input and compare it to the marine component. The proposal is not fully developed, but the area is very interesting owing to the high productivity. Why do the proponents want to drill back to the Cretaceous? Seismic profiles are not shown. Massive sediment slides may exist. Should consider combination with 354/A. Immature proposal; Ranking 2A.

Proposal 347: South equatorial Atlantic. J. McKenzie presented a synopsis of this proposal to study deep bottom water circulation. Not in SGPP, more OHP; Ranking 1.

Proposal 349/A: Drilling into a clastic apron Gran Canaria. J. Boulegue presented information about this proposal. It is a study on chemical evolution during volcanic and orogenic activity. It is of interest to SGPP from the aspects of mass balance (volume of clastics) and the rate of erosion of volcanic islands. It also is interesting for studies of chemical fluxes, and hence within the SGPP mandate; SGPP-related aspects appear relatively immature. It has been mapped geologically. Ranking 3.

Proposal 350: Plio-Pleistocene sedimentation and plate deformation, Gorda Deformation Zone, N. California. M. Goldhaber presented information on the 4 sites proposed to be drilled. The magnetics are being deformed by the movement of the Gorda Plate; these deformations will be studied. Also incorporated into the research are studies on the origin of the California Current and of the Cascadia fan turbidite layers. The relationships to glacial maxima will be sought. The main focus seems to be tectonic and OHP objectives. The sedimentological objectives place this proposal in the SGPP interest area. Ranking 2A.

THERE ALSO EXIST MANY OTHER PROPOSALS FROM THE SOHP ERA WHICH ARE MAINLY ATLANTIC LEFT-OVERS WHICH HAVE NOT BEEN SEEN BY SGPP. It would be of use to know more about these.

The third day of the meeting was called to order at 8:30 AM, January 16, 1990, to finish discussion of proposals and to rank them for PCOM along the lines of SGPP interest.

Prior to review, a discussion of older SOHP-era proposals was attempted based on the notes of former SOHP panel members. These include proposals 221/E, 142, 195, 271/E, 199, 259/E, 257, 275, 202, 203, 260, 182, 222, 253, 284, 224, and 250. Some of these proposals have been combined, others have become portions of the ODP program and others have been modified and resubmitted.

Proposal 322/A: Florida Escarpment. This proposal was re-considered by the panel following a lengthy rebuttal of the proponents concerning questions raised during an earlier SGPP review. J. Boulegue gave a summary of the first version of this proposal for determining extent of seepage off the Florida Escarpment. The panel felt their concerns were not dispelled by this letter; i. e. the proponents should still look into existing oil company data from the area. E. Suess to draft a letter with help from J. Boulegue. Still ranked 3.

Proposal 362/E (Old 318): Chile Triple Junction: Two legs are planned for drilling. This is an active ridge system which is being subducted. The work will yield much new information on pre-, and post-collision zones. The proposal has been expanded considerably to include greater detail on fluid flow; it remains uncertain if the fluid flow is active but is very likely, all potential holes do not address fluid flow interests of SGPP. The potential for using mantle volatiles to trace fluid flow is exciting. Ranking 4.

Proposal 361: Drilling of active hydrothermal system, TAG area. E. Suess gave a summary of this proposal to look at a slowly spreading environment in an unsedimented deep site at high temperature (greater than 350 °C). The site is mature enough to look at mineral relationships. The strategy is to work two locations, a shallow and a deep one. It uses hydrothermal system to explain diagenesis. Needs detailed surface morphology, heat flow and seismic reflection. [Mail review received from H. Elderfield supports this ranking; TAG is an excellent drilling target and SGPP should offer strong support]
Ranking 4.

Grouping of drilling proposals by SGPP themes prior to ranking

Sea Level

Rank 4: 203/E, 335/E, 337/D, 348/A
Rank 3: 338/D, 345/A

Fluids & gases

Rank 4: 233/E rev., 284/E, 290/E, 314/D, 342/A, 355/A,
361/A, 237/E-317/E add., 362/E rev.-318/E rev.
Rank 3: 351/C

Rank 2a: 350/E, 352/E
Not yet ranked: 330/A, 332/A

Metallogenesis & hydrothermalism

Rank 4: 321/E, 325/E, 357/E rev., 360/D
Rank 3: 275/E rev.
Not yet ranked: 252/E

Sediments & Mass Balances

Rank 4: 348/A, 59/A rev.
Rank 3: 327/A, 341/A, 349/A
Rank 2a: 320/A, 323/A, 326/A, 328/A, 329/A rev., 336/A,
353/C rev.
Not yet ranked: Bering Sea, 250/E, 340/B

Paleocean-chemistry & paleoceanography

Rank 2a: 271/E rev. 2, 339/A, 354/A

The proposals were initially grouped into the above thematic categories and ranked within those or eliminated from further discussion because of lower SGPP priority. (i.e. 1 not in SGPP mandate; 2 of marginal interest to SGPP). This procedure left 14 proposals, including several groups of proposals on the same topic. These were ranked by selection and comparison between the top proposal in each category while maintaining the priority within the category:

- 1) Cascadia; 233/E rev., 237/E, 317/E add
- 2) Chile Triple Junction; 362/E, 318/E rev.
- 3) Atolls and Guyots; 203/E, 335/E
- 4) Sedimented Ridge Crests-II; 284/E, 290/E
- 5) New Jersey Margin; 348/A
- 6) Peru Gas Hydrates; 355/A
- 7) East Pacific Rise bare rock; 321/E, 357/E rev.
- 8) Gulf of California; 275/E rev.
- 9) New Zealand Margin; 337/D
- 10) Barbados Ridge; 342/A
- 11) TAG area; 361/A
- 12) Northern Juan de Fuca; 325/E
- 13) Nankai II; 314/D
- 14) Valu Fa; 360/D

Others which are not presently included in the ranking because of deficiencies, but very likely to be ranked high include: 330, 332, 250, 340, 252 and Bering Sea.

Rationale for final ranking

1) **Cascadia:** These proposals give an opportunity to look at a geological framework of fluid flow and model it with regard to sediment and structure type. Both proposals have appealing aspects by contrasting different styles of dewatering of an accretionary prism. The Oregon margin represents specific tectonic elements with different but apparently well-defined flow regimes whereas the Vancouver margin has a relatively simple tectonic setting and hence a broad flow regime. Overall the Oregon proposal seems to address better fluid objectives whereas the Vancouver proposal contains better structural aspects. SGPP's interest lies with the fluid objectives.

2) Chile Triple Junction: The SGPP supports the proposal for drilling the Chile convergent margin because it offers the potential to study a unique hydrothermal environment where the active ridge system is being subducted beneath an overriding continental plate. Of primary interest to SGPP is the study of fluid processes at the rift-contact zone, where the fluids emanating from the hot subducting ridge crest are introduced into the fore-arc sediments. The injected fluids could contain mantle derived volatiles which would mix with continentally derived pore fluids. Using the helium tracers should allow for the quantitative modeling of flow rates, directions and pathways of the fluids within the accretionary prism. The study of fluid circulation processes is a high priority theme for SGPP.

3) Atolls and Guyots: These proposals, considered as a project together, were ranked highest by SGPP under its theme of sea-level change. They are mature proposals which will likely place constraints on the timing of sea-level change for an area of the North Atlantic region which dominates the existing seismic stratigraphic record, and for the mid-Cretaceous to the early Cenozoic. This record will be of importance in the evaluation of sea-level change in a largely non-glacial interval. The proposals also contain several other major objectives including the causes and timing of Cretaceous carbonate platform drowning.

4) Sedimented ridge crests-II: The first leg of the SRC will provide the basis for understanding the hydrology of Middle Valley and of the associated metallogenesis. This second leg is will-justified by deepening of the hole in the basement in view of reaching the high temperature reaction zone and investigating different stages of sulfide formation in the Escanaba Trough.

5) New Jersey margin: This proposal was ranked highest of the proposals aimed at the late Paleogene to Neogene sea-level record, an interval likely to be strongly subdivided by glaciation. Drilling will be conducted on a passive margin that is already well-known geologically and clearly appropriate for sea-level studies. Additional high-resolution seismic data will be collected during 1990.

6) Peru gas hydrates: This will be an opportunity to do a detailed study of how gas hydrates form, what controls their fine-scale distribution and their physical properties. Particularly attractive to SGPP is the combination of geophysical and geochemical objectives among them to test the use of acoustic properties from seismic data to quantify the distribution of gas hydrate and free gas, the precision of heat flow derived from the depth of the BSR, the effect of hydrate on thermal conductivity, and estimate the impedance of flow caused by plugging through hydrate.

7) East Pacific Rise: The two possible targets (12°50'N and 9°40'N EPR) provide a geological setting favorable for tectonic, hydrologic, geochemical purposes related to fluid circulation and water-rock interaction in bare-rock settings. This program must be considered as the compulsory scientific complement the SRC I and II.

8) Gulf of California: SGPP was impressed by opportunities to study hydrothermal alteration/metallogenesis in an organic rich sediment pile. We were also favorably impressed by the broad context of the study: i. e. the usefulness of comparison between Guymas Basin studies and onshore processes in the Salton Sea geothermal system/ ore genesis in Baja California/ comparisons with accreted terrains formed in similar settings.

9) New Zealand margin: This proposal aimed at sea-level changes in the Paleocene and Neogene will take a sequence stratigraphic approach in an area that is far from the passive margins that dominate the existing stratigraphic record.

10) **Barbados accretion:** This leg is envisioned as an ideal location for a field laboratory to study tectonics and fluid flow in accretionary prisms over large scales and long terms. Barbados has the advantage over other settings because there is a large existing database and well-developed theoretical hypotheses to be tested. This is a good site for drilling because drilling through under thrust sediments is feasible.

11) **TAG area:** This proposal will look at a slow spreading environment, which is at fairly high temperatures. It will enable modeling of mineral reactions from an active hydrothermal system.

12) **Northern Juan de Fuca:** This site is in the geographic area of the SRC program and hence complements some of the high-temperature objectives. It can provide an alternate bare rock site although the proposal at this time has some deficiencies.

13) **Nankai-II:** This proposed leg is to investigate a coarse-grained end-member accretionary prism. It will provide an excellent opportunity for comparison with a fine-grained prism such as Barbados. This second leg will provide an opportunity to return to the same area as the upcoming Nankai leg to measure additional physical properties and conduct long-term experiments.

14) **Valu Fa:** This leg is viewed as important to the SGPP theme of metallogensis in alkaic (back arc) settings.

Other Business

There is a need to think about and respond to an IHP request for what will go into the ODP database (E. Suess to conduct mail survey).

We are missing proposals for three suggested sites that look important: The Gulf of California, the Navy Fan and the Barbados proposal properly assembled. E. Suess to obtain and distribute copies.

Membership: Two US participants are rotating off P. Froelich (after November meeting 1990) and M. Goldhaber (after spring meeting, 1991). Possible replacements were discussed at this meeting for appointment by PCOM. E. Suess to forward a list to PCOM for their April meeting, based on mail-survey of SGPP members.

Next meeting to be held in Paris on the 2nd and 3rd of November, 1990 with Jacques Boulegue as host.

We are grateful to S. Dreiss for organization of this meeting and especially for arranging the lunches; we also thank UC Santa Cruz for use of the campus facilities.

Submitted

Stephen A. Macko
SGPP secretary
Erwin Suess
SGPP chairman

JUSTIFICATION OF SGPP 1991 DRILLING PRIORITIES

At its July 1989 meeting held at Lamont-Doherty Geological Observatory, the SGPP voted on the programs from which PCOM will formulate the 1991 drilling schedule. This voting resulted in the following ranking:

- 1) Sedimented Ridge Crests
- 2) Cascadia Accretionary Prism
- 3) East Pacific Rise Bare Rock Drilling
- 584.0 → 4) Eastern Equatorial Pacific Neogene Transect
- 5) Chile Triple Junction

The SGPP panel wishes to emphasize that the two top rated programs were far ahead of the remaining four. All first and second place votes were cast for the two top rated programs and the numerical difference between these two was small. In a general sense, our top-ranked choices reflect a significant SGPP thematic emphasis on quantifying fluid circulation and rock-water interactions in settings with substantial involvement of the sedimentary section. Specific observations on the two top rated programs follow.

SEDIMENTED RIDGE CRESTS

Metallogenesis and fluid circulation are two major elements in SGPP's forthcoming white paper summarizing the panel's thematic goals and objectives. Although metal accumulation arises in a spectrum of marine environments, particular interest focuses on the so-called volcanic massive sulfide deposits. These are now recognized to have formed as a result of oceanic-based tectonism and comprise over a thousand known deposits including some of the world's major suppliers of Cu, Pb, Zn, Ag and Au. Studies on ancient deposits support the conclusion that economic mineralization in many major districts occurred in the subsurface under sedimentary cover. Special opportunities in studying these ore forming processes through ocean drilling arise from the ability to examine in three dimensions the active phase of fluid/mass transport and rock-water interactions in a modern system. These same processes of hydrothermal circulation contribute significantly to crustal alteration and control of ocean chemistry, both high priority SGPP themes.

Our panel's discussions on these topics have consistently revolved around the importance of addressing the hydrothermal flow regime in three dimensions and on identifying the specific rock-water interactions associated with these flow paths. The report of the Sedimented Ridge DPG addresses these issues with what we feel is an extremely well-conceived study. The proposed two-leg drilling program provides exceptional balance among detailed study of hydrology, crustal interaction with fluids, and fundamental metallogenic issues. The emphasis on quantifying the flow system in Middle Valley addresses a major thematic objective of the SGPP. Likewise, the comparison between Middle Valley which is at a relatively immature stage of hydrothermal evolution, with the Escanaba sites which are at a more mature stage will allow perspectives on massive sulfide formation available in no other way. Finally, we believe that the dramatic contrast implied by isotopic and elemental abundance data in sources of ore and accessory elements between Middle Valley (basalt dominated) and Escanaba (sediment dominated) requires drilling in both areas to understand the origin of these crucial differences.

CASCADIA ACCRETIONARY PRISM

The SGPP white paper identifies the large-scale circulation of fluids within the oceanic lithosphere as a high priority theme. Of the hydrodynamic zones in which this circulation occurs, the SGPP believes that active margins are of highest priority for drilling over the next several years. This view arises from our perception that fluids moving through and flowing out of accretionary wedges are important for understanding geochemical fluxes in the lithosphere and hydrosphere.

The SGPP has discussed the relative merits of two Cascadia drilling proposals, 317/E (Vancouver Margin) and 233/E rev (Oregon Margin). We see advantages in each setting. The Vancouver study area has excellent heat flow coverage and evidence for thermal patterns influenced by fluid circulation. It represents apparently simple large-scale accretion tectonics. The Oregon setting is characterized by abundant active venting; distribution of vent sites according to specific tectonic settings; excellent imaging of surface vent sites and subsurface structure for choosing drill sites that promise to intersect and sample diverse elements of the plumbing system.

Despite the merits and advantages of each area, the SGPP feels strongly that at present, the Oregon proposal more clearly addresses our thematic objectives. It is completely focused on our priority themes of understanding fluid flow processes and geochemical evolution of the prism. Geochemical, sedimentological and hydrologic studies of the surface and shallow sub-surface of the Oregon area have been ongoing for several years and are at an advanced stage. In contrast, comparable work in on the Vancouver site has not progressed to the same extent. The Vancouver proposal as initially received and discussed by the panel is focused more heavily on accretion-tectonics topics and incorporated little fluid chemistry. Nor did it adequately address sedimentological issues such as the deformational fabric of the wedge sediments. For these reasons, our high ranking of the Cascadia program specifically reflects our thematic objectives as embodied in the Oregon margin study.

We recognize, however, that new information has been and will be forthcoming in the near future. Such information would probably add much to sharpen the fluid circulation-geochemistry objectives of the Vancouver margin proposal, and the tectonic objectives of the Oregon margin one. In this situation a DPG would be needed to sort out the additional information and such a DPG would be a productive undertaking to plan two legs.

EAST PACIFIC RISE BARE ROCK DRILLING

Although much lower ranked as a SGPP priority than the two programs above, the East Pacific bare rock drilling also has considerable thematic importance for our panel because of the implications for crustal alteration and sea water exchange. Although we have not as yet held comprehensive discussions of all proposals, our feeling is that the final program must occur at a site with high temperature hydrothermal flow to allow evaluation of the dynamics of an active hydrologic regime. Sites with low temperature venting would be of less interest.