

Minutes - Southern Oceans Regional Drilling Panel

February 14 - 16, 1984

Graduate School of Oceanography, University of Rhode Island

Panel Members Present:

J. Kennett, Chairman  
J. Anderson  
P. Barker  
B. Bornhold  
P. Ciesielski  
D. Fuetterer  
J. LaBrecque  
D. Needham  
E. Suess  
  
H. Zimmerman, representing NSF  
Y. Mott, representing ODP, TAMU  
M. Arthur, SOHP Chairman, (first day)

Guests:

I. Christofferson, Norwegian Polar Research Institute  
L. Burckle, Lamont-Doherty Geological Observatory  
P. Hargraves, URI  
W. Prell, Indian Ocean Panel, (last afternoon)

1. Introduction:

- a. Introductory remarks by J. Kennett (SOP Chairman).
- b. Objectives of the meeting were to formulate proposals for drilling in the S. Atlantic sector of the Southern Ocean during the Austral summer of December 1986 - April 1987; to determine site surveying needs and possible vessels that could help with surveying; to consider scientific needs in other sectors of the Southern Ocean and begin making plans for such proposals.
- c. The mandate of the Southern Ocean Regional Drilling Panel was reviewed in relation to the thematic panels and other regional panels.

2. Logistics/Drilling Schedule:

- a. Weather window. For Weddell Sea drilling, weather-sea ice window is from mid-January to mid-March (optimal time is usually mid-February). But there are significant seasonal variations. Areas of interest are generally ice free from early to middle January. Iceberg paths are fairly unpredictable from season to season, and hence potentially pose the most difficult problems in a few areas. Because of this, a program of Southern Ocean drilling should consider flexibility and contain sufficient numbers of contingency sites.

For drilling at subantarctic latitudes, the weather window is longer - December through April; but preferably January through April.

- b. Leg duration. 70 day maximum with extension possible (according to contractual arrangements). As with previous drilling in the Southern Ocean, longer than normal legs are desirable.
- c. King George Island has a Chilean airbase. They have several helicopters that could possibly help with scientific crew change if desirable.
- d. Icebreaker support would be preferable in southern sites. The icebreakers have helicopters that can provide scouting assistance. They also can break up large pieces of sea ice if necessary.

3. Program Status Report (by H. Zimmerman and Y. Mott):

- a. SEDCO 471 selected as vessel.
- b. Ship is "winterized" and is partly ice strengthened.
- c. Is advertized as being "capable of drilling in ice-infested waters in Canada or the Alaskan Arctic."
- d. Can drill as shallow as 50-200 feet water depth.
- e. Ship conversion will be completed by December, 1984.
- f. Space for 50 scientists (including technicians).
- g. Drilling starting date will be delayed slightly from October to January, 1985.

4. General Discussion of Overall Priorities and Objectives:

General objectives of Southern Ocean Drilling have been previously outlined in the following documents: Southwest Atlantic/Southern Ocean Working Group of the Ocean Paleoenvironmental Panel (1977); Ocean Margin Drilling Planning Advisory Committee (1981); Ocean Paleoenvironmental Panel (August, 1983). Also a report published in Geotimes 1976 (21(3): 21-24) by J. Kennett, J. Sclater and T. H. van Andel.

There are three broad categories of problems:

- A. Mesozoic tectonics and paleoenvironmental history. This was summarized by J. LaBrecque.
  - a. Problem of early inter-ocean water mass communication between the Southern Ocean and the Atlantic and the South Atlantic and South Pacific.
  - b. Understanding of the high latitude Mesozoic Ocean environments and biogeography in relation to the global ocean.
  - c. Breakup configuration; early breakup history of east and west Antarctica; cause of South Atlantic anoxia cessation; timing and genesis in relation to the world ocean. Answers may be obtained from Antarctic margin drilling.
  - d. Possible existence of missing "plate."
  - e. Rises in the area can be exploited to obtain Mesozoic record.
  - f. Tectonic and sedimentary character of the Caird margin.

- g. Evolution of subduction in the Orkney area.
- h. Elucidation of the evolution of the Weddell Sea. Reasons for Aptian and Maestrichtian/Mid-Cretaceous changes in poles of rotation.

B. Cenozoic-latest Cretaceous paleoenvironments and tectonic history.

This was summarized by J. Kennett, P. Ciesielski, J. Anderson and others. Here there are many problems that relate to our ultimate understanding of the evolution of the global ocean.

- a. Need for understanding Paleogene and Neogene glacial history. Are glacial changes related to major global sea-level changes? Was there Paleogene glaciation of major significance as some have suggested? Relative history of east and west Antarctic glaciation.
- b. Paleogene biogeography of southern high latitudes.
- c. Antarctic margin sedimentation; relation with Antarctic environment.
- d. History of changes in vertical structure of S.O. water masses through time.
- e. Evolution of planktic groups (especially Paleogene) and relationship to global changes.
- f. Lysocline and CCD fluctuations through time.
- g. Filling gaps in Paleogene and Neogene biostratigraphic record.
- h. History of AABW formation in Weddell Sea and fluctuations in its velocity.
- i. Possible Antarctic influence on mid-Eocene isotopic change.
- j. Record of Drake Passage opening and its influence on paleoceanography, biogeography, and evolution of planktic and benthic faunas and floras.
- k. Test hypothesis that West Antarctic ice sheet has extended out to shelf margins (i.e. as G. Denton, et al. have suggested).
- l. Influence of ice sheet dynamics on evolution of Antarctic shelf and mass wasting processes (best addressed by drilling Weddell Abyssal Fan).

C. Special Problems.

- a. Inorganic and organic geochemistry and sedimentary setting and history of the Bransfield Basin. This is an unusual basin because of intensely cold bottom waters, high organic content and high heat flow.
- b. Tectonic evolution of the South Sandwich forearc.

5. Site Selection and Discussion:

Most of the discussion during the meeting centered upon site selection to best answer the major scientific problems. This is synthesized in our proposal to the ODP Planning Committee (Appendix I). Details are thus not presented in these minutes, but some general comments are tabulated as additional background information. The priorities that were assigned to the various sites are also given in the proposal.

1. Maud Rise

- present data:
- a) one single channel seismic line.
  - b) most of section probably early late Miocene and older.
  - c) good microfossil preservation with calcareous and siliceous sediment.
  - d) basement age - Mesozoic.

additional survey: Norwegian Antarctic Survey will do some survey work (multichannel) in this area next austral summer.

Potential also for German survey work.

objectives: "a" through "i" of previous section.

advantages: Shallow depth, old (Late Mesozoic) record adjacent to East Antarctica, well preserved biogenic sediments (with carbonate).

tectonic significance: Possibly M0 to M4 anomalies along north margin, therefore, adjacent Aptian sea-floor - High amplitude magnetic record; appears to be thick oceanic crust which may have been above sea level during Aptian. The paleobathymetry of the Maud Rise is of critical importance to early circulation to Weddell Basin.

SOP opinion: Multiple sites (2) on the Maud Rise. Encourage additional site survey, however, the lack of additional surveys should not preclude drilling this important target.

- possible sites:
- (1) OMD Site C.
  - (2) Vicinity of core IO 12-36, downslope from OMD Site C, ~1000 - 800 m greater depth.

2. Astrid Ridge region - Caird margin

- have dissected prograding continental margin sediments.
- two sites: Caird and Astrid Ridge regions (see proposal - Appendix I).

3. Weddell Abyssal Plain Site

- A lengthy discussion was held over the scientific objectives of Weddell Abyssal Plain drilling.

Problems:

- possible lack of biostratigraphic control due to poor preservation, diagenesis, and low productivity.

- character of seismic records which suggest turbidite occurrence to great sub-bottom depth.

- possible presence of a sediment record which can unambiguously be interpreted in terms of bottom water history.

Nevertheless, the section may provide useful information about timing and type of sediment input from the Antarctic continent and the nature of the sediment source region.

4. Orkney Traverse concept

- Goals:
- Selection of a traverse of sites at different water depths to provide a "Vema Channel analog" along the Weddell Sea margin as close as possible to source AABW. History of vertical water mass structure.
  - Determination of the possibility of the Powell Basin being a pre-Drake Passage precursor for deep-water Pacific-Atlantic communication.

Site Location: A preference was voiced for a transect along the southeastern margin of the Orkney Platform where the margin does not exhibit slumping characteristics of the southern and southwestern margin.

A transect of probably three holes from the apex or upper margin to approximately 3300 m water depth.

Additional survey work needed.

5. Powell Basin Site (additional site suggested within Orkney Traverse region)

Discussion concluded that scientific return of a deep-water site in the basin was of low priority; but of value as a contingency site.

6. Bransfield Strait

- Goal:
- To obtain a high resolution Pleistocene record. Organic and inorganic geochemistry.

Justification: - Good potential site because of logistic considerations [location, ice conditions (very good)], very high sedimentation rates.

Geochemical Objectives: (1) Formation of hexa-hydrates (only known occurrence of this low temperature mineral phase of calcite - Ikaite).

(2) Formation of Ikaite pseudomorphs.

(3) High hydrocarbons in surface sediments - exploration of relationship of volcanics with rapid maturation of organic rich sediments. Uniqueness of young hydrocarbons of predominantly marine origin and in high heat flow region (unlike Gulf of California where organic carbon is terrestrial and marine).

The site is clearly one of high potential for valuable geochemical studies, but after considerable discussion, the quality of the site as a high resolution Pleistocene section was questioned.

7. Sites north of the American-Antarctic Ridge (N - S transect)

~ 60 m.y. record of Antarctic Cenozoic pelagic sedimentation. (see proposal - Appendix I).

8. Fore-Arc Site - South Sandwich Arc. (see proposal - Appendix I).
9. Islas Orcadas Rise and Northeastern Georgia Rise - (For details see proposal - Appendix I).
  - to obtain latest Miocene pelagic record which is missing almost everywhere in the Southern Ocean.
  - to attempt to fill in previously unrecovered stratigraphic intervals of the Atlantic subantarctic (e.g. Latest Cretaceous - late Paleocene, early - early mid-Eocene, early Miocene).
  - drill to basement to determine origin and age of the rises.
  - importance of Islas Orcadas Rise and Meteor Rise as possible last impediments to deep water circulation into the S. Atlantic.
  - Cretaceous subsidence comparisons between Falkland Plateau and IOR region.
10. Meteor Rise region - (S.W. Atlantic Working Group Sites SI 9-11).  
(see proposal - Appendix I for details).
6. Southern Ocean Drilling after the South Atlantic:

The Panel places highest priority for future Southern Ocean Drilling in the Southern Indian Ocean sector. This is mainly because of the unique and varied scientific opportunities afforded by drilling on the Kerguelen/Gaussburg Ridge. A Southern Indian Ocean drilling proposal will be developed by the S.O. Regional Panel at the next meeting. The Panel requests that the Planning Committee consider that this drilling occurs in the austral summer of 1987-88 and be tied to a more general drilling program in the Indian Ocean.

L. Montadert has reported by letter that the French have conducted a multichannel seismic survey of the Kerguelen Plateau.
7. Site Surveying Possibilities:
  - a. Norwegian Expedition: (Austral summer, 84-85). Maud Rise - Caird Margin area. Ship will be traversing via Bouvet Island. I. Christofferson was enthusiastic about the possibilities of assisting with these surveys. Multichannel seismics.
  - b. British Expedition: (Discovery - austral summer, 84-85). P. Barker summarized his planned expedition to the area of the South Orkney Plateau, Weddell Basin and Bransfield Strait. The ship will be working for 20-25 days in the areas of interest. Surveys could include 48 channel seismics; 4.5 kHz and Gloria.
  - c. W. German Expedition: (Austral summer of 85-86). D. Futterer summarized these possibilities. Karl Hinz is organizing expedition. Could be follow up to Maud Rise - Caird Coast is necessary. Multichannel seismics. D. Futterer will coordinate.
  - d. Glacier Expedition (85-86). S. Orkney Region. Single channel seismics and coring. J. Anderson will coordinate.

- e. Possible Conrad Expedition (85-86): Not yet firm. Could be of assistance in southern sites. P. Ciesielski will coordinate.
- f. Northern Sites: Some site surveying would be desirable including the Meteor Rise region. This issue still requires some attention by the panel.

8. New Panel Members:

It was decided to request that the following two workers be appointed to the panel.

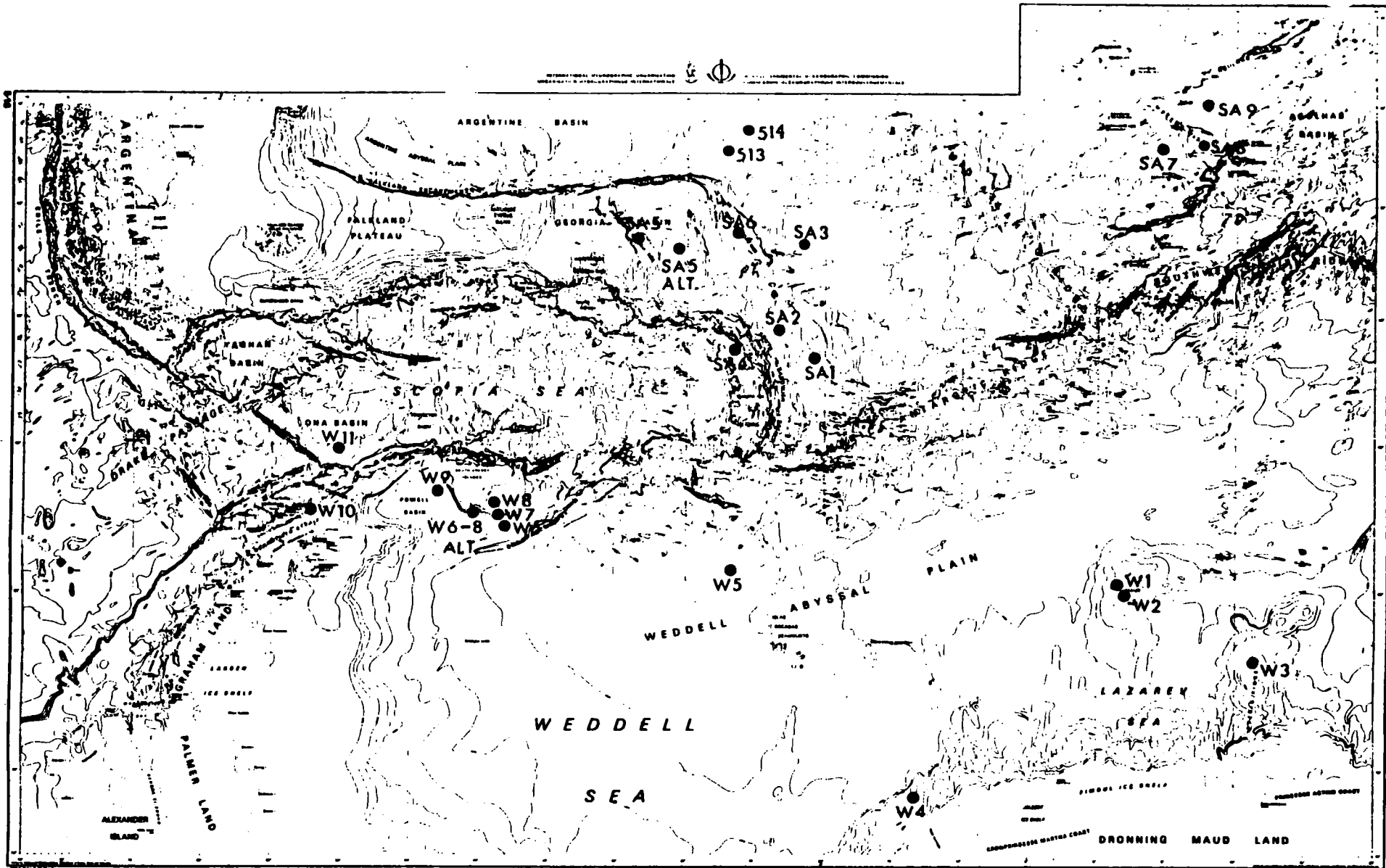
Dr. Ingvar Christofferson, Norwegian Polar Research Institute

Dr. Arnold Gordon, Lamont-Doherty Geological Observatory

9. Next Meeting:

Given the need to work well in advance because of Southern Ocean logistic problems, a meeting is required next late September before the beginning of the next austral summer to help firm-up site surveying needs and plans; and to begin to formulate drilling proposals in other sectors of the Southern Ocean, especially the Southern Indian Ocean.

The Panel requests that this meeting be held at the Alfred Wegener Institute for Polar Research, Bremerhaven, West Germany.

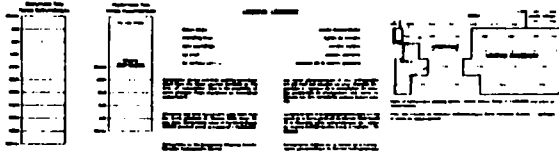


**GENERAL BATHYMETRIC CHART  
 OF THE OCEANS (GEBCO)**

PROPOSEE PAR L'ORGANISATION INTERNATIONALE D'HYDROGRAPHIE

**CARTE GÉNÉRALE BATHYMETRIQUE  
 DES OcéANS (GEBCO)**

PROPOSEE PAR L'ORGANISATION INTERNATIONALE D'HYDROGRAPHIE



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PROPOSED SOUTHERN OCEAN DRILLING SITES

Weddell Sites (W)

	<u>Water depth (m)</u>	<u>Drilling thickness (m)</u>	<u>time</u>
I-Priority			
W1 Maud Rise	3000	500	3½
W2 " "	3500	500	4
W4 Caird Margin	3040	900	6
" " (possible additional site)	3000	400	(3¼)
W5 Weddell Basin	4950	1000	9¼
W6 S. Orkney Plateau	3500	500	4
W7 " "	2100	500	3
W8 " "	700	500	2
			<u>32 days</u>
II-Priority			
W3 Astrid Ridge	2000	700	4
W10 Bransfield Basin	2000	600	3½
W11 Southeast Drake Passage	3600	900	6
			<u>13½ days</u>
Total for southern sites			<u>45½ days</u>

Subantarctic Sites (SA)

I-Priority			
SA1 N-S transect	4700	500	4½
SA2 " "	4100	700	6
SA3 " "	4300	500	4½
SA4 S. Sandwich Forearc	2700	600	4
SA6 Islas Orcadas Rise	3000	500	3½
SA8 Meteor Rise	2500	500	3½
			<u>26 days</u>
II-Priority			
SA5 Northeast Georgia Rise	2000	800	4½
SA7 Late Eocene African Flank	4300	500	4½
SA9 Agulhas Basin	4400	500	4½
			<u>13½ days</u>
Total for northern sites			<u>39½ days</u>