JCOMM SHIP-OF-OPPORTUNITY PROGRAMME IMPLEMENTATION PANEL (SOOPIP)

Third Session

La Jolla, California, USA, 28-31 March 2000

FINAL REPORT

JCOMM Meeting Report No. 3

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE MEETING

1.1 OPENING OF THE MEETING

1.1.1 The Third Session of the JCOMM Ship-of-Opportunity Programme Implementation Panel (SOOPIP) was opened at 0900 hours on Tuesday 28 March 2000 in a conference room of the Scripps Institution of Oceanography, La Jolla, USA, by the chairman of the panel, Mr R. Bailey. Mr Bailey welcomed participants to the session, and expressed his appreciation to Scripps and to NOAA for hosting the meeting and providing such excellent facilities and support. He then called on Dr Dean Roemmich of Scripps to address the meeting.

1.1.2 On behalf of Scripps and of the co-hosting institution, the NOAA National Marine Fisheries Service, Dr Roemmich welcomed participants to Scripps and to La Jolla. He noted the long-term involvement of Scripps in upper-ocean thermal monitoring, which was now being manifested in particular through the new Argo project. The interaction and integration of the XBT sampling and Argo would be an important topic for the present meeting. Dr Roemmich concluded by offering the full support of his institution and of NOAA to the meeting and wishing participants a successful meeting and enjoyable stay in La Jolla.

1.1.3 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, and of the Executive Secretary IOC, Dr P. Bernal, the WMO Secretariat representative also welcomed participants to the session. He expressed the sincere appreciation of the two sponsoring organizations of the SOOPIP to Scripps and to NOAA, and in particular to the local organizers of the session, Dean Roemmich and Steve Cook, for their support for SOOP activities in general, and for hosting the meeting and providing such excellent facilities. He noted that SOOPIP had continued to make good progress in transforming what was largely a research oriented and managed XBT/XCTD programme under TOGA and WOCE into an operational SOOP, in support especially of GOOS and GCOS. This transformation had been accelerated, and SOOP in general strengthened through the work of the new SOOP Operations Coordinator, Etienne Charpentier. The WMO Secretariat representative emphasised the important role which SOOPIP was playing already in the operational ocean observing, data management and services structure now being implemented in support of global climate analysis and prediction. These now fell within the overall responsibility of the joint WMO/IOC Commission for Oceanography and Marine Meteorology (JCOMM). In addition, the new Argo project, which was now being implemented, would require a substantial rationalization of the existing SOOP networks and priorities, and this rationalization was therefore a major discussion item for the present meeting. The WMO Secretariat representative concluded by assuring participants of the full support of the Secretariats in their work, and wishing them a very productive meeting.

1.1.4 The list of participants in the session is given in **Annex I.**

1.2 ADOPTION OF THE AGENDA

1.2.1 The panel adopted its agenda for the session on the basis of the provisional agenda. This agenda is given in **Annex II.**

1.3 WORKING ARRANGEMENTS

1.3.1 The Secretariat reviewed the documentation for the meeting. Participants agreed a timetable and other necessary arrangements for the session.

2. REPORTS BY THE CHAIRMAN, PARENT BODIES AND ASSOCIATED PROGRAMMES

2.1 The panel was presented with reports by the SOOPIP chairman and Secretariats on intersessional activities in support of SOOP. These reports also included recent developments relevant to SOOP within IOC and WMO, particularly in the context of the new Joint WMO/IOC Technical Commission on Oceanography and Marine Meteorology (JCOMM), of which SOOPIP is now a subsidiary body.

Report by the chairman

2.2 The chairman, Mr Rick Bailey, reported that the last inter-sessional period had been an extremely important time in the evolution of the SOOP. There had been the formation of the new parent body, i.e. the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), and the international review of the global upper ocean thermal network. These activities had mapped a new future and structure for SOOP to work under as an integral element of a sustained Global Ocean Observing System (GOOS) in support of both research and operational applications.

2.3 During this period the chairman had been active, representing SOOP in the workings of the GOOS Implementation Advisory Group and the JCOMM Transition Committee (JCOMMTRAN). A presentation on SOOP was also prepared for the first meeting of the CMM-VOS group in an effort to facilitate the closer coordination of the two groups' activities, as proposed under the new JCOMM structure.

2.4 An extensive background study evaluating the global upper ocean thermal network, of which SOOP is the main contributor, was prepared by the chairman as the basis for the international review of the network. In conjunction with the chair of the Ocean Observations Panel for Climate (OOPC – Neville Smith, BMRC), the chairman hosted an international workshop in support of the review. This workshop was held in Melbourne during August 1999. The chairman represented SOOP on the review's Scientific Advisory Committee, and co-authored a key solicited paper and poster on the results for the Ocean Observations for Climate Conference, which was held at St. Raphael, France in October 1999. The findings and recommendations of this paper have been supported and endorsed by the international community.

2.5 With the help and support of the SOOP Coordinator, Etienne Charpentier, the Chairman has helped to design the new SOOP web site and review the programme monitoring reports. Other activities have included preparations for SOOPIP-3 (invitees, agenda, documents, etc), and the general promotion of SOOP.

Report by the Secretariats

2.6 The panel was informed that the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) had been approved by 13th WMO Congress and the 20th IOC Assembly, respectively in May and July 1999. JCOMM replaces the former CMM and IGOSS and becomes the formal reporting and coordinating mechanism for virtually all other operational ocean-related activities of the two parent Organizations (including DBCP, ASAPP and GLOSS). As such, it is now also the parent body for SOOPIP.

2.7 A first transition planning meeting for JCOMM, at which the SOOPIP was represented by the SOOP Coordinator, took place in St Petersburg, Russian Federation, in July 1999. This meeting put in place a variety of transitional arrangements for JCOMM, which included: interim co-presidents to be the president of the former CMM and chairman of the former IGOSS; interim management committee to include the chairs of all existing bodies be a part of or report to JCOMM (including SOOPIP); all existing bodies to continue their present work plans and to report on these to JCOMM-I. The meeting also initiated the process to develop detailed proposals for an integrated work plan and sub-structure for JCOMM, as well as a capacity building strategy. Final agreement on these is to be reached at a second transition planning meeting scheduled for Paris in June 2000. The first formal session of JCOMM is scheduled for June 2001 in Iceland.

2.8 The panel noted all these developments with interest. It welcomed the advent of JCOMM as a significant step in the implementation of operational oceanography, in the same sense as operational meteorology. JCOMM would, indeed be the body with prime responsibility for the international coordination, management and regulation of a comprehensive, operational ocean observing, data management and services system, to serve all ocean users, including global climate studies. The panel therefore pledged its full support to JCOMM. At the same time, it noted with considerable interest the proposal to form an integrated Ship Observations Group, within the JCOMM Observations Programme Area, through a close association of the existing VOS Subgroup, ASAPP and SOOPIP. The panel agreed that there were a number of issues, related for example to ship recruitment and servicing, telecommunications, etc., which were common to all three programmes. At the same time, there were considerable potential advantages in having SOOP and ASAP ships providing also high quality meteorological observations. The panel recognized that there were indeed some potential advantages in this proposal, provided that the many distinct technical differences among the three observational programmes were also recognized and addressed. It therefore agreed in principle to the proposal and to having its next session as part of a combined SOOPIP/VOS/ASAPP/SOG session, possibly in the first quarter of 2002. Further action in this regard is taken under agenda item 9.

OOPC/CLIVAR

2.9 The panel recognized that scientific guidance and oversight for SOOP has been provided jointly by OOPC and CLIVAR UOP through the international review of the global upper ocean thermal network and the Ocean Observations for Climate Conference. These bodies were the major sponsors of these activities.

2.10 The scientific review has helped to redefine the scientific objectives of the SOOP, and has provided clear recommendations on the network to be maintained by SOOP in support of climate observations. These requirements are in addition to any other specific national requirements. A solicited paper (reprinted in the separate Technical Report of SOOPIP-III) on the review's findings received international endorsement at the Oceans Observations for Climate Conference. The conference endorsed the unique role and ongoing need for continuation of SOOP in an integrated **in situ** (including, for example, TAO, Argo, etc) and remote sensing (e.g. altimeter) observing system for GOOS/GCOS.

Argo

2.11 The panel was informed that the second meeting of the international Argo Science Team (AST-2) was held in Southampton United Kingdom on March 7-9, 2000. The meeting report is posted on the web at www-argo.ucsd.edu. Objectives of the meeting were to:

- Review national plans, priorities and commitments - to measure progress toward achieving resource requirements for Argo and to continue formulation of a strategy for global coverage. It is expected that by 2003, more than half of the 3000-float global array will be in place, with full deployment in 2005.

- Examine and compare data management prototypes of those countries having begun to design and implement an Argo Data System. The intention is to ensure that the data system is in place to enable data throughput from floats to be deployed in the near future.

- Review the technical issues relevant to Argo, including salinity stability, float lifetime, communications and depth capability.

- Initiate a forum for discussion of scientific results relevant to Argo.

In two years since its creation, the Argo project has attained a high international profile and strong resource commitments from a number of nations including Australia, Canada, France, Germany, Japan, Korea, the United Kingdom, and the USA, plus a European Union contribution. Additional broad international participation is actively sought, including float procurement, assistance with deployment and utilization of Argo data. An International Coordinator and Argo Information Centre will be located in Toulouse France.

VOSClim Project

2.12 The panel noted with interest that the first session of the JCOMM Subgroup on the VOS (Athens, March 1999) had proposed the development of a project to establish (eventually as an operational programme) a subset of the VOS, to provide high quality data and metadata, to serve as a reference data set for air-sea flux computations, in particular in support of global climate studies. The subset would involve in particular the implementation of the recommendations of the VSOP-NA project regarding VOS instrumentation, observing practices and metadata.

2.13 A first planning meeting for this project took place in Southampton, U.K., in November 1999, hosted by the Southampton Oceanography Centre. Participants included representatives of all VOS operators which had expressed provisional interest in participating, the chairman of the marine climate subgroup and representatives of the OOPC. The meeting agreed in principle to the project, as well as several specific details, a draft project document and an initial action plan. Capt. G. Mackie (U.K.) was appointed project leader, and national focal points were identified. The Data Assembly Centre for the project will be hosted by NCDC, NOAA and the Real Time Monitoring Centre by the U.K. Met Office. A second project planning meeting will take place in late 2000 in Asheville, USA, and implementation will begin in late 2000/early 2001. The objectives of VOSClim are given in **Annex III**.

2.14 The panel agreed that VOSCLIM is an important project for global climate studies, whose success will depend on the combined efforts of many people and institutions. These include in particular ships' officers and crew who are motivated, well trained and conscientious. In addition, it recognized that, for many studies, it may be extremely beneficial to be able to associate high quality surface meteorological observations with coincident (in space and time) upper ocean data. For these reasons, it had been suggested that existing SOOP ships might also be recruited to participate in this project. The panel therefore agreed to cooperate with it to the extent possible, in particular through the participation of SOOP vessels in the VOS Climate Project subset.

3. COORDINATION AND MONITORING

3.1 A core agenda item for the meeting was a detailed review of the coordination and monitoring of the overall programme. This review covered in detail the following sub-items:

- SOOP coordinator (coordinator's report, coordinator's position review, coordinator's funding);
- Information exchange (web site, including programme data-base, and programme promotion, mailing lists, etc.);
- Monitoring reports (sampling, JJYY, QC, data flow, data submission);
- Metadata requirements (standards and formats);

Coordinator report

3.2 Etienne Charpentier reported on his activities as SOOP coordinator since he began working part-time (35%) for the Panel in April 1999. He spends the rest of his activities (i.e. 65%) for the Data Buoy Co-operation Panel (DBCP). The first activities he undertook for SOOP was to build his own database and prepare tools for monitoring the programme. Based upon input from SOOP operators, he produced SOOP semestrial reports for Jan.-Dec. 1998, Jan.-June 1999, and Jan-Dec. 1999. He also produced monthly BATHY statistics based upon input from Australia, France, Japan, and USA. All these products are available via the new SOOP web site. SOOP coordinator is acting as a focal point between SOOP operators, data users, Archiving centres, etc.

3.3 The coordinator attended a few meetings representing SOOP and/or the DBCP, including the JCOMMTRAN-1 meeting, St. Petersburg, July 1999, and the OCEANOBS99 conference, St. Raphael, Oct. 1999. In November 1999, he visited the Australian Bureau of Meteorology to discuss SOOP issues with Rick Bailey. He also visited IRD in Brest (June 1999) and Paris (Dec. 1999) in order to discuss the SOOP web site and database issues.

3.4 The SOOP web site was designed by the coordinator, based upon discussions with the Chairman and Jean-Paul Rebert, plus input from SOOP operators. IRD, Brest, agreed to host and maintain the web site, which is being updated by the coordinator. A SOOP logo was proposed and then formally adopted by the Panel. The web site, for example, includes SOOP documentation such as the TSG guide, Manual & Guides #3, Semestrial survey, monthly BATHY report, list of SOOP operators with references, formal list of SOOP lines, and links to other centres and products (e.g. Call sign search) (see the subsection on the web site below for details).

3.5 The coordinator also discussed the SOOP database issue with Rick Bailey and Jean Paul Rebert, and started writing specifications. A new input format was proposed for submitting data to the Coordinator in order to feed the data-base and eventually produce products useful for the programme (see appropriate paragraphs). With support from IRD, MEDIAS-France, and CNES, a student was hired for 5 months (i.e. until July 2000) to work on the SOOPIP database under the coordinator's supervision in Toulouse.

3.6 The coordinator has been working on various other issues such as metadata, participation of new partners in the programme (e.g. India, UK, MFSPP (funded by the EC)), line definition, Argos GTS sub-system (e.g. interpolation between location, delayed distribution), user assistance (e.g. GTS, MK-21, provide information on SOOP). He provided the WMO and IOC Secretariats with input regarding status of the programme. He also wrote a few preparatory documents for this SOOPIP meeting and dealt with the list of action items from the previous SOOPIP meeting in Nouméa.

Financial statement

3.7 The WMO Secretariat representative presented the financial statement and budget for the employment of the coordinator, funded through voluntary contributions by DBCP and SOOPIP member institutions. The trust fund is maintained by WMO and the coordinator is employed by IOC and located at CLS, Service Argos in Toulouse. SOOPIP contributions so far total $US 20 000, which will be used to fund a portion of the coordinator salary and travel expenses, as agreed previously by both the DBCP and SOOPIP. He stressed that contributions from SOOPIP Members should at least equal those proposed in **Annex IV**. New contributions beyond those proposed would be welcome, and would permit a greater range of activities to be undertaken in support of SOOPIP. The panel accepted the WMO statement of account for the trust fund, noted the SOOPIP components of the expenditure and income estimates for 2000, and noted the possible SOOPIP contributions for 2000.

Information exchange

Web site

3.8 The SOOP web site was developed by the coordinator and physically implemented at IRD in Brest. Design of the site was discussed between the coordinator, Jean-Paul Rebert, and Rick Bailey. A logo was designed and proposed by Jacques Bretillot of CLS. The logo was circulated among SOOP participants and proposed modifications have been edited (see **Annex V** for home page and logo). The site was implemented in early July 1999, and was formally announced on 1st October 1999.

3.9 The site presently includes general information on SOOP plus information regarding the SOOP implementation plan, applications and products, list of participants with references, formal list of SOOP lines, including description and maps, call sign query (ITU), instrumentation and quality control (e.g. XBT, XCTD, TSG, manufacturers, evaluation, MEDS QC), data management and monitoring (e.g. GTSPP, upper ocean thermal review, telecommunication, GTS, SOOP semestrial surveys), a list of publications, contact points, details regarding SOOP mailing lists, list of meetings of interest to SOOP, and links to related websites.

Programme database

3.10 The coordinator reported regarding the development of a SOOPIP database. It is proposed to develop a dedicated SOOP relational database, which will be available via the web. The database will include information on SOOP lines, ships, SOOP operators, available resources (equivalent to the semestrial report but more detailed and more consistent), GTS statistics, plus an XBT profile monitoring table. Data will be accessible by SOOP operators through specific reports, graphics, and editable tables to correct discrepancies. Most of the data will be regularly submitted to the coordinator through files in an agreed format. Since early February 2000, thanks to support provided by Jean-Paul Rebert (IRD), and Michel Hoepffner (MEDIAS-France), a student is now working with the coordinator for 5 months to develop the SOOP website database and related data-access tools. Jocelyn Charvet is doing computer training in Toulouse at Medias-France for 5 months as part of his third year of French Electronic and Computer Science Engineer School (Paris). Training is supported by CNES.

3.11 The panel discussed the possibilities to provide the coordinator with information regarding individual profiles and associated metadata on a semestrial basis. This information would include in particular position and time information, assessment of the quality of the profile, probe type, and more importantly line number. While realising that it might be difficult for some operators to provide requested information, the meeting agreed that the information was crucial for

(i) The coordinator to produce adequate monitoring products for assessing the status of the programme, in line with user requirements;
(ii) For comparing data which are collected with those which eventually make it through the GTS, and therefore assess efficiency of the programme and propose solutions to improve it;
(iii) As a mechanism to collect metadata and to provide some help to the data centres in the management and QC of data sets, which would also be submitted to NODC, as the GTSPP formal depository of SOOP metadata.

3.12 The panel decided that the exercise should be established tentatively for the January to June 2000 data, and that operators should submit the data to the coordinator by the end of September 2000, in a new format which will be proposed by the coordinator and discussed with the chairman, Steve Cook, and Alexander Sy. The new format should be defined before the end of May 2000 in order to leave sufficient time to the operators to prepare related tools. The panel agreed that submitted data should at least include position, time, cruise number, line number, ship's call sign, name real-time system being used, Argos ID (if any), instrument type, recorder type, fall rate equation coefficients, and software version. (**Action**: Coordinator, chairman, S. Cook, A. Sy)

Programme promotion, mailing lists, etc.

3.13 The panel discussed programme promotion and suggested that the SOOP web site should be visible from other web sites in the oceanographic and meteorological communities such as GOOS, GCOS, CLIVAR, WMO, IOC, TAO, etc. through links to it. It requested the coordinator to make contacts with relevant web masters in order to realise this. (**Action**: Coordinator)

3.14 The panel noted that two mailing lists had been established for the programme, one general mailing list operated from CLS, and one technical mailing list operated from IRD, Nouméa. The panel agreed that the mailing lists are useful and that the programme should continue to operate them. In order to make their use more convenient, the coordinator was requested to add links to them directly from the SOOP web site home page. (**Action**: Coordinator)

Monitoring

3.15 The coordinator presented all the monitoring reports produced regularly in support of SOOP, and the meeting discussed the relevance of these reports plus possible improvement. These include:

(i) **The monthly GTS statistics**, produced by WMO based upon input from Australia, Canada, France, Germany, Japan, USA, and occasionally from Argentina and Russia. The reports show statistics of BATHY, TESAC, BUOY, and TRACKOB reports inserted and received at those GTS hubs. Although it was recognized that the report was of limited value to some operators, the meeting nevertheless agreed that it should be continued.

(ii) **SOOP monthly BATHY summary**, produced by the coordinator based upon input from Australia, France, Japan, and USA. The panel agreed that the report was useful in particular for tracking problems. In that perspective, the panel considered that it would be useful to add the GTS bulletin header, originating centre, and average reception delay. It was also agreed, that in a JCOMM "integration" perspective, it would be useful to add other types of GTS reports than BATHY, such as BUOY, TESAC, and TRACKOB, and to indicate platform type if possible. The coordinator was asked to submit a proposal to the panel, with a view to eventually implement these improvements. (**Action**: Coordinator) It was recommended to tally the number of reports by call sign over the semestrial periods, and to compare these numbers to the summaries from the operators (provided in delayed mode) of the number of messages each ship attempted to send to the GTS via satellite. This will provide a guide as to how well the satellite transmission systems are working, in addition to monitoring the GTS.

(iii) **JJYY monthly report**, produced by MEDS based upon GTS data. This report allows the identification of those ships which do not report on the GTS using the correct BATHY code version. In this regard, the panel agreed that the report should be continued, especially in the light of the new code versions (JJVV and KKYY), which will be implemented on 3 May 2000. In order to identify the source more easily, the panel also asked MEDS whether it could include the GTS bulletin header and originating centre information in the report.

(iv) **QC monthly report**, produced by MEDS using GTS profile data and MEDS QC tools. The panel considered that the report was very valuable but that the format in which it is being produced was not very practicable for automatic data processing. For example, it is not easy to extract all items regarding a particular operator. MEDS agreed to refine these requirements directly with the coordinator and chairman of SOOPIP.

(v) **List of ships reporting via Argos**. This report is produced by CLS, Service Argos, for ships reporting via Argos. It is sent to relevant operators and permits to ensure that adequate information such as ship's call sign, probe and instrument types is entered into Argos technical files. The panel agreed that this report should be continued.

(vi) **Argos monthly XBT report**. This report is produced by CLS, Service Argos and shows the number of reports distributed on GTS from Argos for each ship during the month. It permits to compare the figures with the number of transmitted reports and the number of reports actually received at GTS hubs. The panel requested the coordinator to add CLS, Service Argos counts into the SOOP monthly summary in order to facilitate the comparison.

(vii) **Semestrial resources survey**, which is produced by the coordinator based upon input from the SOOP operators. It permits to identify contributions from SOOP operators, to monitor available SOOP resources, to identify areas where too many resources are placed and areas where efforts should be made in order to improve data coverage according to the implementation plan. The panel agreed that the report was useful although information provided was not always sufficient to estimate how the user requirements are met. The panel stressed that, provided the operators submit location/time/line information to the coordinator, it will be possible to produce more precise monitoring products in the future. Meanwhile, the panel agreed that the semestrial survey exercise should be continued.

Metadata requirements

3.16 The panel agreed that it was crucial for both scientific and operational purposes to have easy access to metadata concerning SOOP data for both delayed mode and real-time data (GTS). When using the data, users must have metadata information in hand in order to conduct their work as efficiently as possible. Such metadata include in particular information regarding the ship, line number, instrument type, recorder type, acquisition system, software version. SOOP operators of course maintain their own metadata databases but these might not be consistent among themselves.

3.17 While noting that the JCOMM Subgroup on Marine Climatology is setting up a catalogue of metadata for all types of Ocean Data Acquisition Systems (ODAS), the panel agreed that requirements for SOO metadata differ substantially from ODAS (e.g. VOS, buoys). A specific mechanism for collecting such data should therefore be established for SOOP, at least initially. Such a mechanism might be later integrated into a wider scheme.

3.18 Following discussion between the chairman, the coordinator, and US/NODC, the following initial scheme was proposed at the meeting, discussed, and finally agreed:

(i) Operators to provide a set of mandatory metadata to the SOOP coordinator in an agreed format, which will be defined early in 2000. Extra optional metadata can also be submitted to the coordinator provided that they follow the agreed format. This will be done in conjunction with the resources survey data submitted to the coordinator on a semestrial basis. (**Action**: Coordinator and operators)

(ii) The coordinator makes sure that the data are effectively submitted to him in due course through direct contacts with the operators.

(iii) The coordinator compiles the metadata from all SOOP operators on a semestrial basis and submits them to GTSPP (i.e. US/NODC) in the required format.

This scheme will also make it possible for the coordinator to produce better monitoring products since he will have all necessary data in hand.

SOOPIP-II Action items review

3.19 Under this agenda item, the panel also reviewed action items from SOOPIP-II. The status of these action items is given in **Annex VI**.

4. STATUS OF THE UPPER OCEAN THERMAL (UOT) NETWORK

4.1 The panel undertook a thorough review of the current status of the upper ocean thermal network, based primarily on national reports and the monitoring reports of the SOOP coordinator. Additional sources of oceanographic data such as navies and fisheries were included in the review, as well as the new Mediterranean UOT initiative being coordinated by Italy.

4.2 Specifically, the panel reviewed national reports from Australia, Canada, China, France, Germany, India, Japan, the Russian Federation and the United States of America, as well as from the Mediterranean Forecasting System Pilot Project (MFSPP). These reports are published in a separate document, together with the other written report forwarded to the panel by the United Kingdom. In the course of the presentations, some technical problems encountered were reported and are dealt with under agenda item 7.

4.3 A. Sy raised a problem, which may become more serious in the near future, regarding the deployment of XBTs and other devices in Antarctic waters. Within the context of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol, 1991), it is likely that national governments may restrict research and other activities south of 60S where doubts exist on possible environmental impacts. The panel noted this situation with concern, in view of the importance of undertaking ocean observation and research programmes in these waters. It therefore requested the Secretariats to bring this matter to the attention of relevant bodies in WMO and IOC, with a view to sensitising Antarctic Treaty countries to the value of such programmes as well as the minimal risk of environmental damage from them. (**Action**: Secretariats)

5. PROGRAMME REVIEW AND ORGANIZATION

5.1 Details of the International Workshop on the Upper Ocean Thermal and Salinity Network (Melbourne, Australia, August 1999) (included in a paper presented at OCEANOBS 99), and a proposal for the development of an Upper Ocean Salinity Programme, were presented to the meeting for review. The full review paper is reprinted in the technical report from SOOPIP-III. The background study for the review, as prepared by JFOOS, and sponsored by NOAA/OGP, Australian Bureau of Meteorology and CSIRO, can be found on the SOOP web site. The presentation covered the background, objectives, method, scientific goals, results and recommendations of the review.

5.2 The review noted that, till this point of time, sampling had been in three modes: low density, frequently repeated and high density. The SOOP has been extremely cost-effective for science and, latterly, for operational applications. However it is reasoned that it is timely to consider a change of direction and a new focus. The review proposed a major revision of the ship-of-opportunity program. The program should gradually withdraw from areal/broadcast sampling as Argo was implemented, whilst at the same time ramp up its effort in line (transect) sampling. The line sampling would include both intermediate resolution, frequently repeated lines and high density, quarterly repeat lines (see OCEANOBS paper and **Annex VII**). It was argued that this change in approach enhances complementarity with existing elements, particularly TAO and altimetry, and seeks optimum complementarity for the system envisaged for the future. The new design will address several important scientific goals, both for GOOS and CLIVAR. It will make unique contributions in terms of in situ eddy-resolving data sets and in terms of the repeated lines. This new mode of operating opens up further opportunities for observations from SOOP, though this has to be balanced against the goodwill being offered by the ships.

5.3 Several recommendations were also made with respect to data management. These included: a) A system of data "tagging", and b) A system of quality accreditation. The review proposed that with these pieces of information it would be possible for users to first identify without confusion duplicates in the data bases, and to choose a level of QC that was appropriate to their application. Real-time transmission of the full-resolution data was also highly recommended. The review argued that present arrangements prescribe against efficient and effective use of the data.

5.4 The panel welcomed the review, and congratulated its authors for an excellent piece of work, under difficult circumstances. It agreed:

(i) That the review provided a good scientific guide for the future, for use by operators and funders, and also provided priorities for line maintenance in an operational programme;
(ii) That it also provided scientific guidance for transitioning the XBT network over a period of some 5 years, which was the approximate transition period to full operational status for Argo;
(iii) That, nevertheless, individual operators may have other priorities than those addressed in the review, which focuses on an operational network for climate, and that in any case it represented only the first iteration in an ongoing process;
(iv) That many important specific issues had been highlighted by the study (data sets, metadata, etc.);
(v) That there should be a further iteration of the review, which would crucially require input from all operators. (**Action**: chairman)

A final report of the review will be published by JFOOS before the end of 2000.

5.5 Details of the finally agreed, revised operational SOOP network, including suggested modifications from the CLIVAR Asia-Monsoon Panel, are give in **Annex VII**. The meeting agreed that this network should be implemented progressively over the next five years, in line with resource availability and Argo implementation.

5.6 Before addressing implementation of the conclusions and recommendations of the review, the panel next reviewed in detail the present and projected array status, on the basis of the updated 1999 semestrial resources survey. Specifically, it examined the lines which would transform to Frequently Repeated (FRX) or High Density (HDX) lines in the network to be maintained after full Argo implementation.

Present and Future Implementation Issues

5.7 The meeting noted with great concern that due to recent significant increases in XBT costs (50% increase), coupled in some cases with reduced programme funding, a number of operators were faced with reducing their programmes during 2000. The XBT sampling coverage for 1999 is given in **Annex VIII**. The U.S NOAA programme, who provide the entire XBT supply for the French programme (5184 XBTs) and a proportion of the Australian programme (648/3600) as part of a collaborative effort to support the required global coverage, will have to reduce this support by 50% during 2000. This is in addition to reduced sampling along some of the US lines. Unless the situation changes, this international support will be reduced to 0% during 2001. This will result in even more drastic reductions to the sampling coverage across all the ocean basins, i.e. including support for the Pacific ENSO Observing System. The advantages of pooling resources to obtain global coverage were originally recognised in the pooling concept for the supply of XBTs under TOGA. As both France and Australia provide the considerable additional resources for maintaining these lines (factor of 2 by the cost of XBTs), the reduction in support multiplies into an even greater capacity loss to the global network. NOAA/AOML recognises that this reduction will cause a significant impact on its international colleagues, and will continue to seek additional funding to support the global network wherever possible.

5.8 The meeting noted the immediate reduction of sampling in 2000 along the TRANSPAC (PX-26) line before the full implementation of Argo in the North Pacific. This was due to the shortage of probes and above-mentioned funding problems for NOAA. Japan, however, will maintain its contributions along this line for at least the next couple of years in collaboration with the US (support through data recorders, etc). Due to a concentration of effort, many of the other lines in the Pacific are indeed presently being maintained close to the recommended low-density sampling requirements, with efforts being made to increase sampling to frequently repeated wherever possible, given the availability of sufficient resources. Presently the western Pacific is mostly sampled in broadcast mode. PX-53 was identified as possibly the best line to concentrate resources in the western Pacific to achieve frequently repeated sampling along a well-defined line. All operators agreed to reduce random sampling by ships along the not so well covered lines wherever possible. Problems have been identified with the availability of shipping along lines PX-21 and PX-50. The major problem, however, concerns the large number of French lines in the Pacific, which will begin to be affected in 2000 by the reduction in XBT support from NOAA. These lines include PX-4, 5, 6, 9, 12, 17, 28, 30, 51, 53.

5.9 A number of lines recommended as a high priority in the Indian Ocean by the review (IX-6, IX-10) already have had their sampling reduced in 2000 by the US and France. France are winding down their operations in the Indian Ocean in favour of focusing their remaining reduced resources on operational lines which are more related to their direct interests in the Pacific and Atlantic Oceans. Problems with availability of shipping on the important time series line IX-3 continue to plague the maintenance of this line, although the US will examine the possibility of shifting its resources from IX-7 to IX-3 if alternate shipping can be found. Tramper shipping is available to increase the valuable sampling by India on IX-8 and the US and India are examining ways of addressing the logistical issues of using such shipping. Australia was looking to increasing all of its low-density lines (IX-1, 12, 22 and PX-2, 11) to frequently repeated coverage, given available resources. Some are already or nearly covered in this mode in any respect. This may now have to be partially reconsidered due to the impending decrease in support of probes from NOAA.

5.10 Efforts have been made to sample many of the recommended lines in the Atlantic at the recommended sampling frequency. However, some lines recommended by the review will be affected from 2000 by either reduced probe support or logistical constraints (e.g. availability of shipping). These include AX-8, 11, 15, 20, and 29. Other lines presently well sampled and not in the recommended list (i.e. AX-2, 3, AX-4, AX-33) may be stopped during 2000 to facilitate the support of the recommended lines with the available, but limited resources. Coverage reported along AX-8 appeared to better represent partial coverage on two lines as opposed to one well-sampled line. NOAA will investigate concentrating sampling to one clearly defined line.

5.11 Several of the recommended lines are yet to be implemented in high-density in the Indian and Atlantic Oceans, although Australia (IX-28), India (IX-8), Japan (IX-6), Germany (AX-3) and the US (AX-2, 7, 10) are making considerable contributions. Nearly all the high-density lines in the Pacific are being sampled, however, thanks to the efforts of the US, Australia, Japan, and New Zealand.

5.12 The meeting noted with great interest the expansive sampling programme in the Mediterranean being supported by the European Community for the Mediterranean Forecasting System Pilot Programme (MFSPP).

Conclusions

5.13 SOOP will adopt wherever possible the XBT networks as recommended by the Review (i.e. both frequently repeated and high-density line mode), and eliminate the areal/broadcast low density sampling as Argo is implemented. However:

(i) A significant reduction in the present probe deployments during 2000, due to a decrease in NOAA funding, coupled with an increase in XBT prices and the increased sampling frequency on many lines from low-density broadcast sampling to frequently repeated sampling, will create considerable difficulties for implementing the complete recommended networks.

(ii) The recommended frequently repeated lines to be affected, at least in the short-to-medium term, include IX-3, 6, 12, 22; AX-8, 11, 15, 20, 29; and PX-4, 5, 9, 17.

(iii) A number of the proposed high-density XBT lines in the Atlantic and Indian Oceans will not be able to be initiated without increased XBT support.

(iv) The reduction in probe support will have especially severe ramifications for the lines operated by France (IRD) who rely on probe contributions from NOAA. This will affect all the ocean basins, and therefore also the Pacific ENSO Observing System.

(v) A number of the existing areal/broadcast lines will have to be stopped before Argo is implemented and proven (not recommended by the Review).

(vi) It was estimated that to support the sampling recommended by the review would require approximately 35,000 XBTs/year. During 1999 the number of XBTs deployed by all countries in support of the operational SOOP was of the order of 28,000 XBTs. This represents a deficit of 7,000 XBTs to support the complete recommended networks. This deficit will increase to 10,000 XBTs in 2000 and potentially around 13,000 XBTs during 2001 as funding cuts hit further and existing back-up stores of XBTs become greatly reduced.

(vii) These issues are a matter of extreme concern for both GOOS and CLIVAR. As a result of the recommended unique contribution of the XBT network, they will have serious ramifications for the complementarity of the proposed integrated observing system, which also involves Argo, TAO, and the satellite altimeters.

5.14 The Panel requested the chairman and Secretariats to bring these issues also to JCOMM, through the interim Management Committee, as a matter of urgency, with a view to initiating follow-up action. (**Action**: chairman and Secretariats)

6. DATA MANAGEMENT

6.1 The primary data management mechanism for SOOP data is presently the Global Temperature Salinity Profile Programme (GTSPP). The panel was therefore presented with a report on the status of the GTSPP, including its operations, future role in Argo data management and likely developments under JCOMM.

6.2 Under this agenda item the panel also reviewed the status of the management of the Upper Ocean Thermal Project data, based on reports from MEDS, US/NODC and science centres.

GTSPP overview and future direction

6.3 Mr R. Keeley, from the Canadian Marine Environmental Data System (MEDS), introduced this agenda item. He explained that the core functions of GTSPP are unchanged. MEDS and US/NODC continue to handle the temperature and salinity profile data in real-time and the continuously managed database respectively. Real-time data are sent from MEDS to US/NODC three times each week. Both MEDS and US/NODC have clients that receive regular dispatches of data. Once a year, all data collected two years previously are divided into three oceans and forwarded for scientific QC in the US (AOML and Scripps) and Australia, (CSIRO/BoM/Joint Australian Facility for Ocean Observing Systems (JAFOOS)). The results are returned to US/NODC and updated into the archives. These centres also contribute to the WOCE DAC activities.

6.4 GTSPP has developed a number of users of the data. MEDS has about 6 users that receive data three times a week. The US/NODC has more than a dozen users receiving data either weekly or monthly.

6.5 The data volumes in the continuously managed database are about 1 million stations from 1990 to 1999. A significant fraction of data is still received as real-time reports. Increasing the timeliness of flow of delayed mode data to the archives is still an important function that needs attention, including by SOOPIP.

6.6 SOOP is a significant contributor of data in both real-time and delayed mode. In support of SOOPIP, GTSPP makes available monitoring reports such as data sampling information on a monthly basis (this can be found at www.meds-sdmm.dfo-mpo.gc.ca and follow the real-time data, SOOPIP link). The data quality statistics are posted here each month. Also shown are maps of the sampling both in the past month and over the past twelve months.

6.7 Increased data volumes and more immediate needs for the data will require adjustments to how data are handled in GTSPP. Improvements in many areas will be needed including more standardization of data formats, more careful use of automated quality assessment procedures, more efficient and reliable real-time data transmission systems, and better data monitoring (volumes, quality, types). GTSPP is willing to make the adjustments required to continue to support data users and contributors.

6.8 The panel thanked Mr Keeley for his presentation. In reviewing in detail the functioning of the GTSPP, it noted that the quality control of the delayed mode profiles by the US/NODC did not encompass an individual, computer-assisted visual checking. It recalled that fully automated quality control was not, as far as it was concerned, a recommended practice and could not replace an individual visual checking of the profiles.

6.9 The panel noted that the US/NODC was in the process of preparing sets of data in the form of CD-ROMs and/or posted on the web. The question was raised on how a customer could get transect-oriented data sets from such a compilation. Indeed, several centres had initially organized (and still were organizing) their data sets according to transects, and it was likely that such demands might show up. The panel recognized that the solution would imply the use of dedicated software. It requested Mr Keeley to check with the US/NODC the state of the art regarding the organization of the CDs and to propose a solution to that problem (**Action**: R. Keeley).

6.10 The panel reviewed its relationship with the GTSPP and recognized that the GTSPP could be considered as the SOOP data management segment. This question would anyhow evolve with the building up of JCOMM and, in particular, of the JCOMM Data Management Programme Area. In this connection, it was made clear that, presently, the GTSPP was definitely profile-oriented. It could easily cope with profiles other than of temperature and salinity, but it was not ready to ensure the management of data such as those obtained by thermosalinographs (TSGs), or other along-the-track measurements. In particular, the QC techniques would differ from those used for profiles.

6.11 The panel recognized that the most experienced centre handling TSG data currently was in Noumea. MEDS was already collecting and archiving the real-time TRACKOB reports. Some SOOPIP members were aware of internet-based initiatives to provide real-time data which were now in place. Considering that a number of scientific groups (e.g. OOPC, CLIVAR/UOP) had stated the need for surface salinity observations, the panel expressed the desire to take action to organize the global management of these data. A small, **ad hoc,** working group was formed to decide how to proceed. This group agreed to draft an end-to-end data management plan for surface salinity data, taking into account the experience, capabilities and interests of SOOPIP members. R. Keeley agreed to prepare the first draft and to circulate it to panel members for comment. Considering the commonalities with the VOSClim project, the draft should be circulated by end June 2000, with the idea that one or more interested panel members could attend the VOSClim project meeting scheduled for late 2000 (see paragraph 2.13 above) (**Action**: R. Keeley).

New initiatives in data distribution systems

6.12 Under this agenda item, the panel was informed of a major initiative aiming at reviewing and enhancing the GTS. It requested that more information on this topic be made available to its members (**Action**: WMO Secretariat). At the same time, in line with the recommendations of the UOT Review, the panel agreed to consider alternative data distribution systems for SOOP data. The review also recommended the real time transmission of full resolution data, including a data tagging system.

6.13 The panel further noted the developments underway with regard to web servers, in particular within the Argo community. The two Argo data centres (the AOML in Miami and the Coriolis centre in Brest) have developed very similar plans, encompassing the use of the NetCDF format as a common format for all data centres. Quality control would be the responsibility of each centre with regard to the data they receive. Data would be exchanged on a daily basis. The strawman is to obtain a research quality data set within a three-month timeframe, and procedures to obtain that are under discussion.

6.14 Argo data will in addition be posted onto the GTS and used by the Argo coordinator, in Toulouse, to discharge the obligations entrusted by the IOC Assembly regarding general information on Argo floats and data. In this respect, the question of the format used onto the GTS for those data was raised. This question should be examined in the near future (**Action**: Argo Science Team, with the assistance of the TC and WMO Secretariat).

UOT Status: MEDS, US/NODC and Science Centre reports

Upper Ocean Thermal Data Acquisition Centres (UOT-DACs)

6.15 Under this agenda item, reports were presented by, or on behalf of, the three WOCE UOT-DACs. They had agreed, when established, to follow the same set of guidelines and therefore are working on comparable paces. The main problem encountered is that of the quality control of the data, which includes that of the lateness in the submission of delayed-mode data as well as that of the identification of duplicates. The general philosophy in the quality control procedures is now clearly established: the data should be flagged, but never “edited” or modified in any fashion.

US/NODC and MEDS

6.16 Information about these centres has already been reported earlier under this agenda item. It was noted that one difficult task facing the GTSPP was to recover the line number information that should be attached to the profiles (**Action**: GTSPP/MEDS).

6.17 In this overall context, the panel raised the question of the data contributed by the Navies and recognized that each country had its own practices in this field. It requested that the members document this issue and pass the relevant information to the WMO Secretariat, in view of adding an annex on this topic to the report of the session (**Action**: members, WMO Secretariat; deadline: 15 April 2000). Available information on this topic is given in **Annex IX**.

Real-time code modifications

6.18 The panel noted the modifications introduced in the BATHY and TESAC codes (see **Annex X**). It expressed concern that not every organisation or individual potentially concerned might be aware of the changes and of their coming into force (May 2000). It therefore requested the WMO Secretariat to make sure that proper notification had been issued and to provide guidelines on what had to be done in that respect (**Action**: WMO Secretariat).

6.19 Regarding the introduction in the TESAC code of a code and a table describing the instrument used for the measurements, identical to the one in use in the BATHY code, the panel recognized that new entries were needed for TESAC reports. It requested those concerned to inform, as soon as possible and through an official channel, the WMO Secretariat of which new entries were needed, in order that they could be included in the revised version of the code (**Action**: members concerned).

7. DATA ACQUISITION AND TRANSMISSION

7.1 Quality assurance and standardization for operational programmes

7.1.1 The panel recognized there was a need for some basic guidance for an operational programme such as SOOP. In general, the proposed SOOP Operations Guide (SOOPOG) (see item 7.3) would provide for the required guidance. Some specific additional items were also worth consideration:

- The operation of SOOP requires that a set of formal procedures, in particular regarding instrumentation quality assurance and related issues, be established. This will be done now under JCOMM (**Action**: WMO Secretariat and JCOMM);

- Information regarding quality issues and problems encountered by the operators should be centralized with the technical co-ordinator. Ways and means of achieving this are to be defined within three months (**Action**: Chairman, A. Sy and TC);

- There is a need for on-going monitoring of the quality of probes, which could be co-ordinated by the technical co-ordinator after submission of proposals by members (**Action**: A. Sy to develop a proposal on how this can be organized);

- Manufacturers should inform the SOOP community of any changes in probe manufacturing status (**Action**: TC to provide a facility through the web site, manufacturers to use it).

7.1.2 Under this agenda item, the panel also reviewed the status of implementation of the action items approved by SOOP-II for the Task Team (see **Annex XI**). At the same time, the panel agreed that the formal Task Team should be dissolved, and that technical **ad hoc** groups should be established in future as required, focused on specific issues.

7.2 Shipboard data acquisition and transmission systems

7.2.1 The panel was informed of the new developments regarding the SEAS system. SEAS-2000/1 is being developed in a three-phase process. The panel was presented with the first trials of the prototype, working with a prototype MK-21, that showed encouraging features. An interesting aspect of SEAS-2000/1 is that the messages will contain full resolution data as well as metadata.

7.2.2 Regarding the latter, the problem of inserting the line number was considered as a difficult one because of the changes in ship crews, routes, etc. The idea of attaching to each individual profile a single "number" or identifier (**inter alia** to allow easy recognition of the delayed-mode data versus real-time ones) was considered useful (**Action**: R. Keeley to develop a proposal). Further details of the status of SEAS-2000/1 are given in **Annex XII**.

7.2.3 The panel was further informed of new developments regarding the Argos system. Argos-3 will have a transmission capacity of around 1 kbit per message and, even more importantly, will allow for 2-way communications.

7.2.4 The Royal Australian Navy is funding the development of the Sippican MK12 system to be more user friendly, work under windows NT, and implement the SOOPIP recommended bathymessage formulation and onboard QC procedures. Design and technical advice for the project is being provided by CSIRO, with the new developed system being similar in its function to the CSIRO user friendly MK12 and MK9 software. Due to the concerns of potential timing errors in using MK12's in the windows environment, and hence the possibility of depth errors, an extensive testing programme is planned before operational implementation of the new software. Once successfully tested, the software will be installed on the Australian operated ships-of-opportunity. Satellite transmission systems, with the capability for transmitting the full-resolution data, will be investigated according to the review recommendations. Presently the Australian ships-of-opportunity transmit data in real-time using the Argos system, which has very limited message length capability.

7.3 Publications

7.3.1 Under this agenda item, the panel reviewed the proposal put forward by Dr A. Sy to prepare a SOOP Operations Guide that would encompass all practically oriented SOOP publications, both already finalized or under development.

1. **Best Guide and Principles Manual**: a draft is available. Comments and suggestions to be sent to Steve Cook by May 2000 at the latest;

2. **Manual and Guide No. 3, 3rd revised edition**: published on the web and in paper form. Translations to come;

3. **XBT/XCTD Standard Test Procedures**: to be available in May; comments and suggestions to be sent to A. Sy by end April;

4. **Calculation of new Depth Equations for Expendable Bathythermographs using a Temperature-error-free Method**: done;

5. **Quality Control Procedures**: A proposal should be put forward to define how to make the necessary compilation (**Action**: Chairman);

6. **User Guide for Thermosalinograph Installation and Maintenance aboard Ships**: done;

7. **Manual on Data Transmission Techniques for SOOP:** Steve Cook agrees to prepare a draft (**Action**: S. Cook);

8. **SOOP Implementation Strategy**: not suited for such a practical guide;

9. **SOOP Line Summary Map**: done;

10. **SOOP Bodies: mainly done**; to be completed (**Action**: TC to coordinate);

11. **Useful Addresses and Communication Links**: partly done; to be completed (**Action**: TC to coordinate);

12. **Glossary/Acronym list**: to be prepared (**Action**: TC to coordinate);

13: **Introduction:** to be prepared (**Action**: Chairman).

The Guide should be supplemented by future new publications, as and when necessary. The draft SOOPOG should be available at least in web-based form by end 2000. (**Action**: A Sy and TC)

7.4 *Evaluation Programme*

7.4.1 Under this agenda item, the panel received a number of presentations from manufacturers, operators and other scientists regarding, variously, the evaluation of existing instrumentation and also new instrument developments underway. Those presentations are published separately in the Technical Report from SOOPIP-III (together with the national reports).

7.4.2 Several participants (including A. Sy and V. Philbrick) reported on serious general and specific XBT quality problems. The meeting agreed that manufacturers should provide a warranty to cover situations of unusually high failure rates, which would allow for the replacement of malfunctioning probes. Sippican and TSK were requested to design criteria for such a warranty, under which rapid replacements would be made in cases of well-founded complaints from customers concerning unusually high probe failure rates. This proposal should be discussed with the chairman and A. Sy before being implemented. (**Action**: Sippican, TSK, chairman and A. Sy)

7.4.3 General concerns were raised related to the rising incidence of XBT malfunctions due to manufacturing changes, in addition to increases in probe prices. Gradual progress is being made with the development and testing of the TSK XCTD, although some of the original problems still exist (surface bubble problem, salinity calculation errors). Calibration problems with the XCTD, which lead to the surface bubble problems, were discussed by TSK and reported to be now under control. Accordingly, however, further testing will be required for probes calibrated under the new procedures.

7.4.4 The manufacturers were once again requested to provide up-to-date information to SOOPIP with regards to any changes in manufacturing processes. Although this was also requested at the last meeting, no such action has occurred. The panel stressed such communication is also to the advantage of the manufacturers, and that SOOPIP is willing to continue to help with instrument evaluations and testing procedures, so long as this communication is improved. (**Action**: Manufacturers)

7.4.5 The Panel considered it imperative that an appropriate ongoing testing and evaluation programme, coordinated by the SOOP Coordinator, be maintained by the operators to monitor instrument performance and associated data quality. A schedule of at-sea evaluation opportunities (e.g. by RVs with CTDs) will be devised. The manufacturers agreed to at least supply the required probes for evaluation. (**Action**: Coordinator, manufacturers and operators)

7.5 *Other Instrumentation*

7.5.1 Presentations were given on the following range of other instrumentation and sampling programmes operated under SOOP. Technical reports can be found in the JCOMM Technical Report which accompanies and complements this meeting report. The instrumentation discussed included:

7.5.2 **Moving Vessel Profiler**: A large version of this instrument is presently commercially available from Brooke Technology. A smaller and less expensive version is also currently being developed by Scripps (Dan Rudnick). A prototype of the Scripps system was demonstrated to the panel. These developments represent exciting opportunities for measuring salinity in the upper 200m from moving vessels.

7.5.3 **Meteorological**: Developments in both the U.S. and Australia are underway to install high accuracy, automated meteorological instrumentation on ships-of-opportunity. Synergies and the requirements for installing this equipment on high-density XBT lines were discussed. WHOI currently have a system installed on the merchant vessels operated by Scripps on high-density lines PX-10, 37, and 44. Preliminary results were discussed.

7.5.4 **SST and SSS**: Deployments of thermosalinographs to measure SST and SSS by France, Australia, Germany and US continue to grow gradually, although funding constraints in the US has seen NOAA removing some of its TSGs. It is possible further vessels will be implemented with TSGs to calibrate the planned surface salinity measuring satellite missions by NASA.

7.5.5 **pCO2**: CSIRO Atmospheric Research and CSIRO Marine Research in Australia, with funding contributions from the Australian Bureau of Meteorology, are developing a compact and more reliable pCO2 analyser for deployment from merchant vessels. The system has better precision, stability, and linearity compared to existing systems. The most significant difference, however, is the very small air- flows that are required. To achieve this without contaminating the air is a major achievement and the implications are wide ranging. A prototype is planned for test deployment from a research vessel later in 2000, followed by installation on an Antarctic supply vessel operating on line IX-28 in 2001. A similar system is already operational on land at CSIRO's Cape Grim station.

7.5.6 **Biological**: CSIRO in Australia have commenced an underway, surface sampling programme, which aims to relate variability in biological production to observed climate variability. Fluorescence, temperature, and salinity data together with discrete samples for pigment analysis are being collected for the validation of the SeaWiFS ocean colour sensor. The instrumentation was first installed on fishing- vessels operating off the East Coast of Australia. The merchant ship selected for the expanded programme circumnavigates Australia, and hence transects several important fisheries and major current systems. A programme has recently been funded in France for implementation of similar instrumentation onboard a vessel which circumnavigates the globe. Germany's Federal Maritime and Hydrographic Agency (BSH) operates a network of automatic marine stations, the MARine Monitoring NETwork (MARNET) in the North and Baltic Seas. These eight stations monitor numerous physical, seawater properties and meteorological variables. Nutrient samplers and a data management system for remote control of the devices have been recently added.

8. REVIEW OF SOOPIP-III MEETING REPORT, ACTION ITEMS, AND RECOMMENDATIONS

8.1 Participants reviewed, and approved the final report of the meeting, including action items and recommendations, which are included in **Annex XIII**.

9. DATE AND PLACE OF THE NEXT MEETING

9.1 The panel noted with interest and appreciation the offer from India to host the next SOOPIP session at the National Institute of Oceanography in Goa. Recalling its decision under agenda item 2 to participate in the proposed new SOG, the panel therefore provisionally accepted this kind invitation, on the understanding that it was extended to include the first session of the full SOG, of which SOOPIP-IV would then form a component. Provisionally, this meeting would take place around March/April 2002, and the Secretariats were requested to finalize arrangements, in coordination with the host and the chairs of VOS and ASAPP.

10. CLOSURE OF THE MEETING

10.1 In closing the session, the chairman, Rick Bailey, expressed his appreciation to all participants, the SOOP coordinator and the Secretariats for their input to and support for the meeting, which had contributed substantially to its success. He also thanked Scripps and NOAA once more for their generosity in hosting and supporting the meeting, and wished all SOOPIP members a safe return home and fruitful continuation of the programme.

10.2 The third session of the JCOMM SOOP Implementation Panel closed at 1715 hours on Friday, 31 March 2000.

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PROVISIONAL AGENDA

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8. REVIEW OF SOOPIP-III MEETING REPORT, ACTION ITEMS, AND RECOMMENDATIONS

9. DATE AND PLACE OF THE NEXT MEETING

10. CLOSURE OF THE MEETING

VOLUNTARY OBSERVING SHIPS (VOS) CLIMATE SUBSET PROJECT (VOSClim)

Objectives

The primary objective of the project is to provide a high-quality subset of marine meteorological data, with extensive associated metadata, to be available in both real time and delayed mode. Eventually, it is expected that the project will transform into a long-term, operational programme. Specifically, the project gives priority to the following parameters: wind direction and speed, sea level pressure, sea surface temperature, air temperature and humidity. Data from the project will be used: to input directly into air-sea flux computations, as part of coupled atmosphere-ocean climate models; to provide ground truth for calibrating satellite observations; and to provide a high-quality reference data set for possible re-calibration of observations from the entire VOS fleet. Requirements, rationale and scientific justification for the project are detailed below.

The VSOP-NA demonstrated clearly that the quality of measurements depends significantly on the types of instruments used, their exposures and the observing practices of shipboard personnel. It made a number of substantive recommendations in these areas which, if systematically implemented, would be expected to result in VOS observations of a quality appropriate to global climate studies. For logistic reasons, it is not realistic to expect full implementation to the entire global VOS. However, it is undoubtedly feasible for a limited subset of the VOS, and the primary goal of this project is therefore to effect such a limited implementation.

Scientific requirements and justification

1. The evolving requirements for Voluntary Observing Ship data

1.1 Introduction

For well over 100 years, the weather observations from merchant ships have been used to define our knowledge of the marine climate. This function continues within the Voluntary Observing Ships (VOS) programme as the Marine Climatological Summaries Scheme. However the main emphasis of the VOS programme has traditionally been the provision of data required for atmospheric weather forecasting. Today, the initialisation of numerical weather prediction models remains an important use of weather reports from the VOS. However recent trends, such as the increasing availability of data from satellite sensors, and the increased concern with regard to climate analysis and prediction, are making further requirements for data from the VOS.

That there is a growing need for higher quality data from a sub-set of the VOS has been identified by, *inter alia*, the Ocean Observing System Development Panel (OOSDP, 1995), the Ocean Observations Panel for Climate (OOPC, 1998), and the JSC/SCOR Working Group on Air Sea Fluxes (WGASF, 2000). The justification for improved surface meteorological data was also discussed in detail at the recent Conference on the Ocean Observing System for Climate (see paper by Taylor et al. 1999). Here we shall give examples of the requirements, the present state of the art and the potential improvements.

1.2 Examples of evolving requirements for VOS data

A. Satellite data verification

Satellite borne sensors are now used routinely for, for example, determining sea surface temperature (SST), sea waves, and surface wind velocity. Compared to *in situ* measurements, these remotely sensed data provide better spatial coverage of the global oceans. However the data are derived from empirical algorithms and a very limited number of individual sensors. In this respect, an important role for VOS data is the detection of biases in the remote sensed data due to instrument calibration changes or changing atmospheric transmission conditions. For example, the SST analyses produced by the US National Centers for Environmental Prediction (NCEP) are used at a number of operational weather forecasting centres including the ECMWF. The NCEP analyses (Reynolds and Smith, 1994) use SST data from satellite sensors that have been initially calibrated against drifting buoy data. VOS and buoy data are used to detect and correct biases in the satellite data caused, for example, by varying atmospheric aerosol loading due to volcanic eruptions. Without these real time bias corrections, errors of several tenths K or more can occur in satellite derived SST values (Reynolds, 1999). For satellite verification purposes the need is for a dataset of accurate data with known error characteristics.

B. Climate Change Studies

The VOS data are being increasingly used for climate change studies. Assembled into large data bases (such as the Comprehensive Ocean Atmosphere Data Set, COADS, Woodruff et al., 1993) the observations have been used, for example, to quantify global changes of sea and marine air temperature (Folland and Parker, 1995). Based on such studies, the recommendations of the Intergovernmental Panel on Climate Change (Houghton et al., 1990) have led to politically important international agreements such as the UN Framework Convention on Climate Change. However the detection of climate trends in the VOS data has only been possible following the careful correction, as far as is possible, of varying observational bias due to the changing methods of observation. For example sea temperature data have different bias errors depending on whether they were obtained using wooden buckets from sailing ships, canvas buckets from small steam ships, or engine room intake thermometers on large container ships. For the present, and for the future, it is important that we better document the observing practices that are used.

C. Climate Research and Climate Prediction

Coupled numerical models of the atmosphere and ocean are increasingly being used for climate research and climate change prediction. Because the time and space scales for circulation features in the atmosphere and the ocean are very different, the ocean surface is an important interface for model verification. The simulated air-sea fluxes of heat, water and momentum must be shown to be realistic if there is to be confidence in the model predictions. At present the uncertainty in our knowledge of these surface fluxes is of a similar order to the spread in the model predictions (WGASF, 2000). Partly this is due to the limitations of the parameterisation formulae used to calculate the fluxes. Verification of the model predictions of near surface meteorological variables (air temperature, humidity, SST etc.) against high quality *in situ* observations from moored "flux" buoys and specially selected VOS is required (e.g. Send et al. 1999, Taylor et al. 1999a).

2. The State-of-the-Art for VOS observations

2.1 What is needed?

These relatively new applications for VOS data imply a need to minimise the errors present in the observations. For example, 10 Wm^{-2} is often quoted as a target accuracy for determining the heat fluxes; it is about 10% of the typical interannual variability of the wintertime turbulent heat fluxes in mid to high latitudes. To achieve such accuracy implies that the basic meteorological fields are known to about ±0.2°C for the SST, dry and wet bulb temperatures (or about 0.3 g/kg for specific humidity) and that the winds be estimated to ±10% or better, say about 0.5 m/s. These are stringent requirements which we do not expect to be met by an individual VOS observation. Enough observations must be averaged to reduce the errors to the required level. The more accurate the individual VOS observations, the less averaging will be needed. Nor is averaging alone enough; corrections must also be applied for the systematic errors in the data set.

In terms of the longer term ocean heat balance even an accuracy of 10 Wm^{-2} is not adequate. A flux of 10 Wm^{-2} over one year would, if stored in the top 500m of the ocean, heat that entire layer by about 0.15°C. Temperature changes on a decadal timescale are at most a few tenths of a degree (e.g. Parilla et al., 1994) so the global mean heat budget must balance to better than a few Wm^{-2}. It is unlikely that such accuracy will ever be achieved using VOS data either alone, or combined with other data sources. Thus the calculated flux fields must be adjusted, using "inverse analysis", to satisfy various integral constraints. Inverse analysis techniques rely on detailed knowledge of the error characteristics of the data; information which is poorly known at present for the VOS data set. Thus there is an urgent need to better define the accuracy of VOS data.

2.2 What is presently achieved?

To attempt to quantify the random error in VOS observations, Kent et al. (1999) determined the root-mean-square (rms) error for VOS reports of the basic meteorological variables. Table 1 shows the minimum, maximum and mean error values for individual ship observations calculated for 30° x 30° areas of the global ocean. It is obvious that individual ship observations can not achieve the desired accuracy and that the average of many observations is needed. For example, to reduce a typical temperature error of 1.4C to the desired 0.2C requires some 50 independent observations; more when natural variability is taken into account. Sufficient observations are obtained for adequate monthly mean values in well-sampled regions like the North Atlantic but in data sparse regions acceptable accuracy cannot be achieved.

The Voluntary Observing Ship Special Observing Programme - North Atlantic project, VSOP-NA (Kent et al., 1993a), was an attempt to determine the systematic errors in VOS data. For a subset of 46 VOS, the instrumentation used was documented (Kent & Taylor, 1991), and extra information included with each report. The output from an atmospheric forecast model was used as a common standard for comparison. The results were analysed according to instrument type and exposure, ship size and nationality and other factors, and relative biases were determined. For example it was found that SST values from engine intake thermometers were biased warm compared to other methods (Kent et al. 1993a), and that daytime air temperatures were too warm due to solar heating (Kent et al. 1993b). It could be shown that the dew point temperature was not biased by the latter error (Kent and Taylor, 1996) but, compared to aspirated psychrometer readings, the dew point was biased high when obtained from fixed thermometer screens.

Table 1 - RMS Error Estimates: The uncertainty quoted in the mean error is derived from the weighted sum of the error variances (from Kent et al. 1999)

Observed Field	RMS Error:		
	Min.	Max.	Mean
Surface Wind Speed (m/s)	1.3	2.8	2.1 ± 0.2
Pressure (mb)	1.2	7.1	2.3 ± 0.2
Air Temperature (°C)	0.8	3.3	1.4 ± 0.1
Sea Surface Temperature (°C)	0.4	2.8	1.5 ± 0.1
Specific Humidity (g/kg)	0.6	1.8	1.1 ± 0.2

Some of the VOS in the VSOP-NA project reported anemometer estimated, relative wind speed in addition to the calculated true wind speed. Kent et al. (1991) showed that a major cause of error was the calculation of the true wind speed. Only 50% of the reported winds were within 1 m/s of the correct value, 30% of the reports were more than 2.5 m/s incorrect. For wind direction, only 70% were within ±10° of the correct direction and 13% were outside ±50°. These were large, needless errors which significantly degraded the quality of the anemometer winds. A similar conclusion was reached by Gulev (1999). Preliminary results from a questionnaire distributed to 300 ships' officers showed that only 27% of them used the correct method to compute true wind. The problem is not confined to VOS observations. A majority of the wind data sets obtained from research ships during the World Ocean Circulation Experiment showed errors in obtaining true wind values (Smith et al., 1999).

2.3 How can the situation be improved?

Consider as an example, wind velocity. The typical rms error for a wind speed observation shown in Table 1 (about 2.1 m/s) was achieved after instrumental observations had been corrected for the height of the anemometer above the sea surface (using data from the List of Selected Ships, "WMO47") and the visual observations corrected using the Lindau (1995) version of the Beaufort scale. For the observations as reported, the errors were nearly 20% greater - about 2.5 m/s. Alone, this change in mean accuracy decreases the number of observations required to obtain a reliable mean by a factor of 2/3rds. The quality of the anemometer winds can be further improved by using an automated method of true wind calculation such as the TurboWin system developed at KNMI. The effect on the anemometer measurements of the air-flow disturbance around the ships' hull and superstructure can be investigated using computational fluid dynamics (CFD) modelling of the airflow (Yelland et al., 1998). While it would be impracticable to model all the VOS, it is believed that typical values for the resulting error can be estimated given knowledge of the anemometer position and the overall geometry of the ship (Taylor et al. 1999b).

Similarly for the other observed variables correction schemes can be devised. For example, air temperature errors due to daytime heating of the ship depend on the solar radiation and the relative wind speed (Kent et al. 1993b). Josey et al., (1999) found that correcting the various known biases changed the climatological monthly mean heat flux by around ±15 Wm^{-2} varying with area and season. For climate studies these represent significant changes.

3. Conclusions

Most of the potential improvements discussed above require detailed, accurate documentation on the methods of observation. Some of this information is available in the List of Selected Ships (WMO47) which should be augmented with information similar to that collected for the ships which participated in the VSOP-NA. Improved meta-data with regard to the ship and observing practices, and improved quality control of the observations, are the initial priorities for the VOS Climate project. Other desirable enhancements to the VOS system include increased use of automatic coding, and improved instrumentation. These are being introduced on an increasing number of VOS, and future implementation on the ships participating in the VOS climate subset should be anticipated.

The successful implementation of the VOS Climate project will represent an important contribution to the Ocean Observing System for Climate as defined by the OOSDP (1995) and the OOPC (1998).

4. References

Folland, C. K. and D. E. Parker, 1995: Correction of Instrumental Biases In Historical Sea-Surface Temperature Data. *Q. J. Roy. Met. Soc.*, **121**(522), 319 - 367.

Gulev, S. K., 1999: Comparison of COADS Release 1a winds with instrumental measurements in the Northwest Atlantic*. J. Atmos. & Oceanic Tech*., **16**(1), 133 - 145.

Houghton, J. T., G. J. Jenkins and J. J. Ephraums, 1990: Climate Change: The IPCC Scientific Assessment. , Cambridge University Press, 365 pp.

Josey, S. A., E. C. Kent and P. K. Taylor, 1999: New insights into the Ocean Heat Budget Closure Problem from analysis of the SOC Air-Sea Flux Climatology. *Journal of Climate*, **12**(9), 2856 - 2880.

Kent, E. C. and P. K. Taylor, 1991: Ships observing marine climate: a catalogue of the Voluntary Observing Ships Participating in the VSOP-NA. *Marine Meteorology and Related Oceanographic Activities* 25, World Meteorological Organisation, Geneva, 123 pp.

Kent, E. C. and P. K. Taylor, 1996: Accuracy of humidity measurements on ships: consideration of solar radiation effects. *J. Atmos. & Oceanic Tech.*, **13**(6), 1317 - 1321.

Kent, E. C., B. S. Truscott, J. S. Hopkins and P. K. Taylor, 1991: The accuracy of ship's meteorological observation - results of the VSOP-NA. *Marine Meteorology and Related Oceanographic Activities 26*, World Meteorological Organisation, Geneva, 86 pp.

Kent, E. C., P. Challenor and P. Taylor, 1999: A Statistical Determination of the random errors present in VOS Meteorological reports. *J. Atmos. & Oceanic Tech*., **16**(7), 905 - 914.

Kent, E. C., P. K. Taylor, B. S. Truscott and J. A. Hopkins, 1993a: The accuracy of Voluntary Observing Ship's Meteorological Observations. *J. Atmos. & Oceanic Tech.*, **10**(4), 591 - 608.

Kent, E. C., R. J. Tiddy and P. K. Taylor, 1993b: Correction of marine daytime air temperature observations for radiation effects. *J. Atmos. & Oceanic Tech.*, **10**(6), 900 - 906.

Lindau, R., 1995: A new Beaufort equivalent scale. Internat. COADS Winds Workshop, Kiel, Germany, 31 May - 2 June 1994, Environmental Research Labs., National Oceanic and Atmospheric Administration, Boulder, Colorado, 232 - 252.

OOPC (1998) Report of the Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Grasse, France, 6 - 8 April 1998, GOOS Report No. 61, GCOS Report No. 44, IOC/UNESCO Paris, 37pp. + Annexes.

OOSDP (1995) Scientific Design for the Common Module of the Global Ocean Observing System and the Global Climate Observing System: An Ocean Observing System for Climate, Dept. of Oceanography, Texas A&M University, College Station, Texas, 265 pp.

Parilla, G., Lavin, A., Bryden, H., Garcia, M. and Millard, R. (1984) Rising temperature in the subtropical North Atlantic Ocean over the past 35 years, *Nature*, **369**, 48 - 51.

Reynolds, R. W. (1999) Specific contributions to the observing system: Sea Surface Temperatures. *Proc Conf. The Ocean Observing System for Climate - Oceanobs 99*, St Raphael, France, 25 - 27 October, 1999.

Reynolds, R. W. and T. M. Smith, 1994: Improved global sea surface temperature analyses using optimum interpolation. *J. Climatol.*, **7**, 929 - 948.

Send, U., Weller, R. A., Cunningham, S., Eriksen, C., Dickey, T., Kawabe, M., Lukas, R., McCartney, M. and Osterhus, S. (1999) Oceanographic time series observatories. *Proc Conf. The Ocean Observing System for Climate - Oceanobs 99*, St Raphael, France 25 - 27 October, 1999.

Smith, S. R., M. A. Bourassa and R. J. Sharp, 1999: Establishing more truth in true winds. *J. Atmos. & Oceanic Tech.*, 16(7), 932 - 952.

Taylor, P. K., Bradley, E. F., Fairall, C. W., Legler, L., Schulz, J., Weller, R. A. and White, G. H. (1999) Surface Fluxes and Surface Reference Sites. *Proc Conf. The Ocean Observing System for Climate - Oceanobs 99*, St Raphael, France, 25 - 27 October, 1999.

Taylor, P. K., Kent, E. C., Yelland, M. J. and Moat, B. I. (1999) The Accuracy Of Marine Surface Winds From Ships And Buoys. *CLIMAR 99, WMO Workshop on Advances in Marine Climatology*, Vancouver, Canada, 8 - 15 Sept. 1999, 59 - 68.

WGASF, 2000: *Intercomparison and validation of Ocean-Atmosphere energy flux fields*, Final Report of the WDRP/SCOR Working Group on Air-Sea Fluxes (SCOR Working Group 110) various pagination.

Woodruff, S. D., S. J. Lubker, K. Wolter, S. J. Worley and J. D. Elms, 1993: Comprehensive Ocean-Atmosphere Data Set (COADS) release 1a: 1980-92. *Earth System Monitor*, **4**(1), 4 - 8.

Yelland, M. J., B. I. Moat, P. K. Taylor, R. W. Pascal, J. Hutchings and V. C. Cornell, 1998: Measurements of the open ocean drag coefficient corrected for air flow disturbance by the ship. *J. Phys. Oceanogr.*, **28**(7), 1511 - 1526.

EXTRA INFORMATION WITH EACH OBSERVATION

<u>Ship parameters</u>

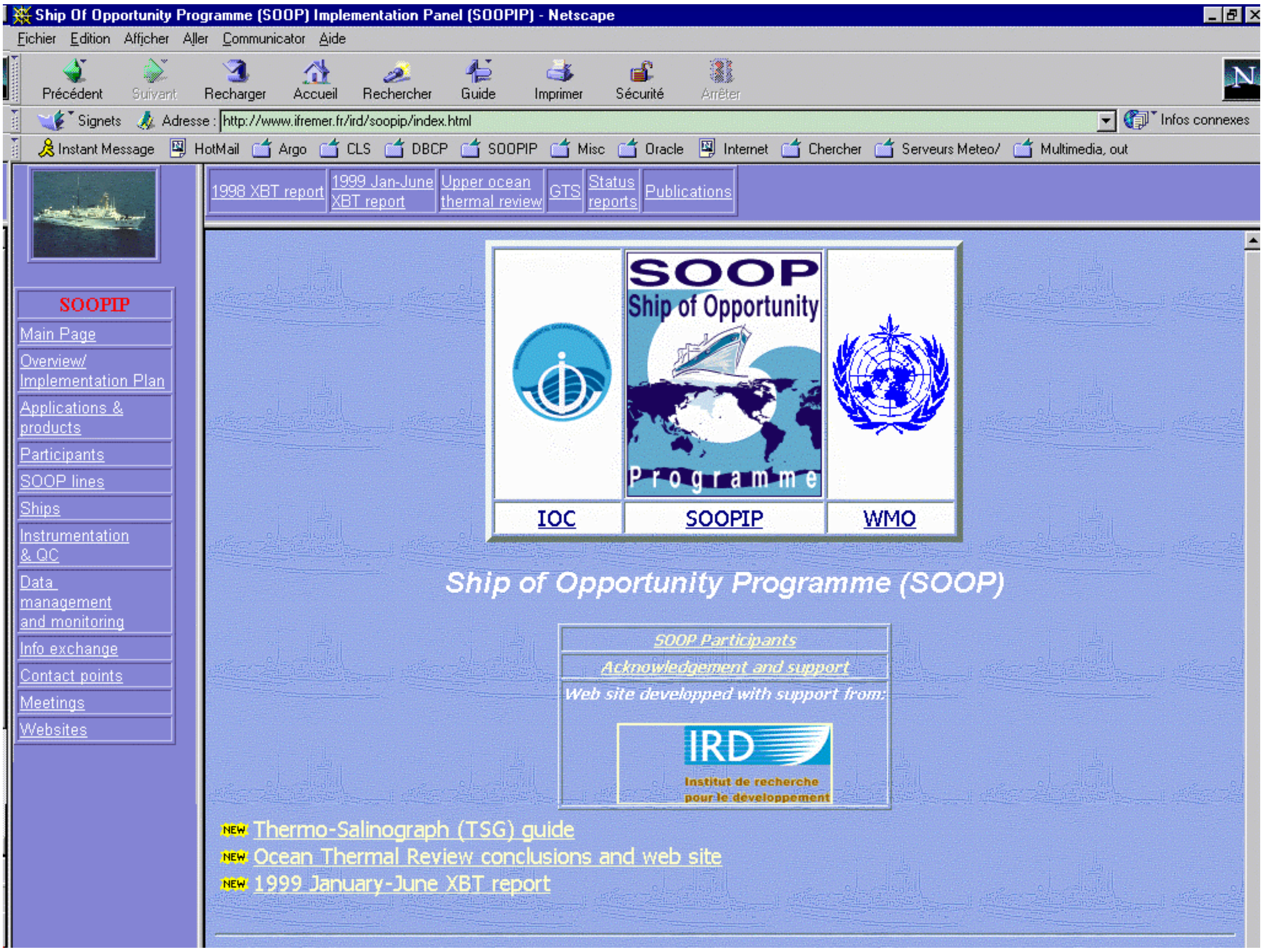
Code 1	ss	Instantaneous ship's speed in knots at time of observation
Code 2	DD	Ship's heading in tens of degrees true
Code 3	LL	Maximum height in metres of deck cargo above summer maximum load line
Code 4	hh	Departure of summer maximum load line from actual sea level (m)

<u>Wind</u>

Code 5	ff	Relative speed in knots or m/s (in conformity with wind code indicator)
Code 6	DD	Relative wind direction in tens of degrees (00 to 36) off the bow.

This information will be included in Section 2 of the SHIP code, in optional groups to be introduced after the ICE groups. The groups will be prefixed by CLIM, and will be of the form 1ssDD 2LLhh 3ffDD, to be extended as required.

Annex 1: SOOP Home Page



Action Items from SOOPIP-II

1. SOOP Coordinator and Secretariats

1.1 Coordinator to work with France in developing web page, especially to make use of existing French expertise in data linkage to web servers.

⋗ Coordinator discussed the issue with Jean Paul Rebert. Web server was implemented for test at IRD, Brest, in June 1999. Web site was formally advertised on 1 October 1999. Coordinator and Jean-Paul Rebert met in Paris in December 1999 to refine requirements regarding web data base and products. Resources might be available from MEDIAS-France to further develop the web site.

1.2 GOOS Project office to make every effort to initiate implementation phase of GOOS, in view of the need for several countries to make formal commitments to such implementation.

⋗ Initial GOOS commitments meeting was held in Paris, 5-6 July 1999. Meeting noted the following commitments: Operationalise SOOP network, and/or maintain involvement in SOOP and/or VOS lines [Australia, France, Germany, Japan, Netherlands, Russia, USA]; Antarctic observation programme (XBTs, buoys, tide-gauges sea ice measurements) [Australia]; Repeat hydrographic sections (i) on Line P in the Pacific, and on the Labrador section in the Atlantic [Canada]; (ii) of waters around Scotland [UK]; (iii) of the Ireland to Greenland section [Netherlands]; (iv) across the North Atlantic to monitor heat transport by N. Atlantic Current [Germany]; and (v) along 137E and 165E in the western North Pacific [Japan]

1.3 WMO and coordinator to continue SOOP monitoring reports, but review and redevelop in the light of operator and user requirements.

⋗ Ongoing. Proposals made by Coordinator during intersessional period.

1.4 Coordinator to assume responsibility for monthly XBT report currently prepared by NOAA.

⋗ Effective since Jan. 1999.

1.5 WMO to update SOOP line summary map and distribute to operators and users.

⋗ Actually made by Coordinator and available via SOOP web site.

1.6 Coordinator to make resources survey and line status maps available on web page.

⋗ Effective since Jan-July 1999 survey.

1.7 WMO to approach potential new SOOP participants with proposals concerning specific lines and contributions.

⋗ WMO made some overtures to the UK, but without any specific positive responses. Otherwise no action.

1.8 Coordinator to make latest versions of all relevant GTS codes available through SOOP web page.

⋗ MEDS is keeping such web pages up to date. Links to MEDS pages added on SOOP web site.

1.9 Coordinator and chairman to develop design for web page, for consideration by SOOPIP. Coordinator to propose a site for web page.

⋗ Done

1.10 Coordinator, chairman, OOPC and Météo France to investigate development of data availability index maps for sub-surface ocean data.

⋗ Météo France was contacted in this regard. Products not available yet.

2 SOOPIP Chairman

2.1 Keep SOOPIP members informed of developments in GOOS/GCOS implementation.

⋗ Ongoing.

2.2 Participate in WMO/VOS group meeting and take action to develop coordination between SOOP and VOS.

⋗ Chairman was unable to participate at the meeting at the last minute due to other commitments. However, a written report on SOOP was prepared and forwarded to the meeting by the Chairman. The SOOP secretariats were represented at the meeting. Ongoing discussions on SOOP/VOS coordination are at hand under JCOMM.

2.3 Coordinate scientific and technical presentations for SOOPIP-III.

⋗ Done.

2.4 Develop a detailed work plan for the coordinator for the present intersessional period, and present an updated version of this to SOOPIP-III (with coordinator and Secretariats).

⋗ Email communication throughout intersessional period on work objectives, including semestrial reports, web site, etc. Future work plan was discussed by Chairman and Coordinator in Melbourne, Nov. 1999. It includes: MK 21 issue; preparatory documents for SOOPIP-III. Proposal on monitoring reports; SOOP on-line data base and web site; operators to provide the Coordinator with actual data for monitoring purposes; meta-data issue.

2.5 Maintain a close watch on developments with Argo, and develop draft coordination proposals as necessary (with coordinator and Secretariats).

➢ Action continues.

2.6 Finalise SOOP Implementation Strategy and present to GOOS/GCOS IAG session, Paris, November 1998.

➢ Strategy was presented at the GOOS/GCOS IAG session. Present SOOP Implementation strategy is basically the one which was presented at the CMM/VOS meeting in Athens, March 1999. Plan is available via the SOOP web site at http://www.ifremer.fr/ird/soopip/general_info.html. Plan should be discussed and reviewed at SOOPIP-III.

3 SOOP Operators amd SOOPIP members

3.1 Collect information on national sampling activities for non-standard atmospheric variables from VOS, and submit to WMO Secretariat by end December 1998.

➢ Nothing received at WMO.

3.2 UK to resume monthly XBT reports to coordinator.

➢ Technically difficult for UKHO.

3.3 European operators to investigate status of existing XBT sampling in Mediterranean and report to coordinator.

➢ MFSPP is now participating in SOOP.

3.4 France to arrange for GTS distribution of salinity data from existing Atlantic cruises.

➢ BATOS system installed onboard Antea in Oct. 1999. Transmission in TRACKOB to begin after April 2000 for Antea and Toucan along AX20. Three other ships later.

3.5 MEDS to continue existing SOOP monitoring reports.

➢ Continues to produce monthly monitoring (QC) and JJYY reports.

3.6 Operators to check observations made against reports received, on the basis of the monthly monitoring reports, and take remedial action as necessary.

➢ Ongoing action. Operators contacted by Coordinator.

3.7 Operators to update SOOP Resources Survey and return to WMO Secretariat by end November 1998.

⋗ Done.

3.8 SOOPIP-II participants to urgently investigate possible contributions to the WMO trust fund for the support of the SOOP coordinator, and inform WMO accordingly.

⋗ Done. Contributions received from Japan, Germany, USA, and Manufacturers.

3.9 MEDS and AOML to develop a system for management of TRACKOB data.

⋗ Discussed at meeting and plan agreed.

3.10 S. Cook (with R. Bailey, A Sy, J. Gilson) to finalize *Best Practices Guide* and submit to Secretariats for publication before SOOPIP-III.

⋗ Guide being finalized by Steve Cook. Draft should be available at SOOPIP-III meeting.

3.11 R. Keeley to finalise MG 3 and submit to IOC for publication.

⋗ Guide finalised. Guide now being published by IOC. Guide also available via SOOP web site.

3.12 C. Henin to finalize *TSG Guide* and provide to coordinator for publication on the SOOP web page.

⋗ Done.

3.13 Develop contacts with other national sources of XBT data and operational activities and inform coordinator and chairman.

⋗ Ongoing.

3.14 STT/IQC chairman to prepare analysis and outline proposal for a *SOOP Operations Guide*, for consideration of TT (end 1998), and TT to prepare draft guide by SOOPIP-III.

⋗ STT/IQC Chairman is working on it. However, no draft available for SOOPIP-III.

4 SOOP Operators - line management

4.1 US and UK to implement a global line encompassing AX-12, IX-2 and the Pacific route New Zealand to Cape Horn. France and Germany to coordinate coverage on AX-11.

⋗ UK: not implemented.
⋗ USA: Work in progress. Lines needed for drifter deployments as well.

⋗ France: One vessel on AX11. Sampling reduced to 1 transect per trip according to SOOPIP recommendations.
⋗ Germany: Germany continues operation of line AX-11 as before

4.2 France to rebalance sampling on AX15 and increase sampling on AX05.

⋗ Maintain an adequate sampling on AX15 during the PIRATA pilot phase. Concerning line AX05 contacts are being taken with the company CGM which operates banana carriers between Europe and Antillas.

4.3 France to address oversampling on AX-20.

⋗ After deselecting the CARRYMAR, one only vessel (TOUCAN) is operating on this line.

4.4 US to attempt to increase sampling on AX-29

⋗ NOAA has identified 3 vessels willing to participate. Awaiting new or recycled equipment.

4.5 US to contact South Africa concerning AX-25.

⋗ NOAA has established seasonal coverage with South Africa research vessels for XBTs and drifter deployments.

4.6 Shipping is available on IX-9, but resources are presently lacking; Australia and US to address.

⋗ The BOM is keen to proceed. However, (i) BOM technicians are not trained on the maintenance of the non-BoM supplied equipment, and (ii) the BoM is not in a position to supply the XBT probes to cover ships operating on this line.
⋗ US is in the process of providing Australia with MK-9's that could support that line.

4.7 France to try to reactivate line IX-3 as soon as possible.

⋗ All ships operated from Nouméa essentially sail in the Western Pacific Ocean. IRD does not operate ships in the Indian Ocean and this does not seem practicable. It is not envisioned to reactivate the line.

4.8 NOAA to continue discussions with NIO (India) with a view to strengthening lines IX-8 and IX-18.

⋗ No progress so far but this can be discussed between USA and India at SOOPIP-III.

4.9 France to address question of sampling on IX-19.

⋗ All ships operated from Nouméa essentially sail in the Western Pacific Ocean. IRD does not operate ships in the Indian Ocean and this does not seem practicable. It is not envisioned to reactivate the line.

4.10 Australia and Japan to discuss possibilities for enhanced sampling on IX-22.

⋗ Resources were not available from either Australia or Japan to proceed with sampling between Fremantle and Japan by the Japanese Research Vessel - Shirase. Unfortunately Japan has no plan to start new sampling on IX22 nor to provide XBT probes to existing ship(s)-of-opportunity on IX22.

4.11 Australia and France to coordinate sampling on IX-1.

⋗ Ongoing. 3 new round the world ships equipped in 1998 with XBT and TSG. Ships are also sampling IX01 and IX10. However, it is likely that Nouméa will no longer drop probes in the Indian Ocean section after January 2000 (probes no longer provided by NOAA). System can, however, be used by other SOOP operators.

4.12 US to endeavour to enhance sampling on PX-36.

⋗ NOAA has established seasonal coverage with US icebreakers.

4.13 Japan and US to expand PX-26 (Transpac) coverage.

⋗ Two ships-of-opportunity have newly recruited on August 1999 and February 2000, respectively. A total of 4 ships are now in operation under the JMA-NOAA cooperative sampling programme. Furthermore additional two or more ships are under consideration by JMA and NOAA. Some recurring equipment problems mentioned by USA.

4.14 Australia, France and US to expand surface salinity networks and ensure data are distributed on GTS.

⋗ Ongoing. Nouméa equipped 3 new ships with TSG, including GOES transmission system. NOAA has expanded about as far as it can. US has no formal TSG programme and in house resources have been severely reduced.

4.15 All operators to liaise with relevant national institutions to try to enhance coverage in the Southern Ocean by irregular shipping in these waters.

⋗ Australia: Ongoing.

- France: Possibilities of using the vessel Marion Dufresne of IFRTP (French polar Institute) on line IX 19 between La Réunion and Kerguelen are investigated. Training and equipment could be provided by IRD. No formal agreement has yet been reached. Test phase planned in 2000 depending on IRD involvement in scientific programmes in La Reunion.

- Germany: From areas not covered by shipping lines BSH arranged to get some data in 1999 from Polarstern (AX-99) and Walther Herwig (AX-98). A second data set which BSH received from Walther Herwig in fall 1999 proved to be erroneous due to serious probe (wire) quality problems and thus was rejected.

- India:

- Japan: no possible ship-of-opportunity in the Southern Ocean.

- MFSPP: Not relevant

- UK:

- USA: Has contacted South Africa, Australia, Antarctic Research Group and US Coast Guards.

REVISED OPERATIONAL SOOP NETWORK

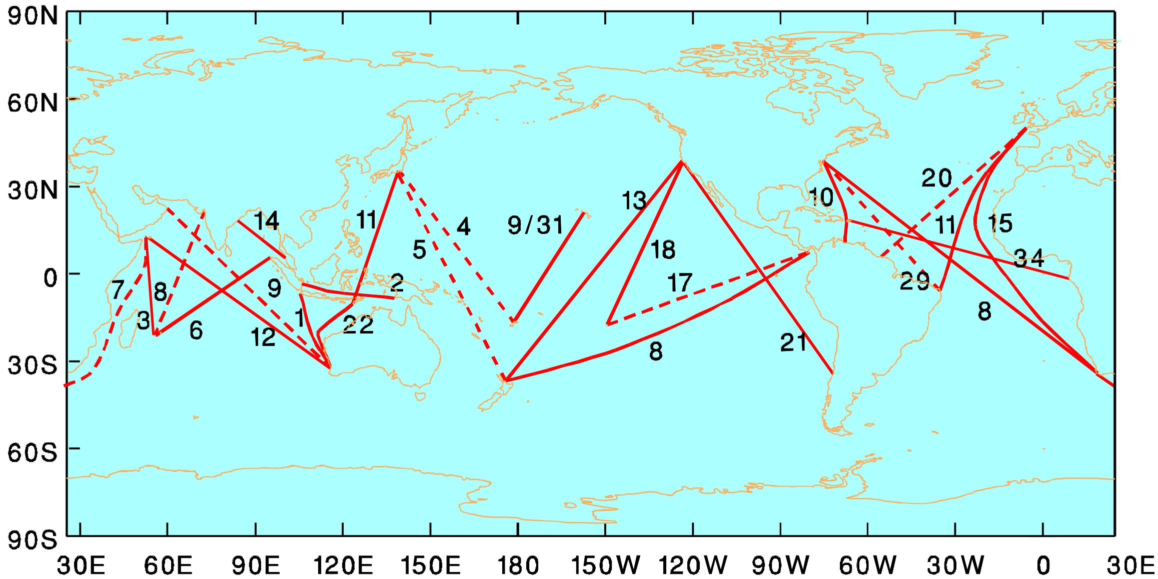


Figure 1: Recommended frequently repeated XBT network.

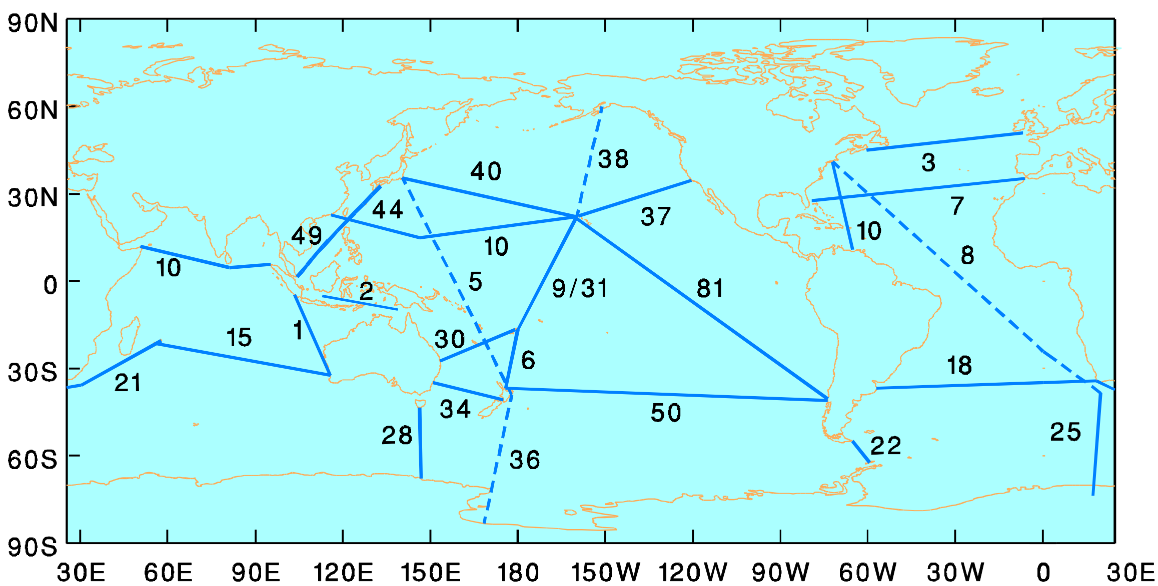
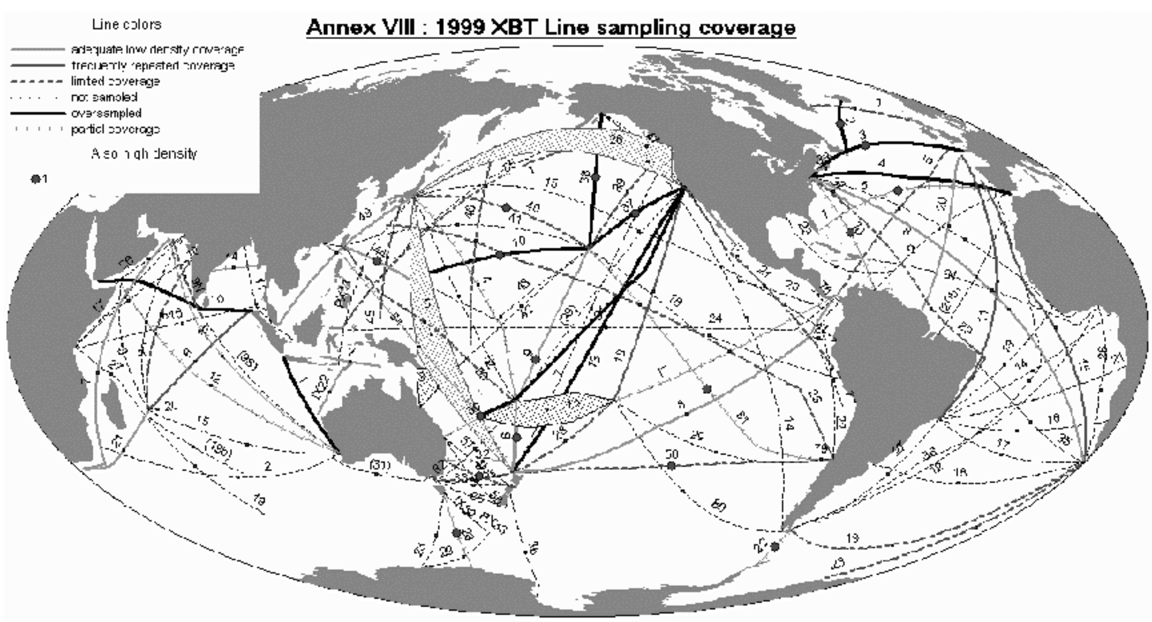


Figure 2: Recommended high-density XBT network.

Figure 3: XBT line numbering scheme.



NATIONAL PRACTICES REGARDING AVAILABILITY OF NAVAL DATA

Australia

The Royal Australian Navy (RAN) collects some 2,000 XBTs per year in its area of operations. This data is inserted onto the GTS (including ship's call sign). The RAN typically deploys Sippican T-10 and T-4 probes, using Sippican MK12 recorders. The full resolution data undergoes quality control at the Australian Oceanographic Data Centre (AODC) upon retrieval from the vessels, and is eventually submitted to the international archives (timeframe 2-3 years). The RAN also supports the Australian Ship-Of-Opportunity Programme, by supplying 2,500 Sippican Deep Blue XBTs each year to the national operators (CSIRO and Bureau of Meteorology) for distribution by participating merchant vessels.

Canada

The Canadian Navy collects oceanographic data using XBTs and some of these data are forwarded to MEDS for processing. In 1999 we received 2831 stations from 69 cruises of 14 ships. They use Sippican probes, of type T7 and T5. MEDS also receives sound velocity profiles and these are archived. Data come mostly in analogue form and are digitized by MEDS. The data are sent to MEDS roughly every 2 months.

Germany

There exists an agreement between the German Navy and BSH that the Navy's BATHY coded data should be sent to BSH for submission into GTS without ship call sign or ID and not earlier than 14 days after given measurement has been carried out. In practice BSH receives data about once or twice per month so that about 3/4 or more of the Navy's data meet the real-time frame for GTS submission. Data older than 30 days are sent to MEDS, all others are submitted by BSH into GTS immediately and thus without quality control. The German Navy uses a large variety of shipboard units of different makes and different probe types. In 1999 some 1600 BATHYs from different areas of the Atlantic Ocean have been submitted into GTS.

Japan

* **XBT** Data provider: *Japan Maritime Self-Defense Force (Defense Agency)*
data type: *subsurface temperature at the significant depths*
data transmission: *via internet to JMA, JFA, Japan Coast Guard*
transmission mode: *on the real time basis (in around a week after observations)*
delayed mode transmission:
to JODC with the data of a whole year (once/year)
data amount:

(received at JMA)	*data number*
Oct. 1999	*1,401*
Nov.1999	*2,039*
Dec.1999	*597*
Jan.2000	*510*
Feb.2000	*768*
Mar.2000	*1,188*

a condition for use: *only for its own analysis (so cannot put the data into GTS)*

** JMA: Japan Meteorological Agency
JFA: Japan Fisheries Agency
JODC: Japan Oceanographic Data Center

Russian Federation

All types of oceanographic data (hydrophysical, hydrochemical, hydrobiological), no matter what agency they originate from, are put into international exchange only through the Russian National Oceanographic Data Centre based in Obninsk and headed by Nikolai Mikhailov. For three years in the 0late 90's, the Russian NODC used to send the unclassified navy bathythermographic data to MEDS, Canada. This kind of data constituted only a few percent of the total amount of the presented data. Later, this project was suspended. Nowadays, in Mr. Mikhailov's words, they are inclined to resume inclusion of navy bathythermographic data into the data packages for exchange.

United States

United States Navy Data Release Policy

The Naval Oceanographic Office (NAVOCEANO) is the US Navy's central collection point for oceanographic data. NAVOCEANO maintains the Navy's Master Oceanographic Observation Data Set, which is an archive for physical oceanographic data collected over the past 130 years. NAVOCEANO releases archived XBT and CTD profiles through the National Oceanic and Atmospheric Administration's National Oceanographic Data Center (NODC). During the period from 1995 to 1999 NAVOCEANO released approximately 333,000 XBT and CTD profiles to NODC for archive and distribution. In addition, data collected by NAVOCEANO's drifting data buoy program is released to the Global Telecommunications System in real-time. These data include sea surface temperature, air temperature, barometric pressure, and in a few cases, subsurface temperature and salinity.

New BATHY reporting code form

A new form of the BATHY code has been approved and will come into effect on 3 May, 2000. Everyone encoding observations into BATHY and decoding observations from BATHY should make the necessary software changes in time to send and receive this code form.

The new form is a slight modification of the present form. The only change is in the code form identifier and in the way latitudes and longitude are reported. Below is shown the complete code form with the changes highlighted in bold.

SECTION 1	**$M_iM_iM_jM_j$** (i_uddff)	YYMMJ $(4s_nTTT)$	GGgg/	**$Q_cL_aL_aL_aL_aL_a$**	**$L_oL_oL_oL_oL_oL_o$**
SECTION 2	$8888k_1$	)	$(k_5D_cD_cV_cV_c))$		
SECTION 4	D....D or 99999	$A_1b_wn_bn_bn_b$			

Changes

L_aL_a L_aL_a L_a Latitude in tenths, hundredths and thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the latitude position group shall be encoded as $Q_cL_aL_aL_a$//. When the position is in hundredths of a degree, the latitude position group shall be encoded as $Q_cL_aL_aL_aL_a$/.

L_oL_o L_oL_o L_oL_o Longitude in tenths, hundredths and thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the longitude position group shall be encoded as $L_oL_oL_oL_o$//. When the position is in hundredths of a degree, the longitude position group shall be encoded as $L_oL_oL_oL_oL_o$/.

M_iM_i Identification letters of the report. These remain JJ.

M_jM_j Identification letters of the part of the report or the version of the code form. These becomes VV.

New TESAC reporting code form

A new form of the TESAC code has been approved and will come into effect on 3 May, 2000. Everyone encoding observations into TESAC and decoding observations from TESAC should make the necessary software changes in time to send and receive this code form.

The new form is a slight modification of the present form. There is a change in the code form identifier, in the way latitude and longitude is reported, and the addition of the instrument and recorder information now found in the current BATHY code form. Below is shown the complete code form with the changes highlighted in bold.

SECTION 1	**$M_iM_iM_jM_j$** (i_uddff)	YYMMJ $(4s_nTTT)$	GGgg/	**$Q_cL_aL_aL_aL_aL_a$**	**$L_oL_oL_oL_oL_oL_o$**
SECTION 2	$888k_1k_2$	**$I_XI_XI_XX_RX_R$** $2z_1z_1z_1z_1$ ..... $2z_nz_nz_nz_n$	$2z_0z_0z_0z_0$ $3T_1T_1T_1T_1$ ..... $d_nc_nc_nc_n$	$3T_0T_0T_0T_0$ $4S_1S_1S_1S_1$	$4S_0S_0S_0S_0$
SECTION 4	(55555	$1Z_dZ_dZ_dZ_d)$			
SECTION 5	D....D or 99999	$A_1b_wn_bn_bn_b$			

Changes:

$I_XI_XI_X$ Instrument type used to make the observations (See BATHY code form).

L_aL_a L_aL_a Latitude in tenths, hundredths and thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the latitude position group shall be encoded as

L_a $Q_cL_aL_aL_a$//. When the position is in hundredths of a degree, the latitude position group shall be encoded as $Q_cL_aL_aL_aL_a$/.

L_oL_o Longitude in tenths, hundredths and thousandths of a degree, depending on the capability of the positioning
L_oL_o system. When the position is in tenths of a degree, the longitude position group shall be encoded as
L_oL_o $L_oL_oL_oL_o$//. When the position is in hundredths of a degree, the longitude position group shall be encoded as $L_oL_oL_oL_oL_o$/.

M_iM_i Identification letters of the report. These remain KK.

M_jM_j Identification letters of the part of the report or the version of the code form. These becomes YY.

X_RX_R Recorder type (See BATHY code form).

Annex XI

Action list relating to instrumentation and data acquisition systems

Coordinator and Secretariats

1. Coordinator to develop internet mailing list for SOOP activities (including TT).

done

TT chairman

1. Develop new testing proposals based on information from manufacturers on changes in production procedures.

ongoing

2. With Chairman SOOPIP, develop preliminary analysis of requirements for operational instrument evaluations and intercomparisons, for consideration by IAG.

under way – refer to JCOMM

3. Prepare outline, analysis and proposals concerning preparation of *SOOP Operations Guide* (SOOPOG) (by end 1998), and coordinate preparation of draft guide for SOOPIP-III

done

TT and SOOPIP members

1. J.-P. Rebert to check on Sparton probe data availability in Brest, and inform other data centres accordingly.

to be reactivated

2. R. Keeley to contact NODC regarding the possibility of accessing additional Sparton probe data in Germany

done – no result

3. R. Keeley, A. Sy and C. Henin to develop appropriate modifications to TRACKOB to include information on the accuracy of observations.

discussed and agreed not useful

4. Operators to include probe serial numbers when notifying manufacturers of probe failures.

new action item – manufacturer warranty

5. D. Varillon to coordinate formation and activities of technical discussion group.

new action item

6. P. Rual, A. Sy and TT members to provide software and documentation on fall-rate

evaluations to others, as required, to facilitate further testing.

ongoing

7. R. Bailey to request AOML specifically to undertake further XBT testing as US GOOS centre. A. Sy to provide procedures brief for this work. Other TT members to assist.

partly done

8. All operators to ensure Y2K compliance of their customized software and hardware, by mid-1999, and notify coordinator of any problems encountered.

Done – no problems encountered

9. R. Bailey and A. Sy to coordinate development of documentation of quality assurance procedures for inclusion in new SOOP Operations Guide.

ongoing

Manufacturers

1. Sippican to investigate potential timing problem with windows-based software on Mk-12, and report to the TT.

report to be sent to the technical coordinator

2. All manufacturers to notify users of any changes in production procedures.

r**einforced, ongoing**

3. All manufacturers to note concerns of climate research and monitoring users relating to decreases in instrument quality coupled with instrument price increases.

noted

4. TSK to undertake work to remove apparent bias in salinity measurements with TSK XCTD probes.

d**one - no problem, according to TSK**

5. Sippican to evaluate apparent wire stretching problem with new Sippican XBTs, develop solutions and report results to TT.

done

6. TSK and Sippican to provide information on fall-rate coefficients for XCTDs to chairman of TT, for forwarding to appropriate data centres and other users.

partly done

7. TSK and Sippican to inform TT chairman when new XCTD system is available (around June 1999).

Done

SEAS 200(1)

A New Approach to BATHY Data Transmission

- Full Resolution with each transmission
  - Temperature Values each 60 cm (approx).
- Metadata with each transmission
  - SEAS Version MMDDYY Hour/Minute Call Sign
  - XBT Manufacturer Probe Type Fall Rate Ship Name
  - Instrument Code Bottom depth
  - How transmitted (ASCII/binary) SST sensor depth
  - SST sampling method Code for SST type
  - Drop Number
  - *TWI Line Number*
  - *Prior ob. Type* *Prior ob. Date*
  - *Prior ob. Position* *Prior Call Sign*

SEAS 200(1)

A New Approach to BATHY Data Transmission

- Environment: Windows 98/NT
- Comms: INMARSAT Std-C
- Format: Compressed Binary
- Content: Full Resolution with Metadata
- Distribution: GTS, NODC, AOML, MEDS
- Delayed Mode: Transmitted as Super-Message

SEAS 2000

BATHY Data Transmission

- Environment: Windows 98/NT
- Comms: INMARSAT Std-C
- Format: Compressed Binary
- Content: 29 Inflection points (max)
- Distribution: GTS, NODC (delayed mode)
- Delayed Mode: FTP’d when ship is met