

SOUTHERN OCEAN PANEL, ANNUAL REPORT 1988

1. 1988 has been a successful year for the SOP, in the sense that Legs 119 and 120, to the Kerguelen Plateau and Prydz Bay, were successfully carried out. There were problems during these legs (and the very sad death of Lamar Hayes during Leg 120) but the main objectives were achieved. It was particularly pleasing that the drill ship was able to get into Prydz Bay and drill the shelf glacial sequences there. We look forward to the results of shore lab studies on material collected during both legs.

2. The SOP did not meet during 1988. Its last meeting, in October 1987, reviewed existing proposals in anticipation of the interim structure, in which the thematic panels undertake initial review of proposals; since no new Antarctic drilling was imminent, it was clear that there was no active role for the SOP in 1988.

3. It seemed most likely that the panel would not meet again, but for most of the year it was not certain what would be happening. The strongest rumour I heard said we were formally disbanded from 1 October 1988. I mention this only in support of a memo to PCOM (or more appropriately perhaps XCOM). It seems very likely that none of the scientists who serve on regional panels have heard directly that their services are no longer required (except by default, by scanning pp 47-59 of the October JJ). How about someone representing the organisation writing a thank-you note?

4. The last time it met, the main concern of the SOP about the future was that the structural changes in ODP would not encourage the flow of proposals into the system. Certainly the ship would continue drilling; but the number of active scientists within the advisory structure was being reduced, and review of proposals would be less supportive, possibly more cursory and certainly more directed (thematic). The constituency for drilling might decrease. There is often a conflict between efficiency and democracy: ODP knows it has chosen efficiency, but may not realise that it has made a choice. The problem may only become apparent at fund renewal time.

For the Southern Ocean constituency, there is now no supporting pressure group within the system. SOP foresees less active interest in Southern Ocean drilling, at a time when one might expect considerable interest stemming from the 4 legs recently drilled. The preliminaries to a drilling proposal (site survey etcetera) take so much longer in such remote areas, that fewer may undertake them on the offchance of interesting a thematic panel whose own interests may have changed in the meantime.

We shall see. Meantime, perhaps the thematic panels should consider strengthening their regional representation? And be prepared to encourage proposals at a more preliminary stage.

5. Last month, in the US on other business, my breakfast-time TV previewed an upcoming 5-minute interview with 5 billionaires. One of them had made his pile by transforming a small sand and gravel business into a conglomerate.

Maybe he can improve core recovery too?

Peter Baker

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Thematic Priorities of Existing Southern Ocean Proposals

1. SUMMARY

Several proposals should be of interest to the new OHP and SGPP (water mass evolution, glacial control of sea level change) and to TECP (divergent margins, ridge subduction). LITHP will have no interest in high latitude drilling until the ship next goes there.

2. INTRO

June 1988 JOIDES Journal lists the following Southern Ocean proposals. Those crossed through have been drilled during the last 2 Austral seasons (113,114,119,120). Figure 1 shows the locations of those remaining.

SOUTHERN OCEANS		
54/C	Sub-Antarctic & Weddell Sea Sites	(Kennett) 3/84
71/C	Drilling on the Shaka Ridge [idea proposal]	(Sclater) 7/84
73/C	Antarctic Margin off Adelie Coast	(Wannesson, et al) 8/84
108/C	E Antarctic Cont. Margin (Prydz Bay)	(SOP) 5/87
109/C	Kerguelen-Heard Plateau	(SOP-Kennett) 10/84
110/C	Wilkesland - Adelie Cont. Margin	(SOP-Kennett) 10/84
111/C	SE Indian Ocean Ridge Transect (Subantarctic)	(SOP-Kennett) 10/84
114/C	Crozet Plateau	(SOP-Kennett) 10/84
129/C	Bounty Trough	(Davy) 5/86*
136/C	Kerguelen-Heard Plateau	(Schlich, et al) 7/85
169/C	S Tasman Rise	(Hinz & Dostmann) 7/85
185/C	Kerguelen Plateau: Origin, Evol. & Paleo.	(Coffin, et al) 8/85
209/C	Eltanin Fracture Zone	(Dunn) 1/86
228/C	Weddell Sea (E Antarctic Cont. Margin)	(Hinz, et al) 5/86
230/C	Wilkes Land Margin, E Antarctica	(Eittreim, et al) 5/86
244/C	N Ross Sea	(Cooper, et al) 8/86
279/C	S Kerguelen Plateau	(Schlich, et al) 3/87
296/C	Ross Sea, Antarctica (Subs. for 244/C)	(Cooper, et al) 12/87
297/C	Pacific Margin, Antarctic Peninsula	(Barker, et al) 12/87

Please bear in mind also that two USSAC Workshops (South Pacific, South Atlantic) have highlighted many targets of considerable interest. The SOP had very limited success in persuading any of the proponents of those Workshop topics to work them up into independent proposals. The main barrier was a disbelief that such effort would be able to attract drilling. That barrier is now higher in the perception of the community: ODP appears as more of a closed shop under the new structure than before. Many of the BEST potential targets, of high thematic interest, lie within those Workshop reports.

3. SOHP Interest

Instead of trying to decide where the boundary between the new OHP and SGPP will lie, we will use the SOHP White Paper as a general guide to combined interest.

3.1 Short-period changes (Neogene)

The proposal most relevant to this theme is 209/C (Eltanin Fracture Zone) by Dean Dunn. It proposed two transects (N-S and

NW-SE) on the flanks of the EPR near the EFZ, to examine the Cenozoic development of the Polar Front. The SOP thought very highly of this target: it has said repeatedly that the Pacific sector is the right sector to examine Polar Front development, since there are no topographic constrictions to distort the climatic signal and encourage non-deposition/erosion. SOP argued for the proposal to be extended into a N-S transect from the continental margin to 30°S, to include sub-tropical fronts, and to form 2 parallel lines, on 2 anomalies (possibly 6c and 21). Neither Dunn nor anyone else has been willing to put the effort into raising site survey time, to develop this into a mature proposal. SOP thought that it was necessary to survey the sites properly, to be able to pick the most continuous sections: the existing (mainly Eltanin) data are sparse.

The proposal also bears on SOHP Objective 3 (Longer-period, Palaeogene), since the sections extend well back into the Eocene and would record the development of the psychrosphere in the Pacific sector before the Southern Ocean became completely circumpolar. SOHP Objective 4 (Palaeo-productivity) is also relevant, since the Paleogene S Pacific silica and carbon budgets are unknown.

3.2 Sea-Level History

One proposal (129/C, Bounty Trough, Davey) addresses this problem in the traditional sense, offering a carbonate section where a transect of sites might observe direct and indirect evidence of sea-level change, in a part of the world clearly decoupled from the Atlantic.

More fundamentally, the importance of drilling the Antarctic margin to test models of sea-level change caused by changes in the volume of grounded ice, does not appear to be appreciated. The Antarctic continental shelf is completely different from those of lower latitudes. It is much deeper (average ca. 300-400m), and is systematically deeper inshore than at the shelf edge. Ice sheets are probably grounded out to the shelf edge at glacial maxima, and carry a basal layer of unsorted glacial till to the shelf break during glacial advance and maximum. During retreat and interglacials, little terrigenous sediment reaches the shelf edge and beyond, except by ice rafting: shelf and slope deposition is sparse and largely pelagic. The outer shelf is built from the prograding glacial sequences, which reflect glacial cycles (particularly ice volume) precisely. A direct comparison is possible therefore, by drilling the outer shelf, between stratigraphic sequences from temperate margins and their hypothesised cause.

Prydz Bay drilling adopted this model, although Prydz Bay drilling did not sample the younger sequences. Several Southern Ocean proposals offer this drilling opportunity, although the opportunity is not always defined within the proposal. Proposals 73/C (Adelie margin, Wannesson) and 230/C (Wilkes margin, Eittrheim) have other, deeper objectives, but could be used for this study. Proposal 296/C (Ross Sea, Cooper) also includes seismic sections across the continental margin which show prograding, presumed glacial sequences. The fourth relevant proposal (Antarctic Peninsula, Barker) includes both tectonic and these glacial process/history objectives.

The perceived problems are the poor recovery in the likely lithologies (mainly overcompacted till) in Prydz Bay, and poor stratigraphic control. The first shows signs of being overcome if the Diamond Coring System is successful, since these lithologies can be very successfully drilled from thick fast ice (eg CIROS-1). The

second is not bad: diatom ooze and diatomaceous mud is laid down on shelf and slope during interglacials, and either buried by or marginally reworked within the next glacial sequence. Dating should be good enough to define third-order Vail cycles, which is what the Antarctic seismic profiles appear to show.

Please note that some aspects of SOHP Objective 6 (Depositional evidence of uplift) are included in these same 4 proposals, since all deal with terrigenous sequences. Both the Ross Sea and the Antarctic Peninsula proposals deal more directly with this topic, the former in connection with the very important (climatically) Transantarctic Mountains uplift in the Neogene, the latter in connection with vertical movement at an active margin, related to ridge crest subduction. Note also that in both cases the vertical motion from these long-term tectonic processes can be clearly separated from the glacio-eustatic effects described above.

3.3 Other SOHP matters

Of the other outstanding Southern Ocean proposals, 114/C (Crozet Plateau, SOP) uses the plateau as a dipstick in the sub-Antarctic water masses (rather like Leg 114 in the South Atlantic). The South Tasman Rise proposal (169/C, Hinz) is concerned mainly with transtensional tectonics associated with plate separation, but the gateway to the south is of some palaeo-oceanographic importance, and the sequences to be drilled may be recording the early stages of opening, when connections were all shallow. Also relevant to gateway-type problems (which the SOHP White Paper does not emphasise) is the Ross Sea drilling (296/C), which considers that there have been pre-glacial and deglacial or interglacial seaways through Antarctica. The entire problem of an extensive Pliocene deglaciation will not go away: the direct continental evidence grows stronger, and challenges the validity of oxygen isotopic variation as a simple record of ice volume. A high-resolution record of glacial advance and retreat seems badly needed.

One proposal not drilled by Leg 113, but retained as a contingency site, is of interest to concern no.5 (geochemical cycling etc). It was to drill a geothermal zone with anomalous chemistry, in Bransfield Strait, and was proposed by Erwin Seuss, but for some reason does not appear in the OIDES Journal list. presumably the OIDES Office has a proposal somewhere? Bransfield Strait is also mentioned in the TECP White Paper.

4. TECP Interest

4.1 Plate kinematics.

SOP has no record of 71/C (Shaka Ridge, Sclater), but we assume it could belong here! Shaka Ridge is a ?fracture zone/?hotspot trace off the western SWIR. Also, part of Dunn's Eltanin FZ proposal (209/C) is concerned with plate motions, and drilling on specific, well-formed magnetic anomalies will help refine the MRTS. SOP thought that combination of this drilling with a programme of ridge-crest dredging would also contribute to the mantle heterogeneity/mantle roll debate.

4.2 Divergent margins.

Both the Wilkes and Adelie margins proposals (73/C and 230/C) had as their main interest the early history of extension. SOP tried to persuade the proponents to combine their proposals with others, on the conjugate margin of the Ceduna Plateau (Veevers) and Otway Basin (197/B) and the intervening "cold spot" (Langmuir, possibly 91/B), but without success (the proponents were advised by individuals with ODP/TAMU and PCOM connections that the ship was unlikely to go south of Australia - a self-fulfilling prophecy!) As already noted, the S. Tasman Rise proposal (169/C, Hinz) concerns transtensional tectonics related to Australia-Antarctica separation at a large-offset transform.

The Ross Sea proposal (296/C) touches TECP's concern with divergent margins, in respect of the post-Early Jurassic break-up of Gondwanaland, the subject of much controversy in the absence of hard data from drilling. More closely concerned with process, however, is the Cenozoic uplift of the Trans-Antarctic Mts. The timing for this comes only from fission-track data, which are ambiguous and badly in need of lithologic and seismic stratigraphic checks. The importance of this uplift extends into palaeoclimate, since the TAM affect the drainage and stability of the Antarctic ice sheet.

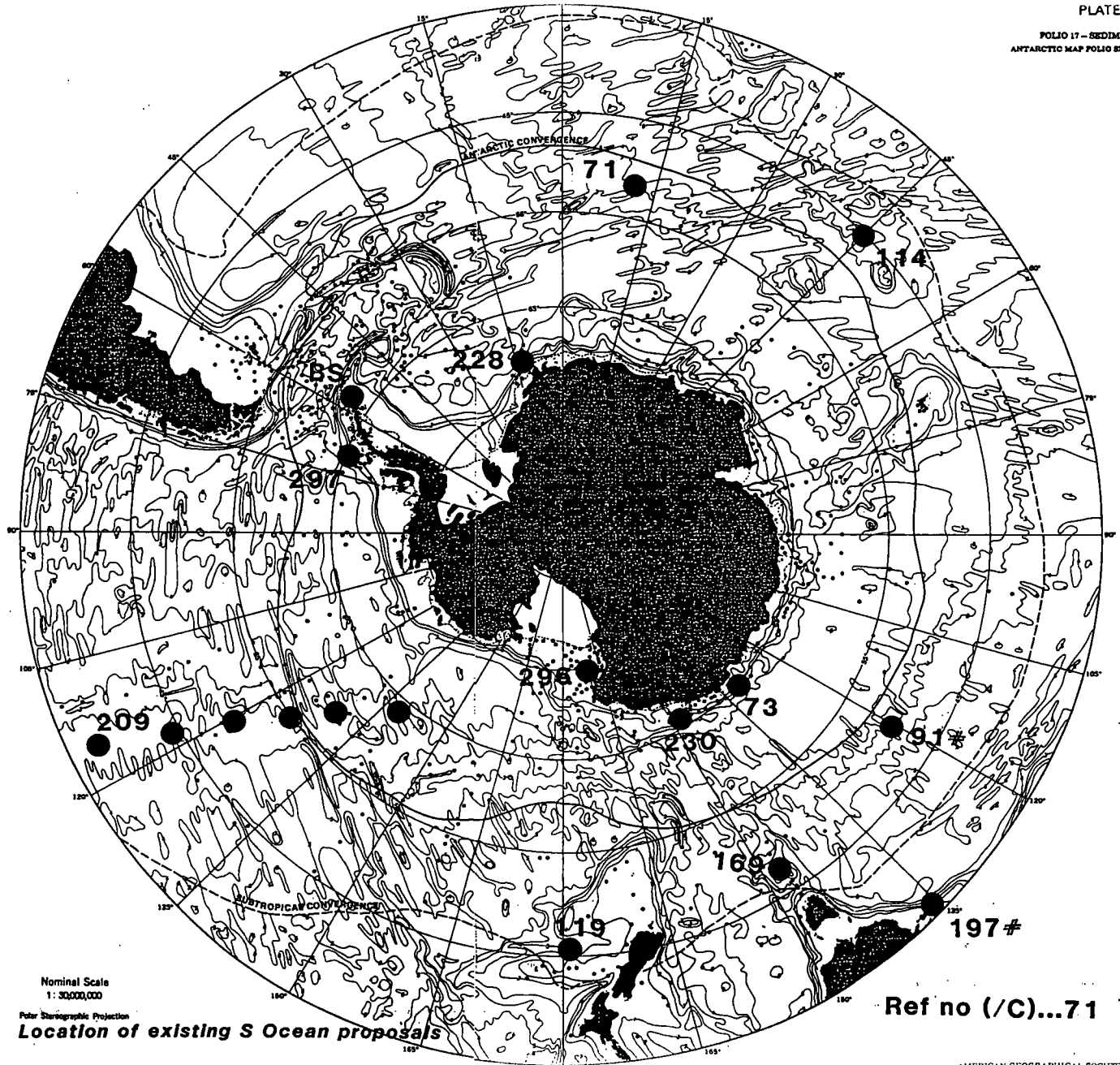
It should be noted also that the deeper objectives of proposal 228/C (E. Weddell Sea margin, Hinz) were not achieved by Leg 113. These concern a seaward-dipping reflector sequence considered analogous to Voring Plateau and similar occurrences, and reflecting the initial opening of the Weddell Sea.

4.3 Convergent Margins.

Proposal 297/C (Antarctic Peninsula) is concerned with ridge crest subduction. Subduction along this margin ceased progressively later northeastward, with a series of ridge crest collisions. The geometry of subduction and collision is very simple, and very well defined. The margin presents a series of snapshots of various times after ridge crest subduction (4, 6.5, 9, 14, 18, 24Ma). The seismic stratigraphy appears to show uplift after collision, followed by slow subsidence (the same subsidence preserves the topset beds of glacio-eustatic sequences of interest to SOHP - see above). Drilling could define the timing and extent of vertical movement, and the nature of hydrothermal circulation resulting from ridge crest subduction, making such events more precisely recognisable in the geologic record of subducting margins in general.

5. LITHP Interest

The LITHP White Paper insists that it has no interest in high latitude drilling. It also claims about 70 percent of the drilling time, with the justification that some TECP and SOHP objectives can be fulfilled at the same time. In the past, LITHP has also been in the habit of arguing for drilling deep into basement at the end of almost any hole drilled for other purposes, forcing in some cases a compromise on those other, primary aims. It will be interesting to see how LITHP reacts, when high latitude drilling next happens.



Nominal Scale
1:30,000,000
Polar Stereographic Projection
FIGURE 1 Location of existing S Ocean proposals

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