

Executive Summary; SGPP meeting, 13-15 March 1989, USGS, Federal Center, Denver

The newly formed panel heard reports about the internal workings of ODP, the expectations attached to the new thematic panels, the long-range planning document, and the engineering leg 124E.

The major topics for a new document with the tentative title: "Sources, Sinks and Behavior of Elements and Sediments in the Oceans" to define the mandate of the new panel were established. Topics falling under this theme fit three general categories: (1) fluxes and balances; (2) processes and mechanisms; (3) recorders of change. From the geochemical perspective these include: paleochemistry; hydrogeology and the physical properties of sediments and crustal materials, crustal alteration, metallogenesis and petroleum genesis. From the sedimentary perspective these include: (1) geostrophic circulation; (2) external controls on sedimentation; (3) depositional architecture. The task of expanding each of these individual subtopics into more concrete descriptions was delegated to various subgroups within the panel.

The first attempt to formally review drilling proposals was somewhat hampered by not having had all proposals and enough advance copies available for the panel members. To facilitate future review of proposals this panel urges the PCOM office to mail proposal copies to all members at the same time as they are mailed to the SGPP chairman.

Proposal #317/E: This proposal appears to be largely based on geophysical objectives; therefore, unless the experiment is re-designed to incorporate fluid and gas chemistry and sedimentology, it would fall outside our mandate.

Proposal #233/E rev.: This proposal is fully within our mandate and its objectives are of the highest priority. Success of this experiment depends upon the operation of several of the new tools currently at a development stage. Although Nankai is the best prism to begin drilling because of its thin sediment cover, all efforts should be made to continue work in tool testing to ensure that Cascadia margin can be drilled successfully.

Proposal #314/D: Drilling of the Nankai margin falls entirely within our mandate; in light of the partial failure of tool testing on Leg 124E the panel recommends that: (1) the engineering leg, now scheduled after the Nankai leg, be advanced to allow for maximum opportunity to get NCB and GEOPROPS operational; (2) all efforts should be made to get good recovery of sand intervals and associated fluids required to establish the plumbing of this system; the panel realizes that this could be a compromise which would not go much beyond existing Resolution capabilities; (3) two holes should be drilled through the décollement which can be achieved by moving one of the proposed holes slightly.

Proposal #318/E rev.: The proposal in its present form does not address our high priority thematic objectives but has several secondary features of clear geochemical significance which should be further developed; i.e. fluid flow, crustal alteration and metallogenesis; deep volatiles as tracers to establish fluid sources; access to high temperature processes at shallower depth than is possible elsewhere. Sites should be located above the "hot-plate", site survey should establish that the system is "hydrothermally alive".

Proposal #319/E: This proposal falls outside our mandate. Emphasis should rather be toward drilling systems where fluid flow processes and metallogenesis are presently active.

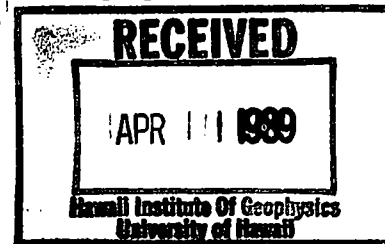
Proposal #284/E; #232/E; #275/E rev; #290/E: Sedimented and bare-rock ridges

The evaluation of drilling sedimented and bare-rock systems should be guided by the following considerations:

- 1) Defining the specifics of the hydrogeology of these systems is the fundamental priority in drilling. Experiments designed to study the plumbing should address the link of fluid flows with sulfide geochemistry and associated metallogenesis as well as high-temperature alteration processes.
- 2) Attention should be paid to the role of the biosphere in these systems. Emphasis between laboratory and field experiments with respect to this objective needs to be established.
- 3) How can primordial signals be differentiated from natural artifacts of geochemical recycling?

We concluded that the study of these systems might proceed as follows: Drill one leg dedicated to Middle Valley to establish the hydrogeology of this system. If sulfides are found, drill into other sedimented systems during a second leg to establish "end-member" variability. If sulfides are not found, the mineralization objectives should be fully addressed elsewhere; Escanaba Trough, Gulf of California. The latter objective requires at least one -perhaps two- drilling legs.

Proposal #142/E, #222/E, #248/E: Objectives of proposals #142/E and #222/E can both be met by utilizing a common set of holes and penetrating 100 m into the volcanics. Objectives of the third proposal (#248/E), requiring deeper penetration, do not lie within the expected mandate of SGPP.



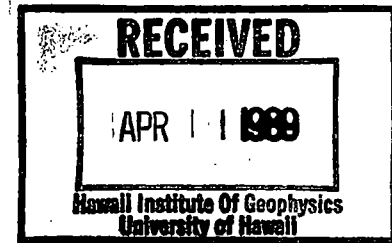
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Minutes of the Sedimentary and Geochemical Processes Panel Meeting

The first meeting of the newly formed SGP Panel of the Ocean Drilling Program was held March 13-15, 1989 at the Federal Center in Denver, Colorado; the meeting was hosted by Martin Goldhaber of the U.S. Geological Survey.

The panel approved the agenda proposed by the chairman; this was followed by a brief introduction by each of the panel members with special emphasis on their scientific expertise to serve the panel mandate. The following members were in attendance:

Erwin Suess (chairman)
Jacques Boulegue
Shirley Dreiss
Henry Elderfield
Phillip Froelich
Martin Goldhaber
Tom Pedersen, representing Larry Mayer
Judith McKenzie
Makato Ito
Jürgen Mienert
William Normark
Fredrick Prah
Dorrik Stow



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Members absent from the meeting and not represented by an alternate were:
Nicholas Criste-Blick
Noel James

The ODP Science Operator (Texas A&M University) was represented by:
Marta von Breymann
The Bore Hole Group by:
Mitchell Lyle
The newly established Ocean History Panel by:
André Droxler
The JOIDES Planning Committee by:
Miriam Kastner and Nick Pisias.

Scientific structure of ODP and the expectations of the new thematic panel SGPP

Miriam Kastner gave a condensed history of ODP, described the structure of this program and recent changes to this structure and identified how the revisions should facilitate more efficient accomplishment of the broad range of scientific goals in ocean drilling. She described the general mandate of the previous Sediments and Ocean History Panel (SOHP) and pointed out that geochemistry was insufficiently represented within SOHP leading to its division into two new thematic panels (SGPP and OHP). In particular, PCOM felt that the response from SOHP with respect to recommendations for drilling in ridge crest systems and accretionary prisms did not sufficiently address geochemical objectives, e.g. the role of fluids and fluid flow within sediments and ocean crust as controls on chemical cycling within the oceans. Scientific recommendations to PCOM from the new SGPP are expected to overcome this deficiency and enhance the scientific utility of ocean drilling experiments.

ODP Long Range Planning Document

Nick Pias described the expected interaction between a thematic panel and PCOM, the Long-Range Planning Document being one manifestation of this interaction. He suggested that the panel's White Paper should act to steer the science conducted by ODP and to identify the types of technological development that are needed to achieve the objectives of future drilling experiments. He brought up the possibility of SGPP revising and authorizing its own white paper and long-term planning document. He also emphasized that one of the major responsibilities of each thematic panel is to evaluate whether or not the scientific objectives of a given proposal are technologically practical. This presentation was primarily for the benefit of new panel members unfamiliar with how ODP operates.

Engineering Leg 124E

Marta von Breymann presented a summary of engineering achievements and shortcomings encountered during Leg 124E in the testing and development of new tools for drilling. The tools discussed were: the advanced hydraulic piston core/extended core barrel (APC/XBC) for improving recovery in chert/chalk sequences (no such sequences were encountered during Leg 124), the Navi-Drill Core Barrel (NCB) under current development for hardrock coring (we hope to improve design), the Diamond Coring System (DCS) for coring and drilling fractured rock (tool was significantly successful, with strength problems and penetration limitation to approximately 500 m), the Pressure Core Sampler (PCS) for retrieving core samples at near *in situ* pressures (the tool worked successfully; but "what do we want scientifically" after the samples have been brought on deck?) and the GEOPROPS Probe for detailed measurements of physical properties (tool could not be deployed). Considerable discussion ensued regarding whether or not important scientific objectives of drilling accretionary prisms could be achieved if these tools were not fully operational. It was made clear from various discussions over the three days of the meeting that detailed sampling of fluids and physical properties using NCB and GEOPROPS and the efficient recovery of sand layers using APC/XBC would certainly remain the highest goal but important scientific advancement would result if these tools were not completely on-line. As an example the usefulness of the wire-line packer was mentioned.

Status and Opinions on ODP by non-U.S. member countries

The non-U. S. members of the panel gave a brief sense of their countries' perception of the current mission of ODP with the following individuals providing input: Jürgen Mienert (Germany), Harry Elderfield (Great Britain), Judith MacKenzie (Switzerland, representing the European consortium), Makato Ito (Japan) and Jacque Boulegues (France). In general, a favorable impression is evident throughout and strong commitments to ODP is apparent for the near future. Better focusing of the science on process-oriented problems is essential if longer term commitments are to be assured, however. There is a sense that the "exclusiveness" of ODP-participating scientists will be challenged and that ODP has to earn its funding in competition with other national research programs in the future.

SOHP Long Term Planning Document

Following an earlier suggestion by Nick Pias, a lengthy discussion ensued regarding whether or not the SOHP Long Term Planning Document (First Draft, November 1988 which was distributed to all panel members prior to the meeting) was appropriate for the new SGPP. It was decided that this document must be abstracted from and in many cases completely rewritten to accommodate the

overall theme of the new SGPP. Because the details of our mandate have not yet been identified or agreed upon, it was decided that the task of assembling a new document could not be accomplished within the timeframe of the present meeting. An attempt was made, however, to outline the major topics that would be included in this document. A tentative title for the new document was created, "Sources, Sinks and Behavior of Elements and Sediments in the Oceans". Topics falling under this umbrella fit three very general categories: (1) fluxes and balances; (2) processes and mechanisms; (3) recorders of change.

From the geochemical perspective, the following subtopics are to be included somehow within these categories: paleochemistry; hydrogeology and the physical properties of sediments and crustal materials, crustal alteration, metallogenesis and petroleum genesis.

From the sedimentary perspective, the following subtopics are to be included: (1) geostrophic circulation; (2) external controls on sedimentation; (3) depositional architecture. The task of expanding each of these individual subtopics into more concrete descriptions was delegated to various subgroups within the panel.

Review of Proposals to PCOM

The major portion of time at this meeting was dedicated to the review of proposals. This task was deemed of fundamental importance because it provided a clearer background by which our newly formed panel could synthesize its overall mandate, and to familiarize the new panel members with the internal workings of ODP. In addition, PCOM and the detailed working group for sedimented ridges required scientific feedback from SGPP to facilitate further planning of drilling legs slotted for the near future.

We discussed only those proposals for which full documents were available. These proposals fell into three categories: the drilling of accretionary prisms (Cascadia margin: northern and southern subduction zones and Nankai margin; certain aspects of Chile Triple Junction), the drilling of sedimented and bare-rock ridges (Gorda Ridge: Escanaba Trough; Juan de Fuca Ridge: Middle Valley; Gulf of California: Guaymas Basin; Juan de Fuca Ridge: Axial Seamount; East Galapagos Rift: Inca transform fault) and the drilling of the Ontong-Java Plateau. To facilitate future review of proposals this panel urges the PCOM office to mail proposal copies to all members at the same time as they are mailed to the SGPP chairman.

Proposal #317/E:

Accretionary Wedge Deformation and Fluid Expulsion Processes.

Shirley Dreiss presented the details of the proposal to drill the northern Cascadia subduction zone off Vancouver Island. In the discussion that ensued, the following comments were essential to the overall evaluation by this panel:

- 1) details of the fluid flow model to be tested were missing;
- 2) little geochemistry and fluid chemistry has been incorporated into the proposed experiment;
- 3) apparent lack of sedimentology, such as deformational fabric of the wedge sediments; this was considered to be a serious deficiency;
- 4) experiment seems to be designed on the basis of geophysical data alone; it lacks a clear multi-disciplinary approach;
- 5) merits of drilling this location versus location in the southern subduction zone can only be ascertained through closer interaction with geophysicists; i.e. depth of décollement, bottom simulating reflector, underthrust vs. overthrust setting, complex vs. simple tectonics.

The panel concludes that unless the experiment could be re-designed to incorporate geochemistry and sedimentology, it would not fall within our mandate. It is imperative to establish the

relationship between the experiments proposed for the northern and southern subduction zone of the Cascadia margin; i.e. fluid venting manifestations, deep submersible surveys, heat flow.

Proposal #2331E rev.:

Cascadia Accretionary Prism

Martin Goldhaber presented the details of the proposal to drill the accretionary prism in the southern Cascadia margin. In the discussion that ensued, the following comments were essential in the overall evaluation by this panel:

- 1) experiment is completely focused on understanding fluid flow processes and geochemical evolution;
- 2) extensive background information documenting the surface geochemical expression of fluid flow is available from submersible observations, coring and *in situ* measurements.
- 3) long-term instrumenting seems feasible for this area and should be encouraged for a later phase;
- 4) structural styles seem complex over short distances: is this an advantage or a disadvantage?;
- 5) are the number and location of sites optimally chosen to answer questions such as: does facies control the plumbing system, what is the lateral continuity of facies units; how does the Astoria two-fan system affect dewatering?
- 6) tectonic complexity of the margin might require return at a later date for another drilling leg;

The panel concludes that the objectives of this proposal fall directly into the mandate of SGPP and are of the highest priority. Numerous comments were made concerning the technological difficulties of this proposed experiment. A lengthy discussion occurred regarding the extent that the success of this experiment would depend upon the operation of several of the new tools currently only at the stage of development within ODP.

Proposal #3141D:

A Study of Fluid Flow and Mechanical Response across an Accretionary Prism: The Nankai Trough.

Makato Ito and Tom Pedersen presented the details and objectives of this proposal. A number of comments were essential in the discussion that ensued to evaluate this proposal:

- 1) Drilling of coarse-grained prisms challenges the existing technology of ODP for core recovery;
- 2) NDC and GEOPROPS are not fully operational, which will pose considerable experimental limitations but perhaps not enough to forego drilling.
- 3) Chemical and fluid data needed from this experiment could be obtained by using other available tools such as packers.
- 4) Evaluation of physical properties are, however, considerably compromised by this technological deficiency.
- 5) Drilling strategy proposed provides an excellent opportunity to constrain the sedimentary geometry and to evaluate the hydrogeology;
- 6) Some concern was raised about the effect that drilling closely-spaced holes may have on the observed fluid flow, it was however, considered unimportant.
- 7) By modifying the placement of holes planned for NKT-3 and NKT-10, it would be possible to penetrate the thrust fault two times and allow the fluid transport pathways to be more clearly defined.
- 8) Nankai was recognized as one of the best locations to study the hydrogeology of an accretionary prism because of the thin sediment cover and the feasibility to drill through the décollement. Unless this depth of penetration is achieved, however, the fluid flow pathways may not be definable without considerable ambiguity (the example of the data obtained from drilling the Barbados accretionary prism (Leg 110) was cited).

Drilling of the Nankai margin falls entirely within the mandate of SGPP and in light of the partial failure of tool testing on Leg 124E the panel recommended: (1) the Engineering leg, now scheduled after the Nankai leg, should be advanced to allow for maximum opportunity to get NCB and GEOPROPS operational; (2) all efforts should be made to get good recovery of sand intervals and

associated fluids required to establish the plumbing of this system; although SGPP realizes that this could be a compromise which would not go much beyond existing Resolution capabilities; (3) two holes should be drilled through the decollement which can be achieved by moving one of the proposed holes slightly; it would allow an evaluation of the geochemical evolution in this prism.

It was also pointed out that although Nankai is the best prism to begin drilling because of the thin sediment cover, all efforts should be made to continue preparatory work in tool testing and improvement of core recovery to drill the Cascadia margin. The southern location (off Oregon) is attractive because an extensive geochemical data set defining the surface expression of fluid flow in this area is already available. The northern location (off Vancouver) is attractive because it is potentially more simple tectonically and may, therefore, be an easier system to interpret hydrologically and unfortunately, the present proposal lacks this objective.

Proposal #318/E rev.:

Chile Triple Junction

Judith MacKenzie presented the details of the proposal to drill the region of the Chile Trench between 46° and 47°S. In the discussion that ensued, the following comments were essential in the final evaluation by this panel:

- 1) Proposal is strong through availability of a large geological data set; it has potential to be tied to land geology;
- 2) Although it is tectonically focused, its geochemical implications make it potentially an attractive study site. These, however, are not spelled out in the present proposal. Geochemical objectives are the infusion of mantle volatiles which may provide a unique (set of) tracer(s) by which to examine fluid flow processes in this system; tracers include gases and high temperature alteration products in fluids;
- 3) Setting provides an opportunity to learn about deep-seated (metamorphic) processes;
- 4) Setting could serve as a model for mineralization of a young accretionary prism;

SGPP concludes that the proposal in its present form does not address high priority thematic objectives of this panel but has several secondary features of clear geochemical significance which should be further developed; these include: fluid flow processes, crustal alteration and subsequent metallogenesis; use of deep volatiles as tracers to establish fluid flow; access to high temperature processes at shallower depth than is possible in other accretionary systems; opportunity to establish the relationship of the sedimentary morphology to the geometry of the trench system. Priority should be given to sites located to the north, where the collision process and its effect on geochemical cycling is presumably occurring at the present time; i.e. sites should be located above the "hot-plate". In order for this proposal to formally fit within the mandate of SGPP, it will be necessary to demonstrate through site survey that the system is now hydrothermally active and not dormant; i.e. establish that the "system is alive".

Proposal #319/E:

Drill an extinct hydrothermal system (10 ka) East Galapagos Rift - Inca Transform Fault

Erwin Suess presented the details of the proposal to drill this extinct hydrothermal system. There was very little discussion; the panel agrees that generally this proposal falls outside the mandate of SGPP. Our emphasis would be toward drilling systems where fluid flow processes and metallogenesis are presently active and not -as in the proposal- where hydrothermal activity has ceased.

Proposal #284/E:

Drilling in Escanaba Trough, Southern Gorda Ridge

Jacques Boulegue presented the details and objectives of this proposal. Several elements of the proposed study were clearly within the mandate of the SGPP and the following comments reflect the evaluation by this panel:

- 1) formation of talc and chlorite,
- 2) effect of hydrothermal circulation on water chemistry,
- 3) metallogenesis,
- 4) study of high temperature thermal alteration of organic matter and subsequent petroleum genesis.

The drilling strategy put forth to examine the time evolution of these processes was recognized as an attractive feature of the proposal.

Proposal #232/E:

Drilling into high-temperature zero-age crust on the Northern Juan de Fuca: Middle Valley Ridge

Jacques Boulegue also presented the objectives of this proposal. The proposal to drill Middle Valley was compared to the one for the Escanaba Trough. It was recognized that the geophysical background for this site was far superior to that available for the Escanaba Trough. It was also noted that this proposal had similar elements with the interests of SGPP as the Escanaba Trough proposal did, although a drilling strategy to examine time evolution was not considered.

Proposal #275/E rev.:

Drilling of the Gulf of California

Jürgen Mienert presented the details and objectives of this proposal. SGPP evaluation was based on the following comments:

- 1) this sedimented ridge system is the better one to study because of the large gradients in heat flow observed throughout the area;
- 2) nonetheless, the proposal is too diffuse and should be re-written to focus on the hydrothermal issues alone.

We concluded that any meaningful paleoceanographic study in the Gulf would probably be limited to shallow sediment depths easily accessed by standard piston coring techniques. Deep sediment intervals, requiring a drilling platform, would more than likely be too complex for a first rate paleoceanographic study.

Proposal #290/E:

Deep Drilling on Axial Seamount

Jacques Boulegue presented the details and objectives of this proposal. In the discussion that ensued the following comments reflected the opinion of the SGPP:

- 1) System is worthy of drilling because it displays a range of morphological diversity and excellent geophysical data are available for this area;
- 2) System is not sediment-hosted, therefore no good heat flow data are obtainable to constrain the fluid flow patterns; this is a major limitation;
- 3) Desirable to design an experiment to enhance understanding of the Helium Basin; this is not an objective addressed in the current proposal but would provide thematic interest of the SGPP.

The panel concludes that this proposal is within the mandate, however further site survey is required to optimize its experimental design. There was discussion of the technological difficulties caused by drilling a fractured (?) rock system and comments were made regarding the attractiveness of this site as a "natural laboratory" because of its close proximity to the research institutions involved. Some discussion centered on the role of the microbiosphere of the proposed drilling sites. The panel suggests that the logistics of the "origin of life" objectives of this experiment be more adequately defined. It remained unclear to what extent the microbiosphere research would require a dedicated hole or could be accomplished along with objectives of other holes.

The objectives of drilling sedimented and bare-rock systems is best summarized in the following statements which should guide the final evaluation; hereby the SGPP implies a ranking with the following order below:

- 1) Defining the specifics of the hydrogeology of these systems is the fundamental priority in drilling. Experiments designed to study the plumbing should address the link of fluid flows with sulfide geochemistry and associated metallogenesis as well as high- temperature alteration processes.
- 2) Increasing attention should be paid to the role of the biosphere in these systems. The degree of emphasis between laboratory and field experimentation with respect to this objective needs to be established.
- 3) How do we identify primordial signals from natural artifacts of geochemical recycling? This is a fundamental question which bears on the chemical evolution of the oceans.

The panel arrives at a conclusion that the study of sedimented ridge systems should use the following approach: One drilling leg should be dedicated to Middle Valley to establish the hydrogeology of this system. If sulfides are found, drilling into other sedimented systems (e.g. Escanaba Trough, Gulf of California) should be done in a second leg to establish "end-member" variability. If sulfides are not found in Middle Valley, the mineralization objectives should be fully addressed elsewhere. This would require at least one -perhaps two- drilling legs. Better knowledge of the regional variability of sedimented systems would facilitate the construction of proper geochemical model(s) for these geological features. A question was asked if the drilling experiments would adequately address the concept of phase separation and subsequent geochemical fractionation.

Proposal #142/E, #222/E, #248/E:

Ontong-Java Plateau

William Normark presented the details and objectives of these proposals. The panel quickly concluded that the study of:

- 1) Seismic reflectors (carbonate dissolution events) in the Neogene record,
- 2) Volcanic and anoxic events in the Cretaceous record clearly placed proposals #142/E and #222/E within our mandate. It was suggested that the objectives of these two proposals could both be met by utilizing a common set of holes and penetrating 100 m into the volcanics. The panel decided that the objectives of the third proposal #248/E, requiring deeper penetration, does not lie within the expected mandate of SGPP.

SGPP liaison assignments

Liaison assignments to the following thematic and service panels were made:

OHP: Phillip Froelich (alternate Judith MacKenzie)

TEC: Shirley Dreiss (alternate not named)

LITH: Martin Goldhaber (alternate Jacques Boulegue)

DMP: Jürgen Mienert (alternate Nicholas Criste-Blick)

SMP: Henry Elderfield (alternate William Normark)

Membership policy

Membership of this panel should remain as defined in these minutes at least for the next year. At that time, a rotation policy would apply and one third of the membership would be replaced annually. Total tenure on the panel would be for <3 years.

The overall expertise represented by the present panel lacks specialists in: sedimentary mass balances, seismic interpretation and crustal alteration. The panel chose not to name individuals to

fill these three positions at the present time but would do so at the July meeting as our mandate will be defined in more detail.

Endorsement of changes in publication policy

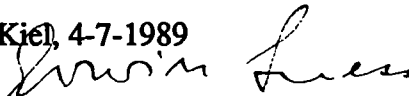
Miriam Kastner described the changes in publication policy proposed by USSAC for both Volume A and B. The panel agreed unanimously that these changes would expedite the publication of results from the drilling legs and lead to an inevitable improvement in the image of the Volume B publication in particular.

Next meetings

An interim meeting was scheduled for July 19-20, 1989 at Lamont-Doherty Geological Observatory, explicitly to formulate and formalize the mandate and to establish a written, first draft of the SGPP document from which to work. This meeting will be hosted by Phillip Froelich; homework assigned to panel members should reach the chairman not later than 26 May, 1989.

A fall meeting of the SGPP was scheduled for September 19-20, 1989 to complete the review of proposals needed by PCOM before the end of November. This meeting will be held at GEOMAR Research Center of the Kiel University and will be hosted by Erwin Suess.

Kiel, 4-7-1989



E. Suess