

**Committee for Co-ordination
of Joint Prospecting for Mineral Resources
in South Pacific Offshore Areas
(CCOP/SOPAC)**

PROCEEDINGS OF THE SIXTEENTH SESSION

**Lae, Papua New Guinea
12-21 October 1987**

including

**Report of the Sixteenth Session of its Technical Advisory Group,
the CCOP/SOPAC Work Programme,
and selected Technical Documentation.**

Compiled by

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1988

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COVER PHOTO

PNG Geological Survey and Techsec staff preparing the boat for a day's bottom sounding at Lorengau, Manus Island during a province-wide survey for harbour and wharf development.
(Photograph by John Harper).

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CCOP/ SOPAC : AN INTRODUCTION

The Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (referred to briefly as the Co-ordinating Committee for Offshore Prospecting, South Pacific, and abbreviated CCOP/SOPAC) is an inter-governmental body established to: investigate mineral and other nonliving resource potential in coastal, inshore, nearshore and offshore areas of its member countries; gather baseline data to determine design criteria for engineering works or other developments in the coastal zone; co-ordinate marine geological and geophysical studies being made in the region; and train nationals in the implementation and management of their work programmes. Member countries are currently Australia, Cook Islands, Fiji, Guam, Kiribati, New Zealand, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa. Since its inception at Suva in 1972 under the sponsorship of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the Committee has met annually (Table 1) to review work completed, and to discuss and plan future work. In 1984 the Committee reaffirmed its legal status as an independent, regional inter-governmental body by its member countries signing a Memorandum of Understanding.

In late 1974, a United Nations Development Programme (UNDP) Marine Geologist was appointed and a Technical Secretariat established in Suva, Fiji. By the middle of 1987 staffing at the Technical Secretariat (including UNDP project staff) had grown to a level of 18 professional and 13 support persons.

Survey work investigating nearshore and offshore minerals started in 1975. Vessels were chartered for offshore surveys every year from 1977 to 1981 including a 6-month charter each year for the 3-year period 1979-81. Since

1981 offshore work continued on major oceanographic vessels provided as a special contribution to CCOP/SOPAC by donor governments, and on vessels available locally throughout the region. Offshore prospecting work has been undertaken for hydrocarbons, polymetallic ferromanganese nodules and crusts, hydrothermal deposits, submarine phosphates and precious corals. Nearshore work began in 1975 with searches being made for placer gold and lagoonal bauxite deposits. In 1978 the near-shore programme was expanded to include construction materials and precious corals. In 1980 coastal and inshore baseline and environmental studies commenced. Subsequently wave energy and geological hazards have been incorporated into the CCOP/SOPAC Work Programme.

Training of national staff has been performed aboard ships, at the Technical Secretariat, and at special courses and workshops. CCOP/SOPAC publishes technical information through the South Pacific Marine Geological Notes, its Technical Bulletin series, and internal reports, and produces a quarterly Newsletter and an Annual Proceedings volume. It has sponsored workshops on petroleum potential, offshore and nearshore mineral resources, concrete from coral aggregate, coastal processes, and regional tectonics.

Financial support of approximately Fiji \$1.7 million annually is currently being provided by international agencies (primarily the UNDP), donor governments, and the member countries themselves. Substantial additional support in the form of services is provided to CCOP/SOPAC by donor governments mainly through major joint activities. Supporting countries include Australia, Canada, Federal Republic of Germany, France, Japan, Netherlands, New Zealand, Norway, Peoples Republic of China, United Kingdom, USA and USSR.

They provide assistance in areas such as funding, training, shiptime, non-reimbursable consultants, gifts and loans of equipment, editorial services, and publishing and printing costs. Member countries also provide considerable support in kind, especially during survey work, by providing personnel, facilities (including ships), equipment, and supplies.

International organisations, such as the Commonwealth Science Council (CSC), the European Economic Community (EEC), the United Nations Educational Scientific and Cultural Organisation (UNESCO) and its associated Intergovernmental Oceanographic Commission (IOC), and the International Decade of Ocean Exploration (IDOE), have also assisted CCOP/SOPAC.

TABLE 1 : SUMMARY OF CCOP/SOPAC ANNUAL SESSIONS

Session	Date	Venue	Chairman	Vice Chairman	TAG Chairman	Rapporteur
Preparatory FIRST	July 1971 Nov. 1972	Manila, Philippines Suva, Fiji	R.W. Willett, NZ D. Green, FJ	S. Tu'a Taumoe- peau, TG	R.W. Willett, NZ	-
SECOND	Aug-Sep. 1973	Nuku'alofa, TG	S. Tongilava, TG	R. Richmond, FJ	R.W. Willett, NZ	-
THIRD	Sept. 1974	Apia, WS	T. Enari, WS	P. Mueller, WS	J.W. Brodie, NZ	-
FOURTH	Sept. 1975	Honiara, SI	R.B. Thompson, SI	G. Sawtell, CK	J.W. Brodie, NZ	-
FIFTH	Nov. 1976	Rarotonga, CK	G. Sawtell, CK	S. Tongilava, TG	D. Kear, NZ	-
SIXTH	Oct. 1977	Port Moresby, PN	N. Agonia, PN	R. Richmond, FJ	J.W. Brodie, NZ	J. Wright, UK
SEVENTH	Oct. 1978	Wellington, NZ	D. Kear, NZ	S. Kingan, CK	J. Wright, UK	G. Shepherd, TS
EIGHTH	Sep-Oct. 1979	Suva, FJ	R. Richmond, FJ	A. Macfarlane, VA	M. Terman, US	J. Wright, UK
NINTH	Oct. 1980	Tarawa, KI	T. Otang, KI	A. Macfarlane, VA	J. Wright, UK	J. Eade, NZ
TENTH	Oct. 1981	Port Vila, VA	A. Macfarlane, VA	S. Tongilava, TG	J. Wright, UK	J. Eade, NZ
ELEVENTH	Nov. 1982	Wellington, NZ	H. Thompson, NZ	S. Tongilava, TG	N. Exon, AU	J. Eade, NZ
TWELFTH	Oct. 1983	Nuku'alofa, TG	S. Tongilava, TG	L. Ioane, WS	N. Exon, AU	D. Howell, US
THIRTEENTH	Oct-Nov. 1984	Apia, WS	K. Eteuati, WS	S. Danitofea, SI	H.G. Greene, US	J. Eade, NZ
FOURTEENTH	Sept. 1985	Honiara, SI	J. Saliga, SI	S. Kingan, CK	H.G. Greene, US	N. Exon, AU
FIFTEENTH	Sept. 1986	Rarotonga, CK	S. Kingan, CK	G. Anderson, PN	J.V. Eade, NZ	D. Mallick, UK
SIXTEENTH	Oct. 1987	Lae, PN	W. Searson, PN	S. Sopoanga, TU	D.J. Mallick, UK	D. Mallick, UK
						J.V. Eade, TS

Abbreviations used:

AU - Australia; CK - Cook Islands; FJ - Fiji; KI - Kiribati; NZ - New Zealand; PN - Papua New Guinea; SI - Solomon Islands;
TG - Tonga, TS - Techsec; TU - Tuvalu; VA - Vanuatu; UK - United Kingdom; US - United States of America; WS - Western Samoa.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

- A. SUMMARY OF THE COMMITTEE IN PLENARY**
- B. SUMMARY OF THE TECHNICAL ADVISORY GROUP**
- C. SUMMARY OF THE COMMITTEE IN SPECIAL SESSION**

A. THE COMMITTEE IN PLENARY (see Part 1, Report of the Committee):

1. was informed that the Bureau of Mineral Resources will arrange storage for geophysical magnetic tapes, and that Australia would continue to provide training in bathymetric mapping (para. 16);
2. decided that every effort would be made to re-order meetings at future Annual Sessions to minimise the waiting time for non member country participants (para. 27);
3. had decided that a review of the Committee's constitution would take place and that pending this review the composition and scope of TAG would remain as in the past (para. 27);
4. had adopted a Conceptual Five Year Programme which established general directions for the period 1988-1992 (para. 28);
5. was informed that the possibility of further Netherlands support to CCOP/SOPAC could be explored by ESCAP if requested (para. 30);
6. was informed that SPREP encouraged and stressed the importance of CCOP/SOPAC representation at ASPEI and BIWP meetings to further the cooperation between SPREP and CCOP/SOPAC (para. 35);
7. was informed that the Secretary of IOC intended to approach officially the Director of Techsec to discuss the possible basis for a Memorandum of Understanding which would include the general framework for cooperation between IOC and CCOP/SOPAC including the carrying out of their respective mandates in STAR (para. 37);
8. was informed that the USA government had approved budgetary assistance for CCOP/SOPAC totalling US\$200,000 per year for three years commencing in the US fiscal year 1987/88 (para. 39);
9. adopted the Report of the Technical Advisory Group (TAG), including the STAR Report, and the recommendations of TAG with two exceptions:
 - firstly, with respect to the TAG recommendation on the distribution of SPOT images, the Committee agreed in principle to accept the offer to have Techsec act as the distributing agent for SPOT images to CCOP/SOPAC member countries;
 - secondly, in accepting the TAG recommendation that some of the ECU's available for marine surveys from Lome III funds be used to commission approximately 30 days of RRS Charles Darwin shiptime to conduct GLORIA and multichannel seismic surveys, the Committee agreed that the suggested amount of approximately one third of the 1.9 ECU's available was only a guideline for Techsec to note (paras 43-45);
10. agreed that the 17th Session would be held in Fiji during October, 1988, and would be preceded by a CCOP/SOPAC Workshop on Non-fuel Nearshore Minerals (para. 47);
11. stated that the 17th Session would consist of, in order, the following meetings:

1. Plenary (Opening);
2. Committee in Special Session;
3. Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources (STAR);
4. Technical Advisory Group (TAG);
5. Committee in Special Session;
6. Plenary (Closing) (para. 48).

**B. THE TECHNICAL ADVISORY GROUP
(see Part 1, Annex 1):**

1. RECOMMENDED that the Australian representative establish contact with RAN and OSI on Techsec's behalf to ensure that in the future Techsec and the member country representatives concerned received copies of cruise plans and cruise reports of work in member countries' waters (para. 10.15);
2. RECOMMENDED that Techsec actively encourage implementation of the Coastal Processes Workshop recommendations, and seeks ways of implementing those recommendations which are part of the CCOP/SOPAC Work Programme (para. 11.1.3);
3. RECOMMENDED that papers presented at the Coastal Processes Workshop be published as a CCOP/SOPAC Technical Bulletin and that Techsec seek funds to facilitate publication (para. 11.1.5);
4. RECOMMENDED that official delegations to future CCOP/SOPAC Annual Sessions include in their delegations experts in coastal studies relevant to the CCOP/SOPAC Work Programme, and that Techsec also invite to future sessions of TAG appropriately qualified experts who are currently active in coastal processes and related studies in the region (para. 11.1.6);
5. RECOMMENDED that further work be done on the distribution and thickness of offshore sand and gravel resources in Tonga (para. 12.1.2);
6. RECOMMENDED that whenever testing for phosphate, samples should also be checked for yttrium as this metal was beginning to be in short supply (para. 12.3.3);
7. RECOMMENDED that Techsec and SPREP work together to advise member countries in the planning, siting, and mining of construction materials and lagoonal phosphate to minimise adverse effects on adjacent environments and resources, especially reef resources used by indigenous people (para. 12.3.5);
8. RECOMMENDED that whenever submersibles are working in the region on programmes funded for scientific research, Techsec should request that a few dives be made available to evaluate the precious coral potential of sites where previous tanglenet surveys had indicated possible potential (para. 12.4.4);
9. RECOMMENDED that Techsec seek ways of maintaining manpower levels in the hydrocarbon activity at no less than three experts beyond the two years already funded by PCIAC and CFTC (para. 13.4);
10. RECOMMENDED that Techsec produce a summary overview of the results stemming from the reviews being made of the hydrocarbon potential of Tonga and other member countries by Techsec as they are completed, and that this summary overview be published as a CCOP/SOPAC Technical Bulletin (para. 13.6);
11. RECOMMENDED that Techsec look into ways and means of purchasing or hiring equipment capable of drilling to depths of about 60m on land to obtain fresh material for source rock analysis. (para. 13.14);
12. RECOMMENDED that Techsec make no definite decisions on acquiring an in-house

- seismic processing system but should keep its options open in case such equipment is offered as a gift (para. 13.17);
13. RECOMMENDED that any analysis of seamount samples for phosphate should also include yttrium as this metal was becoming in short supply (para. 14.4.2);
 14. RECOMMENDED that Techsec investigate possible avenues of collaboration with the Geomechanics Division of CSIRO (para. 16.1.3);
 15. noting that both SPEC and PEDP had been approached in the past by Techsec to consider wave energy sources and that CCOP/SOPAC remained the only organisation to sponsor marine energy activities, TAG RECOMMENDED that Techsec attempt to be represented at the forthcoming PEDP meeting in Tonga in early 1988 (para. 16.2.4);
 16. RECOMMENDED that Techsec convey to appropriate organisations and international agencies the region's requirement to have the existing seismic network strengthened through the installation of further instruments and, in particular, the additional provision for their operation and maintenance (para. 16.3.6);
 17. RECOMMENDED that CCOP/SOPAC should take advantage of the visit to the South Pacific of RRS Charles Darwin in 1988 and that Techsec be instructed to obtain release of Lome III funds to allow CCOP/SOPAC to commission surveys of selected areas of the CCOP/SOPAC region by the RRS Charles Darwin (para. 17.1.9);
 18. RECOMMENDED that approximately one third of the 1.9 million ECU's available for marine surveys from the Lome III funds be used to commission approximately 30 days of RRS Charles Darwin shiptime to conduct GLORIA and multichannel seismic surveys in the CCOP/SOPAC region (para. 17.1.10);
 19. RECOMMENDED that approximately 11 days of multichannel seismic survey time be commissioned - 5 days for the Vanikula Basin of Solomon Islands and Vanuatu and 6 days for Lau Ridge of Fiji, and approximately 19 days of GLORIA surveys in areas selected from the following - Western Woodlark Basin, Western (trench) side of Vanuatu, Central Basin of Vanuatu, Eastern (backarc) side of Vanuatu, North Fiji Fracture Zone, Eastern Lau Basin, Samoa Basin transit, North Penrhyn and South Penrhyn Basins in Cook Island waters, Eastern Manihiki Plateau, Western side of Line Islands, and Gilbert and Tuvalu island chains (para. 17.1.12);
 20. RECOMMENDED the areas chosen should depend on the logistics of the cruise programme and should the multichannel seismic system not be available then more GLORIA work should be accomplished (para. 17.1.13);
 21. RECOMMENDED that "ground truth" surveys be initiated as soon as possible for the Aitutaki SPOT imagery before the next hurricane season (para. 17.2.5);
 22. RECOMMENDED that CCOP/SOPAC not become a distribution agent for SPOT images at this stage but consider the possibility of involvement at some future time (para. 17.2.6);
 23. RECOMMENDED that a working group comprising at least one representative of USP and at least one representative of Techsec be established to look into the present status of the Earth Science programmes at the University and to explore options for the future and that the group should report before the 17th Session (para. 18.2.5);

24. RECOMMENDED adoption of the proposed first-degree scholarship guidelines as presented to TAG with modifications as follows:
 - a. that the term "Conditions" be changed to "Guidelines";
 - b. that any Conditions in the Guidelines may be overruled, at the discretion of the Director in consultation with the member country representatives, so that students may be eligible under special circumstances;
 - c. that a bonding commitment be made to make sure the student applies the training received to the service of his home country for a period of 1.5 years per year of scholarship funding;
 - d. that provision be made to accommodate annual return trips to the home country for non-married students;
 - e. that CCOP/SOPAC is not responsible for salaries as part of the scholarship scheme (para. 18.2.6);
25. RECOMMENDED that Techsec approach the Royal Australian Navy Hydrographer or the Director, BMR to finalise arrangements for continuation of the training in bathymetric drafting (para. 18.3.5);
26. RECOMMENDED that UNISEARCH and Techsec continue to communicate and attempt to identify possible funding sources for workshops in tune with member country needs (para. 18.3.7);
27. RECOMMENDED that as far as possible sources of funding for, and interests of member countries in workshops be identified well in advance to assist in long-range planning and scheduling (para. 18.3.8);
28. RECOMMENDED that Techsec should assist, within resources available to Techsec, educational authorities in CCOP/SOPAC island member countries in the development of a high school course outline in the Earth Sciences (para. 18.4.1).
29. RECOMMENDED that the Techsec Training Co-ordinator investigate the possibility of training workshops being held during the International Geological Congress to be held in Washington, DC during August 1989, as already discussed by USGS and IGC (para 18.4.6);
30. RECOMMENDED that USP take the lead in any cooperative association between USP and Techsec and, in particular, ensure involvement of IOC-TEMA in relevant areas (para. 18.5.5);
31. RECOMMENDED that future SPREP courses be co-ordinated with the CCOP/SOPAC training activity through Techsec (para. 18.5.8);
32. RECOMMENDED that a technical expert be sent from Techsec, if invited, to the UN-IOC group of experts meeting to be held in New York near the end of 1988 to discuss marine scientific research within national jurisdictions (para. 18.6.4-5);
33. RECOMMENDED that the island countries should now take action to obtain copies of data held by petroleum companies (para. 19.4);
34. RECOMMENDED that a collection of papers detailing the scientific results of the RV Natsushima Cruise to the Lau-Tonga Area be published together in the CCOP/SOPAC Technical Bulletin Series and that the cruise leaders should be the editors of such a bulletin (para. 20.1.2);
35. RECOMMENDED that all future cruises should attempt to provide sufficient funding to cover the cost of publication of the results (para. 20.1.4);
36. RECOMMENDED Techsec explore every

avenue available to identify funds and purchase nearshore survey equipment as soon as possible (para. 21.1.5);

37. RECOMMENDED that links be established between CCOP/SOPAC and ODP in order to support drilling plans in the South Pacific (para. 22.1.4);
38. RECOMMENDED that CCOP/SOPAC support the initiatives being made by several international agencies to conduct submersible dives in the CCOP/SOPAC region (para. 22.1.7);
39. RECOMMENDED that technical advisers keep Techsec informed of work being planned, work completed, and the results and publications produced of activities which relate to or meet the objectives of any of the Regional Projects in the CCOP/SOPAC Work Programme (para. 22.1.9);
40. RECOMMENDED that Papua New Guinea, as a member of CCOP/EA, keep Techsec informed of cruises sponsored by CCOP/EA planned for PNG waters (para. 22.1.10);
41. RECOMMENDED that Techsec approach the relevant authorities in France and FRG to explore the use of Lome III funds for joint cruises on French and FRG research vessels (para. 22.1.15);
42. RECOMMENDED that the "CCOP/SOPAC Conceptual Work Programme for 1988-1992" be updated before the next Annual Session to reflect the greater emphasis being placed on nearshore and coastal projects as reflected by the recommendations of the 1987 CCOP/SOPAC Nearshore Processes Workshop and the current priorities of the member countries (para. 24.1);
43. RECOMMENDED the following new projects be added to the CCOP/SOPAC Work

Programme:

- CCSP/CK.9: Management of Cook Islands data relevant to CCOP/SOPAC Work Programme activities;
 - CCSP/KI.7: Management of Kiribati data relevant to CCOP/SOPAC Work Programme activities;
 - CCSP/KI.8: Offshore seabed mapping in the Kiribati EEZ;
 - CCSP/WS.11: Coastal and nearshore mapping in Western Samoa;
 - CCSP/WS.12: Assessment of sand and gravel deposits in nearshore areas of Western Samoa for construction materials and landfill;
 - CCSP/REG.41: Long-range swath mapping in Southwest Pacific offshore areas (para. 25.1.1);
44. RECOMMENDED that the forthcoming PEDP meeting, scheduled for early 1988 in Tonga, be advised of the need for additional equipment for the wave energy programme (para. 25.2.4).

C. THE COMMITTEE IN SPECIAL SESSION (Summary).

1. The Acting Secretary of Minerals and Energy, Papua New Guinea, Mr Lamech Palaso chaired the opening part of the Session. Thereafter Mr Robin Moaina, head of the Papua New Guinea delegation, chaired the Session acting on behalf of Mr W. Searson, Chairman of CCOP/SOPAC for 1987-88.
2. The Director presented a report on the administrative activities of Techsec. The Director informed the Committee of his intention to visit member countries, starting early next year and he requested feedback from representatives on the performance of Techsec.
3. The Committee agreed that the Coastal

Processes Workshop had been very beneficial to members and instructed Techsec to invite experts in coastal processes and related problems to TAG in the future, especially those experts who are currently working in the region.

4. The Committee adopted the Audit Report for Financial Year July 1985 to June 1986 and the report on expenditures and obligations against the approved budget as at 31 December 1986.
5. The Committee reviewed and revised its Accounting Instructions.
6. The Committee reviewed and revised its rules for Techsec staff remuneration and other terms and conditions of employment.
7. The Committee agreed to appoint a Deputy Director, who will be a technical person responsible for managing the Work Programme and a national of one of the CCOP/SOPAC member countries.
8. The Committee reiterated its preference that CCOP/SOPAC's link with the Forum be confined to a reporting function with executive authority on CCOP/SOPAC matters continuing to be vested in the Committee.
9. The Committee considered the national composition of TAG and agreed that pending decisions arising from the MOU review the present national composition of TAG should continue.
10. The Committee, whilst affirming the value of free exchange of scientific data, directed Techsec to clear with the CCOP/SOPAC member countries cruise and survey reports before circulation.
11. The Committee agreed that it should proceed with a review of its MOU and Terms of Reference as required and accepted the New Zealand offer to prepare a draft document for the Committee's consideration.
12. The Committee approved the draft CCOP/SOPAC Conceptual Work Programme for the period 1988-1992 and agreed that it should be updated annually. The Committee noted that Techsec would prepare draft individual country work programme statements reviewing activities implemented over the past 16 years and outlining proposed activities to be undertaken in the next 5 years.
13. The Committee adopted a document outlining aid required to implement projected activities presented in the CCOP/SOPAC Conceptual Work Programme, with modifications which included strengthening resources in the hydrocarbon activity, in nearshore and coastal programmes, and in training.
14. The Committee approved with amendments the proposed operating budget for 1988 and the indicative budget for 1989 and instructed Techsec to make every effort to prevent an increase in the contributions for 1989 and prepare a paper for presentation at the 17th Session on a possible new formula for establishing member country contributions.
15. The Committee agreed that a summary of the Report on the Committee in Special Session be published in the Proceedings.
16. The Committee agreed that Tuvalu, Kiribati, Cook Islands, and Western Samoa should be given priority for the first three ESCAP/UNDP scholarships.
17. The Committee reviewed the TAG Report and its recommendations and noted that it was acceptable except: it did not accept the TAG recommendation that "CCOP/SOPAC not become involved in distribut-

- ing SPOT images" and agreed, in principle, to accept the offer to have Techsec act as the distribution agent for SPOT images to CCOP/SOPAC member countries, but at no cost to the member countries; and it did not accept the TAG recommendation "that approximately one third of the 1.9 million ECU's available for marine surveys from Lome III funding be used to commission approximately 30 days of RRS Charles Darwin ship time to conduct GLORIA and multichannel seismic surveys in the CCOP/SOPAC region" but accepted it as a suggested guideline for Techsec to note.
18. The Committee agreed that if CCOP/SOPAC were invited to have an observer at the Pre-Forum Meeting the Director should attend to represent CCOP/SOPAC.
 19. The Committee requested that Techsec keep the Committee fully informed on all matters requiring major policy decisions and requested Techsec send to all member countries copies of the documents describing technical and financial assistance to CCOP/SOPAC under Lome III.
 20. The Committee requested Techsec to prepare a document on actual and proposed Work Programme activities for the Committee to consider in its Special Session prior to TAG at the 17th Session.
 21. The Committee instructed the Director to adopt a recruitment formula for Techsec staffing with a ratio of three Programme Staff Members to one Administrative Staff Member.
 22. The Committee agreed that the 17th Session be held during October, 1988 at Techsec headquarters in association with Tuvalu, should be preceded by a Workshop, and consist of, in the following order: Plenary (opening and administrative statements), Committee in Special Session, STAR meeting, TAG, Committee in resumed Special Session, and Plenary (adoption of reports and closing) with other meetings being held as appropriate.
 23. The Committee agreed that the Director explore the possibility of finding assistance from external sources to assist with the cost of the attendance at the Annual Session of one representative from each island member country.
 24. The Committee received the Minutes of the MOU Sub-Committee and adopted them as the guidelines to be used in the preparation of the draft document arising from the review of the MOU and Terms of Reference.
 25. The Committee requested Australia consider hosting a CCOP/SOPAC Regional Workshop on marine geology, geophysics, and mineral resources in Canberra in 1989, and in association with it the 18th Annual Session.
 26. The meeting closed with speeches by Mr Stevie Nion (PNG), Mr Tony Utanga (Cook Islands), Mr Jioji Kotobalavu (Techsec), and the Acting Chairman, Mr Robin Moaina (PNG).

Part 1 : REPORT OF THE COMMITTEE, SIXTEENTH SESSION

PLENARY

OPENING SESSION

Opening of the Session (Agenda Item 1)

1. The Sixteenth Session of the Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC) and the Sixteenth Session of its Technical Advisory Group (TAG) were held in Lae, Papua New Guinea, during 12-21 October 1987.

2. Representatives from the following member countries attended : Australia, Cook Islands, Fiji, Kiribati, New Zealand, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, and Western Samoa.

3. Technical Advisers to CCOP/SOPAC provided by the following governments attended : Canada, Federal Republic of Germany, France, Japan, Norway, United Kingdom, and the United States of America. Other Technical Advisers from UN/ESCAP, the Scripps Institution of Oceanography (SIO), Commonwealth Scientific and Industrial Research Organisation (CSIRO), University of the South Pacific (USP), Ocean Drilling Programme (ODP), Hawaii Institute of Geophysics (HIG), and the Institute of Oceanographic Sciences (IOS)/NERC also attended.

4. Observers representing UNDP, IOC, SPREP, and the UN Law of the Sea also attended the Session.

5. The Premier of Morobe Province, Mrs Enny Moaita, welcomed all participants at the 16th Session of CCOP/SOPAC to Morobe Province and Lae. In wishing the meeting

well in its deliberations, she stressed the importance of the various work programme activities of CCOP/SOPAC to the countries in the region.

6. The National Representative of Tonga, Mr Sione Tongilava, in reply to the Premier on behalf of the Committee and the members of its Technical Advisory Group (TAG), expressed his sincere thanks for the Government of Papua New Guinea and the Provincial Government of the Morobe Province consenting to host the 16th Session and for the warm welcome to Lae. He stated that it was the Committee's intent to continue to improve its Work Programme in the cooperative manner that CCOP/SOPAC had established over the last sixteen years.

7. The Acting Secretary for the Department of Minerals and Energy, Mr Lamech Palaso, welcomed all participants on behalf of the Minister of Minerals and Energy, the Honorable John R. Kaputin. He expressed appreciation for the financial support being given to CCOP/SOPAC by the various international organisations and supporting governments. He stated that Papua New Guinea was delighted to host the Annual Session for the second time. In stressing the importance of the development of mineral and energy resources in Papua New Guinea, he noted the predominance of ocean area in his country's own territory including its Exclusive Economic Zone. Papua New Guinea was keen to promote the study and development of its marine area and was therefore committed to playing a vital role in CCOP/SOPAC. In formally opening the 16th Annual Session of CCOP/SOPAC the Acting Secretary hoped that this would be a successful and memorable meeting.

**Report of the Outgoing Chairman
(Agenda Item 2)**

8. Mr Tony Utanga, Cook Islands delegate, presented a statement on behalf of Mr Stuart Kingan, outgoing chairman. He expressed his sincere thanks to the Government of Papua New Guinea for hosting the 16th Session and noted the appropriateness of meeting in a country which demonstrated the importance of mineral resources to development. He reviewed the progress made by Techsec commenting particularly on the number of reports prepared which reflected on the strengthening of Techsec's capability to carry out Work Programme activities, the new Techsec temporary buildings, and the increased number of professional staff. Mr Utanga expressed the view that this Session was a critically important meeting in establishing future directives for the development of CCOP/SOPAC. He stressed the importance of its development as an independent regional organisation and the need to plan ahead. He appealed to fellow members to continue to support its Techsec. Mr Utanga closed by expressing his thanks for the support the Cook Islands had received during its tenure as Chairman.

**Election of Chairman and Vice Chairman of
CCOP/SOPAC for 1987-88 (Agenda Item 2)**

9. The Committee elected Mr William Searson, National Representative for Papua New Guinea as Chairman for the next 12 months and Mr Saufatu Sopoanga, National Representative for Tuvalu as Vice Chairman. The Chairman appointed Mr James Eade, as Rapporteur. In the absence of the Chairman of CCOP/SOPAC, Mr R. Moaina chaired in the Plenary Session.

Adoption of Agenda (Agenda Item 3)

10. The following agenda was adopted :

PLENARY SESSION (Opening)

1. Formal opening
2. a. Report of outgoing Chairman and Vice-Chairman
b. Election of new Chairman of CCOP/SOPAC for 1987-88
c. Appointment of Rapporteur for the 16th Session
3. Adoption of the Agenda
4. Designation of National Representatives
* Special Speeches
5. Identification of Individuals Attending the 16th Session
6. Administrative Reports from Member Countries
7. Administrative Report from Techsec
8. Other Administrative Reports
9. Appointment of Chairman of TAG

TAG SESSION

**Summary Overview of Major Cruises and
other Multidisciplinary Activities**

10. Summary review of cruises and other multidisciplinary field activities completed in the last 12 months

**Consideration of Reports from Meetings
Associated with the 16th Session**

11. Meeting Reports
 - 11.1 Annual CCOP/SOPAC Workshop
 - 11.2 STAR
 - 11.3 Other

CCOP/SOPAC Work Programme

12. Nearshore Minerals
 - 12.1 Construction materials
 - 12.2 Detrital minerals
 - 12.3 Insular phosphates
 - 12.4 Precious corals
 - 12.5 Hydrothermal minerals
 - 12.6 Other nearshore minerals
13. Hydrocarbons

- 14. Offshore Minerals
 - 14.1 Cobalt-rich crusts
 - 14.2 Polymetallic manganese nodules
 - 14.3 Polymetallic massive sulphides
 - 14.4 Metalliferous sediments
 - 14.5 Seamount phosphate
 - 14.6 Other offshore minerals
- 15. Onshore Minerals
 - 15.1 Clay
- 16. Coastal Development
 - 16.1 Coastal engineering
 - 16.2 Renewable energy
 - 16.3 Geological hazards
 - 16.4 Other development studies
- 17. Mapping
 - 17.1 Offshore seabed mapping
 - 17.2 Coastal and nearshore mapping
 - 17.3 Other Mapping
- 18. Training
 - 18.1 On-the-job training
 - 18.2 Courses
 - 18.3 Workshops
 - 18.4 Training assistance
 - 18.5 Other training
 - 18.6 Meetings
(reports from and notices of)
- 19. Data Management
- 20. Technical Information
 - 20.1 Publications
 - 20.2 Library
- 21. Equipment and Techniques
 - 21.1 New equipment
 - 21.2 New techniques
- 22. Regional Co-ordination
 - 22.1 Regional projects
- 23. Other Matters
 - 23.1 Law of the Sea

Formulation of Plans for Future Work

- 24. Long-term Planning
 - 24.1 Five-Year Conceptual Programme
- 25. Country Work Plans
 - 25.1 New country projects
 - 25.2 Formulation of 1988 Work List
- 26. 1988 Regional Work Plan

Adoption of TAG Report and Closure

- 27. Adoption of TAG Report
- 28. Closure of TAG

PLENARY SESSION (Closing)

- 29. Other Matters
- 30. Adoption of 16th Session Reports
- 31. Date and Venue of 17th Session
- 32. Closure of 16th Session

Designation of National Representatives (Agenda Item 4)

11. Plenary was informed that the following had been designated National Representative of their country by their government:

AUSTRALIA - Professor R. Rutland, Director, Bureau of Mineral Resources, Geology and Geophysics, Canberra;

COOK ISLANDS - Mr S. Kingan, Scientific Research Officer, Office of the Prime Minister, Rarotonga;

FIJI - Mr A. Rahiman, Director, Mineral Resources Department, Suva;

GUAM - Mr P. Barcinas, Acting Director, Department of Commerce, Tamuning;

KIRIBATI - Permanent Secretary, Ministry of Natural Resource Development, Tarawa;

NEW ZEALAND - Dr R.A. Heath, Director, Division of Marine and Freshwater Science (DMFS), DSIR, Wellington;

PAPUA NEW GUINEA - Mr W. Searson, Secretary, Department of Minerals and Energy, Port Moresby;

SOLOMON ISLANDS - Mr S. Danitofea, Chief Government Geologist, Ministry of Lands, Energy and Natural Resources, Honiara;

TONGA - Mr S. Tongilava, Permanent Secretary, Ministry of Lands, Survey and Natural Resources, Nuku'alofa;

TUVALU - Mr S. Sopoanga, Secretary, Ministry of Commerce and Natural Resources, Funafuti;

VANUATU - Mr C. Clark, Director, Department of Geology, Mines and Rural Water Supply, Port Vila;

WESTERN SAMOA - Mr S. Iosa, Superintendent, Apia Observatory, Apia.

Special Speeches

12. Mr Jan Wahlberg, UNDP Regional Representative, Papua New Guinea, in an opening statement expressed his pleasure and honour at being able to attend the 16th Session of CCOP/SOPAC. He referred to the now approved Project Document which covers UNDP support of about 3 million US dollars for CCOP/SOPAC over the next five years. He stated that UNDP was pleased to have been associated with CCOP/SOPAC for some 15 years which was a good indication of the importance UNDP attached to the activities of the Committee. He stressed the importance of training to ensure that work started by UNDP would continue. On behalf of the Administrator, Mr William Dreyser, he congratulated the Director of Techsec and his staff for their successful efforts and concluded by thanking the Government of Papua New Guinea and the Provincial Government of Morobe for their hospitality and expressed

the wish for a productive and successful meeting.

13. Mr Larry Machesky, ESCAP representative presented a statement on behalf of the Executive Secretary of ESCAP. The Executive Secretary was grateful to the Government of Papua New Guinea for hosting the 16th Session of CCOP/SOPAC. ESCAP viewed with importance the role that CCOP/SOPAC had to play in the ESCAP region. ESCAP was pleased to have assisted the Committee in its endeavours over the years and expressed gratitude to UNDP for approving the new phase of the regional project which provides programme support to CCOP/SOPAC. The Executive Secretary wishes the Committee every success in its deliberations.

14. The Director of Techsec, Mr Jioji Kotalavu, thanked the Government of Papua New Guinea and the Provincial Government of Morobe for hosting the 16th Session. He stated that participants from overseas could not help to be impressed by the vast and varied mineral and energy resources in Papua New Guinea. He noted that in the search for non-living resources in the vast offshore areas of countries in the region, there was an enormous potential for development. He concluded by thanking the Government of Papua New Guinea for the support it had given Techsec.

Identification of Individuals attending the 16th Session (Agenda Item 5)

15. All individuals attending the 16th Session identified themselves in turn to the meeting.

Administrative Reports from Member Countries (Agenda Item 6)

16. The Australian representative reviewed his country's activities in marine geo-

logical and geophysical researches and marine mineral exploration work carried out during the last 12 months. In support of CCOP/SOPAC he was pleased to inform the Committee that the Bureau of Mineral Resources will arrange storage for geophysical magnetic tapes, and that Australia would continue to provide training in bathymetric mapping.

17. The Cook Islands representative reviewed activities carried out in his country's marine area in support of its Work Programme.

18. The Fiji representative reported that Fiji's marine geological and geophysical work programme, especially the hydrocarbon activity, was receiving more support from Techsec than in the past due to the increased staffing at Techsec. He presented a summary of the activities of hydrocarbon, offshore, and seismology sections at Mineral Resources Department (MRD). He closed by thanking Techsec, the Technical Advisors, and supporting governments, especially UK, Japan, and Australia.

19. The Kiribati representative summarised progress made on the Kiribati work programme and thanked Techsec for the support received over the last 12 months, especially in precious corals, manganese nodules and crusts, coastal erosion monitoring, and training activities.

20. The New Zealand representative reviewed progress made in marine geoscience activities in New Zealand during the last 12 months. The research vessel *Rapuhia* had revitalised geoscience programmes in New Zealand. Government policy now required DSIR to carry out contract work and scientific output had been limited as a result. New equipment purchased included a MCS reflection system.

21. The Papua New Guinea representative summarised activities of the PNG Geological Survey. Techsec support was limited to training. He summarised progress made in geological mapping and mineral exploration, hydrocarbon assessment, geological services, and volcanology. The representative thanked the Federal Republic of Germany for assistance in geological mapping and seismicity programmes.

22. The Solomon Islands representative reviewed the geoscience work carried out by the Solomon Islands Ministry of Lands, Energy and Natural Resources whose activities continued to be land based. A major achievement had been enactment of a Petroleum Bill to provide the legal framework for petroleum exploration and development in the Solomon Islands. Techsec support for the last 12 months has been mainly in training.

23. The Tonga representative reviewed work programme activities where progress had been made. These included hydrocarbons, construction materials, wave energy, coastal engineering, and training activities. The representative thanked Australia and New Zealand and other supporting governments including Canada, Federal Republic of Germany, France, Japan, Norway, USA, and especially UK who had all contributed to the Tonga work programme.

24. The Tuvalu representative presented a summary of activities in his country and was particularly pleased with the Coastal Mapping Workshop which Techsec conducted in Funafuti.

25. A report was received summarising progress made on the Vanuatu Work Programme.

26. The Western Samoa representative summarised his country's work programme activities which are strongly oriented towards

nearshore resources and coastal and near-shore studies. Western Samoa through its Apia Observatory is active in coastal stability studies, subsurface geological investigations for the Afulilo Hydropower Project, seismological studies, hydro- meteorology, and wave energy studies. Techsec support was received in sand and gravel surveys, and training.

Administrative Report from Techsec (Agenda Item 7)

27. The Director thanked the observers in Plenary for their patience while the member countries had met over the past two days. He informed the meeting that every effort would be made to reorder meetings at future Annual Sessions to minimise the waiting time for non member-country participants. He informed that a review of the Committee's constitution would take place and that pending this review the composition and scope of TAG would remain as in the past. He stated that a large increase in staff at Techsec reflected attempts to strengthen Techsec capabilities and increase the capacity of Techsec to self execute all its programmes.

28. The Director thanked Australia, New Zealand, UNDP, Japan, France and the USA for their support. He singled out Canada for special thanks as the Committee had received firm commitments of support from PCIAC and ICOD since the last session. He acknowledged Canada's generosity in assisting Techsec carry out Work Programme activities. He informed the meeting that the Committee had adopted a Conceptual Five Year Programme which established general directions for the period 1988-1992.

29. The Deputy Director/Project Manager introduced the report on Work Programme Activities at Techsec noting that most items

would be covered by later items in the agenda.

Other Administrative Reports (Agenda Item 8)

30. The ESCAP representative reported that ESCAP support to CCOP/SOPAC programme activities were set out in the regional project RAS/86/125 which had been approved at the level of US dollars 3.0 million for the period 1987-1991. Acquisition of non-expendable equipment had commenced, the Training Co-ordinator and a short-term Consultant had been recruited, and other arrangements made that ensured implementation of the approved activities on time. At the request of the Netherlands' authorities, payment had been made for the drill rig and ancillary parts used on the CCOP/SOPAC-Netherlands Joint Drill Project. This action had expended all of the funds in the Netherlands Budget. The possibility of further Netherlands support to CCOP/SOPAC could be explored by ESCAP if requested. Preparations for the ESCAP/China Training Course in Coastal Geology (Guangzhou 21 November - 6 December 1987) and the ESCAP/RMRDC/Japan Kuroko Mineralisation Workshop (Suva, early November 1987) were continuing.

31. The ESCAP Representative also reported that the Marine Affairs Programme Economic Affairs Officer would undertake a fact-finding mission to selected CCOP/SOPAC countries to learn of needs and capabilities concerning Law of the Sea and related matters as well as to inform ESCAP Secretariat's relevant programme on that important subject. An expert to be based at the University of the South Pacific, and charged with implementing activities of the Regional Remote Sensing Project had been recruited. The Urban Geology project docu-

ment had been approved by the Project Review Committee and submitted to donors for consideration of funding. Elements of this sub-programme were of direct relevance to CCOP/SOPAC member countries.

32. The meeting was informed that ESCAP would closely co-operate with CCOP/SOPAC, national and international bodies, and United Nations system agencies on matters of mutual concern.

33. The USP representative reported that it was some time since a representative from the University of the South Pacific had attended a CCOP/SOPAC Annual Session. He informed the meeting that USP was a regional University, serving the Cook Islands, Niue, Nauru, Western Samoa, Tokelau, Kiribati, Tuvalu, Tonga, Fiji, Vanuatu and Solomon Islands, and that the Federated States of Micronesia were about to join. In addition, the University operated a student exchange scheme with the University of Papua New Guinea. The main University campus was at Suva, Fiji but a second, smaller campus was located at Alafua, Western Samoa. There was a University Centre in each of the member countries with the exception of Tokelau. The University carried out and sponsored a considerable amount of research within the region. Although there was no Geology or Earth Sciences Department, such courses were taught by staff of the Geography, Physics and Chemistry Departments.

34. The USP representative informed the meeting that the University welcomed the opportunity to attend the 16th Annual Session of CCOP/SOPAC and thanked the Committee for the invitation.

35. The SPREP Representative informed the meeting that his organisation was a joint programme of UNEP, SPC, SPEC and ESCAP with 22 South Pacific member governments.

The Convention for the Protection of the Natural Resources and Environment of the South Pacific Region had been completed in November 1986. Articles of particular relevance to CCOP/SOPAC were: 1 and 2 - geographical coverage; 7 - pollution from land-based sources; 8 - pollution from seabed activities; 13 - mining and coastal erosion; 17 - scientific and technical cooperation; 18 - technical and other assistance. The meeting was informed that as of September 1987 eleven governments had signed the Convention and one had ratified it. Much of SPREP's Work Programme is implemented by members of the Association of South Pacific Environmental Institutions - ASPEI (UPNG, UNITECH, UOG, ORSTOM, LESE, UH and USP). The next meeting of ASPEI will be in the third week of June 1988 and the Biennial Intergovernmental Work Programme (BIWP) meeting would follow immediately. SPREP encouraged and stressed the importance of CCOP/SOPAC representation at both meetings to further the cooperation between SPREP and CCOP/SOPAC.

36. Plenary was informed that the United Nations had consolidated its marine affairs programmes by bringing together the Ocean Economics and Technology Branch and the Law of the Sea Office into a single office named the Office for Ocean Affairs and Law of the Sea. The new work programme covered all legal, and technical matters related to the oceans including programme in nearshore minerals, coastal zone management, marine technology and marine scientific research.

37. The IOC representative reported that at the Fourteenth Session of the IOC Assembly the Summary Report of the Third Session of STAR had been accepted. The Assembly had noted the positive work of the Joint Working Group and instructed the Secretary of IOC to

develop further a cooperative scientific programme with CCOP/SOPAC within the approved budget base for 1988-89. The representative informed the meeting that the IOC was publishing the report prepared by the STAR Study Group on Age Dating entitled Radiometric Ages from the Pacific within the IOC Technical Report Series. It was also participating in the organisation of the STAR Workshop on Coastal Processes being held in conjunction with the 16th Session and is assisting with a financial contribution of US\$10,000. The Workshop report will be printed in an appropriate IOC report series as a joint publication with CCOP/SOPAC. The representatives informed the meeting that the Secretary of IOC intended to approach officially the Director of Techsec to discuss the possible basis for a Memorandum of Understanding which would include the general framework for cooperation between IOC and CCOP/SOPAC including the carrying out of their respective mandates in STAR.

38. The UK adviser indicated that the UK was continuing its support for the objectives of CCOP/SOPAC mainly through a series of bilateral agreements through which professional expertise was being provided to the Governments of the CCOP/SOPAC region as part of an extensive Aid programme. At the present time UK was providing, on secondment or contract, 7 geologists and a mining engineer on long-term assignment to Government geological organisations in Fiji, Solomon Islands, Tonga and Vanuatu. Approval had recently been given to increase the number of secondments to the Solomon Islands Geology Division to three and recruitment of the additional geologist was now in progress. In addition, two hydrogeologists had been provided for a Technical Co-operation project to investigate the groundwater resources in Fiji. This would generate information of more general interest

to the coastal concerns of CCOP/SOPAC and the project included provision for giving hydrogeological advice to other Commonwealth territories in the region. A research project examining some aspects of wall-rock alteration associated with gold mineralisation had been concluded. Dr Cronan had continued his studies of manganese nodules and crusts, and of base metal distributions in oceanic sediments, and had continued to act in a consulting capacity for Techsec.

39. The USA representative was pleased to inform the meeting that his government had approved budgetary assistance for CCOP/SOPAC totalling US\$200,000 per year for three years commencing in the US fiscal year 1987/88.

40. The Committee thanked the US representative for his government's timely offer and informed the representative that this type of assistance was most welcome.

Appointment of Chairman of TAG (Agenda Item 9)

41. Dr Donald I.J. Mallick was appointed Chairman of the Technical Advisory Group.

CLOSING SESSION

Adoption of 16th Session Reports (Agenda Item 30)

42. The Committee adopted the Draft Workshop Report and Workshop Recommendations of the CCOP/SOPAC Workshop on Coastal Processes in the South Pacific Island Nations, held in Lae, Papua New Guinea, 1-8 October 1987.

43. The Committee adopted the Report of the Technical Advisory Group (TAG), including the STAR Report, and the recommendations of TAG with two exceptions.

44. Firstly, with respect to the TAG recommendation on the distribution of SPOT images, the Committee agreed in principle to accept the offer to have Techsec act as the distributing agent for SPOT images to CCOP/SOPAC member countries.

45. Secondly, in accepting the TAG recommendation that some of the ECU's available for marine surveys from Lome III funds be used to commission approximately 30 days of RRS Charles Darwin shiptime to conduct GLORIA and multichannel seismic surveys, the Committee agreed that the suggested amount of approximately one third of the 1.9 ECU's available was only a guideline for Techsec to note.

Date and Venue of the 17th Session (Agenda Item 31)

46. The meeting was informed that Tuvalu would host the 17th Session, and that because it was difficult to conduct a meeting the size of the CCOP/SOPAC Annual Session in Tuvalu, it had been agreed that Techsec would organise the 17th Session and conduct it in Fiji on behalf of Tuvalu.

47. The Committee also agreed that the 17th Session would be held in October, 1988, and would be preceeded by a CCOP/SOPAC Workshop on Non-fuel Nearshore Minerals.

48. The Committee, noting with regret inconveniences caused by the order of meetings at the 16th Session, stated that the 17th Session would consist of, in order, the following meetings:

1. Plenary (Opening);
2. Committee in Special Session;
3. Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources (STAR);
4. Technical Advisory Group (TAG);
5. Committee in Special Session;

6. Plenary (Closing).

Closure of the 16th Session (Agenda Item 32)

49. The National Representative of Tonga, Mr S. Tongilava, informed the meeting that it was once again his great pleasure on behalf of the rest of the Committee, to extend to the host government, Papua New Guinea, thanks and appreciation for hosting and organising the 16th Session. He acknowledged with gratitude the warm welcome that had been extended and was grateful for the excellent arrangements made by the staff of the Department of Minerals and Energy. Mr Tongilava noted that this was the second time CCOP/SOPAC had met in Papua New Guinea, a country with considerable resources that would inevitably play an important part in the development of the region.

50. Mr Tongilava informed the meeting that he had observed considerable growth of CCOP/SOPAC during the last 15 years. He observed that the work of the Committee was dependent on the generosity of those fortunate enough to be able to give and that the Committee was very grateful for this support. He reminded the meeting that the Committee was a fully independent organisation which had developed, and was implementing, a very productive Work Programme, and that it valued highly its independence and right to determine its own future.

51. On behalf of the Committee Mr Tongilava thanked and congratulated the Director, Mr J. Kotobalavu, and Techsec staff for their contributions and achievements. He also thanked the Project Manager and Acting Deputy Director, Mr C. Matos, for his continuing valuable contribution to CCOP/SOPAC. UNDP and ESCAP were thanked for their continued support, as were IOC and

other funding organisations. The representative was especially grateful to the supporting governments, including the Tripartite partners, who had made it possible for the Committee to achieve some of the goals defined by the Work Programme. He also expressed the Committee's appreciation to the Technical Advisors for making themselves available to assist the Committee develop its Work Programme and plan its implementation.

52. In conclusion, Mr Tongilava thanked Mr R. Moaina for Chairing the 16th Session, and the Rapporteur, staff of the Department of Minerals and Energy, and Techsec staff for their contributions which had ensured the success of the Session.

53. The Canadian Technical Advisor, Dr P. Sherrington, on behalf of TAG offered his special thanks to the government of Papua New Guinea and its Department of Minerals and Energy for the efficient organisation of the meeting and associated activities. He stated that CCOP/SOPAC was a remarkable organisation which had achieved success by discussion and consensus. Because the Committee was successful Technical Advisors held CCOP/SOPAC in high regard and would continue to attend the annual meeting of TAG. He welcomed the Committee's proposal for a tighter timetable for the 17th Session and concluded by congratulating the Committee for a very successful meeting.

54. The Director, Mr J. Kotobalavu, commented that although it had been a long

meeting it had been a very successful one. On behalf of Techsec, he thanked the government of Papua New Guinea and its Department of Minerals and Energy for their efforts, and complimented them on the choice of venue as it had given participants a chance to see something of the country. He noted that the success of the meeting was due to the presence of those member country representatives who had attended many Sessions. He also recognised the contribution made by those who had long supported the Committee, especially UNDP and ESCAP, and acknowledged the support being given by all donors. He commented that it had been a very constructive meeting from which Techsec had been given very clear instructions for the next 12 months. He concluded by thanking the staff of the Department of Minerals and Energy for organising the meeting.

55. The Chairman, Mr R. Moaina, stated that it had been a pleasure to host the 16th Session, especially as it had been a useful and fruitful Session. He said that he looked forward to an expansion of work in coastal and nearshore activities stemming from the Workshop, as recommended by TAG, and as approved by the Committee. In closing the 16th Session he informed the Technical Advisors that their contribution was greatly appreciated, thanked supporting agencies and countries, thanked the Director and the staff of Techsec for their continued contributions, and finally thanked member country representatives for their support in ensuring the success of the meeting.

ANNEXES

to

PART 1 : REPORT OF THE COMMITTEE, SIXTEENTH SESSION

ANNEX 1

REPORT OF THE TECHNICAL ADVISORY GROUP

A. INTRODUCTION

The Sixteenth Session of the TAG was held from 15 to 20 October 1987 in Lae, Papua New Guinea, under the Chairmanship of Dr D. Mallick (UK). Mr J. Eade (Techsec) was appointed Rapporteur.

B. SUMMARY OVERVIEW OF MAJOR ACTIVITIES

Summary Overview of Major Cruises and Other Multidisciplinary Activities (Agenda Item 10)

10.1 TAG was informed of cruises that had been conducted in the CCOP/SOPAC region since the last Session. These included cruises by RV Jean Charcot - 3 legs (IFREMER-ORSTOM), RV Coriolis - 2 cruises (ORSTOM), RV Moana Wave - 2 legs (Tripartite), RV Sonne - 3 legs (BGR), RV Thomas Washington - 3 legs (SIO), RV Hakurei Maru No. 2 (Japan), and HMAS Cook (Australia).

10.2 The RV Jean Charcot (PapNoum Cruise) collected Seabeam and SCS data in the Lau Basin to assist with planning for ODP drilling. This had been collected during a transit voyage from Papeete to Noumea.

10.3 The RV Jean Charcot (Nodco 2 Cruise) spent 26 days investigating the distribution of cobalt-rich crusts in the Tuamotu Archipelago. Several seamounts had been investigated using Seabeam, dredging, photography, and high-resolution side-scan sonar. This work would continue in the future with the possible addition of submersibles being used.

10.4 The RV Coriolis (EVA XIV Cruise) spent one month in the Solomon Islands waters in the northwestern part of the North Fiji Basin. A preliminary analysis of data collected (bathymetry, single-channel seismic, and magnetics) showed that the active grabens in the back-arc are faulted into North Fiji Basin crust and also showed juvenile-stage rifting.

10.5 The RV Jean Charcot (Multipso Cruise) conducted a 17-day cruise in Vanuatu to survey in detail sites proposed by USGS and ORSTOM for drilling by ODP. Seabeam data and 24-channel seismic with flexichoc sound source were collected at the collision zone between the d'Entrecasteaux Ridge and the New Hebrides Arc, on the frontal arc, in the intra-arc Aoba Basin, and in the backarc Vot Taude Trough.

10.6 The RV Moana Wave cruise MW87-01 mapped and sampled active rifts and fractures in the North Fiji Basin. The study included the use of SeaMARC II.

10.7 The Fiji representative informed TAG that his country was particularly pleased with the results of the RV Moana Wave cruise in the North Fiji Basin. He appreciated the opportunity to have had input into the planning of the cruise and make some changes to the cruise plan. He also noted with pleasure that he had received a cruise report shortly after the cruise had ended, and MRD staff had benefited from a post-cruise briefing at which shipboard imagery and bathymetry mosaics had been displayed.

10.8 The RV Moana Wave cruise MW87-02 studied Machias Seamount, the eastern margin of the Manihiki Plateau, and seamounts in the Line Islands for seafloor mineral formation, especially cobalt-rich crusts. Part of the study included the use of SeaMARC II.

10.9 The RV Sonne investigated and mapped with Seabeam two seamounts predicted by ORSTOM from satellite imagery during a transit leg from Papeete to Suva.

10.10 The RV Sonne conducted two legs in the Lau Basin studying mineralisation along active rifts, including Valu Fa Ridge.

10.11 The RV Thomas Washington cruises Crossgrain 1 and 2 consisted of two legs east of the Line Islands where parts of the seafloor were mapped with Seabeam.

10.12 The RV Thomas Washington cruise Crossgrain 3 studied polymetallic manganese nodules in the North Penrhyn Basin in Cook Islands and Kiribati waters.

10.13 The RV Hakurei Maru No. 2 carried out a detailed study of polymetallic nodules in parts of the North and South Penrhyn Basins in Cook Islands waters.

10.14 The HMAS Cook conducted a cruise in Tonga studying the propagation of sound in the water column and seafloor sediments.

10.15 TAG welcomed the work being done on HMAS Cook in the region by the Royal Australian Navy (RAN) and Ocean Sciences Institute (OSI), University of Sydney, and RECOMMENDED that the Australian representative establish contact with RAN and OSI on Techsec's behalf to ensure that in the future Techsec and the member country representatives concerned received copies of cruise plans and cruise reports of work in member countries' waters.

10.16 The Cook Islands Representative

informed TAG that he was grateful for the work done, especially on RV Hakurei Maru No. 2 and RV Moana Wave and the opportunities his country had had on those cruises for training.

10.17 TAG was informed that the RV Fred H. Moore was currently collecting multi-channel seismic data in the Western Solomon Sea for the University of Texas.

10.18 Future cruises planned include: two cruises on the RV Thomas Washington, plus a transit leg from Majuro to Suva during which there will be opportunities to do work subject to funds being available; three cruises on RSS Charles Darwin; a cruise on the RV Kaiyo; a cruise on RV Le Suroit; a cruise on RV Le Nadir; a cruise on RV Hakurei Maru No. 2; and a cruise on RV Franklin.

REPORTS OF MEETINGS

(Agenda Item 11)

11.1 *Annual CCOP/SOPAC Workshop*

11.1.1 TAG was informed that the Workshop on Coastal Processes in South Pacific Island nations was held in Lae, Papua New Guinea, 1-8 October, immediately prior to the 16th Session of CCOP/SOPAC.

11.1.2 The Chairman of the Workshop thanked the speakers, the Rapporteur, and the Workshop organisers, as well as UNDP, IOC, and Government of Australia who funded the Workshop, all of whom contributed to its success.

11.1.3 TAG considered and adopted the Workshop Report together with the seven recommendations from the Workshop and RECOMMENDED that Techsec actively encourage implementation of the Workshop recommendations and seeks ways of implementing those recommendations which are

part of the CCOP/SOPAC Work Programme.

11.1.4 TAG was informed that the STAR Study Group on Coastal Processes and Resources had also considered and adopted the Workshop Report and that the recommendations would be incorporated into the STAR Work Programme. TAG also noted that the recommendations agree closely with parts of the IOC/OSNLR programmes.

11.1.5 TAG, in noting the success of the workshop, RECOMMENDED that the papers presented be published as a CCOP/SOPAC Technical Bulletin and that Techsec seek funds to facilitate publication.

11.1.6 TAG noted the increase in importance of coastal and nearshore work in the CCOP/SOPAC Work Programme and RECOMMENDED that official delegations to future CCOP/SOPAC Annual Sessions include in their delegations experts in coastal studies, and that Techsec also invite appropriately qualified experts who are currently active in coastal processes and related studies in the region.

11.1.7 TAG was informed that IOC would cooperate with CCOP/SOPAC through STAR and OSNLR programmes in implementing the scientific research recommended to the Workshop. TAG noted that the OSNLR's shallow-water sub-programme included common interests such as Cenozoic reef evolution, palaeo-geographic mapping, the coastal zone as a resource, the mapping of strand-lines, and modification of the coastal environment. TAG also noted that under the framework of OSNLR, an exchange of experiences and knowledge with scientists in other regions would be possible and that this would be beneficial to the scientists in the CCOP/SOPAC region.

11.2 *STAR Meeting*

11.2.1 TAG was informed that the STAR Group met on 13 and 14 October 1987 and elected Dr B. Biju-Duval as the new Chairman and Mr R. Richmond as Vice-Chairman. Sixteen scientific papers on research in the area were presented at the session. The Report of the Coastal Processes Workshop held 1-8 October 1987 was presented to STAR and formally adopted.

11.3 *Other Meetings*

11.3.1 The IOC Representative informed TAG that the Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (OSNLR) had been held in Paris in January 1987 and was attended by Dr C. Helsley, the Chairman of STAR. The Guiding Groups recommendations on (i) global shallow water sub-programme on sedimentary environment, eustatic changes, tectonic and resources and (ii) a deep ocean sub-programme, were endorsed by the IOC Assembly at its Fourteenth Session held in Paris in March 1987.

11.3.2 The IOC's Regional Committee for the Western Pacific (WESTPAC), held its Fourth Session in Bangkok (Thailand), in June 1987 and endorsed the following regional projects under the OSNLR programme :

- (i) study of palaeo-geographic mapping,
- (ii) study of marginal active plates.

The Regional Committee recognised that any WESTPAC activities in the field of marine geology and geophysics would benefit from co-ordination with STAR activities, and should be implemented in close collaboration with SOPAC so as to optimise available implementing mechanisms in this field in the South Pacific.

11.3.3 The US Adviser informed TAG that at the 1987 Annual Session of the American Geophysical Union (AGU) in San Francisco, California, USA, 6-12 October 1987, a Special Session on the Tectonics of the Southwest Pacific would be held. This session would last for one full day and would consist of papers dealing with the results of Tripartite Cruises and other studies done in the region since 1982. This session would be chaired by Dr B. Keating (HIG) and Dr G. Greene (USGS).

11.3.4 The US Adviser informed TAG that the next International Geological Congress (IGC) would be held in Washington, DC, USA in 1989. Plans for the Congress were well underway and the Adviser encouraged CCOP/SOPAC member countries to participate.

C. CCOP/SOPAC WORK PROGRAMME

NEARSHORE MINERALS

(Agenda Item 12)

12.1 *Construction Materials*

12.1.1 TAG was informed on the results of surveys for nearshore sand and gravel off Tongatapu and Vava'u, Tonga.

12.1.2 TAG, noting that more information on the distribution and thickness of offshore sand and gravel resources in Tonga was required, RECOMMENDED that further work be done.

12.2 *Detrital Minerals*

12.2.1 No fieldwork on detrital minerals had been carried out by Techsec during the reporting period. A bibliography on detrital minerals relevant to the work of CCOP/SOPAC had been compiled and put on computer.

12.2.2 TAG agreed that the detrital mineral surveys in Fiji should be carried out as soon as

appropriate coring equipment was available.

12.3 *Insular Phosphates*

12.3.1 TAG was informed that a drilling programme had been carried out in Pukapuka and Rakahanga Lagoons in the Northern Cook Islands and that the cores collected would be tested for phosphate.

12.3.2 Samples had been collected on Funafuti and these would be tested for phosphate.

12.3.3 TAG RECOMMENDED that whenever testing for phosphate, samples should also be checked for yttrium as this metal was beginning to be in short supply.

12.3.4 TAG endorsed the proposal to continue the search for lagoonal phosphate with surveys and drilling programmes continuing in the Northern Cook Islands and in Tuvalu.

12.3.5 TAG RECOMMENDED that Techsec and SPREP work together to advise member countries in the planning, siting, and mining of construction materials and lagoonal phosphate to minimise adverse effects on adjacent environments and resources, especially reef resources used by indigenous people.

12.4 *Precious Corals*

12.4.1 TAG was informed of an overview which had been carried out by Techsec of the precious corals activity and endorsed the conclusion that the potential for finding *Corallium* beds was good, especially in deeper water (1000-1500 m) where little work had been done in the South Pacific.

12.4.2 The Fiji Representative informed TAG that he considered *Corallium* had a good potential in Fiji and was changing the priority of his country's project from B to A.

12.4.3 The use of submersibles and ROV's was discussed and TAG reiterated the recommendation of the Submersibles Workshop that submersibles be used in the evaluation of precious coral beds whenever possible.

12.4.4 TAG RECOMMENDED that whenever submersibles are working in the region on programmes funded for scientific research, Techsec should request that a few dives be made available to evaluate the precious coral potential of sites where previous tangle-net surveys had indicated possible potential.

HYDROCARBONS (Agenda Item 13)

13.1 Techsec reviewed progress made in hydrocarbon work since three experts, two provided by PCIAC and one by CFTC, had joined Techsec during the reporting period to form a Hydrocarbon Section.

13.2 TAG was informed that work had begun on reviewing the hydrocarbon potential of Tonga during a visit to Tonga when the hydrocarbon data base had been reviewed, and a large amount of data copied to Techsec. Following this visit mapping of the Tonga Ridge had started.

13.3 TAG commended PCIAC and CFTC for supporting the hydrocarbon activity.

13.4 TAG, noting that the hydrocarbon expert positions were funded for only two years RECOMMENDED that Techsec seek ways of maintaining manpower levels in the hydrocarbon activity at no less than three experts beyond the two years already funded by PCIAC and CFTC.

13.5 The Canadian Adviser commended Fiji for the detailed report which clearly stated Fiji's requirements for assistance with its hydrocarbon programme and informed TAG that such clear statements made it much easier

for donors to justify and approve technical assistance.

13.6 TAG RECOMMENDED that Techsec produce a summary overview of the results stemming from the reviews being made of the hydrocarbon potential of Tonga and other member countries by Techsec as they are completed, and that this summary overview be published as a CCOP/SOPAC Technical Bulletin.

13.7 The USA Adviser from the USGS reviewed the status of the hydrocarbon studies in the CCOP/SOPAC-Tripartite Programme. Tripartite I had been completed and Tripartite II would be completed as soon as all data from Vanuatu had been processed. Tripartite II data was being distributed as agreed. Tripartite I and II reports were either published (two), nearing publication (two) or in advanced stages of preparation (one).

13.8 TAG noted with pleasure that the Tripartite partners were progressing well with the publishing of the Tripartite volumes, and the Tonga Representative thanked Australia for agreeing to provide some additional funds to assist with the costs of publishing the second Tonga volume.

13.9 The Fiji Adviser informed TAG that a hydrocarbon geologist had recently joined MRD and expressed appreciation to CFTC for funding this post.

13.10. The New Zealand Adviser reported a considerable increase in activity in the Taranaki area with five new licences being granted and a busy geophysical and drilling programme that had resulted in promising hydrocarbon shows at several localities and better definition of the giant Maui Gas Field. On the debit side licences had been relinquished in the Canterbury Basin and on the East Coast of North Island where drilling

had continued to be unsuccessful despite widespread seeps in the area.

13.11 The Senior Technical Adviser informed TAG that with the recovery of oil prices in Australia to a more stable US\$18-20, onshore exploration levels in Australia were also improving. However, continuing low levels of offshore exploration were a matter for concern, especially as Australia's offshore areas had the best potential for larger resources. The sizes of recent discoveries had been only 1-5 million barrels of crude onshore and only 5-20 million barrels of crude offshore. The last significant find had been the 270 million Forterous Field in the Gippsland Basin in 1978. Main areas of activity remained the Bonaparte-Browne and Gippsland Basins offshore, and the Cooper/Eromanga Basin onshore. Another major concern for Australia was that by the mid 1990s much of the Giant Gippsland Basin fields would have been depleted and Australia would have to import most of its oil requirements and this would be largely from OPEC. To try to maintain a 50% self-sufficiency in oil by the year 2000 Australia would need to find 120 million barrels of crude oil per year but in the years 1970 to 1986 an average of only 62 million barrels per year had been found.

13.12 The Solomon Islands Representative informed TAG that a Petroleum Act, to provide the legal base for future petroleum exploration and development in Solomon Islands, had been enacted by Parliament in August 1987. The regulations and the model agreement to accompany the Act were to be completed in 1988.

13.13 The Papua New Guinea Adviser informed TAG of progress being made in the search for hydrocarbons in PNG. In the Papuan Basin all options had been taken, in Bougainville and New Ireland Basins options were available but there was no activity, and

in the North New Guinea Basin one well had been drilled but it was dry.

13.14 TAG emphasised the importance of drilling to depths of about 60 m on land to obtain fresh material for source rock analysis and RECOMMENDED that Techsec look into ways and means of purchasing or hiring equipment for this purpose.

13.15 TAG was informed that the Australian Bureau of Mineral Resources (BMR) was prepared to store magnetic tapes of offshore seismic data collected in the CCOP/SOPAC region and that BMR was prepared to assist with a certain amount of seismic reprocessing.

13.16 TAG welcomed the offer from BMR and thanked the Australian Adviser for his efforts which had made the offer possible.

13.17 TAG discussed the value of Techsec acquiring an in-house seismic processing system and while it did not recommend that a system be acquired at present, it RECOMMENDED that Techsec make no definite decisions and keep its options open in case such equipment is offered as a gift.

OFFSHORE MINERALS (Agenda Item 14)

14.1 *Cobalt-rich Crusts*

14.1.1 TAG was informed of two cruises in the CCOP/SOPAC region investigating cobalt-rich crusts. The RV Moana Wave found crusts along the eastern margin of the Manihiki Plateau and along a ridge segment in the Line Islands. RV Thomas Washington found moderately thick crusts on all four seamounts investigated in the Central Line Islands. Samples from both these cruises were being analysed.

14.1.2 TAG was informed that, starting in 1987, the remaining cruises of the joint Five Year Japanese-CCOP/SOPAC Manganese

Nodule Programme on RV Hakurei Maru No. 2 will include exploration for cobalt-rich crusts on seamounts and ridges. Twelve additional days of survey time will be added to the 1987 cruise solely for cobalt-rich crust work.

14.2 *Polymetallic Manganese Nodules*

14.2.1 TAG was informed of three cruises in the region whose primary objectives were to investigate the distribution and metal content of polymetallic manganese nodules. RV Hakurei Maru No. 2 had found high nodule abundances in the two areas studied, both of which lie in the South Penrhyn Basin. Copper and nickel values are higher in the northern area and cobalt values are higher in the southern area. RV Thomas Washington had investigated nodule variability and formation in the North Penrhyn Basin in Cook Islands and Kiribati waters. RV Hakurei Maru No. 2 had completed a cruise near and east of the Phoenix Islands predominantly studying manganese nodules.

14.2.2 TAG welcomed the effort being made on evaluating the manganese nodule potential in the region as it considered this work to be very important.

14.2.3 TAG agreed that a reconnaissance survey of the nodule potential in the Ellice Basin would be most valuable.

14.2.4 The Japanese adviser informed TAG that it would be very difficult to add a preliminary survey of nodules in the Ellice Basin to the RV Hakurei Maru No. 2 Five Year Programme as the budget was fixed.

14.2.5 TAG welcomed the concentrated effort being made by the Japanese in evaluating manganese nodules as a resource and thanked them for their valuable contribution. It hoped that the Metal Mining Agency of Japan would continue its work

beyond the initial Five Year Programme.

14.2.6 TAG was informed that Japan would like to continue its nodule programme after the present Five Year Programme had finished, but there were no funds for this extension as yet. The Japanese Adviser offered to prepare a proposal for such an extension for discussion at the 17th Session of CCOP/SOPAC.

14.2.7 TAG also endorsed the continuation of scientific studies researching the composition and origin of nodules as these studies assisted with exploration activities.

14.2.8 TAG was informed that several mine sites had been identified in international waters in the North Pacific and Indian Oceans, one of which is now registered with the UN as a prospecting area.

14.3 *Polymetallic Massive Sulphides*

14.3.1 TAG was informed that RV Moana Wave had mapped and sampled active rift systems in the North Fiji Basin. Anomalous methane levels were found in the vicinity of the ridge west of Viti Levu and along the northern arm of the newly found triple junction. RV Sonne continued previous surveys of active rifts in the Lau Basin. Sulphide-impregnated volcanic rocks were recovered from the Valu Fa Ridge. In the northern segment of the Valu Fa Ridge old sulphide vents were found at several locations and lumps of massive sulphides were dredged in one haul.

14.3.2 TAG was informed that much of the mineralisation in the Lau Basin was low temperature on the seabed and agreed that these may be low temperature halo deposits above deeper stockworks. Sub-bottom sampling would be required to establish a three dimensional picture of mineralisation, but it was agreed that this would be very

difficult to do in the Lau Basin with available technology.

14.3.3 The West German Adviser informed TAG of mineralisation found on ridges in the North Fiji Basin. This consisted of manganese oxide crusts of hydrothermal origin, Early Pliocene in age, coated with younger crusts of hydrogenous origin.

14.5 *Seamount Phosphate*

14.5.1 TAG was informed that phosphatised material had been found at the bases of manganese crusts recovered from parts of the margin of the Manihiki Plateau.

14.5.2 TAG RECOMMENDED that any analysis of seamount samples for phosphate should also include yttrium as this metal was becoming in short supply.

ONSHORE MINERALS (Agenda Item 15)

15.1 The UK Adviser reported that a study of ammonium in alteration associated with gold mineralisation in the Circum-Pacific region was continuing. There were encouraging signs that in South America there were high levels of ammonium similar to those in North America and that this might be used as a guide to the occurrence of gold. Study of samples from Gold Ridge on Guadalcanal, Solomon Islands, from new prospects on Espiritu Santo and Malekula in Vanuatu and from the Emperor Mine on Fiji showed that there were significant contents of ammonium in some samples from those alteration zones but that the ammonium levels were generally low and rather sporadic, suggesting that in the Circum-Pacific island arcs ammonium is unlikely to prove a useful prospecting guide for gold.

COASTAL DEVELOPMENT (Agenda Item 16)

16.1 *Coastal Engineering*

16.1.1 TAG was informed of Techsec work in support of the Coastal Engineering activities of the CCOP/SOPAC Work Programme which included: a report on the proposed seawall for the western end of the Mulinu'u Peninsula, in Apia, Western Samoa; a review of the A/E design of a boat launching ramp for Umatac village, Guam; baseline hydraulic study for Fanga Uta, Fanga Kakau, and Mu'a lagoons on Tongatapu, Tonga; and bathymetric mapping of Teouma Bay, Efate, Vanuatu.

16.1.2 The representative of the Geomechanics Division of CSIRO informed TAG of the close parallels between the current research programmes of the Division of Geomechanics and the Coastal Engineering activity of the CCOP/SOPAC Work Programme, and made known his Division's research and consultative capacities. Current relevant research is in the fields of: coastal/offshore construction; remote sensing in rugged terrain and shallow water; landslides; and active faulting and earthquake effects.

16.1.3 TAG agreed that the Geomechanics Division's research on the engineering characteristics of calcareous soils was of particular interest to CCOP/SOPAC, and that the research on foundations for oil production platforms was of particular relevance to sites for the wave energy generators planned for the Southwest Pacific. TAG, in noting these capabilities, RECOMMENDED that Techsec investigate possible avenues of collaboration with the Geomechanics Division of CSIRO.

16.2 *Renewable Energy*

16.2.1 TAG was informed that nearshore bottom profiles have been made by Techsec at three possible wave-energy sites seaward of the reef off Tongatapu, Tonga. TAG noted

with interest that a Waverider Buoy, provided by Norway aid, was now collecting data at one of the sites on the south side of the island. TAG heard that four months of data already had been collected and processed, but the system was now inoperative as it required new batteries which were currently unavailable in the South Pacific.

16.2.2 The Cook Island Representative informed TAG that Waverider Buoys had been installed on opposite sides of Rarotonga by New Zealand and Norwegian Governments, and that good wave data had been collected during a recent cyclone. He thanked both the New Zealand and Norwegian Governments for provision of the technology and acquisition of the data.

16.2.3 The Tonga Representative conveyed the appreciation of his Government to Norway and Techsec for the installation of the Waverider Buoy off Tongatapu. He also informed TAG that an offer to install a 300 kw wave energy plant on Tongatapu in 1988 had been received.

16.2.4 Noting that both SPEC and PEDP had been approached in the past by Techsec to consider wave energy sources and that CCOP/SOPAC remained the only organisation to sponsor marine energy activities, TAG RECOMMENDED that Techsec attempt to be represented at the forthcoming PEDP meeting in Tonga in early 1988.

16.2.5 TAG was informed that both PEDP and SPEC acknowledge the accomplishments of CCOP/SOPAC in the field of wave energy and that discussions have been held regarding Techsec participation in future PEDP meetings.

16.3 *Geological Hazards*

16.3.1 Techsec informed TAG that: volcanic activity occurred at various places in

Papua New Guinea during the past year; large damage-producing earthquakes occurred in the region during October 1986 and August 1987; coastal erosion and flooding occurred in Kiribati in December 1986; and extensive damage was inflicted by cyclones to the coastlines of many islands during the past year including Cook Islands, Fiji, Tokelau, Tuvalu, Vanuatu, and Western Samoa.

16.3.2 The HIG Adviser reported on the results of SeaMARC II survey of Rabaul Harbour undertaken during a Tripartite II cruise and indicated that volcanic doming of the seafloor was not apparent in either the SeaMARC II data or the ROV images subsequently obtained.

16.3.3 The UK Adviser informed TAG that MacDonald Seamount had recently erupted under the RV Melville with Dr Harmon Craig on board.

16.3.4 The US Adviser reported that over the next several years the World-Wide Standard Seismic Network (WWSSN) will be upgraded. The USGS, working in co-operation with over 40 universities, will design and install new digital equipment at many WWSSN sites. This new programme is called IRIS (Incorporated Research Institute for Seismology) and is funded by the USA National Science Foundation (NSF). One of the first stations to be upgraded will be the Apia Geophysical Observatory in Western Samoa (in 1-2 years time). Other stations in the SW Pacific to be upgraded are Honiara and Rarotonga (in 2-3 years time). Installation of the new equipment will also include maintenance and operational training. Data from the new system will be telemetered to the US and will be available for reporting and analysis on a realtime basis.

16.3.5 TAG welcomed plans for upgrading WWSSN but expressed concern about the

withdrawal of USAID funding for seismic studies in Tonga and Fiji.

16.3.6 Recognising that there was a continuing need for a regional seismic network, TAG RECOMMENDED that Techsec convey to appropriate organisations and international agencies the regions requirement to have the existing network strengthened through the installation of further instruments and, in particular, the additional provision for their operation and maintenance.

16.3.7 The Fiji Adviser pointed out that although seismic research proved to be particularly useful for studying geological structure and in designing construction codes, the immediate objective was to provide information for educational programmes designed to alert the populace to the dangers arising from locally generated tsunamis, and the appropriate safety measures to be taken.

16.3.8 The PNG Adviser reported that the Port Moresby Geophysical Observatory Project 1988/1989 includes a proposed PNG Digital Seismic Network that has been designed as a powerful, realtime processing network. The network consists of 20 micro-processor controlled field stations planned to operate remotely throughout PNG. This network will replace the present system which records FM analogue data transmitted by telephone line. The reasons for changing the present system include: poor quality of transmitted analogue signal; loss of data because of PTC line-fault or large earthquakes; high cost for rented telephone lines; and no possibility of expanding the current infrastructure to include stations operated by part time observers.

16.3.9 The PNG Adviser thanked the Federated Republic of Germany for funding the network at a cost of about one million US dollars.

16.3.10 TAG was informed by the French Adviser that the Government of Vanuatu, the University of Cornell, and ORSTOM have maintained a seismological network of 21 telemetred seismological stations, and some tide gauges and bench marks. After ten years observing the local seismicity it was now possible to demonstrate that there is no systematic land deformation and no obvious precursor seismological event which occurs prior to a major earthquake. It has been concluded from this that land deformation and precursor earthquakes cannot be used in Vanuatu to predict major earthquakes. Such a conclusion is however, restricted to Vanuatu. Consequently the number of stations in Vanuatu will probably be reduced and only those needed to locate earthquakes precisely in the framework of the world wide network will be kept.

16.3.11 The IOC Representative informed TAG of the work of the International Co-ordination Group for the Tsunami Warning System in the Pacific (ITSU) and the International Tsunami Information Center (ITIC) in the region. CCOP/SOPAC members of ITSU currently include Australia, Cook Islands, Fiji, New Zealand, Tonga, and Western Samoa. Tsunami stations and communication systems have also been established in Papua New Guinea, Marshall Islands, Tuvalu, Kiribati, the Federated States of Micronesia, and Nauru, although they are not yet member states of ITSU.

16.3.12 The Fiji Representative reported that about 27 draft copies of charts showing tsunami travel times for various places in the region had been received and was grateful that the charts had been prepared.

16.4 *Other Development Studies*

16.4.1 TAG was informed that SPREP supports an on-going lagoon water quality

monitoring programme co-ordinated by the Institute of Natural Resources, USP, covering: Laucala Bay, Suva, Fiji; Tarawa Lagoon, Kiribati; Port Vila and Luganville Harbours, Vanuatu; Fanga'uta Lagoon, Tonga; and Marovo Lagoon, Solomon Islands. Other SPREP projects, all of which are related to coastal development, include: PNG coastal water quality monitoring for heavy metals and organochlorines (in association with UPNG); heavy metal monitoring in PNG rivers affected by mining (with UNITECH); coastal water quality monitoring in French Polynesia (with LESE); coastal water quality monitoring on Guam (with GEPA); monitoring of the Vitogo Estuary in Fiji to study water quality affected by wood chip mill operations (with USP); groundwater quality monitoring in the Tuamotus (with LESE); development of effluent and waste disposal standards for the region (with USP); reef and lagoon management plan development Tahiti, Bora Bora, (SPREP); and coastal resource management plan development in Pohnpei, FSM (SPREP).

16.4.2 The UK Adviser reported that the UK government had recently launched a programme to identify enabling technologies for surveying, exploration, development, and management of ocean resources. These resources include minerals, renewable energies, and mariculture. A series of studies to identify the enabling technologies has recently been completed whilst others are continuing.

16.4.3 The USP Adviser informed TAG that in the last two years he had supervised two students who had carried out water quality work, one on a small catchment in southeast Viti Levu (Fiji) for a Masters Degree, and the other on an offshore island. Member country representatives were invited to inform USP of their requirements for water quality studies and USP would attempt to

match those requests with appropriate students.

MAPPING (Agenda Item 17)

17.1 *Offshore Seabed Mapping*

17.1.1 TAG was informed of Techsec efforts in support of the CCOP/SOPAC seabed mapping activities which included: Sea-MARC II surveys - on the RV Moana Wave in North Fiji Basin northwest of Viti Levu in Fiji waters, in Western Samoa waters, across the Manihiki Plateau in the Cook Islands, and in Kiribati waters; and Seabeam surveys - on the RV Thomas Washington in the North Penrhyn Basin in Kiribati and Northern Cook Islands waters, on the RV Sonne in Lau Basin and over seamounts southeast of the Southern Cook Islands, and on the RV Jean Charcot in the central New Hebrides Arc, Fore-arc, and Trench.

17.1.2 TAG was informed by the US Adviser that the compilation of the Geological Map of Vanuatu is continuing. Compilation of most of the northern and central part of the arc-platform has been completed and compilation of the southern part began in March 1987. It was noted that H.G. Greene of the USGS visited ORSTOM, Noumea in March to examine seismic reflection profiles obtained by ORSTOM from the southern part of the arc and produced a preliminary, roughly sketched geological map. Island geology has been compiled by A. Macfarlane and it is now anticipated that a final draft map will be completed in twelve months time.

17.1.3 The HIG Adviser informed TAG of SeaMARC II swath mapping results in the North Fiji Basin, in Western Samoa waters, on the Manihiki Plateau in the Cook Islands, and in Kiribati waters in the Line Islands. TAG heard of the discovery of a new triple junction and new seamount in the North Fiji Basin, the

breakup of Machias Seamount as it moves into the Tonga Trench, and the formation of mud volcanoes caused by the overpressuring of Cretaceous sapropels on the Manihiki Plateau. TAG was informed that the Tripartite II sidescan mosaic and bathymetric charts would be produced at a scale of 1:250,000 on UTM projection. The group were also informed that GLORIA, Seabeam, and SeaMARC II survey data were presently available only through operating institutions, i.e. there is no central swath-map data repository. Nor is there a unique data format on scale, as each institution has its own data manipulation programmes.

17.1.4 TAG was informed by the UK(IOS) Adviser that the RRS Charles Darwin would be in the CCOP/SOPAC region during the middle part of 1988. Three cruises have been programmed for this region on which NERC offers "on-the-job" shipboard training for at least two island member country scientists. One of these cruises would include 10-12 days of GLORIA mapping in the Lau Basin for ODP work funded by NERC.

17.1.5 TAG was also informed that a joint venture of NERC and MUSL were offering CCOP/SOPAC the use of RRS Charles Darwin for GLORIA surveys, at a rate subsidised by both NERC and MUSL, for a period of up to two months. It was emphasised that the ships programme would remain very flexible until CCOP/SOPAC proposals had been formulated.

17.1.6 In addition TAG was informed that NERC would also consider any proposal by CCOP/SOPAC to use RRS Charles Darwin for non-GLORIA work, in which case NERC may subsidise the cost depending on the scientific interests within any proposal.

17.1.7 TAG noted that the cost per unit area of GLORIA mapping was comparable to

the cost of SeaMARC II mapping at 2000 m, but GLORIA costs were substantially less at greater depths.

17.1.8 TAG noted that limited progress had been made during the past year in defining a prioritised programme of needs for shallow and deep-water seabed mapping of the SOPAC region using EEC Lome III funds.

17.1.9 Although there appeared to be a problem in timing of the availability of RRS Charles Darwin and availability of EEC Lome III funds, TAG RECOMMENDED that CCOP/SOPAC should take advantage of the visit to the South Pacific of RRS Charles Darwin in 1988 and that Techsec be instructed to obtain release of Lome III funds to allow CCOP/SOPAC to commission surveys of selected areas of the CCOP/SOPAC region by the RRS Charles Darwin. If necessary, Techsec should seek the support of the Governments of France, the Federal Republic of Germany, and the United Kingdom in the discussions with the EEC.

17.1.10 TAG RECOMMENDED that approximately one third of the 1.9 million ECUs available for marine surveys from the Lome III funds be used to commission approximately 30 days of RRS Charles Darwin ship-time to conduct GLORIA and multichannel seismic surveys in the CCOP/SOPAC region.

17.1.11 TAG agreed to have a working group develop a preliminary proposal during the 16th Session for a RRS Charles Darwin cruise in 1988 (See Part 1: Annex II, this volume).

17.1.12 TAG was informed of the conclusions reached by the working group in their preliminary proposal which identified 12 potential areas for GLORIA surveys and two for multichannel seismic surveys. TAG adopted the working group's RECOMMEND-

ATIONS that: approximately 11 days of and multichannel seismic survey time be commissioned - 5 days for the Vanikula Basin of Solomon Islands and Vanuatu, and 6 days for Lau Ridge of Fiji; and approximately 19 days of GLORIA surveys be made in areas selected from the following: Western Woodlark Basin; Western (trench) side of Vanuatu; Central Basin of Vanuatu; Eastern (back-arc) side of Vanuatu; North Fiji Fracture Zone; Eastern Lau Basin; Samoa Basin transit; North Penrhyn and South Penrhyn Basins in Cook Island waters; Eastern Manihiki Plateau; Western side of Line Islands; and Gilbert and Tuvalu island chains (See Part 1: Annex II this volume).

17.1.13 TAG RECOMMENDED the areas chosen should depend on the logistics of the cruise programme and should the multichannel seismic system not be available then more GLORIA work should be accomplished.

17.1.14 TAG was reminded of a high resolution imaging and bathymetric mapping system, SeaMARC S, developed by SSI for use in the nearshore and shallow water offshore environment. The system, capable of imaging objects as small as an underwater communication cable 2.5 cm in diameter and providing bathymetric contours at a 1 m interval, has been used on contractual surveys for power and telecommunication and cable routes in the Hawaiian Islands and suitable for use in detailed mapping of the shallower EEZ areas of many countries.

17.1.15 TAG noted with interest that preliminary processing of Seasat altimeter data using the recent ORSTOM/Universite d'Orsay method had enabled the discovery of 50 previously uncharted seamounts. At this stage of processing, the location of the seamounts is uncertain (within 40 km). After the final stage of processing the predicted location should be within 15 km, the elevation

above the surrounding seafloor estimated, and the general shape described. Funding for the final stage processing, however, is still to be found. TAG also noted that two seamounts predicted by Seasat data have been located mapped by the RV Sonne.

17.1.16 TAG further noted the work reported in the STAR session on bathymetric and magnetic compilations in the South Pacific Ocean between the Tonga Trench and the East Pacific Rise. Since this area is little known and contains newly-discovered, large bathymetric features and magnetic anomalies, TAG encouraged and supported production of a synthesis of the bathymetric and magnetic-anomaly data of the region.

17.2 *Coastal and Nearshore Mapping*

17.2.1 TAG was appraised of Techsec's effort in air photo interpretation and ground truth surveys in Tuvalu and high-resolution SPOT imaging projects in both Cook Islands and Solomon Islands.

17.2.2 TAG was also informed of a study undertaken by UK of a complimentary SPOT image covering Guadalcanal, Solomon Islands.

17.2.3 TAG observed that at the 15th Session of CCOP/SOPAC held in Rarotonga, Cook Islands, it was recommended that four pilot projects be initiated in co-operation with CCOP/SOPAC Techsec. The purpose was to assess the potential use of high-resolution SPOT imagery in the South Pacific area. The four areas that were recommended included Aitutaki, Suva, Guadalcanal, and Madang. TAG were informed that two images had been acquired by the SPOT satellite, Aitutaki and Guadalcanal. BGS was responsible for processing the Guadalcanal image and IFREMER was responsible for processing the Aitutaki image. Unfortunately, the other two areas,

Madang and Suva, were clouded over and no images of these areas had been acquired.

17.2.4 TAG was informed that the first objective of the Aitutaki study was to construct a bathymetric map of the lagoon and to determine the nature of the seabed. The second objective was to assess the damage done by cyclone Sally by comparing SPOT images taken before and after the cyclone. The main results of this preliminary study included: detailed bathymetry of the lagoon the distribution and character of the shallow water sediments and results of the cyclone damage including modification to the barrier reef.

17.2.5 TAG was informed by the Cook Islands Adviser that there was an urgent need to acquire "ground truth" for the Aitutaki SPOT imagery before the next hurricane season. Accordingly, TAG RECOMMENDED that ground truth surveys be initiated as soon as possible.

17.2.6 TAG was informed of a suggestion to make Techsec the distribution agent of SPOT images for CCOP/SOPAC island member countries. TAG expressed the view that this might be an inappropriate function to develop within Techsec, particularly considering that the space, equipment, and labour requirements might not be commensurate with the demand for images. TAG therefore RECOMMENDED that CCOP/SOPAC not become a distribution agent for SPOT images at this stage but consider the possibility of involvement at some future time.

17.2.7 TAG was pleased to note that the University of the South Pacific, through their Remote Sensing Centre would be happy to assist Techsec with processing problems associated with SPOT images and with advice on their potential use in assisting the region.

17.2.8 The Tonga Adviser informed TAG that a coastal morphology map of Tongatapu

should be completed by the end of the year.

17.2.9 TAG was informed by the French Adviser that ORSTOM (Noumea) expects to receive a new 28-metre ship which could be made available at economic rates for coastal and nearshore activities of mutual interest to CCOP/SOPAC and ORSTOM.

17.3 *Other Mapping*

17.3.1 The US Adviser informed TAG on the status of the Southwest Quadrant Map of the Circum-Pacific Map Project. More additions and corrections to the geological map had been received requiring further work on the final copy and was now estimated that reproducible copy will be sent to the printer in early October 1987. Explanatory notes were complete and had been prepared for reproduction. Completed parts of the Mineral Resources Map had been sent to cartographers while awaiting completion of manuscript by the the panel. The Energy Resources Map was waiting for a compilation manuscript from the panel. The colour proof of the Tectonic Map had been reviewed in detail at a June meeting in Honolulu and had been submitted to panel members in Tokyo for final corrections. Target date for printing was now early 1988.

17.3.2 TAG was informed that the USGS in cooperation with NOAA would produce in the Circum-Pacific Map Project series, physical oceanographic maps of the Pacific showing parameters such as tsunami paths, cyclone and storm tracks, areas of upwelling, mean wave heights, mixing zones, etc. Such maps will be compiled for the CCOP/SOPAC region on the Southwest Quadrant sheets.

17.3.3 TAG was informed that planimetric base maps for the East Asia Geotectonic Map Project, scale 1:200,000, had been completed and had been provided to the panels. Bathy-

metry and topography was being added to base maps at the Reston USGS office. National compilers had been identified through co-operation with CCOP/EA. Dr Tadashi Sato, Tsukuba University, Japan, had agreed to be Chief Compiler. The first meeting had been held in Beijing, China, 29 August 1987. Sheet Number 7 of this map series overlaps with PNG and Solomon Islands and is being presented to CCOP/SOPAC for comment and corrections.

17.3.4 The UK Adviser informed TAG that Dr Artemjev, USSR Academy of Sciences, had telexed that space photographs of the priority areas indicated by CCOP/SOPAC had been ordered from the USSR space archive, that they were expected to be available by early October 1987, and that he offered to have the USSR delegation bring them to the 16th Session of CCOP/SOPAC. Also Dr Artemjev had requested from the USSR space agency further coverage of these areas twice a year for the next two years.

17.3.5 TAG was informed that the USGS at Woods Hole had produced a high-cobalt manganese-crust distribution map for the world, and a 500-page publication containing the station and chemical data used to construct the map would be available soon.

TRAINING (Agenda Item 18)

18.1 *On-the-job Training*

18.1.1 Techsec informed TAG that a CCOP/SOPAC Fellowship Scheme had been established. ICOD had agreed to fund at least three fellowships per year over the next three years for country nationals to be attached to Techsec for periods of up to three months for on-the-job training. The first Fellowship had gone to a Tongan (Saimone Helu) and had already been completed.

18.1.2 TAG expressed its thanks to ICOD

for funding this project.

18.1.3 Techsec reported that training had been carried out in association with field work in the Cook Islands, Western Samoa, and Tonga, and that training had also been carried out on various research vessels visiting the region during the past 12 months.

18.1.4 Member countries expressed their thanks to the appropriate agencies and donor countries for their support in on-the-job training activities.

18.1.5 The US Adviser reported that Solomon Islander Rennel Maghu, was doing well in his degree course at Fairhill College in California. He had been editing the maps produced from the Coastal Mapping Workshop held in Vanuatu in 1983.

18.1.6 TAG was informed by Techsec that a one-month long on-the-job assignment had been arranged by Techsec during the reporting period for: a Cook Islands trainee to work at the Geological Survey of Japan, for which the Cook Islands Representative thanked JICA for funding; and for a Kiribati trainee to work at the Hawaii Institute of Geophysics as follow up to his participation on the 1986 RV Moana Wave cruise for which the Kiribati Representative expressed his appreciation.

18.1.7 TAG was informed that the Cook Island trainee had found the one month attachment to be too concentrated. Techsec agreed to co-ordinate future attachments with the appropriate institution to ensure that necessary modifications can be made to the proposed programme for each trainee's assignment.

18.1.8 Techsec informed TAG of a proposed new scheme for management training of island member country delegates through participation of a second person from each island member country to attend the CCOP/

SOPAC Annual Session. Although no funding had yet been identified for this scheme, Techsec would endeavour to obtain funding.

18.1.9 The New Zealand Adviser noted that the NZ Geological Survey offer for on-the-job training in petroleum exploration had not as yet been taken up. He requested that member countries pass details of suitable candidates to Techsec.

18.2 Courses

18.2.1 Techsec reported on the three-month Basic Earth Science and Marine Geology course held at the IMR/USP during January – March, 1987 which was funded by CFTC, the Government of New Zealand, and UNDP.

18.2.2 TAG acknowledged the support of HIG and the Federal Republic of Germany for allowing the course participants to visit RV Moana Wave and RV Sonne during port stops in Suva.

18.2.3 PCIAAC was thanked for the gift of a binocular petrological microscope for use on CCOP/SOPAC training courses and at Techsec.

18.2.4 The USP Adviser reported on the history of Earth Science teaching at USP and TAG noted with concern the low numbers and declining numbers enrolling for the Earth Science major at the University.

18.2.5 TAG RECOMMENDED that a working group comprising at least one representative of USP and at least one representative of Techsec be established to look into the present status of the Earth Science programmes at the University and to explore options for the future and that the group should report before the 17th Session.

18.2.6 TAG RECOMMENDED adoption of the proposed CCOP/SOPAC Scholarship

Scheme guidelines for first degree studies in geology or engineering (see document CR16/18.2/2) with modifications as follows:

- a. that the term "Conditions" be changed to "Guidelines";
- b. that the Director of Techsec in consultation with the appropriate member country National Representative, will have discretion in applying the scholarship guidelines;
- c. that a financial bonding commitment be made to make sure the student applies the training received to the service of his home country for a period of 1.5 years per year of scholarship funding;
- d. that provision be made to accommodate annual return trips to the home country for non-married students;
- e. that CCOP/SOPAC is not responsible for salaries as part of the scholarship scheme.

18.2.7 The Japanese Adviser reported that several training courses are conducted in Japan for South Pacific countries. An 8-month group training course on Offshore Mineral Prospecting was currently provided at the Geological Survey of Japan, supported by funding from the Japan International Cooperation Agency. Offshore and onshore training courses are provided by the Ministry of International Trade and Industry in association with the RV Hakurei Maru No.2 Cruise studying mineral resources for CCOP/SOPAC, and by the Science and Technology Agency as part of the Japan-France-CCOP/SOPAC programme on rift systems in back-arc basins in the Southwest Pacific.

18.2.8 The Fiji Representative noted the excellent Marine Geological Training Course provided by the Japanese Government and highly recommended this course.

18.2.9 The Canadian Adviser informed TAG that PCIAAC sponsored three 2-month courses offered annually by the Alberta Summer Institute for Petroleum Industry

Development (ASIPID) in Edmonton, Canada. Complete funding is available for qualified students to attend Upstream (exploration), Downstream (refinery and marketing), and Management courses. Details on the 1988 sessions will be sent to Techsec.

18.2.10 The US Adviser reported that funds for a marine geology course offered by the USGS were being sought by ESCAP. Arrangements would be made with the Training Co-ordinator to have this course incorporated into the current CCOP/SOPAC Earth Science Course at USP. Funds for other USGS courses, Data Management and Electronic Maintenance, had not yet been identified.

18.3 Workshops

18.3.1 TAG noted that two CCOP/SOPAC workshops were held during 1987. These were: the Coastal Processes Workshop in Lae, PNG (funded by Australia, IOC/UNESCO, and ESCAP/UNDP); the Coastal Mapping Workshop in Tuvalu (funded by Australia, ESCAP/UNDP, New Zealand, and USGS).

18.3.2 In addition, TAG noted that other workshops attended by island member country trainees were:

- an ICOD Non-fuel Marine Minerals Workshop held in Halifax, Canada (funded by ICOD), attended by Cook Islands, Tonga, and Papua New Guinea;
- a Conference on How Volcanoes Work in Hawaii (funded by Circum-Pacific Council for Energy and Mineral Resources and PNG Government), attended by Papua New Guinea;
- an Earthquake Engineering Conference in New Zealand (funded by the New Zealand Government), attended by Fiji;
- a Computer Software Training Course in Bangkok (funded by CIDA), attended by the Techsec Documentalist;

- the Pacific Rim Congress in Brisbane, Australia (funded by ESCAP/UNDP), attended by Fiji.

18.3.3 TAG noted with gratitude the funding provided by the various donor countries and agencies.

18.3.4 The ESCAP Representative informed TAG that the Coastal Geology Training Course hosted by the Government of China for CCOP/SOPAC nationals would be held at Guangzhou, China from 21 November to 6 December 1987.

18.3.5 TAG was informed that Techsec had received from member countries requests for training in bathymetric drafting and noted with pleasure that Australia was willing to continue bathymetric training either through the Royal Australian Navy Hydrographer or through BMR, and RECOMMENDED that Techsec approach those organisations to finalise arrangements.

18.3.6 TAG was informed about training programmes at the University of New South Wales, Sydney, related to CCOP/SOPAC activities and of interest to member country trainees. A specific proposal was tabled to conduct a Gold Workshop.

18.3.7 TAG noted that the proposed Gold Workshop would be of high interest to a number of member countries. However it was acknowledged that there was a real problem in finding funds for workshops. TAG RECOMMENDED that UNISEARCH and Techsec continue to communicate and attempt to identify possible funding sources for workshops in tune with member country needs.

18.3.8 TAG RECOMMENDED that, as far as possible, interests and requirements of member countries for future workshops, and sources of funding for them, be identified well

in advance to assist in long-range planning and scheduling.

18.3.9 The Western Samoa Representative noted that a Remote Sensing Workshop in Indonesia, was currently being offered.

18.4 *Training Assistance*

18.4.1 Noting that earth science has an important place in high school curricula, TAG RECOMMENDED that Techsec should assist, within resources available to Techsec, educational authorities in CCOP/SOPAC island member countries in the development of a high school course outline in the Earth Sciences.

18.4.2 The Tonga Adviser suggested that Techsec should be prepared to promote seminars and workshops for teachers. Techsec indicated that they would do so and attempt to find funding for such seminars. The advisers from Western Samoa and Fiji likewise indicated their support for developing an earth science curriculum and teacher training.

18.4.3 The SPREP Representative stated that they could assist Techsec in the area of high school curriculum development and would co-ordinate their assistance with Techsec.

18.4.4 The adviser from the University of New South Wales noted that an AGID/IPSU geoscience teaching workshop is being planned for Madras, India in 1989. He stated that funding for 2 or 3 island country members to attend might be forthcoming.

18.4.5 Techsec informed TAG of lecture contributions by Techsec to a workshop on Ocean Resources Management held in Kiribati and to the Ocean Resources Course conducted at USP.

18.4.6 The US Adviser reported that dia-

logue with the International Geological Congress (IGC) had been established to determine the feasibility of offering training workshops at the IGC in Washington, DC in August 1989. More specific information regarding content and numbers of potential participants was required from Techsec before anything could be finalised. TAG RECOMMENDED that the Training Co-ordinator investigate this matter.

18.4.7 The US Adviser also reported that the Solomon Islands trainee was doing well in his studies at Foothills College in USA and should return to the Solomon Islands by July 1988.

18.4.8 The Solomon Islands Representative thanked USAID for funding their trainee.

18.4.9 The Fiji Representative noted that several offers of training assistance had been received but not acted upon due to lack of personnel available at the time. They wished to express their appreciation for such offers and stated that non-participation in the past does not mean a lack of interest for the future.

18.5 *Other Training*

18.5.1 In response to a request from the USP Adviser for closer cooperation between CCOP/SOPAC and USP, Techsec indicated that they agreed in principle to become more involved in the teaching of earth science courses at USP.

18.5.2 In lieu of a formal cooperative lecture programme between USP and CCOP/SOPAC as proposed by the USP Adviser, TAG suggested the formation in Fiji of a geological association of the South Pacific to bring together both transient and local expertise available in the region.

18.5.3 TAG also suggested that the USP

staff might periodically approach CCOP/SOPAC on the possibility of involving university students in current work activities.

18.5.4 Regarding the request for the production of a register of earth scientists working in the South Pacific region, TAG was of the view that this item was not in the mandate of CCOP/SOPAC.

18.5.5 TAG RECOMMENDED that USP take the lead in any cooperative association between USP and Techsec and, in particular, ensure involvement of IOC-TEMA in relevant areas.

18.5.6 The SPREP Representative reported that a two week multi-disciplinary inter-agency training course on Coastal Resource Management Planning had been held in Tonga during May 1987 and again in Federated States of Micronesia during July 1987.

18.5.7 The Tonga Delegation thanked SPREP for this training course but noted that there had been overlap with the CCOP/SOPAC Coastal Processes Workshop held in Lae, PNG, prior to the 1987 Annual Session.

18.5.8 TAG expressed regret that the overlap had occurred and that this SPREP course had not been co-ordinated with Techsec, and RECOMMENDED that future SPREP courses be co-ordinated with the CCOP/SOPAC training activity through Techsec.

18.5.9 The SPREP Representative informed TAG that a SPREP sponsored course would be held in Vanuatu in February 1988 and would be available to island member countries upon request to SPREP. In late 1988 a regional training course on Environmental Impact Assessment (EIA) would also be sponsored by SPREP, and be followed by a series of in-country EIA workshops in 1989 and 1990.

18.5.10 The IOC Representative also

informed TAG of the Visiting Scientists Programme at the International Tsunami Information Centre in Honolulu which is operated with IOC assistance. Two selected scientists from the Pacific received 4 to 6 weeks comprehensive training at the ITIC and the Pacific Tsunami Warning Centre. The IOC seeks nominations of scientists for this programme through its Circular Letter every year.

18.5.11 The Western Samoa Adviser reported that a six-month satellite training course is available from UNEP/UNITAR for Landsat and SPOT image data analysis and interpretation.

18.5.12 The IOC Representative informed TAG of the availability of educational material related to tsunamis and also of the library of films, videos and slides on tsunamis which are maintained at the International Tsunami Information Centre (ITIC) in Honolulu. He suggested that the films, videos, and slides on tsunamis could be borrowed by Techsec for loan to member countries on request.

18.6 *Meetings*

18.6.1 The PNG Adviser reported on the great success of the PacRim Congress held in Australia with over 1000 delegates in attendance.

18.6.2 TAG noted with regret however, the general lack of funding for island nationals to attend the PacRim Congress, and asked Techsec to write to the organisation emphasising the importance of such funding for future PacRim Congresses.

18.6.3 The following meetings were identified by TAG as being of interest to the region:

- the 6th International Coral Reef Symposium to be held in Townsville, Australia, 8-12 August 1988;

- the Association of South Pacific Environmental Institutions meeting to be held in Noumea, New Caledonia, 20-24 June 1988, followed by an inter-governmental meeting June 27-July 1 to develop the 1989-1990 SPREP work programme;
- Seismic Probing of the Continents and their Margins to be held in Canberra, Australia, 6-8 July 1988;
- the Ninth World Conference on Earthquake Engineering to be held in Tokyo/Kyoto, Japan, 2-9 August 1988;
- the 28th International Geological Congress to be held in Washington DC, USA, 9-19 July 1989;
- the 4th International Symposium on Analysis of Seismicity and Seismic Risk to be held in Bechyni, Czechoslovakia, 4-9 September 1989.

18.6.4 The UN Law of the Sea Representative indicated that a UN-IOC group of experts meeting will be held in New York in the fall of 1988 to discuss marine scientific research within national jurisdiction. She indicated that attendance at the meeting would be by invitation only and that she would ascertain whether a representative from the CCOP/SOPAC region would be invited to attend.

18.6.5 TAG RECOMMENDED that a technical expert be sent from Techsec if invited.

DATA MANAGEMENT (Agenda Item 19)

19.1 Techsec reported that the computer facilities have been completed with the purchase of a digitizer, a laser printer, and expansion of the hard disk memory to 250 megabytes as well as software for contouring and statistics. The marine geophysical database (MAGEONC) is now fully operational and more than 50 cruises had been incorporated. The 1983 CCOP/SOPAC Bathymetric Map had been digitized and will be

used to develop a digital bathymetric data bank. The Data Manager had visited Western Samoa, Tonga and Guam to discuss their needs for data management and to formalise their priorities in respect to future developments at Techsec. There was a need to develop regional and international networks with organisations involved in marine information exchange. The Data Manager attended, as observer, a meeting held in March 1987 to establish a Pacific Island Marine Regional Information System. The Data Manager also attended the 12th International Data Exchange Working Committee meeting in Moscow, December 1986.

19.2 TAG was informed that the Data Manager had met with BMR in Canberra in March 1987 to discuss the location and possibility of storage of member country magnetic tapes.

19.3 TAG noted with gratitude the offer of BMR to house marine magnetic tapes from the island member countries. These would be made available for copying by outside organisations on conditions to be agreed with Techsec and the member countries concerned. The details will be arranged between Techsec and BMR, probably along the lines of the proposal to the Australian National Archives who are unable to store non-Australian data (except for PNG). TAG agreed that Techsec should discuss with BMR the possibility of a provision being made for seismic data compaction.

19.4 TAG RECOMMENDED that the island countries should now take action to obtain copies of data held by petroleum companies.

19.5 Techsec reported that the EEC had been asked to provide funding as soon as possible (expected to be early 1989) for an IBM PC compatible system for each island member

country which is a member of the ACP countries. This would consist of a hard disk drive, monitor, printer, peripherals, and software. Training in the use of the equipment would be given at Techsec.

19.6 The Data Manager informed TAG that no on-line network existed in the region at present, except for the USP network which is for its own purposes.

19.7 Techsec noted that following an information survey of the needs of member countries for SPOT imagery to be used in establishing baselines, a total of at least 70 images had been identified. An archive of SPOT images will be established at Techsec as images are received.

19.8 The SPREP Representative noted that their Natural Resource Data Bank project will commence with a Solomon Islands pilot project designed to be compatible with the UNEP Global Resource Inventory Database (GRID) system.

TECHNICAL INFORMATION (Agenda Item 20)

20.1 *Publications*

20.1.1 TAG was informed that a new post of Technical Editor had been established at Techsec with funding from New Zealand. A list of publications and reports produced by Techsec during the last 12 months were presented. Techsec has also produced a detailed description of CCOP/SOPAC activities for use in EEC funding documents and a Five Year Conceptual Programme. Funding proposals for future support from ICOD and New Zealand had also been prepared. Techsec will introduce a Contribution Report series which will be circulated as a list with the Newsletter.

20.1.2 TAG RECOMMENDED that a col-

lection of papers detailing the scientific results of the RV Natsushima Cruise to the Lau-Tonga Area be published together in the CCOP/SOPAC Technical Bulletin Series and that the cruise leaders should be the editors of such a bulletin.

20.1.3 TAG also noted that the papers given at the Coastal Processes Workshop in Lae were planned to be published as a bulletin. The IOC Representative indicated that IOC would be willing to share in the costs of publishing this bulletin.

20.1.4 As it was often difficult to find funds for publishing results, TAG RECOMMENDED that all future cruises should attempt to provide sufficient funding to cover the cost of publication of the results.

20.2 *Library*

20.2.1 Techsec reported that the library had been shifted to more spacious quarters in the new Techsec building. Funding is being sought to assist with the reorganisation of the library and its expansion. The library will be developed as a small specialist collection supplementing the USP library and not duplicating it.

EQUIPMENT AND TECHNIQUES (Agenda Item 21)

21.1 *New Equipment*

21.1.1 The UK Adviser reported that geological mapping of the Offshore Designated Area around the UK landmass by the British Geological Survey had led to the development of various pieces of equipment for sea bottom survey and sampling. These included gravity corers, vibrocorers, various rock drills, and shallow water sonar and seismic instruments, details of which had been sent to Techsec. Deep-water equipment developments had included the Deep Tow

Boomer/Sparker which now operates in water up to 2000 m deep, producing high-resolution/shallow penetration (0.25-1.5 m/75-100 msec.) profiling of the seabed, and can be used in conjunction with GLORIA type wide swath mapping to provide details of the seafloor. Under development at present is a modification to the casing of the micro-processor control unit of the BGS Rockdrill/vibrocoring unit which will extend its use from its current 500 m to 2000 m water depth; this modification will be completed by early 1988.

21.1.2 The UK Adviser also pointed out that a new instrument, PUPPI (Pop-Up-Pore-Pressure-Instrument) has been developed at IOS. The PUPPI measures differential pore-pressures in sediments and hence provides crucial data on the in-situ state of stress. Likely areas of potential sediment instability could be surveyed and monitored using this PUPPI technology. This new equipment would have applications in coastal and offshore construction projects and in understanding the process of local earthquake-induced tsunamis.

21.1.3 In addition to well known instruments, such as GLORIA, IOS has a wide range of equipment and expertise in oceanography of which TAG was informed.

21.1.4 The French Adviser, informed TAG that a new ship, NO Alis, is on the way to Noumea where it will be based. The vessel is 28 metres long with a spacious afterdeck. It has bow thrusters to aid in manoeuvring, a 5-tonne A-frame and two winches, one with a capacity of 1800 m of 18 mm diameter cable, the other with a capacity of 4000 m of 13 mm diameter cable. The engine has 800 horsepower with ample electrical power supply. In addition to the classical "Transit" satellite navigation system, the vessel is equipped with the new "Global Positioning System".

21.1.5 TAG, recognising a shortage in Techsec of nearshore survey equipment including high-resolution seismic sources and recorders at present available to an ever increasing number of technical staff, RECOMMENDED Techsec explore every avenue available to identify funds and purchase such nearshore survey this equipment as soon as possible.

21.2 *New Techniques*

21.2.1 TAG was informed that software for processing satellite imagery on IBM PC compatibles was now available commercially.

21.2.2 TAG was informed that IFREMER was at present improving shallow and deep water seismic recording systems. For shallow waters the improvements in geophysical methods had concentrated on detailed cartography of the coastal zones. A logging system (ADOP) allowed simultaneous control of several pieces of equipment including positioning, high-resolution digital bathymetry, a new generation of side-scan sonar, and very high-resolution seismic reflection. For deep waters the analogue high-speed seismic system on the RV Jean Charcot will be replaced by a digital system.

REGIONAL COORDINATION (Agenda Item 22)

22.1 *Regional Projects*

22.1.1 The advisers from Japan and France described the joint Japan-France-CCOP/SOPAC research programme on the rift system in the Pacific Ocean (STARMER). For this programme, Science and Technology Agency of Japan (STA) will provide RV Kaiyo, the 2000 m class submersible Shinkai 2000, (a 6000 m class submersible to be completed in 1989) the 3000 m class remotely-operated vehicle Dolphin 3K, and other

research vessels. IFREMER will provide the submersible Nautille with mothership Nadir in 1989. Areas to be covered by STARMER would be rifts in and around the North Fiji Basin (Phase 1), followed by studies of other backarc basins such as the Lau, Bismarck, and Woodlark Basins (Phase 2). The timetable for the project is: Phase 1 - 1987 FY site survey, 1988 FY diving and site survey, and 1989 diving; Phase 2 - 1990 FY and 1991 FY continuing research.

22.1.2 The ODP Adviser described the Ocean Drilling Program and facilities on the ODP drilling vessel Joides Resolution. The vessel is a dynamically positioned drillship with the capability of handling a drillstring up to 9000 m in length in 8000 m of water. The Adviser emphasised that ODP drill sites must meet long-term scientific goals and site selection is carried out only within the JOIDES organisational structure.

22.1.3 The ODP Adviser notified TAG that the DV Joides Resolution will be in the CCOP/SOPAC and adjacent regions from October 1989 into 1990. Three drilling legs, each of two months duration, are being planned. They are :

- Northeast Australian Margin (Sea level, Environmental, and Tectonics (SET) objectives) - supported by the Sediments and Ocean History Panel;
- Vanuatu (Collision subduction tectonics in the d'Entrecasteaux Fracture Zone/Santo fore-arc area, and in the Aoba Basin) - supported by the Tectonics Panel;
- Lau-Tonga (Evolution of a back-arc basin, including site 3 on the Tonga Platform and sites 2 and 7 near 18° 45'N) - promoted by the Lithosphere Panel.

The 1990 schedule will be finalised by the ODP Planning Committee in late 1988.

22.1.4 TAG, noting the high scientific value of the Ocean Drilling Program, has

great interest in seeing drilling done in the South Pacific as soon as possible, and RECOMMENDED that links be established between CCOP/SOPAC and ODP in order to support drilling plans in the South Pacific.

22.1.5 The Hawaii Institute of Geophysics (HIG) Adviser reported on the status of Tripartite II investigations in PNG, concerning the mineral potential of the Manus Basin and the assessment of volcanic hazards in the Rabaul Caldera. All objectives of the cruise as defined in the Tripartite Agreement and reported at the 15th Session of CCOP/SOPAC had now been satisfied.

22.1.6 The US Adviser informed TAG that there was a co-ordinated effort underway to plan submersible dives in the Southwest Pacific. The ORSTOM-IFREMER and HURL (Hawaiian Underwater Research Laboratory) groups are jointly planning submersible dives in Vanuatu and Tonga. Approximate dates for the French submersible Nautille to dive in the SOPAC region is 1989, while the HURL submersibles Makali'i and Pisces V are being considered for diving in the region sometime in late 1989-early 1990. During October 1987 HURL will review proposals for diving in PNG, Vanuatu, and Tonga and diving plans should be finalised by late 1988.

22.1.7 TAG, noting with interest the different objectives of the diving proposals and the involvement of several international partners in such programmes, RECOMMENDED that CCOP/SOPAC support these initiatives.

22.1.8 TAG was informed that SPREP is co-ordinating the task teams who are preparing Pacific Region Reports on "The State of the Marine Environment" (part of GESAMP global report), and "The Effects of Climatic Change and Sea-level Rise" (part of UNEP global report). SPREP continues to partly

support ORSTOM in open-ocean oceanographic research.

22.1.9 As a result of discussions on CCOP/SOPAC Regional Projects TAG RECOMMENDED that technical advisers keep Techsec informed of work being planned, work completed, and the results and publications produced of activities which relate to or meet the objectives of any of the Regional Projects in the CCOP/SOPAC Work Programme.

22.1.10 TAG also RECOMMENDED that Papua New Guinea, as a member of CCOP/EA, keep Techsec informed of cruises sponsored by CCOP/EA planned for PNG waters.

22.1.11 TAG was informed of the IFREMER programme for submersible dives in the South Pacific which at present is as follows : November-December 1988 - submersible Nautile with mothership RV Nadir will dive along the New Hebrides collision/subduction zone in areas defined by the SEAPSO project (SUBPSO 1); December, 1988 - submersible Cyana with mothership RV Le Suroit will study volcanism and hydrothermal deposits near Tahiti (TEAHITIA); 1989 - dives to study cobalt-rich crusts in French Polynesia (NODCO 3); possibly in 1989 - dives in the back-arc troughs east of the New Hebrides Arc.

22.1.12 TAG was informed of three dive programmes which may possibly occur in 1989 : the STARMER project in the North Fiji Basin in conjunction with Japan; a French-FRG project in the Lau Basin studying hydrothermal deposits on the Valu Fa Ridge; and ORSTOM programmes to study collision tectonism where the Louisville Ridge meets the Tonga Arc/Trench System and to investigate the back-arc troughs east of the New Hebrides Arc.

22.1.13 The UK Adviser informed TAG that

final plans and a timetable for the RRS Charles Darwin in the South Pacific had not yet been completed because of the possibility of including CCOP/SOPAC proposals in the programme.

22.1.14 TAG was informed that plans for a cruise by the RV Thomas Washington in Tonga waters during 1988 were not yet finalised.

22.1.15 TAG was informed that funds had been requested from the EEC under Lome III for marine surveys and RECOMMENDED that Techsec approach the relevant authorities in France and FRG to explore the use of Lome III funds for joint cruises on French and FRG research vessels.

OTHER MATTERS (Agenda Item 23)

23.1 *Law of the Sea*

23.1.1 The adviser from the United Nations Office for Ocean Affairs and Law of the Sea informed TAG that as of October 1987, 34 nations had ratified the United Nations Convention on the Law of the Sea, and that a total of 60 nations must ratify or accede to the Convention to put it into force. Another two to three years are expected to pass for this to take place. Of great interest to CCOP/SOPAC member nations is that the comprehensive Law of the Sea defines Exclusive Economic Zones (EEZs) as well as Archipelagic Waters. So far 76 nations have enacted EEZ legislation while another 20 have enacted both 200-mile fishery zones and continental shelf legislation. To date one country (India) has been granted an exclusive right to an exploration area, while three other nations (France, Japan and the USSR) will also be registered in 1987 with the United Nations as "pioneer investors".

23.1.2 The UN Adviser informed TAG, following a query by Tonga as to whether there were provisions in the LOS Convention on

nuclear waste and pollution in the international area, that there were many provisions governing dumping, waste disposal, and pollution of the marine environment. In addition, TAG was informed that there are other international conventions dealing with specific environmental topics.

23.1.3 The USA Adviser informed TAG that the United States Government had not signed the LOS Convention nor requested any mining licences under the UN system because the US objects to the seabed mining provisions of the Convention.

23.1.4 TAG was pleased to note that it was planned for an officer of the ESCAP Marine Affairs Programme to undertake a fact-finding mission to selected countries of the South Pacific on Law of the Sea and related matters early in 1988.

D. FORMULATION OF PLANS FOR FUTURE WORK

Long-term Planning (Agenda Item 24)

Five-year Conceptual Programme

24.1 TAG was presented with a document titled "CCOP/SOPAC Conceptual Work Programme for 1988-1992" prepared by Techsec. TAG commended Techsec on the report and RECOMMENDED it be updated before the next Annual Session to reflect the greater emphasis being placed on nearshore and coastal projects as reflected by the recommendations of the 1987 CCOP/SOPAC Coastal Processes Workshop and the current priorities of the member countries. The Tonga Adviser suggested some additional modifications and it was agreed these also be incorporated into the next revision.

COUNTRY WORK PLANS (Agenda Item 25)

25.1 New Country Projects

25.1.1 TAG RECOMMENDED the following new projects be added to the CCOP/SOPAC Work Programme:

- CCSP/CK.9 : Management of Cook Islands data relevant to CCOP/SOPAC Work Programme activities;
- CCSP/KI.7 : Management of Kiribati data relevant to CCOP/SOPAC Work Programme activities;
- CCSP/KI.8 : Offshore seabed mapping in the Kiribati EEZ;
- CCSP/WS.11 : Coastal and nearshore mapping in Western Samoa;
- CCSP/WS.12 : Assessment of sand and gravel deposits in nearshore areas of Western Samoa for construction materials and landfill;
- CCSP/REG.41: Long-range swath mapping in Southwest Pacific offshore areas.

25.2 Formulation of 1988 Work List

25.2.1 TAG was informed of each member's requirements for work to be carried out or co-ordinated by Techsec in their country's waters and the 1988 Work List (Annex IV), listing these requirements, was subsequently compiled.

25.2.2 TAG was informed of the need to rapidly survey in detail sites where Corallium was known to occur and noted that many of these sites were in remote areas which would be difficult and costly to survey.

25.2.3 TAG noted that both projects SI.2 (Evaluation of the hydrocarbon potential of the Central Solomons Trough (the Slot area) and Manning Strait) and VA.2 (To collate all data relevant to hydrocarbon potential in Vanuatu and to carry out and promote further exploration) would be addressed jointly by Techsec and the Tripartite Cruise Programme partners.

25.2.4 TAG noted that additional equipment was needed for the wave energy programme and RECOMMENDED that the forthcoming PEDP meeting, scheduled for early 1988 in Tonga, be advised of this need.

1988 REGIONAL WORK PLAN (Agenda Item 26)

26.1 TAG was informed of cruises in progress or being planned which would contribute to Regional Projects of the CCOP/SOPAC Work Programme. Annex III (of Part 1, this volume) summarises these cruises.

26.2 TAG was informed of plans to conduct a joint submersible-dive programme by STA (Japan) and IFREMER (France). Site surveys would be made by RV Kaiyo in 1987, and 8 dives in the southern rift in the North Fiji Basin by the submersible Nautila are planned for early 1989. This programme would be continued for at least 3 years, and probably last 5 years, and would include site surveys and dives in the South Pacific.

26.3 TAG was informed of tentative proposals for RRS Charles Darwin cruises in the South Pacific, including work using the GLORIA mapping system. Recommendations for work on a CCOP/SOPAC cruise on this vessel are presented as Annex II (of Part 1, this volume).

E. ADOPTION OF TAG REPORT AND CLOSURE

Adoption of TAG Report (Agenda Item 27)

27.1 TAG reviewed the draft report of the TAG session and, subject to changes made, adopted it on 20 October 1988 as its report for the 16th Session.

CLOSURE OF TAG (Agenda Item 28)

28.1 TAG congratulated Dr Don Mallick for a very successful TAG session and thanked him for his excellent services as Chairman. TAG having been informed that this would be the last Annual Session the Chairman would attend representing his country as Technical Adviser, noted that his presence would be sincerely missed, thanked him for the contribution he had made to TAG in recent years, and wished him well in his new job.

28.2 The Chairman of TAG, in closing the TAG session, extended his appreciation to fellow TAG members for their kind words and said he regretted that this was his last session. On behalf of TAG he thanked the government of Papua New Guinea for hosting the session, for their warm hospitality, and for the efficient organisation of the session, due largely to staff of the Geological Survey of PNG supported by Techsec staff.

ANNEX II

REPORT OF TAG WORKING COMMITTEE ON A PROPOSED CHARLES DARWIN CRUISE IN 1988

PRELIMINARY PROPOSAL FOR A CCOP/SOPAC CRUISE ON RRS CHARLES DARWIN IN 1988

This proposal is for approximately 30 days of work by RRS Charles Darwin on behalf of CCOP/SOPAC using EEC Lome III funds. The preferred option is 11 days of MCS and 19 days of GLORIA work, but if this were logistically and economically impossible, a full GLORIA programme might be substituted. Hence the GLORIA suggestions exceed the possible thirty days. NERC/Marconi would put together a logistically sound programme for consideration by the CCOP/SOPAC Technical Secretariat. The detailed suggestions are listed below:

MCS PROFILING

1. Ndende-Vanikolo Basins of Solomon Islands and Vanuatu. 5 days of MCS programme (4 days profiling), complementary to RV S.P. Lee data, on platform region between 9°S and 13.5°S, and approximately 166° and 167.5°E. Water depths generally range from 1000 m to 2000 m.
2. Lau Ridge of Fiji. 6 days of MCS programme (5 days of profiling), complementary to RV S.P. Lee data, on ridge between 19.5°S and 24.5°S, and approximately 178° and 179°E. Water depths generally range from 500 to 2,000 m.

GLORIA MAPPING

1. Western Woodlark Basin of Papua New Guinea. Water depths range from 500 to

- 3500 m. Extending to maximum area 9-11.5°S, 151-155°E.
2. Western Vanuatu along New Hebrides Trench at collision zone of D'Entrecasteaux Ridge and New Hebrides Arc. Water depths range from 1000 to 8000 m. Within area 13-17.5°S, 165.5-167°E.
3. Central Basin region of Vanuatu. Water depths range from 2000 to 3000 m. Within area 14.5-16°S, 167-168°E.
4. Eastern Vanuatu (back-arc spreading centres and Hazel Home Fracture Zone). Water depths range from 2000 m to 4000 m. Within area 12.5-16°S, 168-169°E.
5. North Fiji Fracture Zone. Water depths range from 500 to 3000 m. Within area 14.5-16.5°S, 176.5°E-173.5°W.
6. Eastern Lau Basin of Tonga. Water depths range from 2000 to 2500 m. Within area 15-21.5°S, 174-176.5°W.
7. Samoa Basin transit, area to be determined.
8. North Penrhyn Basin manganese nodule area in Cook Islands waters. Water depths approximately 5000 m. Within area 15-16.5°S, 158.5-160.5°W.
9. South Penrhyn Basin manganese nodule area in Cook Islands waters. Water depth approximately 5000 m. Within area 15-16.5°S, 158.5-160.5°W.
10. Eastern Manihiki Plateau mudvolcano swath between (8) and (9) above.
11. Western side of Central Line Islands (Kiribati). One swath from Fanning Island to Northern Cook Islands. Water depths

range from 2000 m to 5000 m.
12. Gilbert Islands (Kiribati) and Tuvalu

island chains. One swath from 7°N to 10°S
on side of island chain to be determined.

ANNEX III

CURRENT AND PROPOSED CRUISES IN THE CCOP/SOPAC REGION AS AT OCTOBER 1987

Date	Vessel	Organisation(s)	Area	Programme
Aug-Oct. 1987	Hakurei Maru No. 2	Japan-CCOP/SOPAC	Near Phoenix Is, Kiribati	Mn nodules and Co-rich crusts
Nov. 1987-Jan. 1988	Kaiyo	STA (Japan) - IFREMER (France) STARMER prog.	South rift, North Fiji Basin	Site surveys for submersible dives on vents (Seabeam)
Jan-Feb. 1988	Franklin and Cook	CSIRO (Aust.)-Canada, PACKLARK prog.	W. Woodlark Basin, Goodenough Bay	Back-arc spreading and hydrothermal vent studies
May-Oct. 1988	Charles Darwin	NERC (UK: IOS and others)	1. Equatorial 2. Lau Basin 3. Valu Fa Ridge	1. Physical oceanography 2. ODP site surveys (GLORIA) 3. Geophysics
July-Dec. 1988	Thomas Washington	Scripps Instn of Oceanography	1. Ontong Java Plat. 2. Lau Basin	1. ODP site surveys 2. Vent studies/ODP surveys
Aug-Oct. 1988	Hakurei Maru No. 2	Japan-CCOP/SOPAC	Ellice and Central Pacific basins, Tuvalu	Mn nodules and Co-rich crusts
Dec. 1988-Jan. 1989	Le Suroit/Cyana	IGP (France)	French Polynesia	Submersible dives on active volcanoes
Early 1989	Nadir/Nautile	IFREMER (France)-BGR (FRG)	New Hebrides Trench	Subduction processes study, ODP site surveys
1989	Nadir/Nautile	STA (Japan)-IFREMER (France) STARMER prog.	Rift system, North Fiji Basin	Submersible dives on active vents

ANNEX IV

CCOP/SOPAC WORK LIST FOR 1988

(WORK REQUESTED BY MEMBER COUNTRIES
FOR IMPLEMENTATION IN 1988)

A : LISTING BY ACTIVITY

NEARSHORE MINERALS

Construction Minerals

- KI.6 Investigation of nearshore areas for potential sand resources (in the Tarawa area).
- TG.6 Continued assessment of sand and gravel deposits, Vava'u, Tonga.
- TU.2 Investigations for nearshore sand resources in Funafuti.
- WS.5 Nearshore surveys for constructional materials, on Savai'i Island (1st priority) and Upolu (2nd priority)

Detrital Minerals

- FJ.18 Detrital mineral survey, Ba Delta.

Insular Phosphates

- CK.2 Manihiki and Manuae Island phosphate drilling programme.
- TU.9 Map Nukufetau lagoon in preparation for lagoonal phosphate drilling.

Precious Coral

- TU.1 Reconnaissance dredging for deep-water precious corals.
- KI.3 1. Reconnaissance dredging for deep-water precious corals in the Gilbert and Line Islands.
2. Investigate the possibility of using a submersible to study the extent, qual-

ity, and physical and oceanographic environment of a precious coral bed in Kiribati.

- FJ.20 Review bathymetric data and reconnaissance dredging for intermediate water-depth, deepwater precious corals.

Other

- TG.5 Offshore surficial sediment surveys in preparation for geochemical core collection in 'Eua Channel (see Hydrocarbon, TG.5, task 7).

HYDROCARBONS

- FJ.1 1. Analyse kerogen types, vitrinite reflectance, and thermal alteration indices in samples collected at MRD;
2. Perform rock-eval pyrolysis on unweathered material (samples to be collected by MRD);
3. Assist MRD scientists on computer modelling of subsidence and geothermal-gradient histories of sedimentary basins;
4. Acquire new seismic data on the Lau Ridge area and assess the hydrocarbon prospectivity of the Lau Ridge;
5. Faunal analysis and determination of relevant age-ranges of enclosing sediments with paleo- environmental

- implications (Micro-paleontologist to work in co-operation with MRD geologists);
6. Review gravity and magnetic data from offshore exploration licenses;
 7. Acquire infill seismic, gravity, magnetic and refraction data in marginal and deepwater basins.
- PN.5 1. Provide one petroleum geologist and one petroleum geophysicist on an advisory basis to work in Port Moresby (Estimated a total of six man weeks);
2. Provide training at Techsec for a national geophysicist or geologist (Estimated six man weeks of training).
- SI.10 1. Visit of one petroleum geologist and one petroleum geophysicist to Honiara to assess data and work requirements;
2. Identify and reprocess seismic data as necessary;
 3. Assess the hydrocarbon prospectivity of Iron Bottom Sound;
 4. Analyse samples for source rock potential;
 5. Produce a brochure of hydrocarbon prospects to be presented to third parties;
 6. Provide training at Techsec for a national geophysicist (Estimated six man weeks);
 7. Acquire new seismic data in the Vanikoro Basin and provide an interpretation of the data.
- TG.5 1. Magnetometer survey of the island groups of Nomuka and Ha'apai;
2. Reprocess approximately 1,000 kilometres of seismic data from the 'Eua Channel and the Tonga Ridge, south of Tongatapu;
 3. Construct composite base maps containing track plots or shotpoint locations for all cruises relevant to hydrocarbon exploration;
 4. Complete report of hydrocarbon potential, including integration of reprocessed seismic data and acquired magnetometer data;
5. Provide training at Techsec for national geologists (Estimated six man weeks);
 6. Prepare a brochure of hydrocarbon prospects for presentation to third parties;
 7. Geochemical survey of 'Eua Channel: preliminary high resolution seismic survey with trial coring exercise.
- VA.2 1. Visit of one petroleum geologist and one petroleum geophysicist to Port Vila to assess data and discuss work requirements;
2. Reprocess selected seismic data if warranted;
 3. Prepare technical review document of the hydrocarbon potential of Vanuatu;
 4. Prepare descriptive brochure of Vanuatu and its geology for distribution to third parties;
 5. Assess source rock potential of samples collected by a shallow drilling programme;

OFFSHORE MINERALS

- FJ.16 Cooperate with and coordinate the following cruises in Fiji waters:
- (a) UK-NERC programme for GLORIA coverage of proposed ODP sites in Lau Basin;
 - (b) Cambridge University E-M programme on Charles Darwin in Lau Basin;
 - (c) French-Japanese programme in North Fiji Basin on Kaiyo, for submersible and ODP site surveys;
 - (d) Scripps programme on hydrothermal vents in Lau Basin on Thomas Washington.

- KI.2 Assess and assist with interpretation of reports on scientific results and economic evaluation of the Hakurei Maru No. 2 cruise to Phoenix Islands area.
 PN.8 (a) Coordinate PACLARK 2 expedition in western Woodlark Basin;
 (b) Interpret and evaluate seafloor photographs taken along Manus Basin spreading centre during Moana Wave Tripartite cruise.
 TG.4 Coordinate and cooperate with proposed work as follows:
 (a) UK-NERC GLORIA coverage of proposed ODP sites in Lau Basin on Charles Darwin;
 (b) Cambridge University E-M programme in Lau Basin on Charles Darwin;
 (c) Scripps programme on hydrothermal deposits in Lau Basin on Thomas Washington.
 TU.4/5 Coordinate with Japanese the planning for Hakurei Maru No.2 cruise in late 1988 to survey for manganese nodules and cobalt-rich crusts.
 VA.1 Cooperate with and coordinate the Kaiyo cruise to survey sites for ODP and submersible in North Fiji Basin.

COASTAL DEVELOPMENT

Coastal Engineering

- CK.4 1. Ground truth study of SPOT image of Aitutaki Lagoon to assess effects of Cyclone Sally.
 GM.10 1. Continue the development of deep anchoring systems for location upon seamounts;
 2. Conduct current and water quality observations on reefs and seamounts.
 KI.4 1. Complete stable-beach site study in Northern Tarawa and Maiana - evaluate potential hotel sites for erosion hazard, position of fresh water lens, degree of palm tree cover, and water transport facilities;
 2. Conduct baseline monitoring study on Betio- Bairiki causeway and borrow pits with respect to hydraulic impact and sediment transport.
 PN.4 1. Characterise the harbour bottom of several proposed wharf sites on Manus Island, using seismic surveys, sediment texture, bottom profiles, and geology - sites to be photographed and where possible foundation characteristics for pile requirements to be established - the wharf facilities to accommodate 200 to 400 ton and smaller vessels;
 2. Survey the bottom characteristics along two proposed submarine pipeline alignments in Joyce Bay - develop sub-surface characteristics of the benthos over the reef face out to a water depth of 10 metres - collect sediment samples and examine the bottom along the outfall alignment between the reef and the diffuser area.
 SI.17 1. Collect baseline oceanographic data from areas west of Lungga Point and assess for a bulk storage fuel depot facility and anchorage;
 2. Conduct baseline hydraulic and water quality study of the waters of Marovo Lagoon including residence period, thermal budget, fresh water input, and general circulation.
 TG.8 1. Conduct a post construction study in the vicinity of Queen Salote Wharf repeating the observations made upon the reef areas prior to dredging and pre-construction of the harbour development;
 2. Continue observations on the bathymetry and tidal exchange in the inner lagoon on Tongatapu - develop baseline hydraulic characteristics of the

lagoon system for future water quality management of the lagoon waters.

- TU.3 1. Develop a monitoring programme and aid in its execution for the proposed pilot borrow pit filling operation - the monitoring to include dredging operation within the lagoon, filling operations in the borrow pit, ground water impacts in adjacent areas, and tail water discharge;

2. Continue the evaluation of cyclone frequency for Funafuti and the seawall protection required for waves resulting from cyclones and strong winds at Funafuti and other atolls in the group;

3. Conduct a preliminary study for the proposed Marine School causeway at Funafuti.

WS.5 1. Conduct a baseline hydraulic study off Matautu Point reef for comparison with the Sogi submarine outfall location for Apia;

2. Conduct a baseline hydraulic survey in Vaiusu Bay in the vicinity of the Vailima Brewery.

Renewable Energy

- CK.8 1. Continue to operate and maintain the Waverider buoy and anchor system currently collecting data on waves from the south and southeast of Rarotonga;
2. Develop onsite capability for processing wave data in real time for use in a warning system by fishermen, local mariners and others, and for use in coastal protection developments;
3. Conduct baseline surveys of reef face and island rise in the vicinity of the operating Waverider buoy.

- TG.7 1. Continue to operate and maintain the Waverider buoy and anchor system currently collecting wave data from the southern exposure of Tongatapu;
2. Develop onsite capability for pro-

cessing wave data in real time for use in a warning system by fishermen, and others, and for use in coastal protection developments;

3. Conduct baseline surveys of reef face and island rise in the vicinity of the operating Waverider buoy.

- TU.6 1. Updating the wave data collected from the Bebe Ridge wave station.

WS.8 1. Locate a site to deploy a Waverider buoy in Western Samoa - determine the general depth and slope of the bottom at the site for designing of the anchoring system;

2. Establish bathymetry of the ocean bottom in the vicinity of the Waverider buoy site;

3. Design anchor system for the site selected, install anchor system, and deploy Waverider buoy.

Geological Hazards

KI.4 1. Continue beach profiling programme on Bairiki and Betio Islands.

PN.14 1. Explore submarine structure and composition of ash deposits of the volcanoes in the Bismarck Arc on a volcanology oriented cruise;

2. Integrate all marine cruise data collected in the last five years in the Rabaul Caldera area - to be done jointly by Techsec and Tripartite partners.

- TU.3 1. Continue of the Funafuti beach profile surveys.

MAPPING

Coastal Mapping

CK.4 1. Ground truth field survey for interpreting SPOT images of Aitutaki Lagoon.

- FJ.18 1. Ground truth surveys;
2. Assistance with acquisition and in-

terpretation of remote sensing data :
SPOT pilot project in northwest Viti
Levu;

3. Assessment of modern remote sensing techniques for cost effectiveness.
- KI.4 1. Betio causeway : acquire SPOT image for monitoring natural changes;
2. Set up a specific archive for SPOT images of Kiribati.
- PN.14 1. Acquire and interpret 2 SPOT images, one each of Rabaul and Central New Britain.
- SI.23 1. Continue SPOT pilot project - acquire and interpret 3 additional images for West Guadalcanal, North Malaita, and Marovo Lagoon.
- TG.12 1. Map coastal areas of Tongatapu and Vava'u using SPOT imagery.
- TU.2/3 1. Map coastal areas of Funafuti using SPOT imagery
- WS.11 1. Map coastal areas of Apia using SPOT imagery.

Offshore Seabed Mapping

- CK.1 GLORIA swath mapping using Charles Darwin over two areas where manganese nodule abundances and mineralisation is high.
- CK.5 Collect GLORIA swath through Samoa Basin to search for seamounts, and a swath along eastern Manihiki Plateau to outline large mud volcanoes.
- FJ.11 GLORIA swath mapping using Charles Darwin to provide coverage of the Fiji Fracture Zone north and east of Fiji.
- KI.8 Bathymetry and seabed mapping of the EEZ of Kiribati.
(a) Collect GLORIA swath along the Gilbert Island chain;
(b) Collect GLORIA swath along the central and south Line Islands Ridge to assist in cobalt-rich crust evaluation.
- PN.11 Coordinate and cooperate with Scripps programme to survey pro-

Scripps programme to survey proposed ODP sites on Ontong Java Plateau on Thomas Washington.

- TG.13 (a) Collect GLORIA swaths in eastern Lau Basin on Charles Darwin.
- TU.8 Collect a GLORIA swath along Tuvalu-Gilbert islands chain on Charles Darwin.
- VA.4 Collect GLORIA swaths in three areas using Charles Darwin :
(a) Central Basin area including north and south Aoba Basin;
(b) East of eastern island belt including junction with Hazel Holme Fracture Zone;
(c) New Hebrides Trench between 15°S and 19°S.

DATA MANAGEMENT

- CK.9 1. Assess needs for data management - Data Manager to visit.
- FJ.21 1. Supply an IBM PC ;
2. Supply PC compatible geological software for modelling, contouring, basin statistics, grain size analysis;
3. Use of MicroVAX II computer for earthquake epicentre location;
4. Continue support for tasks initiated during 1987.
- KI.7 1. Supply an IBM PC computer, peripherals, software, and training.
- SI.22 1. Supply an IBM PC computer, peripherals, software and training;
2. Develop database for geochemical data;
3. Arrange training at Techsec in data management.
- TG.11 1. Supply an IBM PC computer, peripherals, software and training;
2. Arrange training at Techsec in data management;
3. Arrange storage of magnetic tapes.
- TU.7 Data management for Tuvalu to be set up at Techsec.

WS.9 1. Supply an IBM PC computer, peripherals, software, and training.

TRAINING

On the job attachments using Fellowship Scheme

1. On the job attachments to Techsec professional staff for up to 3 months:
 - (a) Nearshore Minerals: Cook Island (1), Papua New Guinea (1), Kiribati (1), W. Samoa (1), Tonga (1).
 - (b) Hydrocarbons: Tonga (2), Solomon Islands (1).
 - (c) Data Management: Fiji (1), W. Samoa (1).

Workshops

1. Coastal Geology Workshop, Guangzhou, China, 21 Nov - 7 Dec (completed)
2. Kuroko Mineralisation Workshop, Suva, February 1988. (organised by ESCAP).
3. Coastal Mapping Workshop, Kiribati, July (2 weeks)
4. Non-Fuel Nearshore Minerals Workshop, Savusavu, Fiji; prior to 17th Session, 10 days, October 1988.
5. Bathymetric Mapping Training, Canberra (2 Months).

Courses

1. Certificate in Earth Science and Marine Geology: Advance Course 1, Earth Materials, and Advanced Course 2, Marine Geology and Earth History. 11 January-1 April (12 weeks).
2. CCOP/SOPAC Scholarship Scheme: One student from Tuvalu and a second from Kiribati (Mr. K. Babo) are being scheduled to commence in February, a first degree course in Geology at James Cook University, Queensland.

Training Assistance

1. Discussions will continue with member country national representatives and Education Department officials with regard to High School Curriculum Development in Earth Science.
2. The Training Co-ordinator is expected to again be an instructor for the Ocean Resources Management Programme at USP. This will include contributions to (i) a workshop in Vanuatu at the end of January, and (ii) lectures/tutorials in the first degree courses UU301 and UU201.

B : LISTING BY COUNTRY

(for full listing see CCOP/SOPAC Work List for 1988

A : Listing by Activity - above)

COOK ISLANDS

Nearshore Minerals

CK.2 phosphate drilling, Manihiki & Manuae

Coastal Development

CK.8 wave data collection, Rarotonga

Mapping

CK.4 SPOT image study, Aitutaki
CK.1 & 5 GLORIA swaths for mapping nodule fields, seamounts, & mineralisation

Data Management

CK.9 assess country needs

FIJI

Nearshore Minerals

- FJ.18 Detrital mineral survey, Ba
- FJ.20 Corallium assessment and reconnaissance dredging

Hydrocarbons

- FJ.1 assist MRD, assess Lau Ridge potential, review geophysical data

Offshore Minerals

- FJ.16 coordinate cruises studying hydrothermal minerals

Mapping

- FJ.19 ground truth surveys, SPOT pilot project, assess remote sensing techniques available
- FJ.11 GLORIA swaths of Fiji Fracture Zone

Data Management

- FJ.21 supply computer, assist MRD seismology programme, continue 1987 work

GUAM

Coastal Development

- GM.10 assist with seamount study

KIRIBATI

Nearshore Minerals

- KI.6 identify sand resources, Tarawa
- KI.3 reconnaissance deepwater dredging for Corallium in Gilbert and Line Islands, assess use of submersible

Offshore Minerals

- KI.2 review results from cruise in Phoenix Is area

Coastal Development

- KI.4 complete stable-beach study in Northern Tarawa and Maiana, monitor Betio-Bairiki causeway

Mapping

- KI.4 SPOT image study Betio-Bairiki
- KI.8 bathymetry and GLORIA swath map-

ping Gilbert & Line Is

Data Management

- KI.7 supply computer

PAPUA NEW GUINEA

Hydrocarbons

- PN.5 provide assistance in Port Moresby & provide training at Techsec

Offshore Minerals

- PN.8 coordinate PACLARK 2 cruise, review Manus Basin seafloor photographs

Coastal Development

- PN.4 harbour surveys Manus Is, seafloor survey of proposed pipeline alignments in Joyce Bay
- PN.14 cruise to study active volcanoes in Bismarck Arc, review work on Rabaul caldera

Mapping

- PN.14 acquire 2 SPOT images covering Rabaul & Central New Britain
- PN.11 coordinate Scripps Ontong Java Plateau cruise

SOLOMON ISLANDS

Hydrocarbons

- SI.10 assess requirements, collect, reprocess, and review data, assess potential of Iron Bottom Sound, study Vanikoro Basin, provide training

Coastal Development

- SI.17 baseline studies of Marovo Lagoon & areas west of Lungga Point

Mapping

- SI.23 acquire SPOT images for West Guadalcanal, North Malaita, & Marovo Lagoon

Data Management

- SI.22 supply computer, develop geochemical database, arrange training

TONGA

Nearshore Minerals

- TG.6 sand & gravel surveys Vava'u
- TG.5 surficial sediment survey in 'Eua Channel

Hydrocarbons

- TG.5 magnetometer surveys off Nomuka and Ha'apai, geochemical survey in 'Eua Channel, reprocess data, promote hydrocarbon potential, provide training

Offshore Minerals

- TG.4 coordinate hydrothermal mineral cruises

Coastal Engineering

- TG.8 monitor developments made at Queen Salote Wharf, continue inner lagoon observations on Tongatapu
- TG.7 continue collecting wave data

Mapping

- TG.12 map coastal areas of Tongatapu & Vava'u using SPOT images
- TG.13 GLORIA swath mapping in eastern Lau Basin

Data Management

- TG.11 supply computer, arrange storage of tapes

TUVALU

Nearshore Minerals

- TU.2 sand resource surveys Funafuti
- TU.9 preparatory work for drilling in Nukufetau Lagoon
- TU.1 dredging for deepwater Corallium

Offshore Minerals

- TU.4 assist cruise planning for Japanese nodule work
- TU.5 assist cruise planning for Japanese crust work

Coastal Development

- TU.3 monitor pilot filling of borrow pits, evaluate cyclone frequency, Marine School causeway study, continue Funafuti beach profiling
- TU.6 update wave data records

Mapping

- TU.2&3 coastal mapping using SPOT images
- TU.8 GLORIA swath mapping of Tuvalu island chain

Data Management

- TU.7 set up system for Tuvalu at Techsec

VANUATU

Hydrocarbons

- VA.2 assess requirements, collect, reprocess, and review data, assess and promote potential of Vanuatu, provide training

Offshore Minerals

- VA.1 coordinate Kaiyo cruise in North Fiji Basin

Mapping

- VA.4 GLORIA swath mapping in trench, Central Basin, & Hazel Home Fracture Zone areas

WESTERN SAMOA

Nearshore Minerals

- WS.5 sand and gravel surveys on Savai'i & Upolu

Coastal Development

- WS.5 baseline studies off Matautu Point & Vaiusu Bay
- WS.8 survey site & deploy Waverider buoy

Mapping

- WS.11 SPOT image mapping of Apia area coast

Data Management

- WS.9 supply computer

ANNEX V : REPORT OF THE TRIPARTITE REVIEW MEETING

Project RAS/86/125
Development of
South Pacific Institutional Capacity
in Marine Minerals and Technology (CCOP/SOPAC)

Introduction

1. The Tripartite Review Meeting was held on 15 October 1987 in Lae, Papua New Guinea.

Attendance

2. The following attended the meeting:

Government Representatives

Mr A. Utanga,	Cook Islands
Mr A. Simpson	Fiji
Mr A. Takaio	Kiribati
Mr R. Moaina (Chairman)	Papua New Guinea
Mr S. Nion	Papua New Guinea
Mr S. Danitofea	Solomon Islands
Mr S. Tongilava	Tonga
Mr S. Helu	Tonga
Mr D. Tappin	Tonga
Mr S. Taafaki	Tuvalu
Mr A. Titimaea	Western Samoa

UNDP Representative

Mr R. Mountain	Deputy Resident Representative, Suva
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ESCAP Representative

Mr L. Machesky	Natural Resources Division
Mr C. Matos	Project Manager RAS/86/125

Technical Secretariat

Mr J. Kotobalavu	Director
Dr L. Kroenke	Senr Technical Advisor
Mr R. Richmond	Senr Technical Advisor
Mr J. Eade	(Rapporteur)

Observers

Mr K. Joyce	Australia
Mr K. Lewis	New Zealand

Opening Statements

3. The Director thanked UNDP on behalf of the Committee for approving 3 million US dollars for CCOP/SOPAC activities for the five years 1987 to 1991.

4. The UNDP representative explained that UNDP wished to give the Committee the opportunity to evaluate the success of the Project in meeting its goals. These were to strengthen the managerial capacity of Techsec, and to provide expertise to evaluate mineral potentials, assist with coastal zone development, improve the technical capabilities at Techsec, and improve the technical capabilities at country level. The representative stated that this project was UNDP's largest Pacific programme and it had received a substantial amount of support in the 15 years UNDP had been providing funding. He stressed that while the long term benefits of the Project were apparent, concern had been expressed that some economic returns must be realised. UNDP support was for development activities and based on the premise that it was possible to identify mineral deposits that could be exploitable within the foreseeable future for the benefit of Pacific Island states. He informed the meeting that UNDP was pleased with the training activity. In relation to the new fields of activity proposed for CCOP/SOPAC he recommended that the Committee

develop or continue collaboration with the UNDP/UNDTCD Water Resources Project and the ESCAP/UNDP Regional Remote Sensing Project, both at USP Suva; the UNDP/ESCAP Pacific Regional Energy Development Programme, and the UNDP/WMO Meteorological Programme based in Nadi, Fiji. He expressed UNDP's appreciation for the substantial amount of work completed by Techsec and the Project and urged the Committee to move toward creating the capacity for nationals to manage their own work programme activities.

5. The ESCAP representative informed the meeting that the representative from the Technical Cooperation Division regretted being unable to attend. The Representative congratulated the Director and his staff for the accomplishments of Techsec. He stated that ESCAP appreciated the support UNDP had given to have the Project Document approved and thanked UNDP for continuing to agree to have the Project Manager act as Deputy Director.

6. The Tonga representative thanked both UNDP and ESCAP on behalf of the Committee for the support they had given CCOP/SOPAC, especially for the funding provided, and stated that the Committee looked forward to future cooperation.

Matters arising from the 1987 Tripartite Review Meeting

7. In response to a query about arrangements for bonding students if UNDP funds were to be used for first degree training, it was stressed that member countries must give nationals the incentive to return home and have jobs available for them in the field of their training. It would be beneficial, furthermore, if arrangements could be made for students to work at Techsec during school vacations as possible.

Review of the Project's Activities and 1987 Work Programme

8. In reviewing the project progress toward achieving its established objectives, the Committee noted that:

- a. Techsec was successfully progressing towards its managerial capacity objective. Policy and procedures manuals were being produced and the recruitment of a Deputy Director had been agreed at this session of the Committee;
- b. Nationals were successfully participating in report writing and other training activities;
- c. The involvement of nationals in Work Programme activities at Techsec was not progressing as fast as desired;
- d. Project outputs were satisfactory except that reports on the collection of baseline data for coastal zone development were being received late and some were too technical and not easily understood by laymen;
- e. The appointment of qualified locally-recruited support staff at Techsec had been implemented but the development of a core of qualified Pacific island nationals in the professional staff category remained to be done;
- f. Satisfactory progress was being made in developing technical capabilities in member countries.

1988 Work Programme

9. The 1988 Work Programme would be developed as a function of the priorities and requirements being established at this 16th Session by the member countries.

Self Execution of Project by CCOP/SOPAC

10. The Committee were informed that the Project evaluation, which would be made early in 1989, would look at the capacity of

Techsec to execute UNDP financial support and that it might be possible to transfer responsibilities from ESCAP to Techsec in mid 1989.

11. As set out in the approved project document for RAS/86/125, an evaluation mission shall be fielded to determine whether the administrative, financial and other management procedures necessary for self execution could be handled by the CCOP/SOPAC Technical Secretariat. ESCAP also expects that the terms of reference for the evaluation would be consulted with all parties concerned at an appropriate time. The issues would be further discussed at the Tripartite Review during the 17th Session of CCOP/SOPAC in 1988.

Other Matters

12. The UNDP representative agreed to take under consideration the Committee's request to extend the Project Manager's contract for a period of up to three months beyond the end of 1988 when his contract expires, noting that if agreed, a reallocation within the existing budget would be required. This would allow the new Deputy Director, who the Committee expects to interview and appoint during the 17th Session, to overlap with the present Project Manager.

13. ESCAP agreed to explore, in conjunction with UNDP, the possibility of recruiting either Associate Experts or UN Volunteers who could be located in those member countries who have the least national technical capacity.

14. ESCAP agreed to approach the Japanese and Swedish governments for assistance with the CCOP/SOPAC training activity, based on priority needs identified by Techsec and member countries.

15. UNDP informed the Committee that the Project Manager's report had been changed

from semi-annual to annual and that the reporting format used in this TPR meeting would be used in future TPR meetings.

16. In response to the matter of the use of project vehicles (which UNDP procedures now require all TPR meetings to review), the Director of Techsec gave an assurance that the vehicles were a vital necessity at Techsec headquarters in meeting the official transportation needs of the professional and technical staff. The vehicles were being intensively used and in accordance with UN regulations

Summary and Conclusions

17. The ESCAP representative offered sincere appreciation to the Director and his staff and to Project Staff for their efforts, and thanked UNDP for its support.

18. The UNDP representative stated that he had enjoyed working with Techsec and noted that the success of the Committee's work would depend on the support given by member countries.

19. The Cook Islands representative offered, on behalf of the member countries, his appreciation for the contribution made by the UN Project. He thanked Mr Cruz Matos, Project Manager, for his considerable efforts in supporting all aspects of the work of CCOP/SOPAC.

20. The Senior Technical Advisor (Mr L. Kroenke) congratulated the member countries, UNDP and Techsec for their professional deportment. He noted that there had been an increase in the competence shown by Techsec and looked forward to seeing the regional technical capacity develop and improve. He stated that he was proud to be associated with this group.

21. The Tonga representative, in closing, expressed appreciation that the group had

reached a sense of maturity and was now working well together. He stressed that the Committee greatly appreciated the services of Mr Cruz Matos and thanked Mr Machesky for his valuable contribution. He concluded by thanking all present for their support.

22. The Director also took the opportunity to express his warm appreciation to Mr Cruz Matos both as Project Manager and as Acting Deputy Director. In this dual capacity, he had

devoted much of his personal time, beyond his immediate responsibilities as Project Manager, in managing and coordinating the CCOP/SOPAC Work Programme, including the onerous task of putting together the 5-year Conceptual Work Programme and the documentation of the submission to the European Commission.

23. The Chairman thanked everyone for attending and closed the meeting.

PART 2 : CCOP/SOPAC WORK PROGRAMME

A. LIST OF PROJECTS (as at October 1987)

AUSTRALIA

- AU. 1 Continental shelf & slope basins
2 Non-basinal areas
3 Offshore metallic deposits

COOK ISLANDS

- CK. 1 Mn nodules
2 Phosphate
3 Precious corals
4 Coastal engineering
5 Bathymetry
6 Clay (DELETED)
7 Co-rich crusts
8 Ocean energy
9 Data management (NEW)
10 Construction materials (NEW)

FIJI

- FJ. 1 Hydrocarbons
2 Data review for relinquished mineral concessions (COMPLETED)
3 (Hydrocarbons W of Yasawas DELETED)
4 Geol/geophys. shallow shelves
5 Phosphate Lau Group
6 Ocean energy
7 Geophysical surveys (COMPLETED)
8 Regional aeromagnetic data (COMPLETED)
9 Seismic refraction Viti Levu & Vanua Levu
10 Bathymetry and sediments Kandavu Passage (COMPLETED)
11 Geol/geophys. N. margin, Fiji Platform
12 Geol/geophys. Suva-Beqa seismic zone
13 (Geol/geophys. S. Viti Levu, DELETED)

- FJ. 14 Detailed aeromagnetic data
15 Position fixing
16 Metalliferous muds/hydrothermal deposits
17 Mn nodules
18 Detrital minerals
19 Coastal engineering
20 Precious corals
21 Data management
22 Island drilling (NEW)
23 Offshore seabed mapping (NEW)

GUAM

- GM. 1 Geol/geophys. data review (OTEC, DELETED)
2 (OTEC, DELETED)
3 Mn nodules/Co-rich crusts
4 Hydrothermal deposits
5 (Precious corals, DELETED)
6 Hydrocarbons
7 Coastal engineering
8 (Deepwater hydrostation, DELETED)
9 (Radiological survey, DELETED)
10 Seamount ecosystems
11 Offshore seabed mapping
12 Geohazard studies

KIRIBATI

- KI. 1 Phosphate
2 Mn nodules
3 Precious corals
4 Coastal engineering
5 Co-rich crusts
6 Construction materials
7 Data management (NEW)
8 Offshore seabed mapping (NEW)

NEW ZEALAND

- NZ 1 Shelf and slope geology
 2 Structure S. end Kermadec Trench
 3 Offshore sedimentary basins
 4 Mafic sands on Western Shelf
 5 Detrital sand and gravel
 6 Chatham Rise phosphorite and glauconite
 7 Gold in shelf sediments

PAPUA NEW GUINEA

- PN. 1 Geol/geophys. outlying islands
 2 Detrital minerals
 3 (Crustal study, DELETED)
 4 Coastal engineering
 5 Hydrocarbon data review
 6 Hydrocarbons Cape Vogel Basin
 7 Hydrocarbons New Ireland Basin
 8 Hydrothermal deposits
 9 Phosphate
 10 Mn nodules N. of Manus Trench
 11 Bathymetry
 12 Precious corals
 13 Industrial minerals
 14 Geohazard studies

SOLOMON ISLANDS

- SI. 1 Geol/geophys. Choiseul to Santa Isabel
 2 Hydrocarbons Slot and Manning Strait
 3 (Geol/geophys. Solomon Sea, DELETED)
 4 Bauxite in Manning Strait to Choiseul
 5 Detrital minerals (gold) N. Guadalcanal
 6 Phosphate
 7 Hydrothermal deposits, active volcanoes
 8 Hydrothermal deposits Vella Lavella

- 9 Bauxite on Indispensable Reefs and Rennell
 10 Hydrocarbons outer islands
 11 (Geol/geophys. Manning Strait, DELETED)
 12 Mn nodules Polkington Trough
 13 (Hydrocarbons Rennel Arc, DELETED)
 14 Precious corals
 15 Bathymetry
 16 Detrital minerals Santa Isabel, Choiseul, Guadalcanal, San Cristobal
 17 Coastal engineering
 18 Clay
 19 Cement materials
 20 Construction materials Honiara Bay
 21 Geol/geochem. Santa Isabel, Malita, Guadalcanal, San Cristobal
 22 Data management
 23 Geohazard studies
 24 Offshore seabed mapping

TONGA

- TG. 1 Mn nodules (COMPLETED)
 2 Phosphate
 3 Precious corals
 4 Hydrothermal deposits
 5 Hydrocarbons
 6 Construction materials
 7 Ocean energy
 8 Coastal engineering
 9 Seismicity/tsunamis
 10 Co-rich crusts
 11 Data management
 12 Coastal & nearshore mapping
 13 Offshore seabed mapping

TUVALU

- TU. 1 Precious corals
 2 Construction materials
 3 Coastal engineering
 4 Mn nodules

- TU. 5 Co-rich crusts
6 Ocean energy
7 Data management
8 Bathymetry
9 Phosphate
10 Training

VANUATU

- VA. 1 Hydrothermal deposits
2 Hydrocarbons
3 Precious corals
4 Bathymetry
5 Clay
6 Coastal development
7 Data management
8 Nearshore geological mapping
9 Offshore seabed mapping
10 Training

WESTERN SAMOA

- WS. 1 Phosphate (COMPLETED)
2 Mn nodules (COMPLETED)
3 (Mn nodules W Samoa Platform, DELETED)
4 Precious corals
5 Coastal engineering
6 Hydrocarbons
7 Co-rich crusts
8 Ocean energy
9 Data management
10 Onshore clay minerals
11 Coastal & nearshore mapping (NEW)
12 Construction materials (NEW)

REGIONAL PROJECTS

- REG 1 Geol/geophys. Coral Sea
2 Geol/geophys. Manus, Solomon, Woodlark Basins
3 Geol/geophys. Melanesian Borderland
4 Geol/geophys. North Fiji Basin
5 Geol/geophys. Lau Basin
6 Deep sea drilling SW Pacific
7 Abyssal sediments SW Pacific Basin

- REG 8 Planktonic sediments South Fiji Basin
9 Geol/geophys. New Caledonia to Solomon Islands
10 Hydrothermal deposits back-arc basins
11 Seamount phosphate
12 Mn nodules Nauru and Ellice Basins
13 Mn nodules Cook Islands - Tuamotu transect
14 Chemical analysis of sediments regional compilation
15 Mn nodules regional data compilation
16 Seismicity SW Pacific
17 Data compilation and management
18 Ocean thermal data
19 (Tectonics Fiji Plateau, DELETED)
20 Lithosphere study SW Pacific
21 Line Islands evolution
22 Mn nodules Central Pacific Basin
23 Mn nodules Marquesas Fracture Zone
24 Tectonic synthesis SW Pacific
25 Geophysical Atlas, SW Pacific
26 Sedimentary basins SW Pacific
27 Carbonate sediments SW Pacific
28 Subduction effects aseismic ridges and plateaus
29 Co-rich crusts SW Pacific
30 Coastal erosion regional review
31 Saline lakes and lagoons SW Pacific
32 Evolution of coral reefs SW Pacific
33 Hydrocarbon source, maturation, entrapment models
34 Evolution of geomorphic terranes Papua New Guinea
35 Pre-Pliocene evolution SW Pacific

REG 36	Hydrothermal deposits & hazards near surface volcanoes	39	Regional information exchange
37	Sediment budgets in lagoons	40	Geophysics Micronesia Trench
38	Island drilling SW Pacific	41	Long range swath mapping S Pacific (NEW)

B : WORK PROGRAMME SUMMARY FOR 1987-1987

The CCOP/SOPAC Work Programme consists of projects, each project identifying a particular target in one country. The Work Programme is defined on Project Data Sheets which are kept on file at the CCOP/SOPAC Technical Secretariat. Changes to the programme and advances made on individual projects are given below under the following headings.

(a) *Proposed, Revised:*

identify those TAG sessions at which these were made; details of project proposals and project revisions are given under the following headings –

BACKGROUND
OBJECTIVES
ECONOMIC TARGET

(b) *Status:*

indicates whether project is: "to be initiated"; "initiated" with appropriate TAG Session identified; "completed"; or "deleted".

(c) *Work completed:*

describing work completed with reference(s) to appropriate reports and publications.

Priority:

The categories of priorities are:

"A" – very important, early performance desirable;
"B" – scientifically and economically important.

AUSTRALIA

AU.1: STUDIES OF THE CONTINENTAL SHELF AND SLOPE BASINS
Priority A

Proposed: 15th Session

Work Completed: Multichannel seismic cruises (a) in the Great Australian Bight, (b) in the Gippsland Basin and off southern New South Wales' coast, and (c) on the Queensland and Marion plateaus and across the intervening Townsville Trough.

AU.2: STUDIES OF NON-BASINAL AREAS
Priority B

Proposed: 15th Session

AU.3: STUDIES OF OFFSHORE METALLIC DEPOSITS
Priority B

Proposed: 15th Session

Work Completed: Phosphate sampling cruise off the New South Wales' coast.

COOK ISLANDS

CK.1: SEABED INVESTIGATIONS FOR
MANGANESE NODULES IN COOK
ISLANDS OCEANIC AREAS
Priority A

Proposed: 2nd Session
Revised: 7th Session
Status: initiated, 3rd Session
Work Completed: detailed surveys of two areas in South Penrhyn Basin by RV Hakurei Maru No.2 (JICA; MMAJ 1987: Ocean resources investigation in the sea area of CCOP/SOPAC Report on the joint basic study for the development of resources (Volume 2) Sea area of Cook Islands. Japan International Cooperation Agency and Metal Mining Agency of Japan. 173 p, 66 figs, 29 tables); A survey by RV Thomas Washington (CRONAN, D.S.; TIFFIN, D.L.; MEADOWS, P.S. 1987: A study of manganese nodules, crusts, and deep-sea sediments in the Northern Cook Islands, Central Line Islands, and adjacent high seas. Cruise report of the Crossgrain Expedition, Leg 3, Papeete, Tahiti to Hilo Hawaii, April 29-June 3, 1987. CCOP/SOPAC Cruise Report 119 : 14 p, 4 figs).

CK.2: DISTRIBUTION AND ECONOMIC
POTENTIAL OF SUBMARINE
PHOSPHATE DEPOSITS IN COOK
ISLANDS
Priority A

Proposed: 4th Session
Revised: 7th Session
Status: initiated, 5th Session
Work Completed: test drilling in Aitutaki Lagoon (RICHMOND, B.; HEIN, J. 1986: Lagoonal drilling at Aitutaki, Cook Islands, 5 May to 1 July 1986. CCOP/SOPAC Preliminary Report 1 : 4 p, 9 figs, 2 tables).

CK.3: INVESTIGATION FOR PRECIOUS
CORALS IN COOK ISLANDS
NEARSHORE WATERS
Priority B

Proposed: 5th Session
Revised: 7th Session
Status: initiated, 6th Session

CK.4: STUDY OF COASTAL AND NEAR-
SHORE PROCESSES TO ASSIST WITH
COASTAL MANAGEMENT PRO-
GRAMMES
Priority A

Proposed: 6th Session
Revised: 7th Session
Status: initiated, 7th Session

CK.5: BATHYMETRIC MAPPING IN COOK
ISLANDS WATERS
Priority A

Proposed: 7th Session
Status: initiated, 9th Session

CK.6: POTENTIAL OF CLAY DEPOSITS FOR
POTTERY, BRICKS OR TILES

Status: deleted, 12th Session

CK.7: INVESTIGATION OF POTENTIAL OF
COBALT-RICH MANGANESE CRUSTS
Priority A

Proposed: 11th Session
Status: initiated, 12th Session
Work Completed: eastern escarpment of Manihiki Plateau surveyed by RV Moana Wave (COULBOURN, W.T.; HILL, P.J. 1987: CCOP/SOPAC Moana Wave cruise 3

(MW87-02) to the territorial waters of Western Samoa, the Cook Islands, and Kiribati. February 5 - March 3, 1987. CCOP/SOPAC Cruise Report 122: 65 p); a survey by RV Thomas Washington (CRONAN, D.S.; TIFFIN, D.L.; MEADOWS, P.S. 1987: A study of manganese nodules, crusts, and deep-sea sediments in the Northern Cook Islands, Central Line Islands, and adjacent high seas. Cruise report of the Crossgrain Expedition, Leg 3, Papeete, Tahiti to Hilo, Hawaii, April 29 - June 3, 1987. CCOP/SOPAC Cruise Report 119: 14 p, 4 figs.).

**CK.8: FEASIBILITY STUDIES FOR
HARNESSING WAVE ENERGY
Priority A**

Proposed: 12th Session
Status: initiated, 15th Session
Work Completed: Waverider Buoy installed off Rarotonga (CARTER, R. 1987: Installation of Waverider Buoy off-shore Rarotonga 21.174 deg S and 159.726 deg W. CCOP/SOPAC Technical Report 80: 10 p, 6 figs.).

**CK.9: DATA MANAGEMENT
Priority A**

NEW PROJECT
BACKGROUND: The growing amount of data on marine minerals and energy, the coastal environment and processes, and related geological and engineering topics in the Cook Islands region demands a data management system which ensures proper storage, cataloging, and retrieval capabilities.
OBJECTIVES: To establish and manage a system which will ensure preservation and easy access to all data relevant to Cook Islands Projects of the CCOP/SOPAC Work Programme.

**CK.10: CONSTRUCTION MATERIALS IN
COOK ISLANDS NEARSHORE AND
COASTAL AREAS
Priority A**

NEW PROJECT
BACKGROUND: Beaches have been the traditional source of sand for a variety of uses. In recent years the growing tourist industry has required beaches be preserved and even increased in size by artificially adding sand from elsewhere. New sources of sand will be needed and an inventory of available sand on beaches, in lagoons, and on shallow shelves outside reef channels will make it possible to identify these new sources. (Work on sand and gravel resources prior to the 16th Session was done under Project CK.4 which is now restricted to Coastal Development work including assistance with coastal management).
OBJECTIVES; To establish an inventory of sand resources on beaches, in lagoons, and on shelves outside reef channels on those islands where current or planned development is or will put a strain on existing resources.
Work Completed: LEWIS, K.B.; UTANGA, A.T.; HILL, P.J.; KINGAN, S.G. 1980: The origin of channel-fill sands and

gravels on an algal-dominated reef terrace, Rarotonga, Cook Islands. *S. Pacif. mar. geol. Notes* 2(1): 1-24.

GAUSS, G.A. 1982: Seabed studies in nearshore areas of Rarotonga, Cook Islands. *S. Pacif. mar. geol. Notes* 2(9): 131-154.

LEWIS, K.B.; HILL, P.J.; UTANGA, A.; BATCHELOR, J.; KINGAN, S. 1978: Rarotonga nearshore survey, 15-26 May 1978. *CCOP/SOPAC Cruise Rep.* 14: 12 p.

GAUSS, G.A. 1981: Rarotonga nearshore survey, Cook Islands, 6-26 April 1981, Cruise CK 81(1). *CCOP/SOPAC Cruise Rep.* 59: 10 p, 2 app.

FIJI

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|---|---|
| FJ.1: ASSESSMENT OF THE HYDRO-CARBON POTENTIAL OF FIJI
Priority A | <p><i>Proposed:</i> 1st Session</p> <p><i>Revised:</i> 10th & 16th Session</p> <p><i>Status:</i> initiated, 7th Session</p> <p><i>Work Completed:</i> Preliminary evaluation of source rocks (JOHNSON, H. 1987: Petroleum source rocks in Viti Levu, a preliminary assessment and general recommendations for sampling. <i>Fiji Mineral Resources Department Note BP48/1.</i> - restricted).</p> |
| FJ.2: REVIEW OF SHALLOW PENETRATION SEISMIC DATA IN RELINQUISHED OFFSHORE CONCESSIONS DETRITAL HEAVY MINERALS | <p><i>Status:</i> completed, 8th Session</p> |
| FJ.3: RE-EVALUATION OF DATA FROM PETROLEUM CONCESSIONS WEST OF THE YASAWA GROUP | <p><i>Status:</i> deleted and transferred to FJ.1, 7th Session</p> |
| FJ.4: OFFSHORE GEOLOGICAL MAPPING OF THE SHALLOW SHELVES IN FIJI
Priority B | <p><i>Proposed:</i> 1st Session</p> <p><i>Revised:</i> 7th & 10th Sessions</p> <p><i>Status:</i> initiated, 6th Session</p> |
| FJ.5: SEABED SAMPLING FOR PHOSPHORITES IN THE LAU GROUP
Priority B | <p><i>Proposed:</i> 1st Session</p> <p><i>Revised:</i> 7th Session</p> <p><i>Status:</i> initiated, 6th Session</p> |
| FJ.6: ASSESSMENT OF ENERGY POTENTIAL FROM MARINE RENEWABLE SOURCES SUCH AS OTEC, WAVES, AND LAGOON CURRENTS
Priority B | <p><i>Proposed:</i> 2nd Session</p> <p><i>Revised:</i> 10th Session</p> <p><i>Status:</i> initiated, 11th Session</p> <p><i>Work Completed:</i> Aerial reconnaissance of potential OTEC sites along the southern Viti Levu coast (HOLMES, R.; EVERINGHAM, I.B.; EDEN, R.A. 1987: Slides taken from a helicopter of the reef and coast, South Viti Levu. Reef and lagoon geology. <i>Fiji Mineral Resources Department Note BP23/28.</i>).</p> |

FJ.7: BATHYMETRIC, GRAVITY AND MAGNETIC SURVEYS IN SELECTED AREAS	<i>Status:</i>	completed, 8th Session
FJ.8: INTERPRETATION OF REGIONAL AEROMAGNETIC DATA	<i>Status:</i>	completed, 8th Session
FJ.9: SEISMIC REFRACTION SURVEY VITI LEVU AND VANUA LEVU Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Work Completed:</i>	2nd Session 7th Session HOLMES, R. 1987: Refraction experiments, SE Viti Levu. <i>Fiji Mineral Resources Department Note BP23/26.</i>
FJ.10: BATHYMETRY AND BOTTOM SAMPLING, KADAVU PASSAGE, SOUTH AND SOUTHWEST OF SUVA	<i>Status:</i>	completed, 8th Session
FJ.11: MARINE GEOLOGICAL AND GEO-PHYSICAL INVESTIGATION OF THE NORTHERN MARGIN OF THE FIJI PLATFORM Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	3rd Session 7th & 10th Sessions initiated, 5th Session
FJ.12: MARINE GEOLOGICAL AND GEO-PHYSICAL STUDIES OF THE SUVA-BEQA SEISMIC ZONE, SOUTH AND SOUTHWEST VITI LEVU Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	3rd Session 7th & 10th Sessions initiated, 5th Session
FJ.13: MARINE GEOLOGY AND GEO-PHYSICS OF AREA SOUTH AND SOUTHWEST OF VITI LEVU	<i>Status:</i>	deleted and transferred to FJ.12, 7th Session
FJ.14: INTERPRETATION OF DETAILED AEROMAGNETIC DATA Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	6th Session 7th Session initiated, 7th Session
FJ.15: RELOCATION OF SELECTED POINTS THROUGHOUT THE FIJI GROUP BY MULTIPLE PASS SATELLITE FIXES Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	6th Session 7th Session initiated, 7th Session
FJ.16: INVESTIGATION OF MARINE METALLIFEROUS MUDS IN RELATION TO SEAFLOOR SPREADING AND OTHER VOLCANIC ACTIVITY Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i> <i>Work Completed:</i>	6th Session 7th & 10th Sessions initiated, 9th Session Moana Wave cruise to North Fiji Basin active rifts - SeaMARC II, seismic reflection, gravity, magnetics, and seabed sampling (KROENKE, L.; PRICE, R. and shipboard science party, 1987: Cruise Report - CCOP/SOPAC North Fiji Basin expedition, RV Moana Wave cruise MW 87-01, 13 January - 2 February 1987. CCOP/SOPAC Cruise Report 1119 p, 12 figs, 1 table, 1 app.)

investigations of hydrothermal mineral formation at active spreading centres in the Lau Basin on RV Sonne (STACKELBERG, U.VON 1987: Untersuchung der geologischen entwicklung und des hydrothermalismus eines aktiven back-arc-beckens (Lau-Becken, SW-Pazifik) mit F.S. SONNE (SO 48). Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover. Archiv-Nr. 101 309. 86 p, 25 figs, 2 appendices - in German and English).

FJ.17: CHARACTERISATION OF THE
EXTENT AND QUALITY OF DEEP
SEA MANGANESE NODULES
Priority B

Proposed: 9th Session
Status: to be initiated

FJ.18: NEARSHORE SURVEYS OF COASTAL
AREAS, BEACH TO REEF, FOR
METALLIFEROUS DETRITAL
MINERALS
Priority A

Proposed: 10th Session
Status: initiated, 10th Session

FJ.19: BASELINE STUDIES OF INSHORE
AND NEARSHORE AREAS IN FIJI
FOR COASTAL DEVELOPMENT
PROGRAMMES
Priority A

Proposed: 10th Session
Status: initiated, 10th Session
Work Completed: Baseline seismic (3.5 kHz) survey of Togalevu, Namuka Harbour (SMITH, R. 1987: Seismic survey Togalevu, Namuka Harbour, Fiji. *Mineral Resources Department Note BP35/9.*).

FJ.20: INVESTIGATION OF DEEP WATER
PRECIOUS CORALS IN FIJI
WATERS
Priority A

Proposed: 10th Session
Status: initiated, 10th Session

FJ.21: DATA MANAGEMENT
Priority A

Proposed: 14th Session
Status: initiated, 15th Session

FJ.22: ISLAND DRILLING
Priority A

NEW PROJECT

BACKGROUND: At the Third Session of STAR the Island Drilling Study Group concluded that there was sufficient interest in an Island Drilling Programme to justify its inclusion in the CCOP/SOPAC Work Programme as a Regional Project. Fourteen specific proposals for deep drilling were recommended, including two for drilling in Fiji. Both Fiji proposals have the same objectives of investigating the nature of basement and the stratigraphic sections above basement. As this work is an important part of Fiji's own work programme this element is introduced here as a new project.

OBJECTIVES: To understand the tectonic evolution of the Fiji Platform, particularly during Oligocene and Miocene times; and to assist in the interpretation of offshore stratigraphic data and basin analysis.

FJ.23: OFFSHORE SEABED MAPPING
Priority A

NEW PROJECT

BACKGROUND: With the development of several different seabed swath-mapping systems, such as GLORIA, Seabeam, and SeaMARC, it is now possible to obtain continuous-coverage maps of the seafloor, both side-scan images and bathymetric maps. These images and maps are of considerable assistance to other projects in Fiji's work programme, especially mineral exploration and tectonic evolution studies. In examining its requirements for offshore seabed mapping Fiji has initially identified reconnaissance mapping of part of the North Fiji Basin and the northern margins of the Fiji Platform as its highest priority work within this project.

OBJECTIVES: To collect swath mapping data from selected areas to: allow structural analysis and integration with previous backarc research knowledge for assessing the best prospect areas to find massive polymetallic sulphide deposits; determine the regional pattern of fracture zones; identify new areas with potential for commercial fishing.

ECONOMIC TARGETS: To establish the economic potential of Fiji's offshore mineral deposits; to find new areas suitable for commercial fishing.

Status: initiated 16th Session

Work Completed: Moana Wave cruise to North Fiji Basin active rifts - SeaMARC II, seismic reflection, gravity, magnetics, and seabed sampling (KROENKE, L.; PRICE, R. and shipboard science party, 1987: Cruise Report - CCOP/SOPAC North Fiji Basin expedition, RV Moana Wave cruise MW 87-01, 13 January - 2 February 1987. CCOP/SOPAC Cruise Report 11: 19 p, 12 figs, 1 table, 1 app); Fiji's priority areas identified, to be included in CCOP/SOPAC swath mapping strategy manual.

GUAM

**GM.1: REVIEW OF BASIC GEOLOGICAL
AND GEOPHYSICAL DATA**
Priority A

Proposed: 11th Session

Status: initiated, 14th Session

**GM.2: OCEAN THERMAL ENERGY
CONVERSION**

Status: deleted, 14th Session

**GM.3: MANGANESE CRUST AND
NODULE STUDIES**
Priority A

Proposed: 11th Session

Status: to be initiated

**GM.4: EVALUATION OF METALLIFEROUS
ENRICHMENT RELATED TO ISLAND
ARC VOLCANISM**
Priority B

Proposed: 11th Session

Status: pending completion of GM.1

GM.5: PRECIOUS CORALS IN GUAM WATERS	<i>Status:</i>	deleted, 14th Session
GM.6: EVALUATION OF THE HYDRO-CARBON POTENTIAL OF THE GUAM AREA Priority B	<i>Proposed:</i> <i>Status:</i>	11th Session pending completion of GM.1
GM.7: BASELINE ENVIRONMENTAL SURVEYS OF BEACH INSHORE AND NEARSHORE AREAS FOR COASTAL EROSION AND COASTAL ENGINEERING STUDIES Priority B	<i>Proposed:</i> <i>Status:</i> <i>Work Completed:</i>	11th Session deleted, 14th Session; reinstated 15th Session an in-office evaluation of plans and designs for a boat launching ramp (CARTER, R. 1986: Review of boat launching ramp A/E design for Umatac Village, Territory of Guam. CCOP/SOPAC Technical Report 74: 7 p, 4 figs.).
GM.8: ESTABLISH DEEPWATER HYDRO-STATION IN TRENCH AREA	<i>Status:</i>	deleted, 14th Session
GM.9: RADIOLOGICAL SURVEY OF MARINE ORGANISMS AND SEDIMENTS	<i>Status:</i>	deleted, 14th Session
GM.10: STUDY OF THE SEAMOUNT ECOSYSTEMS NEAR THE MARIANA ISLANDS Priority B	<i>Proposed:</i> <i>Status:</i>	13th Session initiated, 14th Session
GM.11: BATHYMETRIC AND SEABED MAPPING OF GUAM'S EXCLUSIVE ECONOMIC ZONE Priority A	<i>Proposed:</i> <i>Status:</i>	15th Session to be initiated
GM.12: GEOLOGICAL HAZARDS Priority B	<i>Proposed:</i> <i>Status:</i>	15th Session to be initiated
KIRIBATI		
KI.1: DISTRIBUTION AND ECONOMIC POTENTIAL OF SUBMARINE AND LAGOONAL PHOSPHATE DEPOSITS IN KIRIBATI WATERS Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	4th Session 7th, 10th, & 11th Sessions initiated, 9th Session
KI.2: INVESTIGATION OF THE OCCURRENCE OF MANGANESE NODULES IN THE KIRIBATI REGION Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i> <i>Work Completed:</i>	4th Session 7th, 10th, & 11th Sessions initiated, 9th Session a survey by RV Thomas Washington (CRONAN, D.S.; TIFFIN, D.L.; MEADOWS, P.S. 1987: A study of manganese nodules, crusts, and deep-sea sediments in the Northern Cook Islands, Central Line Islands,

- and adjacent high seas. Cruise report of the Crossgrain Expedition, Leg 3, Papeete, Tahiti to Hilo, Hawaii, April 29 - June 3, 1987. *CCOP/SOPAC Cruise Report 119*: 14 p, 4 figs.); a survey by RV Hakurei Maru No.2 in the Phoenix Islands area (CRONAN, D.S. 1987: Report on the first leg of the 1987 cruise of RV Hakurei Maru No.2 to the Kiribati EEZ, Phoenix Islands area (Primary stage survey), 30 August - 20 September 1987. *CCOP/SOPAC Cruise Report 123*: 3 p, 1 fig.).
- KI.3: SEARCH FOR PRECIOUS CORALS
 IN KIRIBATI WATERS
 Priority A
Proposed: 5th Session
Revised: 7th & 11th Sessions
Status: initiated, 9th Session
- KI.4: BASELINE STUDIES OF INSHORE
 AREAS IN KIRIBATI FOR
 COASTAL DEVELOPMENT AND
 PROTECTION PROGRAMMES
 Priority A
Proposed: 9th Session
Revised: 11th Session
Status: initiated, 11th Session
Work Completed: baseline survey of sedimentation along Betio/Bairiki Causeway (HARPER, J.R. 1987: Initial survey of the Betio/Bairiki causeway Tarawa, Republic of Kiribati. *CCOP/SOPAC Tech. Rep. 82*: 34 p, 13 figs, 3 Tables, 2 Appendices.
 HARPER, J.R. 1988: Follow-up survey of the Betio-Bairiki causeway, Tarawa, Republic of Kiribati. *CCOP/SOPAC Tech. Rep. 86*: DRAFT).
- KI.5: SEARCH FOR COBALT-RICH CRUSTS
 IN OFFSHORE AREAS OF KIRIBATI
 Priority A
Proposed: 11th Session
Status: initiated, 15th Session
Work Completed: surveys of Line Islands seamounts by (a) RV Moana Wave (COULBOURN, W.T.; HILL, P.J. 1987 *CCOP/SOPAC Moana Wave cruise 3* (MW87-02) to the territorial waters of Western Samoa, the Cook Islands, and Kiribati. February 5 - March 3, 1987. *CCOP/SOPAC Cruise Report 122*: 65 p), and (b) RV Thomas Washington (CRONAN, D.S.; TIFFIN, D.L.; MEADOWS, P.S. 1987: A study of manganese nodules, crusts, and deep-sea sediments in the Northern Cook Islands, Central Line Islands, and adjacent high seas. Cruise report of the Crossgrain Expedition, Leg 3, Papeete, Tahiti to Hilo, Hawaii, April 29 - June 3, 1987. *CCOP/SOPAC Cruise Report 119*: 14 p, 4 figs.).
- KI.6: INVESTIGATION OF NEARSHORE
 AND COASTAL AREAS FOR LAND-
 FILL AND CONSTRUCTION
 MATERIALS
 Priority A
Proposed: 13th Session
Status: initiated, 13th Session
- KI.7: DATA MANAGEMENT
 Priority A
 NEW PROJECT

**KI.8: SEABED MAPPING IN OFFSHORE
AREAS OF KIRIBATI**
Priority A

BACKGROUND: The growing amount of data on marine minerals and energy, the coastal environment and processes, and related geological and engineering topics in the coastal, lagoon, nearshore, and offshore areas of Kiribati demands a data management system which ensures proper storage, cataloging, and retrieval capabilities.

OBJECTIVES: To establish and manage a system which will ensure preservation and easy access to all data relevant to Kiribati Projects of the CCOP/SOPAC Work Programme.

NEW PROJECT

BACKGROUND: In the large offshore areas in the Gilbert Phoenix, and Line island groups, lines of depth soundings are few and most areas are very poorly mapped. With the development of several different seabed swath-mapping systems, such as GLORIA, Seabeam, and Sea-MARC, it is now possible to obtain continuous-coverage maps of the seafloor, both side-scan images and bathymetric maps. These images and maps would be of considerable assistance to other projects in the Kiribati work programme, especially mineral exploration including the search for precious corals, and tectonic evolution studies. In examining its requirements for offshore seabed mapping Kiribati has initially identified reconnaissance mapping of seamounts and ridges, especially areas in the Gilbert Group where cobalt-rich crusts and Corallium may be found, and where seamounts suitable for exploiting living resources may be found.

OBJECTIVES: To collect bathymetric and long-range swath mapping data from offshore areas where non-living and living resources may be found, and prepare maps which can be used when assessing the resource potential of these offshore areas.

NEW ZEALAND

**NZ.1: MORPHOLOGICAL, SEDIMENTARY
STRUCTURAL FEATURES OF THE
NEW ZEALAND SHELF AND SLOPE**
Priority A

Proposed: 2nd Session
Status: continuing project

**NZ.2: STUDIES OF THE SOUTHERN
TERMINATION OF THE TONGA-
KERMADEC TRENCH**
Priority A

Proposed: 2nd Session
Status: initiated, 3rd Session

**NZ.3: TECTONIC HISTORY AND STRUCTURE
OF SEDIMENTARY BASINS
OFFSHORE FROM NEW ZEALAND**
Priority A

Proposed: 3rd Session
Status: initiated, 5th Session

NZ.4: STUDY OF MAFIC SANDS ON THE WESTERN SHELF Priority B	<i>Proposed:</i> <i>Status:</i>	6th Session initiated, 6th Session
NZ.5: SURVEY OF NEARSHORE DETRITAL SAND AND GRAVEL Priority B	<i>Proposed:</i> <i>Status:</i>	6th Session initiated, 6th Session
NZ.6: INVESTIGATION OF PHOSPHORITE AND GLAUCONITE DEPOSITS OF THE CHATHAM RISE Priority A	<i>Proposed:</i> <i>Status:</i>	6th Session initiated, 6th Session
NZ.7: DISTRIBUTION OF GOLD IN SHELF SEDIMENTS Priority B	<i>Proposed:</i> <i>Status:</i>	6th Session initiated, 8th Session

PAPUA NEW GUINEA

PN.1: REGIONAL RECONNAISSANCE GEOLOGICAL MAPPING, PARTICULARLY OF THE OUTLYING ISLANDS Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	1st Session 7th Session initiated, 7th Session
PN.2: PRELIMINARY APPRAISAL OF DETRITAL HEAVY MINERALS IN COASTAL AND NEARSHORE AREAS, AND RECONNAISSANCE SAMPLING OF POTENTIALLY FAVOURABLE AREAS Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	1st Session 7th Session initiated, 7th Session
PN.3: CRUSTAL STUDY OF EASTERN PAPUA NEW GUINEA	<i>Status:</i>	deleted and transferred to PN.14, 15th Session
PN.4: INSHORE AND NEARSHORE SURVEYS RELATED TO HARBOUR DEVELOPMENT AND COASTAL MANAGEMENT Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i> <i>Work Completed:</i>	4th Session 7th Session initiated, 8th Session Marine geophysical survey near the mouth of the Kikori River as part of the Dames and Moore geotechnical study for an oil pipeline from the Southern Highlands.
PN.5: EVALUATION OF THE HYDRO-CARBON POTENTIAL OF OFF-SHORE AREAS IN PAPUA NEW GUINEA FROM EXISTING DATA Priority A	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 9th Session
PN.6: INVESTIGATION INTO THE HYDRO-CARBON POTENTIAL OF CAPE VOGEL BASIN Priority A	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 14th Session

PN.7: INVESTIGATION INTO THE HYDROCARBON POTENTIAL OF NEW IRELAND AND MANUS BASINS Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	7th Session 11th Session initiated, 9th Session
PN.8: EXPLOR FOR AND EVALUATE HYDROTHERMAL DEPOSITS IN BASINS WITH HIGH HEAT FLOW OR NEARBY VOLCANIC ACTIVITY Priority A	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 8th Session
PN.9: POTENTIAL FOR SUBMARINE AND LAGOONAL PHOSPHATE DEPOSITS IN NORTHERN PAPUA NEW GUINEA Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	7th Session 10th Session initiated, 8th Session
PN.10: EXPLORE FOR AND EVALUATE MANGANESE NODULE DEPOSITS NORTH OF THE MANUS TRENCH Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	7th Session 11th Session to be initiated
PN.11: BATHYMETRIC MAPPING OF THE SEAFLOOR OF PAPUA NEW GUINEA Priority A	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 11th Session
PN.12: ASSESSMENT OF THE POTENTIAL OF DEEP WATER PRECIOUS CORALS (ESPECIALLY CORALLIUM) IN PAPUA NEW GUINEA Priority B	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 8th Session
PN.13: POTENTIAL FOR INDUSTRIAL MINERALS IN PAPUA NEW GUINEA Priority B	<i>Proposed:</i> <i>Status:</i>	14th Session to be initiated
PN.14: STUDY AND ASSESSMENT OF GEOLOGICAL HAZARDS IN PNG Priority A	<i>Proposed:</i> <i>Status:</i> <i>Work Completed:</i>	15th Session initiated, 15th Session Continuous surveillance of Rabaul, Manam, Bagana, Karkar, Langila, Ulawun, and Laming-ton volcanoes.

SOLOMON ISLANDS

SI.1: COASTAL SURVEY, CHOISEUL TO SANTA ISABEL ISLANDS Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	1st Session 7th Session initiated, 2nd Session
SI.2: EVALUATION OF THE HYDRO-CARBON POTENTIAL OF THE CENTRAL SOLOMON TROUGH (THE SLOT) AND MANNING STRAIT Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	1st Session 7th, 10th, & 11th Sessions initiated, 8th Session

Work Completed: VEDDER, J.G.; POUND, K.S.; BOUNDY, S.Q.(eds) 1986: Geology and offshore resources of Pacific island arcs - Central and Western Solomon Islands. *Circum-Pacific Council for Energy and Mineral Resources Earth Science Series 4*: 306 p.

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| SI.3 | GEOLOGY AND GEOPHYSICS OF THE SOLOMON SEA | <i>Status:</i> | deleted and transferred to CCSP/REG.1, 4th Session; then to CCSP/REG.2, 8th Session |
| SI.4: | INVESTIGATION OF SHALLOW SUBMERGED PLATEAUS IN MANNING STRAIT AND SOUTH-WEST OF CHOISEUL ISLAND FOR BAUXITE DEPOSITS
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 3rd Session
7th Session
initiated, 5th Session |
| SI.5: | INVESTIGATION OF DETRITAL GOLD IN BEACH AND NEARSHORE AREAS OF CENTRAL NORTH GUADALCANAL
Priority A | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 4th Session
7th & 11th Sessions
initiated, 5th Session |
| SI.6: | INVESTIGATION OF THE PHOSPHATE POTENTIAL OF LAGOONS, SUBMERGED SEAMOUNTS, AND CURRENT-SWEPT RIDGES
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 4th Session
7th & 10th Sessions
initiated, 9th Session |
| SI.7: | INVESTIGATION INTO DISCHARGES FROM SUBMARINE VOLCANOES IN THE SOLOMON ISLANDS
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 4th Session
7th Session
initiated, 9th Session |
| SI.8: | INVESTIGATION INTO METAL DISPERSION IN MARINE SEDIMENTS AROUND VELLA LAVELLA AND IN OTHER NEARBY AREAS
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i>
<i>Work Completed:</i> | 4th Session
7th Session
initiated, 8th Session
TAYLOR, B.; EXON, N.F. (eds) 1987: Marine geology, geophysics, and geochemistry of the Woodlark Basin - Solomon Islands. <i>Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, 7</i> : 363 p. |
| SI.9: | SEARCH FOR BAUXITIC SEDIMENTS INSIDE INDISPENSIBLE REEFS AND IN LAKE TE NGGANO, RENNELL ISLAND
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 5th Session
7th Session
initiated, 6th Session |
| SI.10: | EVALUATION OF HYDROCARBON POTENTIAL IN SOLOMON ISLANDS OFFSHORE AREAS (RENNELL ARC, | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 6th Session
7th & 11th Sessions
initiated, 7th Session |

SAN CRISTOBAL AND SANTA CRUZ
AREAS)
Priority A

SI.11: MARINE GEOLOGY OF MANNING STRAIT	<i>Status:</i>	deleted and transferred to CCSP/SI.10, 9th Session; then to CCSP.SI.2, 11th Session
SI.12: SURVEY OF DEEP SEA AREAS SOUTH OF THE SOLOMON ISLANDS TO INVESTIGATE THE POSSIBLE OCCURRENCE OF MANGANESE NODULES Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	6th Session 7th & 9th Session initiated, 9th Session
SI.13: HYDROCARBON POTENTIAL OF RENNEL ARC	<i>Status:</i>	deleted and transferred to CCSP/SI.10, 9th Session
SI.14: THE POTENTIAL OF PRECIOUS CORALS, ESPECIALLY CORALLIUM SPECIES, IN SOLOMON ISLANDS Priority B	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 8th Session
SI.15: BATHYMETRIC MAPPING OF SOLOMON ISLANDS Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	7th Session 9th Session initiated, 9th Session
SI.16: DETRITAL HEAVY MINERALS IN BEACH AND NEARSHORE AREAS AROUND SANTA ISABEL, CHOISEUL, GUADALCANAL, AND SAN CRISTOBAL Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	9th Session 10th Session completed, 14th Session
SI.17: INSHORE STUDIES RELATED TO COASTAL DEVELOPMENT Priority A	<i>Proposed:</i> <i>Status:</i>	9th Session initiated, 10th Session
SI.18: INVESTIGATION OF SUITABILITY OF LOCAL MATERIALS FOR THE MANUFACTURE OF CERAMICS Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	9th Session 11th Session initiated, 10th Session
SI.19: INVESTIGATION OF SUITABILITY OF LOCAL MATERIALS FOR THE MANUFACTURE OF CEMENT Priority B	<i>Proposed:</i> <i>Status:</i>	10th Session to be initiated
SI.20: INVESTIGATION OF CONSTRUCTION MATERIALS IN HONIARA BAY AND EFFECTS OF BEACH MINING ON THE COASTAL ENVIRONMENT NEAR HONIARA Priority A	<i>Proposed:</i> <i>Status:</i>	11th Session initiated, 14th Session

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| SI.21: GEOLOGICAL MAPPING AND
GEOCHEMICAL EXPLORATION ON
SANTA ISABEL, MALAITA,
GUADALCANAL, AND SAN CRISTOBAL
Priority B | <i>Proposed:</i>
<i>Status:</i> | 12th Session
to be initiated |
| SI.22: DATA MANAGEMENT
Priority A | <i>Proposed:</i>
<i>Status:</i> | 13th Session
initiated, 14th Session |
| SI.23: NEARSHORE AND COASTAL ZONE
CHANGES DUE TO EARTHQUAKES
Priority A | <i>Proposed:</i>
<i>Status:</i> | 14th Session
initiated, 14th Session |
| SI.24: LONG-RANGE ACOUSTIC MAPPING
OF THE SEAFLOOR
Priority A | <i>Proposed:</i>
<i>Status:</i>
<i>Work Completed:</i> | 14th Session
initiated, 16th Session
Solomon Islands' priority areas identified, to be incorporated in CCOP/SOPAC swath mapping strategy manual. |

TONGA

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| TG.1: INVESTIGATION OF MANGANESE
NODULES ON THE DEEP SUBMARINE
SHELF ON THE EAST SIDE OF TONGA
PLATFORM | <i>Status:</i> | completed, 12th Session |
| TG.2: ASSESSMENT OF PHOSPHATE
POTENTIAL ON THE TONGA
PLATFORM AND IN LAGOON AREAS
Priority B | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 1st Session
7th, 10th, & 11th Sessions
initiated, 5th Session |
| TG.3: SURVEY OF NEARSHORE AREAS
FOR PRECIOUS CORALS
Priority A | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 5th Session
7th Session
initiated, 6th Session |
| TG.4: SEARCH FOR HYDROTHERMAL
DEPOSITS IN ACTIVE VOLCANIC
AREAS IN TONGA (TOFUA RIDGE
AND LAU BASIN) | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i>
<i>Work Completed:</i> | 5th Session
7th Session
initiated, 6th Session
cruise on RV Sonne investigating areas Priority A in north and south part of Lau Basin for hydrothermal deposits (STACKELBERG, U.VON 1987: Untersuchung der geologischen entwicklung und des hydrothermalismus eines aktiven back-arc-beckens (Lau-Becken, SW-Pazifik) mit F.S. SONNE (SO 48). Bundesanstalt fur Geowissenschaften und Rohstoffe, Hannover. Archiv-Nr. 101 309. 86 p, 25 figs, 2 appendices - in German and English). |
| TG.5: SEISMIC REFLECTION SURVEYS OF
THE TONGA PLATFORM TO
DETERMINE SEDIMENT THICKNESS | <i>Proposed:</i>
<i>Revised:</i>
<i>Status:</i> | 6th Session
7th Session
initiated, 7th Session |

- AND BASEMENT STRUCTURE, WITH PARTICULAR REFERENCE TO OIL PRODUCTION POTENTIAL
Priority A
- TG.6: STUDY OF COASTAL, BEACH, AND INSHORE SAND DEPOSITS TO DETERMINE THE NATURE OF KNOWN DEPOSITS AND TO LOCATE NEW DEPOSITS SUITABLE FOR CONSTRUCTION, ROADING, LANDFILL AND OTHER PURPOSES
Priority A
- TG.7: INVESTIGATION OF OCEANOGRAPHIC CONDITIONS AT TONGATAPU BLOW HOLES FOR ASSESSMENT STUDIES OF POWER FROM WAVE ENERGY
Priority A
- TG.8: BASELINE STUDY OF INSHORE AREAS IN TONGA FOR COASTAL DEVELOPMENT PROGRAMMES
Priority A
- TG.9: INSTALLATION AND OPERATION OF A SEISMIC NETWORK AND A TSUNAMI WARNING SYSTEM IN TONGA
Priority A
- TG.10: INVESTIGATION OF POTENTIAL OF COBALT-RICH MANGANESE CRUSTS IN TONGA WATERS
Priority B
- TG.11: DATA MANAGEMENT
Priority A
- TG.12: COASTAL AND NEARSHORE MAPPING IN TONGA
Priority A
- Work Completed:* advice received on the management of existing hydrocarbon data (CFTC project).
- Proposed:* 6th Session
Revised: 7th, 9th, & 10th Sessions
Status: initiated, 7th Session
Work Completed: geophysical and sampling surveys to map sand and gravel resources off Tongatapu and Vava'u (RICHMOND, B. 1987: High resolution seismic surveys for lagoonal sand and gravel resources in Tongatapu and Vava'u, Tonga. CCOP/SOPAC Preliminary Report 2: 8 p, 6 figs.).
- Proposed:* 9th Session
Revised: 11th Session
Status: initiated, 13th Session
Work Completed: Waverider Buoy deployed off southern coast of Tongatapu (CARTER, R. 1987: Installation of Waverider Buoy offshore Tongatapu 21 deg 13.26 min S and 175 deg 12.9 min W. CCOP/SOPAC Technical Report 79: 8 p, 5 figs.).
- Proposed:* 10th Session
Status: initiated, 11th Session
Work Completed: bathymetry, water sampling, and current meter survey of Tongatapu Lagoon, (CARTER, R. 1988: Bathymetry of nearshore area proposed wavepower site, Makeke area, Tongatapu, Kingdom of Tonga. CCOP/SOPAC Prelim. Rep. 6: 16 p, 5 figs.).
- Proposed:* 11th Session
Status: initiated, 12th Session
- Proposed:* 11th Session
Status: initiated, 12th Session
- Proposed:* 13th Session
Status: initiated, 14th Session
- Proposed:* 14th Session
Status: initiated, 14th Session
Work Completed: reconnaissance mapping of Tongatapu and Vava'u islands (ROY, P.S.; RICHMOND, B.M. 1988: The morphology and surface geology of the islands of

Tongatapu and Vava'u, Kingdom of Tonga. CCOP/SOPAC Tech. Rep. 62: DRAFT); coastal features mapped and sediment budget investigated for Tongatapu beaches (RICHMOND, B.M.; ROY, P.S. 1986: Nearshore sediment distribution and sand and gravel deposits in lagoonal areas, Northern Tongatapu, Tonga. CCOP/SOPAC Tech. Rep. 63: 6 p, 3 figs.).

TG.13: RECONNAISSANCE SWATH AND BATHYMETRIC MAPPING OF THE SEAFLOOR IN OFFSHORE AREAS

Proposed: 15th Session
Status: initiated, 16th Session
Work Completed: Tonga's priority areas for GLORIA mapping Priority A identified, to be included in CCOP/SOPAC swath mapping strategy manual.

TUVALU

TU.1: INVESTIGATION OF PRECIOUS CORALS INCLUDING CORALLIUM AND BLACK CORALS
 Priority B

Proposed: 13th Session
Status: initiated, 14th Session

TU.2: NEARSHORE INVESTIGATIONS OF CONSTRUCTION MATERIALS AND LANDFILL
 Priority A

Proposed: 13th Session
Status: initiated, 13th Session

TU.3: BASELINE STUDIES OF INSHORE AREAS IN TUVALU TO ASSIST WITH COASTAL MANAGEMENT PROGRAMMES
 Priority A

Proposed: 13th Session
Status: initiated, 13th Session
Work Completed: coastal mapping on Funafuti and air photo interpretation of all 9 atolls in Tuvalu made during 1987 Mapping Workshop (HOWORTH, R.; RICHMOND, B.M. 1987: CCOP/SOPAC Coastal Mapping Workshop, 1-12 June 1987, Tuvalu. CCOP/SOPAC Training Report 14: 20 p.).

TU.4: INVESTIGATION OF MANGANESE NODULES IN TUVALU WATERS
 Priority B

Proposed: 13th Session
Status: to be initiated

TU.5: INVESTIGATION OF COBALT-RICH CRUSTS IN TUVALU WATERS
 Priority A

Proposed: 13th Session
Status: to be initiated

TU.6: BASELINE STUDIES TO ASSIST IN DEVELOPING THE USE OF OCEAN ENERGY
 Priority B

Proposed: 13th Session
Status: to be initiated

TU.7: DATA MANAGEMENT
 Priority A

Proposed: 13th Session
Status: initiated, 13th Session

TU.8: BATHYMETRIC MAPPING OF THE SEAFLOOR IN TUVALU'S EEZ
 Priority A

Proposed: 13th Session
Status: to be initiated

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| <p>TU.9: INVESTIGATION OF PHOSPHATE RESOURCES IN TUVALU
Priority A</p> | <p><i>Proposed:</i> 13th Session
<i>Status:</i> initiated, 14th Session
<i>Work Completed:</i> on-land deposits mapped in preparation for lagoon drilling programme (RADKE, B.M. 1985: Seismic and bathymetric profiling of Nukufetau Lagoon, Tuvalu, for evaluation of phosphate potential, Tuvalu, February-March 1985. CCOP/SOPAC Cruise Rep. 108: 6 p, 3 figs, 2 tables, 1 Appendix.).</p> |
| <p>TU.10: TRAINING PROGRAMMES FOR TUVALUANS IN GEOLOGY, GEOPHYSICS AND RELATED TOPICS
Priority A</p> | <p><i>Proposed:</i> 13th Session
<i>Status:</i> initiated, 13th Session</p> |
| <p>VANUATU</p> | |
| <p>VA.1: METALLIFEROUS MUD POTENTIAL IN THE ACTIVE VOLCANIC ARC AND THE BACK-ARC BASINS OF VANUATU
Priority B</p> | <p><i>Proposed:</i> 7th Session
<i>Status:</i> initiated, 9th Session</p> |
| <p>VA.2: INVESTIGATE THE HYDROCARBON POTENTIAL OF VANUATU AND CARRY OUT AND PROMOTE FURTHER EXPLORATION
Priority A</p> | <p><i>Proposed:</i> 7th Session
<i>Status:</i> initiated, 9th Session</p> |
| <p>VA.3: DETERMINE THE POTENTIAL FOR PRECIOUS CORAL OCCURRENCE IN VANUATU WATERS
Priority B</p> | <p><i>Proposed:</i> 7th Session
<i>Status:</i> initiated, 8th Session</p> |
| <p>VA.4: BATHYMETRIC MAPPING OF VANUATU ISLAND ARC AND THE ADJACENT DEEP SEAFLOOR
Priority A</p> | <p><i>Proposed:</i> 7th Session
<i>Status:</i> initiated, 10th Session</p> |
| <p>VA.5: INVESTIGATION OF SUITABILITY OF CLAY DEPOSITS FOR THE MANUFACTURE OF POTTERY BRICKS OR TILES
Priority A</p> | <p><i>Proposed:</i> 9th Session
<i>Status:</i> initiated, 10th Session</p> |
| <p>VA.6: BASELINE STUDIES OF INSHORE AREAS IN VANUATU FOR COASTAL DEVELOPMENT PROGRAMMES
Priority A</p> | <p><i>Proposed:</i> 10th Session
<i>Revised:</i> 11th Session
<i>Status:</i> initiated, 13th Session
<i>Work Completed:</i> bathymetric study of Teouma Bay (CARTER, R. 1987: The bathymetry of Teouma Bay for harbour development, Efate, Vanuatu. CCOP/SOPAC Technical Report 81: 8 p, 5 figs.).</p> |

VA.7: DATA MANAGEMENT Priority A	<i>Proposed:</i> <i>Status:</i>	11th Session initiated, 15th Session
VA.8: EXTENSION OF GEOLOGICAL MAP OF VANUATU INTO OFFSHORE AREAS Priority A	<i>Proposed:</i> <i>Status:</i>	14th Session initiated, 15th Session
VA.9: LONG-RANGE ACOUSTIC MAPPING OF THE SEAFLOOR IN THE VANUATU EEZ Priority A	<i>Proposed:</i> <i>Status:</i>	14th Session to be initiated
VA.10: TRAINING ON MONITORING POLLUTION LEVELS Priority	<i>Proposed:</i> <i>Status:</i>	15th Session SPREP to implement

WESTERN SAMOA

WS.1: POTENTIAL OF SEABED PHOSPHORITES ON THE SLOPES OF THE SAMOA PLATFORM AND SEAMOUNTS NORTHWEST OF SAVAII AND SOUTH OF UPOLU	<i>Status:</i>	completed, 12th Session
WS.2: INVESTIGATION OF MANGANESE DEPOSITS ON THE SAMOA PLAT- FORM AND IN SAMOAN OCEANIC AREAS	<i>Status:</i>	completed, 9th Session
WS.3: MANGANESE DEPOSITS ON WESTERN SAMOA PLATFORM	<i>Status:</i>	deleted and transferred to WS.2 at 9th Session
WS.4: INVESTIGATION OF THE FLANKS OF ISLAND SLOPES FOR PRECIOUS CORALS Priority B	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i>	5th Session 7th Session initiated, 6th Session
WS.5: BASELINE STUDIES OF INSHORE AREAS TO ASSIST WITH COASTAL ZONE MANAGEMENT Priority A	<i>Proposed:</i> <i>Revised:</i> <i>Status:</i> <i>Work Completed:</i>	6th Session 7th & 16th Session (Construction materials transferred to WS.12, WS.5 restricted to Coastal development studies) initiated, 7th Session a seawall to protect the Mulinu'u Point shoreline from erosion has been designed (CARTER, R. 1987: Seawall protection facility for Mulinu'u Point, West- ern Samoa. CCOP/SOPAC Technical Report 78: 18 p, 10 figs, 4 tables.).
WS.6: STUDIES OF SEDIMENT THICKNESS AND BASEMENT STRUCTURE OF THE SAMOAN PLATFORM TO	<i>Proposed:</i> <i>Status:</i>	7th Session initiated, 9th Session

**DETERMINE THE HYDROCARBON
POTENTIAL**

Priority A

**WS.7: INVESTIGATION OF COBALT-RICH
CRUSTS IN WESTERN SAMOAN
WATERS**

Priority A

Proposed: 13th Session

Status: initiated, 16th Session

Work Completed: Machias Seamount surveyed by RV Moana Wave Priority Acruise (COULBOURN, W.T.; HILL, P.J. 1987: CCOP/SOPAC Moana Wave cruise 3 (MW87-02) to the territorial waters of Western Samoa, the Cook Islands, and Kiribati. February 5 - March 3, 1987. CCOP/SOPAC Cruise Report 122: 65 p.).

**WS.8: BASELINE STUDIES TO ASSIST
IN EVALUATING THE PROSPECTS
OF USE OF OCEAN ENERGY AS A
SOURCE OF POWER**

Priority A

Proposed: 13th Session

Status: initiated, 16th Session

Work Completed: potential sites identified and surveyed (CARTER, R. 1988: Site location for waverider buoy in Western Samoa. CCOP/SOPAC Prelim. Rep. 3: 9 p, 4 figs.).

WS.9: DATA MANAGEMENT

Priority A

Proposed: 13th Session

Status: initiated, 14th Session

**WS.10: INVESTIGATE POTENTIAL OF
ONSHORE CLAY DEPOSITS FOR
MANUFACTURE OF CERAMICS**

Priority B

Proposed: 14th Session

Status: to be initiated

**WS.11 MAPPING OF COASTAL AND
NEARSHORE AREAS IN WESTERN
SAMOA**

Priority A

NEW PROJECT

BACKGROUND: Geological mapping of coastal and areas has proved to be of considerable assistance in assessing resources, combating erosion, and coastal management programmes. In Western Samoa most people live on the coast. Information on the coastal environment, especially when presented on maps, is a valuable tool for planning future development.

OBJECTIVES: To map coastal and nearshore areas by direct observation and measurement and aerial photography and other remote sensing methods, and present the information in a format most suitable for mineral exploration and coastal development and management programmes.

**WS.12 ASSESSMENT OF SAND AND GRAVEL
DEPOSITS IN NEARSHORE AREAS OF
WESTERN SAMOA FOR
MATERIALS AND LANDFILL**

Priority A

NEW PROJECT (transferred from WS.5)

BACKGROUND: Sand and gravel are basic raw materials needed for many development projects. They are constantly being required in Western Samoa as an ingredient in concrete for major projects such as wharves, causeways, hotels, and other large buildings; good quality sand will be required for airport runway extensions; sand and gravel are required as infill during major road works; sand and gravel are also needed from time to time by

small manufacturing industries for a variety of projects; a supply of sand and gravel is needed on a regular basis for the building industry. The quantity and quality of material is such that an inventory of sand and gravel resources, close to areas where they will be used, is required to assist with planning and ensure convenient and appropriate supply from the most suitable source. (Work on sand and gravel resources prior to the 16th Session was done under Project WS.5 which is now restricted to Coastal Development work including assistance with coastal management).

OBJECTIVES: To establish an inventory of sand and gravel resources in Western Samoa, especially in areas near where the resource is likely to be needed, and to establish quantities and qualities of these resources.

Work Completed: EADE, J.V. 1979: Solosolo Beach report. CCOP/SOPAC Cruise Rep. 27: 5 p, 2 figs.

RUBIN, D.M. 1984: Landfill materials and harbour surveys at Apia Harbour, Mulinu'u Point, Faleolo Airport and Asau Harbour, Western Samoa, 15 May - 4 June 1984. CCOP/SOPAC Cruise Rep. 98: 8 p, 8 figs.

RICHMOND, B. 1985: Reconnaissance survey for construction and landfill materials at Aleipata, Western Samoa. CCOP/SOPAC Cruise Rep. 110: 14 p, 10 figs.

CARTER, R. 1985: Faleolo Airport, Western Samoa. CCOP/SOPAC Tech. Rep. 46: 12 p. RESTRICTED

RICHMOND, B.M.; ROY, P.S. 1986: Nearshore studies in Apolima and Manono Districts of Upolu, Western Samoa. CCOP/SOPAC Tech. Rep. 64: 4 p, 2 figs. (Preliminary)

REGIONAL ELEMENTS

REG.1: GEOLOGICAL AND GEOPHYSICAL
INVESTIGATIONS IN THE CORAL
SEA

Proposed: 1st Session
Revised: 8th Session

REG.2: STUDY OF THE MANUS, SOLOMON
SEA, AND WOODLARK BASINS

Proposed: 1st Session
Revised: 8th Session

REG.3: MELANESIAN BORDERLAND STUDY

Proposed: 1st Session
Revised: 8th & 12th Sessions

REG.4: GEOLOGICAL AND GEOPHYSICAL
INVESTIGATIONS OF THE NORTH
FIJI BASIN (FIJI PLATEAU)

Proposed: 1st Session
Revised: 8th & 12th Sessions
Work Completed: SeaMARC II imagery and bathymetry, seismic reflection, and bottom samples collected by RV Moana Wave cruise MW87-01 (KROENKE, L.; PRICE, R. and shipboard science party, 1987: Cruise Report - CCOP/SOPAC North Fiji Basin expedition, RV Moana

Wave cruise MW 87-01, 13 January - 2 February 1987.
CCOP/SOPAC Cruise Report 11: 19 p, 12 figs, 1 table, 1 app.).

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| REG.5: GEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS OF THE LAU BASIN | <p><i>Proposed:</i> 1st Session</p> <p><i>Revised:</i> 8th & 12th Sessions</p> <p><i>Work Completed:</i> Seabeam bathymetry, high resolution seismic profiling, deep-tow sidescan, gravity, magnetics, and bottom photographs, sediment, and rock samples collected by RV Sonne cruise SO48 (STACKELBERG, U.VON 1987: Untersuchung der geologischen entwicklung und des hydrothermalismus eines aktiven back-arcbeckens (Lau-Becken, SW-Pazifik) mit F.S. SONNE (SO 48). Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover. Archiv-Nr. 101 309. 86 p, 25 figs, 2 appendices - in German and English).</p> |
| REG.6: REGIONAL GEOLOGIC EVALUATION TO DETERMINE DRILLING SITES IN THE SOUTH PACIFIC REGION | <p><i>Proposed:</i> 1st Session</p> |
| REG.7: SURVEYS OF ABYSSAL SEDIMENT COVER NORTH AND EAST OF NEW ZEALAND | <p><i>Proposed:</i> 2nd Session</p> |
| REG.8: DISTRIBUTION OF SHELLED PLANKTON IN THE WATER COLUMN AND IN SEDIMENTS OF THE SOUTH FIJI BASIN | <p><i>Status:</i> completed, 10th Session</p> |
| REG.9: SEISMIC PROFILING AND BOTTOM SAMPLING BETWEEN NORTHERN NEW CALEDONIA AND ONTONG JAVA PLATEAU | <p><i>Proposed:</i> 3rd Session</p> <p><i>Revised:</i> 8th Session</p> |
| REG.10: NATURE, ORIGIN AND DEVELOPMENT OF METALLIFEROUS DEPOSITS ALONG ACTIVE RIFTS | <p><i>Proposed:</i> 3rd Session</p> <p><i>Revised:</i> 8th & 12th Sessions</p> <p><i>Work Completed:</i> studies, including swath mapping, of North Fiji Basin and Lau Basin rifts (see REG.4 and REG. 5 above).</p> |
| REG.11: SEARCH FOR PHOSPHATE ON SEAMOUNT SURFACES IN EQUATORIAL AREAS OF THE SOUTH PACIFIC | <p><i>Proposed:</i> 3rd Session</p> <p><i>Revised:</i> 8th & 12th Sessions</p> |
| REG.12: SEARCH FOR MANGANESE NODULES IN NAURU AND ELLICE BASINS | <p><i>Proposed:</i> 4th Session</p> <p><i>Revised:</i> 8th Session</p> |

REG.13: SEARCH FOR MANGANESE NODULES ALONG A COOK ISLANDS-TUAMOTUTRANSECT	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th Session
REG.14: COMPILATION OF CHEMICAL ANALYSES OF SEDIMENT IN THE SOUTH PACIFIC	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th Session
REG.15: COMPILATION OF MANGANESE NODULE DATA	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th Session
REG.16: THE STUDY OF ENERGY RELEASE AND SEISMICITY IN THE SOUTHWEST PACIFIC	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th Session
REG.17: REGIONAL DATA COMPILATION AND SYNTHESIS	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th & 12th Sessions
REG.18: OCEAN THERMAL DATA COLLECTION	<i>Proposed:</i> 4th Session <i>Revised:</i> 8th Session <i>Work Completed:</i> Scripps Institution of Oceanography continues to collect XBT data using hourly drops from commercial vessels trading between Suva and Auckland.
REG.19: TECTONICS OF FIJI PLATEAU	<i>Status:</i> deleted and transfered to REG.4, 8th Session
REG.20: AN INVESTIGATION OF LITHOSPHERIC PROPERTIES BY TELESEISMIC STUDIES IN THE SW PACIFIC	<i>Proposed:</i> 5th Session <i>Revised:</i> 9th & 16th Sessions (extended to SW Pacific) <i>Work Completed:</i> SUNDARALINGAM, K.; DENHAM, D. 1987: Structure of the upper mantle beneath the Coral and Tasman Seas, and phase velocities of Raleigh Waves. <i>N.Z. Journal of Geology and Geophysics</i> 30: 329-341.
REG.21: ORIGIN AND EVOLUTION OF THE LINE ISLANDS	<i>Proposed:</i> 8th Session
REG.22: SEARCH FOR MANGANESE NODULES IN THE CENTRAL PACIFIC BASIN	<i>Proposed:</i> 8th Session <i>Revised:</i> 9th & 12th Sessions <i>Work Completed:</i> cruises by RV Hakurei Maru No.2 to area around Phoenix Islands (see project KI.2), and by RV Thomas Washington to area along SW margin of Line Islands (see project KI.2).
REG.23: SEARCH FOR MANGANESE NODULES IN THE NEIGHBOUR- HOOD OF THE MARQUESAS FRACTURE ZONE	<i>Proposed:</i> 8th Session
REG.24: A TECTONIC ANALYSIS OF THE SOUTHWEST PACIFIC	<i>Proposed:</i> 9th Session

REG.25: CCOP/SOPAC GEOPHYSICAL ATLAS OF THE SOUTHWEST PACIFIC	<i>Proposed:</i>	9th Session
REG.26: DELINEATION OF SEDIMENT BODIES IN TIME AND SPACE	<i>Proposed:</i> <i>Revised:</i>	9th Session 12th Session
REG.27: CARBONATE SEDIMENT STUDIES IN THE CCOP/SOPAC REGION	<i>Proposed:</i>	9th Session
REG.28: EFFECTS OF SUBDUCTION OF ASEISMIC RIDGES AND SMALL PLATEAUS IN THE SOUTHWEST PACIFIC	<i>Proposed:</i>	9th Session
REG.29: COBALT POTENTIAL IN MANGANESE CRUSTS FROM GUYOTS AND RIDGES OF THE SOUTHWEST PACIFIC	<i>Proposed:</i> <i>Work Completed:</i>	11th Session cruises by RV Moana Wave (MW87-02) in Central Line Islands, Manihiki Plateau, and Machias Seamount (see project KI.5), by RV Thomas Washington (Crossgrain Leg 3) in the Line Islands (see project KI.5), and by RV Sonne (SO 48) in the southern part of French Polynesia (see project TG.4).
REG.30: COASTAL EROSION STUDIES IN THE SOPAC REGION	<i>Proposed:</i>	12th Session
REG.31: STUDIES OF SALINE LAKES AND LAGOONS IN THE SOPAC REGION	<i>Proposed:</i>	12th Session
REG.32: EVOLUTION OF CORAL REEFS AND ASSOCIATED ENVIRONMENTS IN THE SOUTH PACIFIC	<i>Proposed:</i>	12th Session
REG.33: HYDROCARBON SOURCE, MATURATION AND ENTRAPMENT MODELS IN ISLAND ARC SETTINGS AND COLLISION TERRAINS	<i>Proposed:</i>	12th Session
REG.34: EVOLUTION OF MAJOR GEO- MORPHIC TERRAINS IN THE PAPUA NEW GUINEA REGION	<i>Proposed:</i>	12th Session
REG.35: PRE-PLIOCENE BREAK-UP HISTORY OF THE SOUTHWEST PACIFIC	<i>Proposed:</i>	12th Session
REG.36: NEAR SURFACE SUBMARINE VOLCANOES: METALLOGENESIS AND ASSESSMENT OF VOLCANIC HAZARDS	<i>Proposed:</i>	12th Session
REG.37: SEDIMENT BUDGETS IN REEF- FRINGED LAGOONS	<i>Proposed:</i>	12th Session

REG.38: ISLAND DRILLING IN THE
SOUTHWEST PACIFIC

Proposed: 13th Session
Work Completed: drilling in lagoons on Aitutaki, Pukapuka, and Rakahanga, Cook Islands (see project CK.2).

REG.39: REGIONAL INFORMATION
EXCHANGE

Proposed: 14th Session

REG.40: GEOPHYSICAL INVESTIGATIONS
OF THE MICRONESIAN TRENCH

Proposed: 14th Session
Work Completed: KROENKE, L.W.; WALKER, D.A. 1986: Evidence for the formation of a new trench in the Western Pacific.

REG.41: LONG-RANGE SWATH MAPPING
OF THE SEABED IN THE SOUTH
PACIFIC

NEW PROJECT

BACKGROUND: With the development of several different seabed swath-mapping systems, such as GLORIA, Seabeam, and SeaMARC, it is now possible to obtain continuous-coverage maps of the seafloor, both side-scan images and bathymetric maps. These images and maps provide information on seafloor character and form and can be used to develop an understanding of tectonic, volcanic, and sedimentary processes, both of the past and currently active. From this understanding, mineral and geohazard potential can be assessed, and geological development and tectonic evolution studies can be made of an area.

OBJECTIVES: To collect swath mapping data throughout the South Pacific, especially the CCOP/SOPAC region, to assist in the understanding of the geological development and tectonic evolution of the South Pacific; to assist in the assessment of mineral potential of the region; and to assist in the assessment of geohazard risk in the region.

Work Completed: Seabeam data has been collected on cruises by RV Sonne, RV Thomas Washington, and RV Jean Charcot in North Fiji Basin, Lau Basin, Havre Trough, New Hebrides Arc Forearc and Trench, Tonga Trench, North and South Penrhyn Basins, and Southwestern Pacific Basin; SeaMARC II data has been collected on several cruises by RV Kana Keoki and RV Moana Wave in Manus Basin, Rabaul Harbour, Woodlark Basin, North Fiji Basin, Machias Seamount, Manihiki Plateau, North Penrhyn Basin, and Line Islands.

Part 3 : 16th SESSION DOCUMENTATION

A : LIST OF DOCUMENTS

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/1/1	Statement on behalf of the outgoing Chairman. (see Part 1: Plenary report para. 8)	A. Utanga
CR16/1/2	Opening address on behalf of the Honorable John R. Kaputin, CMG, MP Minister for Minerals and Energy at the Opening of 16th CCOP/SOPAC. (see Part 1: Plenary report para. 7)	Lamech Palaso, Acting Sec. Dept of Minerals & Energy
CR16/1/3	Response to Premier. (see Part 1: Plenary report para. 6)	S.L. Tongilava
CR16/1/4	Opening Address by UNDP Representative (see Part 1: Plenary report para. 12)	Jan Wahlberg, UNDP Res.Rep. PNG
CR16/1/5	Opening Address at the 16th Session by ESCAP Representative. (see Part 1: Plenary report para. 13)	Larry Machesky
CR16/3/1	Annotated Provisional Agenda for Plenary and Technical Advisory Group Sessions see Part 1: Plenary report para. 10)	Techsec
CR16/5/1	List of Participants. (see Part 5: Appendices - A)	Secretariat
CR16/6/1	Vanuatu: Progress on 1987 Work Programme (see Part 1: Plenary report para. 25)	Vanuatu Representative
CR16/6/2	Fiji Country Report: 16th Annual Session, CCOP/SOPAC. (see Documentation item 1, also Part 1: Plenary report para. 18)	R. Singh, H. Johnson R. Smith, & A. Simpson
CR16/6/3	Report on New Zealand Offshore Geoscience 1986-87. (see Documentation B. item 2, also Part 1: Plenary report para. 20)	K.B. Lewis

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/6/4	Australia: Review of Marine Geoscience Activities in 1987. (see Documentation B. item 3, also Part 1: Plenary report para. 16)	N.F. Exon, BMR
CR16/6/5	CCOP/SOPAC 16th Session, Lae 1987: Country Report Papua New Guinea. (see Documentation B. item 4, also Part 1: Plenary report para. 21)	PNG Delegation
CR16/6/6	Country Report, Kingdom of Tonga, 1986-1987 (see Documentation B. item 5, also Part 1: Plenary report para. 23)	D. Tappin, & S. Helu
CR16/6/7	Country Report - Kiribati. (see Part 1: Plenary report para. 19)	Kiribati Delegate
CR16/6/8	Member Country Report - Western Samoa. (see Documentation B. item 6, also Part 1: Plenary report para. 26)	A.K. Titimaea
CR16/6/9	Country Report - Cook Islands. (see Part 1: Plenary report para. 17)	A. Utanga
CR16/7/1	Report on Work Programme Activities of the CCOP/SOPAC Technical Secretariat for the Period 1 October 1986 through 30 September 1987. CCOP/SOPAC Misc. Rep. 33. (see Part 1: Plenary report para. 27)	Techsec
CR16/8/1	Brief Note on the Status on Norwegian Ocean Mining Efforts. (see Documentation B. item 7)	Jan Magne Markussen
CR16/8/2	Articles of the SPREP Convention of Relevance to CCOP/SOPAC. (see Part 1: Plenary report para. 35)	P. Holthus, SPREP
CR16/8/3	UNDP Regional Project of the Governments of Pacific Island Countries for Water Resources. (see Documentation B. item 8)	R. Mountain, UNDP
CR16/10/1	CCOP/SOPAC Moana Wave Cruise 3 (MW87-02) to the Territorial Waters of Western Samoa, the Cook Islands and Kiribati Feb 5 - Mar 3, 1987. CCOP/SOPAC Cruise Rep. 122. (see TAG report para.10.6)	W.T. Coulbourn, P.J. Hill, and shipboard scientists

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/10/2	A study of Manganese Nodules, Crusts and Deep-sea Sediments in the Northern Cook Islands, Central Line Islands, and Adjacent High Seas. (Abstract). CCOP/SOPAC Cruise Report 119. (see TAG report paras 10.12, 14.1.1)	D.S. Cronan, D.L. Tiffin, P.S. Meadows, and shipboard party
CR16/10/3	Brief update of the Tripartite Marine Geoscience Program. (see TAG report paras 10.6, 10.7, 14.1.1, 14.3.1)	N.F. Exon, BMR
CR16/10/4	Outline SONNE Cruise S048: Geological Development and Hydrothermalism of an Active Back-arc Basin (Lau Basin, SW Pacific Ocean) (Abstract). BGR Report 12335/87. (see TAG report paras 10.10, 14.3.1)	U. Von Stackelberg, BGR
CR16/10/5	Crossgrain Expedition, Leg 1. (see Documentation B. item 9)	J. Mammerickx, SIO
CR16/10/6	Crossgrain Expedition, Leg 2. (see Documentation B. item 10)	J. Mammerickx, SIO
CR16/10/7	Crossgrain Expedition, Leg 3. (see TAG report paras 10.12, 14.1.1, 14.2.1)	J. Mammerickx, SIO
CR16/10/8	Status of HIG Tripartite II Investigations – Mineral Potential of the North Fiji Basin. (see TAG report para. 14.3.1)	L. Kroenke, HIG
CR16/11.1/1	CCOP/SOPAC Workshop on Coastal Processes in the South Pacific Island Nations: Draft Report and Workshop Recommendations. CCOP/SOPAC Train. Rep. 15. (see Documentation B. item 11, also TAG report paras 11.1.1-7)	Techsec
CR16/12.1/1	High Resolution Seismic Surveys for Lagoonal Sand and Gravel Resources Tongatapu and Vava'u, Tonga Jan 7 - Feb 6, 1987 (Abstract). CCOP/SOPAC Prelim. Rep. 2. (see TAG report para. 12.1.1)	B. Richmond, Techsec
CR16/12.3/1	Lagoonal Drilling at Aitutaki, Cook Islands 5 May - 1 July, 1986 (Abstract). CCOP/SOPAC Prelim. Rep. 1.	B. Richmond, Techsec; J. Hein, USGS

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/13/1	Petroleum Developments in New Zealand (see TAG report para. 13.10)	R.H. Herzer, NZGS
CR16/13/2	General Summary of Petroleum Division Activities and Exploration Review (compiled from PNG Geological Survey report no. 87/14). (see TAG report para. 13.13)	PNG Delegation
CR16/13/3	PNG's Petroleum Promotion Project - Summary; Results; and PPL 82, Gulf of Papua. An Exploration Case History. (see Documentation B. item 12)	PNG Delegation
CR16/14.2/1	Ocean Resources Investigation in the Sea Area of CCOP/SOPAC. (see TAG report paras 10.13, 14.1.2, 14.2.1)	Japanese Delegation
CR16/16.1/1	Seawall Protection Facility for Mulinu'u Point, Western Samoa (Abstract). (CCOP/SOPAC Tech. Rep. 78. (see TAG report para. 16.1.1)	R. Carter, Techsec
CR16/16.2/1	Installation of Waverider Buoy Offshore Rarotonga 21.2745'S, 159.726W Cook Islands (Abstract). CCOP/SOPAC Tech. Rep. 80. (see TAG report para. 16.2.2)	R. Carter, Techsec
CR16/16.2/2	Installation of Waverider Buoy Offshore Tongatapu 21°13.26'S, 175°12.90'W Kingdom of Tonga (Abstract). CCOP/SOPAC Tech. Rep. 79. (see TAG report para. 16.2.1)	R. Carter, Techsec
CR16/16.2/3	Brief Note on the Status of Norwegian Wave Energy Plant Projects in the South Pacific. (see Documentation B. item 13)	NECOR
CR16/16.2/4	Wave Power - a State of the Art Report (see Documentation B. item 14)	Torkild Carstens
CR16/16.3/1	Geological Hazards (Tsunamis). (see Documentation B. item 15, also TAG report para. 16.3.11)	R. Richmond (for IOC)
CR16/17.1/1	Using the GLORIA Side-scanning Sonar System to Map the Sea Floor. (see Documentation B. item 16)	H. Gary Greene, USGS

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/17.1/2	NERC, RRS Charles Darwin and GLORIA in the SW Pacific - 1988. (see TAG report paras 17.1.4-6)	P.J. Schultheiss, IOS
CR16/17.1/3	High Resolution Swath Bathymetry and Side-scan Mapping: SeaMARC S (MS of paper in press).	D.M. Hussong, J.G. Blackington, J.F. Campbell, SSI Inc
CR16/17.2/1	SPOT 1 Status and First Applications Results in Geology, Coastal Studies, and Oceanography (Abstract).	J.C. Rivereau, SPOT IMAGE
CR16/18.2/1	Report on the Recent History of Teaching of the Earth Sciences at the University of the South Pacific. (see TAG report paras 18.2.4-5)	P. Nunn, USP
CR16/18.2/2	Draft Regulations for the CCOP/SOPAC Scholarship Scheme. (see Documentation B. item 18, also TAG report para. 18.2.6)	Techsec
CR16/18.2/3	Earth Science and Marine Geology Training Programme Jan - Mar 1987. Course Instructor's Report. CCOP/SOPAC Train. Rep. 13. (see TAG report para. 18.2.1)	R. Howorth, Techsec
CR16/18.3/1	CCOP/SOPAC Coastal Mapping Workshop 1-12 June 1987, Tuvalu. CCOP/SOPAC Train. Rep. 14. (see TAG para. 18.3.1)	Techsec
CR16/18.3/2	Proposal to: TAG - CCOP/SOPAC for a SOMRC - Unisearch Gold Workshop/Short Course to be held in conjunction with STAR - 1988 CCOP/SOPAC Meeting. (see TAG report para. 18.3.6-7)	M. Katz, Univ. NSW
CR16/18.4/1	High School Curriculum Development in the Earth Sciences for Island Member Countries of CCOP/SOPAC. CCOP/SOPAC Misc. Rep. 26. (see TAG paras 18.4.1-4)	Techsec

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/18.5/1	Call for Increased Co-operation between CCOP/SOPAC and Institutions of Higher Education in the Region. (see TAG report paras 18.5.1-5)	Dr P. Nunn, USP
CR16/20.1/1	Geo-Marine Letters, Vol. 6(4), 1987 Special Issue: Western Solomon Sea and Region, Part 1 (Contents). (also issued as CCOP/SOPAC Tech. Rep. 75)	D. Tiffin, Techsec
CR16/20.1/2	Geo-Marine Letters, in press (1987) Special Issue: Western Solomon Sea and Region, Part 2 (Contents). (also issued as CCOP/SOPAC Tech. Rep. 76)	D. Tiffin, Techsec
CR16/20.1/3	Call for the Establishment of an International Geoscience Journal dedicated to the Pacific Basin and its Margins.	Dr P. Nunn, USP
CR16/20.1/4	Tripartite Marine Geoscience Program Publications. (see TAG report paras 13.7-8)	H. Gary Greene, USGS
CR16/22.1/1	The Joint Research Program on the Rift System in the Pacific Ocean, Japan-France-SOPAC. (see TAG report para. 22.1.1)	Dr E. Honza, GSJ
CR16/22.1/2	The Ocean Drilling Program: Operations in the Western Pacific Region (see TAG report paras 22.1.2-4)	L.E. Garrison, P.D. Rabinowitz, & A.W. Meyer
CR16/22.1/3	Materials for SOPAC Annual Meeting, Ocean Drilling Program. (see TAG report para. 22.1.2)	H. Gary Greene, USGS
CR16/22.1/4	Status of HIG Tripartite Investigations in PNG: Mineral Potential of the Manus Basin and Volcanic Hazards Assessment of Rabaul Caldera. (see TAG report para. 22.1.5)	B. Taylor, HIG
CR16/23.1/1	Status of the Law of the Sea Convention and Progress Report on the Work Being Undertaken in the Preparatory Commission, 8 Oct. 1987. (see TAG report para. 23.1.1)	M. Fisk, UN Office of Ocean Affairs and Law of the Sea

<u>Document</u>	<u>Title</u>	<u>Submitted by</u>
CR16/23.1/2	Circum-Pacific Council, East Asia Map Project, Status - July 1987. (see TAG report para. 17.3.3)	H.Gary Greene, USGS
CR16/24/1	DRAFT CCOP/SOPAC Conceptual Work Programme for 1988 - 1992. CCOP/SOPAC Misc. Rep. 34. (see TAG report para. 24.1)	Techsec
CR16/25/1	Vanuatu: Proposed Work Programme, 1988. (see Part 1: Annex IV. CCOP/SOPAC Work List for 1988)	Vanuatu

B : SUMMARIES OF SELECTED DOCUMENTS

1. DOCUMENT CR 16/6/2:

Fiji Country Report: 16th Annual Session, CCOP/SOPAC, by R. Singh, H. Johnson, R. Smith, and A. Simpson

INTRODUCTION

The increase in CCOP/SOPAC Technical Secretariat's manpower resources has resulted in a greater direct involvement of CCOP/SOPAC in Fiji's marine geological/geophysical work programme, particularly in the Hydrocarbon area. CCOP/SOPAC has continued to play a vital role in technical support for the Mineral Resources Department (MRD) shallow-water marine geological/geophysical investigations and the various training schemes. It also has played an essential role in co-ordination of international marine geological/geophysical research.

This report summarises the activities of Mineral Resources Department's Hydrocarbons, Offshore and Seismology Section activities for the period October 1986 to September 1987. During this period, emphasis has been placed on staff training, capital resource upgrading, reducing backlog of data interpretation and, of highest priority, the hydrocarbons work. The moderate field programme was curtailed during the latter half of the reporting period, due to the reduction in manpower resources. Substantial time was devoted to testing the newly acquired survey equipment and the acceptance trials for the new survey vessel RV Yautalei. The refit and A-frame modifications to the shelf survey vessel HMFS Latui have been completed and the vessel is now standing by for trials using the CCOP/SOPAC Geomarex Vibrocorer. A complete revision of Fiji projects in the CCOP/SOPAC Work Programme elements (CCSP/FJ) has commenced. The revision for the project

CCSP/FJ.1 - Hydrocarbons is attached as Annex I.

Efforts of the Hydrocarbons Section have been directed towards planning programmes for hydrocarbons prospectivity evaluation. Petroleum source-rock evaluation and preparation of a hydrocarbons prospectivity report has commenced.

The activities of the Seismology section were concentrated on routine data acquisition, analysis and exchange; seismic risk study; seismographic network consolidation and mitigation of seismic and tsunami hazards through a public awareness and education programme.

OFFSHORE SECTION ACTIVITIES

The Offshore Section has had mixed fortunes with staff resources. Mr H. Johnson, Petroleum Geologist, has been a valuable addition to MRD, however, Offshore Section lost the services of Marine Geologist R. Holmes at the end of his contract, without replacement, and also lost an upcoming young local scientist, Mr T. Vuibau, who has been drafted for military duties for an indefinite period of time.

A total of twenty-seven man-months was spent on training of local staff (this does not include on-the-job training). One technical officer completed a post-graduate training course in Marine Geology in December, four technical assistants completed the Basic Earth Science Course at USP, a seismologist is on a full time M.Sc. course in Australia, and another technical assistant is doing a part-time B.Sc. course at USP. This indicates MRD's very strong commitment towards training of local staff.

In relation to CCOP/SOPAC projects within the Fiji EEZ: 100% completion can be

reported for the third leg of the Tripartite II cruise on RV Moana Wave, (a brief on the cruise results was presented by Co-Chief Scientist Dr L. Kroenke at MRD in February 1987); 50% completion can be reported for the RV Sonne cruise results; no progress for the vibrocoreing programme; 100% completion for nearshore and inshore baseline studies; 50% completion for data management; 100% for raining; 80% for equipment and technician loan. Work on the project CCSP/FJ.1 (Hydrocarbons) has just been initiated with about 30% of the CCOP/SOPAC agreed work due to be completed in September 1987.

With the staff restrictions and training commitments mentioned elsewhere, survey effort has been directed to: regional bathymetric compilation of sheets 1, 2, 3 in the 1:250,000 Bathymetry of Fiji; interpretation of seismic-reflection data for Laucala Bay, southern Viti Levu; interpretation of seismic-reflection and geological- sampling data from Savusavu Bay, Vanua Levu.

Three geophysical cruises were completed during the year, at Nukubuco, Togalevu, and the Navua River; a control-point survey was completed along the southeast coast of Vanua Levu and Taveuni; more Seabeam data were collected by RV Sonne on transit into Suva. Software development for processing Trisponder data and computer-assisted mapping are now part of the Mineral Resources Department Offshore work programme.

With the addition of the new research vessel Yautalei, the Mineral Resources Department now has available an excellent platform for inshore and nearshore geophysical surveys. Recent cruises have indicated that this vessel will be invaluable to the section's future programme. Also, Offshore Section support to Seismology, Hydrogeological and island geological-mapping programmes has been increased with the acquisition of the Yautalei.

HYDROCARBONS SECTION ACTIVITIES

The Hydrocarbons Section activities commenced in March 1987 after the arrival of Petroleum Geologist Mr H. Johnson on a two-year contract. He has been seconded by the British Geological Survey (BGS) and supported through the Commonwealth Fund for Technical Cooperation (CFTC). A local graduate trainee will be recruited for training and eventually to take over the responsibilities.

A two-year work programme has been planned and it includes three major projects:

1. Hydrocarbons-prospectivity evaluation and seismic interpretation of the area around Nadi Bay (Viti Levu) and the Yasawa Group.
2. Preparation for publication of a report on the hydrocarbons prospectivity of Fiji.
3. Hydrocarbons-prospectivity evaluation and seismic interpretation of Bau Waters.

A complete revision of the Fiji work programme CCSP/FJ.1 - Hydrocarbons has been completed (refer to Annex I for details).

Work has commenced on the following tasks with considerable support from CCOP/SOPAC Technical Secretariat:

- a) Assessment of requirements for reprocessing and acquisition of seismic data;
- b) Assessment of hydrocarbon shows in Fiji wells;
- c) Assessment of hydrocarbon source-rock potential in Viti Levu.

Also, the Hydrocarbons Section has commenced work on a hydrocarbon prospectivity evaluation and seismic interpretation of the area around Nadi Bay and the Yasawa Group.

There has been a downturn in commercial activity during the reporting period. Three of the four Oil Exploration Licences (OELs) that were granted previously became due for renewal in July 1987. The holders offered to surrender the OELs and apply for an option in a new area. They proposed to drill one hole in

the option area. Negotiations for the renewal of the fourth OEL are continuing.

SEISMOLOGY SECTION ACTIVITIES

Routine monitoring of earthquake activity in the Fiji Region is continuing and an annual summary of seismicity has been published since 1982. Research relating to Fiji seismicity is being carried out on focal mechanisms, local earthquake sequences, crustal structure, earthquake magnitudes, seismic risk and tsunamis.

The cooperative research project to evaluate seismic risk in Fiji (funded by USAID) was completed in 1986 and USAID support for maintenance of the Fiji seismographic network terminated in the same year. Strategic planning for network management was completed during the reporting period and has been implemented earlier than envisaged due to financial difficulties. Stations at Galoa, Magodro, Namosi, Taveuni, Udu and Vunidawa have been closed. A temporary station at Ahau, Rotuma, has also been closed. Furthermore, the establishment of a permanent station at Kadavu has been deferred indefinitely. The programme to introduce digital strong-motion accelerographs has been postponed indefinitely.

The Hon. Tadashi Kuranari, Minister for Foreign Affairs, Japan, Mrs Kuranari and a Japanese Delegation visited the Seismological Observatory at MRD on 13 January 1987 to inspect the seismic telemetry system installed under a bilateral aid agreement between Fiji and Japan and meet the Japanese volunteer working at MRD.

No unusual seismic activity was detected during the period. Two moderate earthquakes (MS 5.0 and 5.4) occurred on 18 May 1987, six minutes apart. Both were felt in Labasa, on Vanua Levu, with maximum intensities of MM III and MM IV respectively. No damage was reported. The focal mecha-

nisms of the events are being investigated.

During the reporting period, no significant tsunamis (tidal waves) were detected. As a result of the Pacific-wide tsunami warning issued on 7 May 1986, after the Alaskan earthquake, some faults within the National Tsunami Warning Procedure was detected. A review of the Procedure has been initiated in an attempt to improve it. Public education and awareness continues to be a high priority task. A permanent display has been prepared and displayed at MRD for visiting schools, institutions and occasional visitors. The earthquake information pamphlets "Fiji Earthquakes" and "Earthquake Rules" have been proven extremely popular, requiring a reprint of 15,000 copies; these have been circulated to schools all over Fiji.

ANNEX I: REVISION OF CCOP/SOPAC PROJECT

CCSP-FJ.1: Assessment of the Hydrocarbon Potential of Fiji.

INTRODUCTION

Project FJ.1 has been given a high priority by the Fiji Government since it was proposed at the 1st Session. Recently, considerable assistance has been provided by the Hydrocarbons Group at CCOP/SOPAC. The initial project proposal was as follows:

CCSP-1/FJ.1: (new project) *Stratigraphic test drilling northern margin of Fiji shelf* (Priority "A"). (a) Proposed: TAG-1, paragraph 38, to obtain subsurface stratigraphic data bearing on the petroleum potentials of adjoining shelf areas. CCSP-1/FJ.1A: Location, Viwa Island, Yasawa Group. CCSP-1/FJ.1B: Location, on the Great Sea Reef, north of Vanua Levu.

At the 7th Session the project was revised and its scope was broadened as follows:

CCSP-1/FJ.1: Assessment of hydrocarbon potential of northwest Fiji about Bligh Water (Priority A).

In this revision project FJ.3 (Re-evaluation of seismic and other data available on relinquished petroleum concession west of the Yasawa Group, (Priority A)) was incorporated into the revised FJ.1 project.

At the 10th Session the project was again revised. The intention was to bring together under one project all hydrocarbon studies in Fiji offshore areas. Prior to this the aims of the following projects were, at least in part, to assist in the evaluation of hydrocarbon potential:

CCSP-FJ.9 (Priority B): Seismic refraction survey, Viti Levu and Vanua Levu. Proposed 2nd Session.

CCSP-FJ.11 (Priority B): Marine geological and geophysical investigation of northern margin of the Fiji Platform. Proposed 3rd Session.

CCSP-FJ.12 (Priority B): Marine geological and geophysical investigation of the southern Koro Sea between Viti Levu, Kadavu and Moala islands. Proposed 3rd Session.

CCSP-FJ.14 (Priority B): Interpretation of detailed aeromagnetic data. Proposed 5th Session.

At the 10th Session the project was revised as follows:

CCSP/FJ.1: Assessment of the hydrocarbon potential of Fiji (Priority A).

Element objectives: To promote, initiate, participate or generally support all activities which will assess or assist in the assessment of the hydrocarbon potential in Fiji offshore areas.

Recommendations: to outline the major fault and basement boundaries defining marine sedimentary basins by seismic interpretation; to determine source rock potential of various lithostratigraphic formations; to analyse facies in relation to basin evaluation and with

regard to lateral variation within stratigraphic systems or series.

The purpose of the following revision is to identify specific tasks within the project and to put them in order of priority. Some tasks have already been initiated by the Mineral Resources Department, but considerable assistance from CCOP/SOAPC is also requested.

PROJECT FJ.1:

ASSESSMENT OF THE HYDROCARBON POTENTIAL OF FIJI (REVISION)

Proposed: 1st Session

Revised: 7th, 10th and 16th Sessions

Status: initiated, 7th Session.

Background information: see introduction, above

Project Objectives: To provide, initiate, participate or generally support all activities which will provide an assessment or assist in the assessment of the hydrocarbon potential of Fiji, both offshore and onshore.

Elements of FJ.1 and List of Tasks.

1. Evaluation of hydrocarbon source rocks in Viti Levu (this project has been initiated by MRD).
 - 1.1 Sampling of outcrops and existing borehole material can be carried out by the MRD, and has been initiated.
 - 1.2 Analysis of total organic carbon content of samples is to be carried out at the University of the South Pacific.
 - 1.3 Analyse kerogen types, vitrinite reflectance and thermal alteration indices.
 - 1.4 Drill shallow holes (about 30 m) for unweathered samples of the most promising lithofacies.
 - 1.5 Perform Rock-Eval pyrolysis on unweathered material.
 - 1.6 Model subsidence and geothermal gradient histories of sedimentary basins to determine the timing of hydrocarbon generation and migration.

2. Assess parameters for acquisition and processing of all multichannel seismic reflection data and carry out reprocessing requirements.
 - 2.1 Review acquisition and processing parameters of all multichannel seismic reflection data.
 - 2.2 Recommend data which would particularly benefit from reprocessing.
 - 2.3 Recommend reprocessing parameters.
 - 2.4 Reprocess the data, as recommended.
 - 2.5 Highlight areas where reprocessing of present data could not significantly improve the data quality and where acquisition of new data is desirable.
 - 2.6 Recommend parameters for the acquisition and processing of new multichannel seismic data.
3. Assess the hydrocarbon prospectivity of the Lau Ridge.
 - 3.1 Interpret all available, deep-penetration, multichannel and singlechannel seismic reflection data.
 - 3.2 Assess the available gravity and magnetic data.
 - 3.3 Assess the availability and style of potential hydrocarbon traps.
 - 3.4 Assess source rock potential.
 - 3.5 Assess the thermal history and comment on the likely level of maturation of the sediments.
 - 3.6 Comment on timing of maturation with respect to trap formation and on possible migration routes.
 - 3.7 Assess reservoir potential.
 - 3.8 Make recommendations for future work, such as stratigraphic drilling, source rock sampling, geochemical surveys, collection of dredge samples, etc.
4. Assessment of hydrocarbon shows in oil exploration wells.
 - 4.1 Review hydrocarbon test results, geophysical well logs, hot wire instrument charts, final well reports, etc.
 - 4.2 Assess the significance of the recorded hydrocarbon shows.
 - 4.3 Recommend future work requirements.
5. Analysis of pre-Colo Unconformity, shallow-water sediments at outcrop in Viti Levu to assist identification of petroleum source rocks.
 - 5.1 Measure sections through pre-Colo Unconformity, shallow-water facies strata.
 - 5.2 Describe lithofacies, sedimentary structures, ichnofacies.
 - 5.3 Carry out palaeontological studies for dating and palaeoenvironmental analysis.
 - 5.4 Interpret environments of deposition.
 - 5.5 Assess source rock potential.
 - 5.6 Assess reservoir potential.
 - 5.7 Assess palaeogeography, sea level changes and plate tectonic reconstruction.
 - 5.8 Assess palaeofacies belts and suggest sites for stratigraphic and source rock drilling.
6. Micropalaeontological study to assist evaluation of the geological evolution of the Fiji Platform.
 - 6.1 Identify fauna and flora in the samples.
 - 6.2 Determine age-range of enclosing sediments.
 - 6.3 Interpret palaeoenvironments.
 - 6.4 Further micropalaeontological work is required on samples from the Nadi area and the Yasawa Islands in particular, and other parts of Fiji.
7. Drill deep (1000 m or more), extensively cored, stratigraphic wells.
 - 7.1 Analyse lithofacies and lithostratigraphy.
 - 7.2 Assess palaeoenvironments.
 - 7.3 Analyse biostratigraphy and chronostratigraphy.
 - 7.4 Analyse source rock quality and degree of thermal maturation.

- 7.5 Analyse reservoir quality of significant coarse-grained epiclastic and volcani-clastic units and of limestone intervals.
- 7.6 Wells in areas including the following are desirable: Central Viti Levu Basin; Lau Ridge (Futuna Limestone); Vanua Levu; Yasawa Islands; Vatulele.
8. Review of gravity and magnetic data.
 - 8.1 Apply geological models to obtain a best fit for each sedimentary basin.
 - 8.2 Assess depth to effective economic basement for hydrocarbon prospec-tivity.
 - 8.3 Assess seismically defined build-ups and comment on the likelihood of reefal or volcanic origin.
9. Carry out geochemical surveys to seek and identify seepages of thermogenic hydro-carbons.
 - 9.1 Regional survey over Lau Ridge, particularly concentrating on the part opposite Tongatapu and 'Eua, where oil seeps have been verified.
 - 9.2 Detailed surveys over the most promis-ing seismically defined prospects in Nadi Bay, Lomaiviti area and Bligh Water sedimentary basins.
 - 9.3 Regional surveys over the Baravi and Suva deep-water sedimentary basins.
10. Acquire seismic refraction data to deter-mine crustal structure and estimate depth to effective economic basement for hydrocarbon exploration, particularly across the axis of the Oligocene to Mid-Miocene island arc, includ-ing the following locations: across the Yasawa Group; from the Mamanuca Group to Nadi Bay; across Bau Waters; across Vanua Levu; across the Lau Ridge
11. Acquire multichannel seismic reflection, gravity and magnetic data over the Lau Ridge (particularly the part opposite Tongatapu and 'Eua, where oil seeps have been verified) and from deep-water sedimentary basins around Viti Levu, especially the Suva Basin.
12. Basin analysis of the Rewa and Nadi Basins, Viti Levu.
 - 12.1 Analyse lithofacies, sedimentary struc-tures and trace fossil assemblages.
 - 12.2 Additional palaeontology.
 - 12.3 Assess depositional environments and sea level changes.
 - 12.4 Assess structural development of the basin.
 - 12.5 Assess source rock potential and levels of thermal maturation.
 - 12.6 Assess reservoir potential.
 - 12.7 Make recommendations for future work.
13. Acquire seismic data across sedimentary basins on land.
 - 13.1 Analyse structure, seismic facies and ties to offshore data.
 - 13.2 Use land seismic control to recommend sites for stratigraphic boreholes.
14. Collect dredge samples from the rifted arc margin of the Baravi Basin.
 - 14.1 Analyse lithofacies.
 - 14.2 Analyse palaeontology.
 - 14.3 Interpret environments of deposition.
 - 14.4 Correlate with seismic stratigraphy.
15. Seismic interpretation and evaluation of the hydrocarbon prospectivity of sedimentary basins east, west and northwest of Viti Levu.
 - 15.1 Interpret seismic data and produce structure contour maps for significant geological horizons.
 - 15.2 Assess the structural evolution of sedi-mentary basins.
 - 15.3 Assess the presence and likely level of thermal maturation of hydrocarbon source rocks.
 - 15.4 Assess the timing of hydrocarbon gen-eration and likely migration pathways.
 - 15.5 Assess the presence and likely quality of reservoir rocks.
 - 15.6 Assess the timing of trap formation with respect to hydrocarbon genera-tion.

- 15.7 List potential hydrocarbon targets identified by this study and make recommendations for future work.
- 15.8 Publication of a document describing the hydrocarbon prospectivity in Fiji.
- 15.9 Training of local professional personnel in petroleum geology.

Work planned for 1987-1988

- (i) Sampling of outcrop and borehole material for petroleum source rock analysis.
- (ii) Evaluation of hydrocarbon shows in oil exploration wells.
- (iii) Assessment of seismic reprocessing and acquisition requirements.
- (iv) Basin analysis of the Nadi Basin, Viti Levu.
- (v) Seismic interpretation and evaluation of the hydrocarbon prospectivity of sedimentary basins west and northwest of Viti Levu.
- (vi) Preparation for publication of a document describing the hydrocarbon prospectivity in Fiji.

Work completed

A review of the work completed prior to October 1981 is included in the Proceedings of the Tenth Session of CCOP/SOPAC. The list that follows includes work completed from November 1981 to September 1987.

(i) A comprehensive review of commercial activities in the (OELs) up to February 1984 has been produced (Eden and Smith, 1984). Not included in this are geochemical and gravity surveys carried out in 1983 by Dr D. O'Brien. Most of the records of this work in OEL 7, and possibly other areas, have not yet been received by MRD. In 1985 a geochemical "sniffer survey" was carried out in OEL 8 by Interocean but a final interpretation report has not been received.

A regional study of three OELs using remote sensing techniques was completed by

SCAIS A.B. in late 1984 and final reports have been received. These three OELs became due for renewal in July 1987. The holders offered to surrender the OELs and apply for an option in a new area largely included within the surrendered OELs. They proposed to drill one hole in the option area. Negotiations for the renewal of the fourth OEL are continuing.

(ii) Inventories of hydrocarbon exploration data held by two oil companies have been obtained.

Reports

JOHNSON, H. 1987. Petroleum source rocks in Viti Levu, a preliminary assessment and general recommendations for sampling. *Fiji Mineral Resources Department Note BP48/1* (unpublished), Restricted circulation.

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BUCHBINDER, B.; HALLEY, R.B. 1985. Source rock evaluation of outcrop and borehole samples from Tongatapu and 'Eua Islands, Tonga, and from Viti Levu and Vanua Levu Islands, Fiji. Page 335-349 in Scholl, D.W.; Vallier, T.L. (comps. and eds.) 1985. Geology and offshore resources of Pacific island arcs - Tonga region. *Circum-Pacific Council for Energy and Mineral Resources, Earth Science Series, Volume 2*.

EDEN, R.A.; SMITH, R. 1984. Fiji as a petroleum prospect. Mineral Resources Department, Suva. 38 pp.

EVERINGHAM, I.B. 1987. Seismic refraction data and crustal structure for southeastern Viti Levu. *Fiji Mineral Resources Department Report 63*.

KATZ, H.R. 1986. Hydrocarbon potential in the SW Pacific. Pages 83-116 in Cronan, D.S. (ed.) 1986. *Sedimentation and Mineral Deposits in the Southwestern Pacific Ocean*. Academic Press. London.

2. DOCUMENT CR 16/6/3:

Report on New Zealand Offshore Geoscience 1986-87, by K.B. Lewis

In the last year there have been some significant changes to marine geoscience in New Zealand.

Offshore Strategic Research

Firstly, commissioning of our own research vessel, *Rapuhia*, has completely revitalised marine geoscience programmes in New Zealand. The RV *Rapuhia* was previously the German Hydrographic Institute's research vessel *Meteor*. She is large, stable, comfortable, with all facilities but somewhat expensive to run. The vessel's stability and maneuverability means that we can operate in sea states where previously we would have been hove to.

Of the 12 strategic science cruises this last year, 6 have been for geoscience projects by NZOI and Geophysics Division. These have included studies of the crust beneath the Hikurangi Trough, the basement structure of the southern Lord Howe Rise, the evolving fault system in Cook Strait, the geomechanics of slope failure on the active Hikurangi Margin and the mechanics of lahar deposition on the shelf around the volcanic cone of Mt Egmont. One biological sciences cruise was to determine growth rates of precious coral using isotope tracer fed to live colonies. Most of the cruises have evolved from data syntheses during our 2.5 years without a ship.

Contract Work

The second major change has been the change in Government policy that requires us to earn a significant part of our revenue from commercial contracts. In the last year NZOI (DSIR Division of Marine and Freshwater Science) has completed over 40 contracts, the majority in geosciences. These include small jobs such as data reviews, impact reports, and equipment servicing. There have been numerous route surveys for sewer outfalls, gas pipelines and electricity cables. There was a dam stability study after the Bay of Plenty earthquake. A big contract, involving use of the *Rapuhia*, was a site survey for the New Zealand era of the trans-Tasman fibre optics cable. Some of these contracts have involved the cooperation of the marine geophysicists at DSIR Geophysics Division. One effect of the commercial work has been to limit the output of scientific publications.

Staff Changes

The other major change for us is that, after almost a quarter of a century at NZOI, Jim Eade has left to accept the post of Technical Editor with CCOP/SOPAC. Jim's knowledge and experience is sorely missed, and not only in science but in his understanding of the administrative procedures that affect science in this region. Fortunately he is still heavily involved and he is only as far away as the nearest telephone.

He has been replaced by two recent graduates who have considerable enthusiasm but not yet, his depth of experience. One of them, Phil Barnes, an engineering marine geologist, has begun work on the geomechanics of submarine slope failure under earthquake stress.

The other, Ian Wright, is also in the field of geological hazards. He is studying the effects of volcanic eruptions in the Bay of Plenty and the evolution of the transform between the Havre Trough and the Taupo Volcanic Graben.

At DSIR Geophysics Division, Fred Davey, who was appointed Director of the division, has been replaced at the workplace by Ray Wood, from NZ Geological Survey's Petroleum Basin Studies Group.

New Equipment

Along with our new research vessel, we have received some funds to buy new equipment. The first purchase was a 16 transducer ORE hullmounted 3.5 kHz system, which gives high resolution seismic image of the top 100 ms (75 mm) at almost any ocean depth. Geophysics Division have complimented this with a multichannel seismic system that uses a 24-channel Teledyne Model 178 hydrophone array reconfigurable between 900 m for deepwater work and 360 m for high-resolution inshore work. This is used with twin 120/130 cu.in. airguns. Full seismic processing is available up to migration and a migration package is being developed. At present we are in the processes of purchasing a new, twin frequency Klein Side-scan Sonar system with full slant range and speed correction to replace our 15 year old Klein system. For nearshore work we have purchased a small airgun with interchangeable 1 to 10 cu.in. chambers. This consistently gives better penetration but poorer resolution than the boomer and is extensively used in contract work.

During the year NZOI has updated its computer facilities with purchases of PCs appropriate to particular tasks (including desk top publishing) and with full digitising and plotting capabilities. An extensive data base of station and underway data is now readily accessible.

Future Plans

In the near future, we intend to concentrate resources on several studies of New Zealand's active margin, particularly the northern part where recent observations have

cast doubt on the conventional understanding of the nature of the subducting slab, the fate of sediments at the plate boundary, and the evolution of a backarc basin at a continental margin.

Now that a series of studies of critical areas is nearing completion, it is hoped to proceed with a synthesis of geological information on New Zealand's very large EEZ. This will be published in a series of offshore geological maps and monographs. The existing research programme and expected load of contract work means that New Zealand's 9 marine geoscientists expect to be heavily committed. However, all of them retain a keen interest in what is happening to the north and a desire to assist where their expertise is appropriate.

3. DOCUMENT CR 16/6/4:

Australia: Review of Marine Geoscience Activities in 1987, by N.F. Exon

BMR's marine operations included six geoscience cruises including one multichannel seismic cruise in the Gippsland Basin and off the southern New South Wales coast, one phosphate sampling cruise off the New South Wales coast, and one multidisciplinary cruise on the Queensland and Marion plateaux and across the intervening Townsville Trough. The final cruise is of particular interest to CCOP/SOPAC, and a preliminary cruise report is expected soon.

The geoscience capability of BMR's marine vessel Rig Seismic, has been upgraded during the year. On the geophysical side it now has two airgun strings with a total capacity of 3200 cubic inches, and a 96-channel seismic cable with a length of up to 4500 m. High-resolution seismic work has been greatly strengthened by the purchase of 40 and 80 cubic inch waterguns. The coring system has also been improved, and more than 7 m of core has been recovered in favourable sediments.

Australian scientists remained heavily involved in the Tripartite marine geoscience programme. On Moana Wave cruise MW87-01, in the North Fiji Basin, Dick Price of La Trobe University was petrological Co-Chief Scientist, and Jock Keene of Sydney University was a sedimentologist. On Moana Wave cruise MW87-02, in Cook Islands, Western Samoan and Kiribati waters, Peter Hill of BMR was geophysical Co-Chief Scientist, and Jules Bogi of the New South Wales Institute of Technology was a metals geochemist. Both cruises met most of their objectives.

Work continued on the results from these and earlier Tripartite cruises, and the Circum-Pacific Council for Energy and Mineral Resources Earth Science Series Volume 7: "Marine Geology, Geophysics and Geochemistry of the Woodlark Basin - Solomon Islands", edited by Brian Taylor (HIG) and Neville Exon (BMR), was published. Two more volumes (Vanuatu and New Ireland) should go to press this year. Australia, New Zealand and the United States of America have agreed to a Third Phase of the Tripartite Programme, which should come into effect early next year.

Seven Australians attended the very important CCOP/SOPAC-IOC "Coastal Processes Workshop" in Lae, in early October 1987, and most were speakers.

Australia is still considering joining the Ocean Drilling Program (ODP) in partnership with Canada. Four ODP cruises in Australian waters are scheduled for 1987 and 1988; two in the southern Indian Ocean, and two on the Exmouth Plateau and Argo Abyssal Plain off northwest Australia. The recent Rig Seismic cruise off northeast Australia included site surveys for a Queensland Plateau ODP leg, which is proposed for 1989, and which has good prospects of going ahead. Joint proposals for submersible work, using NOAA's "Pisces V" have been submitted for various areas including the Manus Forearc, the Great

Barrier Reef, and Vanuatu. Should these be approved they would probably take place in 1990.

At the Fifteenth Session of CCOP/SOPAC, Australia was asked to consider arranging the archiving of geophysical magnetic tapes, mostly seismic tapes collected by petroleum exploration companies from CCOP/SOPAC countries. The Bureau of Mineral Resources is willing to arrange storage of such tapes, and to make them available for copying, under conditions to be agreed with member countries and CCOP/SOPAC Techsec.

A request was made at the Fifteenth Session for bathymetric drafting training in Australia. The Division of National Mapping, which had provided such training in past years, is vacating the bathymetric area, but it is highly probable that either the Hydrographic Service of the Royal Australian Navy, or BMR, will be able to undertake such training.

Australia continues to provide direct financial support to CCOP/SOPAC, beyond its membership contribution and its support of the Tripartite Programme. This amounted to A\$250,000 in 1986/87, and it is estimated to be the same in 1987/88.

4. DOCUMENT CR 16/6/5:

Summary of Activities, Related to CCOP/SOPAC Work Programme since October 1986, by PNG Delegation

INTRODUCTION

The government of PNG is represented by the Minerals and Energy Department, in particular personnel from the Geological Survey, which is the chief function of the department. Hence, the work programme and/or scientific projects carried out in the region are closely monitored and assessed by one of the four divisions of the Geological Survey, which are the Minerals, Petroleum, and Geological Serv-

ices (i.e. Engineering Geology/Ground Water and Geophysical Observatory), and the Volcanological Observatory in Rabaul.

WORK PROGRAMME WITH TECHSEC ASSISTANCE

Techsec activity in the region for the period 1986-1987 has been non-existent. Much of the work relating to the PNG Work Programme (PN1-14) was carried out inhouse. However Techsec has been in contact with the Geological Services Division in regard to bottom sampling of Fairfax Harbour, and we were fortunate enough to send two officers for training to the CCOP/SOPAC Earth Science and Marine Geology Course, and to the Coastal Mapping Workshop in Tuvalu. The officers, namely Upu Kila and John Kawatt, have expressed their gratitude and appreciation and report that the training was successful and beneficial. As English skills were a problem faced by one of our participants on the course, it was suggested that CCOP/SOPAC consider sponsoring a course on "English as a Second Language".

WORK PROGRAMME - INHOUSE AND RELATED ACTIVITIES

Minerals Division

The major push since the last session has been documenting all South Sepik geological mapping and mineral exploration into Memoir 12, and carrying out a similar programme for the northern portion of the Bougainville Island in conjunction with personnel from the German Federal Institute for Geosciences and Natural Resources (BGR). The Bougainville Island project is in part a ground follow-up of aerophysical anomalies detected by the German airborne geophysical team in 1986.

The joint geoscientific team has confirmed the use of ground geophysics (EM, Magnetic plus Radiometric) for highlighting the argillic

zone, particularly low magnetic areas. Perhaps the highlight of the year in terms of village-level development is a much successful demonstration of special small-scale alluvial gold mining on Bougainville Island.

Petroleum Division

Much of the work for the past twelve months has been promotion of PNG as a prospective petroleum province, in particular the geological assessment of the New Ireland Basin and Manus Island. Although the oil market is depressed, Iagifu oil field discovery was encouraging to prospectors. There is much activity in the Papuan Basin.

Geological Services Division

Plans have been completed for comprehensive study in November 1987 of the submarine geotechnical conditions in Fairfax Harbour. This will involve Techsec, GSPNG (Mr Joe Buleka) and later CCOP/EA. Mr Buleka will take this project as partial fulfillment of a postgraduate diploma in Science at UPNG.

A marine geophysical survey was carried out near the mouth of Kikori River as part of the Dames and Moore geotechnical study for an oil pipeline from Southern Highlands, and we are still awaiting the report. The division is embarking on an establishment of a geotechnical and hydrogeological data bank, and this would be with the help of United Nations Department of Technical Cooperation for Development Project in conjunction with the UNDP Project "Planning and Management of Water Resources in Small Island Countries in the Pacific".

Proposals for future work are in two parts:

- (i) a pilot project along the coastline of Morobe and East Sepik provinces for geotechnical information in regard to small wharves construction; and
- (ii) a project to monitor and control severe coastal erosion at Bereina and coastline of

the Gulf of Papua.

A proposed PNG Digital Seismic Network has been designed and would be funded by the Federal Republic of West Germany for about K1 million (US\$1 million). It is a powerful, realtime processing network consisting of 20 microprocessor controlled field stations, with a sophisticated earthquake-alarm system. Its main function is to accurately locate earthquake hypocentres.

VOLCANOLOGICAL OBSERVATORY – RABAU

Volcanic activity in Rabaul, Manam, and Bagana has been low and mild. Surveillance of the volcanoes including Karkar, Langila, Ulawun, Lamington is continuous. Horizontal measurement networks for Karkar, Ulawan and Manam, and new dry tilt assays in Manam have been established. The new observatory has a new outstation seismograph system, new receiver/demodulators for Rabaul Harbour Network stations, and new computers.

CONCLUSION

CCOP/SOPAC Techsec activity in PNG for the period 1986-1987 has been very quiet.

PNG proposals for the coming 12 months include:

- (i) side-scan sonar mapping in Woodlark Basin and Goodenough Bay (reintroduced);
- (ii) pilot geotechnical project for the coastline of the north coast of PNG; and
- (iii) a project to monitor severe coastal erosion of Bereina and Gulf of Papua.

Training for indigenous scientific and technical officers is paramount, in particular to strengthen geotechnical and petroleum expertise.

5. DOCUMENT CR 16/6/7:

Country Report, Kingdom of Tonga 1986–

1987, by Dave Tappin and Saimone Helu.

CCOP/SOPAC WORK PROGRAMME

Tonga Country Projects addressed during the year include:

TG.3: *Survey of nearshore areas for precious corals.* A draft Technical Report was received from Dr J. Harper of Techsec entitled "Precious Corals Prospecting Strategies for the South Pacific Region". This report reviews precious coral work in the Tonga Region and recommends further surveys.

TG.4: *Survey for zones of metalliferous enrichment in active volcanic areas in Tonga.* A report was received detailing the initial results of the HMNZS Tui Cruise carried out in 1986 as part of Tripartite II and co-authored by Drs M. Meylan and G. Glasby. The RV Sonne carried out surveys in the Southern Lau Basin investigating areas of hydrothermal mineralisation.

TG.5: *Seismic reflection survey of the Tonga Platform to determine sediment thicknesses and basement structure with particular reference to oil.* During the year, work continued on the interpretation of data from the SP Lee cruise of 1984 carried out under the Tripartite II Programme. Presentations of some of the results of this cruise were made at the Circum-Pacific Energy and Minerals Conference held in Singapore in 1986 and at the International Association of Sedimentologists meeting held in Canberra in the same year. It is planned to complete the report of this cruise by early 1988. The Director and the three Techsec petroleum specialists, visited the Kingdom of Tonga in June at the invitation of the Government of Tonga, for discussions on the organisation and implementation of a hydrocarbon re-interpretation programme utilising all available hydrocarbon data from both commercial and non-commercial sources. One of the Kingdom's highest priorities is the promotion of the hydrocarbon prospects and Tech-

sec were strongly urged to begin the re-interpretation as soon as was practicable, Tonga already having a substantial archive of hydrocarbon data available for reproduction. As a result of the mission, re-interpretation of data was initiated as part of a programme including reprocessing of data as and when funds become available.

TG.6: *Study of Coastal, Beach and Inshore sand deposits to determine the nature of known deposits suitable for construction, roading, landfill, and other purposes.* Techsec (Mr B. Richmond) carried out geophysical and sampling surveys investigating sand and gravel resources offshore of the islands of Tongatapu and Vava'u. Additionally, geophysical surveys were carried out off Lifuka in the Ha'apai Group in an attempt to locate the British privateer Port au Prince, burnt and sunk in 1906 by Finau Uluha'ala, a Tongan warrior chief. The ship was reportedly treasure laden. The search was unsuccessful.

TG.7: *Investigation of oceanographic conditions at Tongatapu Blow Holes for assessment studies of power and wave energy.* Techsec (Dr Carter), in association with experts from Norway, deployed a Waverider buoy off the southern coast of Tongatapu in March. During Dr Carter's visit, engineering consultants from Norway were in the Kingdom assessing possible locations for the construction of a wave-powered electricity generator.

TG.8: *Baseline study of inshore areas in Tonga for coastal development programmes.* Dr R. Carter carried out a bathymetric water sampling and current meter survey of the Tongatapu Lagoon. This also included tidal measurements of the lagoon and open ocean for comparison in estimating tidal exchange.

TG.11: *Data Management.* Techsec Data Manager visited Tonga briefly in September to outline new developments in the SOPAC region and to be informed of national priori-

ties. These are to develop a data base of country information, notably of cruise data, for use in programme and country activity as soon as possible.

TG.12: *Reconnaissance coastal and near-shore mapping.* A draft report was received from Dr P. Roy on reconnaissance mapping in Tongatapu and Vava'u Islands, Tonga.

TG.13: *Reconnaissance and bathymetric mapping of the seafloor.* A report prepared by Tonga on priority areas in Tonga EEZ for sea floor mapping by GLORIA was presented at 16th Session.

OTHER ACTIVITIES

Training

The Training Co-ordinator (Dr Russell Howorth) visited the Kingdom twice for discussions with the Ministry of Lands and the Ministry of Education on issues relating to curriculum development in the field of geological sciences. Mr Fuka Kitekei'aho assisted Dr Howorth on the Earth Science and Marine Geology Course, held at the University of the South Pacific in the first quarter of the year. Mr Kitekei'aho also attended the ICOD-sponsored Workshop "Non-fuel Marine Resources of the Ocean Basins" held in Halifax, Nova Scotia in March. Mr Saimone Helu spent one month with Techsec in Suva on an on-the-job training exercise in multichannel seismic interpretation. Mr Sione Tongilava, Mr David Tappin and Mr Saimone Helu attended the Coastal Processes Workshop held in Lae immediately preceding the 16th Session. Mr Tappin gave a paper on "Coastal Morphology and Sediment Budget of Tongatapu, Tonga" and Mr Helu on "Seawall Construction and Coastal Development, Nuku'alofa, Tonga".

Hydrocarbons

In-country work continued on promotion of the prospects. Companies expressing inter-

est were sent information packages and data lists. Preliminary reprocessing of existing commercial data, funded by CFTC, was carried out and resulted in substantial improvements in the quality of the data. Advice was received, funded by CFTC, on the management of existing hydrocarbon data. An application for an oil agreement has been received and this is now being assessed.

Bulk Minerals

A coastal morphology map together with a report describing the main coastal features and the sediment budget of the beaches of Tongatapu was produced to draft form. A paper describing the results of this study was presented at the Coastal Processes Workshop, held in Lae. A preliminary visit by a member of the New Zealand Geological Survey, Engineering Division was made to Tonga as a precursor to the "Bulk Minerals Investigation Project", funded by New Zealand on a bilateral basis.

Environment

SPREP held a two day Workshop on "Environmental Issues in Tonga and Future Responses" in Nuku'alofa followed by a two-week training course on Coastal Resource Management Planning.

Offshore Cruises

The RANL Cook carried out a survey in association with the Ocean Sciences Institute of Sydney University, investigating the acoustic properties of sound in the water column. Minerals Exploration

Two Exploration Licences were issued during the year and preliminary exploration carried out by one company on the islands of Vava'u and Eua. The primary objective of the exploration is the discovery of gold.

6. DOCUMENT CR 16/6/8:

Country Report, Western Samoa, by
A.K. Titimaea

INTRODUCTION

Western Samoa has been a member of CCOP/SOAPC since its inception as a UN project in 1972. Being an initial signatory to the 1984 Memorandum of Understanding indicates Western Samoa's support to the fully fledged inter-governmental organisation. However, it is poorly gifted with potential in offshore minerals as compared to other member countries and therefore Western Samoa's projects are orientated towards nearshore resources, cost-effective coastal development projects, and to the training component provided by CCOP/SOPAC.

ORGANISATION

The Apia Observatory, a division of the Department of Agriculture, Forests and Fisheries, is the executing arm of the government in all CCOP/SOPAC activities, with the Superintendent being the National Representative. The Observatory is divided into several sections:

- Meteorological - weather forecasting and climate data;
- Hydrological - surface, groundwater hydrology, water quality, CCOP/SOPAC;
- Geological - subsurface geological investigation water well drilling and CCOP/SOPAC activities;
- Geophysics - geomagnetics, seismology, CCOP/SOPAC, DSIR;
- Administration - financial and administration, CCOP/SOPAC.

STAFFING

Current staff consists of 3 professional staff (2 hydrologists, 1 seismologist), 1 technical adviser (NZ) and 13 persons either technicians or administrators.

ACTIVITIES

- (a) A joint-project on Coastal Mapping (Mulinu'u Peninsula) to assess shoreline recession/progradation is now underway between the office and Lands and Survey Department. The overlay technique is applied using 4 sets of aerial photographs taken since 1950. The technique is applied to a digitised database and processed on a PC.
- (b) Subsurface geological investigation drilling by the drilling crew of the Geological Section on the Afulilo Hydropower Project funded by ADB, EDF, and GWS, northeast of Upolu Island. Data is now available.
- (c) The computer system for seismic signal detection is still in operation. Seismological data reliability has been enhanced tremendously with the present facilities. This is the responsibility of the Geophysics Section with assistance from the Alburque Institute of Seismology (Colorado).
- (d) The Apia Observatory provides a continuous service to the Tsunami Warning Network in Hawaii, as one of its major stations in the South Pacific.
- (e) A substantial amount of hydro-meteorological equipment has been received under Australia's DIG programme.
- (f) The Australian Navy has undertaken airborne mapping of the Exclusive Economic Zone.
- (g) A member of our staff participated on a 6-month fellowship to study Geographical Information Systems and Satellite Image Processing at the UNEP Processor Facility in Geneva.
- (h) A team of Norwegian experts from the commercial firm Kvaerner visited Apia to discuss progress of our wave energy project which was initiated by CCOP/SOPAC.

CCOP/SOPAC ACTIVITIES

- (a) A reconnaissance survey of nearshore sand and gravel was conducted on the

northeast of Upolu Island early in the year by the Techsec Marine Scientist.

- (b) The Training Co-ordinator visited us in June to discuss with staff training officers and education personnel, Western Samoa's in-country training needs.
- (c) Two staff members undertook the CCOP/SOPAC Basic Earth Science Course at USP, one participated on the RV Moana Wave cruise, and one participated in the Coastal Mapping Workshop in Tuvalu.
- (d) The Techsec Data Manager visited us in September to discuss our data requirements.

7. DOCUMENT CR 16/8/1:

Brief Note on the Status on Norwegian Ocean Mining Efforts, by Jan Magne Markussen

SUMMARY

The Fridtjof Nansen Institute is an independent research institution, primarily engaged in questions related to the world oceans, the seabed and the polar regions. The Institute's efforts also comprise a project engaged in studies of the international markets for oil and natural gas. These activities are financed through grants over the national budget, and through contributions from the ministries, the research councils and the business community.

The Fridtjof Nansen Institute has been engaged in studies of various aspects of the deep seabed minerals since 1973. In January 1981, the Institute established its Ocean Mining Project, whose aim is to keep Norwegian companies, research institutions and governmental authorities informed as to the developments and emerging industrial opportunities related to the seabed minerals.

As of today, the Ocean Mining Project has published a total number of 90 reports, memos, etc. with analyses of the perspectives

for the exploitation of polymetallic nodules in the Indian Ocean and the Pacific, polymetallic sulfide deposits along the East Pacific Rise, polymetallic crust deposits in the Pacific, Red Sea metalliferous mud, phosphorite nodules, placer deposits, etc.

Three reports will be published during 1987-88 which are intended to provide a total overview of the status and perspectives for the exploitation of nodules, sulfides, and crust deposits, and for market development of copper, cobalt, nickel, and manganese.

The Ocean Mining Project also organises seminars and conferences.

8. DOCUMENT CR 16/8/3:

UNDP Regional Project of the Government of Pacific Island Countries for Water Resources by R. Mountain

SUMMARY

A new project document "Water Resources/Assessment and Planning in Pacific Islands" was expected to be signed before the end of 1987 and would operate for four and a half years. Objectives include improved living conditions of urban and rural populations by providing adequate water supply, and increased industrial and agricultural production by proper development of water resources for industrial use and irrigation. Most CCOP/SOPAC member countries will benefit from this project.

9. DOCUMENT CR 16/10/5:

Crossgrain Expedition, Leg 1, by J. Mamerickx

SUMMARY

Bathymetry (including Seabeam), magnetics, gravity, and seismic reflection were collected mostly in international waters but some data was collected at the edge of the Kiribati

EEZ east of Christmas, Malden, Caroline, and Flint islands.

10. DOCUMENT CR 16/10/6:

Crossgrain Expedition, Leg 2, by J. Mamerickx

SUMMARY

Bathymetry (including Seabeam), magnetics, gravity, and seismic reflection were collected in the waters of French Polynesia (Tuamotu Archipelago and Marquesas Islands).

11. DOCUMENT CR 16/11.1/1:

CCOP/SOPAC Workshop on Coastal Processes in the South Pacific Islands Nations, by Techsec

SUMMARY

The Workshop made the following Recommendations to the sponsoring organisations.

Recommendation 1:

IMPLICATION OF PAST, PRESENT AND FUTURE SEA-LEVEL FLUCTUATIONS

The Workshop expressed its concern about the likely implications to the Pacific island nations of an accelerated rise in eustatic sea-level expected to occur during the next century, and recommended that the CCOP/SOPAC and the IOC undertake an assessment of the probable impacts of sea-level fluctuations on the land and its coastal resources, and assemble information to enable the production of Sea Level Hazard Assessment Maps and Contingency Plans, with a view to preventing and/or mitigating the effect of an accelerated rise in eustatic sea level, and, in due course, the development of a public awareness programme.

Recommendation 2:

INFLUENCE OF OCEAN CLIMATE AND

WEATHER PATTERNS OF THE COASTAL ZONES

The Workshop recommended that the CCOP/SOPAC Technical Secretariat, with the collaboration of the IOC, consider collecting and co-ordinating appropriate meteorological data from all available sources with a view to developing a regional climatic data base useful in coastal studies and, from this, commission a series of reports on the implications and effects of any climatic changes on the coasts of Pacific island countries and, in collaboration with the Australian Institute of Marine Science (AIMS), establish a systematic Porites coral coring programme in selected areas for the determination of environmental history.

Recommendation 3:

COASTAL ZONE INVENTORY AND MAPPING

Recognising the concerns expressed by CCOP/SOPAC member countries relating to such matters as environmental hazards (hurricanes, volcanic eruptions, earthquakes, landslides, etc.), development and conservation issues in the coastal zone, and acknowledging that there is inadequate baseline information for planning/management purposes, the Workshop recommended that: (i) CCOP/SOPAC and IOC use or develop appropriate methods and procedures for compiling coastal-zone inventories and for coastal-zone mapping; and (ii) CCOP/SOPAC and IOC encourage their members to initiate coastal inventory programmes and identify priority areas relating to specific themes (e.g. hazard maps).

Recommendation 4:

ASSESSMENT OF VOLCANIC, SEISMIC AND RELATED EVENTS RELEVANT TO COASTAL ZONE UTILISATION

The Workshop recommended that a tectonic framework be established for the understanding of geological hazards, such as earthquakes, volcanic eruptions, tsunamis and

landslides as they are likely to affect the coastal zone. It also requested that detailed ocean-bottom maps of submarine slopes be prepared to identify potential areas of slumping and mass wasting.

Recommendation 5:

DETAILED STUDIES OF COASTAL AND SHALLOW WATER SYSTEMS

The Workshop recommended that detailed shallow-water investigation with particular attention to coastal and shallow water environmental systems, typical of various island settings, be established in cooperation with the Global Shallow Water Sub-programme of OSNLR.

Recommendation 6:

DESIGN CRITERIA, ENGINEERING PRACTICES, GEOTECHNICAL CHARACTERISATION AND ENVIRONMENTAL IMPACT ASSESSMENT

The Workshop felt that there was a need for the control of engineering works proposed in the coastal zone. The Workshop recommended that CCOP/SOPAC, in collaboration with IOC, prepare Guidelines on Environmental Impact Assessment of Coastal Construction.

Recommendation 7:

DEVELOPMENT OF CAPABILITY AND INFRASTRUCTURE OF CCOP/SOPAC FOR COASTAL ZONE INVENTORIES AND INFORMATION DISSEMINATION AND DISASTER RESPONSE; AND TRAINING OF MEMBER COUNTRY NATIONALS

The Workshop recommended that the CCOP/SOPAC in collaboration with IOC and/or other appropriate international/inter-governmental organisations, establish a set of data related to the coastal zone, including natural hazard data, to provide services for the needs of Member countries on coastal zone management and to provide training for member governmental personnel in marine information management.

12. DOCUMENT CR 16/13/3:

PNG's Petroleum Promotion Project: Summary; Results; and PPL 82, Gulf of Papua: An Exploration Case History, by PNG Delegation

INTRODUCTION

In 1982 the Papua New Guinea (PNG) Geological Survey and the Department of Minerals and Energy set out to encourage a more thorough and accelerated evaluation of PNG's petroleum potential.

A project to accomplish these goals was initiated, executed in a large part, and still continues to some degree. This project was undertaken with the combined funding from the World Bank and OPEC, and guidance from the Department of Minerals and Energy, the PNG Geological Survey, and outside consultants (Robertson Research Australia Ltd, Flower Doery Buchan Pty, Worldwide Exploration Consultants Inc.).

THE PROJECT

In retrospect the project can be seen to have had the following major phases:

1. Initial planning and design of work effort;
2. Assessment, collection, and cataloguing of all available data, 1982;
3. Technical evaluation/legal review; 1983-1984;
4. Promotion efforts, 1984;
5. Call for tenders, Papuan Basin, 1985;
6. Subsequent promotion by basins - 1985-1986 Eastern islands and Trobriand area, 1987 North New Guinea Basin;
7. Exploration acceleration, 1985 - present.

RESULTS

Some of the major items that have accrued to PNG as a result of the project are:

1. a good, accessible, technical data base for

explorers to work with as well as for the Government to develop its own appraisals of subsequent exploration work;

2. a petroleum section with personnel and facilities to administer and monitor oil activities within the country;
3. an influx of explorers in spite of the rather dismal economic time for the oil industry from early 1986 to present - this was of course aided by the Juha and Iagifu discoveries that were part of a programme already in operation;
4. an aggressive exploration programme is in progress - PNG is seeing more concurrent drilling activity than at any time in its history and active new seismic programmes are developing further drilling prospects.

PPL82

1. Original tender awarded to Placid Oil. For reasons unknown (economic ?) it was dropped in 1986.
2. International Petroleum Corporation filed in late 1986; awarded in February 1987.
3. Preliminary assessment of lead and re-process Shell data.
4. IPC seismic survey in April/May 1987, 888 line-kms.
5. Results - excellent prospect!!
6. Plans - Detailed Seismic to define drill sites; drilling in 1988.

CONCLUSION

It is believed that the PNG Petroleum Promotion Project has been a success. It has accomplished many of its original goals. If future discoveries of oil or gas result from exploration work initiated as a result of the project, then the return on investment will be almost infinite in terms of new investment, jobs, industry, and foreign exchange earnings.

(Report by E.F. Durkee)

13. DOCUMENT CR 13/16.2/3:

Brief Note on the Status of Norwegian Wave Energy Plant Projects in the South Pacific, by NECOR Foundation.

THE PROTOTYPE PLANTS

Two different types of wave energy plants have been operating since autumn 1985 on the Norwegian west coast, feeding electricity into the local grid. One of the prototypes is based on the multiresonant oscillating water column (MOWC) principle, the other on the tapered channel (TC) principle.

The development and the construction of these two prototype plants have been financed in cooperation between private industry and the Norwegian Government (Kvaerner Brug A/S, Norwave A/S, and the Royal Norwegian Ministry of Oil and Energy).

ACTIVITIES IN THE SOUTH PACIFIC

In cooperation with CCOP/SOPAC a wave energy programme was started in 1984.

Interested member countries were visited by a wave energy utilisation mission which recommended favourable sites as regards wave energy potential. Wave measurement equipment including Waverider buoys Buoys and satellite communication equipment were purchased, and stations set up off southwest coast of Tongatapu Island (Kingdom of Tonga) and off Rarotonga Island (Cook Islands). Prefeasibility studies of favourable construction sites have been carried out including cost estimates for construction of a prototype plant in the region. A rough estimate is about 1.9 million USD excluding cost of the power generating equipment.

The Norwegian support to the CCOP/SOPAC programme is granted by the Ministry for Development Cooperation (DUH). The

cooperation from the Norwegian side is coordinated by NECOR Foundation, which is the appointed national counterpart agency to CCOP/SOPAC.

EVALUATIONS OF THE PROTOTYPE PLANTS

Extensive testing of the two prototype plants has been carried out during a period of about two years. A committee has been appointed by the Norwegian Ministry of Oil and Energy (OED) which is expected to finalise its report at the end of 1987. The task of this Committee is to sum up the experience obtained, to compare ideal construction costs of the two plants, and to compare energy conversion efficiencies and kWh cost.

When hopefully the first prototype plant is put into operation on a South Pacific island sometime in the near future, we have to be sure that the country and community it serves will benefit from it. A next step in the evaluation process therefore is to determine the usefulness, i.e. the efficiency and operating reliability of the plant, for use in a developing country. To perform this task an independent highly qualified body will be appointed by our Foundation. The work will to a large extent be based on the evaluations carried out by OED, and should be completed early in 1988.

Further Norwegian Government support to the CCOP/SOPAC wave energy programme will depend on the result of this independent verification.

14. DOCUMENT CR 16/16.2/4:

Wave Power - A State of the Art Report, by Professor Carstens

BACKGROUND

In 1983, ten years after the OPEC action that triggered a world-wide search for alternative energy, an evaluation was made in the

countries most deeply involved in research on ocean wave power (UK, Japan and Norway). In UK practically all research came to a halt as government funding was cut off. In Japan ambitious plans for further research were severely curtailed and a modest programme adopted, primarily a continuation of ongoing testing of air turbines on the moored vessel Kaimei.

In Norway things took a different turn. While the other nations backed up or out, we went ahead with two full scale pilot plants. This remarkable decision was more than anything else due to the willingness of some private companies to come up with the matching money required by our government for funding of innovative research. Norway has more energy per capita than perhaps any other nation, so we were not driven into this research by a need greater than other people.

What made the Norwegians think differently? First, it should be made clear that like everyone else we have discarded offshore wave power plants, which are definitely too costly. However, unlike everyone else we conceived two onshore systems that looked, and still look, promising. Of the more than 2000 patents for devices to extract wave power, some 99 percent deal with offshore plants, i.e. floating or bottom-mounted ones. It is easy to understand the fascination with offshore devices. The temptation with offshore wave power is that the power source is so huge. But that is precisely what makes it so expensive to harness. Except for a class of select, very large petroleum fields the investment and operating costs of stationary offshore facilities seem to be prohibitive.

By going onshore most of the available power is abandoned and we are limited to that small fraction which hits the steep submarine shores of the world. Even so there are tens of thousands of potential onshore sites with enough waves to produce inexpensive

energy. There must be thousands of sites near existing power grids and consumers.

POWER COMBINATIONS

Wave power shares with other renewable energy sources the problems caused by fluctuations. Whether we deal with solar, wind or wave energy, there are periodicities and more random fluctuations in the available power. Storage of electric energy is very expensive, so the general utilisation of any of these renewable energies presently requires a back-up generating system of some kind. Whenever the demand exceeds the output of the alternative source, the conventional back-up power source is turned on.

Wind and wave energy have an advantage over solar energy in that their power is rather well correlated with domestic demand. The cold season is also the stormy season. But there will be cold days without wind or waves, and there may be a calm season when electricity is still needed. Hydropower from storage reservoirs can be turned on and off without loss of energy, making it an ideal back-up for a fluctuating power source like waves. But hydropower is also renewable and tends to be cheaper than wave power. A more interesting combination is therefore wave power and diesel power. The latter is a conveniently turned on and off as hydro, but generally produces more expensive energy.

Thus the perfect setting for a wave power project is a rocky island in the trade wind zones, where an abundance of unused wave power beats the shores almost continuously while expensive electricity is produced from imported diesel. It is not difficult to point out such islands in the South Pacific.

TAPERED CHANNEL WAVE POWER PLANT (TWC)

The energy absorber or collector is a taper-

ed channel acting as a sort of side channel with spillways running into the wide end of the channel which grows in height as the channel narrows, spilling over the crest and into the reservoir. The ideal TWC is passive collector without any resonance or wave response, i.e. neither wave reflection nor wave breaking. Any real case will display some selective response and perform best for waves of a certain period.

The crest elevation of the tapered channel determines the maximum reservoir level. The reservoir must be large enough to smooth out short-term variations in the trapped water flux generated by the spilling waves. The actual reservoir size should be tuned to the turbine allowing enough storage to provide smooth governing.

Earlier versions of the TWC featured an elaborate wave lens in the sea to focus waves in to the channel entrance. The lens was abandoned as it proved too costly and also as it might create hazards to other activities.

THE MULTIRESONANT OSCILLATING WATER COLUMN (MOWC)

Technically the MOWC is more of a novelty than the TWC as it is based on an entirely new turbine design and also features a collector built on a new idea.

The Oscillating Water Column (OWC) is a vertical or inclined cylinder communicating with the sea through a submerged opening. The simple water column has a natural frequency of U-tube oscillation which are excited by the waves arriving at the opening. The water column acts as a piston in the cylinder, pushing air out on its upstroke and sucking air in on its downstroke. The vertical excursion of the water surface is many times that of the wave outside. It turns out that when the action in the cylinder is damped, energy can be extracted from the flowing water. In the KVAERNER design the energy is harnessed

with an air turbine.

A breakthrough in power absorption was obtained when a harbour was added to the simple OWC proposed by others, turning it into a MOWC. The harbour consists of two walls protruding into the sea from the entrance to the OWC. Model studies at the Norwegian Hydrotechnical Laboratory proved that the quarter wave resonator created by the walls improved the response of a simple fixed geometry over a surprisingly large bandwidth of wave frequencies. Its direction response is also very favourable.

The MOWC employs a new rectifying air turbine designed to rotate in the same direction even when driven by a reversing flow. The WELLS turbine eliminates complex valves that would otherwise be needed. The reversing air flowing past the fixed blades of the turbine cannot maintain the same high conversion efficiency as a turbine in steady flow. This drop in efficiency must be weighed against the lower cost of the WELLS turbine. The energy convertor is a conventional low-head hydropower plant through which the seawater returns.

In contrast to the TWC which is a passive collector with little effect on the waves on either side of the channel entrance, the MOWC is an active resonator. By emitting waves with the right phase, this type of collector acts as a point absorber, drawing wave energy from a capture width substantially exceeding the collector width.

EXPERIENCE WITH THE PILOT PLANTS

The pilot plants at Toftestallen were originally conceived partly as demonstration plants, and partly to obtain conversion efficiencies between electric power output and mechanical wave power input. As demonstrations the plants have been very successful. When it comes to extraction of generally meaningful efficiencies, there are certain

drawbacks:

- The plants are not sufficiently flexible. Certain parts can be changed, but those parts that are blasted into bedrock or made of concrete cannot be changed without a lot of expense.
- The plants were not optimised on beforehand. Reduced scale model tests, always a reassuring but also costly phase of design development, were not carried out.
- Underwater blasting, never an easy operation in a place with waves, did not produce quite the intended geometries.

In these circumstances it is difficult to derive general statements, or even to make a fair comparison between the two systems. Performance results are influenced by a number of more or less arbitrary and unnecessary constraints in addition to system-specific and site-specific constraints. Understandably, the two companies are not eager to release general efficiencies for their designs at present.

The obtained efficiencies never-the-less make a population of sites attractive for exploration. Whether any site belongs to this population or not depends on the local cost of power. With higher plant efficiencies the population of attractive sites increases. But even with the present state of the art the cost of wave energy compares favourably with actual costs in a number of places. Perhaps the best proof of the economic feasibility of these systems is the recent interest shown by investment capital.

15. DOCUMENT CR 16/16.3/1:

Geological Hazards (Tsunamis), by IOC

The International Co-ordination Group for the Tsunami Warning System in the Pacific (ITSU) was established in 1965 as a technical body within the IOC framework to liaise effectively among participating Member States as well as with interested organisations on

tsunami warning, and to promote exchange of information on developments of observation methods and techniques of tsunami forecasting. The membership of ITSU is open to interested Member States in the Pacific. Present ITSU Membership consists of 24 nations, including the following CCOP/SOPAC member countries: Australia, Cook Islands, Fiji, New Zealand, Tonga, and Western Samoa. Many tsunami stations and communications have already been established in several Pacific Island nations, i.e. Papua New Guinea, Marshall Islands, Tuvalu, Kiribati, the Federated States of Micronesia, and Nauru, although they are not yet Member States of ITSU.

The International Tsunami Information Center (ITIC) in Honolulu was given the general mandate of mitigating the effects of tsunami throughout the Pacific by supporting Member States of ITSU in developing and improving the Tsunami Warning System for the Pacific; by gathering and disseminating knowledge on tsunamis; by fostering tsunami research; and by bringing to non-Member States a knowledge of the Tsunami Warning System and ITIC, and information on how to become participants through IOC/ITSU.

The ITIC operates, with IOC assistance, the Visiting Scientist Programme under which two selected scientists from the Pacific receive individual training of 4 to 6 weeks at the ITIC and PTWC. The training these visiting scientists receive is comprehensive. The scientists are thoroughly familiarised with the operations of the Tsunami Warning System. In addition, the visiting scientists receive a thorough introduction on all aspects of the tsunami problem, and work on specific problems related to tsunami warning in their own country and on improvements of communications. The IOC seeks nominations of scientists for this programme through its Circular Letter every year.

The ITIC produces education materials related to tsunami, such as: (1) Tsunami Glossary, and (2) Tsunami Brochure, which are both in preparation and will be issued before long; and (3) Tsunami Bibliography, the first version of which was published in 1982, and the ITIC is now compiling necessary information for a revised version. Besides these series of publications, the ITIC holds a library of films, videos and slides on tsunami. These are available to Member States upon request for rent.

16. DOCUMENT CR 16/17.1/1:

Using the GLORIA side-scanning Sonar System to Map the Sea Floor, by G. Greene

The GLORIA (Geological Long Range Inclined Asdic side-scanning sonar system can be used to construct acoustic, plan-view images of the seafloor similar in appearance to aerial photomosaics of the land surface. The system was developed by the British Institute of Oceanographic Sciences (IOS) and has been used primarily by them as an oceanographic research tool to study specific, large-scale features of the seafloor such as faults that accommodate motion between adjacent blocks of the earth's crust, spreading centers where oceanic crustal rocks form, and deep-sea fans where large volumes of marine sediment accumulate.

In 1984, the United States Geological Survey (USGS) began a long-term cooperative programme with IOS to use GLORIA in a new application to map the seafloor of the U.S. Exclusive Economic Zone (EEZ). The objective was to collect overlapping GLORIA images along adjacent tracklines and construct mosaics that for the first time show large regions of the seafloor (hundreds of thousands of square kilometers). In this mode, GLORIA is used as a reconnaissance, medium-resolution mapping tool. The first

phase of the programme covered 850,000 square kilometers of the U.S. EEZ off the western conterminous states (California, Oregon, and Washington), requiring 96 days of surveying time. In the succeeding years, the EEZ off the Atlantic states, the Gulf of Mexico, the Bering Sea, and part of Hawaii were mapped. The major geologic features of these regions are clearly displayed on the mosaics. Many new features (particularly seamounts) were discovered, and knowledge about the geometry and interrelations of some known features was revised.

The GLORIA system operates by the periodic transmission of strong acoustic pulses, centered around 6.5-kHz frequency and with 100-Hz bandwidth, from a total of 120 transducers housed in two banks along the port and starboard sides of the towfish. At a pulse-repetition rate of 30 sec, the acoustic energy strikes a swath of seafloor that extends to a distance of about 22 km laterally on each side of the trackline and is backscattered with a strength that depends on the topography and hardness of the seafloor. The strength of the backscattered energy sensed by the transducers is digitally encoded onto magnetic tape, computer processed to make geometric corrections, and transmitted to a camera that produces a line-by-line (pulse-by-pulse) photo-acoustic image on which the strongest reflections appear white and the weakest appear black. Placement of the images along a properly scaled rendering of the ship's tracklines forms a mosaic of the seafloor.

The GLORIA system has proven to be exceptionally reliable. During the 96-day west-coast survey, the system was inoperable for less than 4 days. Surveys proceed at 8 to 10 knots (4 to 5 meters/sec), and at a nominal trackline spacing of 30 kilometers in water depths greater than about 2,000 meters, more than 10,000 square kilometers of seafloor can

be mapped per day of surveying time. The surveys are less efficient in successively shallower depths because a narrower swath of seafloor is insonified, and tracklines must be more closely spaced. Because of the configuration of the deployed system, and because of narrow insonification widths, the GLORIA system is not used in water depths less than about 300 to 400 meters, which excludes the large areas of continental shelf.

Theoretically, features larger than about 100 meters in plan dimension and with more than a few meters relief will appear on the images. However, the direction of insonification (i.e. the direction of the ship's track relative to the trend of a feature), the relative hardness of adjacent features, and the surface smoothness of a feature all determine the degree of correspondence of the mosaic to the actual geology of the seafloor. For example, some fields of large sand waves (dune-like features) in the west-coast EEZ, with dimensions greater than the minimum for detection, are indistinct to obscure on the mosaics. Also, comparison of images along crossing tracklines in a few locations shows better display of low-relief bedrock lineations in one direction than the other.

Other types of geological data are collected during GLORIA operations, including medium and high-resolution seismic-reflection profiles that reveal the geology up to a depth of about 1 kilometer beneath the seafloor along the tracklines, bathymetry, and gravity and magnetic-field measurements. These data significantly augment the GLORIA images for geologic interpretations.

Because GLORIA data are in digital format, they can be subject to a multitude of computer-aided image processing and enhancement techniques. Standard processing includes removal of the water column, slant-range and anamorphic shape correction, high- and low-pass filtering, near- to far-range

shade balancing, and optimal contrast stretching over a 256 DN range.

Overall, the GLORIA system probably is the best available system for regional recon-

naissance mapping of the deep seafloor. Other side-scan systems exist with higher resolution capability and are more appropriate for certain applications, in particular in shallow water and for obtaining detailed views of small areas. The GLORIA mosaics clearly show most large-scale geomorphic and sedimentologic features of the seafloor. When properly interpreted within the constraints of the sonographic technique, the mosaics can be an invaluable base for deciphering marine geologic structures and processes, for planning marine scientific expeditions, and for making decisions regarding use of the seafloor.

17. DOCUMENT CR 16/18.2/2:

Draft Regulations for the CCOP/SOPAC Scholarship Scheme, by Techsec

GENERAL CONDITIONS

1. CCOP/SOPAC Scholarships are awarded with funds made available from the United Nations Development Programme.
2. All island country members of CCOP/SOPAC are eligible to put forward candidates for scholarships.
3. Scholarships are tenable in any country member of the United Nations. Examples of the scholarships are attached for study in Australia, Canada, New Zealand and United States.
4. Scholarships are available for study leading to a first degree in marine geology and marine mineral resource assessment programmes.
5. Normally 3 scholarships will be available per year. Under normal circumstances

scholarships would be granted for a period of two years.

6. Selection of scholarship holders is by the appropriate CCOP/SOPAC member country representative and the scholarship office in consultation with the Director of CCOP/SOPAC or his nominee.
7. Personal and educational merit together with experience are the major selection criteria.
8. The scholarship should be adequate to fully cover costs of the first two years of study and will be awarded in conjunction with a second scholarship which will cover the final two years of study.
9. A scholarship holder would normally be aged 30 or under at the time of taking up the scholarship.
10. Scholarships are granted on condition that those who take up the awards return to their country at the completion of the Scholarship to apply the skills they have acquired.
11. CCOP/SOPAC should not be responsible for the results of misconduct of scholarship holders. Scholarships would normally be terminated in such instances.
12. In cases of emergency affecting either the scholarship holder or his immediate family, CCOP/SOPAC would treat such matters as important for the well-being of the Scholarship holder.
13. Processing of entry requirements with institutions where scholarship holder will study will be handled by CCOP/SOPAC.

FINANCIAL CONDITIONS

1. All allowances, stipend etc. will be paid direct to scholarship holders. CCOP/SOPAC will not be responsible for bills incurred by scholarship holders.
2. Scholarship holders are expected to make their own accommodation arrangements during the study period.
3. CCOP/SOPAC will arrange most direct and economical air travel and any necessary stopovers en route to/from training destination at appropriate CCOP/SOPAC rates.
4. The Scholarship will meet the costs of spouses and immediate family.
5. Stipend will not normally be reduced during periods of hospitalisation.
6. The Scholarship will cover costs of all tuition fees, examination fees, fieldwork fees, an outfit allowance on first arrival, and an annual book and equipment allowance.
7. It is understood the salaries of all employed scholarship holders will continue to be paid.
8. The Scholarship will cover reasonable insurance costs.
9. All international travellers are entitled to 20kg baggage. Each scholarship holder will be entitled to 10kg excess on outward travel and up to 50kg on return travel.
10. Single scholarship holders receive a return airfare after two years of study.
11. Married scholarship holders with family at home receive a return airfare at the end of each year of study.

Part 4 : APPENDICES

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C : LIST OF ACRONYMS

AAPG	- American Association of Petroleum Geologists	CNEXO	- Centre National pour l'Exploitation des Océans (Paris, Brest, France; Tahiti, French Polynesia: renamed IFREMER in 1984)
ADAB	- Australian Development Aid Bureau (Canberra, Australia)	CNR	- Committee on Natural Resources (ESCAP)
AGID	- Association of Geoscientists for International Development (Bangkok, Thailand)	CPCEMR	- Circum-Pacific Conference on Energy and Mineral Resources
ANU	- Australian National University (Canberra, Australia)	CR.-D	- Conference Room paper for Discussion
APEA	- Australian Petroleum Exploration Association Limited (Sydney, Australia)	CR.-I	- Conference Room paper for Information
ASPEI	- Association of South Pacific Environmental Institutions	CSC	- Commonwealth Science Council
ASIPID	- Alberta Summer Institute for Petroleum Industry Development (Edmonton, Canada)	CSIRO	- Commonwealth Scientific and Industrial Research Organisation
BGR	- Bundesanstalt für Geowissenschaften und Rohstoffe ([Federal Institute for Geosciences and Natural Resources] Hannover, Federal Republic of Germany)	DIESA	- Department of International Economic and Social Affairs (ESCAP, Bangkok, Thailand)
BGS	- British Geological Survey (UK, formerly IGS)	DMFS	- Division of Marine and Freshwater Science (of DSIR, Wellington, New Zealand)
BHP	- Broken-Hill Proprietary	DOMINO	- Documentation Mineral Offshore (name of bibliographic data base developed at Techsec for the South Pacific)
BIWP	- Biennial Intergovernmental Work Programme (SPREP programme)	DSDP	- Deep Sea Drilling Project (JOIDES, replaced by ODP)
BMR	- Australian Bureau of Mineral Resources, Geology and Geophysics (Canberra, Australia)	DSE	- Defence Scientific Establishment (New Zealand)
BRGM	- Bureau de Recherches Géologiques et Minières (Paris, France)	DSIR	- New Zealand Department of Scientific and Industrial Research (Wellington, New Zealand)
CCOP	- Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (Bangkok, Thailand)	ECOR	- Engineering Committee on Ocean Resources (Advisory body to IOC)
CCOP/EA)		EEC	- European Economic Community
CCOP/SOPAC	- Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (Suva, Fiji)	EEZ	- Exclusive Economic Zone
CFTC	- Commonwealth Fund for Technical Co-operation	EIA	- Environmental Impact Assessment
		ESCAP	- Economic and Social Commission for Asia and the Pacific (Bangkok, Thailand)

FFA	- Forum Fisheries Agency (Honiara, Solomon Islands)	IOC	- Intergovernmental Oceanographic Commission (of UNESCO, Paris)
FRG	- Federal Republic of Germany	IODE	- International Oceanographic Data Exchange (an IOC Activity)
FSM	- Federated States of Micronesia	IOS	- Institute of Oceanographic Sciences (UK)
FSU	- The Florida State University (United States)	IRIS	- Incorporated Research Institute for Seismology (US, NSF)
GEPA	- Guam Environmental Protection Agency	ITIC	- International Tsunami Information Center (Honolulu)
GESAMP	- Group of Experts on the Scientific Aspects of Marine Pollution (UNEP, IOC, IMO, WMO, and IAEA)	ITSU	- International Co-ordination Group for the Tsunami Warning System in the Pacific (of IOC)
GLORIA	- Geological Long Range Inclined Asdic	IUGS	- International Union of Geological Sciences (of ICSU)
GRID	- Global Resource Inventory Database (UNEP)	JICA	- Japan International Co-operation Agency
GSJ	- Geological Survey of Japan	LESE	- Laboratoire des d'Etudes et de "Surveillance de l'Environnement"
HIG	- Hawaii Institute of Geophysics (University of Hawaii)	LRRS	- Long-range Refraction Survey
HRV	- High Resolution Visible	MCS	- Multi-channel Seismic
HURL	- Hawaiian Underwater Research Laboratory	MFES	- Multi-Frequency Exploration System
IAEA	- International Atomic Energy Organisation	MMAJ	- Metal Mining Agency of Japan
ICG/ITSU	- International Co-ordination Group for the Tsunami Warning System in the Pacific	MORB	- Mid-Ocean Ridge Basalt
ICOD	- International Centre for Ocean Development	MRD	- Mineral Resources Department, Suva Fiji
ICSU	- International Council of Scientific Unions	MUSL	- Marconi Underwater Systems Limited
IDOE	- International Decade of Ocean Exploration	NERC	- National Environmental Research Council (UK)
IFREMER	- Institut Francaise de Recherche pour l'Exploitation de la Mer (formerly CNEXO)	NOAA	- National Oceanographic and Atmospheric Administration (United States)
IGC	- International Geological Congress (Washington D.C.)	NSF	- National Science Foundation (United States)
IGCP	- International Geological Correlation Programme (of UNESCO and IUGS)	NZGS	- New Zealand Geological Survey (DSIR, Lower Hutt, New Zealand)
ILP	- International Lithosphere Program	NZOI	- New Zealand Oceanographic Institute (Section of DMFS)
IMO	- International Maritime Organisation	OBS	- Ocean Bottom Seismometer
IMR	- Institute of Marine Resources (University of the South Pacific, Suva, Fiji)	ODP	- Ocean Drilling Program (JOIDES, replacement for DSDP)
		OETB	- Ocean Economics and Technology Branch (United Nations)

OPEC	- Oil Producing Economic Community	SPEC	- South Pacific Bureau for Economic Co-operation (Suva, Fiji)
ORSTOM	Institut Francais de Recherche Scientifique pour le Developpement en Co-operation (formerly Office de la Recherche Scientifique et Technique Outre-Mer)	SPC	- South Pacific Commission (Noumea, New Caledonia)
OSI	- Ocean Sciences Institute (University of Sydney)	SPOT	- Satellite pour l'observation de la Terre
OSNLR	- Ocean Science in Relation to Non-living Resources (an IOC/UN(OETB) programme)	SPREP	- South Pacific Regional Environmental Programme
OTEC	- Ocean Thermal Energy Conversion	SSI	- Seafloor Surveys International, Inc. (Honolulu, Hawaii)
PCIAC	- Petro-Canada International Assistance Corporation	STA	- Science and Technology Agency of Japan
PEDP	- Pacific Energy Development Programme (Suva, Fiji)	STAR	- CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
PTWC	- Pacific Tsunami Warning Center	STARMER	a joint STA(Japan)-IFREMER(France)-CCOP/SOPAC programme to study mineral resources on rift systems in back-arc basins in the Southwest Pacific
PUPPI	- Pop-Up-Pore-Pressure-Instrument	SUBPSO	- Submersible Programme in Sud-Ouest
RAN	- Royal Australian Navy	TAG	- Technical Advisory Group (of CCOP/SOPAC)
RMRDC	- Regional Mineral Resources Development Centre (Bandung, Indonesia)	Techsec	- Technical Secretariat (of CCOP/SOPAC)
ROV	- Remotely Operated Vehicles	TEMA	- Training Education and Mutual Assistance in the Marine Science
RVO	- Rabaul Volcanological Observatory	UH	- University of Hawaii (Honolulu, Hawaii)
SAR	- Synthetic Aperture Radar	UN	- United Nations
SBP	- Sub-Bottom Profiler	UNDP	- United Nations Development Programme (New York, United States)
SCS	- Single-Channel Seismic	UNDP/	- United Nations Development Programme/South Pacific Regional Office (Suva, Fiji)
SEABEAM	a multiple-transducer echo sounder for swath mapping of bathymetry	UNEP	- United Nations Environment Programme (Nairobi, Kenya)
SEAPSO	- SEABEAM dans le Pacifique Sud-Ouest	UNESCO	United Nations Educational, Scientific and Cultural Organization (Paris, France)
SEATAR	- Studies on East Asia Tectonics and Resources (A CCOP/EA-IOC joint activity)	UNITECH	University of Technology (Lae, Papua New Guinea)
SIO	- Scripps Institution of Oceanography (La Jolla, California)	UNOETB	United Nations Ocean Economics and Technology Branch
SOPAC	- South Pacific (also shortened version of CCOP/SOPAC)		
SOPAC/STAR	- see STAR		
SPMGN	- South Pacific Marine Geological Notes		

UOG	-	University of Guam	USP	-	University of the South Pacific (Suva, Fiji; Apia, Western Samoa)
UPNG	-	University of Papua New Guinea (Port Moresby, Papua New Guinea)	WMO	-	World Meteorological Organisa- tion
USAID	-	United States Agency for Inter-national Development	WWSSN	-	World-wide Standard Seismic Network
USGS	-	United States Geological Survey (Reston, Virginia; Menlo Park, California and other regional offices)	XRD	-	X-ray Diffraction