Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

First Session of the Joint IOC-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel

Cape Town, South Africa
16-18 April 1997

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In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping ***(Also printed in French and Spanish)***
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica ***(Spanish only)***
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources ***(Also printed in French and Spanish)***
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities ***(Also printed in Spanish)***
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
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54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Spanish only)***
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
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1. ORGANIZATION OF THE MEETING

1.1 OPENING OF THE MEETING

1 The First Session of the IGOSS Ship-of-Opportunity Programme Implementation Panel (SOOPIP) was opened at 0900 hours on Wednesday 16 April 1997 in the headquarters of the Sea Fisheries Research Institute, Cape Town, South Africa, by the Chair of the SOOPIP, Mr R. Bailey. He welcomed participants and wished everyone a successful meeting, which was an important step towards an eventual operational SOOP.

2 The List of Participants in the session is given in Annex II.

1.2 ADOPTION OF THE AGENDA

3 Several small additions were proposed to the provisional agenda. The Agenda finally adopted for the session is given in Annex I.

1.3 WORKING ARRANGEMENTS

4 The Meeting agreed its hours of work and other necessary arrangements for the session. The documentation was introduced.

2. REVIEW OF THE STATUS OF THE SOOP

2.1 REVIEW OF THE SOOP PLAN

5 The Meeting reviewed the background to and details of the SOOP Plan adopted at IGOSS-VII. On the basis of this plan, objectives for and expected outcomes of the meeting were presented by the chairman and agreed by the meeting. These are given in Annex III. It was agreed that the SOOP plan, and the work of SOOPIP, were directed primarily towards the implementation of the common GOOS/GCOS ocean climate module, and that SOOP was thus very much an existing operational component of GOOS. In addition, many of the SOOP lines also served, or contributed to other aspects of GOOS, including in particular the coastal and services modules.

2.2 SOOPIP - TERMS OF REFERENCE AND ACTIVITIES

6 The Meeting reviewed and accepted the terms of reference of the SOOPIP as given by IGOSS-VII. Concern was expressed that too many levels of bureaucracy could hamper the implementation of the SOOP. However, it was recognized that the science design bodies such as OOPC would be dealing directly with SOOPIP. At the same time the SMC, as an ad hoc group working primarily by correspondence, had a continuing role to play in the generation of resources to support SOOP at the national level, but that some of the apparent responsibilities of SMC were better dealt with by SOOPIP.

2.3 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS FROM SOOP-VI

7 The Meeting reviewed both the action items and recommendations agreed at SOOP-VI. The annotated lists of these items are given in Annex IV. As a follow-up action, the WMO Secretariat was requested to distribute to all SOOPIP participants copies of the reports of the VSOP-NA project of WMO.

8 Action items arising from the present meeting are summarised in Annex V, while recommendations to SMC, OOPC and IGOSS/GOOS are in Annex VI.

2.4 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS FROM SMC-I

9 The Meeting reviewed the recommendations addressed to SOOPIP by SMC-I, and noted that these would all be considered in detail under specific agenda items for the present meeting.

3. SCIENTIFIC AND TECHNICAL INPUT

3.1 RESULTS OF THE SMC XBT RESOURCES SURVEY

10 The Meeting noted with interest the detailed SOOP resources survey results compiled by the IGOSS Operations Co-ordinator as agreed by the SMC, and expressed its appreciation to the Co-ordinator for his very valuable work. It recognized that this resources document, regularly updated, would be an essential element in overall SOOP management, both internationally and at the national and agency level. A number of proposals were made to enhance the value and presentation of the survey. These were:

(i) Highlight in the survey (both summary and projections) the number of transects;

(ii) Note in the summaries of projections where there are missing data from countries and/or agencies;

(iii) Include line-coverage maps showing covered, partly covered, not covered and oversampled transects.

11 The Meeting reiterated the importance of agencies giving projections for future years, as far ahead as possible, when completing the survey, as these projections formed the basis of ongoing operational line management in support of agreed requirements. The survey results are considered in more detail under agenda item 4 following the national reports.

3.2 SCIENTIFIC INPUT FROM WOCE, CLIVAR AND OTHER PROGRAMMES

12 The Meeting recognized that the CLIVAR Implementation Plan was still under preparation, while the WOCE field phase was nearing completion, and that no detailed input and/or requirements were therefore available at the present time from these programmes.

3.3 SCIENTIFIC INPUT FROM THE OOPC

13 The Meeting recognized that the OOPC was the body charged with the scientific design of the common GOOS/GCOS ocean climate module, and was thus the principal scientific advisory body for SOOP. Preliminary results of the SOOP resources survey had been considered by the OOPC at its recent second session (Cape Town, February 1997), together with a request for advice and guidance on optimum network design in the light of available resources. In this context, the Meeting considered the report of the Chair of OOPC, N. Smith, based largely on discussions at OOPC-II.

14 In response to the specific comments of the OOPC on the resources survey, as well as its conclusions and recommendations, the SOOPIP offered the following comments:

SOOP Survey

(i) The resources presently available and projected were not too much below the maximum available during TOGA/WOCE and, based on the projections for 1997/98, appeared rather stable (see also item 4.1 below);

(ii) Because of delayed submission of some survey input, the results seen by OOPC were incomplete. Future survey summaries would carry dates and/or version numbers, and would also clearly indicate where data were missing, especially in the projections (see also para. 10 above);

(iii) Greater efforts will be made to adapt the statistics to modelling requirements. In particular, information will be given on sampling rates (see para. 10 above); the IGOSS/SOOP homepage will include additional monthly information and statistics, and also point to relevant information at other sites; and R. Bailey will discuss with N. Smith regarding the generation and presentation of relevant RMS error statistics;

(iv) Noting nevertheless that resources are only 50-60% of requirements, the SMC should urgently address the resources question;

(v) The OOPC itself should address whether the original design network remains appropriate in the light of available resources, in collaboration with SOOPIP;

(vi) Apparent oversampling was often done deliberately, for scientific reasons not related to the low density network (e.g. because they were actually high density lines). The SOOPIP addressed cases where there was genuine over sampling at the present meeting (see agenda item 4). In addition, several lines appear in the network which have never been sampled, and for which there is no apparent scientific justification.

With regard to the conclusions and recommendations:

(I) The SOOPIP strongly encouraged enhanced expertise within OOPC related to upper ocean thermal sampling, including the formation of an ad hoc panel on XBT sampling. Where possible and relevant, the Chair of SOOPIP or an alternate would participate in future OOPC meetings, and also contribute to the ad hoc group.

(ii) SOOPIP strongly encouraged the preparation of guidelines on high priority XBT lines for the ocean climate module. Some input to this may come from the results of the 1995 Brest meeting which dealt with sampling questions;

(iii) The Chair of SOOPIP will prepare a draft SOOP Implementation Plan, on the basis of the original SOOP plan, and using the present SOOP status as a first guess. Members of the panel will be requested to contribute to its completion, which will be done by the end of 1997.

Finally, with regard to other issues dealt with by OOPC:

(I) Questions relating to line PX 26 (TRANSPAC) are dealt with under agenda item 4;

(ii) The Chair of SOOPIP will work with OOPC on the demonstration brochure for upper ocean thermal data. The almost-completed IGOSS/IODE brochure may provide some input to this;

(iii) The SOOPIP supported the Global Ocean Data Assimilation Experiment (GODAE) concept and was willing to contribute to its preparation and implementation.

4. SHIP OF OPPORTUNITY LINE MANAGEMENT

4.1 STATUS OF EXISTING OPERATIONAL LINES
4.2 PLANNED AND PROPOSED LINES

15 The Meeting considered these agenda items to be closely related and agreed to discuss them together.

16 The Meeting reviewed in detail national reports from Australia, Canada, France, Germany, India, Japan and USA. These reports are published in a separate document. Information relevant to SOOP was also provided by Russia and South Africa. The Meeting was encouraged by evidence that SOOP activities were expected to stabilise at around the present level, and continue there for some years to come. It was also encouraged by the successful efforts in a number of countries towards transition to real operational SOOP management.

17 On specific issues raised by these reports, the following were agreed:

(i) France will introduce a ship on IX 6, to complement existing USA sampling and bring this closer to requirements;

(ii) Australia and France will rationalize sampling on PX 3, which will free some 360 probes for use elsewhere;

(iii) Canada will continue efforts to obtain the real-time release onto the GTS of research and navy data;

(iv) OOPC/UOP were urged to make a decision on the real sampling requirements for TRANSPAC (PX 26), as these had a direct bearing on a significant amount of resources which might be available for other lines;

(v) The Japanese line Hong Kong-Wellington will henceforth be numbered PX 5/51;

(vi) NOAA was requested to review the possibility to take over from Germany AX 17/18, which has ceased through lack of XBT resources due to the end of WOCE funding for this project in early 1997;

(vii) All operators were requested to examine the possibilities of providing equipment and probes to the South African Weather Bureau for the operation of the SA Agulhas to South Atlantic islands and Antarctica (AX 25); discussions were also encouraged between SAWB and SFRI on this issue;

(viii) A similar request was made regarding the operation of a Russian ship from St Petersburg to Antarctica.

(ix) The probes made available from a rationalization of the French/German sampling on line AX 11 will be used to make up the deficit on line Ax 5;

(x) PX 52 and 53 have been merged with PX 5;

(xi) The WMO Secretariat will contact the UK Royal Navy, to obtain a reliable contact point for discussions with NOAA and Germany on lines AX 1 and 12.

4.3 ANALYSIS OF DEFICIENCIES AND PROPOSED SOLUTIONS

18 The Meeting undertook a line-by-line ANALYSIS of the network, based in the first instance on the detailed resources survey tabulations. A rationalization of lines and line numbering was made in some situations; some others, never sampled, were effectively deleted; and a classification of the line coverage was made on the basis of oversampled (0), fully covered (1), partially covered (2) and no coverage (3). Note was also taken of which lines were implemented to serve applications other than climate modelling and prediction, with sampling rates set on the basis of these applications. The revised line maps are given in Annex VII.

19 The summary tables were revised on the basis of this ANALYSIS, and it was agreed that these revised tables should constitute the next resources survey, which should be circulated by June 1997 at the latest for final review and confirmation by SOOPIP members. The Operations Co-ordinator was also asked to prepare maps showing the agreed line classifications.

20 As a result of the ANALYSIS, the following general conclusions were drawn and certain specific actions taken:

(i) Substantial deficiencies (compared with the accepted network design) are apparent in the northern boundary of the North Atlantic, the South Atlantic, the eastern Pacific and parts of the Indian Oceans;

(ii) The OOPC should, in collaboration with SOOPIP, address priorities for implementing lines to cover these perceived deficiencies as a matter of urgency, including the possibility of transferring resources from other lines, especially those only partially covered, as appropriate;

(iii) In general, guidelines are required on how to obtain urgent scientific advice on priorities for action to address strategic line management issues;

(iv) All operators should inform the Chair and the Operations Co-ordinator of reasons for variations from required sampling, as well as when changes or anticipated changes to the network will occur, with the latter information copied also to other operators;

(v) Other specific actions to address deficiencies and/or over sampling are noted in para. 17 above.

4.4 TRANSITION TO OPERATIONAL LINE MANAGEMENT

21 It was recognized that, internationally, the most appropriate mechanisms to properly manage operational oceanographic systems and services would take time to evolve, since this was a new and complex development. For the present, the mechanisms now in place for SOOP, including the interactions between operations and science, were realistic and workable. Nationally, the developments now underway in Australia towards operational SOOP management were noted with interest, and other operators were urged to investigate all possibilities for a similar transition in their respective countries.

4.5 A POSSIBLE FUTURE PROBE POOL

22 The Meeting recalled that, by formal agreement among several participating agencies, a "probe pool" had been successfully implemented during TOGA, and that this had been effectively continued to the present, with NOAA supplying probes for deployment by other agencies in support of SOOP. It was recognized that a new, formal, international agreement was required under SOOP, to replace the old TOGA agreement. The SMC was requested to address this issue, bearing in mind that many countries and particularly research agencies contributing probes to the low density network would regard with concern the possibility of their probes being "controlled" in some way by SOOPIP. In the interim, bilateral agreements involving the USA, Australia and France would be implemented for the supply and deployment of probes.

5. DATA FLOW MONITORING

5.1 REVIEW OF IGOSS XBT-RELATED MONITORING REPORTS

23 The Meeting reviewed the following monitoring reports presented by the IGOSS Operations Co-ordinator: (I) the IGOSS XBT summary report prepared by NOAA, (ii) the monthly GTS statistics report, (iii) the six-monthly line report, and (iv) the ship performance report. It recognized that all these reports were valuable in different ways to both operators and users in the operations of the SOOP and the management and application of the data, expressed its appreciation to the Co-ordinator for his work, and agreed that the reports should be continued.

24 The Meeting noted the value of the monthly GTS statistics in allowing them to keep track of ship operations and GTS data distribution. Operators were urged to check the reports each month and advise R. Keeley of apparent discrepancies, for appropriate follow-up action. It was recognized that the overall summaries were useful for demonstrating the success of an operational programme.

25 The Meeting reiterated the value of the call sign data base maintained by the coordinator, and urged operators to keep him continually up-to-date on call signs, ships used and related metadata. Operators were also requested to provide the Co-ordinator with information on the total number of probes deployed, as well as the number of good drops, with input for the six-monthly report.

26 The Meeting considered that the ship performance report was valuable for operators and for the GTSPP in keeping track of QC and related problems. It noted that some revision to following-up

on this information was required, and requested R. Keeley to advise the Co-ordinator on this. It was particularly valuable to know which ships had continuing problems, and to devise a mechanism to correct this.

5.2 GLOBAL TEMPERATURE SALINITY PROFILE PROGRAMME

27 The Meeting noted with interest and appreciation the report from MEDS, Canada, on the current status of the GTSPP, including its monitoring activities. This report is given in Annex VIII. It noted and supported the efforts being made by the GTSPP to obtain delayed mode data, while recognizing the difficulties of the task and the manpower resources required. It also encouraged the GTSPP to continue its efforts to monitor real time data flow and track anomalies in the flow. In this regard it noted with concern the apparent drop in data submissions in late 1996.

5.3 MONITORING AND MANAGEMENT OF TRACKOB DATA

28 The Meeting recognized the need for a centre which would deal specifically with this question, noting that the GTSPP was not presently structured nor resourced properly for this additional task. It therefore requested R. Keeley and T. Ando to examine the possibilities for JMA to assume the role, in collaboration with the sub-surface data centre in Brest. In addition, C. Henin was requested to inform R. Keeley of ship call signs and GTS bulletin headers for the distribution of French TSG data in TRACKOB.

6. EQUIPMENT

6.1 STATUS OF EXISTING COMMUNICATION AND DATA COLLECTION SYSTEMS

29 The Meeting noted with interest a report by D. Wright on the latest SEAS-IV software, which includes capabilities for meteorological, oceanographic and vessel position (AMVER) reports, through GOES or INMARSAT-C. This software requires a shipboard PC and Inmarsat-C terminal, and Inmarsat reports must be sent to either of the two US CES or to CES Perth, for on-forwarding to NOAA for decompression and GTS insertion. It will be made available by NOAA, on request, to any interested operator. A copy of this report is in Annex IX. The Meeting encouraged all operators to switch to the use of Inmarsat-C, as being a reliable and cost-effective means of real time data communication to shore.

6.2 NEW APPROACHES TO UPPER OCEAN SAMPLING

30 Under this item, the Meeting noted with interest reports: (I) by F. Dobson on ALACE/PALACE and on moving vessel profilers (MVP); (ii) by R. Bailey on synthetic temperature profiles derived from satellite altimeter and SST data. It also recalled that TSGs and XCTDs had been extensively dealt with during the TT/QCAS meeting, with details recorded in the report of this meeting. The reports by F. Dobson and R. Bailey are given in Annexes X and XI.

31 The Meeting recognized that PALACE floats were potentially a very valuable, operational tool, the data from which already fitted well into the IGOSS system, with some data already being distributed on the GTS. They provide an excellent complement to SOOP and satellite data, and require only a deployment strategy and the capability for deployment from SOO to be fully operational. Manufacturers were therefore encouraged to develop a capability for easy deployment from merchant ships. The OOPC was also requested to advise on the optimum mix of PALACE and XBT/XCTD data for climate modelling.

32 Despite the high initial cost and large weight of the MVP, the Meeting recognized that it provides good CTD profiles, especially for high density sections. It considered that MVPs may eventually be used on SOO, and requested to be kept informed of developments.

33 The Meeting recognized the potential value of the technique being developed for deriving synthetic temperature profiles from altimeter and SST data, to complement XBT/PALACE observations in certain areas, in particular to allow interpolation of equivalent high density profiles

between sampling. It encouraged continuation of the work, and requested to be kept informed of progress.

6.3 METEOROLOGY, SST AND SURFACE SALINITY MEASUREMENTS AS PART OF SOOP

34 SST and SSS data are discussed above under item 5.3. It was also recognized that all SOO make standard meteorological observations, which are transmitted to shore as SHIP messages, for operational and research applications. These data are managed under the Marine Climatological Summaries Scheme of WMO.

6.4 REPORT OF THE CHAIR, SOOPIP *AD HOC* TASK TEAM ON QCAS

35 The Meeting approved both the recommendations of TT/QCAS-IV. It also requested the Secretariats to use the status report on JJYY implementation to urge continuing efforts at compliance with the code.

7. DATA QUALITY

36 The Meeting noted with interest the report on the UOT/DAC meeting, Washington, April 1996, presented by R. Bailey. This report is given in Annex XII. The following points and action items were noted as being particularly relevant to SOOP:

(i) All QC, flags and related information are strongly encouraged to be preserved with delayed mode data submissions;

(ii) The STT/IQC should examine the optimum number of inflection points in real time data submissions of temperature and salinity profiles, for QC for climate modelling, in conjunction with modellers and OOPC;

(iii) The efforts now being made to transition the WOCE UOT/DACs from research to operations, through transfer of techniques and expertise to operational data centres;

(iv) The efforts of the DACs to standardize QC procedures;

(v) The results of the intercomparison tests, demonstrating that the use of automated QC procedures alone are insufficient to QC profile data;

(vi) Delayed mode submissions are too slow to permit timely and effective scientific QC.

37 The Meeting was informed of the work to quantify the added value of scientific QC to be undertaken by R. Bailey, R. Molinari and R. Keeley. The Meeting expressed interest in being informed of the results of this study.

38 Given the importance of SST to climate forecasting, the Meeting emphasised that the top 3.7m of an XBT profile is an unreliable temperature measurement. The Meeting therefore strongly recommended that the real depth of the first reliable temperature in a profile should be given in a BATHY message, and not reported at 0 m.

8. RECRUITMENT AND ENHANCEMENT OF THE SOOP

8.1 SOOP CONTRIBUTION TO THE IGOSS-IODE BROCHURE

39 The Meeting noted with interest the draft of an IGOSS-IODE brochure, which had been prepared by the Operations Co-ordinator and was now being finalized by a WMO graphics artist. It strongly supported the publication of the brochure, including a page devoted to SOOP, which it considered a very valuable aid in generating resources for the programme and generally in publicising its importance to a range of applications, and it congratulated the Co-ordinator for his work.

Recognizing that finalization of the brochure should take place very soon, the Meeting urged SOOPIP members to provide urgent input, concentrating in particular on the SOOP page, photographic illustrations, and products and applications of SOOP data.

8.2 RECRUITMENT OF NEW PARTICIPANTS TO SOOP

40 The Meeting recognized that actions to enhance recruitment to the programme had already been flagged under other agenda items. In addition, operators were urged to make efforts to encourage their national navies to participate in SOOP and in the work of SOOPIP. Operators should inform the Secretariats of appropriate contact points in these navies.

8.3 IGOSS OPERATIONS CO-ORDINATOR POSITION

41 The Meeting reiterated the essential nature of the Operations Co-ordinator position to the operational SOOP. It expressed its appreciation to NOAA for having seconded the post over many years, but nevertheless was very disappointed that the secondment was to end just when the position was assuming maximum importance.

42 The Meeting noted with appreciation the efforts by WMO to secure at least a short term, interim replacement, but recognized the need to find a longer term solution to secure continuity in support for SOOP and related operational activities. SOOPIP members were therefore actioned to seek such longer term solutions nationally, to inform the Chair and the Secretariats of possibilities, and to assist where possible in any follow-up negotiations.

9. DATE AND PLACE OF NEXT MEETING

43 The Meeting accepted with appreciation the offer of ORSTOM, France, to host the next session in Noumea, New Caledonia, in October 1998.

10. CLOSURE OF THE MEETING

44 The First Session of the IGOSS Ship-of-Opportunity Programme Implementation Panel closed at 1810 hours on Friday 18 April 1997.

ANNEX I

AGENDA

1. **ORGANIZATION OF THE MEETING**

   1.1 OPENING OF THE MEETING
   1.2 ADOPTION OF THE AGENDA
   1.3 WORKING ARRANGEMENTS

2. **REVIEW OF THE STATUS OF THE SOOP**

   2.1 REVIEW OF THE SOOP PLAN
   2.2 SOOPIP - TERMS OF REFERENCE AND ACTIVITIES
   2.3 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS FROM SOOP-VI
   2.4 REVIEW OF ACTION ITEMS AND RECOMMENDATIONS FROM SMC-I

3. **SCIENTIFIC AND TECHNICAL INPUT**

   3.1 RESULTS OF THE SMC XBT RESOURCES SURVEY
   3.2 SCIENTIFIC INPUT FROM WOCE, CLIVAR AND OTHER PROGRAMMES
   3.3 SCIENTIFIC INPUT FROM THE OOPC

4. **SHIP-OF-OPPORTUNITY LINE MANAGEMENT**

   4.1. STATUS OF EXISTING OPERATIONAL LINES
   4.2 PLANNED AND PROPOSED LINES
   4.3 ANALYSIS OF DEFICIENCIES AND PROPOSED SOLUTIONS
   4.4 TRANSITION TO OPERATIONAL LINE MANAGEMENT
   4.5 A POSSIBLE FUTURE PROBE POOL

5. **DATA FLOW MONITORING**

   5.1 REVIEW OF IGOSS/XBT-RELATED MONITORING REPORTS
   5.2 GLOBAL TEMPERATURE-SALINITY PROFILE PROGRAMME
   5.3 MONITORING AND MANAGEMENT OF TRACKOB DATA

6. **EQUIPMENT**

   6.1 STATUS OF EXISTING COMMUNICATION AND DATA COLLECTION SYSTEMS
   6.2 NEW APPROACHES TO UPPER OCEAN SAMPLING
   6.3 METEOROLOGY, SST AND SURFACE SALINITY MEASUREMENTS AS PART OF SOOP
   6.4 REPORT OF THE CHAIRMAN, SOOPIP *AD HOC* TASK TEAM (TT/QCAS)

7. **DATA QUALITY**

8. **RECRUITMENT AND ENHANCEMENT OF THE SOOP**

   8.1 SOOP CONTRIBUTION TO THE JOINT IGOSS-IODE BROCHURE
   8.2 RECRUITMENT OF NEW PARTICIPANTS TO SOOP
   8.3 IGOSS OPERATIONS CO-ORDINATOR POSITION

9. **DATE AND PLACE OF NEXT MEETING**

10. **CLOSURE OF THE MEETING**

ANNEX II

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ANNEX III

SOOPIP MEETING OBJECTIVES AND EXPECTED OUTCOME
(overhead presentation by the Chairman of SOOPIP)

MEETING OBJECTIVES:

- *Implement low density SOOP as an operational programme*
- *Co-ordinate national SOOPs to achieve the above*
- *Coordinate operational SOOP with other SOOP activities (Navy, fisheries, research, etc)*
- *Act upon scientific panel input and provide feedback*
- *Exchange information on instrumentation and observing techniques*
- *Establish standard data quality procedures to ensure ongoing data quality*
- *Ensure successful and timely transmission and exchange of data*
- *Identify areas of potential further collaboration*
- *Determine resource limitations*

DESIRED OUTCOMES:

- *An optimally implemented and well coordinated SOOP in support of recommended operational and research requirements*
- *Procedures to ensure data quality, data transmission, and data exchange*
- *Feedback to scientific panels on areas requiring further guidance*
- *Assessment of additional and ongoing resource needs*

ANNEX IV

RESULTS OF RECOMMENDATIONS AND ACTION ITEMS FROM SOOP-VI

A. STATUS OF RECOMMENDATIONS

1. The appropriate scientific bodies of CLIVAR and GOOS review the track lines and sampling requirements of the original TOGA-WOCE Low Density XBT network in light of experience gained during TOGA and WOCE.

This is on the agenda for both OOPC and the CLIVAR UOP as a high priority, but has not been as yet addressed.

2. The Joint Committee for IGOSS to encourage IGOSS National Representatives to pursue declassification of data collected by their navies and encourage these data to be inserted onto the GTS.

Although recognising some navies already do declassify their data (eg Australian Navy), no action from the IGOSS Representatives was noted on the above.

3. IGOSS National Representatives contact the appropriate agencies in their countries to inform them of the IGOSS End-to-End SOOP Management Proposal and to secure their participation.

Limited action noted.

4. WMO accompany its data flow monitoring proposal at IGOSS-VII with documentation describing what will be required of participants so that they may judge the work required and estimate how soon they can be ready for the monitoring exercise.

In progress.

5. The WMO data flow monitoring exercise be conducted over a two week period separate from the usual GTS monitoring period in October.

To start this year (1-15 April, 1-15 July, 1-15 October).

6. GTSPP archive delayed-low resolution data to ensure that these data (such as are available from the German Navy) are not lost.

Done with limited success due to poor submission rate.

7. GTSPP archive both real-time and delayed mode Sea Surface Salinity data.

GTSPP considered this not to be possible given other priorities and available resources.

8. GTSPP archive TRACKOB messages and include these in their data exchanges.

Being considered.

9. WMO consider whether Sea Surface Temperature sensors could be calibrated and the TRACKOB format be modified to indicate the type of sensor used. CMM has just established a new group for the VOS which may address this.

Not addressed as yet.

10. TT/QCAS address the question of using the above QC procedures in non-tropical waters.

Not addressed as yet.

11. Argos remove the limitation that constrains the transmission of information from a single XBT profile to 256 bits and restricts the deepest depth to 512m. Removing this limitation will allow profiles to be reported to deeper depths and greater detail to improve general accuracy and to allow the transmission of information on probe type, recorder and fall rate equation coefficients.

Progress on this, but no implementation as yet.

12. (Ship) Operators include appropriate documentation of QC procedures and flags with the data.

Some have instigated this (eg Australia, Germany).

13. Data originators submit all data (good and bad) and flag rather than delete bad data.

Some have instigated this (eg Australia, US, Canada).

14. Data originators perform extensive QC on the collected data before submission to the data centres to ensure those with the best knowledge of the data collection programmes are part of the QC process.

Some have instigated this (eg Australia, France, Germany, Japan).

15. Operators configure their data acquisition software to generate BATHYs with a high number of significant points because profiles with a high number of significant points are more suitable for QC.

Argos transmission systems are presently limited to transmitting 15 points only. Other systems are transmitting up to 29 points. Efforts will made when new, more efficient transmissions systems are in place.

16. XBT manufacturers provide information about storing and deploying XBTs which could be placed with the equipment on board ships. IGOSS to help spread the information as widely as possible.

Information is available on Sippican's Home Page.

17. NOS restore the daily data transfers from FNMOC to NOS.

Despite constant efforts, no success on this matter.

18. Joint Committee on IGOSS recognize that increased funding for SOOPIP meetings is intended to encourage wider participation by representatives from interested Member States.

Significant financial support provided for present meetings.

B. LIST OF ACTION ITEMS FROM SOOP-VI

(Note: The term "Operators" refers to ship managers who provide equipment and training to ships of opportunity and are responsible for the data collection.)

1. The IGOSS Operations Co-ordinator to revise the GTS Monthly Statistics Report to include more analysis.

   Done; a Difference (of messages received) Matrix has been added to the report.

2. The IGOSS Operations Co-ordinator to create a supplementery six-month report to include total XBTs deployed and the total number of BATHY messages received at GTSPP by ship call sign.

   In progress...

3. Operators send delayed-low resolution data to the GTSPP.

   Still a major problem; it was recommended at the last GTSPP meeting that the IGOSS Operations Co-ordinator track down missing delayed mode data in collaboration with the WOCE/IPO and USA-NODC.

4. Operators convert to the new BATHY code form as soon as possible and ensure that information about probe types, recorders and fall rate coefficients is included.

   Done.

5. GTSPP and the IGOSS Operations Co-ordinator monitor the progress in converting to the new BATHY code form.

   Ongoing.

6. IGOSS National Representatives encourage submission of SSS data in both TRACKOB messages and in delayed mode.

   Done on an individual basis.

7. Operators collect SSS data whenever possible and to submit them to the GTSPP.

   Done on an individual basis.

8. The IGOSS National Representative for Canada to contact the IOC-WMO Secretariat to request a demonstration of the IGOSS Home Page at IGOSS-VII in November.

   Done.

ANNEX V

SOOPIP-I ACTION ITEMS

For Operations Co-ordinator and Secretariats

1. Modify future SOOP resources survey presentations as detailed in paragraph 3.1.2. Deadline: June 1997.

2. Include on the IGOSS/SOOP homepage monthly information and statistics, as well as pointers to relevant information at other sites. Deadline: end 1997.

3. Contribute to preparation of the SOOP Implementation Plan. Deadline: end 1997.

4. Contribute to preparation of the OOPC demonstration brochure on upper ocean thermal sampling, making use of existing material for the IGOSS/IODE brochure.

5. Revise the resources survey tabulations. Deadline: June 1997.

6. Prepare line classification maps as agreed. Deadline: June 1997.

7. Contact Royal Navy (UK) to obtain a reliable SOOPIP contact point and for discussions with NOAA and Germany on assistance for lines AX 1 and AX 12. Deadline: May 1997.

8. Review and revise use of the information in the ship performance report, with R. Keeley. Deadline: June 1997.

9. WMO to provide TRACKOB compilation software to operators. Deadline: May 1997.

10. Secretariats to send status report on JJYY implementation to IGOSS representatives to encourage further action. Deadline: May 1997.

For SOOPIP Chair and Members

1. R. Bailey to discuss with N. Smith on preparation and presentation of relevant RMS statistics. Deadline: May 1997.

2. R. Bailey, members and Secretariats to prepare a SOOP Implementation Plan. Deadline: end 1997.

3. R. Bailey and Secretariats to work with OOPC on demonstration brochure on upper ocean thermal sampling.

4. USA and Japan to examine the possibilities for obtaining suitable ships for lines PX 14/15/16/21/24/25. Deadline: May 1997. R. Bailey to discuss priorities for implementing these lines with OOPC once this information is available.

5. NOAA to contact NIO, India, with a view to coordinating sampling on line IX 8. Deadline: June 1997.

6. All operators to inform the Chair of reasons for variations from required sampling (e.g. high density, etc.). Deadline: June 1997.

7. All operators to immediately inform the Chair and the Co-ordinator when changes or anticipated changes to lines or the network will occur, and copy this information to other operators. Deadline: ongoing.

8. All operators to make efforts to encourage their national navies to participate in SOOP and also in the work of SOOPIP. The Secretariats to be informed of appropriate contact points in these navies. Deadline: ongoing.

9. Australia, France and USA to modify the former TOGA probe pool agreement and adopt it as an interim measure for SOOP. Deadline: draft by June 1997.

10. All operators to review IGOSS XBT summary report and advise R. Keeley of discrepancies, for follow-up action. Deadline: ongoing.

11. All operators to keep Operations Co-ordinator continuously advised of changes to ships, call signs, etc. Deadline: continuous.

12. All operators to provide information on total drops as well as good drops in their six-monthly line report input to the coordinator. Deadline: continuous.

13. R. Keeley and T. Ando to collaborate with Brest to address the possibility for JMA to assume the role of monitoring and data management centre for TRACKOB reports. Deadline: end 1997.

14. C. Henin to send R. Keeley information on ship call signs and bulletin headers for the distribution of TSG data in TRACKOB. Deadline: end 1997.

15. STT/IQC, R. Keeley and R. Bailey should discuss with the WOCE DACs on the optimum detail (number of inflection points) required in real time BATHY messages for quality control for climate modelling applications. Deadline: end 1997.

16. Operators urged to ensure that all QC and related data are preserved with the delayed mode submissions. These should be done within one year of the end of the year in which the data were collected. Deadline: continuous.

17. SOOPIP members provide input to the IGOSS/IODE brochure to WMO within 3 weeks. Emphasis should be put on the proposed SOOP page, products and illustrations. Deadline: mid-May 1997.

18. SOOPIP members to actively seek solutions nationally to maintain the essential Operations Co-ordinator position. Deadline: as soon as possible.

ANNEX VI

SOOPIP-I RECOMMENDATIONS TO THE OOPC, SMC AND IGOSS/GOOS

To OOPC

1. To provide urgent advice on criteria for prioritizing lines for the GOOS/GCOS ocean climate module.

2. To make an urgent decision on the real sampling requirements for TRANSPAC (PX 26) for the GOOS/GCOS module, as this directly and substantially affects the resources available for other lines.

3. To advise quickly on scientific requirements and priorities for lines AX 17/18/25 in the South Atlantic and lines PX 14/15/16/21/24/25 in the south eastern Pacific.

4. The demonstration brochure on upper ocean sampling is vital to the future of the SOOP, and should be completed as soon as possible.

5. To advise on the optimum mix of PALACE and XBT/XCTD observations for climate modelling, and if possible develop an overall deployment strategy.

To SMC

1. To address again the resources available to SOOP in the light of the results of the resources survey, the scientific requirements, and the SOOP Implementation Plan.

2. To address the possibility for establishing a new, formal, international probe pool agreement under SOOP, to replace that formerly operated under TOGA.

To IGOSS and GOOS

1. To also address the resources issue, including greater participation in SOOP from all countries, individual institutes and agencies with an interest in the applications of SOOP data. Such participation could include some or all of the provision of probes, ships, operators, greeting facilities, etc.

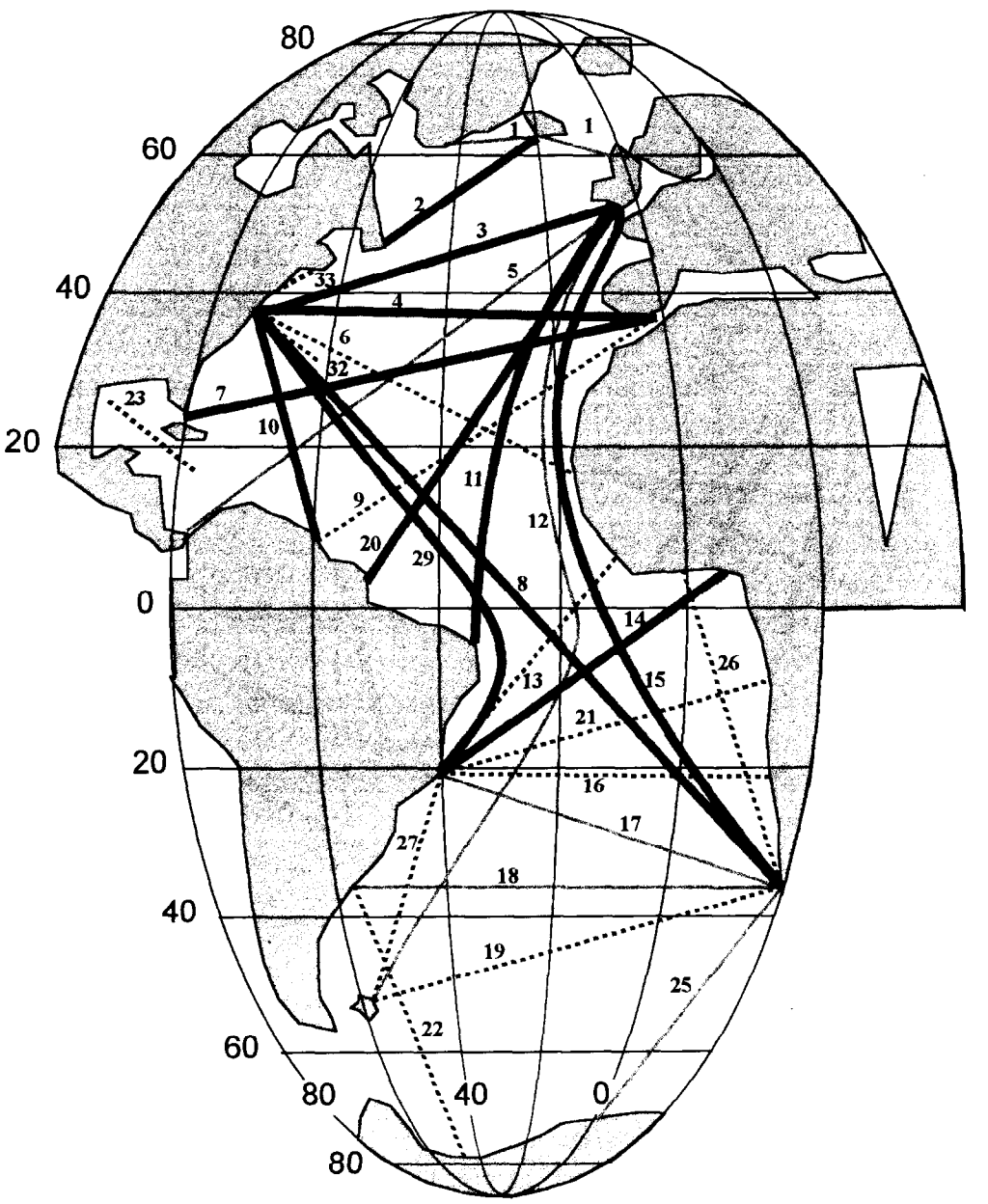
2. Given the importance of SST to climate forecasting, it should be noted that the top 3.7 m of an XBT profile is an unreliable temperature measurement. It is therefore strongly recommended that the real depth of the first reliable temperature in an XBT profile should be reported in the BATHY message, and not at 0 m. This recommendation is also addressed to the OOPC.

3. Recommendation 2 of TT/QCAS-IV is approved and formally conveyed to IGOSS and GOOS for action.

ANNEX VII

REVISED XBT LINE MAPS

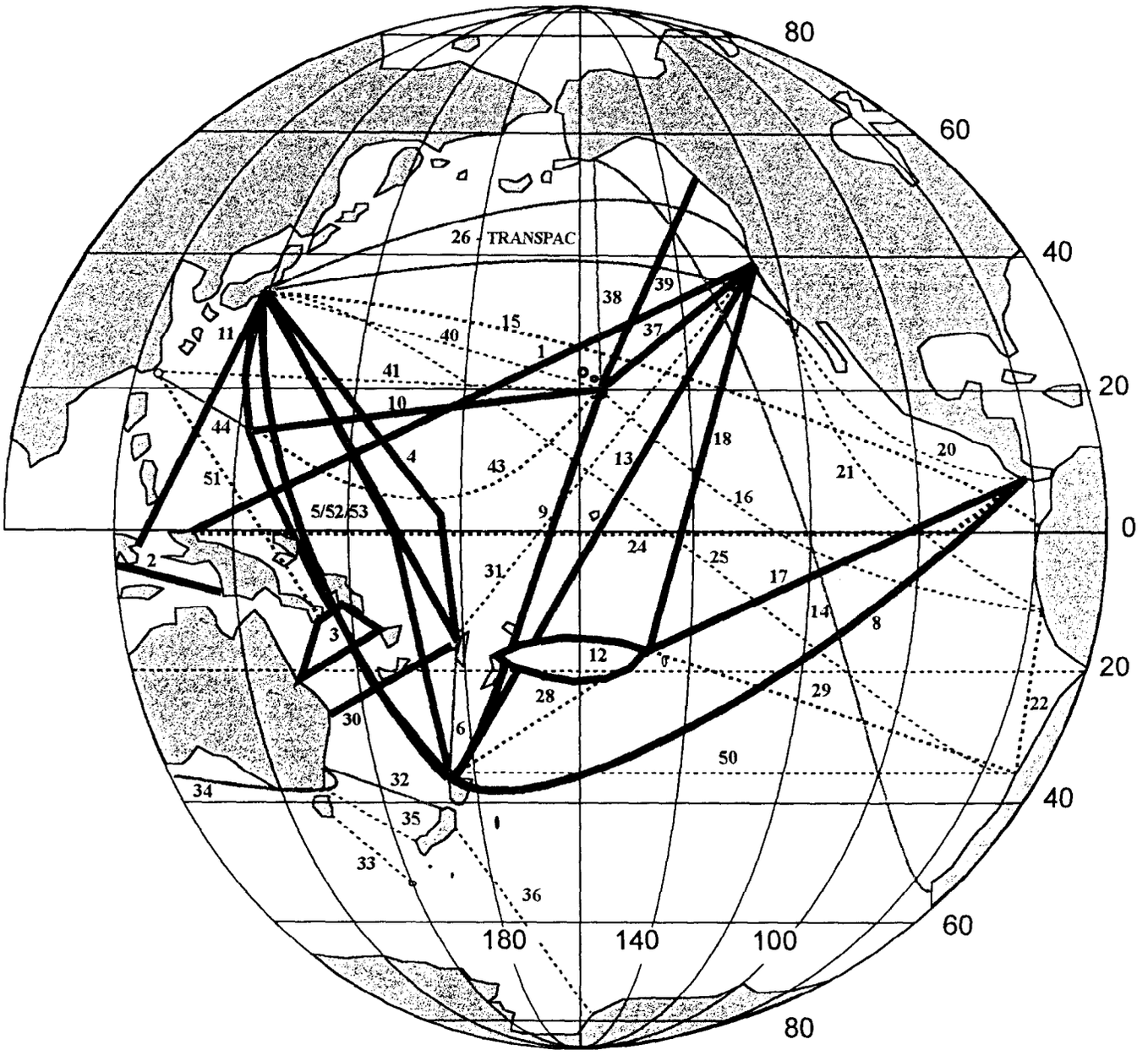
SHIP-OF-OPPORTUNITY-PROGRAMME (SOOP)
LOW DENSITY XBT NETWORK
Atlantic Ocean



Oversampled
Fully Covered
Partially Covered
Not Covered

Source: 1997-98 SOOP XBT Resources Survey
Version: *5 May 97*

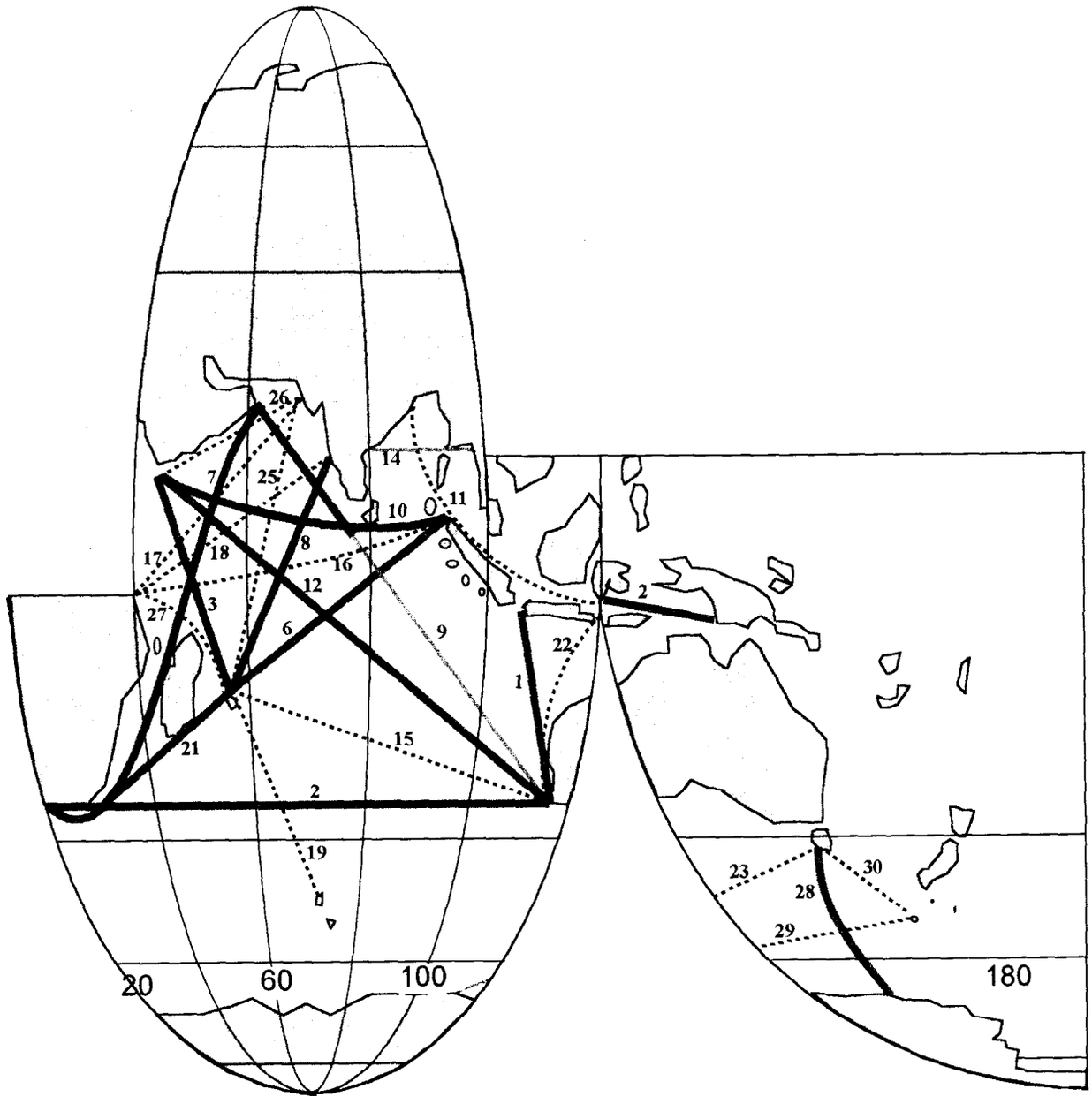
SHIP-OF-OPPORTUNITY-PROGRAMME (SOOP)
LOW DENSITY XBT NETWORK
Pacific Ocean



▬▬▬	**Oversampled**
▬▬▬	**Fully Covered**
———	**Partially Covered**
·····	**Not Covered**

Source: 1997-98 SOOP XBT Resources Survey
Version: 5 May 97

SHIP-OF-OPPORTUNITY-PROGRAMME (SOOP)
LOW DENSITY XBT NETWORK
Indian Ocean



Oversampled
Fully Covered
Partially Covered
Not Covered

Source: 1997-98 SOOP XBT Resources Survey
Version:

ANNEX VIII

STATUS REPORT ON THE GTSPP

Introduction

GTSPP has been running for about 7 years and although it continues to function well there is always work to do to ensure optimum performance. This report briefly describes the present status and work required to improve performance in various aspects of the project. It concentrates on the real-time data exchange although some issues of managing high resolution delayed mode data also arise.

Data Flow

Data arrive daily from MEDS connections to the GTS and from NMC. The US Navy is changing operations from Monterey to Bay St. Louis. This causes files to arrive intermittently from Monterey. MEDS is working with the navy to regularize the daily GTS data from the new location.

GTS data arrive regularly monthly from BSH (Germany) and JMA (Japan). Data from JODC has been a sporadic. These latter arrive too late for insertion on the GTS but are placed into the CMD of GTSPP.

MEDS continues to deliver updates to the CMD at NODC 3 times a week. In addition MEDS is delivering the same files to Bay St. Louis.

Corrections to wrongly flagged real-time data are currently being fixed and will be sent to NODC likely before the SOOPIP meeting begins.

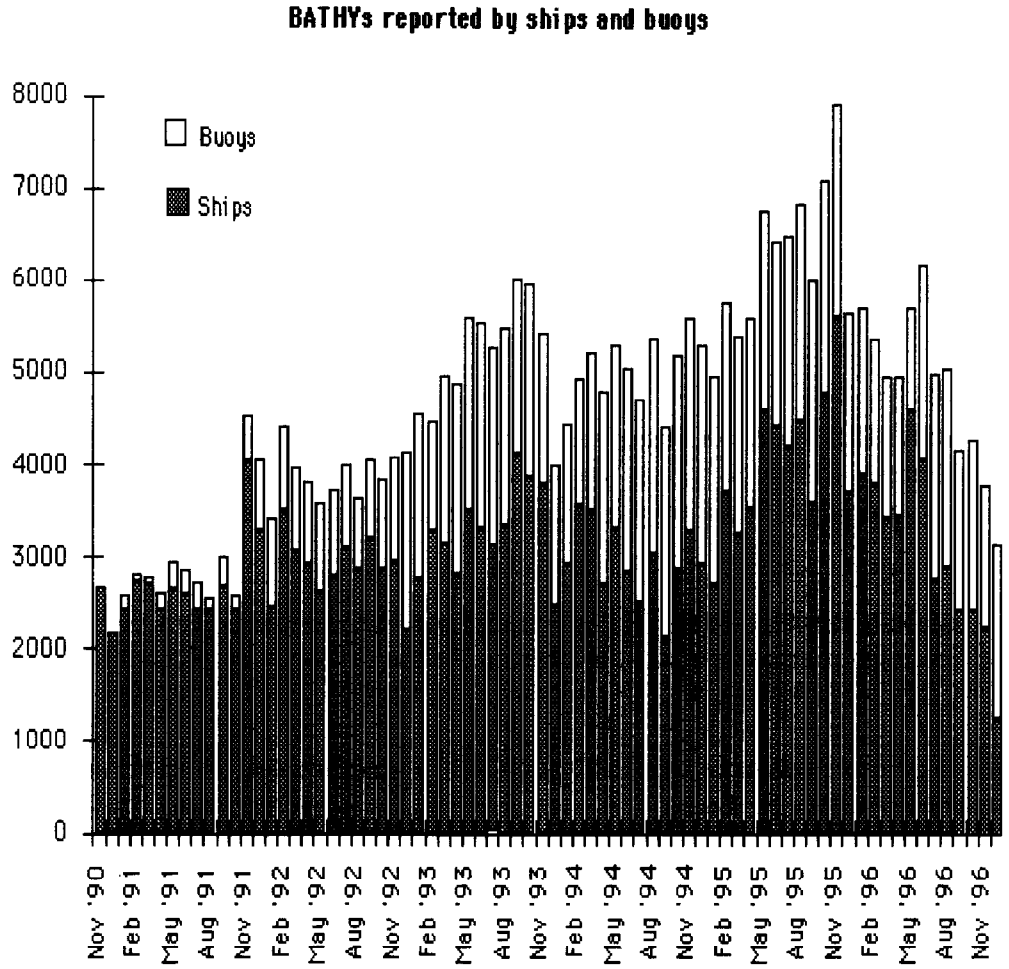
There continue to be users of real-time data on both daily and weekly delivery schedules. Recently MEDS has added a new user for data from the Northwest Atlantic. Users are from Canada and the US at present. In addition, NODC also supplies users with real-time data delivered by MEDS.

Recent counts of the number of BATHYs and TESACs in MEDS archive suggests that total volumes have decreased since the summer of 1996. (*See figure*)

It is not known if this is the result of WOCE sampling decreasing, or some other cause.

New data from P-ALACE floats started to be placed on the GTS in October, 1995. There are now more floats being deployed by people at Woods Hole in the US. NOS is working with them to put these on the GTS as well.

In the last few months, by comparing reports from the IGOSS-TC, NOS and our own and alerted by Australia, it would appear that some BATHYs are being lost to the real-time system. The reasons are not clear. Some of the differences are due to differences in counting based on date (observation or reported GTS date, for example). Some action will be necessary to identify what are the problems and then what steps can be taken to correct them.



Reports and Products

A number of reports are generated routinely by participants of GTSPP. Internal reports of QC problems found by AOML are sent back to MEDS for correction and to improve MEDS procedures.

MEDS generates two monthly reports for the IGOSS-TC. The first is counts of BATHYs and TESACs received from North American sources on the GTS. The second is the same but includes the data from Germany and Japan as well.

MEDS produces a monthly report of ship performance that is distributed directly to ship operators (this was a result of discussions between GTSPP and WOCE UOT in 1996). Responses to this report are received and assist MEDS in better quality control of data from regions not so familiar to MEDS staff. At the same time the IGOSS-TC now keeps track of ships and operators that show consistent problems month to month. It is now his responsibility to contact these operators to encourage them to improve their sampling procedures.

NOS in the US produces a monthly report of XBTs deployed and counted from various sources.

MEDS WWW site shows monthly maps of locations of BATHYs and TESACs and a catalogue of data received by ship call sign. The ship performance report is also available from the same site.

Scripps has an extensive suite of products, based in part on GTSPP data. They include SST and subsurface temperature anomalies as well as heat storage. Readers should visit the WWW site at http://jedac.ucsd.edu.

AOML also maintains a web site for UOT. It has a description of their quality control procedures as well as some other information. Readers should visit http://www.aoml.noaa.gov for more information.

MEDS has also taken part in a WMO monitoring exercise for BATHYs, TESACs and TRACKOBs. We have not seen the results of the exercise, but are prepared to participate in a follow on if requested.

Data Quality

At the last GTSPP meeting Rick Bailey presented an overview of an intercomparison of quality control work carried out at MEDS, NODC and CSIRO. Keeley was requested to prepare a report and this was completed. The full report is available from MEDS WWW site **(http://www.meds.dfo.ca).**

MEDS is developing software to portray waterfall plots for stations as part of its processing of profiles. This should be completed by the summer.

MEDS and AOML will be undertaking an evaluation of the value added to a data set by quality control. At the time of writing, no work has started. The intention is to develop a quantitative measure of the benefits of QC. It is expected that MEDS will benefit from the exercise through the identification of more efficient ways to improve quality control processing. This increased efficiency will also be as a result of the transfer of expertise from AOML to MEDS.

Data and Information Availability

The first GTSPP CD-ROM was issued in the summer of 1996. It requires a PC running Windows 3.1. Included on the CD is commercial software to permit viewing of data and documents from the project. Copies may be obtained from IOC in Paris or from MEDS.

Both MEDS and NODC maintain web sites where information about GTSPP is maintained. The NODC site also permits downloading of data from the project.

At the last GTSPP meeting a number of suggestions were made to increase the availability of the data and information. With this and the requirement from WOVE DPC to produce a platform independent CD by the beginning of 1998, MEDS will be enhancing its WWW pages devoted to GTSPP. This will occur on the same schedule as the production of the CD.

There is still problems in acquiring the high resolution data after the ships return to port. The data collected through the NOS/SEAS system do reach NODC in a timely way.

ANNEX IX

STATUS OF SEAS-IV SOFTWARE

The United States National Oceanic and Atmospheric Administration (NOAA) has developed a software package, called SEAS IV to facilitate the compilation, encoding, and transmission of meteorological (BBXX)and bathy (JJYY) observations via INMARSAT Standard C. In 1996, ships using SEAS collected and transmitted 17,514 met and 927 bathy observations through Standard C (see *attached plots for 1996). SEAS IV is an upgrade to previous SEAS programs and incorporates the ability to generate Automated Mutual assistance VEssel Rescue System (AMVER) messages and transmit data in compressed binary format through Standard C, resulting in significant savings.

The software is available at no cost from NOAA. The software requires an IBM PC or laptop (MET/AMVER only) computer with DOS 3.3 or higher. Ships are not required to participate in the U.S. VOS program in order to receive this software. However, to take advantage of the compressed message capability and thus reduced cost, the ship will need to register with the U.S. program.

The software:

(a) Compiles ships' meteorological, bathy and AMVER reports in standard code and prepares them for transmission. Extensive help-fields are available. An AMVER position report is automatically generated each time a meteorological and/or bathy report is prepared and transmitted. An AMVER sail plan function is also included.

(b) Performs quality control on the met and AMVER reports prior to transmission and storage.

(c) Stores the reports on diskette (or hard disk) for later retrieval, further quality control, and permanent archival for climatological and research purposes and data exchange.

(d) Is compatible with a Synergetics GOES and many Standard C transmitters.

The reports are stored in files or can be printed, for:

- Transmission by telefax, Telex over Radio (TOR), Inmarsat-A TELEX, Inmarsat-C TELEX, morse code, or voice manually;

- Transmission via NOAA-GOES satellites automatically;

- Transmission as a compressed binary message through the ship's Inmarsat-C system semi-automatically via COMSAT. The reports are converted back to standard format upon receipt.

Advantages for the system are:

(a) Help-fields for every element, a VOS code card is no longer necessary;

(b) A number of quality control checks achieve increased accuracy and reliability of the observed data.

(c) Transmission of an observation through Inmarsat-C in the binary mode is very cheap, compared to other transmission methods such as INMARSAT-C TELEX.(56 cents vs. $5-$8 dollars for met reports. Bathy and AMVER reports will vary in cost depending on the size of the report.)

(d) Standard C also provides error checking in the transmission process which greatly reduces the number of transmission errors using GOES.

(e) AMVER messages transmitted in the binary mode via INMARSAT-C are paid by the AMVER program rather than the participating vessel. The increased frequency of AMVER messages (each met/xbt observation vs. several days) assure an enhanced level of safety. The AMVER functionality of SEAS IV provides additional incentive for ships to participate in the VOS program.

Additional SEAS Features

(a) SEAS IV also provides the capability to transmit TESAC (KKXX) messages.

(b) An ancillary benefit in the development of SEAS IV has been the availability to NOAA of the U.S. Coast Guard Data Network (GGDN). Through a cooperative program with the Coast Guard and COMSAT, NOAA is allowed to use the CGDN for its land traffic from the satellite ground station and eliminate the landline costs for the messages.

Future Developments

(a) The ability to transmit messages via the INMARSAT-C signaling channel at even greater savings is under study.

(b) The integration of data from:
1) XBT auto-launcher developed by AOML.
2) thermosalinograph to generate trackob(NNXX) messages.

(c) To integrate SEAS with automated meteorological and navigation sensor data as might be provided by an integrated bridge or electronic chart system. Current SEAS software allows connection to a GPS receiver for automatic entry of vessel position.

ANNEX X

REPORT ON ALACE AND PALACE FLOATS

DATE: January 1997

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BRIEF OVERALL DESCRIPTION OF PROJECT:
This project concerned the assessment of new technology in the N. Pacific Ocean and the use of that technology in the North Atlantic subduction experiment, in the Labrador Sea. This project formed part of Canada's response to the World Ocean Circulation Experiment.

RATIONALE:
The ocean is a difficult environment to sample. The salt water is itself corrosive, and the surface is frequently inhospitable, particularly when there is a perceived need for careful sampling of that environment. A particularly inhospitable part of the world is the Labrador Sea, and partially for that reason it is scientifically one of the most interesting locations, from the scientific perspective.

Human activity is injecting large amounts of CO_2 into the atmosphere. Part of the injected CO_2 remains in the atmosphere, and we see a steady rise in the atmospheric CO_2 content. However, only about half of the gas injected appears to remain in the atmosphere, the other half is absorbed into the surface layers of the ocean. The CO_2 so absorbed can return to the atmosphere unless that water is removed from contact with the air. There are very few places in the world where this can happen and one of those is the Labrador Sea. In the Labrador Sea extremely cold outbreaks during the winter cause deep convection that allows the surface waters, with their high levels of CO_2, to be carried down to depths in excess of 2000 metres. Thus the associated load of CO_2 is permanently removed from the atmosphere.

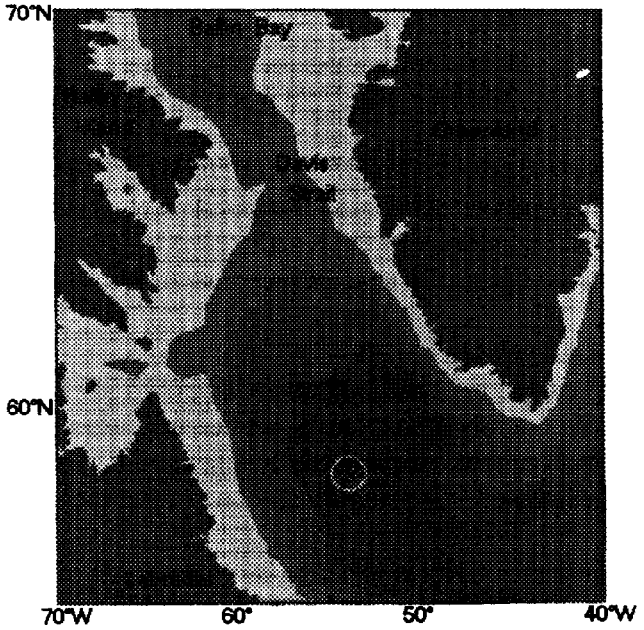
The problem is that all of the interesting oceanography occurs during the winter cold outbreaks. During these periods humans and their ship-borne equipment do not perform well, and we need automatic sampling equipment to function in the area, this is the profiling Alace float.

The profiling Alace float, or Palace float, is designed to drift at depth, say 1000 metres, and then adjust its buoyancy after a programmed period, drift to the surface, compute a profile of temperature and salinity, transmit the data to a satellite, and then return to depth. An array of these floats will allow us to monitor the development of the temperature and salinity fields and to observe ocean currents themselves through the most inhospitable conditions.

WHAT WE DID:
Two P-Alaces were bought initially for testing in the north Pacific Ocean. The figure opposite shows the drift trajectories of both of these devices.

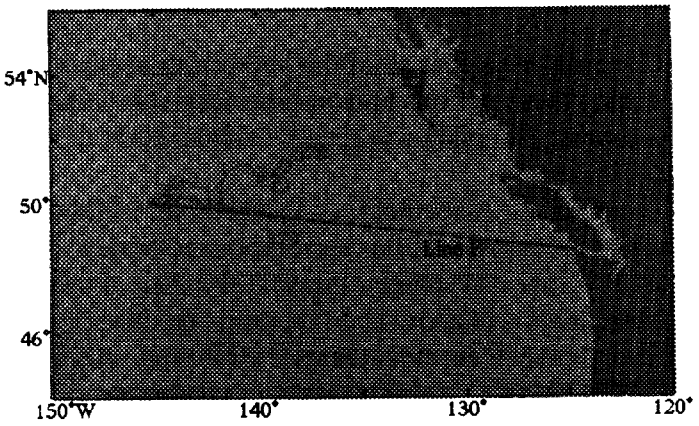
Instrument 578 was deployed first and 579 about 3 months later. Both of these devices were prototypes, and the data acquired from the tests have been instrumental in providing data for significant improvements in the design of the floats. These improvements have been used on the floats acquired subsequently for use in the Labrador Sea experiment.

Seven floats were prepared for deployment in the Labrador Sea in October of 1996, from the R.V. Hudson. As might be expected at this time of year, severe weather was encountered. The result was that a minor incident in the main lab resulted in damage to two of the floats, and only five were deployed. The pattern of deployment was as is shown on the diagram opposite. The intention with this pattern of deployment is not to map the evolution of the major convective areas of the Labrador Sea, but rather to map the small deviations in current structure over a small region. We believe that with the Alace floats we will be able to observe the convergence in surface currents and the divergence in deep currents with this array. This will allow us to make direct estimates of the vertical velocity associated with the winter convection. Knowing the vertical velocity, and assuming (a good assumption) that the convecting water is saturated in carbon dioxide, we can then make direct estimates of the rate at which CO_2 is sequestered from the surface layers of the ocean, and so from the atmosphere.



The location of P-Alace floats deployed in the Labrador Sea, fall 1996.

In many respects this project has very close relationships to the Sea of Okhotsk section described in the report of Green Plan Project W1. In the case of W1 we were able to establish that winter convection was not climatologically important, this was a surprise. If with this venture we make a similar discovery in the Labrador Sea, then the climatological community will be more than surprised, shocked would be a more apt description.

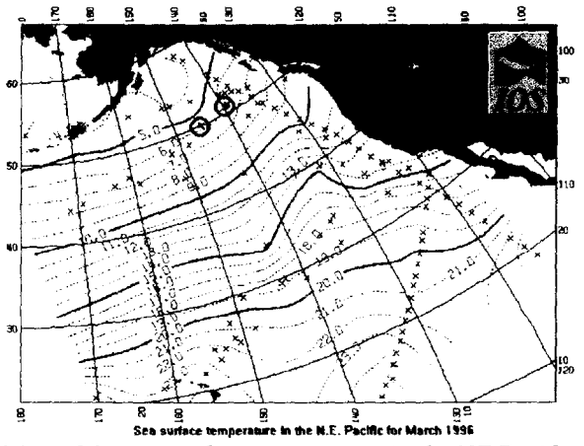


The drift of two P-Alace floats in the NE Pacific, both deployed at Ocean Station Papa

The tracking of the 5 Alace floats is proceeding smoothly and is being carried out by a Graduate Student at Dalhousie University (Patrick Roussel, supervised by Barry Ruddick).

WHAT HAVE WE LEARNED FROM THIS PROJECT?

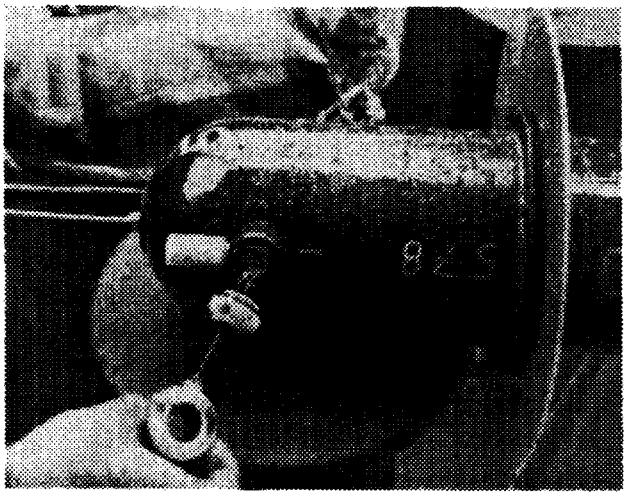
It is too early in the Labrador Sea segment of the project to discuss definitive results. However, this is a new technology, and part of the reasoning in the execution of this project was to test prototypes, and assess their potential usefulness as a tool for the Canadian commitment to GOOS.



Map of the sea surface temperature in the NE Pacific from IGOSS data. The red circles show data transmitted in near real-time onto the GTS from P-Alace floats.

Two profiling Alace floats were deployed in the N. Pacific Ocean near OWS Papa. Float #578 was deployed in Sept. 1995 and float #579 in February 1996. Tracking and data processing was discovered to be a non-trivial problem, and this has led to recommendations on the re-design of the transmitting protocol, recommendations that have been implemented on the next generation of prototypes, all of which were deployed in the Labrador Sea. The problems were worked around, and we developed expertise to the point where we could insert data from the floats in near real-time on the GTS (Global Telecommunications System). Thus data from these floats have been inserted transparently into the IGOSS system, indeed, IGOSS is probably not even aware that profiling Alace floats are reporting to it. IGOSS publishes maps of ocean conditions, and these maps have been greatly enhanced in the waters off the BC coast by the addition of these data. Clearly, the transparent insertion of Alace data is possible, and these can indeed form a major part of the GOOS network.

In the spring of 1986 the float #578 began to show erratic and improbable profiles for salinity, the instrument had been in the ocean for about 6 months. A short time later, and after only 3 months life, #579 also began to show erratic salinities. It did not escape our attention that the one item in common between the two floats was time, both began drifting in spring. We debated the problem at length with the design engineers. We suspected fouling of the conductivity sensor, but they disagreed. The received wisdom was that the floats spend relatively little time at the surface, and they cannot foul at depth. Any minimal fouling that occurs during the brief sojourn at the surface will be killed by the next cycle to high pressure and low temperature. Engineers developed complex theories about the cause of the failure, and we decided that it was necessary to retrieve a malfunctioning Alace float. This was not easy and had never been done before. We knew very well that a P-Alace float would be a very difficult optical target at sea. We prepared well and were successful.



The picture opposite shows the state of the float on recovery. Contrary to "received wisdom" the float was heavily fouled. The small dots are gooseneck barnacle larvae. The larvae are failing to thrive and we assume that they are settling on the float during its brief period at the surface and are being stunted by the deep excursions rather than being killed. As far as the conductivity cell is concerned the result is essentially the same. Fouling has a strong negative effect on the ability to sample conductivity, and, therefore, salinity. In preparation for the Labrador Sea deployment, the conductivity cells were redesigned and coated with anti-fouling agents. This will have a negative impact on the response time of the conductivity cell, but is better than a complete failure.

The Labrador floats have only recently been deployed and initial data returns have only just begun, so it is too early to describe concrete scientific results from the primary thrust of this project. However, we have:-

1) Tested and verified the usefulness of a new technology.
2) Flaws in the new technology have been discovered and remedial measures implemented.
3) A major discovery concerning climate change at Station Papa (evolution of the mixed layer depth described in the report on project W1) needed to be reported and techniques developed to estimate the mixed layer depth in the N.E. Pacific. This was made possible by the availability of fall to spring mixed layer sampling at 5 day intervals acquired through the use of the P-Alace floats. Data from the floats is an integral part of a paper that is currently sub-judice.
4) We have demonstrated the use of robot devices for the automatic insertion of data on the GTS. Thus, real-time mapping of sea-surface and sub-surface temperature in the N.E. Pacific has been greatly enhanced by the availability of this technology. Thus this technology is identified as a viable option for GOOS.
5) We still have much to do before we can be confident of our estimates of salinity from long duration, unattended platforms.

ANNEX XI

OBTAINING SYNTHETIC BATHYTHERMOGRAPHS FROM SATELLITE ALTIMETRY

(K. Ridgway and R. Bailey, CSIRO)

In the Tasman Sea it has been known for many years that steric height is highly correlated with the temperature at a single depth (Hamon, 1968). In a variety of studies these correlations have allowed parameters such as current strengths and transports to be inferred from temperature data on time scales associated with eddy variability (Hamon, 1968; Pearce, 1983; Nilsson and Cresswell, 1981; Ridgway and Godfrey, 1994). Similar relationships in the Gulf Stream region have also been used to determine steric height from temperature profiles (Cheney, 1982; Bernstein et al., 1982; Kheudouri and Szczechowski, 1983). We note, however, that these workers appear to have been unaware of the earlier Tasman Sea results.

The present project essentially involves the determination of empirical relationships between measurements readily obtained from satellites (sea level and sea surface temperature) and the quantity that we are seeking - the subsurface temperature profile. This overall task is broken down into two separate elements. Firstly, from the hydrology data we obtain relationships between the surface steric height and subsurface temperature. Secondly, the steric height obtained from the hydrology is related to the sea level measurement from the satellite. Satellite sea surface temperature (SST) information is used to improve the estimates of subsurface temperature. A second order correction is provided by using the synthetic temperature profile to recalculate steric height, which can then be compared with the known value of steric height used for the initial estimate.

The method described above is still in the development stage, and therefore the results are not discussed in detail here. However, it is noted that promising results have already been obtained for reconstructing the subsurface temperature field using satellite altimeter and SST data alone, when compared to independent in-situ data collected along eddy-resolving XBT tracks in the Tasman Sea. It is planned that this work will eventually help with the design of an optimal observing system for the region. The empirical relationships between sea level and SST, and subsurface temperature will be examined for other regions in the hope that the same methods can be extended to other areas.

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ANNEX XII

SUMMARY OF ISSUES RELEVANT TO SOOP FROM THE WOCE UOT/DACS MEETING

-Washington, DC, 18-19 April 1996-

(by R. Bailey, CSIRO)

1. Introduction

The sixth meeting of the WOCE Upper Ocean Thermal (UOT) Data Assembly Centres (DACs) was held at the new site of the US National Oceanographic Data Centre (NODC) in Silver Spring, MD, USA. The aim of the meeting was to discuss the ways in which the UOT DACs were to meet the requirements of WOCE and future programmes. In particular the issues discussed included the data and products required for the WOCE Scientific Workshops, the role of the DACs in long term climate study programme such as CLIVAR, and the production of a globally consistent data set. The meeting was held in conjunction with the fourth meeting of the IOC-WMO Steering Group of the Global Temperature and Salinity Pilot Project (GTSPP). The following highlights items of relevance to SOOP as discussed at the meeting.

2. Review of Action Items from Workshop on Quality Control of UOT Data

The list of action items from the Workshop on Quality Control of Upper Ocean Thermal Data, May 1995 (WOCE Report No. 133/95) was reviewed and the outstanding action items revisited. Several actions were discussed later in the meeting and so are not referred to here.

Items 1-3 all related to preserving information on data quality from data originators. The Workshop recommended that quality flags and information from the source of the data be preserved, so utilising the expertise of those closest to the collection of data. This recommendation was passed to the IGOSS Ship of Opportunity Programme meeting (SOOP-V) in October 1995, and to the IGOSS and IODE meetings in late 1995 and early 1996. The representatives from NODC indicated that unless this information was submitted in the MEDS ASCII format, it could not be stored with the data.

Item 4 concerned the optimum number of inflection points in a BATHY message; WOCE has not specified the tolerance required from real time data so this issue could not be resolved. The issue will be revisited at future meetings, and is critical to SOOP operations. The TT/QCAS should follow up on this.

Item 9 concerned the automatic flagging of data outside Climatology limits. At this time NODC are the only centre still giving data Flag 2 when they lie outside of Climatology. NODC was requested to reconsider automatic flagging of data outside Climatology and recommended that instead the QC expert be alerted of a test failure and to view the profile individually.

Item 13 discussed the overall profile quality flag ("Q" record). It was agreed at the GTSPP meeting that this flag should reflect the "worst" quality data in the profile; i.e. to retain the meaning as described in the GTSPP QC manual (IOC Manuals and Guides 22).

E Lindstrom and R Bailey reported that the planned "UOT-DAC QC Handbook" discussed in Item 21 is currently being compiled.

Items 26-28 were concerned with providing helpful information to ship operators and the officers deploying profiles from ships of opportunity. Jim Hannon of Sippican Inc. compiled some information points to be distributed. The issue was discussed at the IGOSS Ship of Opportunity Programme meeting in October 1995. As Chairman of the TT/QCAS I also had input into this document early in 1996. I have not seen the final product since.

3. WOCE Scientific Steering Group Review of the UOT DACs

The WOCE SSG is carrying out a review of the entire WOCE data management system in order to document what added value each component brings, both for WOCE and in terms of future programmes. As part of this review, the SSG tasked a small ad hoc group to review and document the UOT DAC system which has several participating data and science centres. The review group aims to document the added value that scientific quality control brings to the data set, how the delivery schedule for UOT data and products affects results from WOCE, and how the flow in particular of delayed mode data can be improved.

Eric Lindstrom, chairman of the WOCE Data Products Committee, opened this agenda item with a summary of the requirements of the SSG review and reiterated that the overall aim of the UOT DAC is to produce a consistent high quality global data set with flags that users can understand and utilise. The field phase of WOCE will end after 1997 and a series of basin-wide scientific workshops is planned, starting with the Pacific Workshop in August 1996. The purpose of the Workshops is to initiate cooperative research activities to address the major scientific issues. It is envisaged that they will encourage the synthesis of all available data sets from each basin to study various aspects of the general circulation. It is apparent from the schedule for delivery of UOT data (see WOCE Report 133/95, the Workshop for quality control of UOT data) that the scientifically quality controlled UOT data will have a limited impact on these Workshops simply because they will not be available. This is mainly a result of the slow submission of delayed mode data by the operators (an Area of concern for SOOPIP). It was noted that large UOT data sets are available already; all real time data have been subjected to GTSPP quality control (consistency checks and visual inspection by MEDS), and delayed mode data received by NODC have also undergone GTSPP consistency checks (without visual inspection however).

The UOT DAC quality control will have an important and significant impact in the detection of long term climatic signals; the scientific quality control eliminates apparent

climate signals which are in fact caused by the instruments. The SIO DAC has shown that apparent anomalies in Pacific sea surface temperature maps can disappear or have their signs reversed after the scientific quality control has been applied.

Within the GTSPP/WOCE UOT DAC cooperation, new techniques for quality control have been developed by both data and science centres. The cooperative arrangement has helped data centres to improve/calibrate their QC techniques with those employed by science centres in the project. It is envisaged that eventually the skills developed at the Science Centres will be completely transferred to national data centres (Section 6). Thus the WOCE UOT DACs provide a service essential for WOCE and which will be invaluable to long term programmes such as CLIVAR, GOOS etc. It was recommended that the added value the Science DACs are providing should be documented and widely distributed within the scientific community (for example through the WOCE Newsletter).

The Group concluded that the UOT DACs need to address the issue of submission of delayed mode data with some urgency. Immediately after NODC and Brest have completed their exchange of data, the outstanding delayed mode data must be identified and the ship operators contacted to obtain the data. Information held by the IGOSS Operations Coordinator will be used to identify the programme managers responsible. NODC, Brest, IGOSS Operations Coordinator and WOCE IPO were asked to carry out an urgent delayed mode data tracking exercise:

- NODC/Brest provide inventory by call sign of real time, delayed mode data and "matches" received for years 1990-1994.
- IGOSS Operations Coordinator and WOCE IPO to identify and contact the ship operators or programme managers responsible for the known outstanding data
- NODC to contact the national oceanographic data centres of programme managers with outstanding delayed mode data.

Since this exercise began, a considerable amount of delayed mode data has been identified and submitted to the international archives. The international archives alone were found to have largely mutually exclusive data sets which did not help the situation. SOOP operators should ensure their delayed mode data is submitted to the international archives within one year of collection. This is imperative.

4. Present Status of the WOCE UOT DAC System

Each component of the UOT DAC system was asked to provide a short summary of their achievements in 1995-1996 and the status of their data sets and products. R Bailey presented the status of the Indian Ocean DAC at CSIRO, Hobart; he reported that they were presently quality controlling the 1991 data set and provided figures on the percent of profiles with the different levels of QC flags. He noted that the 1991 data set contained considerably more real time data than 1990. The Indian Ocean DAC has developed a regional Climatology and carries out some mapping, though the latter is made difficult by the data distribution which tends to be along shipping tracks.

S Diggs reported on the achievements of the Pacific DAC at SIO over the last year. The DAC has a series of products currently available on the Web, including data distribution maps, Climatology, real-time analyses, animations, historical analyses, and

temperature anomalies maps. The quality controlled 1990 and 1991 data sets have been delivered to NODC. They have found that with their growing experience and expertise they have more confidence in the quality control of the 1991 set and plan to re-process the 1990 data set by May 1996 as a result. NODC will not load the Pacific 1990 set until they have received the updates version from the Pacific DAC. During the discussion it was noted that the DAC receives a quantity of marginal seas profiles which they do not quality control because they do not have the appropriate knowledge to do so; in these cases the profiles are not returned to NODC with the quality controlled set.

Y Daneshzadeh summarised the status of the Atlantic DAC at AOML; both the 1990 and 1991 data sets have been quality controlled and delivered to NODC. She noted that the 1991 data set has a higher number of bad profiles than 1990. R Molinari informed the Group that the DAC is currently developing data products and their Web pages. They are also compiling a delayed mode data report which will include heat content and temperature at selected depths and anomaly maps. The report will show how representative the WOCE field phase years are (Goal 2 of WOCE) and the difference the scientific quality control makes to the data set.

M Hamilton summarised the achievements of NODC over the past 12 months. A key new ability is being able to manage the quality control information provided by the Science Centres. Recently they have been carrying out an extensive comparison of their data holdings with Brest after it was discovered that there is a substantial difference between the two centres. The comparison has revealed that NODC requires around 13000 profiles retained at Brest, and Brest requires around 71000 profiles from NODC (many of these are extra-tropical profiles; Brest became a global centre in 1993). In particular a large number of delayed mode profiles from 1992 are archived at Brest and not at NODC, the exchange of data will go some way to improving the level of delayed mode data available for the Science Centres to quality control. The two centres are developing mechanisms for ensuring that there is continual exchange of data between them to ensure such a discrepancy does not arise again.

M-C Fabri outlined the highlights of the past year at Global Subsurface Data Centre in Brest. The database now resides on a new machine and the increased capability means it is no longer necessary to perform any data reduction in their working database. Recorder and probe type are recorded when information is provided. A new input format has been developed, and the centre can routinely provide a new data distribution map for the CLIVAR-WOCE XBT/XCTD Programme Planning Committee. Information and statistical products are available on the Web.

5. Flag Intercomparison

The primary product of the UOT DAC is a globally consistent data set and it is valuable to carry out flag comparison exercises both to quantify the added value of scientific quality control and to ensure consistency between the Science Centres. MEDS, NODC and CSIRO performed an intercomparison between a common data set. R Bailey presented the Group with some examples of how the different centres flag the same profile in a slightly different way. The comparison highlighted the need for visual inspection of profiles, i.e. automated tests were inadequate for the quality control of the data, and SOOP operators should ensure they also visually inspect their data during QC and before submission. The comparison also highlighted the added value of the scientific input from

the Science Centres in retaining anomalous, but real data, which is sometimes flagged as erroneous by the Data Centres.

6. Transfer of Expertise to National Data Centres

An important legacy of the WOCE data management infrastructure is the system itself and the skills, experience and expertise that have been developed over the WOCE period. From the start, it has been envisaged that the WOCE DACs would not be permanent centres, but that eventually their role would be fulfilled by the more permanent national oceanographic data centres. The UOT DAC has been particularly active in working towards achieving that long term goal. There have been many meetings of the various centres involved under the umbrella of the GTSPP and the WOCE UOT DAC, during which experiences and techniques have been demonstrated and exchanged. This cooperation has led to changes and improvement to the procedures employed by the national data centres (MEDS, AODC, NODC, GSDC) and has contributed to the success of the GTSPP.

An example of a partnership that has progressed further than most is that between the Indian Ocean Science Centre at CSIRO and the Australian Oceanographic Data Centre (AODC). Close cooperation between the two centres has enabled AODC to use the interactive QC system developed at CSIRO. The process has been a long one, with much time and resources being committed by both centres to ensure its success. It has involved several exchanges of personnel between the centres for substantial periods of training, and the purchasing of new equipment by AODC. The AODC now also utilise the QC system developed by CSIRO to QC their own data originated by the RAN fleet.

The WOCE field phase is coming to an end in 1997. However, requirements for new and improved quality control procedures, data products and data dissemination techniques will continue through CLIVAR. As indicated above, the WOCE Science Centres have made many contributions to the national data centers, and it is envisaged that they can play a similar role for CLIVAR (particularly since new data sets will come on-line, e.g., profiling floats, continuous observation of surface salinity, etc.). Many issues must be resolved to evaluate the utility of such a role for the science centres. For example, using the Science Centres as a site for development of techniques used by the national data centres will require substantial commitment from both sides in terms of time and money.

It was suggested that the UOT DACs request a commitment from particular national data centres to facilitate the exchange. However, this was not felt to be appropriate at this stage. Instead, the UOT DAC Group reported the following recommendation to the GTSPP Steering Committee during their joint session:

Establishing improved quality control procedures is an important goal of UOT DACs. The transition of these procedures to the National Data Centres is another goal that has been performed on an ad hoc basis. The Group recommended that formal mechanisms for transferring new techniques from the DACs to the Data Centres should be established, e.g. personnel transfers and exchange/purchases as required; training over a prolonged periods; commitment from both sides. The ultimate objective is to establish the National Data Centres as the sites for the highest level quality control needed to meet as yet unspecified accuracy criteria.

The GTSPP was asked to consider how such mechanisms could be put in place, and to obtain commitment from appropriate national data centres to acquire the techniques from the WOCE Science Centres. Such commitments could not be made at the GTSPP-IV meeting, but possibilities will be explored during the intersessional period and reported on at GTSPP-V.

7. Standardisation of Quality Control

The report of the Workshop for Quality Control of WOCE UOT data (WOCE Report No 133/95) discussed the issue of "start-up transient" data associated with XBTs. Agreement was reached at the Workshop but some participants of the UOT/DACs requested further discussion since the Science Centres were still employing different procedures. The IGOSS Task Team for Quality Control of Automated Systems has identified that the data from 0-3.7m of each XBT profile is unreliable since the instrument takes some time to equilibrate. At present only the Indian Ocean UOT/DAC operated by CSIRO removes data from 0-3.7m and flag them as changed values (retaining the original values in the history table). It was argued by some members of the meeting that not every profile contained bad data at the top. AOML noted that in the 1991 dataset they identified only about 2% of profiles with start-up transient problems. However, it is not clear if the other profiles started at 0m or had already had the top 3.7m of data removed. Further clarification was requested before another recommendation can be made.

ANNEX XIII

LIST OF ACRONYMS AND ABBREVIATIONS

ALACE	Autonomous Lagrangian Circulation Explorer
BATHY	Bathythermograph Report
BSH	Bundesamt für Seeschiffahrt und Hydrographie (Germany)
CLIVAR	Climate Variability and Predictability
CSIRO	Commonwealth Scientific and Industrial Research Organization
CTD	Conductivity-Temperature-Depth
CWXXPPC	CLIVAR WOCE XBT XCTD Programme Planning Committee
DFO	Department of Fisheries and Oceans (Canada)
GCOS	Global Climate Observing System
GOES	Geostationary Operational Environmental Satellite
GOOS	Global Ocean Observing System
GPS	Global Positioning System
GTSPP	Global Temperature-Salinity Profile Programme
I-GOOS	Intergovernmental Committee for GOOS
IGOSS	Integrated Global Ocean Services System
INMARSAT	International Maritime Satellite Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IQC	Instrumentation and Quality Control
JGOFS	Joint Global Ocean Flux Study
MEDS	Marine Environmental Data Service (Canada)
MVCTD	Moving CTD
NOAA	National Oceanic and Atmospheric Administration (USA)
NOS	National Ocean Service (USA)
ONB	Observing Networks Branch (of NOS)
OOPC	Ocean Observations Panel for Climate
OOSDP	Ocean Observing System Development Panel
ORSTOM	Institut français de recherche scientifique pour le développement en coopération
PALACE	Profiling ALACE
QC	Quality Control
QCAS	Quality Control of Automated Systems
QUIPS	Quality Improvement Performance System
SEAS	Shipboard Environmental Data Acquisition System (USA)
SIO	Scripps Institution of Oceanography (University of California, USA)
SMC	SOOP Management Committee
SOC	Specialized Oceanographic Centre (IGOSS)
SOOP	Ship-of-Opportunity Programme
SOOPIP	SOOP Implementation Panel
SSS	Sea-surface Salinity
SST	Sea-surface Temperature
STT/IQC	*Ad hoc* SOOP Task Team on Instrumentation and Quality Control
TAO	Tropical Atmosphere Ocean Array
TESAC	Temperature, salinity and current report from a sea station
TOGA	Tropical Ocean and Global Atmosphere (WCRP)
TRACKOB	Report of marine surface observation along a ship's track
TSG	Thermosalinograph
TT	Task Team
UNESCO	United Nations Educational, Scientific and Cultural Organization
UOP	Upper-Ocean Panel
UOT DAC	Upper-Ocean Thermal Data Assembly Centre
URL	Uniform Resource Locator
WCRP	World Climate Research Programme
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
XBT	Expendable bathythermograph
XCTD	Expendable CTD

82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO_2 Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS CO_2 Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GLOSS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" ***(Spanish only)***
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic ***(Also printed in French)***
116. Tenth Session of the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO)
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
119. First Session of the Joint IOC-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel