SHIP OBSERVATIONS TEAM (SOT)
THIRD SESSION

Brest, France, 7 to 12 March 2005

FINAL REPORT

JCOMM Meeting Report No. 35

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

SHIP OBSERVATIONS TEAM (SOT)
THIRD SESSION

Brest, France, 7 to 12 March 2005

FINAL REPORT

JCOMM Meeting Report No. 35

N O T E

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariats of the Intergovernmental Oceanographic Commission (of UNESCO), and the World Meteorological Organization concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

C O N T E N T S

GENERAL SUMMARY OF THE WORK OF THE SESSION

I. COMMON SESSION

I/1. ORGANIZATION OF THE SESSION

I/1.1 Opening of the session

I/1.1.1 The third session of the JCOMM Ship Observations Team (SOT) was opened by the chairperson of the Team, Mr Graeme Ball (Australia), at 0930 hours on Monday, 7 March 2005, in the conference room of the French Institute for the Exploitation of the Sea (Ifremer), Brest France.

I/1.1.2 On behalf of all participants, Mr Ball expressed his appreciation to Météo-France, the Institute de Recherche pour le Développement (IRD) and the French Research Institute for the Exploitation of the Sea (Ifremer) for hosting the session and for providing such excellent facilities and support. He particularly thanked the local organizers of the session, in the preparations for the session on behalf of the SOT. He then stressed the importance of the present meeting, both in following up the progress achieved at the second session of the SOT (SOT-II) (London, United Kingdom, 28 July - 1 August 2003) in integrating and streamlining environmental monitoring from volunteer ships, and also in continuing efforts to enhance the quantity and quality of ship-based meteorological and oceanographic observational data. He then introduced Mr Jean-Louis Gaumet, the representative of the Director-General of Météo-France.

I/1.1.3 On behalf of Mr Jean-Pierre Beysson, Director-General, Météo-France and Permanent Representative of France with WMO, Mr Jean-Louis Gaumet welcomed the SOT-III meeting and the opportunity to exchange information on ship observations in Brest. Météo-France plays an important role in the WMO and EUMENET/EUCOS programmes, mainly for surface marine observations. Météo-France Brest is a traditional place where research and operational surveys of meteorological buoys and ships, and other marine observation systems have taken place for many years. He wished that this SOT meeting would be another good one, as were the last two meetings in Goa (India) and London (United Kingdom).

I/1.1.4 On behalf of the President of the French Institute for Research and Development (IRD), Pr J.F. Girard, and the Director General, Mr Serge Calabre; Mr Claude Roy, Directeur of the Centre IRD de Bretagne welcomed the participants to the third SOT meeting. IRD's mission is to develop scientific research programmes contributing to the sustainable development of the countries of the South with a special emphasis on the relationship between man and the environment, covering a wide range of topics from climate variability, biodiversity, resource dynamics, health and society. Mr Roy wished the participants a very fruitful meeting and an enjoyable stay in Brest

I/1.1.5 Mr Gérard Riou, Director of the Centre of Ifemer Brest, welcomed participants to Brest and to the meeting on behalf of Ifremer Brest, the largest of the Ifremer centres. Ifremer carries out activities which aim to develop knowledge and expertise about the oceans and their resources. Ifremer is highly concerned by a global observing system; and the ship based surface and sub-surface measurements, organized under the SOT, are a highly valuable contribution to the construction of this global observing system. He wished the participants a very successful and productive meeting.

I/1.1.6 On behalf of the Secretary-General of WMO, Professor Michel Jarraud, and the Executive Secretary IOC, Dr P. Bernal, the Secretariat representative, Ms Teruko Manabe (WMO), also welcomed participants to the third session of the SOT. She expressed the very sincere appreciation of both Organizations to Météo-France, IRD, and Ifremer, especially Mr Pierre Blouch, Mr Joël Quere, Mr Jean Rolland (Météo-France) and Yves Gouriou (IRD), for the excellent facilities provided as well as for the tremendous organizational effort already put into preparations for the meeting. In doing so, she expressed appreciation to these organizations for the ongoing high level of cooperation extended by them to the JCOMM activities including the work of the SOT. The

Secretariat representative then supported the remarks of the chairperson concerning the objectives and importance of the meeting. She assured participants of the full support of the Secretariat, both during the meeting and throughout the implementation of the SOT work programme, and she concluded by wishing all participants a very successful meeting and an enjoyable stay in Brest.

I/1.1.7 Mr Graeme Ball (Australia) made a brief presentation on background and overview of the SOT and this session.

I/1.1.8 The list of participants in the meeting is in ***Annex I.***

I/1.2 Opening of the Scientific and Technical Workshop (see item II)

I/1.3 Adoption of the agenda

I/1.3.1 The SOT adopted its agenda for the session on the basis of the provisional agenda with some changes which are given in ***Annex II***.

I/1.4 Working arrangements

I/1.4.1 The meeting agreed its hours of work and other practical arrangements for the session. The documentation was introduced by the Secretariat.

I/2. REPORTS BY THE SECRETARIAT, OBSERVATION PROGRAMME AREA COORDINATOR AND CHAIRPERSON OF SOT

I/2.1 Report by the Secretariat

I/2.1.1 The meeting noted a brief report by the Secretariat on its activities during the past intersessional period relevant to the SOT. This included the Brussels 150 celebration seminar; the Second JCOMM Workshop on Advances in Marine Climatology (CLIMAR-II); a major JCOMM workshop on operational oceanography products - Ocean Ops 04; and various other activities of a routine nature. The meeting recalled that the second session of JCOMM (JCOMM-II) will take place in Halifax, Canada, 19-27 September 2005. The meeting noted with interest that a scientific conference entitled" Operational oceanography and marine meteorology for the 21st century" will take place on 15-17 September prior to JCOMM-II.

I/2.2 Report of the Observations Programme Area Coordinator

I/2.2.1 The meeting noted with appreciation the report on the Observations Programme Area (OPA) priorities by Mr Mike Johnson (USA), the OPA Coordinator. He reported that three observing system issues are common to all three JCOMM implementation panels - the SOT, the DBCP, and the GLOSS GE – as well as to the Argo programme. The Observations Coordination Group (OCG) has chosen to give priority attention to these:

A. Achieving global coverage by the in situ networks
B. System-wide monitoring and performance reporting
C. Funding to meet implementation targets

A. Achieving global coverage by the in situ networks

I/2.2.2 The first issue is the fundamental need for achieving global coverage by the in situ networks. There is presently significant international momentum for implementation of a composite global observing system consisting of: 1) the in situ networks -- moored and drifting buoy arrays, profiling floats, tide gauge stations, repeat ship lines and VOS; 2) continuous satellite missions; 3) data and assimilation subsystems; and 4) system management and product delivery. The GCOS *Implementation Plan for the Global Observing System for Climate in support of the UNFCCC* (GCOS-92) has now been published. The plan has been endorsed by the UNFCCC and the ocean

chapter is expected to be endorsed by the Global Earth Observation System of Systems (GEOSS) as the ocean baseline for the GEOSS implementation plan.

I/2.2.3 Although the system specified by GCOS-92 is designed to meet climate requirements, marine services in general will be improved greatly by implementation of the global coverage called for by this design. The system will support global weather prediction, global and coastal ocean prediction, marine hazard warning, marine environmental monitoring, and many other non-climate users. The JCOMM implementation panels are particularly well positioned to provide the logistics and organizational infrastructure needed to implement the international global arrays. JCOMM is identified as the implementing agent, or a contributing implementing agent, for 21 of the specific actions listed in the GCOS-92 ocean chapter (pages 56-84). These specific actions now provide an excellent roadmap to guide the OPA work plan for the next four years. (GCOS-92 is accessible at GCOS, or link from www.oco.noaa.gov -- click on “Reports & Products.”)

I/2.2.4 The status of system elements being implemented by the DBCP, GLOSS GE, and Argo was summarized. Specific actions for the SOT implementation identified in GCOS-92 were reviewed. In particular the plan calls for:

- Greater use of VOS data;
- Implementation 200 VOSClim ships (presently 108 ships);
- Full occupation on 51 high resolution and frequently repeated XBT lines that were specified by the 1999 Upper Ocean Thermal Review Workshop (presently 27 lines);
- Coordination with the International Ocean Carbon Coordination Project.

It was noted that GCOS-92 does not identify goals for ASAP and that the ASAP goals need to be included in the OPA work plan. Also, it was noted that the SOT partnership is essential to help DBCP and Argo meet their implementation targets since volunteer ships provide the backbone for deployment of the drifting arrays.

B. System-wide monitoring and performance reporting

I/2.2.5 A major challenge for the Observations Programme Area is to develop easy to understand performance reports that can help in evaluating the effectiveness of the observing system and help in efforts to convince governments to provide the funding needed to meet global implementation targets. JCOMMOPS is working with the OCG to develop standard base maps showing required global coverage against what is presently in place. Much work is being done by JCOMMOPS, the implementation panels, and other partners around the world to evaluate observing system status and effectiveness. The Observations Coordination Group is working to bring together elements of this work in order to develop summary reports illustrating how advancements toward global coverage improve the adequacy of the observational information that is essential for monitoring the state of the ocean and marine meteorology.

I/2.2.6 A standard map projection has now been accepted by the OPA for reporting system status and progress. It is an Equidistant Cylindrical Projection, 90°N to 90°S, broken at 30°E. A standard set of colors, indicating country contributions, is used by JCOMMOPS. For indicating system performance, a progression of colors (red, orange, yellow, green, blue) is used varying from red-for-bad to blue-for-good. The coloring of the continents and oceans on the base map is still being discussed; at present the JCOMMOPS light green and light blue are generally used on the status maps and dark green and white on evaluation maps.

I/2.2.7 A demonstration project is now underway to develop quarterly reports of observing system monitoring and performance metrics in cooperation with the GOOS Project Office. A consolidated Progress Report with Contributions by Countries is available at www.jcommops.org/network_status which lists the 64 countries and the European Union that maintain elements of the composite ocean observing system, and the number of platforms and expendables contributed by each country. This report will allow tracking of progress toward

implementation of the ocean system specified in GCOS-92. Using this listing the global system can be estimated to be 51% complete at this time.

I/2.2.8 Information needed from SOT for this report includes contributions by countries for:

- HRX lines occupied
- FRX lines occupied
- XBTs deployed
- VOSClim ships operational
- VOS AWS ships operational
- ASAP ships operational
- ASAP radio sondes deployed

I/2.2.9 The first four elements listed above have established long range planning targets that allow calculation of percent complete. It was requested that the SOT establish long range planning targets for the last three elements listed above and that the VOS Panel consider developing a performance measure and planning target for the VOS fleet in addition to the VOSClim and AWS metrics, if possible.

C. Funding to meet implementation targets

I/2.2.10 JCOMM must help in efforts to convince governments to provide the funding needed to meet global implementation targets. Global coverage cannot be achieved with the resources that are presently being applied. As noted above, the baseline GCOS system is only 51% complete. One way the OPA can help is to develop easy to understand statistics and reports that the decision makers will be able to use to justify new funding. Efforts in this regard are summarized above.

I/2.2.11 The OPA has developed a proposal for consideration by JCOMM-II to establish a trust fund for consumables. The initial thrust of this idea is XBTs but other expendables could be added in time. JCOMM-I passed Recommendation 2 (JCOMM-I) - Resources for ship-based observation - strongly recommending that Members/Member States “increase the resources committed to supplying expendables for ship observations in support of international implementation plans.” Based upon the 1999 Upper Ocean Thermal review frequently repeated (FRX) and high density (HDX) line requirements, JCOMMOPS calculated that about 24,000 probes were needed annually to maintain the system. Presently the five counties contributing to XBT procurements provide only about 18,000 probes per year. This leaves a 6,000 probe gap. The OPA proposal is for establishment and management of a JCOMM Trust Fund to help fill this gap.

I/2.3 Report by the chairperson of SOT

I/2.3.1 The SOT chairperson, Mr Graeme Ball (Australia), noted that since SOT-II there had been a noticeable improvement in the level of cooperation and coordination between the VOS, SOOP and ASAP programmes, and between countries operating similar programmes. This is particularly pleasing and it is hoped that SOT-III will further enhance this spirit of unity. He also noted that the organization of this session of SOT differed from previous sessions, in that VOSClim is now contained within the VOSP session, and the Technical Workshop precedes the main meeting, as is the practice at DBCP. The agenda is full and includes a number of important issues. He encouraged all members to participate in the wide range of topics during the week ahead to ensure lively discussion, where all opinions are heard and all options are considered. In doing so, he recognized that the challenge for the SOT was to maintain, coordinate and, wherever possible, integrate ship-based observing programmes, to support a developing range of well defined operational and research applications.

I/2.3.2 He reviewed the objectives of the SOT and strongly encouraged the Team to actively participate in: the common sessions of SOT-III; the separate VOS Panel, the VOSCim project, SOOPIP and ASAP Panel sessions; and the SOT-III workshop, to realize the following outcomes:

a. Provide a status, and build on the understanding among the participants of the programmes and projects using merchant vessels and ships of opportunity;
b. Continue to evolve the mechanisms for coordinating and integrating the ship-based observing programmes;
c. Exchange information on existing and developing instrumentation and data applications;
d. Review the implications of contributing to operational programmes, including the need to standardize observing systems and methods, data processing and data management;
e. Identify general issues requiring consideration and support from JCOMM.
f. Review the recommendations of the Task Teams on:

    i. VOS Recruitment and Programme Promotion,
    ii. Satellite Communications System Costs,
    iii. Metadata for Pub. 47;

g. Review the recommendations of the Expert Group on Instrument Testing and Inter-Calibration;
h. Review and document issues, and, where necessary, form Task Teams to consider specific issues during the intersessional period;
i. Continue the liaison and coordination with the other groups using ships as observing platforms, in particular the International Ocean Carbon Coordination Project.

I/2.3.3 He also reported on actions undertaken by himself in support of the Team since SOT-II. The meeting expressed its considerable appreciation to the chairperson for his report and work to date both as the SOT chairperson and as a member of a number of Task Teams within SOT, and endorsed his views of the key issues to be addressed. Actions on these are recorded under subsequent agenda items.

I/2.3.4 The meeting noted that while so far the SOT had been dealing with physical measurements, the importance of biological and chemical data had recently been more and more recognized. As a first step to integrate such observation under the coordination of the SOT, the meeting agreed that representatives from the communities of such observations should be invited to the next session of the SOT. The meeting requested the SOT chairperson and the Secretariat to liaise with relevant SOT members to take appropriate actions in due course. (**Action:** SOT chairperson and the Secretariat)

I/2.4 Review of Action Items from SOT-II

I/2.4.1 The meeting reviewed action items raised at SOT-II except those to be reviewed under other agenda items. The meeting noted with satisfaction that most actions items have been completed. Ongoing issues as well as items addressed to component panels are reviewed and recorded under relevant agenda items.

I/3. REPORTS ON ASSOCIATED PROGRAMMES AND REQUIREMENTS FOR SHIP-BASED OBSERVATIONS

I/3.1 Ocean Observations Panel for Climate

I/3.1.1 The meeting noted with interest and appreciation a report on the activities of the Panel, and specifically on requirements for ship observations for climate by Dr Ed Harrison (USA), the chairperson of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC). The OOPC has been tasked by its sponsors to review and recommend requirements for sustained observations of the ocean for climate and related services. The importance of the ship-based surface and subsurface measurements organized under the SOT to ocean and weather forecasting and to continuous climate monitoring are widely understood. The SOT and its sub-panels have been valuable partners of the OOPC in coordinating standards, data exchange, and metadata for these observations.

I/3.1.2 OOPC has contributed to two recent documents updating the requirements and implementation plans for the global observing systems for climate, with broad input from ocean community scientists. In response to a request in 2001 from the UN Framework Convention on Climate Change (UNFCCC), GCOS undertook an evaluation of the status of the existing global observing efforts for ocean, land and atmosphere. The April 2003 *Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC* was accepted by the Conference of the Parties (COP) of the UNFCCC, and a five-to-ten year implementation plan was requested. OOPC and other ocean community scientists contributed to the ocean domain section of this implementation plan (IP), which was reviewed and in December 2004, recommended for implementation by COP-10 in Buenos Aires. Both reports and their executive summaries are available at the GCOS home page: http://www.wmo.ch/web/gcos/gcoshome.html. The recommendations in these documents are very similar to the guidance the OOPC has provided in the past to the SOT. The number one recommendation is the completion of the planned ocean observing networks, which includes the full occupation of the high-frequency and high-density XBT lines, and the operation of 200 VOSClim ships.

I/3.1.3 Uncertainty about long-term climate trends, in particular in subsurface data, is acute due to the lack of observations. Dr Harrison showed examples of the trend in the past 50 years of subsurface temperatures from observations, which showed regionally coherent variations, but no clear global trend.

I/3.1.4 Dr Harrison posed some specific questions for the SOT, asking for reflection and guidance in several areas. For surface observations, he asked whether it was possible to set community observing standards for VOS observations; whether WMO Pub. 47 was being adequately updated; and whether the OOPC could help to raise the visibility and importance of VOS. For subsurface observations, he asked whether SOT had feedback on the recommendations for observations that have been provided through a consultative process with CLIVAR. And in general for all ship observations, he asked whether measures could be taken to reinforce the role of the Port Meteorological Officers (PMOs); whether OOPC could help in measures to improve bandwidth and cost limitations for communications; and whether progress could be made in creating community recommendations for a standard merchant vessel ‘science room’.

I/3.2 THORPEX

I/3.2.1 Dr Albert Fischer (IOC) reported on the WMO THORPEX (“THe Observing system Research and Predictability EXperiment”) weather research programme and opportunities for interaction with SOT programmes. THORPEX is an international research programme, with the goal of accelerating the improvement of one-day to two-week high-impact weather forecasts, and the demonstration of their benefit for society, economies, and the environment. It is envisioned as a follow-up to the Global Atmospheric Research Programme (GARP), and will operate for a nominal period from 2005 through 2015. THORPEX has published an international science plan and implementation plan (available from http://www.wmo.int/thorpex/), both of which have been approved, and has received support from many national numerical weather prediction centres.

I/3.2.2 THORPEX will have four research sub-programmes, in: Predictability and Dynamical Processes; Observing Systems; Data Assimilation and Observing Strategies; and Societal and Economic Applications. The two involving observing systems and strategies are of particular interest to the SOT, as they will include Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs) and have the goal of producing feedback on the observing networks for weather prediction. THORPEX will also operate through Demonstration Projects, focused in geographic extent and time, which will demonstrate the social and economic benefit resulting from operational implementation of new forecasting tools and techniques, including in some cases targeted observations.

I/3.2.3 The SOT stands to benefit from THORPEX through its improvement of coupled forecasting systems in certain regimes (tropical cyclone/hurricane prediction; longer-range predictions of tropical convection and intraseasonal variability; mid-latitude storm system

interaction with western boundary current features; storms interacting with ice leads; sea-breeze and coastal fog), and potentially, the provision of proof of value of SOT observations for cost-benefit calculations. The SOT will be able to contribute to THORPEX by working to improve real-time availability on the GTS of its observations, and by standing ready to temporarily improve the density or frequency of observations during THORPEX Demonstration Projects. In many cases, these demonstration projects will be organized at the regional or national level, and the cooperation will have to take place through regional and national mechanisms.

I/3.3 International Ocean Carbon Coordination Project

I/3.3.1 Dr Nathalie Lefèvre (France) presented an update on underway pCO2 measurements on behalf of the International Ocean Carbon Coordination Project (see background document SOT-III/Doc. I/3.3 for details). Dr Lefèvre told the SOT that a new inventory of underway pCO2 programmes was carried out in January 2005. There are currently 17 programmes in the Atlantic Ocean, 9 programmes in the Pacific Ocean, and 2 programmes in the Indian Ocean. This represents a 42% increase in the Atlantic, and a 33% increase in the Pacific from 2003 (no change for the Indian Ocean). Dr Lefèvre provided a more detailed overview of the ocean carbon network in the North Atlantic operated as part of the EU CAVASSOO programme and now continued under the EU programme Carbo-Oceans, and highlighted the technical aspects and challenges of the underway systems. Dr Lefèvre also described the data management and synthesis activities being planned through several new regional and global research programmes. The IOCCP will be working closely with the GCOS-GOOS-WCRP Ocean Observations Panel for Climate at the upcoming May 2005 meeting to determine the most appropriate ways for the ocean carbon community to become more integrated with the VOS and SOOP programmes. The meeting expressed its appreciation for Dr Lefèvre's comprehensive report.

I/3.3.2 The meeting recalled that at the SOT-II (London, July 2003), the issue of establishing a closer cooperation between the SOT and the Ocean Carbon Working Group was discussed and that it was suggested (i) to add appropriate links between the International Ocean Carbon Coordination Project (IOCCP) and SOOP web sites, and (ii) to prepare for a possible contribution of compiled data sets of measurements by VOS of the Carbon Network, and in particular of data sets that include temperature and salinity data. The SOOP Coordinator reported that web links had been added between IOCCP and SOOP web sites. Regarding the possible contribution of compiled data sets of measurements by VOS of the Carbon Network, and in particular of data sets that include temperature and salinity data, he reported that data sets were made freely available in deferred time from the Carbon Dioxine Information Analysis Centre (CDIAC) which serves as central repository. Also, status maps of activities and plans are available by IOCCP and routinely updated. IOCCP provides metadata and information useful for implementation purposes. On the other hand, while recognizing that discussions had taken place between the IOCCP and the Global Ocean Surface Underway Data Pilot Project (GOSUD), the meeting agreed that efforts remained to be made to make the temperature and salinity measurements available to GOSUD. Much cooperation and communication between IOCCP and the SOT will still be needed in this regard while the underway CO_2 community is facing a number of practical / technical problems regarding implementation of a pseudo-operational network. For example, the raw data are typically received by the PI in real-time or near-real time in order to verify system operations, but since there is no scientific need for real-time pCO_2 data, these data are not made publicly available until after quality control and analysis. One of the major challenges, however, remains developing underway pCO2 systems that are fully autonomous, which is not currently the case. Compiled data sets of pCO_2 will be publicly available following the data exchange policies of the global research programmes (SOLAS, IMBER). As for any potential for real-time data release, the IOCCP will work with Principal Investigators and CDIAC to work out the details of the principles, protocols, and data formats before eventually being in a position to submit the data to GOSUD.

I/3.4 Use of VOS data in climate products

I/3.4.1 The meeting noted with interest a presentation given by Dr Elizabeth Kent (United Kingdom) on use of VOS data in climate products including the Intergovernmental Panel on

Climate Change (IPCC) Assessments, reanalysis products (such as those of the National Centres for Environmental Prediction (NCEP) and the European Centre for Medium Range Weather Forecasting (ECMWF)) and in the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). The report is in ***Annex IV***.

I/3.4.2 It was recognized that the VOS played a vital role in the ability to detect and understand climate change. The meeting noted the overall decline in the number of VOS reports of important parameters such as air temperature. The increase in the use of automatic systems has led to increased sampling in some regions. However, there has also been a decrease in the sampling of a greater proportion of the world's ocean, leading to larger sampling errors over much of the globe and a degradation of the observing system. This decrease in the sampling is due to a decrease in the number of VOS and those observations which are made, whilst frequent in time, being concentrated in a few geographical regions and along the major shipping lanes.

I/3.4.3 The meeting noted with interest an example of this degradation seen in the preliminary uncertainty estimates from a night time air temperature dataset from the Met Office Hadley Centre for Climate Prediction and Research. Error estimates are increasing over large regions of the ocean due to under sampling of the natural variability of air temperature. This is not compensated by the increase in high resolution data from the automatic systems which have a localized effect and it is therefore essential to maintain a large observing fleet and not rely on a small number of ships. It was further noted that a mix of observing platform types, including both automatic systems and more traditional ship observations, is needed for accurate estimates of global fields of the essential climate variables. Inter-comparisons and assessment of data from different sources is highly desirable.

I/3.4.4 The meeting recognized the importance of adhering to the Global Climate Observing System (GCOS) Climate Monitoring Principles (GCOS 2003) and actively encouraged the operators of observing networks to take account of these principles in the operation of the observing networks and in planning changes to those networks (see **Appendix to *Annex IV***). The meeting considered the recommendation that the GCOS Climate Monitoring Principles be integrated into the revised terms of reference for relevant subsidiary bodies of JCOMM. However it was felt that the requirement to adhere to these principles was already implicit in, for example, the SOT terms of reference. The value of an explicit statement of the importance of the GCOS Climate Monitoring Principles for all elements of the observing system was strongly supported. The meeting requested the Observations PA Coordinator to ensure that this message from SOT be reflected at JCOMM-II (**Action**: OPA Coordinator).

I/3.4.5 The meeting was pleased to note the importance and necessity of VOS data including SST measurements. The meeting also noted the importance of both a complete historical record of metadata for climate studies, as well as current metadata for operational activities.

I/3.5 GHRSST including report on the Ferrybox Project

I/3.5.1. At the Scientific and Technical Workshop, Dr Craig Donlon (United Kingdom) made a presentation entitled "Validation of SST data products within the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP)", which provided background information on the GHRSST, autonomous SST in situ radiometer systems and the EU FerryBox ship observing strategy and hardware. Dr Donlon concluded that collectively these significant developments were driving a new generation of data products and services that were now delivering a new generation of ship observations for satellite observation uncertainty estimation and assimilation into ocean forecast, numerical weather prediction and climate models. Finally, Dr Donlon raised several recommendations.

I/3.5.2 The meeting noted that infrared and microwave satellite radiometer systems measure physically different temperatures from traditional in situ measurements. It agreed that there was a need to differentiate between these classes of SST observations. The meeting reviewed the

definition of SST that had been developed by the GHRSST-PP International Science Team, and agreed with the usefulness of these definitions (see ***Annex V***).

I/3.5.3 The meeting noted that given the rapid development of a new class of real-time reporting of in situ technology for VOS style deployment, here was a need for a new set of reporting codes that would enable this new class of observations to be used in operational agencies. The meeting agreed that the SOT, with the agreement of JCOMM, should propose BUFR descriptors for this purpose. The meeting therefore decided to establish a Task Team on Coding chaired by Dr Donlon. The members and TOR of the Task Team are in ***Annex III***.

I/4. REPORTS BY TASK TEAMS

I/4.1 Task Team on VOS Recruitment and Programme Promotion

I/4.1.1 The meeting was presented with a report of the Task Team on VOS Recruitment and Programme Promotion by its convenor, Mr Steven Cook (USA).

Task 1: Single Page Recruitment Flyer

I/4.1.2 The Task Team discussed a possible single page recruitment flyer together with the development of a SOT Certificate of Appreciation. A draft flyer was presented and reviewed during the meeting. The final draft, agreed by the meeting, is in ***Annex VI***. The meeting agreed that the flyer would be made available on the JCOMMOPS and VOS web sites. (**Action**: JCOMMOPS Coordinator and BoM). The meeting encouraged ship operators to use the flyer as appropriate.

Task 2: Recruitment Power Point Presentation

I/4.1.3 The meeting was pleased to note that the recruitment presentation had been updated since SOT-II and had been used on a number of occasions. The meeting agreed that the power point presentation would be made available on the JCOMMOPS and VOS web sites (**Action**: JCOMMOPS Coordinator and BoM). The meeting agreed that the presentation should be kept under review and be used whenever appropriate.

Task 3: Development of Design Standards

I/4.1.4 The meeting noted with appreciation that the Task Team chairperson had received a lot of input and developed some basic draft design standards. The meeting agreed that the Task Team on VOS Recruitment and Programme Promotion should now present this proposal to the classification society for comments and input (**Action**: Sarah North, Steven Cook).

Task 4. Generic SOT Certificate

I/4.1.5 A draft generic SOT certificate to be used for VOS, SOOP and ASAP vessels, was presented and reviewed during the meeting. The meeting agreed that national VOS certificates and VOSClim certificates should be retained, in addition to this generic SOT certificate. The final draft agreed by the meeting is in ***Annex VI***. The meeting agreed that the certificate would be made available on the JCOMMOPS and VOS web sites. (**Action**: JCOMMOPS Coordinator and BoM). The meeting encouraged ship operators to use the certificate as appropriate.

Task 5. International Newsletter

I/4.1.6 The meeting noted that developing/issuing an international newsletter was really a resource issue, as it needs somebody with lots of spare time to take the lead to develop the layout, collect newsworthy items and be the editor. It agreed that it was not practical to issue a newsletter at present, although consideration could be given to making articles electronically available. The meeting noted this issue should be kept under review.

Task 6. Communication Mechanism

I/4.1.7 The meeting noted with appreciation that the VOSP and SOT chairpersons worked with the JCOMMOPS Coordinator to establish mailing lists at JCOMMOPS for this as follow:

pmo@jcommops.org
vos@jcommops.org

I/4.1.8 The meeting thanked the Task Team and agreed to re-establish the Task Team to follow-up tasks (see ***Annex III***).

I/4.2 Task Team on Satellite Communication System Costs

I/4.2.1 The meeting gave detailed consideration to the report of the Task Team on Satellite Communication System Costs presented by its chairperson, Ms Sarah North (United Kingdom). It was noted that the cost burden of ship observations sent by Inmarsat C was being borne by the relatively few National Met. Services that host Land Earth Stations (LES) that have agreed to accept Code 41 observations. Moreover the problem was likely to increase with the growing use of shipborne AWS systems sending hourly observations; with the migration to BUFR coded observations; and with the growth in TEMP messages being sent by ASAP ships using Code 41. In addition the problem was not being helped by the fact that Code 41 LES are operated by a relatively small number of companies, and because of the tendency of some ships to restrict their transmissions to certain LES and Inmarsat providers.

I/4.2.2 An associated problem had recently arisen where a ship owner had been invoiced for observations transmitted through certain LES, contrary to the principle of Special Access Code 41, that the NMS should carry such costs. It was believed that these costs had arisen because of the tendency for certain LES to only accept Code 41 messages sent from geographical areas, and because of the transmission of observations to LES that were not listed as accepting Code 41 messages. Although a list of Code 41 LES was maintained on the WMO web site, there appeared to be no formal responsibility for ensuring the accuracy of the list.

I/4.2.3 In accordance with its Terms of Reference, the Task Team prepared a detailed submission which was sent to the JCOMM MAN-III for initial review and which was subsequently presented to EC-LV by the co-president of JCOMM, recommending that a global cost sharing scheme should be developed with costs paid through a central WMO fund. The scheme would be independent of the Inmarsat supplier and was believed to present a realistic way of fairly sharing the cost burden between members, whilst at the same time avoiding any changes to the Code 41 system.

The Council recognized that the problem was not necessarily a global one, but might best be addressed on a regional basis, and that in any case more detailed information was required before any decisions could be considered. It therefore requested that such detailed information, together with possible options for solutions, should be made available for consideration by EC-LVII in 2005.

I/4.2.4 In this regard it was noted that the E-SURFMAR programme, representing 15 European National Met Services, had recently formulated a regional solution to the problem whereby the costs incurred by European nations hosting LES – France, Netherlands, Greece and the United Kingdom – would be increasingly compensated. Similarly it was noted that compensation arrangements were being considered within the E-ASAP programme for reimbursing the cost of ASAP TEMP messages sent via European LES.

I/4.2.5 As the Code 41 cost burdens had been most noticeable in Europe, the meeting considered that the E-ASAP and E-SURFMAR initiatives would, in the coming years, go some way to addressing the problem, although the costs of non E-SURFMAR VOS observations sent via European LES would still pass to the host National Met Services.

I/4.2.6 As a consequence of these considerations, and recognizing the difficulties of establishing a global scheme based upon a common WMO fund, the Task Team had revisited the issue and proposed to the meeting that an 'Accounting Authority' approach may now represent the most realistic way of achieving a solution to this complex problem. Accordingly the Task Team invited the meeting to consider its proposal that an Accounting Authority should be appointed to oversee the payment of code 41 satcom costs, acting as the billing intermediary between the LES service providers and the National Met Services. Ideally it was recommended that a Responsible National Met Service should be invited to take on this role, rather than appoint a commercial accounting authority.

I/4.2.7 The meeting considered the Task Teams proposals in detail but recognized that there were many issues that would need to be resolved if it were to have any chance of success. In particular a method would need to be devised to allocate costs back to individual VOS operators, either based upon the Inmarsat numbers of individual ships or on the volume of ship code observations received through GTS collecting centres. This could incur significant administrative effort and agreements would need to be established between the accounting authority and the NMS operating VOS to ensure the prompt payment of invoices. Start up and ongoing costs would also be incurred by the Accounting Authority, and provision would need to be made for bad debtors. There was also the risk that some VOS operators may reduce the size of their fleets in order to cut costs.

I/4.2.8 The meeting thanked the Task Team for its work on this complicated issue but decided against pursuing an Accounting Authority solution. The meeting requested the SOT chairperson and the WMO Secretariat to take necessary actions so that the WMO EC-LVII (June 2005) would be informed of these results in due course (**Action**: WMO Secretariat).

I/4.2.9 Recognizing that the problem remained, albeit lessened by the E-ASAP and E-SURFMAR initiatives, the meeting nevertheless decided to retain the Task Team on Telecommunication Costs in order to monitor the problem. The members and terms of references are in ***Annex III***.

I/4.2.10 The meeting noted the importance of updating an up-to-date list of Inmarsat LES accepting code 41 messages, and the need to monitor any restrictions that might be imposed on the receipt of code 41 messages by LES. The meeting noted with concern that such restrictions were likely to discourage reporting messages.

I/4.3 Task Team on Metadata for WMO-No. 47

I/4.3.1 The meeting noted with appreciation a report by the chairperson of the Task Team on Metadata for WMO-No. 47, Mr Graeme Ball (Australia). The Task Team developed a detailed proposal on the revision of WMO-No. 47 (Pub. 47) and submitted it to the first session of the JCOMM Expert Team on Marine Climatology (ETMC-I), Gdynia, Poland, July 2004. ETMC-I made some comments and suggested that the Task Team should make a final proposal to the SOT-III taking their comments into consideration. ETMC-I also agreed that the SOT (VOS Panel) had the appropriate expertise to make proposals on revisions to Pub. 47 and that the SOT should assume the responsibility for the future revisions involving this Team as appropriate. With regard to a need for a dedicated ASAP metadata database, the Team suggested that the SOT should be the more appropriate body to consider this issue. The Team agreed that the ETMC could assist, if so requested by the SOT and the ASAP Panel. The report by the Task Team presented its final proposal.

I/4.3.2 The meeting reviewed and agreed to the proposed revised format with a minor change. The final proposal to be submitted to JCOMM-II is in ***Annex VII***. The meeting decided to re-establish the Task Team on Metadata WMO-No. 47. The members and terms of references are in ***Annex III***. The meeting also considered the recommendation from the Task Team to use XML as a future method of exchanging Pub. 47 metadata. The meeting agreed with the ETMC's recommendation for trial use of XML in the VOSClim project.

I/4.3.3 The meeting, was then presented with the information on the content of WMO-No. 47 (Pub. 47) by Dr Elizabeth Kent (United Kingdom). It was informed that the historical editions of Pub. 47 are an important resource for climate research; and the accessibility to the up-to-date metadata is an important issue for research and operational purposes. Dr Kent made an assessment of the data contained within all electronically available editions of Pub. 47 from 1972 to the second quarter of 2004.

I/4.3.4 It was noted that many participating countries were not updating their metadata regularly. The mechanism by which Pub. 47 is generated means that any metadata from countries which have not submitted an update is copied to the latest edition unchanged. The importance of a mechanism to identify the updated records was recognized. The meeting requested the WMO Secretariat to make such information available (**Action**: WMO Secretariat). The meeting also requested the WMO Secretariat to send a formal letter to PRs of VOS requesting they send the latest updated information so that the outdated metadata included in the current Pub. 47 would be excluded in the future updated Pub. 47 (**Action**: WMO Secretariat).

I/4.3.5 The Panel recognized that the provision of metadata by some participating countries is incorrect and in outdated formats was causing significant problems in the timely provision of Pub. 47 by the WMO. Therefore the meeting strongly encouraged VOS operators to ensure that up to date metadata are regularly provided to the WMO Secretariat in the latest version, and that metadata are correctly formatted. (**Action**: VOS operators). The meeting requested the WMO Secretariat to send a quarterly reminder to the VOS focal points, using the VOS focal point mailing list, for the purpose of encouraging metadata submission. The importance of this metadata should be mentioned in the reminder (**Action**: WMO Secretariat).

I/4.3.6 A number of duplicate call signs were identified in Pub. 47. The meeting noted that information on duplicates was extremely useful for VOS operators. It is highly desirable that this information is easily available. It was noted that some apparent duplicate information was actually due to outdated metadata. The multi-recruitment problem was discussed under agenda item III-A/4.6.

I/4.3.7 It is important that any changes to the delivery mechanisms for electronic versions of Pub. 47 meet the needs of climate researchers for historical metadata, as well as operators needs for up-to-date metadata.

I/4.3.8 The meeting recalled that VOSClim-III (Southampton, January 2002) was informed by the Secretariat that an electronic database had been developed and future on-line access and downloading functions with the ship catalogue were under investigation. The meeting noted there were a lot of difficulties in full on-line access, and requested the WMO to investigate the possibility of making the Pub. 47 database available to VOS operators in read-only mode.

I/4.3.9 The meeting once again stressed the importance of accurate, complete and up-to-date metadata for both operational meteorological services and for climate studies. Therefore it request that the production of electronic versions of Pub. 47 should become a priority activity in the WMO Secretariat. The meeting requested the SOT chairperson to raise this issue at the JCOMM-II. (**Action**: SOT chairperson)

Use of JCOMMOPS as a portal to WMO-No. 47

I/4.3.10 The JCOMMOPS Coordinator reported that JCOMMOPS was now regularly importing into its database some metadata for all ships contained in the most recent copy of WMO Pub. 47. Imported data are useful for JCOMMOPS monitoring purposes, e.g. production of programme status, quality information relay, etc. In addition, the JCOMMOPS database also includes references of ships which do not necessarily appear in the WMO publication (e.g. SOOP ships, ships used for deployments and some research vessels). A web query form (http://w4.jcommops.org/cgi-bin/WebObjects/JCOMMOPS.woa/wa/ship) was developed by

JCOMMOPS during the last intersessional period so that ships can be quickly identified and one can get information about them. As the JCOMMOPS version of the database is not the official one, it differs somewhat from the official version. A note appears at the top of the page which explains where to get an official copy of the publication. The note includes a link to the appropriate WMO web page.

I/4.3.11 The meeting agreed that the query form was useful for ship operators and data users to quickly identify ships and that it was more user friendly than searching through flat files as is the case with the WMO publications. It therefore regarded the JCOMMOPS product as complementary to the official version of the publication. While noting that the JCOMMOPS did not import all metadata fields from the WMO publications, it asked JCOMMOPS to upgrade its system in order to include all available fields (**Action**: JCOMMOPS).

I/5. SUPPORT INFRASTRUCTURE

I/5.1 JCOMM in situ Observing Platform Support Centre

I/5.1.1 The SOOP Coordinator reported on JCOMMOPS developments and activities during the last intersessional period. JCOMMOPS includes international coordination facilities which support the DBCP, SOOP, and Argo programmes. It is staffed with two persons. The Centre basically provides support in an integrated way for implementation, and the operation of the three observational programmes.

I/5.1.2 During the last intersessional period, JCOMMOPS continued to build up and it is now fully operational. It will continue to development as products and services, offered by JCOMMOPS to the community, need to be constantly adjusted to present needs. A good infrastructure is now in place, including three computer servers, a relational database, dynamic web applications, and a Geographical Information System (GIS).

I/5.1.3 JCOMMOPS offers integrated services on one hand and services specific to the DBCP, SOOP, or Argo on the other hand. Integrated services include a news section, query forms (e.g. search through platforms, contacts, documents), static and dynamic maps, information on deployment opportunities, a monthly GTS report, and information on the WMO number allocation system. Services dedicated to the SOT include the SOT web site; a SOOP news section; SOT, PMO, and VOS mailing lists; and a web page to automatically relay reports on VOS systematic errors to VOS National focal Points, SOOP line sampling indicators, query to access GTSPP quality information from MEDS, routine maps, SOOP semestrial survey, and query forms to search for ships, SOOP lines, and line types.

I/5.1.4 The meeting agreed that JCOMMOPS was providing valuable services and monitoring tools in support of the DBCP, SOOP, and Argo communities, including for the SOT as a whole to a lesser extend. It agreed that efforts should be made in order to ensure long-term support for JCOMMOPS (see also paragraphs IV/1.4.3, and IV/6.3).

I/5.2 Telecommunication facilities

Inmarsat

I/5.2.1 The meeting noted that the Secretariat had been informed by Mr Andy Fuller (IMSO) that there had been no changes since the information provided at SOT-II (July 2003).

Argos

I/5.2.2 The meeting noted that there were no major issues on Argos relevant to SOT.

EUMETSAT

I/5.2.3 The meeting noted that a full report on the status of the EUMETSAT data collection system is given under item V/1.2.

I/5.2.4 The meeting agreed that the SOT should be kept informed of any relevant development regarding telecommunication facilities in its future sessions.

I/6. OPERATIONAL STANDARDS

I/6.1 Instrumentation standards

I/6.1.1 SOT at its first and second sessions well recognized the importance of the issue on instrument testing and standards, and therefore SOT-II established the Expert Group on Instrument Testing, The meeting noted with regret that there had been no major progress.

I/6.1.2 The meeting recognized the importance of this issue and decided to establish the Task Team on Instrument Standards and accepted the nomination of Mr Robert Luke (USA) as the new chairperson of the Task Team. The members and terms of reference of the Task Team are in ***Annex III***.

Items I/7 to I/13.2 are located at the end of the report.

==========

II. Scientific and Technical Workshop

II/1. Four oral papers and three poster papers were presented to the scientific and technical workshop, which constituted an integral part of the session. In addition, various EUMETNET AWS systems (MILOS 500. BATOS, MINOS) were on display. The theme of the workshop at SOT-III was “new initiatives and/or new developments of equipment, expendables and marine telecommunication facilities. The programme and abstracts of the papers are in ***Annex VIII***. The meeting recognized the value of the workshop, both to meeting participants and all ship operators and data users, and expressed its appreciation to Mr Frits Koek (Netherlands) for chairing it. It also requested that a similar workshop should be organized in conjunction with SOT-IV. The meeting encouraged participants to submit papers to the next workshop. (**Action**: Secretariat and SOT chairperson)

==========

III. VOSP, Fourth Session including VOSClim, Fifth Session

==========

==========

III.A VOSP, Fourth Session

==========

III-A/1.1 Report by the chairperson of the VOS Panel

III-A/1.1.1 Ms Julie Fletcher (New Zealand), VOS Panel (VOSP) chairperson, welcomed members to the fourth VOSP session. She summarized the tasks she had undertaken in the intersessional period and outlined the progress made by the Task Teams to advance VOS issues. VOS has traditionally been a nationally based effort, with individual countries each maintaining a VOS fleet. The VOSP chairperson commented that the inclusion of VOS under SOT had brought the opportunity to better coordinate and promote VOS activities at an international level to the benefit of all VOS programmes. Prior to SOT there were few mechanisms to monitor and report on the status of Global VOS, and she felt the profile of VOS lagged behind that of other panels. SOOP and ASAP (and DBCP) have been organized on a global basis since their inception and these

panels have well established international coordination and defined monitoring and reporting procedures. It is the aim of the VOSP chairperson to raise the profile of VOS to the level of the other SOT panels.

III-A/1.1.2 Ms Fletcher outlined where progress was being made on VOSP issues and linked this to the Terms of Reference for the VOS Panel. She was confident that through the work of the VOS Panel and the Task Teams, global VOS is becoming better coordinated. Good progress has been made on global monitoring and reporting procedures for VOS and measures to enhance global PMO and VOS Focal Point cooperation have been made.

III-A/1.1.3 The Panel chairperson advised that for the first time the VOSClim meeting would be held within the VOSP session. VOSClim is now a mature project and it was felt that it no longer required a separate meeting, so VOSClim-V would be held as a meeting within the session of the VOS Panel parent body. The success of this incorporation would be reviewed following the VOSClim session.

III-A/1.1.4 The Panel chairperson thanked the chairpersons of SOT, SOOP and ASAP, the Project Leader for VOSClim, the WMO Secretariat, the JCOMMOPS Coordinator and the members of the Task Teams for their patience, help and direction through the intersessional period.

III-A/1.1.5 The Panel expressed its sincere appreciation to Ms Fletcher for her efforts and leadership.

III-A/1.2. Review of Action Items from VOSP-III

III-A/1.2.1 Ms Fletcher reported on the status of the three Action Items from VOSP-III. Two items (ref. III/5.2.2 and I/7.2(iv)) have been completed and the third item (I/3.5(ii)9 to develop a "*plan for reporting all VOS and SOOP observations in real time (with minimal human intervention)* " was ongoing.

III-A/2. PROJECT REVIEW

III-A/2.1 The VOSClim Project (VOSClim fifth session to take place)

III-A/2.1.1 As VOSClim is a special project under the VOS Panel, the fifth session of VOSClim took place preceding other VOS Panel agenda items. Discussions are recorded under III-B.

III-A/2.3 PMO activities and coordination

III-A/2.3.1 Mr Graeme Ball (Australia) presented a document on PMO activities and coordination. The meeting agreed with the activities noted in his document and that there was no need to revise the WMO Guide and Manuals (WMO-No. 471) (WMO-No. 558) with regard to PMO activities and coordination. It expressed its appreciation to Mr Ball for developing this document and making it available on the VOS web site.

III-A/2.3.2 The meeting noted that some PMOs were unfamiliar with the barometer calibration practices of other countries and recommended that these be made available on the VOS web site (**Action**: VOS operators and BoM). With respect to PMO training, the meeting also noted that each country is responsible for its own PMO training.

III-A/2.3.3 Considering the worldwide coverage of PMOs, the meeting noted that PMO services in the areas with much ship traffic such as the Persian Gulf and Mediterranean should be enhanced. The presentation on PMO activities and coordination provided a good grounding for the new VOS participants from Turkey and Saudi Arabia.

III-A/2.4 Presentation on E-SURFMAR activities

III-A/2.4.1 Mr Pierre Blouch (E-SURFMAR Project Manager) presented the E-SURFMAR programme activities during the intersessional period. Fifteen European National Meteorological Services (NMS) are participating in this programme which concerns VOS as well as data buoy observations. The objectives of E-SURFMAR consist in coordinating, optimizing and progressively integrating the activities for surface observations over the sea within the EUMETNET Composite Observing System (EUCOS) operational framework. Météo-France is the responsible member for this programme.

III-A/2.4.2 Although the main EUCOS aim is to improve Numerical Weather Prediction over Europe, E-SURFMAR takes care of all the surface marine observations carried out by EUMETNET members, even if they are done outside the EUCOS area of interest. A design study, performed in 2004, recommended an increase of air pressure measurements in the north of 30°N in the North Atlantic and Mediterranean Sea and a few moored buoys for the calibration and the validation of wind and waves satellite data.

III-A/2.4.3 Each component of the programme - data buoys and VOS - is fitted with a Technical Advisory Group which helps the Programme Manager for his work. The programme is funded by participants according to the Gross National Incomes (GNI) of their respectives countries. The fund is used to manage the programme and to purchase equipment (buoys and shipborne Automatic Weather Station (AWS)), and also to partially compensate observations and communication costs.

III-A/2.4.4 Non-automated EUMETNET VOS ships represent about 43% of the world's VOS ships and provide about 50% of all observations onto the GTS. Besides, EUMETNET shipborne AWS systems provide 57% of all observations for this category. Three systems are mainly used: Milos 500 (21 units operated by Germany), Batos and Minos (30 and 6 units operated by Météo-France respectively). The Batos system has been chosen by E-SURFMAR to become the standard European shipborne AWS. Four to five units per year should be funded by the programme over the next years.

III-A/2.4.5 E-SURFMAR is very concerned about monitoring the quality of VOS data, especially air pressure measurements. A few tools, available on the Internet, have been developed at Météo-France for that purpose. They include monthly statistics, graphs displaying the data and the differences with model outputs over the past two weeks, as well as "blacklists" updated daily. These tools are available for any VOS ship reporting onto the GTS at:

(http://www.meteo.shom.fr/vos-monitoring/)

III-A/2.4.6 Another important issue for E-SURFMAR is the cost of communications. Besides starting compensation to participating members who pay Inmarsat-C "code 41" communication costs, several other solutions are being explored: data compression through Inmarsat-C, better use of Meteosat DCP and alternate systems such as Iridium.

III-A/2.4.7 The meeting noted with appreciation that monitoring tools developed by Météo-France are available on the Internet for each VOS reporting onto the GTS, and are very useful for the worldwide PMO and VOS operators. The meeting noted that if the monitoring period was extended from 14 to 21 days, the information would be even more useful. The meeting requested Météo-France to take action, if appropriate, and possible. (**Action**: Météo-France)

III-A/2.4.8 The meeting noted some countries had a mechanism to pay to mariners or ship companies for observations, although such a scheme was not encouraged within the framework of the E-SURFMAR or VOSP. The meeting noted that it would be desirable that all VOS observations were done voluntarily regardless of the VOS operating country. The meeting agreed that an award system such as issuing certificates should be encouraged instead of payment schemes.

III-A/3. AUTOMATION AND SOFTWARE

III-A/3.1 TurboWin developments

III-A/3.1.1 Mr Martin Stam (Netherlands) presented the latest updates to the TurboWin electronic logbook software. Started 15 years ago as a simple entry form for SHIP coded messages, the application is moving towards a complete software suite for marine observers. In the latest version (released October 2004, version 3.5) many items were updated (e.g. added documentation like Guide to Wave Analysis and Forecasting, second edition (WMO-No. 702) (1998), added administration buoy deployment support, added extended phenomena descriptions, added more Quality Control rules etc.) Development goals for this year are BUFR implementation, adding a Climate Atlas and adding a metadata module.

III-A/3.1.2 The meeting noted that if a self-training tool such as a video on how to use TurboWin was developed and included in TurboWin, the software would be even more useful. The meeting requested KNMI to investigate possibilities to make such an enhancement of TurboWin and take necessary actions if appropriate and possible (**Action**: KNMI).

III-A/3.1.3 At the request of Australia, TurboWin will be modified to save an archived copy of the IMMT-2 log data when the option to transfer the data to disk is selected (**Action**: KNMI). TurboWin currently erases the IMMT-2 log file when this option is selected, and has resulted in data loss when the floppy disk has failed at the time of data transfer or has subsequently become corrupt.

III-A/3.1.4 The meeting expressed its appreciation to KNMI for their efforts to keep updating and enhancing this useful application.

III-A/3.2 Status of VOS automation

III-A/3.2.1 VOSP-III (London, July-August 2003) noted the importance of enhancing the automation of all aspects of shipboard procedures, from observation to message transmission, using readily available software and hardware. The VOS Panel chairperson was tasked with collating information on global VOS automation for presentation at subsequent VOS Panel sessions.

III-A/3.2.2 There has been a steady increase in the numbers of VOS using electronic logbook software e.g. TurboWin, since 2003. Fully automated shipboard weather observing systems are still few in numbers; but Australia, Canada, France, Japan, New Zealand, USA and E-SURFMAR have all indicated plans to expand their marine AWS networks in 2005.

III-A/3.2.3 The meeting noted that challenges with respect to installing automated systems on board VOS ships continued to include:

- Problems in finding ‘long term’ ships – the length of charter is often insufficient to justify AWS installation;
- Difficulties in siting equipment for best exposure;
- Volatility of ship routes;
- Lack of warning of withdrawal of ships and potential loss of AWS equipment.

III-A/3.2.4 The meeting expressed its appreciation to Ms Fletcher for her informative report. The meeting agreed that status information of VOS automation should be kept updated and requested the VOS chairperson to continue this task. The meeting agreed that the list should be included in the SOT Annual Report (**Action**: VOS Panel chairperson).

III-A/3.3 SAMOS

III-A/3.3.1 Dr Elizabeth Kent presented information on the Shipboard Automated Meteorological and Oceanographic System (SAMOS) initiative on behalf of Mr Shawn Smith from the Center for Ocean Atmosphere Prediction Studies (COAPS). The SAMOS initiative is designed to improve the quality and accessibility of surface marine meteorological and oceanographic data from research

vessels and VOS equipped with research-quality instruments. It was noted that many research vessels also make routine weather observations but do not typically utilize the research quality instrumentation for these routine observations. SAMOS has recently started a pilot project collecting data from two ships, one from Woods Hole Oceanographic Institution and one from Scripps Institution of Oceanography. One-minute average data from these ships is transmitted once a day and assessed for quality and archived at COAPS. Any problems with the data can be reported back to the ship and ship operators with minimum delay helping to ensure high quality data. Further measures to improve data quality include: a portable instrumentation standard to allow intercomparisons of instruments; studies of air flow distortion; an emphasis on training of technical staff and the proposed development of a manual describing best practice. SAMOS has an ethos of free access to data and expertise. Data stewardship is an important element. SAMOS is collaborating with the Global Ocean Surface Underway Data Pilot Project (GOSUD) to coordinate data exchange and increased opportunity for data collection. Interested members of SOT are invited to contact SAMOS (smith@coaps.fsu.edu) for further information and SAMOS would appreciate hearing from individuals or groups performing complementary activities with a view to sharing expertise.

III-A/3.3.2 The Panel noted that SAMOS instruments were regularly inspected and that data were high-quality, and therefore agreed that SAMOS data would be useful if they were transmitted onto the GTS. The Panel encouraged all SAMOS ships not yet doing so to contribute to the VOS programme, and where appropriate to VOSClim. (**Action**: SAMOS participants) The Panel encouraged SOT members to consider possible interactions with SAMOS programme and to contact SAMOS directly if appropriate. (**Action**: SOT members)

III-A/4 ISSUES FOR VOSP

III-A/4.1 Security issues arising from availability of SHIP data on the web

III-A/4.1.1 Ms Julie Fletcher (New Zealand) and Mr Graeme Ball (Australia) raised security issues arising from availability of SHIP data on the web. Ships participating in the VOS scheme do so on the understanding that their data are only being exchanged between NMS for real-time meteorological forecasting activities and for climatological research. SHIP data are now however also displayed in many public web sites. This has led to questions about how these data were obtained, but of greater concern is the identification of ships' names, call signs and positions and the security risk this exposes them to. Some Shipping Companies have threatened to withdraw their ships from the VOS programme if the leak of this data to the web continues. The meeting was informed that the IMO had recognized the issue of marine security and was organizing an international meeting on the subject later in 2005.

III-A/4.1.2 The meeting noted that replacing call signs with "SHIP" could mitigate the problem and be an interim solution, but would not completely solve the problem as those who chase ships with malicious intent could still follow the ship routes. With regard to the possibility of using encrypted call signs, the meeting noted that it was unrealistic to encrypt ship reports as had been done with AMDAR messages from aircraft.

III-A/4.1.3 The meeting requested VOSP members to take any possible actions to prevent making the ship positions available on the web site, such as contacting the relevant organization/companies and informing them of the security risk by making ship data available (**Action**: VOS operators, SOT chairperson). It also requested the WMO Secretariat to inform NMS about this issue so that NMS could monitor the situation and take appropriate actions. (**Action**: WMO Secretariat). The meeting also noted that the problem would continue to exist whilst FM-13 SHIP is included as "essential data" in the Resolution 40 (Cg-XII). It therefore requested the WMO Secretariat to advise the WMO Executive Council (EC) about this issue and to take the necessary actions. The meeting requested that the WMO Secretariat ensure that this issue is discussed at the coming WMO EC (EC-LVII) (June 2005). (**Action**: WMO Secretariat)

III-A/4.1.4 The meeting noted that some weather charts issued by NMS were also made available on their web sites and included Ship Data and callsigns. The meeting agreed that although mariners liked to see observations on the charts, displaying of callsigns exposed them to a security risk. (**Action**: NMS)

III-A/4.2 Requirement to promote VOS scheme through IMO

III-A/4.2.1 Ms Fletcher reminded the meeting that some recent recruitment opportunities had been unsuccessful because the Duty Officer could not identify taking weather observations as a normal duty according to the ship's standing orders. The meeting agreed that despite the SOLAS convention and the importance it places on taking weather observations, there is a need for further promotion of the VOS. The meeting recalled that MSC Circular 1017 was issued in June 2001 for this purpose in response to a request sent from the WMO to the IMO.

III-A/4.2.2 The meeting agreed that the reissue of such a MSC Circular might encourage greater VOS recruitment. The meeting requested the VOS chairperson and the WMO Secretariat to prepare an updated version of the Annex to MSC Circular 1017; and requested the WMO Secretariat to send a request to the IMO Secretariat to issue a MSC Circular accordingly (**Action**: VOSP chairperson and WMO Secretariat). The meeting noted that a MSC Circular often did not reach mariners on ships and encouraged PMO and VOS operators to show a copy of the MSC Circular to mariners once it had been issued. (**Action**: PMO/VOS operators)

III-A/4.2.3 The meeting noted that adding the task of 'making weather observations' to the masters standing orders would remove the excuse PMOs often hear about the observation being forgotten and that it would normalize the task and make it routine. The meeting therefore agreed that it would be desirable if masters' standing orders would include the statement *"the making of weather observations, when it is safe to do so, should be undertaken".* The meeting noted that Shipowners/Operatiors can, and do, give guidance on what instructions Masters should include in their Standing Orders, although it is in the end up to individual Masters what they put in their Orders. The meeting therefore requested the WMO Secretariat to raise this issue with the International Chamber of Shipping (ICS) that represents the Shipowners/Operators worldwide (**Action**: WMO Secretariat).

III-A/4.2.4 Under this agenda item, the meeting noted that the tools developed by the Task Team on VOS Recruitment and Programme Promotion (e.g flyer, power point presentation) should also be used to promote VOS through shipping companies (**Action**: PMO and VOS operators). The meeting further recognized that there are a number of other potential issues, such as future ship design to accommodate observation instrument/ocean science room, training of mariners in meteorological observations, which could be raised with IMO. The meeting agreed with the importance of further enhancement of the relationship between IMO and WMO (**Action**: WMO Secretariat).

III-A/4.3. Impact of ISPS Code on VOS operations

IIIA/4.3.1 Ms Fletcher presented a review of how the International Ship and Port Security Code (ISPS Code), introduced on 1 July 2004, had impacted on PMO operations and VOS ships worldwide. PMOs now have to comply with a range of security requirements before they can gain access to VOS ships. Compliance with these requirements is further complicated by the fact that the requirements may be different at each Port and Ship. PMOs now need to be better organized; planning visits carefully in advance to ensure access to Ports and Ships. PMOs have adapted to deal with these requirements, but problems still arise from time to time when a PMO has to visit a Port or Ship for the first time. Difficulties can also arise if NMS attempt to send personnel other than the accredited PMO to the Port for some reason.

III-A/4.3.2 The meeting noted with concern that the enforcement of the ISPS Code in many ports had stopped the PMO from being able to make spontaneous visits to ships. These were the type of visits where a PMO would walk up the gangway of a ship, discuss weather and VOS activities with

the Master and often be successful in persuading the ship to join the VOS programme. Since 1 July 2004, a PMO must be on a Ship's 'Visitors List' before being allowed access to the Ship berth or Ship. In many cases, it is the job of the shipping agent to add the PMO's name to both the Ship Visitor List and the Port Gate security list. If the agent fails to perform this function, then it can mean a wasted trip to the port for the PMO. Lack of Ship access, means VOS ships do not receive PMO support, instruments remain uncalibrated and delays can mean that opportunities to load buoys or floats for deployment are lost.

III-A/4.3.3 The meeting noted with appreciation some suggestions given by some experts including Captain Gordon Mackie. At a local level, PMOs are encouraged to meet with the Port Security Committee (PSC) at each port to try to obtain an agreement to allow the PMO access; without, for example, a 24-hour notice or the security and safety induction. A list of PMOs and their details could be lodged with the PSC so that this information can then be given to the Port Facility Security Officers to allow an easier access process when arriving. (**Action**: PMOs, VOS operators as appropriate)

III-A/4.3.4 The meeting noted that, for the future, it would be advantageous if NMS personnel would be accepted as bona fide visitors acting on Government business (in the same way as Customs, Immigration, Health Inspectors, Police etc). In this regard, the meeting requested the VOSP and SOT chairpersons and WMO Secretariat to keep monitoring this issue and take appropriate actions in due course. (**Action**: VOSP and SOT chairpersons and WMO Secretariat)

III-A/4.4. Impact of National Customs requirements on VOS operations

III-A/4.4.1 Ms Fletcher raised an issue that some National Customs agencies have required increased documentation to move instruments and scientific equipment on and off ships, which can delay PMO activities. The meeting noted that although this was not a problem for most countries, VOS operators need to be familiar and comply with their National Customs requirements to ensure ongoing VOS operations.

III-A/4.5 Review of the Marine Met Services Monitoring Programme Questionnaire

III-A/4.5.1 The marine meteorological services monitoring questionnaire has been sent to National Meteorological Services (NMS) for completion by national VOS at four-yearly intervals since the early 1990s. The results of the year 2000 survey were presented to JCOMM-I in June 2001. JCOMM-I agreed on the need to continue a long-term global marine meteorological services monitoring programme, based on the format of the year 2000 questionnaire. JCOMM-I thus decided to keep in force Recommendation 1 (CMM-XI) - Marine Meteorological Services Monitoring Programme on that subject. The JCOMM Expert Team on Maritime Safety Services (ETMSS) at its first session (ETMSS-I) (Lisbon, September 2002) made some minor changes to the format of the 2000 marine meteorological services monitoring questionnaire. The revised 2004 questionnaire was sent to PMOs on the PMO list kept by the WMO Secretariat and the collected questionnaires are now being analyzed by Captain Gordon Mackie under subcontract with a WMO consultant, Mr Andy Fuller.

III-A/4.5.2 The meeting noted that some VOS ships had difficulties understanding the questionnaire. This was mainly on ships where English was not the first language of the Master or Officer who completed the questionnaire, but even on English speaking ships, Officers reported difficulties in completing the questionnaire to NMS. Terms such as 'clarity' and 'timeliness' might be better understood if they were expanded in short questions, e.g. 'are warnings easy to understand?', 'are warnings received on time?' Another problem is that some ships do not indicate the name of the NMS providing the forecasting service or the identity of the LES/NAVTEX station. The name of the NMS and LES/NAVTEX station is obvious for coastal ships, but if not completed by deep-sea vessels it is difficult to know which service to attribute the assessment to.

III-A/4.5.3 From his experience with the 2004 questionnaire, Captain Mackie proposed some amendments and the Panel was invited to provide the VOSP chairperson with a list of other

improvements which would be passed to ETMSS for inclusion in the next questionnaire. (**Action**: VOSP chairperson and Task Team on VOS Recruitment and Programme Promotion)

III-A/4.6 Multi-Recruitment Problem

III-A/4.6.1 Referring to the WMO-No. 47, it appears that several ships are declared as being recruited by more than one country. Mr Pierre Blouch (France) reported on the difficulties he had to identify the NMS which must be compensated for some multi-recruited ships under the framework of E-SURFMAR. Data monitoring is also affected by multi-recruitment. The multi-recruitment raises questions such as "Who is responsible for a ship which reports dubious values onto the GTS"? The meeting agreed that it is strongly desirable that each VOS has only one responsible country.

III-A/4.6.2 The meeting noted that the regular update of WMO-No. 47 and its use by PMOs, prior to the recruitment of ships, would minimize the multi-recruitment problem. Dr Elizabeth Kent (United Kingdom) advised that from a scientific viewpoint she was also concerned by the multi-recruitment issue and the meeting accepted her offer to provide regular lists of ships which are declared as being recruited by more than one country in the short term (**Action**: Dr Elizabeth Kent). The list will be published on the E-SURFMAR web server (**Action**: Mr Pierre Blouch).

III-A/4.7 Transmission of test SHIP messages onto the GTS

III-A/4.7.1 Mr Pierre Blouch (France) reported that a few VOS operators were presently using callsigns such as "TEST" in SHIP reports to test the GTS transmission despite there being no procedures defined in the Manual on the GTS for the transmission of "test" SHIP reports on the GTS. Although the data sent with this callsign is often easily identified as being "test" data, the practice is not necessarily known by meteorological centres so the data is automatically ingested by model assimilation schemes. Recently, callsign "AVOSTEST" was used by a VOS operator. Having 8 characters instead of the 7 maximum characters allowed for callsigns, it appears as "AVOSTES" at some monitoring centres. Thus, it was not obvious that these data were not valid.

III-A/4.7.2 To enable a "test" ship message to be sent on GTS, Mr Blouch recommended the use of dedicated callsigns for this purpose. Callsigns could be the "TEST" string followed by 2 characters identifying the country of origin – for example: TESTFR for France. Meteorological centres would be then advised to ignore this data and so avoid assimilation in the Global Data Processing and Forecasting System (GDPFS) centres.

III-A/4.7.3 The meeting noted that there was a need to develop procedures defined in the Manual on the GTS for the transmission of test SHIP reports on the GTS. The meeting therefore agreed that the requirements for the exchange of test SHIP reports be detailed and submitted to CBS, through the CBS Expert Team on GTS-WIS Operations and Implementation (ET-OI) of the CBS OPAG on ISS, for consideration. The meeting accepted the nomination of Mr Pierre Blouch as the SOT focal point to liaise with the CBS ET-OI on this issue (**Action**: Pierre Bloch).

III-A/5 DATA MANAGEMENT

III-A/5.1 Monitoring Centre Report

RSMC, Exeter

III-A/5.1.1 The meeting noted with appreciation a report on real-time data quality monitoring conducted by the RSMC, Exeter, presented by Mr Gareth Dow (United Kingdom). The report is reproduced as ***Annex IX***. The meeting agreed that monitoring and its follow-up by PMOs has significantly enhanced the quality of data available in real-time on the GTS.

III-A/5.1.2 The meeting recalled that the RSMC, Exeter produces i) Monthly Lists of Suspect Marine Platforms, ii) Monthly Reports on the Quality of Marine Surface Observations and iii)

Monthly lists of monitoring statistics for individual national fleets. The results are sent to the WMO Secretariat and other global lead monitoring centres (RSMC, Exeter, JMA, NCEP and ECMWF). Based on the agreement at SOT-II, six variables (Pressure, Wind Speed + Direction, & SST, Air Temperature and Relative Humidity) are monitored.

III-A/5.1.3 The meeting reviewed the current monitoring criteria for the six variables and agreed that no changes were needed, although it was suggested that the current format could be amended to highlight the actual criteria being flagged (**Action**: RSMC Exeter).

III-A/5.1.4 The meeting noted that the RSMC Exeter was not well informed of remedial actions taken by PMOs based on suspect ship lists. The meeting agreed that the feedback system used for the buoy monitoring had been working well and that the system could be applicable to VOS data monitoring as long as Pub. 47 is kept updated. The meeting requested the RSMC, Exeter, the JCOMMOPS Technical Coordinator and the VOS Panel chairperson to discuss and decide the details of the procedures, and inform VOS operators. (**Action**: RSMC Exeter; JCOMMOPS Technical Coordinator and the VOS Panel chairperson)

III-A/5.1.5 The meeting noted that although six-monthly reports were not as effectively used as monthly reports, there would be some usefulness if the information was distributed in a different format. The meeting requested the Met Office and the VOS Panel chairperson to review the format. (**Action**: RSMC Exeter, VOS Panel chairperson)

III-A/5.1.6 The meeting noted with appreciation that monthly monitoring suspect ship lists are provided to countries and/or national VOS focal points, and should be available shortly on the following Met Office web site as Table1 in the monthly Global Data Monitoring Report:

http://www.metoffice.com/research/nwp/observations/monitoring/index.html

The meeting noted with appreciation that the RSMC Exeter was pleased to provide any country and/or national VOS focal point with monthly monitoring statistics for their VOS. The meeting encouraged those wishing to receive copies in the future to advise the Met Office of their e-mail addresses, so that they can be added to the distribution list. (**Action**: VOS focal points and ship operators). Noting that while Pub. 47 is updated on a quarterly basis, some countries update their ship lists on a monthly basis. The meeting requested the Met Office to use national ship lists for monitoring as appropriate (**Action**: RSMC Exeter).

III-A/5.1.7 The meeting noted with interest examples of the timeliness of the VOS reports received at the RSMC Exeter (see ***Annex IX***). It can be seen from the upper graph that during November 2004, the majority of ship reports were received promptly: nearly 20% were received within just 5 minutes, 80% within 45 minutes and 90% of all VOS reports were received within about 80 minutes of the observation time. The cut-off time for operational NWP global data assimilation is typically 2 hours after the nominal analysis times of 00, 06, 12 and 18 UTC, by which time the graph shows that a healthy 95% of all VOS observations should have been received. The meeting agreed that this was useful information for monitoring, and requested the Met Office to include this timeliness information on the VOS as a whole in its monthly reports, to produce timeliness plots for all VOS national fleets listed in WMO Pub. 47 and to make them available from the Met Office web site. (**Action**: RSMC Exeter, VOSP chairperson)

Sample VOS Data Monitoring Analysis

III-A/5.1.8 Dr Elizabeth Kent (United Kingdom) presented a report on sample VOS data monitoring analysis including some simple analyses of marine surface observation numbers, global distribution and completeness of reports, regional differences from a forecast model and metadata. Some monitoring information can be obtained from the Observations System Monitoring Centre, live-access server: http://www.ferret.noaa.gov/OSMC/. It has been shown that counting only the number of observations per month does not give a correct indication of the data coverage or completeness; and that the quality of the observing system, in terms of sampling, will be

overestimated. Examination of regional variations in the quality of the data will highlight systematic errors in the observations, such as heating errors in the air temperature observations. Regional variations may also be a useful diagnostic tool for examining the quality of the model used in the monitoring. These are just two examples of how the monitoring can be extended to give a more complete analysis of the quality of the observing system. In addition to monitoring individual ship quality, monitoring statistics should be constructed to assess: data quality; global coverage; metadata availability; regional differences in data; differences due to measurement methods; independence of observations; completeness of reports (for calculation of surface heat exchange) and contributions to observing systems from the various platforms (ships, moored buoys and drifting buoys).

III-A/5.1.9 The meeting noted that Dr Kent's report presented information which could be useful for any future extension of data monitoring activities.

III-A/5.2 Global Collecting Centres (GCCs) Report

III-A/5.2.1 GCC Report on VOS

III-A/5.2.1.1 Miss Elanor Gowland (United Kingdom) presented the GCC report. The meeting reviewed the 2004 GCC annual report, the functioning of the two centres, their responsibilities as well as their role in the VOSClim project. 2004 was the 11th year of GCC operation, and 17 countries submitted more than 1.1 million observations to the centres (3% increase on 2003).

III-A/5.2.1.2 At the first session of the JCOMM Expert Team on Marine Climatology, ETMC-I, Gdynia, Poland, July 2004, the new IMMT-3 format and the new MQCS-5 version as proposed by Germany, which took into account the VOSClim data requirements, were agreed upon. The full layout is given in appendices IV and V of the ETMC report, available on the JCOMM web site: http://www.wmo.int/web/aom/marprog.

III-A/5.2.1.3 Miss Gowland also presented the current status of a pilot project being undertaken by the Expert Team on Data Management Practices. The GCCs are represented on this Team. The United Kingdom (as a Responsible Member) is participating in the End-to-end Data Management prototype project, providing marine climatological data. The results of the prototype will be presented to JCOMM-II.

III-A/5.2.1.4 SOT-III supports these recommendations, as well as the proposed role and responsibilities of the GCCs, complemented by their responsibility for the revision of the MQCS-software for the GCCs and Contributing Members (CMs).

III-A/5.2.2 GCC Report on VOSClim

III-A/5.2.2.1 The GCC's report on VOSClim was presented and discussed under agenda item III-B/2.3.

III-A/5.3. Review of MCSS including codes and formats (report by the chairperson of the Expert Team on Marine Climatology)

III-A/5.3.1 The activities of the Expert Team on Marine Climatology during the last intersessional period was presented in detail by Dr Miroslaw Mietus (Poland), chairperson of the Expert Team. Dr Mietus stressed the importance of ETMC activities, recalling the new International Marine Meteorological Archive (IMMA) format, metadata, the history of CMM decisions concerning VOS and MCSS, bilateral data exchange within GCCs, development of the new IMMT format (IMMT-3) and the new version of MQCS (MQCS-V) which meets the needs of the VOSClim Project, etc. He pointed out that data management, including data quality, is a very important issue for VOS/VOSClim data and the continuation of MCSS. He also mentioned that cooperation with the JCOMM Expert Team on Data Management Practice (ETDMP) was an important issue for the ETMC.

III-A/5.3.2 Dr Mietus informed the SOT-III that the Second JCOMM Workshop on Advances in Marine Climatology (CLIMAR-II), in association with a seminar to celebrate the 150th anniversary of the Brussels Maritime Conference, successfully took place in Brussels, Belgium in November 2003. Almost 80 participants attended the meeting, 46 oral presentations were given, and 28 posters were presented. He also informed the meeting that selected papers would be published shortly in a special issue of the International Journal of Climatology and will form an update to the Dynamic Part of the Guide to the Applications of Marine Climatology.

III-A/5.3.3 The meeting expressed its appreciation to Dr Mietus for his comprehensive report. The meeting agreed that the ETMC and the SOT, especially the VOS Panel should keep close liaison.

III-A/6 INFORMATION EXCHANGE

III-A/6.1 Web site

III-A/6.1.1 Mr Graeme Ball (Australia) reported on the JCOMM VOS web site that is hosted and maintained by the Australian Bureau of Meteorology.

III-A/6.1.2 The JCOMM VOS web site draws on the VOS Framework Document and the Final Report from SOT-I, as well as training material from the Second Regional PMO Training Workshop (RAs II & V, Melbourne, 1999) and the Third Regional PMO Training Workshop (RA I, Cape Town, 2000).

III-A/6.1.3 The web site provides an overview of the VOS and PMO programmes and the VOSClim project, and provides links to: operational information; electronic logbook software; VOS and VOSClim monitoring reports; VOS, VOSClim and ASAP brochures; and national VOS web sites.

III-A/6.1.4 Mr Ball also reported on the changes he had made to the web site since SOT-II:

- Complete rewrite to make better use of Cascading Style Sheets for page formatting;
- Full compliance with Level A of the Web Content Accessibility Guidelines 1.0;
- Use of an alternate and more functional Javascript main menu;
- Port Meteorological Officers elevated to a ‘top level’ menu item.;
- Addition of the ASAP brochure (PDF format), action item V/5.2.2 from SOT-II;
- Addition of the SOT-II Final Report (PDF format).

The web site URL is http://www.bom.gov.au/jcomm/vos/.

III-A/6.1.5 The Panel expressed its appreciation to Mr Ball and the BoM for maintaining the useful web site.

III-A/6.2 Publications

III-A/6.2.1 The meeting noted that the VOS brochure remained useful for programme promotion. The meeting agreed that there was no need to produce a revised brochure. The brochure can be downloaded from the VOS web site. Hard copies are also available from the WMO Secretariat upon request. The meeting noted that the brochure was a very useful tool for new participants in SOT for their future ship recruitment.

III-A/7 FUTURE WORK PROGRAMME AND IMPLEMENTATION ISSUES

III-A/7.1 SOT coordination and integration issues

III-A/7.1.1 The Panel recalled that VOSP-III discussed the issues of 'over-tasking of VOS' and 'volatility' of ship trading patterns. Both of these remain significant issues for VOS operators and for SOT in general.

III-A/7.1.2 Issues for VOS were raised under agenda item 4. The Panel agreed that the SOT should endorse discussion on the security issues arising from availability of SHIP data on the web. With regard to the Marine Meteorological Services Monitoring Programme, the Panel, through SOT, will submit suggested improvements to the questionnaire to the Expert Team on Maritime Safety Services (ETMSS) so that the revised questionnaire should be used for the next monitoring.

III-A/7.1.3 The Panel recalled that the Recommendation (JCOMM-I) (June 2001) on 'Resources for Ship-based Observations' underlined the VOS programme. In consequences, the fifty-fourth session of the WMO Executive Council (EC-LIV) (June 2002), by its Resolution 7 (EC-LIV):

(a) Approved the recommendation;
(b) Urges Members to take actions regarding ship-based observations as detailed in the recommendation;
(c) Requests the Secretary-general, in coordination with the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) and the co-presidents of JCOMM, to consult with and assist Members, as appropriate, in the implementation of the recommendation.

The Panel agreed that Recommendation 2 (JCOMM-I) should be kept in force at JCOMM-II.

III-A/7.2 Action items

III-A/7.2.1 Action items raised in the meeting are summarized in ***Annex XX***.

III-A/8. ORGANIZATIONAL MATTERS

III-A/8.1 Terms of Reference of VOSP

III-A/8.1.1 The terms of reference of the VOSP were reviewed, along with those of the other component panels, under agenda item I/9.

==========

III-B. VOSClim, Fifth Session

==========

III-B/1. STATUS REVIEW

III-B/1.1 Report of the VOSClim Project Leader

III-B/1.1.1 The Project Leader, Ms Sarah North (United Kingdom), presented a report on the structure and current status of implementation of the project, and highlighted the outstanding issues that needed to be addressed before it could be considered as fully operational. The report is reproduced in ***Annex X***. She pointed out that progress had been disappointing since VOSClim-IV with only 113 project ships having been recruited by December 2004, still well short of the target of 200 ships established at the outset of the project. Although a further 57 ships had been proposed for recruitment to the project in 2005 the target was unlikely to be met before mid-2006 at the current recruitment rates. To some extent this was due to PMO resource limitations and to many changes in the project focal points over the last year.

III-B/1.1.2 Although the real time transmission of project data was operating efficiently, significant problems had arisen with respect to the display of and availability of data sets on the project web site. Investigations were being made into why there were discrepancies between the volume of BUFR data sent by the Real Time Monitoring Centre (RTMC) (Met Office, United Kingdom) and that being displayed by the Data Assembly Centre (DAC) (National Climatic Data Center, USA). Similarly the volume of delayed mode project data (including the additional project IMMT-2 code groups) being sent by the Global Collecting Centres (GCCs) to the DAC had been disappointingly low, and would need to be addressed. Scientific analysis of the data could not properly commence until real time and delayed mode data streams were operating correctly.

III-B/1.1.3 The Project Leader also invited the meeting to consider a number of issues relating to the collection of the project metadata, and stressed the importance of the PMO involvement, both of which are essential to the success of the project. It was noted that the real time monitoring activities were functioning well, although the remedial actions taken in response to ships listed as 'suspect' were not currently being recorded. Although Certificates of Participation were being issued to recruited ships, and the project brochure was being given to prospective recruits, resource issues were preventing preparation of a second issue of the Project Newsletter.

III-B/1.1.4 Summarizing the Project Leader said that there was a pressing need to re-invigorate the project, by encouraging increased recruitment levels, by evaluating the value of the project data, and by making the data available to a wider range of users.

III-B/1.2 Report on Status of Participation and Ship recruitment

III-B/1.2.1 This issue was addressed in the report of the Project Leader (III-B/1.1)

III-B/1.3 Report by the VOSClim Scientific Advisers

III-B/1.3.1 The meeting was presented with a summary of the status of VOSClim by the Scientific Advisers. The report is reproduced in ***Annex X***. Although some problems with data provision have occurred (see Project Leader's Report, VOSClim DAC report and GCC VOSClim report), it was felt that the system required only relatively small changes to overcome these problems and that this was achievable in the short term. Despite these problems the meeting was pleased to note that a scientific paper using the VOSClim dataset and digital images had been accepted by the International Journal of Climatology.

III-B/1.3.2 The meeting discussed the mechanisms for delivery of VOSClim metadata and agreed that responsibility for VOSClim metadata was best achieved by a single point of delivery through the WMO Pub. 47. The meeting requested the DAC to link to the latest version of Pub. 47 on the WMO web site and the JCOMM VOS web site, and the tools for metadata display and interrogation on the JCOMMOPS web site (**Action**: DAC). Responsibility for the association of metadata with individual VOSClim reports will be assumed by the Scientific Advisers making use of current metadata from the WMO web site and an archive of Pub. 47 held at the NOAA Climate Diagnostics Center. It was agreed that a mechanism for the provision and storage of VOSClim digital images would be investigated. (**Action**: Scientific Advisers and DAC) It was noted that there was experience at MEDS in digital image storage that would be valuable in the development of any archival and retrieval system. In the absence of a common digital standard for recruitment forms, it was agreed that responsibility for archival of the VOSClim recruitment and ship visit forms would remain, for the time being, with the operators rather than being collected by the DAC.

III-B/1.3.3 The meeting recognized with regret that VOSClim recruitment was below the level where a high quality dataset could be developed. The importance of increased recruitment, both among operators who already contribute to VOSClim and to operators who have yet to contribute, was stressed (**Action**: VOS operators). The meeting was reminded of the revised recruitment criteria adopted at VOSClim-IV and reported at SOT-II. VOSClim requires participation from a wide variety of ships, and a good reporting record is as important as sophisticated instrumentation and automatic systems. The meeting was reminded that one goal of VOSClim was to assess data

quality from all instruments used on the VOS and that the construction of the VOSClim dataset would include quality assurance to exclude observations where necessary. The meeting requested VOS operators to consider all ships with electronic logbooks for inclusion in the VOSClim project (**Action**: VOS operators). The expertise of the VOS operators and PMOs in assessing potential ship quality was recognized as important; however it was pointed ou that more ships needed to be recruited. For example French ships using the BATOS system have been considered and rejected for VOSClim participation by France because it was not possible for the PMOs to make frequent visits to the ships. However it was noted that the monitoring procedures in place meant that extra visits, although desirable, were not essential if the results of the monitoring could be relayed to the ship.

III-B/1.3.4 The meeting agreed with the addition of Mr Scott Woodruff (USA) and Mr David Berry (United Kingdom) to the VOSClim Scientific Advisers Team; and noted that Dr Peter Taylor (Unted Kingdom) would no longer be able to act as Scientific Adviser due to other commitments. Dr Taylor was thanked for his valuable contribution to the project.

III-B/1.4 Review of Action items from VOSClim IV

III-B/1.4.1 The meeting reviewed the status of action items arising from VOSClim-IV and earlier sessions. Some of the outstanding actions remaining to be completed (e.g archiving the BUFR data) were addressed under the relevant SOT agenda items. However, it was noted that the majority of these actions concerned routine matters, and would therefore be addressed through the efficient routine operation of the project. Accordingly, whilst these ongoing actions remain for further review by the project team, any future actions related to VOSClim will be included in the consolidated list of SOT Actions (***Annex XX***).

III-B/2. DATA MANAGEMENT

III-B/2.1 Real Time Monitoring Centre

III-B/2.1.1 Mr Gareth Dow (United Kingdom) made a presentation on behalf of the VOSClim Real Time Monitoring Centre (RTMC) (***Annex XII***). Six variables are currently monitored by the RTMC: Pressure, Air Temperature, Relative Humidity, Sea Surface Temperature, and Wind Speed & Direction. The RTMC provides:

- Monthly ship statistics: a monthly list of monitoring statistics for all participating project ships is sent by e-mail to the Data Assembly Centre (NCDC, USA) for inclusion on the project web site.
- Monthly ‘suspect’ lists: a monthly list of monitoring statistics for project ships identified as having submitted 'suspect' observations is sent to the project focal point in each participating National Meteorological Service (NMS).

The meeting noted with appreciation that the RTMC monitoring had recently been extended to include prospective (or candidate) ships.

III-B/2.1.2 It was noted that some of the ships being flagged by the monitoring procedure were typically operating near coasts or in ice covered regions. The meeting requested the RMTC to take appropriate actions so that only reports received in ocean areas (model surface type 'ocean') would be included in the monitoring statistics (**Action**: RTMC). The RTMC requested that operators who had responded to the monitoring statistics should provide feedback on remedial actions taken (**Action**: VOSClim operators). The meeting agreed that once a VOS monitoring feedback system has been established using the JCOMMOPS facility, the mechanism should be extended to the VOSClim project (see para III-A/5.4.1) (**Action**: RTMC, JCOMMOPS Coordinator, VOSClim operators). The need to maintain an up-to-date list of the project focal points on the web sites was stressed (**Action**: VOSClim focal points). It was also requested that the modifications to the list of participating ships be sent to the RTMC as well as the VOSClim Data Assembly Centre (**Action**: VOSClim operators).

III-B/2.1.3 The RTMC is also responsible for transferring the project ships' observations along with co-located model data to the Data Assembly Center (DAC) at the National Climatic Data Center, USA. Since July 2002 the Met Office has been sending daily VOSClim BUFR data to Washington via the GTS. These data has been transmitted onwards to the DAC since April 2003. The 47 elements encoded in the BUFR message can be seen in Appendix 4 of the RTMC report (***Annex XII***). More information on this part of the VOSClim data flow is given in the report of the DAC.

III-B/2.2 Data Assembly Centre (including data and metadata collection, and the project web site)

III-B/2.2.1 The National Climatic Data Center (NCDC) has been conducting the VOSClim Data Assembly Center (DAC). Mr Alan Hall (USA) presented the current VOSClim data flow on behalf of DAC (***Annex XIII***). Three data streams are archived at the DAC, a near real time collection of ship observations extracted from the GTS, ship observations plus model fields received from the RTMC in BUFR format and a delayed mode stream from the Global Collecting Centres (GCCs). There has been much recent activity which has resulted in improved data flow. It was noted that there is a gap in the BUFR data stream between the end of April and the end of August 2003 due to the transition from e-mail to GTS transmission of the BUFR data stream. The meeting requested the DAC and the RTMC to take actions to recover data from the Met Office to fill this gap (**Action**: DAC and RTMC). The meeting noted with concern that only a few observations have been received from the GCCs (see III-B/2.3).

III-B/2.2.2 It was agreed that there should be improved mechanisms put in place to avoid RTMC BUFR data loss, to be agreed between the DAC and the RTMC (**Action**: DAC and RTMC). Mechanisms for simplifying data delivery between the RTMC and the DAC, such as ftp, should be considered (**Action**: DAC and RTMC). The meeting requested the DAC to simplify data delivery to users through use of ftp site (**Action**: DAC). The delayed mode delivery mechanisms require clarification. The meeting requested the RTMC to investigate whether the monthly statistics and suspect lists can be transferred to the DAC by ftp rather than e-mail. (**Action**: RTMC)

III-B/2.3 (III-A/5.2.2) GCC Report on VOSClim

III-B/2.3.1 Ms Elanor Gowland (United Kingdom) reported on the availability of VOSClim data through the GCCs. An important element of the VOSClim project is the availability of additional elements intended to allow an improved assessment of data quality. These additional elements require data to be transferred in either IMMT-2 or preferably IMMT-3 format. Two issues were identified which have resulted in only small amounts of delayed mode data being available. Firstly, although TurboWin has been modified to allow the export of these parameters, the mechanisms are not in place in all of the contributing countries to apply the minimum quality control standards to these data, which is required before relaying the observations to the GCCs. The second problem is that if the contributing countries submit the data in IMMT-1 format the VOSClim additional parameters are missing. It is not clear in all cases whether the additional parameters were initially collected and then stripped from the report, or whether they were never logged. We therefore have a backlog of IMMT-2/3 format data which has not yet been submitted to the GCC and missing elements from many of the reports which have been submitted. The result is that only about 10k reports containing delayed mode parameters are presently available from the DAC. About 55k delayed mode reports are available in total, most without the additional parameters. The meeting requested that the VOSClim operators should ensure the implementation of the latest version of IMMT. (**Action**: VOSClim operators)

III-B/2.3.2 The VOSClim reports are separated from the VOS delayed mode data stream by the GCC Germany and transferred to the DAC at NCDC. The GCCs will keep on addressing technical problems in the contributing, storing, processing and accessing VOSClim data. All contributing members of the VOSClim project should review their delayed mode data submission processes to

the GCCs in IMMT-2 or IMMT-3, and ensure or work toward their processes and submissions being up-to-date. (**Action**: VOSClim operators)

III-B/2.3.3 It was also noted that the French BATOS system does not presently allow the output of the VOSClim additional elements. The meeting encouraged France to attempt to revise the system. (**Action**: France)

III-B/2.3.4 The meeting expressed its appreciation to the RTMC, the DAC and the GCCs for their valuable support to the VOSClim project.

III-B/3. FUTURE DEVELOPMENT

III-B/3.1 The Future of VOSClim

III-B/3.1.1 Dr Elizabeth Kent (United Kingdom) and Ms Sarah North (United Kingdom) presented recommendations for the future of the VOSClim Project. The meeting agreed that it was now appropriate that VOSClim should progress from an 'implementation phase' into an 'evaluation phase' which will be designed to assess the added value that the VOSClim project provides. It was noted that the lack of delayed mode data for the project was a problem and it was agreed that as an interim measure that the VOSClim operators would provide raw data from the data entry software direct to the Scientific Advisers.

III-B/3.1.2 The meeting also agreed that an assessment of the 'added-value' of VOSClim data should be performed by the Scientific Advisers by comparing it with data from the wider VOS. This should allow the identification of which, if any, of the VOSClim project components which are acting to improve the quality of VOS data. For this purpose, the meeting agreed the following:

a. The Scientific Advisers convene an informal 'Scientific Users Group' to widen expertise, inform the development of the high-quality dataset and guide the assessment and exploitation of the value of VOSClim datasets. (**Action**: Scientific Advisers)
b. Based upon the results of this assessment, a strategy for the future production and maintenance of a high-quality dataset should be developed and agreed. This should include a determination of how many ships and observations will be needed to ensure the quality of the dataset.
c. The resultant high-quality dataset should be produced in preparation for further consideration and presentation at SOT-IV. Once produced it should be advertised and made available to users.

III-B/3.1.3 The meeting agreed that management of the VOSClim Project should be transferred to a task team under the VOS Panel of SOT. The meeting decided to establish the Task Team on the VOS Climate Project under the leadership of Ms Sarah North (formerly the VOSClim Project Leader). This Task Team will replace the VOSClim Project management team. Membership of the Task Team should include representatives of all participating countries, the VOS Panel chairperson, the RTMC, the DAC, the GCC and the Scientific Advisers. The members and tasks of the Task Team on the VOS Climate Project are in ***Annex III***. The meeting requested the JCOMMOPS to setup and maintain a VOS Climate Project Task Team mailing list (**Action**: JCOMMOPS).

III-B/3.1.4 Taking full account of the scientific assessment of project data, the meeting agreed that this new Task Team should prepare a report to SOT-IV on, inter-alia, the following over-arching VOSClim issues (**Action**: Task Team on the VOS Climate Project):

a. Should VOSClim be continued as a project, or be developed into a separate long term operational programme? If so, what form should this programme take?
b. Is the high-quality dataset a valuable resource? If so, how should it be updated operationally?
c. How can the lessons of VOSClim be used to improve data quality in the wider VOS?

III-B/3.1.5 The meeting requested the Scientific Advisers to produce a VOSClim dataset in time for presentation to SOT-IV. Mechanisms for the maintenance of the datatset should also be developed (**Action**: Scientific Advisers). The meeting recalled that the GCC report on VOSClim (item III-A/5.2.2) presented that there were a number of registered VOSClim ships which do not provide GCC with appropriate IMMT-2 data. The meeting noted that the Scientific Advisers need delayed mode data from all VOSClim ship, and therefore requested that VOSClim operators who are currently not providing delayed mode data in IMMT-2 and IMMT-3 formats to the GCC to contact the Scientific Advisers (eck@soc.soton.ac.uk) to arrange delivery of delayed mode data as a temporary measure to allow scientific assessment to proceed. (**Action**: VOSClim ship operators) The meeting stressed that this was a temporary measure and that all VOSClim data should be sent to GCC accordingly.

III-B/3.2 Project Promotion

III-B/3.2.1 The meeting recalled that three tools (the VOSClim brochure in four languages, the VOSClim Newsletter, and the VOSClim certificate) have been developed and used for the purpose of project promotion. The meeting agreed that the VOSClim brochure was still valid and useful and that it can be downloaded through the VOSClim web site. The meeting also agreed that although a SOT certificate was being developed, the VOSClim certificate should also be retained. No further tools were needed at this stage.

III-B/3.2.2 The meeting agreed that issuing a newsletter needed considerable resources for editing and publishing, and that therefore it was not appropriate at this time to issue further issues. As an alternative, Robert Luke (USA) kindly offered to include an updated VOSClim article in a coming edition of the US Mariners Weather Log. The meeting thanked Mr Luke for making the article widely available. The meeting encouraged NMS to take similar actions as appropriate (**Action**: NMs).

III-B/3.2.3 The meeting noted with appreciation that the DAC maintained a VOSClim web site which provided access to all the required project information including the brochure, monitoring information and various forms. The web site is a useful operational tool and has also been playing an important role for project promotion. It was felt, however, that there was room for improvement in the content and layout of the web site. The meeting requested the DAC to review the arrangement of the front page and make revisions as appropriate. The meeting also agreed that the Task Team on the VOS Climate Project should advise the DAC regarding any web site enhancement. (**Action**: DAC, Task Team on the VOSClim Project)

III-B/3.3 Future Recruitment

III-B/3.3.1 Based upon the foregoing discussions, the meeting was invited to set the future levels of ship recruitment and participation in the project, with a view to achieving the optimum level of global coverage.

III-B/3.3.2 The meeting once again recognized the importance of increasing the number of VOSClim ships. The meeting agreed that VOS operators should make further efforts to recruit ships. The meeting recalled that VOSClim-IV (London, July-August 2003) had agreed to accept "self-recruiting" ships as VOSClim ships provided a PMO can eventually collect the necessary metadata and follow up their performance (see para 3.2.2 of the VOSClim-IV final report - JCOMM Meeting Report No. 23). The meeting was pleased to note that a few cases of self recruitment had happened since SOT-II.

III-B/3.3.3 The meeting noted that ships equipped with TurboWin were good potential VOSClim ships pending that TurboWin would be kept revised in accordance with the VOSClim requirements.

III-B/4 FUTURE WORK PROGRAMME AND IMPLEMENTATION ISSUES

III-B/4.1 Action items

III-B/4.1.1 Action items raised in the meeting are summarized in ***Annex XX***.

III-B/4.2 Proposal of revision of Terms of Reference of VOS

III-B/4.2.1 The meeting requested the VOS Panel to review (and revise, if appropriate) the terms of reference of the VOSP taking into consideration that the meeting had agreed that VOSClim should become a Task Team within the VOS Panel. This issue was discussed under agenda item III-A/8.1.

==========

IV. SOOPIP, Sixth Session

==========

IV/1 Programme Review

IV/1.1 Report by the chairperson of SOOPIP

IV/1.1.1 The chairperson of the SOOP Implementation Panel, Mr Steven Cook (USA), opened by recalling the history of the ship of opportunity programme, with the establishment in 1985 of a panel under the Integrated Global Ocean Services System (IGOSS) with the participation of 7 nations. This has grown through the 1997 establishment of the SOOPIP, and the 2002 first meeting with SOT. Eighteen nations and many more individuals participated at the last SOT meeting.

IV/1.1.2 The chairperson then recalled the Terms of Reference of the SOOP Implementation Panel, which are to: review, recommend, and as necessary coordinate the implementation of ship of opportunity observations; to coordinate the exchange of technical information and survey new developments; to ensure the distribution of resources to ships and the transmission of data; to maintain inventories and analyses through the SOOP Coordinator; to provide guidance to the SOOP Coordinator; and to prepare an annual report. The chairperson commended the utility of the tools that the SOOP Coordinator has developed to help oversee the global system.

IV/1.1.3 The scientific objective of the XBT programme remains the same, and is based on the recommendations from the proceedings of the Ocean Observations for Climate Conference (St. Raphael, France) and The Role of XBT Sampling in the Ocean Thermal Network in Observing the Oceans in the 21st Century (2001). SOOP continues to provide complementary data to Argo and the TAO/TRITON/PIRATA moored arrays. As Argo comes on line, plans are that SOOP should gradually reduce the Low Density Sampling mode while at the same time shifting SOOP resources into Frequently Sampled and High Density line modes.

IV/1.1.4 There has been a measurable growth in the past few years in the number of XBTs being reported on the GTS. While this increase is to be commended, SOOPIP faces a challenge in balancing national priorities with the internationally agreed climate observing plans.

IV/1.1.5 The chairperson noted the submission of the two Japanese papers concerning the comparison between TSK and Sipican T5 probes and possible changes in the fall rate equation. SOOPIP encourages the XBT community to review and comment to the SOOPIP chairperson on these documents. (**Action**: XBT community)

IV/1.1.6 The chairperson noted that in cooperation with the Office of Global Program and the SOOPIP, an XBT workshop would be held during the intersessional period to facilitate XBT sampling in the Indian Ocean.

IV/1.2 Report by the SOOP Coordinator

IV/1.2.1 The SOOP Coordinator, Mr Etienne Charpentier, presented a summary of his activities on behalf of the Panel during the last intersessional period. During this period the Coordinator was based in Toulouse at CLS, Service Argos, and was employed by UNESCO. The Coordinator now shares his time between the Data Buoy Cooperation Panel (DBCP) and SOOPIP. About 11% of the total time is devoted to JCOMM and JCOMMOPS as long as there are DBCP and SOOP implications, and about 4% of the time is spent with the Argo Coordinator (supervision, team work at JCOMMOPS, relationship with the Argo Steering Team). About 30% of his total time is devoted to SOOPIP.

IV/1.2.2 The Coordinator maintains web pages, produces a number of analyses, gives user assistance, and maintains global implementation requirements and helps to coordinate implementation. This last task involved a number of missions (travels) on behalf of the Panel.

IV/1.2.3 Four types of regular reports are issued by the Coordinator: a monthly SOOP BATHY report, a monthly map of XBT profiles reported on the GTS, a temperature profile monthly map, and the semestrial SOOP resources survey, all available at the JCOMMOPS web site. Some XBT reports come in with the old JJXX or JJYY formats and need to be upgraded to JJVV. The SOOP Coordinator asked for feedback on the reports that he was creating, in particular on whether the reports were useful and appropriate. This feedback should be forwarded to both himself and the chairperson.

IV/1.2.4 Work in this last intersessional period included discussions with a number of stakeholders on global implementation. A new estimate of the number of probes necessary to fulfill the global climate line requirements, as proposed by the UOT review (1999) 24,000, was produced, which was lower than previous estimates. This however assumes an ideal distribution, which cannot always be done for logistical purposes, and taking into account national priorities. The Panel agreed that the number of required probes needed to be refined, and asked the SOOP Coordinator to continue to work on the issue. (**Action**: SOOP coordinator)

IV/1.2.5 The Coordinator maintains resources for information exchange, including mailing lists, the SOT web site, a number of JCOMMOPS monitoring tools, and links to SOOP technical reports and papers. The SOOP forum, which was not being used, was discontinued and will be replaced by a news section. The SOOP web site is maintained at IRD, and is static; information that requires regular updating is maintained at JCOMMOPS.

IV/1.2.6 The Panel thanked the Coordinator for his report and congratulated him for his work on behalf of the Panel during the intersessional period. Mr Bob Keeley (Canada) agreed to identify ships still reporting in the old JJXX format in MEDS reports, so that Panel members could target the ships for improvements (**Action**: Bob Keeley). Panel members were also urged to submit updates for the technical report and papers section of the SOOP/JCOMMOPS web site (**Action**: SOOPIP members).

IV/1.3 SOOP Monitoring reports

IV/1.3.1 Timely submission of data for Semestrial Reports

IV/1.3.1.1 The SOOP Coordinator, Mr Etienne Charpentier, recalled that since January 2001, SOOP operators were providing him on a semestrial basis with a list of XBT drops made during the last semester (January to June, and July to December). Data basically include the date, time, location, SOOP line number, operator's name, plus a set of metadata for each drop. As data are used for monitoring and statistical purposes, they do not include geophysical data such as temperature profiles. Submitted data are imported into the JCOMMOPS database, and are useful to the SOOP operator in compiling the semestrial survey, and particularly in producing line sampling indicators, showing how the global requirements (Upper Ocean Thermal Review, 1999) are being met. This in turn is useful for programme planning.

IV/1.3.1.2 For some ships, SOOP operators were not in a position to provide this data until the ship had returned to port, making it available only in deferred time. Under the present scheme, data has to be submitted to the SOOP Coordinator within three months of the end of the considered period:

- before 31 March for the preceding July to December period;
- before 30 September for the preceding January to June period.

The Panel agreed that in most of the cases, as data were transmitted in real-time, all required data could be submitted in a more timely manner. Recently, BSH has made monthly submissions, which have been very effective. The SEAS programme was also tentatively establishing procedures that would permit more timely submissions.

IV/1.3.1.3 The SOOP Coordinator discussed advantages and drawbacks of timely or monthly submissions of metadata. Advantages include: (i) more rapid production of programme status, (ii) availability of intermediary products, (iii) better programme coordination, (iv) better time management for the SOOP Coordinator, and (v) less work for SOOP operators for each monthly submission, as the total amount of data to submit would be limited. Drawbacks included: (i) incomplete semestrial reports until all required metadata are submitted, (ii) operators would need to define and implement new procedures, and (iii) making sure that timely submissions remained consistent with later ones.

IV/1.3.1.4 The Panel agreed that timely submission of the metadata would have many advantages, including earlier availability of the semestrial reports. It questioned, however, how fragmentary the reports would become, with some data being added at a later date, and particular cruises being potentially divided over more than one report. The Panel agreed to investigate the possibility of, and where possible, improving the timeliness of reporting to the SOOP Coordinator. (**Action**: SOOPIP members) The SOOP coordinator recommended the following procedures:

1) Timely submission as soon as possible of the list of observations collected XBTs. A timely submission can be monthly or as soon as sufficient data are collected for a cruise or a set of cruises. A number of fields were identified as mandatory for such submissions;
2) Timely re-submissions with complementary information is possible (i.e. in case new metadata are available);
3) Semestrial submission of all data and metadata that were not submitted with the timely submissions: due dates remain the same as before, i.e. 31 March and 30 September respectively.

IV/1.3.1.5 The meeting also discussed monitoring of XBT profile data which are distributed in real-time onto the GTS but are not necessarily taking part in the UOT implementation plan. Hence such observations are part of the broadcast mode. The meeting agreed that specific monitoring products should be established for these in order to discriminate between the two modes of operation. It asked the SOOP Coordinator to investigate feasibility of such monitoring reports and to report at the next SOT meeting *(***Action***:* SOOP Coordinator *)*.

IV/1.4 Information Exchange

IV/1.4.1 Metadata and system monitoring

IV/1.4.1.1 Mr Mike Johnson (USA) presented his plans, in his role as JCOMM OPA Coordinator, to develop real-time system monitoring and reporting capabilities, available on the web. He is working in close coordination with JCOMMOPS to avoid duplication. The effort relies on work at the NOAA Office of Climate Observation for system monitoring and reporting; PMEL for visualization and analysis tools; NDBC for connections with the GTS and additional data streams (like the GODAE servers) as well as for database operations; and JCOMMOPS for observational

platform information and monitoring as well as international coordination of implementation and operations.

IV/1.4.1.2 Plans are for a real-time monitoring capability that would allow a user to easily select what type of report is desired. This would allow for selection of a domain, resolution by observing platform or parameter, or by time frame. The database would store 5 years of real-time data, which will eventually allow for a sense of the trends in the observing system. Selection of data by country and platform would be available.

IV/1.4.1.3 Security will be an issue for ship-based operations, as the concept was to allow for real-time tracking of all incoming data. The solution currently being considered is to build a time delay of between 2 and 7 days in the availability of ship observations. Mr Johnson indicated that the discussions at this meeting on ship security were helpful in that regard.

IV/1.4.1.4 A web portal that is an entry into all JCOMM observations, as well as other elements of the global ocean observing system, was being constructed. This would allow an overview of total system operations, and would include links to the individual programme web sites. This web site is available as a link off of the general network status page (which includes links to JCOMMOPS status reports as well as the NOAA OCO reports and pages): http://www.jcommops.org/network_status/. Corrections should be sent to opa@jcommops.org. The web pages presented should be operational in the 6-month time frame.

IV/1.4.2 Mailing lists

IV/1.4.2.1 The meeting reviewed existing mailing lists for the SOT. Two mailing lists were established during the last intersessional period, for VOS (vos@jcommops.org) and for PMOs (pmo@jcommops.org). The following mailing lists are also available: for SOT (sot@jcommops.org), and SOOPIP (soopip@jcommops.org). All mailing lists are managed by JCOMMOPS. Participants are invited to contact JCOMMOPS to add or delete names from the mailing lists or for changing email addresses.

IV/1.4.2.2 The SOOPIP technical mailing list (soopip_tech@noumea.ird.nc) was not being used, and is no longer functional. The meeting agreed to replace the soopip_tech mailing list with direct contacts between participants on technical issue communications, with Mr Robert Luke (USA) as focal point. (**Action**: Robert Luke)

IV/1.5 SOOPIP-III Action items review

IV/1.5.1 The Action items identified at SOT-II were reviewed during the presentations of the chairperson and SOOP Coordinator, and the outcomes are summarized below.

IV/1.5.1 Contact the two ADCP Data Centres regarding continuation under JCOMM

IV/1.5.1.1 The chairperson reported that the NOAA/NODC and JODC collaborate as a Data Assembly Centre for CLIVAR. They will continue to archive and distribute finalized, calibrated, quality-controlled ADCP data from CLIVAR cruises.

IV/1.5.1.2 The Joint Archive for Shipboard ADCP is (JASADCP), http://ilikai.soest.hawaii.edu/sadcp/. Requests for contributions of calibrated, quality-controlled data are made to US principle investigators who collect shipboard ADCP. The JASADCP does not process raw data. A finalized SADCP dataset requires integration of three data streams (ADCP currents, ship heading, and ship position), which must be done prior to submitting to JASADCP.

IV/1.5.1.3 JODC archives SADCP data in delayed-mode mainly from Japanese research organizations, and provides them with data users through Internet. SADCP data are available, as a part of ocean current data archives in JODC, on the J-DOSS (JODC Data Online Service System: http://www.jodc.go.jp/service.htm).

IV/1.5.2 Contact OOPC regarding transition from LDX to FRX and HDX

IV/1.5.2.1 The chairperson reported on his contact with Ed Harrison (USA), the chairperson of OOPC. OOPC has strongly endorsed SOOP's move to HDX and FRX mode. SOOP can count on that support continuing. Argo is coming along well in the North Pacific and North Atlantic. There is not clear guidance from GODAE concerning the continuation of LDX yet, but this should be available soon. There is growing interest in underway observing systems, including for pCO_2 and phytoplankton and chlorophyll and other biogeochemical variables. Thus there are lots of opportunities to think about the 'next-generation' of underway activities within SOOP.

IV/1.5.3 Investigate possibilities of obtaining or increasing resources for JCOMMOPS & SOOP Trust Fund to an overall SOT Trust Fund

IV/1.5.3.1 This item is reported under Item IV/5.

IV/1.5.4 Prepare for possible contribution of compiled data sets of measurements by VOS of the Carbon Network

IV/1.5.4.1 The SOOP Coordinator reported on this action under Item I/5.1.

IV/1.5.5 Develop a plan for reporting all VOS & SOOP observations in real time

IV/1.5.5.1 This action item was reported under Item IV/1.4.1 by Mr Mike Johnson, OPA Coordinator.

IV/1.5.6 Initiate development of generic scientific design standards for new ships

IV/1.5.6.1 The chairperson noted that this item was addressed during the SOT Common Session under agenda item I/4.1.

IV/1.5.7 Liaise with SOOPIP chairperson regarding WRAP vessel

IV/1.5.7.1 The chairperson coordinated with Captain Gordon Mackie and the UK Met Office to place drifting buoys on the WRAP ship for deployment in the Indian Ocean. Plans are to continue to use this vessel for buoy, float and possible XBT deployments in the Indian Ocean.

IV/2 Implementation

IV/2.1 Present Status of Sampling

IV/2.1.1 The Panel received reports on the present status of sampling from Panel members representing Germany, France, Australia, Japan, and the USA.

IV/2.2 Review of Line Responsibilities

IV/2.2.1 The meeting reviewed and discussed line responsibilities assigned to participating agencies or countries. The chairperson reminded the Panel that showing progress in implementing the lines was important in maintaining funding for the programmes. Line responsibility implies investigating ship opportunities for the line, and coordinating the logistics, training, and negotiations with shipping companies and ships. Results of agreed upon responsibilities are given in the table in ***Annex XI***.

IV/2.2.2 The Panel agreed to renew efforts to recruit ships on the following lines (**Action**: SOOP operators)

- AX34 Gulf of Guinea - Caribbean: The US and France will collaborate to investigate possibilities for this line;
- IX06 Mauritius - Malacca Straight: Japan is currently searching for a suitable ship;
- IX07 Cape of Good Hope - Persian Gulf: France will pursue a possibility (Red Sea - Reunion - Comores via the Mozambique channel);
- IX08 Mauritius - Mumbai: India will be asked to investigate this possibility, and Kenya volunteered to investigate;
- IX09S Freemantle - South Africa: No ships have been identified, but Sarah North will investigate if an MSC ship runs this route;
- IX10 Red Sea - Malacca Straight/Singapore: Japan performs the eastern part of this line, Sarah North will investigate other possibilities via the Singapore PMO;
- IX15 Mauritius - Freemantle: CSIRO and SIO will be asked to investigate this line;
- IX21 Cape of Good Hope - Mauritius: Kenya will investigate;
- PX11 Flores Sea - Japan: BOM needs additional probes if it is to perform this line;
- PX21 California - Chile: Due to changes in shipping practices, this may no longer be possible;
- PX31 Nouméa/Fiji - California: France will investigate;
- PX50 Valparaiso - Auckland: No ships currently run this route, but Ms Julie Fletcher (NZ) will inform if any possibilities arise.

IV/2.3 Discussion regarding a pool of probes to support specific lines

IV/2.3.1 The chairperson reminded the Panel that NOAA has provided funding for a pool of probes to support undersampled lines. The meeting identified two further opportunities for ship recruitment on undersampled lines: contact with the Chilean IFOP and contact with participants in the upcoming CLIVAR South Pacific Observations Workshop in October 2005 (**Actions**: SOOPIP chairperson).

IV/3 Data Management

IV/3.1 GTSPP overview and future direction

IV/3.1.1 Mr Bob Keeley (Canada) presented his report. The Global Temperature Salinity Profile Project continues to develop capabilities and deal in greater volumes of data. The project began in 1990, with the goal of collecting and archiving all profile data in the oceans. The annual report for 2003 is posted at http://www.nodc.noaa.gov/GTSPP/document/index.html. The report for 2004 is in preparation and will appear at the same URL in the first half of 2005.

IV/3.1.2 The number of BATHY and TESAC data handled at the GTSPP increased in 2003, due in large part to the Argo programme, but also to increased sampling by Triton buoys and other moored platforms. Delayed mode data continued to be added to the archive, which now counts nearly 2 million profiles. About half exist in real-time form (the delayed mode versions have not yet arrived), particularly true of data from more recent years. The timeliness of real-time data delivery continues to improve. Nearly 80% of ship observations are processed within 3 days, and by the end of 2004 Argo was providing more than 85% of its observations to the GTS within 24 hours of collection.

IV/3.1.3 The GTSPP collaborates with a number of international programmes. The monitoring that is done to the real-time GTS data is an important contribution to Argo. The GTSPP is a contributor to the CLIVAR programme, where requirements are still being defined. The GTSPP is also collaborating with the GODAE QC Intercomparison project along with Coriolis and the GODAE Data Server in Monterey

IV/3.1.4 A strategy for attaching a single unique identifier to both the real-time and delayed mode versions of XBT data has been under development at the GTSPP, and has been implemented by the US SEAS programme on a trial basis. Preliminary results were very positive.

GTSPP will continue to monitor these results to test how well the unique identification scheme performs. Both France and Australia expressed interest in implementing the same scheme for data originating from their platforms.

IV/3.1.5 The GTSPP has developed a data dictionary to help identify different data and metadata identification schemes. It is hosted by MEDS, and available at: http://www.meds-sdmm.dfo-mpo.gc.ca/meds/About_MEDS/standards/login_e.asp. Contributors to the data dictionary include major oceanographic institutes of Canada, the US NODC, and BODC. Other contributors are welcome.

IV/3.1.6 The GTSPP has collaborated with JCOMM OPA to develop an easy to understand metrics of data collection for temperature and salinity profile sampling. These are updated quarterly, and are available at http://www.jcommops.org/network_status from early 2005.

IV/3.1.7 The GTSPP plans to move forward in a number of directions. It intends to convert to BUFR code form; to regularly reconcile the NODC and Coriolis databases; to provide Argo participants profile data in an Argo GDAC-like format; to provide a hard copy source (DVD) of GTSPP data; to continue work on the unique data identifier between real-time and delayed-mode data; to extend the data dictionary; and to continue collaboration with CLIVAR and GODAE.

IV/3.1.8 In response to a question from the Panel, Bob Keeley indicated that the 4 different GTS sources monitored by the GTSPP are not tremendously different, though this varies in time and has improved substantially lately. The redundancy remains important for completeness. Statistics are available in the Annual report.

IV/3.2 GOSUD

IV/3.2.1 This report was given by Mr Bob Keeley (Canada). The Global Ocean Surface Underway Data Project continues to develop towards full capabilities to manage the surface data collected by ships while traversing from port to port. Further information, including the 2003 annual report, are available at http://www.gosud.org. The 2004 annual report will be published in the third quarter of 2005. GOSUD held 2 meetings in conjunction with Argo meetings in 2004. Meeting reports are available at the address above.

IV/3.2.2 In 2004, GOSUD produced a manual explaining its data format and QC procedures. When fully operational, GOSUD will rely on a Global Data Assembly Centre at Ifremer in Brest France. GTS data will be monitored to encourage potential participants to join, using software developed by the project. Some of the present data held at GOSUD appeared on the GTS, and this data is now available on both a web and ftp server at Brest, which can be found from the link above.

IV/3.2.3 A number of national developments relating to GOSUD are notable: IRD has taken the lead in developing products, especially of sea surface salinity (see http://www.ird.nc/ECOP). Australian colleagues have succeeded in changing data policies and will soon be providing more data to GOSUD, including historical data. The US is planning on developing TSG deployments, including procedures for delayed mode QC. Japanese colleagues send all available data in real-time.

IV/3.2.4 GOSUD has been collaborating with a number of international projects: with Shipboard Automated Meteorological and Oceanographic Systems (SAMOS) for the exchange of data; with NASA and ESA regarding sea surface salinity satellite calibration; with CLIVAR for the archiving of underway data; and with the JCOMM OPA in the production of quarterly reports and metrics.

IV/3.2.5 GOSUD will be moving forward in a number of directions. It has been seeking to collaborate with the pCO_2 observing community. It is moving towards operational procedures for more reliable and routine data handling, including streamlining with SAMOS. It is developing a BUFR template to move beyond limitations imposed by the present character code form

TRACKOB, and is working towards the development of more products, including the provision of gridded fields.

IV/3.2.6 The Panel thanked Mr Keeley for his report, and expressed their appreciation for the efforts in GOSUD in archiving the collected data.

IV/3.3 SOOP metadata requirements

IV/3.3.1 Mr Etienne Charpentier reported on the proposal to establish a pilot project to distribute in real time metadata regarding SST and temperature profile data. This followed a request by the seventh GSC meeting to JCOMM to develop and implement, through its OPA and sub-panels, a pilot project. A draft proposal was subsequently written with input from Panel Members and other JCOMM parties and presented at the 20th DBCP session in Chennai, 18-22 October 2004 as the DBCP provides most of the *in situ* SST data. Proposal was also discussed and agreed upon at the 4th JCOMM Management Committee meeting, Paris, 9-12 February 2005.

IV/3.3.2 In the proposal, it was explained that the issue had a number of implications because the observational systems, data telecommunication systems, and data processing systems in place were numerous and not necessarily homogeneous. Moreover, platform operators in charge of such *in situ* marine observing systems often came from different communities with different perspectives and priorities. Implementation was achieved nationally although there was substantial room for international coordination and standardization. Fortunately, implementation of most of these systems was well coordinated through dedicated JCOMM sub-panels (e.g. SOT, DBCP, TIP) and other associated pilot projects (e.g. Argo). However, these sub-panels were defining their strategies regarding metadata in relatively independent ways and much standardization was required.

IV/3.3.3 The proposal recommended to include a combination of (i) real-time distribution of a very limited subset of metadata along with the observations, and (ii) provision of an extensive set of metadata through dedicated JCOMM global data centre(s) yet to be established. In any case, there would need to be strong justification by the users for any metadata to be included in real-time reports, and this would have to be documented. It was also proposed to document the need for other metadata not necessarily included in the real-time reports.

IV/3.3.4 The DBCP agreed with the proposal and offered assistance in building up the project if required. The fourth session of the JCOMM Management Committee agreed that the issue had at least both OPA and DMA integration implications and should be placed under the responsibility of the OCG as the main challenge lies with the collection of the metadata from platform operators rather than with data management aspects which should be relatively straight forward, at least technically. It decided to establish an ad hoc working group and to organize a workshop in early 2006 with a fairly broad community representation (platform operators, modelers, scientific users, data centres, communications specialists). The workshop was tasked to (i) refine metadata categorization, (ii) establish rules to determine the categorization of metadata, (iii) scope out a metadata model framework for the organization of content, (iv) clarify priorities (e.g. what observational systems to target first), (v) look for candidate centres that might be willing to eventually implement a JCOMM dedicated metadata server, and (vi) establish a JCOMM *ad hoc* working group tasked to write specifications in detail and to possibly formalize the project. The JCOMM Management Committee agreed that experts should attend at their own expenses. It tasked OCG to take practical steps for the organizing the workshop, i.e. identifying appropriate experts, finding a meeting venue, drafting the agenda for the workshop, and issuing the invitations with assistance from the Secretariats for the latter. The JCOMM Management Committee meeting agreed on the Terms of Reference for the ad hoc working group.

IV/3.3.5 The SOOP Coordinator explained that the establishment of a real-time metadata server would probably be necessary to implement real-time distribution, and so XBT operators would have to write or obtain software to encode the metadata in the agreed format. These metadata standards would first have to be agreed. The Panel agreed during the intersessional period to

identify a common consistent set of metadata that is of use to XBT operators, and can be provided to scientific users, in advance of the JCOMM workshop. (**Action**: SOOPIP chairperson to initiate with XBT operators)

IV/3.4 BUFR distribution for XBT, XCTD & ADCP data

IV/3.4.1 The SOOP Coordinator reviewed the current status of GTS distribution of XBT, XCTD, and ADCP data. XBT and XCTD data distributed on GTS in real time are presently encoded using FM 63-XI Ext. BATHY (JJVV) and FM 64-XI Ext. TESAC (KKYY) character code forms respectively. During the last intersessional period, there was not a strong push from the data users to get these data in FM 94 XII Ext. BUFR format, and SOOP operators did not consider development of BUFR encoding capability as a priority. However, the meeting recognized that BUFR had the potential to include higher resolution data as well as useful metadata, unique tag, and quality information (e.g. GTSPP flags).

IV/3.4.2 BUFR should be considered, although it is a code form used primarily for meteorological purposes. Many meteorological centres are running ocean models and assimilate data from the GTS. BUFR distribution on GTS of XBT, XCTD, or ADCP data would increase the amount of information available to these models. While CBS is pushing the transition to Table Driven Code forms such as BUFR, modification of traditional character code forms is not an option anymore and any new coding requirement can now only be implemented through BUFR or CREX.

IV/3.4.3 Most SOOP operators are using INMARSAT for real-time data telecommunication, and received data is processed at national centres. From there, raw satellite data are decoded, quality controlled, and encoded in GTS format for distribution. However, no BUFR encoding capability for XBT or XCTD data have been developed so far. Only those XBT data collected via Argos can potentially be distributed in BUFR format. These are limited to XBT data collected by France, and Australia, but the real-time data resolution is low and the advantage of BUFR for Argos collected data is therefore not obvious.

IV/3.4.4 In order to permit GTS distribution of XBT data in BUFR, the following would be required at the data processing centres: (i) real-time data reception through high bandwidth satellite transmission (this is presently the case with Inmarsat), (ii) real-time reception of unique tag, (iii) implementation of adequate GTSPP quality control procedures, and (iv) availability of the required metadata.

IV/3.4.5 The SOOP Coordinator noted that the present BUFR template for XBT and XCTD data presently meets user needs. However, he suggested and the Panel recommend the addition of the GTSPP unique tag in BUFR tables and templates (**Action**: SOOP Coordinator). The Panel asked SOOP operators to evaluate impact, cost, and time required to make the necessary developments to implement the move towards BUFR, and to report to the chairperson and the SOOP Coordinator on their findings by then end of 2005 (**Action**: SOOP operators). If costs can eventually be supported, SOOP operators should start developments during the next intersessional period; if not they should look for possible funding sources and report at the next SOT meeting.

IV/3.4.6 In any case, as some of the data users have no BUFR decoding capability, BATHY/TESAC GTS distribution will continue to be required for a few more years. Parallel GTS distribution in BUFR and character code form would therefore be required for the foreseeable future.

IV/3.4.7 Regarding ADCP data, the meeting invited Member States presently making ADCP measurements and having the capability and willingness of transmitting the data in real time on the GTS to work with the SOT in order to study feasibility of using BUFR. The meeting therefore asked such Members States to designate appropriate contact points to work with the SOOP Coordinator in order to work on potential impact of developing BUFR encoding/distribution capability and to work out a proposed BUFR template for ADCP data (**Action**: XBT operators). Once a template is

agreed upon, the meeting invited the SOOP Coordinator to submit proposed template to the CBS Expert Team on Data Representation and Codes (ET/DRC) (**Action**: SOOP Coordinator).

IV/4 Issues for SOOPIP

IV/4.1 Review of N-S vs. E-W line assignment vs. required horizontal resolution

IV/4.1.1 The chairperson asked the Panel members to send their XBT sampling plans, for each route that they maintain, to the SOOP Coordinator and to the chairperson. The chairperson will solicit input from the OOPC on this issue. (**Action**: Panel members, SOOPIP chairperson, SOOP Coordinator)

IV/4.2 Status and future plans for Thermosalinograph network & GOSUD

IV/4.2.1 The chairperson reported that NOAA plans to continue TSG installations in support of a future pCO2 network. NOAA will continue to develop auto QC procedures for the real-time transmission of TSG data and integrate TSG messaging into SEAS 2000. Plans are to install three more TSG units is support of the pCO2 project during the next year. Two in the Atlantic and one in the Pacific. NOAA will also initiate discussions with other TSG programmes, like IRD Noumea, to integrate pCO2 sampling into those other TSG programmes.

IV/4.3 Coordination/integration with other projects

IV/4.3.1 Atmospheric carbon measurements

IV/4.3.1.1 The Panel received a report on atmospheric carbon and other trace gas measurements by Thomas Conway (USA), NOAA/CMDL. These measurements are important to take to improve our understanding of natural carbon sinks, which are observed to have high interannual variability. Discrepancies between the estimates of the ocean and terrestrial sinks must also be resolved. There is also both political and scientific interest in resolving these carbon sinks down to the regional and country level. A global network of atmospheric observations exists, organized under both NOAA and in Europe (CarboEurope).

IV/4.3.1.2 Ship observations are taken in the Pacific and Atlantic Oceans on routes that vary widely in latitude. Samples are taken with air intakes running to the sampling device on the bridge (the routing of these air intakes is often the most difficult part of the installation), and the samples are analyzed in labs. There is a considerable annual cycle of carbon dioxide content in the northern hemisphere, with a gradient towards lower levels in the southern hemisphere. Indications from the observations are that levels are slowly increasing in the southern hemisphere. Since data comes from samples analyzed in the lab, it can take several weeks to months to be obtained. The delayed mode data are available from the Climate Monitoring and Diagnostics Laboratory (CMDL) soon after analysis, and are eventually archived after being QC with CDIAC and the Japan Meteorological Agency (JMA) world data centre for greenhouse gases.

IV/4.3.1.3 The New York-Cape Town ship changed routes, and the CMDL would like to restart this route. There is also interest in 3 other lines: Gulf of Mexico-Mediterranean; Reykjavik-Newfoundland; and Singapore-Hong Kong, where there is high methane production from rice production. CMDL is working on an automated sampler, but currently relies on manual sampling for shipboard observations. The volunteering officers can be trained in 20 minutes, are provided with simple instructions, and experience has shown high compliance.

IV/4.3.1.4 Dr Conway expressed his gratitude for the US SOOP programme, which has helped him identify and instrument ships. There are plans to integrate with the pCO_2 systems. The Panel expressed interest in collaborating with both atmospheric carbon and other observations.

IV/4.3.2 Other projects and parameters

IV/4.3.2.1 The chairperson gave a report on the intersessional work on the inclusion of other measurements. Discussions were held and actions initiated on the following projects:

- Woods Hole Oceanographic Institution, AutoIMET project
  - Real time transmission of high resolution climate quality meteorological data
  - Integrated with SEAS 2000
- NOAA, Climate Monitoring and Diagnostics Laboratory
  - Atmospheric Carbon Dioxide monitoring
  - Delayed mode data
  - Installed on SEAS equipped vessels
- NOAA, PMEL & AOML, Ocean Chemistry Division
  - Measurement of Partial Pressure of CO2 on VOS
  - Installed on research vessels and SEAS equipped vessels
- NOAA, AOML and SIO, High Density XBT Projects
  - Integration of XBT Autolaunchers with SEAS 2000
- University of Rhode Island, Acoustic Doppler Current Profiler project
  - Incorporating ADCP system into new ship design with BCL

IV/5 Organizational Matters

IV/5.1 SOOP Coordinator position review and funding

IV/5.1.1 The meeting recalled that at the SOT-II meeting, following recommendations by the Task Team on SOT Coordination, it was agreed in principle that JCOMMOPS could eventually provide some additional support to the SOT provided that additional resources could be identified and committed to a new SOT Trust Fund established for such purposes. At the same time, the meeting recognized that a number of activities, both one-off and ongoing, contained in the plan might most effectively be done in national agencies, rather than on the basis of additional funding resources provided to JCOMMOPS. The meetings identified specific new activities and functions for JCOMMOPS which should be developed and implemented within the facility itself. These included adaptation of some of the monitoring tools already provided to the DBCP and SOOP for the VOS programme; and in particular (i) maps to show global distribution of VOS SHIP observations to help identify data sparse regions, (ii) metrics to quantify SHIP performance by parameters e.g. AP, SST etc, and (iii) performance indicators to show timeliness of the receipt of SHIP observations.

IV/5.1.2 Discussions between the SOT Task Team on Coordination and the JCOMM Observations Group (OCG) during the last intersessional period lead to a proposal to revise the JCOMMOPS Terms of Reference. JCOMMOPS would then be in a position to provide some support to the SOT as a whole.

IV/5.1.3 SOT-III agreed with the new proposed Terms of Reference and recommended that they be submitted to JCOMM-II for adoption. They are listed in ***Annex XV***. The meeting agreed that if JCOMM-II endorses the proposed ToR for JCOMMOPS, the additional support by JCOMMOPS for SOT coordination that is not directly related to SOOP, would remain limited as long as no additional resources were committed by Member States.

IV/5.1.4 Regarding JCOMMOPS funding, the meeting recognized that this was realized through various sources, including the DBCP, Argo, and SOOP. The meeting therefore agreed that the following cross cutting issues had to be considered regarding overall JCOMMOPS funding (i.e. two persons, logistical support, hardware and software required to develop and maintain JCOMMOPS operations):

- DBCP/SOOP Trust Fund: Latest currency variations having negative impact on the trust fund, questions are raised regarding what measures could be taken in order to

smooth such variations. For example, what currency for the trust fund? whether the trust fund should be at WMO or IOC? level of service charges by hosting organization for managing the trust fund? whether risks associated with currency variations could be anticipated and tempered through budgeting of a buffer?.

- Argo Information Centre Trust Fund: Argo is not part of JCOMM although the Argo Information Centre is part of JCOMMOPS. Argo was initially a 5-year pilot project and the Argo Information Centre was funded accordingly. The current situation is that AIC funding is planned until 2006 only. Although it is desirable to continue the AIC operations after 2006, both for Argo and JCOMMOPS, there are no firm commitments from Member States at the moment. The question therefore needs to be addressed.

IV/5.1.5 The SOT agreed that the synergy that had been put in place at JCOMMOPS between the DBCP/SOOP Coordinator on one hand and the Argo Technical Coordinator on the other hand has been extremely efficient. Much more has been achieved with two persons working together using the same infrastructure (database, application software, etc.) than would have been with two persons working independently from two different locations and using different infrastructures. The SOT also agreed that JCOMMOPS should be in a position to provide its services to the DBCP, Argo, and the SOT with a staff of two persons, as is the case today. Additional services for the SOT would be developed by sub-contracting the work on an ad hoc basis using additional resources possibly committed in the future by the SOT.

IV/5.1.6 The meeting agreed that JCOMMOPS funding for the longer term should be secured in a better way than with the existing situation. It agreed in principle that the SOT Trust Fund for JCOMMOPS was not required. At the same time, it suggested that after JCOMM-II, the OCG investigate the possibility to eventually establish a JCOMM Trust Fund dedicated to JCOMMOPS development and operations. As there are DBCP, SOT, and Argo aspects within JCOMMOPS, any commitment to the trust fund could be earmarked either for JCOMMOPS as a whole, either for one of the three panels in particular, or even to one of the SOT sub-panels in particular. The level of services that a given panel would receive from JCOMMOPS would be discussed at the OCG level, and linked to the level of commitment earmarked in the trust fund for that panel.

IV/5.1.7 Of course, a necessary condition would be that all Member States presently making commitments to the DBCP/SOOP and AIC Trust Funds continue to do so under a new proposed agreement. It therefore asked the Secretariats to investigate whether it would be agreeable in principle for those presently providing funding to the DBCP & SOOP Trust Fund on one hand, and to the AIC Trust Fund on the other hand, that their contributions be made to a JCOMM Trust Fund dedicated to JCOMMOPS instead (**Action**: Secretariat).

IV/5.1.8 The meeting also invited the VOS and ASAP Panels or Members/Member States participating in the SOT to investigate making contributions to the trust fund once/if established (**Action**: Members/Member States participating in the SOT).

IV/5.2 SOOP Trust Fund

IV/5.2.1 The Panel was presented with the financial statements and budget for the employment of the coordinator, funded through voluntary contributions by DBCP and SOOPIP member institutions. The Panel accepted the WMO and IOC statements of account for the trust fund for 2004/2005, agreed the SOOPIP components of the expenditure and income estimates for 2004/5, and endorsed the SOOPIP contributions for 2004/5 (see ***Annex XVI***).

IV/6 Future Work Programme

IV/6.1 The summary of Action Items is in ***Annex XX***.

==========

V. ASAPP, Fifteenth Session

==========

V/1. PROGRAMME REVIEW

V/1.1 Report by the chairperson of the ASAP Panel

V/1.1.1 The meeting noted with appreciation the report of the ASAPP chairperson, Mr Jean-Louis Gaumet (France). This report covered in particular changes in ASAP operational status since SOT-I, the evolution of the ASAP operational status, as well as activities of the ASAP chairperson. He noted with concern that the recruitment of new ships with RS operations had become a difficult task requiring much time and effort, and that the southern hemisphere continued to be data sparse. The chairperson noted that ASAP operational status had undergone technical and operating changes the past few years, mainly under EUMETNET/EUCOS organization. For the future of the ASAP programme, the tendency is to encourage development of new ASAP units in sensitive areas where storms are generated. He concluded by stressing that the fundamental objectives of the Panel remained unchanged: to enhance the numbers of soundings over the oceans, both by improving the cost-effectiveness of the system and by obtaining new resources where possible; and to maintain and enhance data quality, thus improving the value of the data to users.

V/1.2 Review of Action Items from ASAPP-XIV

V/1.2.1 The actions from ASAP-XIV were reviewed. The Panel noted that issues related to the ASAP data management were still to be considered (see V/5.3).

V/1.3 Report by EUMETSAT

V/1.3.1 The EUMETSAT representative, Mr William Doran, reported on the status of its monitoring activity and of the geostationary meteorological satellites. He indicated, in particular, that Meteosat-9 would be launched in June 2005 and would be in operation in January 2006.

V/1.3.2 The Panel noted the problem on the ASAP DCP transmission through Meteosat satellite. This issue was discussed under agenda item V/5.2.

V/1.3.3 The Panel expressed its appreciation to EUMETSAT for the report and for its continuing support for ASAP, and for marine data collection in general. The full report will be included in the 2004 SOT Annual Report.

V/1.4 Monitoring reports

V/1.4.1 Report by ECMWF

V/1.4.1.1 The meeting noted with appreciation that Mr Antonio Garcia submitted a report on ECMWF monitoring activities for ASAP. The Panel was pleased to note that the quality of the ASAP data was comparable with or superior to that of land stations with respect to model fields with a few exceptions. The meeting noted the following points submitted by Mr Garcia for the future improvement of the ASAP performance:

- Every year, it is noted that 90% of ASAP units are operating in the North Atlantic. A much better coverage of the Southern Hemisphere in general and of the Pacific Ocean in particular is highly desirable. Although the coverage of satellite radiances on a global scale is very good, it is necessary to calibrate those radiances by using reliable data sources such as ASAP;
- In 2004, a small drop in the percentage (5%) of ASAP reports reaching 20 hPa was noted. The reason should be investigated;

- In the ECMWF monitoring, there are three ASAP units in the wind blacklist. That is the largest number of suspicious ASAP at the same time in many years. Some action should be taken to correct the problem.

V/1.4.1.2 The Panel expressed its appreciation to ECMWF for this report, which will be reproduced in full in the 2004 SOT Annual Report.

V/1.4.2 Report by ASAP monitoring centre

V/1.4.2.1 Mr Jean-Louis Gaumet (France) reported on the status and operation of and some results from the ASAP monitoring centre, which had been established by Météo France as agreed at ACC-VII. The Panel expressed its appreciation to Météo France for this comprehensive and very valuable report. The report of the ASAP Monitoring Centre will be reproduced in the 2004 SOT Annual Report.

V/2. PROJECT REVIEW

V/2.1 Report on the EUMETNET ASAP project

V/2.1.1 On behalf of Mr Rudolf Krockauer, E-ASAP Programme Manager, Mr Pierrre Blouch gave a presentation of this important ASAP programme. E-ASAP is a core programme of EUCOS and DWD is the EUMETNET member responsible for this programme. The main purpose of E-ASAP is to coordinate and to centralize the European ASAP activities to enhance the efficiency and increase the number of soundings over data sparse areas. The target is to have 18 ships providing about 6,300 soundings in 2006 and every following year. Although the target should be reached for the number of ships, it will probably not be the case for the number of soundings.

V/2.1.2 At present, the E-ASAP fleet is composed of:

- 9 E-ASAP units including four former national units (three German and one British) now integrated into E-ASAP and three E-ASAP units recently installed. All of these units are now managed by E-ASAP;
- 8 national units operated by Denmark, France, Iceland and Spain that should be integrated into E-ASAP in the future.

V/2.1.3 In 2004, the integrated ships and the European ships which were not yet integrated, carried out about 3,950 soundings. Although an increase of the soundings is expected in 2005, it will not reach the target of 6,300 soundings in 2006. The original target of 350 annual soundings per ship turned out to not be achievable because of technical and managerial restrictions. Thus, the target for 2004-2006 was revised to a lower number. Performing 3,958 soundings from 14 ships represented 95% of the revised target for 2004. The number of successful soundings could be increased by better communication efficiency. The programme had to cope with several changes in ship management and routes.

V/2.1.4 The sounding systems of the Met Office (United Kingdom) and Icelandic Meteorological Office (IMO) / Swedish Meteorological and Hydrological Institute (SMHI) were upgraded with some E-ASAP financial support. The costs are shared among the EUMETNET Members on a Gross National Income (GNI)-scale.

V/2.1.5 Before delivery of three new E-ASAP (10' container) units, appropriate ships were identified plying routes between the east coast of the USA/Canada and the western Mediterranean. Nonetheless, several preparational efforts had to be carried out before installing the containers on the ships. The installation took place between November 2004 and February 2005. All three ships call at Genoa which makes the port the central E-ASAP base in the Mediterranean.

V/2.1.6 The Panel expressed its appreciation to Mr Blouch and Mr Krockauer, for the presentation, as well as for the success of E-ASAP to date.

V/2.1.7 The discussion turned on the advantages and drawbacks of the use of dedicated containers and on the communication issue. Although it is difficult to find a suitable place to install a container, the work for the sounding operator is made easier.

V/2.1.8 Difficulties in ASAP DCP transmission was noted. Discussion is recorded under agenda item V/5.2.

V/2.2 Worldwide Recurring ASAP Project (WRAP)

V/2.2.1 On behalf of the WRAP Project leader, Captain Gordon Mackie, Mr Graeme Ball presented a report of the WRAP. The M.V. MSC Corinna was recruited early in 2004 as the second WRAP vessel but was not declared operational until late in 2004, due to a number of problems with the equipment. The problems have mostly been addressed and the ship successfully completed four test flights from Australia to Europe late in 2004. The route of the MSC Corinna is shown in Figure 1. The round-trip takes approximately 100 days. It is expected that the routine upper-air flights will commence during February 2005 on the southbound voyage across the Indian Ocean.

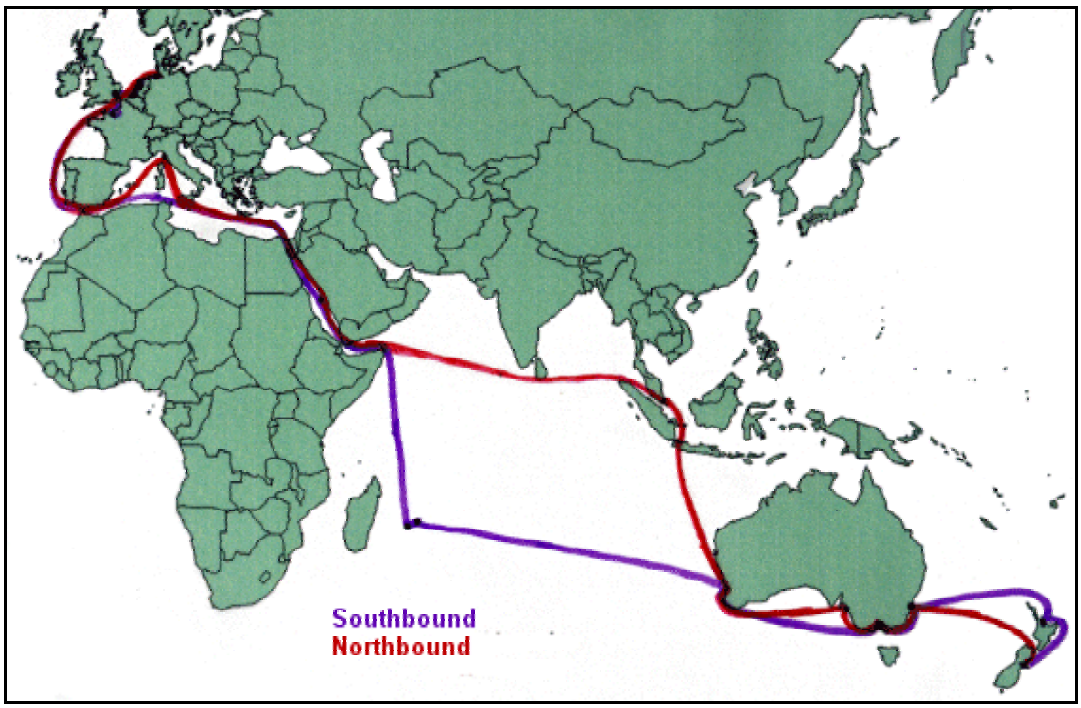


Figure 1. Route of the WRAP-II vessel, MSC Corinna.
Europe - Reunion - Mauritius - Australia - New Zealand - Australia - Far East - Red Sea - Mediterranean – Europe

V/3. Coordination of implementation

V/3.1 Mr Jean-Louis Gaumet (France), chairperson of the ASAP Panel raised issues critical to the implementation of ASAP at regional and global levels. These issues included maritime route recommendations, monitoring the overall performance, different elements involved in ASAP radio-sounding implementation aboard ships, and operating costs.

V/3.2 Mr Gaumet stressed that ship routes should be selected in accordance with scientific and operational requirements. ASAP routes are generally chosen using the following criteria:

- Keep and increase the number of radiosounding data obtained in regions of major meteorological interest for numerical forecasts, i.e., where depressions and storms would usually develop. This criterion is new and recommended by EUCOS. Another

concept would be to perform ASAP radiosoundings mainly over specific areas of meteorological interest in an adaptive mode.

- Keep and increase the number of soundings over large oceanic areas, especially in the Pacific Ocean and the Southern Hemisphere, where the radiosounding data are very sparse. This objective is recommended by WMO.

V/3.3 Mr Gaumet noted that the choice of sondes is an important part of ASAP radiosounding cost and contributes greatly to quality. LORAN-C sondes represent a rather cheap alternative to GPS sondes; but its future is not clearly known. However, in the future there is a good possibility that the cost of GPS-3D sondes will decrease.

V/4. ISSUES FOR ASAPP

V/4.1 Problems for ship recruitment for ASAP: Requirement to promote ASAP programme with ship companies

V/4.1.1 Mr Gaumet noted that the recruitment of new ASAP ships becomes a difficult task for NMS mainly for economical reasons as the ASAP activities must not represent a financial charge for companies. The first challenge is to find ship companies sensitive to the work of the WMO World Weather Watch in order to improve general meteorological forecasts over oceans. The second difficulty is to recruit voluntary ship crew to operate the radiosoundings . Another problem is to find companies which accept to provide sufficient place on the ship upper-desk for radiosounding materials. Carrying out a radiosounding aboard is no easy work, and requires technical knowledge and at least one hour of crew time, whereas the crew on duty is very busy elsewhere. Consequently, it requires promoting the ASAP programme with ship companies so that it becomes an important task. This could be done by the ASAP Panel by means of providing fliers or other documents on the ASAP international programme.

V/4.2 Difficulties with satellite transmission

V/4.2.1 The Panel expressed its concern that most of the European ASAP units moved from the Meteosat DCP transmission to Inmarsat-C due to a lack of reliability of the DCP transmission. Unfortunately, the cost of communications increased significantly due to this change. Data transmission problems, mainly loss of messages, were observed on Meteosat first generation. The Panel noted that if the performance of the ASAP DCP transmissions through the Meteosat satellite improved, more countries would re-start using the DCP transmission. The representative of EUMETSAT, Mr William Doran (EUMETSAT), expressed his concern about this issue and informed the Panel that the communication link should improve with Meteosat 9 (2nd MSG-2 satellite). This satellite should be in operation at the beginning of 2006.

V/4.3 Improvement of ASAP general quality

V/4.3.1 Mr Gaumet noted that successful operations, which were required to reach the 100 hpa level with a 90% success rate, were not always achieved. Mr Gaumet stressed the importance of data quality and invited National Meteorological Services operating radiosondes to put great care on sounding performance.

V/5. INFORMATION EXCHANGE

V/5.1 Web site

V/5.1.1 The meeting recalled that a simple static web page, accessible through JCOMMOPS and the SOT page, would prove a useful window for the programme, and also a gateway for accessing operational information, such as the status of E-ASAP and the ECMWF monitoring results. It requested the JCOMMOPS Coordinator to prepare such a page, in coordination with the

ASAPP chairperson. The page should include links to related operational information and pages as noted above. (**Action**: ASAP chairperson and JCOMMOPS Coordinator)

V/5.2 Publications including ASAP annual report

V/5.2.1 The Panel noted that the SOT was planning to publish a full SOT Annual Report (see I/8). The Panel therefore agreed that there would be no specific requirement to publish a separate ASAP Annual Report, as long as all the information included in the current ASAP annual report such as summary and monitoring reports are included in the new full SOT Annual Report. The structure of the SOT Annual Report is discussed under agenda item I/8.

V/5.2.2 The meeting recalled that the latest ASAP brochure, which was prepared after SOT-I, was still valid. It was agreed that there were no requirements for further revisions at the present time, but to keep the brochure under review at future sessions as appropriate (**Action**: ASAPP chairperson and Secretariat). The Panel noted with appreciation that the brochure was now available, in pdf format, on the VOS and JCOMMOPS web sites.

V/5.3 Future data management

V/5.3.1 ASAP-XIV (at SOT-II) noted that although the low resolution ASAP sounding profiles on the GTS were all archived in relevant national data archives; this was not presently the case for the high resolution profiles available in delayed mode. ASAP-XIV considered that there were potentially valuable data which might be used, for example, in studies of the fine scale structure of the marine planetary boundary layer.

V/5.3.2 The meeting noted high-resolution ASAP sounding data were required for new modeling. The meeting also noted that such high resolution data could be collected using BUFR codes, be archived in relevant national archives and be made available on their web sites after each cruise. The meeting suggested that the E-ASAP store high-resolution data, if appropriate and possible.

V/5.3.3 With regard to a dedicated ASAP metadata database, the meeting noted that metadata (those regarding observation/transmission and those regarding ships) are currently available in the ASAP Annual Report (future SOT Annual Report) and in the WMO Ship Catalogue (WMO-No. 47) for ships that also participate in the VOS Scheme. The meeting noted that a dedicated online ASAP database, initially developed around the existing metadata requirements in the ASAP Annual Report, would remove the need to report ASAP metadata in future SOT Annual Reports.

V/6 FUTURE WORK PROGRAMME

V/6.1 SOT coordination and integration issues

V/6.1.1 No additional coordination issues were identified at the present time.

V/6.2 Action items

V/6.2.1 The meeting reiterated that the top priority in programme implementation for the Panel over the next year and more would be the continuation and enhancement of WRAP. Other implementation **action items**, in addition to those noted in preceding paragraphs, are included in the SOT action list in ***Annex XX***.

V/7. ORGANIZATIONAL MATTERS

V/7.1 Terms of Reference of ASAPP and Membership

V/7.1.1 The Terms of Reference of the ASAPP were reviewed, along with those of the other component panels, when addressing the overall Terms of Reference of the SOT under agenda item XIX.

V/7.1.2 Mr Jean-Louis Gaumet informed the Panel that he had to resign as chairperson of the ASAP Panel. The Panel expressed its sincere appreciation to Mr Gaumet for his work as the chairperson and wished every success to Mr Gaumet. The Panel was pleased to accept the nomination of Ms Sarah North as the interim chairperson pending the election of the next ASAP chairperson at JCOMM-II.

V/7.2 ASAP Trust Fund

V/7.2.1 The meeting reviewed and accepted the final statement of account for the ASAP Trust Fund for the biennium 2002/2003 and an interim statement for 2004/2005. These statements are given in ***Annex XVII***. It recognized that substantial expenditures would continue to be required during 2005, to support the further development of WRAP, including the continued engagement of Captain Gordon Mackie as consultant to support the project. It therefore agreed the budget for 2005, including a table of contributions, which is also given in ***Annex XVI***.

==========

I/7 PANEL SUMMARIES AND ISSUES

I/7.1 The meeting was reminded of the major discussion and outcome of the Panel sessions by the Panel chairpersons, VOSClim project leader and the chairperson of the technical workshop. The meeting expressed its appreciation to all the chairpersons for their comprehensive summaries.

I/8 OVERARCHING IMPLEMENTATION PLAN

I/8.1 SOT-II had agreed that there was an immediate requirement for a short descriptive document on the SOT, giving its objectives, structure, status and working procedures. Mr Graeme Ball (Australia), SOT chairperson, prepared a draft document “Overarching Implementation Plan”. The meeting reviewed the draft and made a few changes. The final version is in ***Annex XVIII***.

I/8.2 SOT-II agreed that the SOT should eventually have a full SOT Annual Report, using information in the national reports as basic input data. Mr Ball presented a draft proposal of the SOT Annual Report and the template for the 2004 national report. The meeting agreed with the basic structure of the SOT annual report, but noted that there were a number of details to be carefully reviewed. The meeting therefore decided to establish an ad hoc Task Team to thoroughly review the contents and the template. The Task Team is composed of Mr Graeme Ball, Ms Julie Fletcher, Mr Steven Cook, Ms Sarah North, Dr Elizabeth Kent, and Mr Bob Keeley. The SOT members are encouraged send their comments to Mr Ball as soon as possible, so that the 2004 Annual Report can be published by the middle of 2005. (**Action**: ad hoc Task Team)

I/9 REVIEW OF THE TERMS OF REFERENCE

I/9.1 The Team reviewed its Terms of Reference, including those of its component panels. A few changes were proposed, and these are shown in ***Annex XIX***. The meeting requested the Secretariat to submit the proposed revised version of TORs to JCOMM-II for its consideration and approval. (**Action**: Secretariat)

I/9.2 The meeting requested the OPA chairperson to provide the guidance to the SOT on if and how in situ data, which is collected by fishery organizations, coastal moorings and navies but not currently part of established groups (DBCP, Argo, etc.), might be included.

I/10 NATIONAL REPORTS

I/10.1 The meeting was presented with national reports from Australia, France, Germany, Greece, Netherlands, New Zealand, United Kingdom and USA. Those reports, together with other written national reports received by the Secretariat, will be published in the SOT Annual Report. (**Action**: Secretariat and participants).

I/11 NEXT SESSION OF THE SOT

I/11.1 The meeting agreed that the SOT, including its component panels, required at least a bi-annual meeting to ensure ongoing programme coordination and implementation, as well as to address new requirements and technical developments in a timely manner. The meeting noted that SOT sessions took place on an average of every 18-month in the past, and agreed that a two-year interval would be more appropriate. The meeting also noted that there are some issues to be reviewed every year such as SOOP lines. It agreed that the preparation process of the planned SOT Annual Report could serve such purposes. It recalled and reiterated its agreement at SOT-I and SOT-II, that the Team and its Panels should be largely self-funding.

I/11.2 The meeting agreed that SOT-IV should be convened, if possible, during the first half of 2007 (March-April time frame). It requested the chairpersons and Secretariat to finalize the exact dates and venue as soon as possible. (**Action**: chairpersons and Secretariat)

I/12 REVIEW OF SOT-III SESSION REPORT, ACTION ITEMS, AND RECOMMENDATIONS

I/12.1 The meeting reviewed, revised and adopted the final report of the session, including action items and recommendations.

I/13 CLOSURE

I/13.1 In closing the meeting, the chairperson, Mr Grame Ball, offered his sincere thanks once more, on behalf of all participants, to Météo-France, Ifremer and IRD for organizing and hosting the meeting and for providing such excellent support. He also thanked all participants for their active participation in and input to the meeting. He looked forward to the fourth session of the Team in 2007, by which time many of the actions reviewed or initiated at the present meeting would be coming to fruition.

I/13.2 The third session of the JCOMM Ship Observations Team, including sessions of the component VOS, SOOP and ASAP Panels and the VOSClim project meeting, closed at 12:40 hours on Saturday, 12 March 2005.

_____

Annex I

List of Participants

AUSTRALIA

Mr Graeme Ball
Chairman, JCOMM Ship Observations Team
Manager, Marine Operations Group
Bureau of Meteorology
GPO Box 1289K
MELBOURNE, Vic. 3001
Australia
Telephone: +61-3 9669 4203
Telefax: +61-3 9669 4168
E-mail: g.ball@bom.gov.au
smmo@bom.gov.au
marine_obs@bom.gov.au (group address)

Mr Alexander Papij
Manager
Marine Instrumentation Group
CSIRO Marine Research
GPO Box 1538
HOBART, TAS 7001
Australia
Telephone: +61-3 6232 5230
Telefax: +61-3 6232 5229
E-mail: alex.papij@csiro.au

CANADA

Ms Yvonne Cook
Life Cycle Manager Surface Networks
Environment Canada
4905 Dufferin Street
DOWNSVIEW, Ontario
Canada M3H 5T4
Telephone: +1-416 739 4468
Telefax: +1-416 739 4261
E-mail: yvonne.cook@ec.gc.ca

Mr Robert Keeley
MEDS, Department of Fisheries and Oceans
W082, 12th floor, 200 Kent Street
OTTAWA, ON K1A 0E6
Canada
Telephone: +1-613 990 0246
Telefax: +1-613 993 4658
E-mail: keeley@meds-sdmm.dfo-mpo.gc.ca

CROATIA

Dr Milan Hodzic
The Meteorological Office
Marine Meteorological Center - Split
P.O. Box 370
Glagoljaska 11
HR-21000 SPLIT
Croatia
Telephone: +385-21 347 399 or 343 785
Telefax: +385-21 347 399
E-mail: hodzic@cirus.dhz.hr

Captain Zeljko Sore
Marine Meteorological Center - Split
P.O. Box 370
Glagoljaska 11
HR-21000 SPLIT
Croatia
Telephone: +385-21 347 399 or 343 785
Telefax: +385-21 347 399
E-mail: sore@cirus.dhz.hr

FRANCE

Mr Pierre Blouch
E-SURFMAR Programme Manager
Météo-France
Centre de météorologie marine
13, rue du Chatellier
BP 90411
29604 BREST Cedex
France
Telephone: +33-2 98 22 18 52
Telefax: +33-2 98 22 18 49
E-mail: pierre.blouch@meteo.fr

Mr Denis Diverres
Institut de recherche pour le développement (IRD)
Département Milieu et Environment
BP 70
29280 PLOUZANE
France
Telephone: +33-2 98 22 46 55
Telefax: +33-2 98 22 45 14
E-mail: Denis.Diverres@ird.fr

Mr Jean-Louis Gaumet
Chairman, ASAP Panel
Météo France
1, Quai Branly
75340 PARIS Cedex 07
France
Telephone: +33-1 45 56 70 53
Telefax: +33-1 45 56 70 05
E-mail: Jean-Louis.gaumet@meteo.fr

Mr Yves Gouriou
Centre IRD de Bretagne
BP 70
29280 PLOUZANE
France
Telephone: +33-2 98 22 45 07
Telefax: +33-2 98 22 45 14
E-mail: yves.gouriou@ifremer.fr

Ms Nathalie Lefèvre
Université Pierre et Marie Curie
4 place Jussieu
75252 PARIS Cedex 05
France
Telephone: +33-1 44 27 38 21
Telefax: +33-1 44 27 28 05
E-mail: nathalie.lefevre@lodyc.jussieu.fr

Mr André Péries
PMO Supervisor
Météo-France DSO/RESO/PMO
42, Avenue Gustave Coriolis
31057 TOULOUSE Cedex
France
Telephone: +33-5 67 69 87 29
Telefax: +33-5 67 69 87 09
E-mail: andre.peries@meteo.fr

Mr Loïc Petit de la Villéon
Institut Français pour la Recherche
de l'Exploitation de la Mer (IFREMER)
BP 70
29280 PLOUZANE
France
Telephone: +33-2 98 22 49 13
Telefax: +33-2 98 22 46 44
E-mail: petit@ifremer.fr

Dr Sylvie Pouliquen
Responsible Coriolis
IFREMER
BP 70
29280 PLOUZANE
France
Telephone: +33-2 98 22 44 92
Telefax: +33-2 98 22 45 33
E-mail: sylvie.pouliquen@ifremer.fr

Mr Joël Quere
Météo-France
13, rue du Chatellier
BP 90411
29604 BREST Cedex
France
Telephone: +33-2 98 22 18 48
Telefax: +33-2 98 22 18 49
E-mail: joel.quere@meteo.fr

Mr Jean Rolland
Météo-France
13 rue du Chatellier
BP 90411
29604 BREST Cedex
France
Telephone: +33-2 98 22 18 53
Telefax: +33-2 98 22 18 49
E-mail: jean.rolland@meteo.fr

Ms Vinciane Unger
Direction des Systèmes d'Observation / OCEan
Météo-France (DSO/DOS/OCE)
7 rue T. de Bort
BP 202
78195 TRAPPES Cedex
France
Telephone: +33-1 30 13 61 22
Telefax: +33-1 30 13 60 20
E-mail: vinciane.unger@meteo.fr

Mr David Varillon
Institut de recherche pour le développement
(IRD)
Centre de Nouméa
BP A5
NOUMEA
New Caledonia
France
Telephone: +687 26 07 11
Telefax: +687 26 43 26
E-mail: David.Varillon@noumea.ird.nc

GERMANY

Mr Peter König
Bundesamt für Seeschifffahrt und Hydrographie
(BSH)
Federal Maritime and Hydrographic Agency
Bernhard-Nocht-Strasse 78
20359 HAMBURG
Germany
Telephone: +49-40 3190 3228
Telefax: +49-40 3190 5000
E-mail: peter.koenig@bsh.de

Mr Reinhard Zöllner
Deutscher Wetterdienst
Bernhard-Nocht-Strasse 76
20359 HAMBURG
Germany
Telephone: +49-40 6690 1400
Telefax: +49-40 6690 1499
E-mail: reinhard.zoellner@dwd.de

GREECE

Mr Michael Myrsilidis
Marine Meteorology Section
Hellenic National Meteorological Service (HNMS)
El. Venizelou 14
16777 Helliniko
ATHENS
Greece
Telephone: +30-210 9699013
Telefax: +30-210 9628952, 9649646
E-mail: mmirsi@hnms.gr

JAPAN

Mr Yoshiaki Kanno
Japan Meteorological Agency
Marine Division
1-3-4 Otemachi, Chiyodaku
TOKYO 100-8122
Japan
Telephone: +81-3 3211 6909
Telefax: +81-3 3211 6908
E-mail: ykanno@met.kishou.go.jp

KENYA

Mr Ali Juma Mafimbo
RA I Co-rapporteur on Regional Marine Meteorological and Oceanographic Services
Senior Meteorologist
Marine Meteorology and Physical Oceanography Services
Forecasting Division
P.O. Box 30259 00100 GPO
NAIROBI
Kenya
Telephone: +254-20 567880
Telefax: +254-20 576955 / 577373 / 567888
E-mail: mafimbo@meteo.go.ke
mafimbo@yahoo.com

NETHERLANDS

Mr Frits B. Koek
Royal Netherlands Meteorological Institute (KNMI)
Wilhelminalaan 10
P.O. Box 201
3730 AE DE BILT
Netherlands
Telephone: +31-30 220 6860
Telefax: +31-30 220 6401
E-mail: koek@knmi.nl

Mr Martin Stam
Royal Netherlands Meteorological Institute (KNMI)
Wilhelminalaan 10
P.O. Box 201
3730 AE DE BILT
Netherlands
Telephone: +31-30 220 6835
Telefax: +31-30 221 0843
E-mail: martin.stam@knmi.nl

NEW ZEALAND

Ms Julie Fletcher
Chairman, JCOMM VOS Panel
Manager Marine Observations
Meteorological Service of New Zealand Ltd
P.O. Box 722
WELLINGTON
New Zealand
Telephone: +64-4 4700 789
Telefax: +64-4 4700 772
E-mail: fletcher@metservice.com

POLAND

Dr Miroslaw Mietus
Chairman, JCOMM Expert Team on Marine Climatology
Institute of Meteorology and Water Management
Maritime Branch
ul. Waszyngtona 42
PL-81-342 GDYNIA
Poland
Telephone: +48-58 62 88 271
Telefax: +48-58 62 88 163
E-mail: Miroslaw.Mietus@imgw.pl

SAUDI ARABIA

Mr Ahmed Y. Hussain
Ministry of Defense & Aviation
Presidency of Meteorology & Environment (PME)
P.O. Box 100155
JEDDAH 21311
Saudi Arabia
Telephone: +966-2 6512312 ext. 2820
Telefax: +966-2 6514282
E-mail: metobah@hotmail.com

SWEDEN

Ms Elisabeth Boholm
Swedish Meteorological and Hydrological Institute (SMHI)
Folkborgsvägen 1
S-601 76 NORRKOPING
Sweden
Telephone: +46-11 4958510
Telefax: +46-11 4958001
E-mail: Elisabeth.Boholm@smhi.se

TURKEY

Mr Hüseyin Cem Dalgün
Corresponding Member, JCOMM ET/WWS
Turkish State Meteorological Service
P.O. Box 401
06120 ANKARA
Turkey
Telephone: +90-312 302 25 54
Telefax: +90-312 359 34 30 / 360 79 04
E-mail: cdalgun@meteor.gov.tr

Mr Omer Polatkan
Turkish State Meteorological Service
P.O. Box 401
ANKARA
Turkey
Telephone: +90-312 302 25 55
Telefax: +90-312 359 34 30 / 360 79 04
E-mail: opolatkan@meteor.gov.tr

UNITED KINGDOM

Mr David Berry
James Rennell Division
Southampton Oceanography Centre
European Way
SOUTHAMPTON SO14 3ZH
United Kingdom
Telephone: +44-23 8059 7740
Telefax: +44-23 8059 6400
E-mail: dyb@soc.soton.ac.uk

Dr Craig Donlon
Director
GHRSST-PP International Project Office
National Centre for Ocean Forecasting
Met Office
Fitzroy Road
EXETER EX1 3PB
United Kingdom
Telephone: +44-1392 886 622
Telefax: +44-1392 885 681
E-mail: craig.donlon@metoffice.gov.uk

Mr Gareth Dow
Observation Monitoring
Met Office
FitzRoy Road
EXETER
Devon
EX1 3PB
United Kingdom
Telephone: +44-1392 886 243
Telefax: +44-1392 885 681
E-mail: Gareth.Dow@Metoffice.gov.uk

Miss Elanor Gowland
Marine Data Supply
Met Office
S9, Saughton House
Broomhouse Drive
EDINBURGH, EH11 3XQ
Scotland
United Kingdom
Telephone: +44-131 528 7313
Telefax: +44-131 528 7345
E-mail: elanor.gowland@metoffice.gov.uk

Dr Elizabeth C. Kent
James Rennell Division (254/26)
Southampton Oceanography Centre
European Way
SOUTHAMPTON SO14 3ZH
United Kingdom
Telephone: +44-23 80596646
Telefax: +44-23 80596400
E-mail: eck@soc.soton.ac.uk

Ms Sarah C. North
Project Leader, VOSClim
Marine Networks Manager
Met Office
Observations Supply - Marine Networks
FitzRoy Road
EXETER
Devon EX1 3PB
United Kingdom
Telephone: +44-1392 885 617
Telefax: +44-1392 885 681
E-mail: sarah.north@metoffice.gov.uk

USA

Mr Thomas J. Conway
NOAA/Climate Monitoring and Diagnostics Laboratory
R/CMDL, 325 Broadway
BOULDER, CO 80305
USA
Telephone: +1-303 497 6681

Telefax: +1-303 497 6290
E-mail: thomas.j.conway@noaa.gov

Mr Steven K. Cook
Chairman, JCOMM SOOP Implementation Panel
NOAA/OAR/AOML
GOOS Center
8604 La Jolla Shores Drive
LA JOLLA, CA 92037
USA
Telephone: +1-858 546 7103
Telefax: +1-858 546 7185
E-mail: Steven.Cook@noaa.gov

Mr Alan Hall
National Climatic Data Center
151 Patton Ave., Room 120
ASHEVILLE, NC 28801-5001
USA
Telephone: +1-828 271 4071
Telefax: +1-828 271 4022
E-mail: alan.hall@noaa.gov

Commanding Officer, N62306
Attn: NS3, Elizabeth Horton
Naval Oceanographic Office
1002 Balch Boulevard
STENNIS SPACE CENTER, MS 39522-5001
USA
Telephone: +1-228 688 5725
Telefax: +1-228 688 5514
E-mail: hortone@navo.navy.mil

Mr Michael Johnson
Coordinator, JCOMM Observations PA
Chairman, JCOMM Observations Coord. Group
NOAA Office of Global Programs
1100 Wayne Avenue, Suite 1202
SILVER SPRING, MD 20910
USA
Telephone: +1-301 427 2089 ext. 169
Telefax: +1-301 427 0033
E-mail: mike.johnson@noaa.gov

Mr Warren H. Keenan
NOAA Office of Global Programs
1100 Wayne Avenue, Suite 1210
SILVER SPRING, MD 20910
USA
Telephone: +1-301 427 2089 ext. 155
Telefax: +1-301 427 2073
E-mail: warren.keenan@noaa.gov

Mr Robert A. Luke
VOS Program Leader
National Weather Service/NOAA
National Data Buoy Center
Building 3203, Room 305B
STENNIS SPACE CENTER, MS 39529-6000
USA
Telephone: +1-228 688 1457
Telefax: +1-228 688 3923
E-mail: Robert.Luke@noaa.gov

Mr Derrick Snowden
NOAA/AOML
4301 Rickenbacker Causeway
MIAMI, FL 33149
USA
Telephone: +1-305 361 4322
Telefax: +1-305 361 4392
E-mail: Derrick.Snowden@noaa.gov

ORGANIZATIONS

EUMETSAT

Mr William Doran
EUMETSAT
Am Kavalleriesand 31
64295 DARMSTADT
Germany
Telephone: +49-6151 807 361
Telefax: +49-6151 807 304
E-mail: wil.doran@eumetsat.int

HMEI

Mr Rémy Pepin
Association of Hydrometeorological Equipment Industry (HMEI)
MODEM
Z.A. de l'orme à bonnet
91750 CHEVANNES
France
Telephone: +33-1 64 99 77 52
Telefax: +33-1 64 99 77 53
E-mail: rpepin@meteomodem.com

PROGRAMMES/PROJECTS

OOPC

Dr D.E. Harrison
Chairman, GCOS/GOOS/WCRP Ocean Observations Panel for Climate
Pacific Marine Environmental Laboratory
NOAA/PMEL/OCRD
7600 Sand Point Way, NE
SEATTLE, WA 98115

USA
Telephone: +1-206 526 6225
Telefax: +1-206 526 6744
E-mail: d.e.harrison@noaa.gov

SEAKEEPERS SOCIETY

Mr Geoffrey Morrison
The International SeaKeepers Society
1800 SE 10th Avenue, Suite 300
FT LAUDERDALE, FL 33316
USA
Telephone: +1-954 776 7100 ext 115
Telefax: +1-305 675 0256
E-mail: Morrison@seakeepers.org

COMPANIES

VAISALA

Mr Jarmo Franssila
Product Manager
Sounding Systems
Vaisala
P.O. Box 26
Vanha Nurmijärventie 21
FIN-016760 HELSINKI
Finland
Telephone: +358-9 89492328
Telefax: +358-9 89492564
E-mail: jarmo.franssila@vaisala.com

Mr Jorma Islander
Product manager SWD/SWNI
Vaisala Oyi
P.O. Box 26
FIN-00421 HELSINKI
Finland
Telephone: +358-9 894 92337
Telefax: +358-9 894 92568
E-mail: jorma.islander@vaisala.com

SECRETARIAT

Mr Edgard Cabrera
Chief
Ocean Affairs Division
Applications Programme Department
World Meteorological Organization
7 bis, Avenue de la Paix
Case postale No 2300
CH-1211 GENEVE 2
Switzerland
Telephone: +41-22 730 82 37
Telefax: +41-22 730 81 28
E-mail: ecabrera@wmo.int

Mr Etienne Charpentier
Technical Coordinator, DBCP and SOOP
JCOMMOPS
c/o CLS
8-10 rue Hermes
Parc Technologique du Canal
31526 RAMONVILLE SAINT-AGNE
France
Telephone: +33-5 61 39 47 82
Telefax: +33-5 61 39 47 97
E-mail: charpentier@jcommops.org

Dr Albert Fischer
Intergovernmental Oceanographic Commission
UNESCO
1, rue Miollis
75732 PARIS Cédex 15
France
Telephone: +33-1 45 68 40 40
Telefax: +33-1 45 68 58 13
E-mail: a.fischer@unesco.org

Ms Teruko Manabe
Ocean Affairs Division
Applications Programme Department
World Meteorological Organization
7 bis, Avenue de la Paix
Case postale No 2300
CH-1211 GENEVE 2
Switzerland
Telephone: +41-22 730 84 49
Telefax: +41-22 730 81 28
E-mail: tmanabe@wmo.int

Annex II

Agenda

==========

I. Common session

==========

1. ORGANIZATION OF THE SESSION

1.1 Opening of the session
1.2 Opening of the Scientific and Technical Workshop
1.3 Adoption of the Agenda
1.4 Working Arrangements

2. REPORTS BY THE SECRETARIAT, OPA COORDINATOR AND CHAIR OF SOT

2.1 Report by the Secretariat
2.2 Report by the Observations Programme Area Coordinator
2.3 Report by the Chaiperson of SOT
2.4 Review of Action Items from SOT-II

3. REPORTS ON ASSOCIATED PROGRAMMES AND REQUIREMENTS FOR SHIP-BASED OBSERVATION

3.1 Ocean Observations Panel for Climate (OOPC)
3.2 THORPEX
3.3 International Ocean Carbon Coordination Project
3.4 Use of VOS data in climate products
3.5 GHRSST including report on the Ferrybox Project

4. REPORTS BY TASK TEAMS

4.1 Task Team on VOS Recruitment and Programme Promotion
4.2 Task Team on Satellite Communication System Costs
4.3 Task Team on Metadata for WMO-No.47 (Pub.47)

5. SUPPORT INFRASTRUCTURE

5.1 JCOMM in situ Observing Platform Support Centre (JCOMMOPS)
5.2 Telecommunication facilities

6. OPERATIONAL STANDARDS

6.1 Instrumentation standards

==========

II. Scientific and Technical Workshop

==========

==========

III. VOSP, Fourth Session including VOSClim, Fifth Session

==========

==========

IV. SOOPIP, Sixth Session

==========

==========

V. ASAPP, Fifteenth Session

==========

==========

I. Common session (continued)

==========

7. PANEL SUMMARIES AND ISSUES

8. OVERARCHING IMPLEMENTATION PLAN

9. REVIEW OFTHE TERMS OF REFERENCE

10. NATIONAL REPORTS

11. NEXT SESSION OF THE SOT

12. REVIEW OF SOT-III SESSION REPORT, ACTION ITEMS, AND RECOMMENDATIONS

13. CLOSURE

==========

III. VOSP, Fourth Session including VOSClim, Fifth Session

==========

==========

III-A. VOSP, Fourth Session

==========

1. PROGRAMME REVIEW

1.1 Report by the Chairperson of the VOS panel
1.2. Review of Action Items from VOSP-III

2. PROJECT REVIEW

2.1 The VOSClim Project (VOSClim Fifth session to take place)
2.2 Review of VOSClim Project Structure
2.3 PMO activities and coordination
2.4 Presentation on E-SURFMAR activities

3. AUTOMATION AND SOFTWARE

3.1 TurboWin developments
3.2 Status of VOS automation
3.3 Shipboard Automated Meteorological and Oceanographic System (SAMOS)

4. ISSUES FOR VOSP

4.1 Security issues arising from availability of SHIP data on the web
4.2 Requirement to promote VOS scheme through IMO
4.3 Impact of ISPS Code on VOS operations
4.4 Impact of National Customs requirements on VOS operations
4.5 Review of the Marine Met Services Monitoring Programme Questionnaire
4.6 Multi-recruitment problem
4.7 Transmission of test SHIP message onto the GTS

5. DATA MANAGEMENT

5.1 Monitoring Centre Report
5.2 Global Collecting Centres (GCCs) Report
    5.2.1 GCC Report on VOS
    5.2.2 GCC Report on VOSClim (III-B/2.3)
5.3 Review of MCSS including codes and formats (report by the chairpserson of Expert Team on Marine Climatology)

6. INFORMATION EXCHANGE

6.1 Web site
6.2 Publications

7. FUTURE WORK PROGRAMME AND IMPLEMENTATION ISSUES

7.1 SOT coordination and integration issues
7.2 Action items

8. ORGANIZATIONAL MATTERS

8.1 Terms of Reference of VOSP

==========

III-B. VOSClim, Fifth Session

==========

1. STATUS REVIEW

1.1 Report by the VOSClim Project Leader
1.2 Report on Status of Participation and Ship recruitment
1.3 Report by the VOSClim Scientific Advisers
1.4 Review of Action Items from VOSClim-IV

2. DATA MANAGEMENT

2.1 Real Time Monitoring Centre (RTMC)
2.2 Data Assembly Centre (including data and metadata collection and the project website)
2.3 GCC Report on VOSClim (III-A/5.2.2)

3. FUTURE DEVELOPMENT

3.1 The future of VOSClim
3.2 Project Promotion
3.3 Future recruitment

4. FURURE WORK PROGRAMME AND IMPLEMENTATION ISSUES

4.1 Action items
4.2 Proposal for the revision of the Terms of Reference of VOS

==========

IV. SOOPIP, Sixth Session

==========

1. PROGRAMME REVIEW

1.1 Report by the Chairperson of SOOPIP
1.2 Report by the SOOP Coordinator
1.3 SOOP Monitoring reports
  1.3.1 Timely submission of data for Semestrial Reports
1.4 Information Exchange
  1.4.1 Metadata and system monitoring
  1.4.2 Mailing lists
1.5 SOOPIP-III Action items review
  1.5.1 Contact the two ADCP Data Centers regarding continuation under JCOMM
  1.5.2 Contact OOPC regarding transition from LDX to FRX and HDX
  1.5.3 Investigate possibilities of obtaining or increasing resources for JCOMMOPS & SOOP Trust Fund to an overall SOT Trust Fund
  1.5.4 Prepare for possible contribution of compiled data sets of measurements by VOS of the Carbon Network
  1.5.5 Develop a plan for reporting all VOS & SOOP observations in real time
  1.5.6 Initiate development of generic scientific design standards for new ships
  1.5.7 Liaise with SOOPIP chairperson regarding WRAP vessel

2. IMPLEMENTATION

2.1 Present Status of Sampling
2.2 Review of Line Responsibilities
2.3 Discussion regarding a pool of probes to support specific lines

3. DATA MANAGEMENT

3.1 GTSPP overview and future direction
3.2 GOSUD
3.3 SOOP metadata requirements
3.4 BUFR distribution for XBT, XCTD & ADCP data

4. ISSUES FOR SOOPIP

4.1 Review of N-S vs. E-W line assignment vs. required horizontal resolution
4.2 Status and future plans for Thermosalinograph network & GOSUD
4.3 Coordination/integration with other projects
  4.3.1 Atmospheric carbon measurements
  4.3.2 Other projects and parameters

5. ORGANIZATIONAL MATTERS

5.1 SOOP Coordinator position review & funding
5.2 SOOP Trust Fund

6. FUTURE WORK PROGRAMME

==========

V. ASAPP, Fifteenth Session

==========

1. PROGRAMME REVIEW

1.1 Report by the Chairpserson of the ASAP Panel
1.2 Review of Action Items from ASAPP-XIV
1.3 Report by EUMETSAT
1.4 Monitoring reports
  1.4.1 Report by ECMWF
  1.4.2 Report by ASAP monitoring centre

2. PROJECT REVIEW

2.1 Report on the EUMETNET ASAP project
2.2 Worldwide Recurring ASAP Project (WRAP)

3. COORDINATION OF IMPLEMENTATION

4. ISSUES FOR ASAPP

4.1 Problems for ship recruitment for ASAP: Requirement to promote ASAP programme with ship companies
4.2 Difficulties with satellite transmission
4.3 Improvement of ASAP general quality

5. INFORMATION EXCHANGE

5.1 Web site
5.2 Publications including ASAP annual report
5.3 Future data management

6 FUTURE WORK PROGRAMME

6.1 SOT coordination and integration issues
6.2 Action items

7. ORGANIZATIONAL MATTERS

7.1 Terms of Reference of ASAPP and Membership
7.2 ASAP Trust Fund

_____

Annex III

Task Team on Coding

Tasks:

1. Develop a draft new code table for BUFR which accommodates new types of SST measurements.

2. Submit the draft proposal to a relevant body of the CBS.

3. Investigate possible future inclusion of bio-chemical data in BUFR through various interactions with other ship-based observation communities.

4. Report to SOT-IV.

Members:

Craig Donlon (TT chairperson, United Kingdom)
Graeme Ball (Australia)
Etienne Charpentier (JCOMMOPS)
Bob Keeley (Canada)
Loïc Petit de la Villéon (France)

Task Team on Metadata for WMO-No. 47 (Pub. 47)

Tasks:

1. Prepare a submission to JCOMM-II regarding the proposed changes to WMO-No. 47 (Pub. 47) metadata based on the recommendations from SOT-III.

2. Prepare a consolidated list of ship routes in accordance with the submission to JCOMM-II for presentation at SOT-IV.

3. Regularly review the Pub. 47 metadata requirements and make recommendations as appropriate.

4. Monitor the receipt of regular Pub. 47 updates at WMO from participating VOS members.

Members:

Graeme Ball (TT chairperson, Australia)
Pierre Blouch (France)
Yvonne Cook (Canada)
Julie Fletcher (New Zealand)
Elizabeth Kent (United Kingdom)
Robert Luke (USA)
Sarah North (United Kingdom)

Task Team on Satellite Communications System Costs

Tasks:

1. Continue to monitor the cost implications of Inmarsat satellite communications sent by Code 41.

2. Report to SOT-IV on any relevant issues/proposals.

Members:

Sarah North (TT chairperson, United Kingdom)
Pierre Blouch (E-SURFMAR)
Andy Fuller (IMSO)
Ali Mafimbo (Kenya)
Representatives of countries where LES accepting Code 41 are located
A representative of RA III
A representative of the WMO Secretariat

Task Team on VOS Recruitment and Programme Promotion

Tasks:

1. Further develop the generic pre-installation design standards that will eventually be available to ship builders and classification societies.

2. Review existing promotional aids (flyer, certificate) and recommend new promotional aids.

3. Promote the use of, and keep under review, the promotional presentation "The Partnership between the Maritime Industry, Marine Forecasting and Science".

4. Establish a store of newsworthy articles for use in a SOT or VOSClim Newsletter or in national newsletters.

5. Review the questionnaire used for the Marine Meteorological Services Monitoring Programme, and propose amendments, which should be reflected in the questionnaire survey to be conducted in 2008.

Members:

Steve Cook (TT chairperson, USA)
Graeme Ball (Australia)
Pierre Blouch (France)
Julie Fletcher (New Zealand)
Gordon Mackie (United Kingdom)
Sarah North (United Kingdom)

Task Team on Instrument Standards

Tasks:

1. Compile information on existing activities, procedures and practices within JCOMM relating to instrument testing, standardization and intercalibration, as well as the standardization of observation practices and procedures,

2. Using guidance contained in existing guides including the WMO Guides on Instruments and Methods of Observation (WMO-No.8), communicate with manufactures regarding new technologies and recognized equipment problems.

3. Prepare a JCOMM Technical Report containing this information, to be made widely available through relevant web sites (JCOMM, JCOMMOPS, VOS, DBCP, SOOP, SOT),

4. Provide guidance on testing and the intercalibration of marine meteorological and oceanographic observing systems.

5. Liaise closely with WMO/CIMO, both in the compilation of the information and also in assessing what additional work in this area might be required under JCOMM.

6. Liaise closely with IOC in the preparation of the wider compilation of existing instrumentation and observing practices standards in oceanographic observations in general, with a view to inputting an appropriate contribution from JCOMM.

Members:

Robert Luke (TT chairperson, USA)
Graeme Ball (chairperson of SOT)
Pierre Blouch (E-SURFMAR project manager)
Steven Cook (chairperson of SOOPIP)
Yvonne Cook (Canada)
Julie Fletcher (chairperson of VOSP)
Rudolf Krockauer (E-ASAP Programme Manager)
Sarah North (chairperson of TT on the VOS Climate Project)
Derrick Snowden (USA)

Task Team on the VOS Climate Project

Tasks:

1. Coordinate, maintain, promote and enhance the VOS Climate project, monitor its performance, and encourage increased participation.

2. Revise the VOS Climate project document to reflect the current procedures and to clarify and revise where necessary the responsibilities of the VOSClim data centres.

3. Prepare a report to SOT-IV on, inter-alia, the following over-arching VOSClim issues

    a. Should VOSClim be continued as a project, or developed into a separate long-term operational programme? If so, what form should this programme take?
    b. Is the high-quality dataset a valuable resource? If so, how should it be updated operationally?
    c. How can the lessons of VOSClim be used to improve data quality in the wider VOS?

Members:

Sarah North (TT chairperson, United Kingdom)
Julie Fletcher (VOSP chairperson, New Zealand)
Representatives of participating countries (VOSClim focal points)
Representative of the Real Time Monitoring Centre
Representative of DAC
Representatives of the GCCs
Scientific advisers

Annex IV

Use of VOS Data in Climate Products

Elizabeth C. Kent.[1,5,6], Scott D. Woodruff [2,4] and Peter K. Taylor [1,3,5]

1. Introduction and Background

This document will summarise some of the uses of data from the ships participating in the WMO Voluntary Observing Ships Scheme, and other earlier ship reports (which we shall collectively refer to as VOS), in climate products. The foresight of early mariners, such as Matthew Fontaine Maury of the US Navy, led to the first international Maritime Conference, held in Brussels in August 1853. The Conference was convened for the purpose of "establishing a uniform system of meteorological observations at sea, and of concurring in a general plan of observation on the winds and currents of the ocean". This was the first international meteorological conference, and the forerunner of international cooperation and coordination in operational meteorology and oceanography. It led to the first International Meteorological Congress in Vienna in 1873 and to the establishment of the International Meteorological Organization (IMO). The 150th anniversary of this conference was celebrated in Brussels in November 2003, in association with the second International Workshop on Advances in Marine Climatology (CLIMAR-II).

As a result of these and later efforts, we now have analyzed (gridded, near-complete oceanic) monthly mean datasets of surface pressure, sea surface temperature and air temperature from the mid-1850s to the present day. Similar datasets of other important variables, such as wind speed and direction and humidity tend to be available from the 1950s. Datasets of global heat exchange, estimates of precipitation (derived from the ship's weather code) and wind stress have been derived using data from 1945 onwards. The quality of the data will obviously vary over this long period, and climate researchers are just starting to attempt to estimate the uncertainty in these datasets (see Section 4).

Figure 1 shows the global average temperature, taken from the Intergovernmental Panel on Climate Change (IPCC) 3rd assessment report (IPCC, 2001). The global temperature is a combined land and sea temperature, with the estimates of ocean surface temperature derived from VOS SST measurements, supplemented in recent decades with data from drifting and moored buoys. SST data from satellites are not used in this particular timeseries of global change. This is because the remotely sensed data represent the temperature of the top thousandth of a millimetre of the ocean, which we cannot yet combine reliably with the bulk measurements from the VOS to provide a consistent record. Consistency and continuity are essential for the assessment of climate change (see Appendix).

[1]Southampton Oceanography Centre, UK, [2]Climate Diagnostics Center, NOAA/OAR, USA.
The authors are members of the indicated working groups, panels, or teams; however the contents of this paper represent their own views:
[3] GCOS/GOOS/WCRP Ocean Observing Panel for Climate, [4]JCOMM Expert Team on Marine Climatology, [5]WCRP Working Group on Surface Fluxes, [6]WCRP Working Group on Observations and Assimilation.

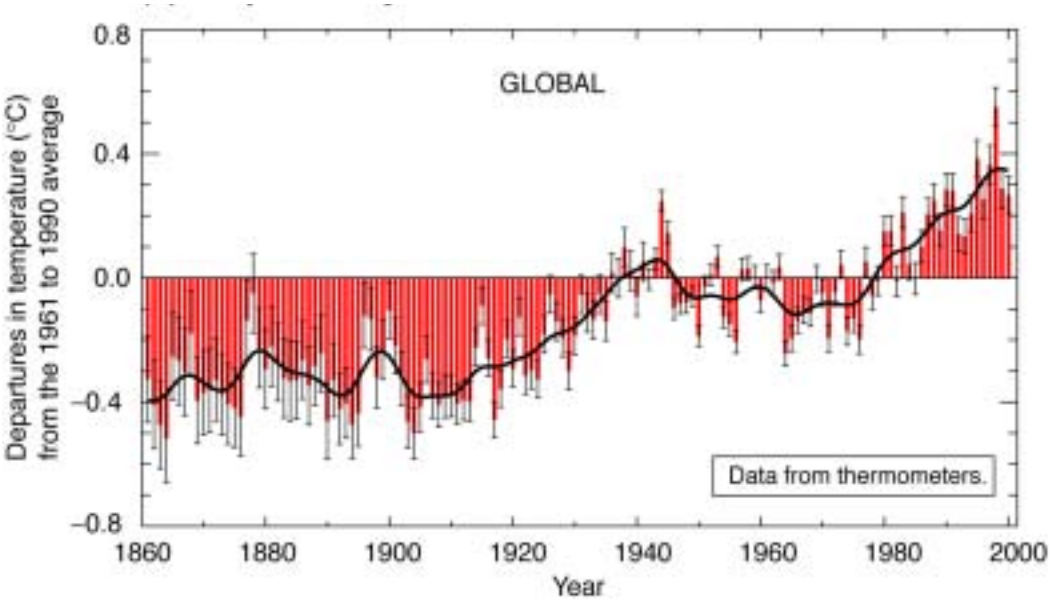


Figure 1. Variations of the Earth's surface temperature over the last 140 years showing variations on annual (red bars) and decadal (black line) time scales. The error bars indicate the 95% confidence range in annual values with uncertainties due to data gaps, random instrument errors and uncertainties, uncertainties in bias corrections in ocean surface temperature data and in adjustments for urbanisation over land. (Source: IPCC 2001)

It should be noted that whilst for short term weather forecasting the requirements of climate monitoring and numerical weather prediction do not always closely align, for longer term forecasting the requirements (for higher quality data, surface flux estimates and global coverage) are more similar.

2. Data Requirements

Almost all the variables reported by the VOS are used in climate products. All of the basic meteorological variables (wind speed and direction, surface pressure, air and sea temperatures and surface humidity) are needed to make estimates of both the air-sea heat and momentum exchange. Additionally observations of cloud cover and weather codes allow us to estimate the long and short-wave components of the radiation balance and also to estimate precipitation. Since these variables are frequently contained within a single VOS report we can estimate these fluxes of radiative and turbulent heat, freshwater and momentum with better accuracy than if we have to combine information from different places and times. In the future, we may also find better ways to make use of additional VOS variables in climate products, including sea state (wind wave and swell) data.

The need for metadata, data about data, to accompany VOS reports has long been recognised. Climate researchers need to know as much information as possible about the data and the ships or other platforms which produce the data. Some of this information can be transmitted with the report, such as the ship callsign and methods of SST and wind measurement. For other variables we rely on WMO Publication No. 47, the "List of Selected, Supplementary and Auxiliary Ships" (Pub. 47) which is currently produced quarterly in digital form. Pub. 47 is available in digital form from 1973 onwards (1973-1997 as annual files, quarterly thereafter). The importance of this metadata to climate research is demonstrated by the US National Climatic Data Center (NCDC) agreeing to fund the digitisation of the metadata from 1955 to 1972 as part of its Climate Database Modernisation Programme. This digitisation is in progress. Important metadata in Pub. 47 include, heights of measurement for winds and temperatures and measurement methods for air temperature, humidity and SST.

To use the information in Pub. 47 with VOS reports there needs to be a valid callsign associated with the report. Any report with a blank callsign, or generic callsign such as 'SHIP',

cannot have height corrections properly applied or a full range of measurement methods assigned. Even if there is no information for a particular ship in Pub. 47 (several countries do not currently make regular updates) assessments of the quality of data from a particular ship can still be made if those data can be identified and isolated. In certain cases it may be possible to deduce methods of measurement from the data themselves. For example histograms of wind speed for particular ships can sometimes reveal whether the ship has made Beaufort estimates of wind speed or anemometer measurements, even if no metadata are available. For climate research and monitoring it is therefore essential that we can identify reports from individual platforms (ships, buoys etc.), and wherever possible associate metadata from Pub. 47 with each report.

There has been much work in the climate community trying to better understand VOS reports and construct an homogeneous record from the in situ data sources. Many of the sources of inhomogeneity are well known: visual vs. anemometer winds; bucket vs. engine intake SST; and night vs. daytime air temperatures. One of the aims of the VOSClim project[1] is to produce a dataset that can be used to quantify and adjust for these differences.

More recently new sources of possible inhomogeneity have appeared in the climate data record. For example, the introduction of the height adjustment of winds to an effective height of 10 metres by the TurboWin[2] software to comply with WMO specifications was aimed at improving the homogeneity of the dataset but probably actually had the opposite effect. There is no evidence that height correction to 10 metres had previously been widely applied to marine anemometer wind speeds, either reported from the VOS over the Global Telecommunication System (GTS) or in delayed-mode, and climate researchers usually apply height correction to the VOS reports using Pub. 47 metadata. As there were no metadata to identify TurboWin derived winds, these reports would have been overcorrected.

Another recent source of possible inhomogeneity is the increasing use of automatic weather systems (AWS) on VOS. These automatic measurements potentially offer greater consistency and accuracy. However, at this stage they have not been adequately benchmarked against ordinary shipboard observations in order to assess the impact of including them in the data mixture used for climate products. Moreover, neither the GTS ship code nor the current IMMT format for delayed-mode data, support the metadata necessary to separate the two types of measurements or to distinguish different types of AWS. These recent examples illustrate the importance of adhering to the GCOS Climate Monitoring Principles (see Appendix, taken from Appendix 2 in GCOS 2003) to ensure data long-term data continuity.

3. The Products

There are many different climate products that use VOS data. The most commonly used climate database is the International Comprehensive Ocean-Atmosphere Dataset (ICOADS). ICOADS grew out of datasets held by NCDC and has been supplemented over the years by data from the Japanese Kobe Collection, the US Maury Collection, the UK Met Office Marine Databank, the Russian MORMET dataset and many others. Early data came from ships logbooks and some countries still collect and key these logs. More recent data comes from the GTS in near real time and is later supplemented with quality-checked data from electronic or paper logbooks via the Global Collecting Centres (GCCs). Where possible duplicate reports are identified and the report expected to be of highest quality and more complete is used. Datasets derived from ICOADS are to be used in the ocean component of the next IPCC assessment (IPCC 4th assessment, 2006).

---

[1] Other aims of VOSClim, the VOS Climate Project, include the production of a dataset for validation of model output and satellite products, and to promote good observing practices and improve the availability of ship metadata.
http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html

[2] TurboWin is automatic logging software developed for the VOS by KNMI. Height correction was applied to anemometer measured winds in versions 2.1.2 to 3.0. More details:
http://www.knmi.nl/onderzk/applied/turbowin/turbowin.html

Figure 2 shows the number of air temperature observations from the ICOADS dataset and also those available from the NCEP Near Real Time dataset which contains data exclusively from the GTS. Before 1995 ICOADS contains significantly more data than the NCEP stream but after 1995 typically a bit less. Different factors explain these variations, including a transition at NCEP in 1995 to archiving hourly and sub-hourly moored buoy (and other automated) data, more stringent duplicate elimination and quality controls applied to ICOADS, etc. ICOADS allows modern data which is not transmitted on the GTS to be used in climate research. For example the logbook data handled by the GCCs will be present in ICOADS, but only the lower quality transmitted report appears in the NCEP stream.

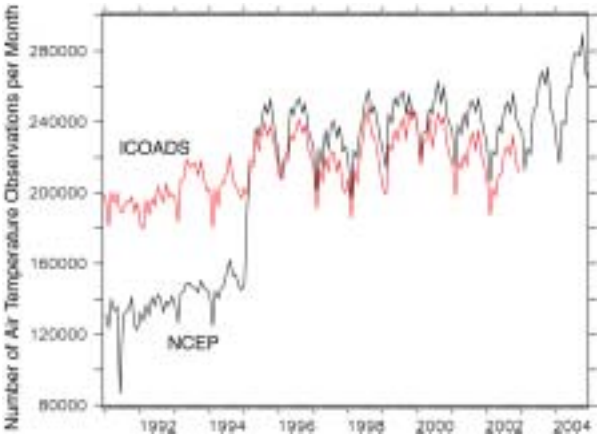


Figure 2: Monthly number of air temperature observations from the NCEP Near Real Time data stream (black) and present in the ICOADS monthly products (red). ICOADS presently only provides data up to the end of 2002.

VOS observations are an important (and sometimes sole) data source for a range of climate products, national and international assessments of climate change (e.g., IPCC), and a variety of other applications. The long-term global ocean record from VOS has supported research in many other scientific domains; recent examples include satellite and in situ blended analyses, long-term historical climate analyses, ground truth for remotely sensed or pre-instrumental proxy data, changes in coastal geological features, and assessment of global anthropogenic emissions from ships.

VOS observations are assimilated into the NCEP, ECMWF and JMA Reanalyses which are used in a wide variety of applications. Reanalyses are a global analysis of atmospheric fields spanning back in time over several decades employing a frozen, state-of-the-art global data assimilation system and an atmospheric general circulation model to produce as consistent as possible a set of atmospheric fields.

Research has led to improvements in derived quantities like ocean-atmosphere fluxes. A number of flux and other climatologies were developed in the 1980s, which advanced and analyzed the ICOADS monthly summary statistics. Subsequently, analyzed products such as monthly tropical wind pseudo-stresses have been created using ICOADS observations. Observations which have been adjusted for bias have been used in products such as monthly flux analyses, and flux climatologies have been constrained with estimated ocean advective fluxes or utilizing other improvements including time-dependent adjustments of the Beaufort wind scale.

Sources of Individual Observations and Basic Gridded Datasets

- ICOADS: http://www.cdc.noaa.gov/coads/
- NCEP Near Real Time: http://www.cdc.noaa.gov/coads/nrt.html
- CLIWOC: http://www.ucm.es/info/cliwoc/

Analyzed Datasets

- Hadley Centre: http://www.hadobs.org/
- Kaplan: http://markov.ldgo.columbia.edu:81/SOURCES/.KAPLAN/
- NOAA ERSST: http://www.ncdc.noaa.gov/oa/climate/research/sst/sst.html
- NOAA ERSLP: http://www.ncdc.noaa.gov/oa/climate/research/slp/index.html
- NOAA OI.v2: http://www.emc.ncep.noaa.gov/research/cmb/sst_analysis/
- FSU: http://www.coaps.fsu.edu/RVSMDC/SAC/index.shtml

Surface Flux Products

- SOC Climatology: http://www.soc.soton.ac.uk/JRD/MET/fluxclimatology.php
- UWM/COADS: http://ingrid.ldeo.columbia.edu/descriptions/.dasilva.html
- FSU: http://www.coaps.fsu.edu/RVSMDC/SAC/index.shtml

Reanalyses

- ERA-40: http://www.ecmwf.int/research/era/
- NCEP Reanalysis: http://www.cpc.ncep.noaa.gov/products/wesley/reanalysis.html
- JRA-25: http://www.jreap.org/indexe.html

4. Data Accuracy

Although climate researchers are extremely concerned about data quality and consistency it is only recently that producers of datasets have been able to include estimates of uncertainty. Figure 3a shows an estimate of the monthly mean air temperature uncertainty in a particular North Atlantic 10° area over the period 1960 to 2004. Note that this is a preliminary estimate of uncertainty for the HadMAT dataset and is likely to be revised. This area is relatively well sampled, but we see that the uncertainty has been increasing in this region since about 1970 and has typically increased more rapidly since about 1990. This uncertainty estimate suggests that we are less confident about our estimates of night-time marine air temperature now than we were thirty years ago. The increase in uncertainty is due to the reduced number of observations. This seems at odds with the observation numbers shown in Figure 2 which shows that the total number of air temperature observations has increased.

This can be explained by the changing nature of the observing system. In Section 2 we noted that the number of VOS using automatic weather systems has increased. This means that the proportion of reports from ships which sample hourly is increasing relative to the more traditional 6-hourly VOS sampling. Figure 3b shows an estimate of how the composition of ICOADS temporal sampling has changed over time for VOS air temperature reports only. Although hourly data can be useful for some purposes, for example to learn about diurnal variability, for climate monitoring purposes data which are nearby in space and/or time provide less information than widely spaced observations. ICOADS presently ends in 2002 and the estimate for 2004 has been calculated from GTS reports obtained from the Met Office in November and December 2004. Air temperature has been chosen as an example as it cannot presently be retrieved from satellites with usable accuracy. VOS reports are therefore the primary source for marine air temperature.

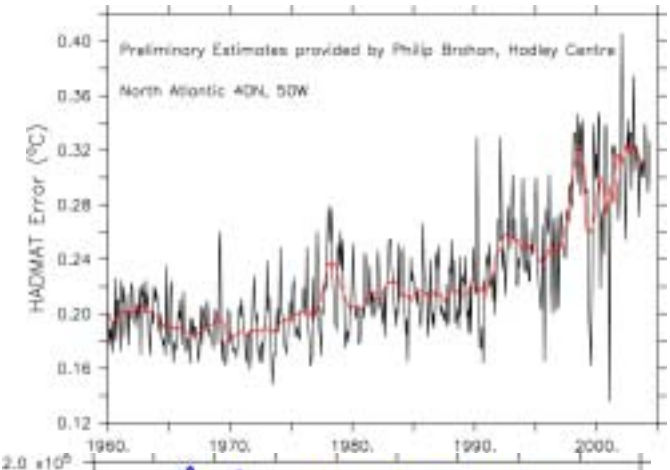


Figure 3a: Provisional estimate of uncertainty in monthly 5° area Night-time Marine Air Temperature (HadMAT).

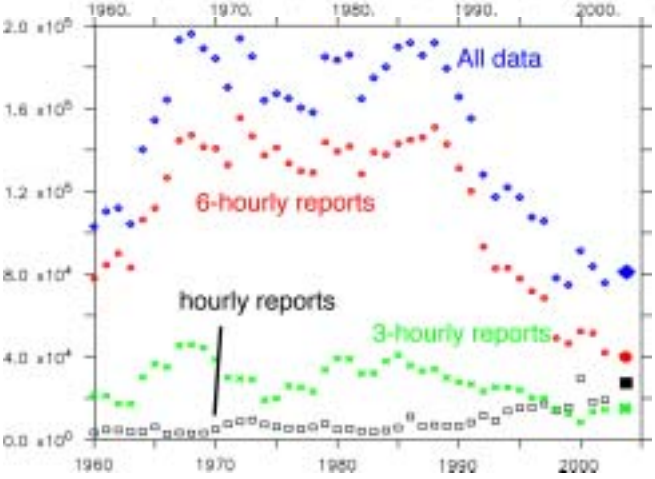


Figure 3b: Number of observations per month from ships in ICOADS in the period 1950 to 2002. All ship data (blue), estimates of number of reports made by ships which report 6-hourly (red), 3-hourly (green) and hourly (black). Last point is an estimate from data in Nov/Dec 2004.

The change in sampling composition has been dramatic. The decrease in total number of VOS reports of air temperature is striking (compare with Figure 2 which includes reports from moored and drifting buoys and from other platforms). The number of hourly sampled VOS reports has risen steeply and if current trends continue, hourly-reports will soon be more common than either 6-hourly or 3-hourly reports. When buoy observations are included this is almost certainly already the case. This trend towards higher-frequency observations from an increasingly limited number of different ships has led to fewer independent observations as successive hourly reports from the same ship are highly correlated. It is this effect that has led to the increase in uncertainty in gridded air temperature products. Indeed it is likely that the HadMAT error estimates actually underestimate the increase in uncertainty as in the calculation, correlations between the reports have been assumed to remain constant over time.

Drifting buoy observations are becoming more common and are thought to provide SST data of reasonable quality. Assessments of the usefulness of drifting buoy air temperatures for climate research are yet to be made and drifting buoys do not presently provide reliable estimates of humidity or winds. Moored buoy data should be of good quality, but their limited spatial coverage means that their spatial contribution to gridded datasets is comparatively small, whereas their frequency of measurement (hourly or sometimes sub-hourly) means that their contribution to individual grid boxes can overwhelm any available VOS observations.

CONCLUSIONS

- VOS data are an essential climate resource and an important component of the GCOS.
- VOS data (currently) extend in digital form back as far as the 18th century, and are among the only direct observations of the ocean surface until the advent of automated observing systems and remote sensing. As such, they represent a critical climate baseline.

- The number of VOS reports is declining.

- VOS data are the most important source of marine surface air temperature and humidity.

- The uncertainty in gridded and analyzed ocean surface products increases over recent years due to the declining number of VOS reports, except for parameters for which satellite data can be utilised (e.g. for SST and wind speed).

- The introduction of automatic observing systems on VOS means that more observations are required to generate fields of the same accuracy as more frequent reports are more highly correlated with each other.

- VOS data are essential for the generation of flux fields (estimates of the exchanges of heat, momentum and freshwater) over the global ocean. To calculate heat exchange and evaporation reports that contain SST, air temperature, humidity, wind speed and direction, surface pressure are required. If cloud cover and the present weather code are available, radiative fluxes and precipitation can also be estimated.

- Moored buoy data can provide high quality data but are spatially limited. Drifting buoys report a limited range of variables and data quality can be low. Drifting buoy data is the least preferred for climate studies, but can be valuable in data-sparse regions.

- For the best quality data reports from identifiable ships are required which can be associated with metadata to give observation methods and heights.

- Up-to-date metadata can improve the quality of climate datasets.

- The evolution of the observing system has not followed the GCOS Climate Monitoring Principles (see Appendix).

- There is currently no monitoring of marine surface observations against climate requirements, and further, these climate requirements have not yet themselves been adequately defined.

RECOMMENDATION

The GCOS Climate Monitoring Principles critically impact JCOMM, and cut across all of its Programme Areas and are directly relevant to many of the Expert Teams. We recommend that JCOMM actively integrate these Principles, as appropriate, into revised terms of reference for its subsidiary bodies, as a key outcome from JCOMM-II.

References

IPCC, 2001: Climate Change 2001: The Scientific Basis: Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, (Houghton, J.T. et al., eds.), Cambridge Univ. Press., Cambridge, U.K., 881 pp. [available from: http://www.ipcc.ch/]

GCOS, 2003: The Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCC WMO/IOC/UNEP/ICSU, GCOS – 82 (WMO/TD No. 1143) [available from: http://www.wmo.ch/web/gcos/Second_Adequacy_Report.pdf]

Appendix: 1

Appendix to Annex IV

The GCOS Climate Monitoring Principles (GCOS, 2003)

Effective monitoring systems for climate should adhere to the following principles [1]:

1. The impact of new systems or changes to existing systems should be assessed prior to implementation.

2. A suitable period of overlap for new and old observing systems is required.

3. The details and history of local conditions, instruments, operating procedures, data processing algorithms and other factors pertinent to interpreting data (i.e., metadata) should be documented and treated with the same care as the data themselves.

4. The quality and homogeneity of data should be regularly assessed as a part of routine operations.

5. Consideration of the needs for environmental and climate-monitoring products and assessments, such as IPCC assessments, should be integrated into national, regional and global observing priorities.

6. Operation of historically-uninterrupted stations and observing systems should be maintained.

7. High priority for additional observations should be focused on data-poor regions, poorly-observed parameters, regions sensitive to change, and key measurements with inadequate temporal resolution.

8. Long-term requirements should be specified to network designers, operators and instrument engineers at the outset of system design and implementation.

9. The conversion of research observing systems to long-term operations in a carefully-planned manner should be promoted.

10. Data management systems that facilitate access, use and interpretation of data and products should be included as essential elements of climate monitoring systems.

Furthermore, satellite systems for monitoring climate need to:

(a) Take steps to make radiance calibration, calibration-monitoring and satellite-to-satellite cross-calibration of the full operational constellation a part of the operational satellite system; and

(b) Take steps to sample the earth system in such a way that climate-relevant (diurnal, seasonal, and long-term interannual) changes can be resolved.

Thus satellite systems for climate monitoring should adhere to the following specific principles:

11. Constant sampling within the diurnal cycle (minimizing the effects of orbital decay and orbit drift) should be maintained.

[1] The ten basic principles were adopted by the Conference of the Parties to the UN Framework Convention on Climate Change through Decision 5/CP.5 of COP-5 at Bonn in November 1999.

12. A suitable period of overlap for new and old satellite systems should be ensured for a period adequate to determine inter-satellite biases and maintain the homogeneity and consistency of timeseries observations.

13. Continuity of satellite measurements (i.e., elimination of gaps in the long-term record) through appropriate launch and orbital strategies should be ensured.

14. Rigorous pre-launch instrument characterization and calibration, including radiance confirmation against an international radiance scale provided by a national metrology institute, should be ensured.

15. On-board calibration adequate for climate system observations should be ensured and associated instrument characteristics monitored.

16. Operational production of priority climate products should be sustained and peer-reviewed new products should be introduced as appropriate.

17. Data systems needed to facilitate user access to climate products, metadata and raw data, including key data for delayed-mode analysis, should be established and maintained.

18. Use of functioning baseline instruments that meet the calibration and stability requirements stated above should be maintained for as long as possible, even when these exist on de-commissioned satellites.

19. Complementary in situ baseline observations for satellite measurements should be maintained through appropriate activities and cooperation.

20. Random errors and time-dependent biases in satellite observations and derived products should be identified.

Annex V

Definitions of Sea Surface Temperature

Submitted by Dr. Craig Donlon to the JCOMM Ship Observations Team (SOT) secretariat at the SOT 3rd workshop (SOT-III), IFREMER, Brest, France, 8th March 2005.

1 Introduction

The primary aim of the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP) is to develop and operate an operational demonstration system that will deliver high-resolution (better than 10 km and ~6 hours) global coverage SST data products for the diverse needs of GODAE and the wider scientific community. A new generation of SST data products is now being derived and served to the user community based on the combination of complementary infrared and microwave satellite and in situ SST observations in near real time. A full description of the GHRSST-PP project is given in the GHRSST-PP Development and Implementation Plan (GDIP) which can be obtained from the GHRSST-PP project web server located at http://www.ghrsst-pp.org.

The GHRSST-PP is managed by an international Science Team comprising of 23 international experts in SST which is supported by an international project office based at the Met Office, United Kingdom. Definitions of SST provide a necessary theoretical framework that can be used to understand the information content and relationships between measurements of SST made by different satellite and in situ instruments. The following SST definitions are defined and explained according to the consensus reached at the 2nd (Donlon, 2002) and 3rd GHRSST-PP workshops (Donlon et al., 2003). Each SST definition has been carefully considered by the GHRSST-PP Science Team in order to achieve the closest possible coincidence between what is ***defined*** and what ***can be measured operationally***, bearing in mind current instrumentation, scientific knowledge and understanding of how the near surface thermal structure of the ocean behaves in nature. These definitions are the working definitions used by the GHRSST-PP and are embodied in the GHRSST-PP Data Processing Specification (Donlon et al., 2004). The GDS document defines the methodology implemented by the GHRSST-PP regional data assembly centres (RDAC) tasked with implementing the GHRSST-PP.

2 GHRSST-PP definitions of sea surface temperature

Figure 1 presents a schematic diagram that summarises the definition of SST in the upper 10m of the ocean and provides a framework to understand the differences between complementary SST measurements. It encapsulates the effects of dominant heat transport processes and time scales of variability associated with distinct vertical and volume regimes of the upper ocean water column (horizontal and temporal variability is implicitly assumed). Each of the definitions marked in the bottom right of the figure is explained in the following sub-sections.

2.1 The Interface SST (SSTint)

SSTint is a theoretical temperature at the precise air-sea interface. It represents the hypothetical temperature of the topmost layer of the ocean water and could be thought of as an even mix of water and air molecules. SSTint is of no practical use because it cannot be measured using current technology.

2.2 The Skin SST (SSTskin)

SSTskin is defined as the radiometric skin temperature measured by an infrared radiometer operating in the 10-12 µm spectral waveband (typical for satellite imaging instruments). As such, it represents the actual temperature of the water at a very thin (<< 1mm) surface or 'skin' layer of the ocean surface having a depth of approximately 10-20 µm. This definition is chosen for consistency with the majority of infrared satellite and ship mounted radiometer measurements. SSTskin measurements are subject to a large potential diurnal cycle including cool skin layer effects (especially at night under clear skies and low wind speed conditions) and warm layer effects in the daytime (not shown in Figure 1).

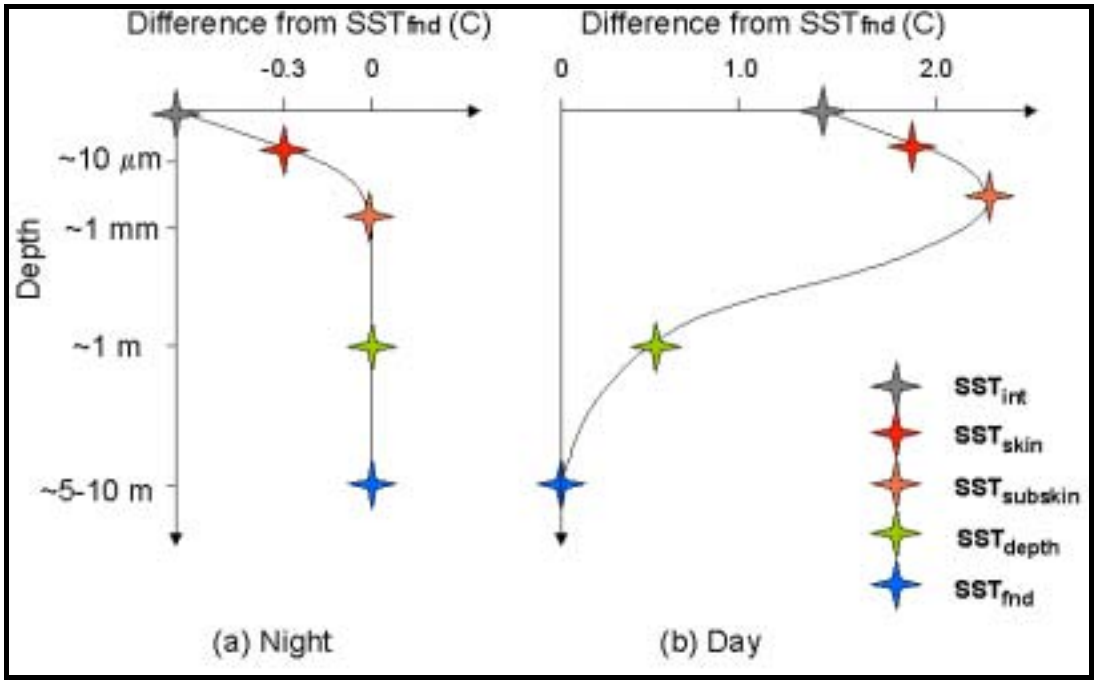


Figure 1 Schematic diagram showing (a) idealised night-time vertical temperature deviations from SSTfnd and (b) idealised day-time vertical temperature deviations from SSTfnd in the upper ocean. The GHRSST-PP definitions for SST are indicated by coloured stars and fully explained the accompanying text (see Donlon et al, 2002b).

2.3 The subskin SST (SSTsubskin)

SSTsubskin represents the temperature at the base of the thermal skin layer. The difference between SSTint and SSTsubskin is related to the net flux of heat through the thermal skin layer. For practical purposes, SSTsubskin can be well approximated to the measurement of surface temperature by a microwave radiometer operating in the 6-11 GHz frequency range, but the relationship is neither direct nor invariant to changing physical conditions or to the specific geometry of the microwave measurements.

2.4 The sea temperature at depth (SSTdepth)

All measurements of water temperature beneath the SSTsubskin are obtained from a wide variety of sensors such as drifting buoys having single temperature sensors attached to their hull, moored buoys that sometimes include deep thermistor chains at depths ranging from a few meters to a few thousand meters, thermosalinograph (TSG) systems aboard ships recording at a fixed depth while the vessel is underway, Conductivity Temperature and Depth (CTD) systems providing detailed vertical profiles of the thermohaline structure used during hydrographic surveys and to considerable depths of several thousand meters and various expendable bathythermograph systems (XBT). In all cases, these temperature observations are distinct from those obtained using remote sensing techniques and measurements at a given depth arguably should be referred to as 'sea temperature' (ST) qualified by a depth in meters rather than sea ***surface*** temperatures.

The situation is complicated further when one considers ocean model outputs for which the SST may be the mean SST over a layer of the ocean several tens of meters thick.

SSTdepth or SST(z) is the terminology adopted by GHRSST-PP to represent an *in situ* measurement near the surface of the ocean that is typically reported simply as SST or "bulk" SST. For example SST_{6m} would refer to an SST measurement made at a depth of 6m. Without a clear statement of the precise depth at which the SST measurement was made, and the circumstances surrounding the measurement, such a sample lacks the information needed for comparison with, or validation of satellite-derived estimates of SST using other data sources. The terminology has been introduced to encourage the reporting of depth (z) along with the temperature.

2.5 The Foundation SST (SSTfnd)

The **foundation SST, SSTfnd**, is defined as the temperature of the water column free of diurnal temperature variability or equal to the SSTsubskin in the absence of any diurnal signal. It is named to indicate that it is the foundation temperature from which the growth of the diurnal thermocline develops each day. SSTfnd provides a connection with historical “bulk” SST measurements typically used as representative of the oceanic mixed layer temperature. This definition was adopted by GHRSST-PP at the Third GHRSST-PP Workshop (Donlon, 2003) to provide a more precise, well-defined quantity than previous loosely defined “bulk” temperature quantities and consequently, a better representation of the mixed layer temperature. The SSTfnd product provides an SST that is free of any diurnal variations (daytime warming or nocturnal cooling). In general, SSTfnd will be similar to a night time minimum or pre-dawn value at depths of ~1-5 m, but some differences could exist. Only in situ contact thermometry is able to measure SSTfnd. SSTfnd cannot be directly measured using either microwave or infrared satellite instruments. Analysis procedures must be used to estimate the SSTfnd from radiometric measurements of SSTskin and SSTsubskin.

2.6 The diurnal cycle/variation of SST (DV)

In the context of SST, the diurnal cycle refers to changes in vertical and horizontal distribution of SST throughout a 24 hour period and thus includes warm stratified layers ***and*** cool skin effects. Cool skin effects are typically more pronounced at night due to radiative cooling of the sea surface but may also occur during the day when the wind is light following a significant rainfall that may leave a cool freshwater layer on the surface of the ocean.

Warm layer effects are associated with environmental conditions characterised by low wind speed and strong insolation. A warm layer readily forms under such conditions effectively decoupling the surface layers (typically 0.1-3m deep) from the water beneath.

References

Donlon, C. J., Proceedings of the Second GODAE High Resolution Sea Surface Temperature Pilot Project Workshop, Tokyo, Japan, May 13-15th 2002, available from the GHRSST-PP International Project Office, 2002a.

Donlon, C. J., P. Minnett, C. Gentemann, T. J. Nightingale, I. J. Barton, B. Ward and, J. Murray, Towards Improved Validation of Satellite Sea Surface Skin Temperature Measurements for Climate Research, J. Climate, Vol. 15, No. 4, 353-369, 2002b.

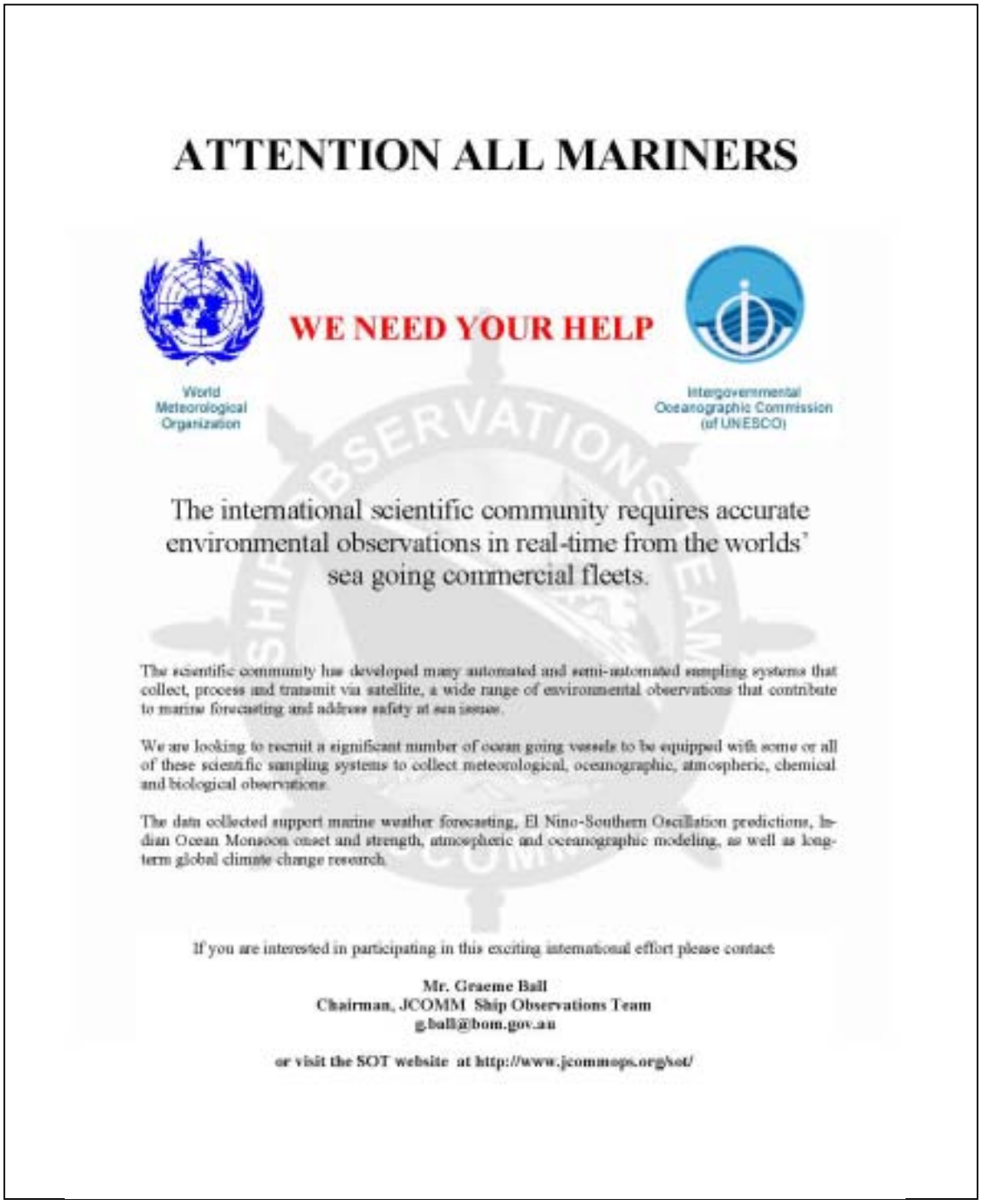
Donlon, C. J., Proceedings of the Third GODAE High Resolution Sea Surface Temperature Pilot Project Workshop, ESA/ESRIN, Frascati, Italy, December 2-4, 2002, available from the GHRSST-PP International Project Office, 2003.

Donlon, C., et al, The Global Ocean Data Assimilation Experiment High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP): Data Processing Specification version 1.5, available from the Intgernational GHRSST0-PP Project Office, National Centre for Ocean Forecasting, Met Office, Fizroy Road, Exeter, EX1 3PB, United Kingdom, pp254, 2004.

Annex VI

Flyer and Certificate

Single Page Recruitment Flyer



ATTENTION ALL MARINERS

WE NEED YOUR HELP

World Meteorological Organization

Intergovernmental Oceanographic Commission (of UNESCO)

The international scientific community requires accurate environmental observations in real-time from the worlds' sea going commercial fleets.

The scientific community has developed many automated and semi-automated sampling systems that collect, process and transmit via satellite, a wide range of environmental observations that contribute to marine forecasting and address safety at sea issues.

We are looking to recruit a significant number of ocean going vessels to be equipped with some or all of these scientific sampling systems to collect meteorological, oceanographic, atmospheric, chemical and biological observations.

The data collected support marine weather forecasting, El Nino-Southern Oscillation predictions, Indian Ocean Monsoon onset and strength, atmospheric and oceanographic modeling, as well as long-term global climate change research.

If you are interested in participating in this exciting international effort please contact

Mr. Graeme Ball
Chairman, JCOMM Ship Observations Team
g.ball@bom.gov.au

or visit the SOT website at http://www.jcommops.org/sot/

Generic SOT Certificate

CERTIFICATE OF PARTICIPATION

PRESENTED ON BEHALF OF THE
SHIP OBSERVATIONS TEAM
TO THE MASTER AND CREW OF

M.V. Northwest Sanderling

For participating in the marine data collection programmes coordinated internationally by the *Ship Observations Team*, operating under the auspices of the World Meteorological Organization and the Intergovernmental Oceanographic Commission through the *Joint Technical Commission for Oceanography and Marine Meteorology* (JCOMM).

Data collected by ships participating in the Voluntary Observing Ship (VOS) Scheme, the Ship-of-Opportunity Programme (SOOP) and Automated Shipboard Aerological Programme (ASAP), support a wide range of meteorological, climatological and oceanographic applications.

Geoff Love
Director
Australian Bureau of Meteorology

Graeme Ball
Manager, Marine Operations Group
Australian Bureau of Meteorology

October 2006

Annex VII

Revision of WMO-No. 47 (Pub. 47)

Proposed changes to WMO Publication No. 47

Preamble

WMO Publication No. 47 (Pub. 47), the *International List of Selected, Supplementary and Auxiliary Ships*, contains details about the names, call signs, ship layout, types of instrumentation and methods of observation used on VOS ships. It relies on the regular submission of metadata from National Meteorological Services operating VOS programmes, nominally on a quarterly basis.

Pub. 47 was formerly printed annually, but, since about 1999, has been available electronically on the WMO website. Until recently the electronic version has been updated very infrequently, much to the frustration of VOS operators, and was a topic for discussion at both VOSClim-IV and SOT-II (London, 2003). Whilst it is the timely availability of current Pub. 47 metadata that is concern for VOS operators, there is also a need to maintain a digital archive of historical metadata for use with climate datasets to allow the identification and correction of spurious climate signals that may result from changes in VOS instrumentation.

Pub. 47 is an important tool for VOS operators as it:

1. Greatly assists in identifying the status of foreign ships.
2. Identifies which ships, through their omission from the list, can be targeted for possible VOS recruitment. An up-to-date version of Pub. 47 reduces the chance of multi-recruitment by more than one NMS and avoids unnecessary ship visits by Port Meteorological Officers.
3. Assists when preparing to visit a foreign VOS vessel.
4. Identifies which ships can be targeted as possible deployment vessels for buoys and floats.

Accurate details about the method of observation and instrument type, instrument exposure, instrument calibration dates and ship layout, are vital if the objectives and desired accuracies of the VOS Climate Project (VOSClim) are to be achieved.

Introduction

This document was prepared by the *Task Team on Metadata for Pub. 47* (TT) that was established at SOT-II (London, 2003). The original proposals were presented at ETMC-I (Gydnia, Poland, July 2004) and later approved at SOT-III (Brest, France, March 2005) and is now presented to JCOMM-II for final approval.

This document incorporates the changes recommended at SOT-III and comprises six separate parts with supporting documentation at Annexes 1 – 6.

Broadly, the parts may be summarised as follows:

1. Proposal that SOT take responsibility for the future revision of content in approved Code Tables.
2. Proposed changes to the content of existing Code Tables. This includes improving the descriptions of some selections in Code Tables. These changes <u>will not</u> affect the existing layout of Pub. 47.
3. Proposed revision of some field definitions. These changes <u>will not</u> affect the existing layout of Pub. 47. If the revised field definitions are not supported then the TT proposes that these fields are deleted, in which case these <u>will</u> affect the layout of Pub. 47.
4. Proposed addition and deletion of fields. These changes <u>will</u> affect the existing layout of Pub. 47.
5. Proposed semi-colon delimited format for exchanging Pub. 47 metadata. The layout is based on the approval of all proposed changes in parts 1, 2 and 3.
6. Proposal to develop XML for the future exchange of Pub. 47 metadata.

Summary of the required actions from JCOMM-II, grouped by part.

Part 1

1. Approve SOT to take responsibility for making future changes to existing Code Tables in Pub. 47.

Part 2

2. Approve changes to the existing codes and or definitions in the table 'Type of Vessel'.
3. Approve changes to the existing codes and or definitions in the table 'Type of Barometer'.
4. Approve changes to the existing codes and or definitions in table 'Thermometer and Hygrometer exposure' respectively.
5. Approve changes to the existing codes and or definitions, as well as the field description for table 'Type of Barograph'.
6. Approve changes to the existing codes and or definitions in the table 'Type of Meteorological Reporting Vessel'.
7. Approve changes to the existing codes and or definitions in the table 'Barometer Location'.
8. Approve recommendation to consolidate separate national route list into one consolidated list.
9. Approve changes to the existing codes and or definitions in the table 'Other Instruments'.
10. Approve changes to the existing codes and or definitions in the table 'Vessel Digital Image'.
11. Approve a change to the definition of 'Footnotes'.
12. Approve changes to the existing codes and or definitions in the table 'Temperature Scale'.
13. Approve changes to the existing codes and or definitions in the field 'Vessel Dimension'.

Part 3

14. Approve a change to the definition of the field for 'Teleprinter and Satellite' to 'Satellite system for transmitting observations', or otherwise delete the field.
15. Approve a change to the definition of cargo height from 'Average cargo height' to 'Maximum cargo height', or otherwise delete the field.

Part 4

16. Approve the addition of a new field and its corresponding table for 'Type of Anemometer'.
17. Approve the addition of a new field and its corresponding table for 'Routine frequency of observations'.
18. Approve the addition of a new field for the 'Side indicator of the anemometer from the centre line', and redefine **anDC** to only report the 'Distance of the (fixed) anemometer from the centre line'. The field **anDC** is currently used to report both of these metadata values.
19. Approve the deletion of the field and its corresponding table for 'Radiotelephony and Radiotelegraphy'.
20. Approve the addition of a new field for the 'Version' of Pub. 47 format.
21. Approve the addition of a new field for the 'Make and Model of Anemometer'.
22. Approve the addition of a new field for the 'Make and model of automatic weather station'.
23. Approve the addition of a new field for the 'Name and Version of AWS processing software'.
24. Approve the addition of a new field for the 'Name and Version of AWS console software'.
25. Approve the addition of a new field for the 'Name and version of electronic logbook software'.
26. Approve the addition of a new field for the 'Recruitment date of the current VOS participation'.
27. Approve the addition of a new field for the 'De-recruitment date of the last VOS participation'.
28. Approve the addition of a new field for the 'Last VOSClim recruitment date in the current period of VOS participation'.
29. Approve the addition of a new field for the 'Last VOSClim de-recruitment date in the current period of VOS participation'.
30. Approve the addition of a new field for the 'Country of Registration'. This field is currently reported as part of the name field when the country of registration is different to the country of recruitment.

Part 5

31. Approve the new format to transmit delimited files containing the Pub. 47 metadata. The new format is based on the adoption of all changes proposed contained in parts 4, 5 and 6.

Part 6

32. Approve the development of XML for the future exchange of Pub. 47 metadata.

Discussion

Part 1

The TT, and VOS operators in general, are concerned about the long delays in approving changes to the coding and formatting of Pub. 47. The inadequacies of Pub47, combined with the delays in approving revisions to Pub47 as technologies and or systems change, have led to the misuse and over-use of footnotes as de-facto and non-searchable database fields. Some of the coding changes contained in Annex 1 to this document were first raised with WMO more than four years ago.

The TT therefore proposes that SOT, which meets every 2 years, take responsibility to approve changes to the selections in existing Pub47 Code Tables. ETMC-I supported this proposal.

JCOMM would continue to give final approval regarding changes to the layout of Pub47, including the addition and deletion of fields, as proposed by SOT.

Part 2 *(Supporting documentation at Annex 1)*

Some of the current field codes in Pub47 are in need of review to take account of new types of instruments; to expand the choice of type of vessel; or to restrict the type of meteorological reporting vessels to selected, supplementary or auxiliary, without any concern for the type of vessel or, for USA recruited vessels, the country of registration.

There is also a need to provide documentation to explicitly define some of the required elements of metadata, such as ship's dimensions. Furthermore, there is a need to expand some code descriptions, or, in some cases, remove the ambiguity that exists in some descriptions. These changes will help to promote a consistent approach by VOS operators and Port Meteorological Officers to collecting, and more accurately describing, the metadata.

Although the use of footnotes in Pub47 can be somewhat cumbersome for those having to compile metadata listings, the TT generally supports their retention. However it is proposed that it should be made clear that they can be used to provide supplementary detail in free-form text, about any field where a selection is made from a code table, i.e. in addition to those fields where the code OT (other) is selected from a code table.

The TT also proposes to consolidate the existing separate national route lists into a consolidated list to be used by all countries. This approach is consistent with SOOPIP which uses a consolidated list of XBT sampling lines. A consolidated list of VOS routes will benefit operators searching for a ship to participate in SOOP, ASAP or to deploy buoys or floats along a particular route or in an ocean area. Subject to approval from JCOMM-II, the TT would prepare a consolidated list of routes for approval at SOT-IV. The current separate national route codes will remain in use until the consolidated list of routes has been approved at SOT-IV and been formally implemented.

The TT also proposes that if a ship has two instruments to measure a parameter, the primary instrument will be designated as 'instrument 1' and the secondary instrument will be designated as 'instrument 2'. In the case of air temperature and humidity, the Observing Officer selects the portside or starboard-side instrument depending on the prevailing wind direction; hence there is no primary or secondary instrument, and it is immaterial which is recorded against instrument 1. However, if a ship usually reports bucket SST, but reverts to engine intake in bad weather, then the bucket is recorded as 'SST method 1' and the engine intake as 'SST method 2'. Similarly if a marine screen encloses both a mercury dry bulb thermometer and an electrical resistance thermometer, the method generally used would be reported as thermometer type no. 1

Part 3 (Supporting documentation at Annex 2)

The TT proposes that the field for 'Teleprinter and Satellite' (**prST**), be redefined to the "Satellite system for transmitting observations", noting:

1. The table for prST is incomplete in respect of the range of Inmarsat facilities available to ships. At the same time it is superfluous to record the availability of an Inmarsat C facility when nearly all ocean-going ships are required by the SOLAS Convention to have this facility.
2. The field provides no tangible means to contact a ship; hence its purpose is unclear. Websites such as Inmarsat <www.inmarsat.com> and the International Telecommunications Union (ITU) <www.itu.int/cgi-bin/htsh/mars/ship_search.sh> maintain a complete and current list of ship's Inmarsat numbers, which also obviates the need to include specific contact numbers in Pub. 47.

3. The table includes a range of other satellites, e.g. GPS and Argos, however the purpose of recording these facilities is unclear.

If the redefinition is not approved then the field **prST** should be deleted.

The 'average cargo height' (**chtvsslD**) can vary widely from one voyage to another voyage, and from one route to another route. To record one average value against a ship is therefore considered to be misleading and meaningless. Ships participating in VOSClim record the maximum cargo height in IMMT-2 format at each observation, which is considered to be more useful for modelling purposes. The TT therefore proposes that **chtvsslD** should be redefined to the 'maximum cargo height', described as the maximum height of the deck cargo above the maximum Summer load line. This value can usually be obtained from the ship's General Arrangement Plan or from the ship's stability information. Schematic drawings may need to be developed by the TT to assist the operators in reporting this, and the other ship dimension fields.

If the proposed redefinition of **chtvsslD** is not approved then the element should be deleted, as it is not usually possible to define an average cargo height.

Part 4 (Supporting documentation at Annex 3)

The communications table for 'Radiotelephony and Radiotelegraphy' (**phGr**) has become out-dated and is no longer considered relevant. It is recommended that this field should be removed.

It is proposed to add fields to record the dates of VOS and VOSClim participation; the version of the metadata format to aid database ingestion; the type of anemometer, which will be selected from a new table; and the model of the anemometer. These new fields for anemometer will bring conformity with the metadata requirement for other instruments, e.g. barometer and thermometer.

Field **anDC** currently stores two separate but related metadata values, i.e. the distance of the anemometer from the centre line as well as a side indicator of the anemometer from the centre line. The TT proposes to add a new field **anSC** to represent the side indicator and redefine **anDC** to only report the distance from the centre line for fixed anemometers. The current method of reporting and storing these metadata values is considered to be poor database design, and makes the extraction of, and the use of the metadata by end-users cumbersome and difficult.

New fields are also proposed to record the name and version of Electronic Logbook Software, the type and version of Automatic Weather Station, and the version(s) of software used by the Automatic Weather Station. Some VOS operators have typically recorded these important details as footnotes.

The TT also proposes that the 'Country of Registration' (**reg**), which was previously appended in parentheses to the **name** field when the Country of Registration was different to the country of recruitment, should be reported for all ships in a separate field using the ISO 2-letter country code.

Part 5 (Supporting documentation at Annex 4)

Annex 4 contains the proposed semi-colon delimited Pub. 47 file layout.

The TT recognises that the existing Pub. 47 User Documentation is poor. In an effort to improve this situation, the TT proposes to adopt a Code Table numbering scheme similar to that used in the WMO Manual on Codes. The proposed four digit numbering scheme is based on the alphabetical listing of the field identifiers.

1. The first two digits are determined by the first letter of the field identifier (a or A = 01, b or B = 02, z or Z = 26).
2. The last two digits are allocated sequentially within each letter group. If two fields use the same Code Table (hgrE / thmE, rcnty / reg) the Code Table number is determined by the field identifier appearing first in the alphabetical list.

The revised Code Tables will be maintained as a separate document from the Pub. 47 layout document and will be referenced from the layout document as shown in Annex 4.

Part 6 (supporting documentation at Annex 5 and Annex 6)

The current method of metadata transfer via a semi-colon delimited text file is efficient in terms of file size, but is not easy to read; is very inflexible; and fails to take advantage of alternative data transfer methods that are now available. The TT is aware that several database administrators with responsibility for producing the semi-colon delimited format have expressed a desire to shift to XML.

Extensible Markup Language (XML) is a simple, very flexible text format derived from SGML (ISO 8879). Originally designed to meet the challenges of large-scale electronic publishing, XML is playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere.

The TT therefore seeks approval to pursue the introduction of XML for the future exchange of Pub. 47 metadata. XML User Documentation and an XML Schema containing formatting requirements have been prepared based on the layout in Annex 5. The proposed XML structure is shown in Annex 6.

Coincident with the introduction of XML for data transfer, would be the adoption of the ANSI standard date format (yyyymmdd) for all existing and future Pub. 47 date fields transmitted in XML. The comma-delimited Pub. 47 layout uses the ‘ddmmyyyy’ date format

The use of XML as the method of transferring the metadata would not be at the expense of the current semi-colon delimited file, which would be retained in parallel until such time that the XML transfer method was used, without exception, by all VOS operators.

Annex 1 **Code changes to existing tables**

(1) vssl – Vessel type

BA	1	Barges, including crane barges and tank barges
BC	*	Bulk Carriers, including Ore/Bulk/Oil (OBO) carriers and Ore/Oil carriers
CA	#	Cable ships
CG	*	Coastguard cutters, patrol ships and launches
CS	2	Container ships, including open and closed container ships and refrigerated container ships
DR	*	Dredgers including bucket, hopper, grab and suction dredgers
FE	3	Passenger ferries (carrying passengers only)
FP	#	Floating Production and Storage Units
FV	*	Fishing Vessels including purse seiners, long liners etc., but excluding trawlers
GC	*	General Cargo ships with one or more holds
GT	*	Liquefied gas carriers/tankers including LNG and LPG carriers
IC	#	Icebreaking vessels (dedicated vessel). If the vessel fits in another category and is ice strengthened then include 'ice strengthened' as a footnote
LC	#	Livestock Carrier: dedicated ship for the carriage of livestock
LT	*	Liquid tankers including oil product tankers, chemical tankers and crude oil tankers (including VLCC's and ULCC's)
LV	*	Light vessels
MI	#	Mobile installations including mobile offshore drill ships, jack up units, semi-submersibles
MS	*	Military ships
OW	*	Ocean Weather Ship (dedicated weather ship)
PL	#	Pipe Layers
PS	4	Passenger ships and Cruise liners
RF	*	Ro Ro ferries (carrying passengers and laden vehicles)
RR	*	Ro Ro cargo ships for carriage of road and/or rail vehicles and cargo, including containerised cargo
RS	5	Refrigerated cargo ships including banana ships
RV	*	Research Vessels, including oceanographic, meteorological and hydrographic research ships and seismographic research ships
SA	#	Large sailing vessels, including sail training vessels
SV	*	Support vessels including offshore support vessels, offshore supply vessels, stand-by vessels, pipe carriers, anchor handling vessels, buoy tenders (including coastguard vessels engaged solely on buoy tending duties), diving support vessels, etc.
TR	6	Trawler fishing vessels
TU	*	Tugs, including fire-fighting tugs, salvage tugs, pusher tugs, pilot vessels, tenders etc
VC	#	Vehicle Carriers: dedicated multi deck ships for the carriage of new unladen road vehicles
YA	7	Yachts and pleasure craft
OT	*	Other (specify in footnote)

Notes for Table 'vssl'

***** Code unchanged but possible expansion of the description

\# New addition to table

1 Previously code B

2 Existing code **CS** is amended to include both open and closed container ships that have similar profiles. To avoid confusion previous code **CC** (Closed Container) is therefore deleted from the list

3 Previously code F

4 This proposed addition to table replaces **PV** for Passenger Vessel and **PL** for passenger liner in order to avoid confusion regarding the variety of passenger ships and liners in service.

5 This proposed addition to table replaces previous code **BS** (banana ships), which represented only one particular type of refrigerated cargo ship

6 Previously code T

7 Previously code Y

Note 1 Code **IF** (inshore fishing vessel) is deleted as it is considered unnecessary to define where fishing is carried out, and because this type of fishing vessel is already adequately covered by codes **FV** and **TR**

(2) barm - Barometer type

AN	*	Aneroid barometer (issued by Port Meteorological Officer or Meteorological Agency)
DA	*	Digital aneroid barometer
ELE	#	Electronic digital barometer (consisting of one or more pressure transducers)
MER	*	Mercury barometer
SAN	*	Ship's aneroid barometer
OT	#	Other (specify in footnote)

Notes for Table ‘barm’

* Code and description are unchanged

\# New addition to table

(3) thmE and hygE – Thermometer and hygrometer exposure

A	*	Aspirated (Assmann type)
S	@	Screen (non ventilated, i.e. natural ventilation)
SG	*	Ship's sling
SL	*	Sling
SN	@	Ship's screen (property of the ship)
US	*	Unscreened
VS	@	Screen (ventilated, i.e. assisted ventilation)
W	*	Whirling psychrometer

Notes for Tables ‘thmE’ and ‘hygE’

* Code and description are unchanged

@ Amended description

(4) barg – Type of barograph, or method of obtaining pressure tendency

OS	*	Open Scale barograph
OS1	*	Open Scale barograph with 1 day clock
OS2	*	Open Scale barograph with 2 day clock
OS3	*	Open Scale barograph with 3 day clock
OS4	*	Open Scale barograph with 4 day clock
OS5	*	Open Scale barograph with 5 day clock
OS6	*	Open Scale barograph with 6 day clock
OS7	*	Open Scale barograph with 7 day clock
OS8	*	Open Scale barograph with 8 day clock
OS9	*	Open Scale barograph with 9 day clock
SS	*	Small Scale barograph
ET	#	Tendency obtained from an electronic digital barometer
OT	*	Other (specify in footnote)

Notes for Table 'barg'

*	Code and description are unchanged
#	New addition to table
Note 1	Change to table description

(5) vsslM – Type of meteorological reporting vessel

10	*	Selected
40	*	Supplementary
70	*	Auxiliary
OT	$	Other (specify in footnote)

Notes for Table 'vsslM'

*	Code and description are unchanged
$	Formerly 99. Changed for consistency with other tables
Note 1	Codes 20, 21, 22, 60, 61, 80 and 81; which essentially refer to vessel type, are deleted
Note 2	The USA has confirmed that codes 88-90 are no longer required and can be deleted

(6) brmL – Barometer location

CR	*	Chart room
PW	#	Pressurised wheelhouse
WH	@	Wheelhouse, not pressurised
OT	*	Other (specify in footnote)

Notes for Table 'brmL'

*	Code and description are unchanged
#	New addition to table
@	Amended description

(7) rte – Routes

Consolidate the existing and separate national routes lists into a single three-tiered list, viz:

1. International / continental / national
2. Area of Operation
3. Specific country to country routes

The consolidated list of ships' routes will be presented at SOT-IV. Subject to its endorsement at SOT-IV, the consolidated list will be provided for inclusion in the revised version of Pub. 47.

(8) othI – Other meteorological/oceanographic instruments

BAT	*	Bathythermometer
BT	*	Bathythermograph (towed)
FLM	#	Fluorometer
HA	#	Hand held anemometer
LWR	*	Long wave radiation
MAX	*	Maximum thermometer
MIN	*	Minimum thermometer
NTE	#	Nitrate sensor
NTT	#	Nutrient sensor
P	*	Pilot balloon equipment
CO2	#	pCO2 system
PLK	#	Plankton recorder
PRS	#	Photosynthetic radiation sensor
PYG	#	Pyrogeometer
R	*	Radiosonde equipment
RG	*	Rain gauge
RSD	*	Radar storm and meteorological phenomena detection
RT	*	Reversing thermometer
SKY	#	Sky camera
SLM	#	Solarimeter
ST	*	Sea thermograph
SWR	*	Short wave radiation
SON	#	Sonic anemometer
TSD	*	Temperature/salinity/depth probe
TUR	#	Turbidity sensor
W	*	Radiowind or radarwind equipment
WR	#	Wave Recorder
XBT	*	Expendable bathythermograph
OT	*	Other (specify in footnote)

Notes for Table 'othI'

***** Code and description are unchanged

New addition to table.

Note HA and SON will be unnecessary if new Table 'anmT' and the field 'anmM' are approved.

(9) vsslP – Vessel Digital Image

AV	*@*	*Available in separate digital file. The file naming convention is: 00 – IMO Number – photo_description – Date (ANSI format, i.e. yyyymmdd), e.g. 007417868aerial_starboard_profile_from_stern20030717.jpg*
NA	*	*Not available*
PA	*	*Photograph available, but not yet scanned and placed in separate digital file*

Notes for Table 'vsslP'

* Code and description are unchanged

@ Amended description to include a revised style file naming convention (based upon VOSClim descriptions)

(10) Footnotes

fieldAbbrev (1-10)	Code name of the field to which the footnote, in the equivalently positioned footID, applies. It is used to convey: (1) additional detail whenever the code OT is selected from a code table, or (2) to provide additional comment about ANY field that is selected from a table. e.g. thmE.
footID (1-10)	Supplementary detail in free-form text, pertaining to the field specified in the equivalently positioned fieldAbbrev. e.g. plastic screen

Notes for footnotes Expanded descriptions

(11) tscale – General temperature reporting practice

1	*	Centigrade to tenths
2	*	Half degrees centigrade
3	*	Whole degree centigrade
4	*	Whole degree fahrenheit
5	*	Fahrenheit to tenths
6	*	Dry bulb centigrade, wet bulb fahrenheit
7	*	Dry bulb fahrenheit, wet bulb centigrade
OT	$	Other combinations or scale (specify in footnote)

Notes for Table 'tscale'

* Code and description are unchanged

$ Formerly 8. Changed for consistency with other tables.

(12) vsslD – Vessel dimension

lenvsslD	Overall length of the ship, ignoring bulbous bow length
brdvsslD	Moulded breadth. The greatest breadth amidships
frbvsslD	Freeboard. The average height of the upper deck above the maximum Summer load line
dftvsslD	Draught. The average depth of the keel below the maximum Summer load line
chtvsslD	Cargo height. The maximum height above the maximum Summer load line. Refer to Part 5

Note for vsslD Expanded descriptions

Annex 2 ***Fields recommended for redefinition***

prSt	The TT requests the clarification of the requirements of this field from the ETMC, as it's value and use is unclear. The TT recommends that his field should be redefined as the "Satellite system for transmitting observations". If the redefinition is not approved then the field should be deleted.
chtvsslD	Average cargo height (an element of vsslD). This dimension can vary widely from voyage to voyage, and from route to route. To record one average value is misleading and meaningless. Vessels participating in VOSClim record the maximum cargo height in IMMT-2 format at each observation, which is considered to be more useful for modelling purposes. The TT proposes that this field should be redefined to the 'maximum cargo height', which is described as the maximum height of the deck cargo above the maximum Summer load line. If this redefinition is not approved then the field should be deleted.

Annex 3 ***Formatting changes to Pub. 47***

New field with their associated code table

(1) anmT – Type of anemometer

AN	Anemograph.
CCV	Cup anemometer and wind vane (combined unit).
SCV	Cup anemometer and wind vane (separate instruments).
HA	Handheld anemometer.
PV	Propeller vane.
SON	Sonic anemometer.
OT	Other (specify in footnote).

Notes for Table ‘anmT

Note This table and the proposed field anmM (Make and model of anemometer) will replace the current dual-purpose field ‘anmI – Anemometer Instrument Type’. These changes will enable anemometer metadata to be reported in a similar manner to other instrument types, e.g. barometer and thermometer.

(2) freq – routine observing frequency

OPD	One observation per day (24 hour intervals)
TPD	Two observations per day (12 hour intervals)
FPD	Four observations per day (6 hour intervals)
EPD	Eight observations per day (3 hour intervals)
HLY	Hourly observations
IRR	Irregular observations

(3) anSC – Side indicator of the fixed anemometer from the centre line, if appropriate.

P	Port
S	Starboard

Field recommended for deletion

phGr Communication codes are out-dated and no longer considered useful.

New fields

ver	Version of the Pub. 47 format (This version defined as 03).
anmM	Make and model of the anemometer.
awsM	Make and model of the Automatic Weather Station.
awsP	Name and version of the Automatic Weather Station processing software.
awsC	Name and version of the Automatic Weather Station data entry/display software.
logE	Name and version of the electronic logbook software.
vosR	Recruitment date of the current VOS participation.
vosD	De-recruitment date of the last VOS participation (applicable only if the vessel has been re-recruited).
vclmR	Last VOSClim recruitment date within the current period of VOS participation.
vclmD	Last VOSClim de-recruitment date within the current period of VOS participation .
reg	Country of Registration.

Annex 4 Proposed Pub. 47 semi-colon delimited layout

Order	Code name	Explanation	Table	Format	Example
1	rcnty;	Recruiting country.	1801		
2	ver;	Version of Pub. 47 format.			03
3	prepared;	Date of report preparation.		ddmmyyyy	
4	name;	Ship's name.			
5	reg;	Country of registration.	1801		
6	call;	Call sign or WMO Number. Some sea stations are identified by a WMO Number instead of a call sign			
7	IMOn;	IMO Number. Unique identifying number assigned by Lloyd's Register to the hull of the ship.			
8	vssl;	Vessel type.	2201		
9	vsslP;	Vessel digital image.	2203		
10	lenvsslD;	Length overall of the ship, ignoring bulbous bow.		0.0 m	
11	brdvsslD;	Moulded breadth. The greatest breadth amidships.		0.0 m	
12	frbvsslD;	Freeboard. The average height of the upper deck above the maximum Summer load line.		0.0 m	
13	drfvsslD;	Draught. The average depth of the keel below the maximum Summer load line.		0.0 m	
14	chtvsslD;	Cargo height. Maximum height above the maximum Summer load line.		0.0 m	
15	brdg;	Distance of the bridge from the bow.		0.0 m	
16	rte;	Route No.1.	1802		
17	rte;	Route No.2.	1802		
18	rte;	Route No.3.	1802		
19	rte;	Route No.4.	1802		
20	rte;	Route No.5.	1802		
21	rte;	Route No.6.	1802		
22	rte;	Route No.7	1802		
23	rte;	Route No.8.	1802		
24	rte;	Route No.9.	1802		
25	rte;	Route No.10.	1802		
26	vosR;	Recruitment date of the current VOS participation.		ddmmyyyy	

Order	Code name	Explanation	Table	Format	Example
27	vosD;	De-recruitment date of the last VOS participation (report only if the vessel has been re-recruited).		ddmmyyyy	
28	vclmR;	Last VOSClim recruitment date if within the current period of VOS participation.		ddmmyyyy	
29	vclmD;	Last VOSClim de-recruitment date if within the current period of VOS participation.		ddmmyyyy	
30	vsslM;	Type of meteorological reporting ship.	2202		
31	atm;	General observing practice.	0105		
32	freq;	Routine observing frequency.	0602		
33	prST;	Satellite system for transmitting reports.			INMARSAT-C
34	logE;	Name and version of the electronic logbook software.			TurboWin 2.12
35	wwH;	Visual wind/wave observing height.		0.0 m	
36	anmU;	General wind observing practice.	0103		
37	blc;	Baseline check of the automatic weather station.	0203		
38	awsM;	Make and model of the automatic weather station.			Vaisala Milos 500
39	awsP;	Name and version of the automatic weather station processing software.			Yourlink 1.03.20
40	awsC;	Name and version of the automatic weather station data entry/display software.			Milos 500 2.56
41	barm;	Primary barometer type.	0202		
42	barm;	Secondary barometer type.	0202		
43	bMS;	Make and model of the primary barometer.			Vaisala PTB220B
44	bMS;	Make and model of the secondary barometer.			
45	brmH;	Height of the primary barometer above the maximum Summer load line.		0.0 m	
46	brmH;	Height of the secondary barometer above the maximum Summer load line.		0.0 m	
47	brmL;	Location of the primary barometer.	0204		
48	brmL;	Location of the secondary barometer.	0204		
49	brmU;	Pressure units of the primary barometer.			hPa
50	brmU;	Pressure units of the secondary barometer.			
51	brmC;	Most recent calibration date of the primary barometer.		ddmmyyyy	
52	brmC;	Most recent calibration date of the secondary barometer.		ddmmyyyy	
53	thrm;	Dry bulb thermometer type No.1.	2002		
54	thrm;	Dry bulb thermometer type No.2.	2002		

Order	Code name	Explanation	Table	Format	Example
55	thMS;	Make and model of the dry bulb thermometer No.1.			Rosemount ST401
56	thMS;	Make and model of the dry bulb thermometer No.2.			
57	thmE;	Exposure of the dry bulb thermometer No.1.	0801		
58	thmE;	Exposure of the dry bulb thermometer No.2.	0801		
59	thmL;	Location of dry bulb thermometer No.1 and hgyrometer No.1.	2001		
60	thmL;	Location of dry bulb thermometer No.2 and hgyrometer No.2.	2001		
61	thmH;	Height of the dry bulb thermometer No.1 and hygrometer No.1 above the maximum Summer load line.		0.0 m	
62	thmH;	Height of the dry bulb thermometer No.2 and hygrometer No.2 above the maximum Summer load line.		0.0 m	
63	tscale;	General reporting practice for dry bulb thermometer No.1 and hygrometer No.1.	2003		
64	tscale;	General reporting practice for dry bulb thermometer No.2 and hygrometer No.2.	2003		
65	hygr;	Hygrometer type No.1.	0802		
66	hygr;	Hygrometer type No.2.	0802		
67	hgrE;	Exposure of the hygrometer No.1.	0801		
68	hgrE;	Exposure of the hygrometer No.2.	0801		
69	sstM;	Primary method of obtaining the sea surface temperature.	1901		
70	sstM;	Secondary method of obtaining the sea surface temperature.	1901		
71	sstD;	Depth of the primary sea surface temperature observation below the maximum Summer load line.		0.0 m	
72	sstD;	Depth of the secondary sea surface temperature observation below the maximum Summer load line.		0.0 m	
73	barg;	Primary barograph type, or method of determining pressure tendency.	0201		
74	barg;	Secondary barograph type, or method of determining pressure tendency.	0201		
75	anmT;	Primary anemometer type.	0102		
76	anmT;	Secondary anemometer type.	0102		
77	anmM;	Make and model of the primary anemometer.			Vaisala WAV151 & WAA151
78	anmM;	Make and model of the secondary anemometer.			
79	anmL;	Location of the primary anemometer.	0101		
80	anmL;	Location of the secondary anemometer.	0101		
81	anDB;	Distance of the primary (fixed) anemometer from the bow.		0.0 m	
82	anDB;	Distance of the secondary (fixed) anemometer from the bow.		0.0 m	

Order	Code name	Explanation	Table	Format	Example
83	anDC;	Distance of the primary (fixed) anemometer from the centre line.		0.0 m	
84	anSC;	Side indicator of the primary (fixed) anemometer from the centre line, if appropriate.	0104		
85	anDC;	Distance of the secondary (fixed) anemometer from the centre line.		0.0 m	
86	anSC;	Side indicator of the secondary (fixed) anemometer from the centre line, if appropriate.	0104		
87	anHL;	Height of the primary (fixed) anemometer above the maximum Summer load line.		0.0 m	
88	anHL;	Height of the secondary (fixed) anemometer above the maximum Summer load line.		0.0 m	
89	anHD;	Height of the primary (fixed) anemometer above the deck on which it is installed.		0.0 m	
90	anHD;	Height of the secondary (fixed) anemometer above the deck on which it is installed.		0.0 m	
91	anmC;	Most recent calibration date of the primary anemometer.		ddmmyyyy	
92	anmC;	Most recent calibration date of the secondary anemometer.		ddmmyyyy	
93	othI;	Other meteorological/oceanographic instrument No.1.	1501		
94	othI;	Other meteorological/oceanographic instrument No.2.	1501		
95	othI;	Other meteorological/oceanographic instrument No.3.	1501		
96	othI;	Other meteorological/oceanographic instrument No.4.	1501		
97	othI;	Other meteorological/oceanographic instrument No.5.	1501		
98	othI;	Other meteorological/oceanographic instrument No.6.	1501		
99	chgd;	Last date of change to any metadata.value		ddmmyyyy	
100	fieldabbrev;	Code name of the field to which footnote No.1 applies.	0601		vssl
101	fieldabbrev;	Code name of the field to which footnote No.2 applies.	0601		thmE
102	fieldabbrev;	Code name of the field to which footnote No.3 applies.	0601		
103	fieldabbrev;	Code name of the field to which footnote No.4 applies.	0601		
104	fieldabbrev;	Code name of the field to which footnote No.5 applies.	0601		
105	fieldabbrev;	Code name of the field to which footnote No.6 applies.	0601		
106	fieldabbrev;	Code name of the field to which footnote No.7 applies.	0601		
107	fieldabbrev;	Code name of the field to which footnote No.8 applies.	0601		
108	fieldabbrev;	Code name of the field to which footnote No.9 applies.	0601		
109	fieldabbrev;	Code name of the field to which footnote No.10 applies.	0601		
110	footID;	Footnote No.1 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			Ice strengthened

Order	Code name	Explanation	Table	Format	Example
111	footID;	Footnote No.2 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			Plastic screen
112	footID;	Footnote No.3 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
113	footID;	Footnote No.4 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
114	footID;	Footnote No.5 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
115	footID;	Footnote No.6 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
116	footID;	Footnote No.7 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
117	footID;	Footnote No.8 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
118	footID;	Footnote No.9 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			
119	footID;	Footnote No.10 (Mandatory free-form detail whenever code OT is reported. Optional for other codes).			

Annex 5 Proposed Pub. 47 XML layout

Order	Header Detail	Explanation	Table	Format	Footnote*	Example
1	country	Recruiting country.	1801		No	
2	version	Version of Pub. 47 format.			No	03
3	prepared	Date of report preparation.		yyyymmdd	No	

Order	Record Element	Explanation	Table	Format	Footnote*	Example
4	nmsID	NMS reference number. Unique reference or identifier assigned by the NMS to the ship (if applicable).			No	
5	name	Ship's name.			No	
6	reg	Country of registration.	1801		No	
7	call	Call sign or WMO Number. Some sea stations are identified by a WMO Number instead of a call sign			No	
8	IMOn	IMO Number. Unique identifying number assigned by Lloyd's Register to the hull of the ship.			No	
9	vssl	Vessel type.	2201		Yes	
10	vsslP	Vessel digital image.	2203		Yes	
11	lenvsslD	Length overall of the ship, ignoring bulbous bow.		0.0 m	No	
12	brdvsslD	Moulded breadth. The greatest breadth amidships.		0.0 m	No	
13	frbvsslD	Freeboard. The average height of the upper deck above the maximum Summer load line.		0.0 m	No	
14	drfvsslD	Draught. The average depth of the keel below the maximum Summer load line.		0.0 m	No	
15	chtvsslD	Cargo height. Maximum height above the maximum Summer load line.		0.0 m	No	
16	brdg	Distance of the bridge from the bow.		0.0 m	No	

Order	Record Element	Explanation	Table	Format	Footnote*	Example
17	rte	Route No.1.	1802		Yes	
18	rte	Route No.2.	1802		Yes	
19	rte	Route No.3.	1802		Yes	
20	rte	Route No.4.	1802		Yes	
21	rte	Route No.5.	1802		Yes	
22	rte	Route No.6.	1802		Yes	
23	rte	Route No.7	1802		Yes	
24	rte	Route No.8.	1802		Yes	
25	rte	Route No.9.	1802		Yes	
26	rte	Route No.10.	1802		Yes	
27	vosR	Recruitment date of the current VOS participation.		yyyymmdd	No	
28	vosD	De-recruitment date of the last VOS participation (report only if the vessel has been re-recruited).		yyyymmdd	No	
29	vclmR	Last VOSClim recruitment date if within the current period of VOS participation.		yyyymmdd	No	
30	vclmD	Last VOSClim de-recruitment date if within the current period of VOS participation.		yyyymmdd	No	
31	vsslM	Type of meteorological reporting ship.	2202		Yes	
32	atm	General observing practice.	0105		Yes	
33	freq	Routine observing frequency.	0602		Yes	
34	prST	Satellite system for transmitting reports.			No	INMARSAT-C
35	logE	Name and version of the electronic logbook software.			No	TurboWin 2.12
36	wwH	Visual wind/wave observing height.		0.0 m	No	
37	anmU	General wind observing practice.	0103		Yes	
38	blc	Baseline check of the automatic weather station.	0203		Yes	
39	awsM	Make and model of the automatic weather station.			No	Vaisala Milos 500
40	awsP	Name and version of the automatic weather station processing software.			No	Yourlink 1.03.20
41	awsC	Name and version of the automatic weather station data entry/display software.			No	Milos 500 2.56

Order	Record Element	Explanation	Table	Format	Footnote*	Example
42	barm	Primary barometer type.	0202		Yes	
43	bMS	Make and model of the primary barometer.			No	Vaisala PTB220B
44	brmH	Height of the primary barometer above the maximum Summer load line.		0.0 m	No	
45	brmL	Location of the primary barometer.	0204		Yes	
46	brmU	Pressure units of the primary barometer.			No	hPa
47	brmC	Most recent calibration date of the primary barometer.		yyyymmdd	No	
48	barm	Secondary barometer type.	0202		Yes	
49	bMS	Make and model of the secondary barometer.			No	
50	brmH	Height of the secondary barometer above the maximum Summer load line.		0.0 m	No	
51	brmL	Location of the secondary barometer.	0204		Yes	
52	brmU	Pressure units of the secondary barometer.			No	
53	brmC	Most recent calibration date of the secondary barometer.		yyyymmdd	No	
54	thrm	Dry bulb thermometer type No.1.	2002		Yes	
55	thMS	Make and model of the dry bulb thermometer No.1.			No	Rosemount ST401
56	thmE	Exposure of the dry bulb thermometer No.1.	0801		Yes	
57	thmL	Location of dry bulb thermometer No.1 and hgyrometer No.1.	2001		Yes	
58	thmH	Height of the dry bulb thermometer No.1 and hygrometer No.1 above the maximum Summer load line.		0.0 m	No	
59	tscale	General reporting practice for dry bulb thermometer No.1 and hygrometer No.1.	2003		Yes	
60	thrm	Dry bulb thermometer type No.2.	2002		Yes	
61	thMS	Make and model of the dry bulb thermometer No.2.			No	
62	thmE	Exposure of the dry bulb thermometer No.2.	0801		Yes	
63	thmL	Location of dry bulb thermometer No.2 and hgyrometer No.2.	2001		Yes	
64	thmH	Height of the dry bulb thermometer No.2 and hygrometer No.2 above the maximum Summer load line.		0.0 m	No	
65	tscale	General reporting practice for dry bulb thermometer No.2 and hygrometer No.2.	2002		Yes	
66	hygr	Hygrometer type No.1.	0802		Yes	
67	hgrE	Exposure of the hygrometer No.1.	0801		Yes	

Order	*Record Element*	Explanation	Table	Format	Footnote*	Example
68	hygr	Hygrometer type No.2.	0802		Yes	
69	hgrE	Exposure of the hygrometer No.2.	0801		Yes	
70	sstM	Primary method of obtaining the sea surface temperature.	1901		Yes	
71	sstD	Depth of the primary sea surface temperature observation below the maximum Summer load line.		0.0 m	No	
72	sstM	Secondary method of obtaining the sea surface temperature.	1901		Yes	
73	sstD	Depth of the secondary sea surface temperature observation below the maximum Summer load line.		0.0 m	No	
74	barg	Primary barograph type, or method of determining pressure tendency.	0201		Yes	
75	barg	Secondary barograph type, or method of determining pressure tendency.	0201		Yes	
76	anmT	Primary anemometer type.	0102		Yes	
77	anmM	Make and model of the primary anemometer.			No	Vaisala WAV151 & WAA151
78	anmL	Location of the primary anemometer.	0101		Yes	
79	anDB	Distance of the primary (fixed) anemometer from the bow.		0.0 m	No	
80	anDC	Distance of the primary (fixed) anemometer from the centre line.		0.0 m	No	
81	anSC	Side indicator of the primary (fixed) anemometer from the centre line, if appropriate.	0104		Yes	
82	anHL	Height of the primary (fixed) anemometer above the maximum Summer load line.		0.0 m	No	
83	anHD	Height of the primary (fixed) anemometer above the deck on which it is installed.		0.0 m	No	
84	anmC	Most recent calibration date of the primary anemometer.		yyyymmdd	No	
85	anmT	Secondary anemometer type.	0102		Yes	
86	anmM	Make and model of the secondary anemometer.			No	
87	anmL	Location of the secondary anemometer.	0101		Yes	
88	anDB	Distance of the secondary (fixed) anemometer from the bow.		0.0 m	No	
89	anDC	Distance of the secondary (fixed) anemometer from the centre line.		0.0 m	No	
90	anSC	Side indicator of the secondary (fixed) anemometer from the centre line, if appropriate.	0104		Yes	
91	anHL	Height of the secondary (fixed) anemometer above the maximum Summer load line.		0.0 m	No	
92	anHD	Height of the secondary (fixed) anemometer above the deck on which it is installed.		0.0 m	No	
93	anmC	Most recent calibration date of the secondary anemometer.		yyyymmdd	No	

Order	*Record Element*	Explanation	Table	Format	Footnote*	Example
94	othI	Other meteorological/oceanographic instrument No.1.	1501		Yes	
95	othI	Other meteorological/oceanographic instrument No.2.	1501		Yes	
96	othI	Other meteorological/oceanographic instrument No.3.	1501		Yes	
97	othI	Other meteorological/oceanographic instrument No.4.	1501		Yes	
98	othI	Other meteorological/oceanographic instrument No.5.	1501		Yes	
99	othI	Other meteorological/oceanographic instrument No.6.	1501		Yes	
100	chgd	Last date of change to any metadata value.		yyyymmdd	No	

Annex 6 ***Proposed Pub. 47 XML structure***

```
<?xml version="1.0"?>
<pub47dataset country="" version="" prepared="">
	<pub47record nmsID="">
		<name/>
		<reg/>
		<call/>
		<IMOn/>
		<vssl footnote=""/>
		<digital_image>
			<vsslP/>
		</digital_image>
		<dimensions>
			<lenvsslD/>
			<brdvsslD/>
			<frbvsslD/>
			<drfvsslD/>
			<chtvsslD/>
			<brdg/>
		</dimensions>
		<operations>
			<rte Id="" footnote=""/>
		</operations>
		<vos_service>
			<vosR/>
			<vosD/>
			<vclmR/>
			<vclmD/>
		</vos_service>
		<met_prgm>
			<vsslM footnote=""/>
			<atm footnote=""/>
			<freq footnote=""/>
			<prST/>
			<logE/>
			<wwH/>
			<anmU footnote=""/>
			<blc footnote=""/>
		</met_prgm>
		<instrumentation>
			<automated Id="">
				<awsM/>
				<awsP/>
				<awsC/>
			</automated>
			<barometer Id="">
				<barm footnote=""/>
				<bMS/>
				<brmH/>
				<brmL footnote=""/>
				<brmU/>
				<brmC/>
			</barometer>
			<dry_bulb Id="">
				<thrm footnote=""/>
				<thMS/>
				<thmE footnote=""/>
				<thmL footnote=""/>
				<thmH/>
				<tscale footnote=""/>
			</dry_bulb>
			<hygrometer Id="">
```

```
                        <hygr footnote=""/>
                        <hygE footnote=""/>
                    </hygrometer>
                    <sea_temp Id="">
                        <sstM footnote=""/>
                        <sstD/>
                    </sea_temp>
                    <barograph Id="">
                        <barg footnote=""/>
                    </barograph>
                    <anemometer Id="">
                        <anmT footnote=""/>
                        <anmM/>
                        <anmL footnote=""/>
                        <anDB/>
                        <anDC/>
                        <anSC footnote=""/>
                        <anHL/>
                        <anHD/>
                        <anmC/>
                    </anemometer>
                    <other>
                        <othI Id="" footnote=""/>
                    </other>
                </instrumentation>
                <chgd/>
            </pub47record>
</pub47dataset>
```

Annex VIII

Scientific and Technical Workshop
7 March, 2005

Chair:Mr Frits Koek (KNMI)

Workshop begins immediately after the opening of SOT-III

Oral presentations *(15 min (+ 5 min for Q&A) for each presentation)*

1. Progress and status of the Devil XBT system with USB interface – Alex Papij and Lindsay Pender
2. Performance of the Automatic Voluntary Observing Ships System (AVOS) - Yvonne Cook CET
3. The CORIOLIS Project – Sylvie Pouliquen
4. Validation of SST data products within the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP) - Craig Donlon

Poster presentation

5. Field Testing of the SEAS2000 XBT Data Collection System – Derrick Snowden, Steve Cook and Molly Baringer
6. Shipboard Automated Meteorological and Oceanographic System Initiative

ABSTRACTS

1.

Progress and Status of the Devil XBT System with USB Interface

Alex Papij and Lindsay Pender
CSIRO Marine Research

Devil is the new XBT data acquisition system developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in a project assisted by the Australian Bureau of Meteorology (BoM).

Devil includes software with a global geographic atlas, a global climatology, graphical displays, QC checking, levels of password protection and an operator interface suitable for Ship Of Opportunity Program (SOOP) operation. The Devil hardware is a small acquisition box with USB connection to a Windows XP computer. The Devil is 100% compatible with Sippican launchers and probes. Just prior to production in early 2004 a key component became obsolete and impossible to obtain so a complete redesign (hardware and firmware) was carried out, using the original design principles. The second version of the Devil using this new design is finished. In 2003 excellent results were obtained in trials carried out on a research vessel using the first Devil version. Now, trials using the second Devil version have been carried out, again on a research vessel, comparing XBT data against an oceanographic CTD.

The first production versions of the hardware are now being deployed by CSIRO and BoM.

2.

Performance of the Automatic Voluntary Observing Ships System (AVOS)

Yvonne Cook CET
LCM, Surface Networks
Meteorological Service of Canada

The Meteorological Service of Canada is continuing to automate a fleet of 75 Voluntary Observing ships. The main criteria for ship selection, is to cover data sparse areas of Canada particularly the north. Under contract to MSC, the Automatic Voluntary Observing Ships system (AVOS) has been developed and manufactured by Axys Technologies of Victoria British Columbia.

The MSC now operates, maintains and collects data from 24 AVOS systems which have been installed on various public and privately owned vessels including the Canadian Coast Guard ships. The installation of an additional 31 units is expected to be completed by the end of 2005. Being a new system, a number of unforeseen problems were addressed during the first installations. Training courses have been provided to MSC staff to enable proper maintenance and repair of the units, and to enable effective training of ship board staff in the input of value added data to the transmitted message onto the GTS. This presentation will provide the solutions to the problems and the results of an evaluation of the performance of the AVOS over a three year period.

The MSC will continue to use the AVOS systems in its fleet of 75 operational vessels, support a full complement of spares, and maintain and train staff. The data from all 75 automatic systems will become part of the VOSClim project, as they become operational.

3.

Validation of SST data products within the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP).

Craig Donlon
Director of the GHRSST-PP International Project Office

The primary aim of the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP) is to develop and operate a demonstration system that will deliver high-resolution (better than 10 km and ~ 6 hourly) global coverage SST data products operationally in near real time for the diverse needs of GODAE and the wider scientific community. A new generation of global coverage SST data products will be derived and served to the international user community by combining complementary satellite and in situ observations in real time.

There are obvious synergy benefits to such an approach but their practical realisation is complicated by characteristic differences that exist between measurements of SST obtained from subsurface situ sensors, satellite microwave radiometers and, infrared radiometer systems. Furthermore, diurnal variability of SST within a 24 hour period, manifest as both warm layer and cool skin deviations, introduces additional uncertainty for direct inter-comparison and the implementation of data merging strategies.

Validation of the data products produced by the GHRSST-PP requires different measurements for observational products and analysis products. This presentation will review the validation of observational data products using a new infra-red ship mounted autonomous radiometer system that can be deployed aboard ships of opportunity for up to 3 months. The system, called the Infrared SST Autonomous radiometer (ISAR) has been developed specifically for the validation of satellite derived SST measurements and has been deployed aboard the P&O vessel ‘Pride of Bilbao’ in collaboration with the EU FerryBox project. The "FerryBox" concept is to make use of ferries and merchant ships which run regular routes year round. Robust autonomous measuring systems are fitted relatively simply in engine rooms and in this case, to the ships bridge area. The EU-“FerryBox project uses several ships and rigorous calibration procedures so that output from different systems can be linked. This is being done in the scientific context of examining eutrophication, sediment transport and circulation (see http://www.ferrybox.org).

The **SOC-FerryBox** (measuring temperature, conductivity and fluorescence in water at 5-7 m depth) and the **ISAR** project (sea surface radiometer and meteorological measurements) are both deployed on the P&O Ferries Vessel Pride of Bilbao (PoB) and was installed in April 2002. It is intended to be permanently on the ship and operate year round except for January when the ship is in dry dock for its annual refit. The ship makes two crossings weekly between Portsmouth (50.8° N, 1.1° W) and Bilbao (43.4° N, 3.0° W) the distance is approximately 1000 km and the journey time is about 35 hours.

This presentation will quickly review the data products and services of the GHRSST-PP that are now being implemented by regional projects in Europe, USA and Australia. The remainder of the presentation will discuss the validation of satellite SST using the FerryBox systems.

4.

The CORIOLIS Project

Sylvie Pouliquen
IFREMER; head of CORIOLIS

The seven French agencies concerned by ocean research are developing together a strong capability in operational oceanography based on a triad including satellite altimetry (JASON), numerical modelling with assimilation (MERCATOR), and in situ data (CORIOLIS). The CORIOLIS project aims to build a pre-operational structure to collect, valid and distribute ocean data (temperature/salinity profiles and current speeds) to the scientific community and modellers. CORIOLIS aims at four goals:

- To build up a data management centre, part of the ARGO network for the GODAE experiment, able to provide quality-controlled data in real time and delay modes.
- To contribute to ARGO floats deployment mainly in the Atlantic with about 300 floats during the 2001-2006 period.
- To develop and improve profiling ARGO floats: PROVOR
- To integrate into CORIOLIS all other data presently collected at sea by French agencies from surface drifting buoys, PIRATA anchored buoys, oceanographic research vessels data transmitted on a daily basis.

CORIOLIS data centre, already one of the two global data centres for ARGO, is the data centre for 5Prcd projects like Gyroscope and MFSTEP and is an important partner in projects within GMES et 6th PRCD calls like Mersea or Carbocean. Since 2004 it has also set up a one of the two global data center for GOSUD (Global Ocean Surface Underway data) under the IOC umbrella.

The CORIOLIS project implementation by the French agencies in charge of oceanography, will contribute to the ocean observing system, providing world coverage of the oceans in real time. CORIOLIS a multi-disciplinary pilot project is involved in new autonomous instruments development with up-to-date transmission capability, in float deployment in the Atlantic Ocean then world and in data collection, processing and distribution to users. It aims to be sustained when the world programs, to which it refer to, will have drawn their assessment for the coming years. One will then witness an evolution similar to the one observed in meteorology field twenty years ago: the deep-sea oceanography will go from science to operational for the benefit of the world population on a sustainable base.

5.

Field Testing of the SEAS2000 XBT Data Collection System

Derrick Snowden, Steve Cook and Molly Baringer
NOAA Atlantic Oceanographic and Meteorological Laboratory

The Shipboard Environmental data Acquisition System (SEAS) is a software application, which facilitates the collection, and transmission of environmental data by volunteer observing ships (VOS). SEAS software has been used successfully for over 20 years to collect surface meteorological and subsurface bathythermograph observations. Over the past several years SEAS has been completely rewritten as part of a modernization effort. In addition to software changes, several hardware changes had to be made. Specifically, the analog-to-digital converter board marketed by the Sippican Corporation has been redesigned in the years between the original SEAS software was released (currently SEAS version 4) and the SEAS 2000 rewrite. What follows are preliminary results from comparing temperature profiles collected with various software/hardware configurations aimed at identifying systematic biases that could be introduced in transitioning between data collection systems. In the first experiment, two automated Expendable Bathythermograph (XBT) launchers were used. One used older SEAS-4 software with a Mark-12 A-to-D board and the other used the rewritten SEAS2000 software and a Mark-21 A-to-D board. In the second experiment, XBT profiles were collected with a hand launcher connected to a SEAS2000/Mark-21 system and were compared with high precision temperature profiles from a Conductivity-Temperature-Depth (CTD) instrument.

6.

Shipboard Automated Meteorological and Oceanographic System Initiative

Shawn R. Smith 1 , Elizabeth C. Kent 2 , and Steven K. Cook 3
1 Center for Ocean-Atmospheric Prediction Studies
The Florida State University, Tallahassee, FL 32306-2840 USA
smith@coaps.fsu.edu
2 *Presenting author*
Southampton Oceanography Centre
European Way, Southampton, SO14 3ZH, UK
eck@soc.soton.ac.uk
3 NOAA – OAR, GOOS Center
c/o NMFS, 8604 La Jolla Shores Dr.
La Jolla, CA 92037 USA
Steven.Cook@noaa.gov

An ongoing initiative will be described which aims to improve the quality of observations collected in-situ by shipboard automated meteorological and oceanographic systems (SAMOS) on research and merchant vessels. SAMOS are typically some form of a computerized data logging system that continuously records navigation (ship's position, course, speed, and heading), meteorological (winds, air temperature, pressure, moisture, rainfall, and radiation), and near ocean surface (sea temperature and salinity) parameters while the vessel is at sea. Measurements are recorded at high-temporal sampling rates (typically 1 minute or less). Our particular goals are ensuring routine access to and improving upon the accuracy, calibration, and archival of quality-assured SAMOS observations.

The initiative results from the 13 recommendations of the "Workshop on High-Resolution Marine Meteorology" (HRMM; http://www.coaps.fsu.edu/RVSMDC/marine_ workshop/Workshop.html) and is a collaboration that includes university, government, and international partners. In 2004, a data center was established at the Florida State University to coordinate the assembly, quality assurance, distribution, and permanent archival of SAMOS observations. An update of the center's activities will be provided, including status of data exchange and metadata standards, data accuracy targets, and pilot projects with several U.S. research vessels. Progress on a portable, state-of-the-art flux instrumentation suite will be presented. The portable suite is designed for onboard, at-sea comparison with the SAMOS deployed on individual vessels. Updates on other components of the SAMOS initiative will include a handbook of "best practices" for marine meteorological measurements, routine airflow modeling of research vessels, and interaction with user communities to design suitable products for research and operational activities. Finally, international collaborations between the SAMOS initiative, GOSUD, VOSClim, and international climate programs (e.g., CLIVAR) will be discussed.

Annex IX

RSMC Exeter Monitoring Report

Monitoring the quality and timeliness of VOS observations

1. The Met Office (RSMC Exeter), as WMO-designated lead centre for monitoring the quality of marine surface data (observations from ships, buoys and other in situ marine platforms), compares observations from individual platforms with the model background 6-hour forecast fields for each variable. Platforms for which the observed values differ from the background by a significant amount are labelled as suspect.

2. Monthly lists of suspect platforms are sent to the WMO Secretariat (a recent issue, December 2004, is shown in Appendix A); they are also exchanged among the 4 lead monitoring centres (Met Office, JMA, NCEP and ECMWF), and other centres, for comparison. Generally there is considerable agreement between the different centres, both in terms of suspect platforms and mean and standard deviation of differences from background. These monthly lists will also soon be available via the Met Office web site, within the monthly Global Data Monitoring Report (in Table 1).

3. Every 6 months more detailed monitoring reports, for all platforms, are also sent to the WMO Secretariat. The statistics relating to suspect VOS operated by specific members are extracted from the report and distributed by the Secretariat to PMO national focal points for the members concerned, under a covering letter requesting that remedial action be taken to correct the problems.

4. Initially only mean sea level pressure was monitored, but wind speed and direction and sea surface temperature were subsequently added to the information being exchanged on a monthly basis. Following SOT-II the Met Office further extended its monitoring in November 2003 to include air temperature and relative humidity - thereby increasing the monitoring list to 6 observed variables.

5. The meeting is invited to:

   5.1 Confirm that the current monitoring criteria for the 6 variables are set correctly;

   5.2 Confirm that the format for the monthly monitoring list meets members' requirements;

   5.3 Consider the extent to which members are responding to the lists of suspect ships;

   5.4 Consider whether a feedback system for responding to monthly monitoring problems should be developed;

   5.5 Consider whether the 6-monthly report is useful (or have all problems been sorted out by the time it is available?) and whether any feedback on problem resolution is received by WMO.

6. As mentioned in the report to SOT-II, any PMO national focal points who wish to receive a copy of the monthly list of 'suspect' ships should advise the Met Office of their email addresses, so that they can be added to the distribution list. Alternatively, they can visit the Met Office web site, as mentioned above.

7. The Met Office also produces monthly lists of monitoring statistics for the VOS fleets recruited by certain countries, which are then e-mailed to those countries' contact points. To maintain up-to-date lists of the VOS fleets for each country concerned, the Met Office currently relies on receiving regular fleet updates from them. If WMO Pub 47 is updated regularly (as it should be), then in the future the Met Office may just access this each month to update its VOS lists.

This will make it possible to produce monthly statistics for all VOS national fleets listed, which could then be put on the Met Office web site. Does the meeting think that this would be useful?

8. Examples of the timeliness of the VOS reports received at the Met Office are shown in the graphs in Appendix B. It can be seen from the upper graph that during November 2004 the majority of ship reports were received promptly: nearly 20% were received within just 5 minutes, 80% within 45 minutes and 90% of all VOS reports were received within about 80 minutes of the observation time. The cut-off time for operational NWP global data assimilation is typically 2 hours after the nominal analysis times of 00, 06, 12 and 18 UTC, by which time the graph shows that a healthy 95% of all VOS observations should have been received. The Met Office intends to include this timeliness information on the VOS as a whole in its monthly reports, and is considering producing timeliness plots for all VOS national fleets listed in WMO Pub 47 and making them available from the Met Office web site. Does the meeting think that this would be useful?

Appendices: A. Monitoring of Marine Surface Observations by the Met Office (UK), Dec. 2004

B. Timelines of VOS observations received at the Met Office (UK), Nov. 2004

Appendix A to Annex IX

MONITORING OF MARINE SURFACE OBSERVATIONS
MONTHLY SUSPECT LIST - SHIPS, FIXED BUOYS AND PLATFORMS
MONITORING CENTRE: EXETER
MONTH: DECEMBER 2004

Monitoring procedures

Data monitored
All reports from each unique identifier for ships, fixed buoys and platforms.

Standard of comparison
Background field from the Met Office global model (This is the T+6 forecast from the previous model run).

Elements monitored

P	Mean sea level pressure (hPa).
SPEED	Wind speed (m/s).
DIRN	Wind direction (Degrees).
T	Air Temperature (degrees C).
RH	Relative Humidity (%).
SST	Sea Surface Temperature (degrees C).

Parameters monitored

NOBS Total number of observations received at Exeter over the GTS in the month. Only those observations received in time for use in the numerical models have been included, and the relevant cut-off times are 0715, 1315, 1915 and 0115 UTC for the observation times 0000, 0600, 1200 and 1800 UTC respectively. Identical reports having exactly the same position, time and observed value have only been counted once.

PGE Percentage of observations with gross errors over the period. These are observations which differ from the background value by an amount which is far in excess of the likely background error (e.g. 15 hPa for pressure). The statistics for bias and standard deviation are calculated excluding these observations.

SD Standard Deviation of difference of observations from background values excluding those with gross errors over the month relative to reference values provided by the UK numerical forecasting system (these are short-term forecasts or background fields). The background values have been interpolated to the observation position.

BIAS Mean difference of observations from background values excluding those with gross errors over the month relative to reference values provided by the UK numerical forecasting system (background). The background values have been interpolated to the observation position.

The resulting estimates of the observation bias are thought to be accurate to about 0.5 hPa or m/s where there is a sufficiently large number of observations from the ship.
N.B. a positive wind bias indicates the observation is veered to the background.

RMS Root Mean Square difference of observations from background values excluding those with gross errors over the month relative to reference values provided by the UK numerical forecasting system

(background fields).

GROSS ERROR LIMITS

Pressure	15 hPa
Vector Wind	25 m/s
T	15 degrees
RH	50 %
SST	10 degrees

SELECTION CRITERIA

NOBS>= 20, and one or more of the following:

1.|bias|	>= 4 hPa	(pressure)
	>= 5 m/s	(wind speed)
	>= 30 degrees	(direction)
	>= 4 deg C	(T)
	>= 15 %	(RH)
	>= 3 deg C	(SST)
2.SD	>= 6 hPa	(pressure)
	>= 80 degrees	(direction)
	>= 6 deg C	(T)
	>= 25 %	(RH)
	>= 5 deg C	(SST)
3.PGE	>= 25	

(NOTE. >= means 'greater than or equal to')

N.B. Observations of wind direction are only included in the wind direction statistics if the observed OR background wind speed > 5 m/s

IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
A8CF3	P	30	0	0.9	-5.6	5.7
A8FA5	P	34	0	1.1	5.2	5.3
ELRR2	P	29	28	4.5	-0.4	4.5
ELWD5	P	34	3	2.0	4.2	4.6
ELWO6	P	54	0	1.2	-4.3	4.4
FNYF	P	48	0	1.0	-4.2	4.3
UDBK	P	21	62	9.5	2.0	9.7
UDWH	P	29	38	2.6	0.1	2.6
UDYG	P	61	0	1.1	-7.2	7.3
UDYN	P	88	17	7.1	-1.2	7.2
UFAA	P	24	50	1.5	13.6	13.7
VRZK9	P	26	0	1.8	6.0	6.3
WADZ	P	69	1	6.1	1.6	6.3
WCY7054	P	24	0	1.3	6.1	6.2
WSRH	P	40	0	2.6	-4.4	5.2
ZCDF8	P	65	0	0.9	-4.7	4.7
4XIS	P	43	0	1.1	4.6	4.7
42046	P	704	0	0.5	4.0	4.1
62140	P	25	8	3.1	-8.4	8.9
62166	P	46	0	4.4	5.3	6.8

IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
A8CJ9	SPEED	35	3	5.1	8.5	9.9

ELZT3	SPEED	446	13	5.6	6.3	8.4
FNCI	SPEED	95	22	6.3	6.3	9.0
HOKP	SPEED	21	0	2.9	6.6	7.2
HPNE	SPEED	47	0	3.6	5.3	6.4
LACF5	SPEED	44	0	3.4	7.1	7.9
LALK4	SPEED	42	0	5.2	9.4	10.8
SCKM	SPEED	30	0	5.2	6.1	8.0
UCOO	SPEED	27	0	4.3	5.8	7.2
UDYN	SPEED	89	3	4.8	5.9	7.6
VEP717	SPEED	218	0	4.4	6.0	7.4
VRUR7	SPEED	51	10	7.9	6.9	10.5
VVKV	SPEED	40	0	3.1	5.7	6.5
V2IA	SPEED	67	1	5.0	5.4	7.4
V7CY4	SPEED	30	0	3.4	5.0	6.1
ZCDG7	SPEED	135	0	5.0	6.4	8.2
3ERW2	SPEED	37	8	4.2	8.1	9.1

IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
CGJK	DIRN.	49	0	26.6	-46.4	53.5
ELVZ7	DIRN.	43	0	33.0	-33.9	47.3
FNCI	DIRN.	72	29	88.8	49.2	101.6
ZCBZ4	DIRN.	24	4	42.5	-36.1	55.7
42013	DIRN.	60	0	71.4	-67.4	98.1
52083	DIRN.	174	0	95.3	-34.8	101.5
62116	DIRN.	622	0	11.9	33.4	35.4

IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
CYLY	T	23	0	2.5	7.6	8.0
ELWC5	T	46	0	2.8	4.2	5.0
SP33	T	115	0	4.3	-6.9	8.2
UCJJ	T	113	0	3.4	-4.4	5.6
UCOY	T	31	26	7.6	-4.6	8.9
WCW9126	T	286	2	3.1	6.3	7.0
WWU8	T	25	20	3.4	8.4	9.1
46081	T	717	2	3.4	6.8	7.6
46131	T	711	0	2.0	5.2	5.5
46146	T	714	0	1.7	5.1	5.3
46181	T	710	0	2.9	4.0	5.0

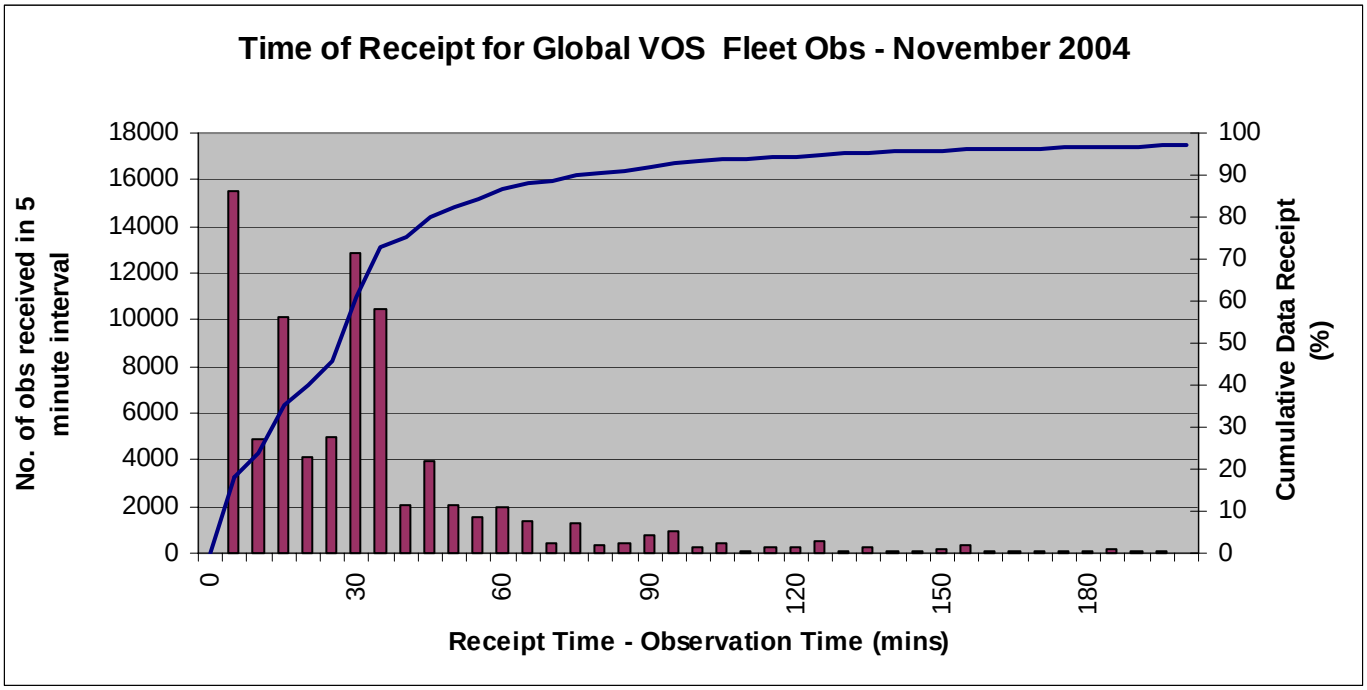
IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
A8DO9	RH	30	0	7.2	18.5	19.8
C6NR7	RH	27	0	6.7	16.7	18.0
ELUX2	RH	58	0	16.9	16.7	23.8
FNAT	RH	64	0	5.7	24.7	25.3
FQFL	RH	131	0	7.1	-17.8	19.2
HPEU	RH	32	0	9.0	20.6	22.5
VRYS8	RH	31	0	8.0	16.2	18.1
ZSWAV1	RH	21	0	10.1	-33.2	34.7
3EBX6	RH	41	0	17.2	-31.2	35.6
3FMM6	RH	47	0	6.7	15.2	16.7
62140	RH	25	0	7.7	19.4	20.9

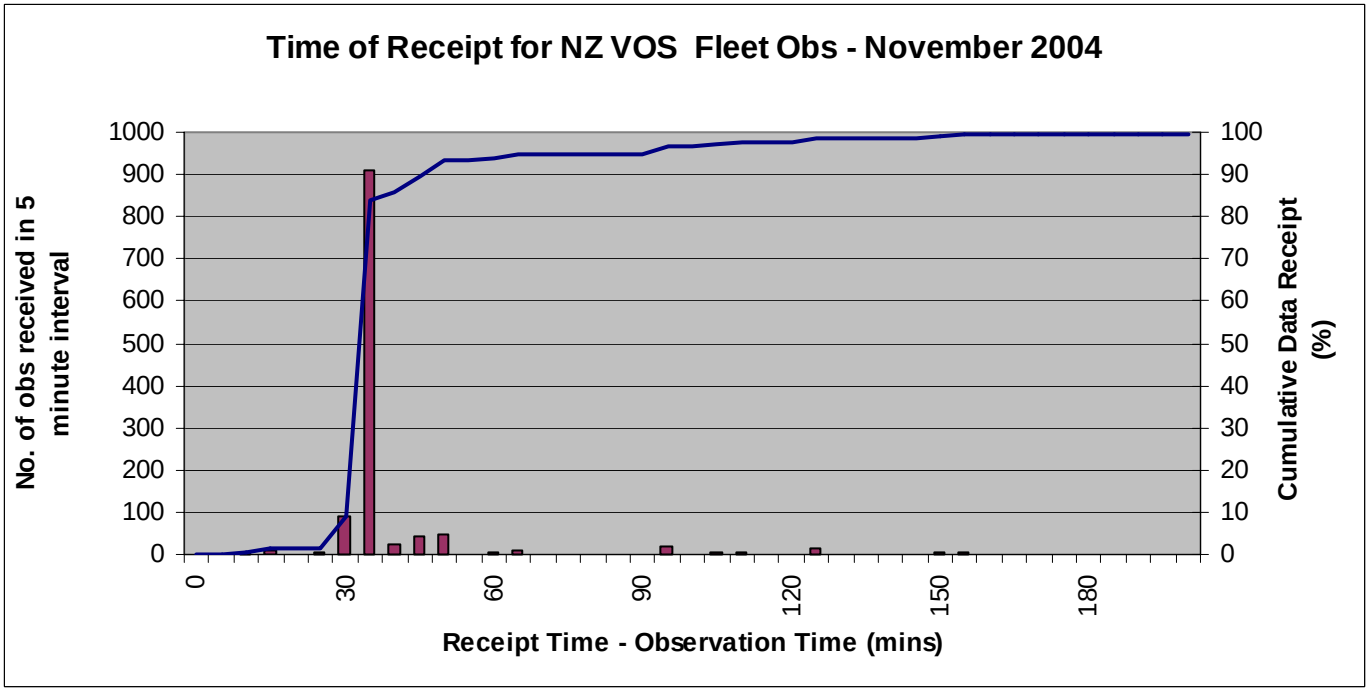
IDENTIFIER	ELEM	NOBS	PGE	SD	BIAS	RMS
A8CR6	SST	43	0	2.1	3.3	3.9
C6KJ5	SST	69	0	2.1	3.4	4.0
C6QF4	SST	46	48	1.8	4.8	5.1
C6RJ6	SST	48	0	0.8	-3.0	3.2

DAJL	SST	30	0	0.8	3.0	3.1
ELYP7	SST	82	7	1.9	-3.2	3.8
HPZR	SST	55	0	1.2	4.5	4.7
KHRC	SST	42	0	0.8	-3.4	3.5
KHRP	SST	40	0	0.7	3.1	3.2
KRGB	SST	338	36	2.2	-2.6	3.4
LAWO2	SST	21	5	3.2	4.2	5.3
PHSG	SST	25	0	0.7	-3.9	4.0
UBAM	SST	31	0	1.2	5.3	5.4
UCJO	SST	28	0	1.8	-4.2	4.6
V2AC6	SST	26	0	1.2	3.4	3.7
V2EU	SST	26	0	1.5	-3.3	3.6
V7BW7	SST	33	3	2.0	-4.5	4.9
WAAH	SST	46	0	1.3	3.4	3.6
WCZ5528	SST	54	0	2.5	-4.2	4.9
WCZ9703	SST	55	0	2.5	-3.0	3.9
WSRH	SST	35	0	1.1	-3.2	3.4
3EMQ9	SST	48	0	0.8	-3.6	3.6
3ERW2	SST	33	3	2.4	3.9	4.6
3FPA6	SST	56	0	0.9	6.2	6.3
31055	SST	216	0	0.6	-3.5	3.5
42021	SST	400	0	1.0	-4.9	5.0
42035	SST	683	0	1.2	-3.0	3.2
44141	SST	678	0	1.1	-3.1	3.3
44161	SST	303	0	0.4	-3.8	3.8
9HCH7	SST	30	7	0.8	3.6	3.7

Appendix B to Annex IX

Timelines of VOS observations received at the Met Office (UK), Nov. 2004





Annex X

Report of the VOSClim Project Leader

1. Although the project procedures are now in place, and the project can be considered as being 'operational', there has been limited progress since the last session of the project team – both in terms of ship recruitment and the consequent collection and dissemination of project data.

Participation

2. At VOSClim-IV (July 2003) the number of ships recruited to participate in the project stood at 89, whilst at the close of 2004 the number of ships reported to the DAC stood at 113 – still well short of the target figure of a minimum of 200 ships established at the start of the project.

3. The current and proposed levels of national participation in the project are as follows;

Country	Number of VOSClim ships at 31 December 2004	Number of VOSClim ships recruited in 2004	Number of VOSClim ships withdrawn in 2004	Number of VOSClim recruitments planned for 2005	Target number of ships to participate in VOSClim
Australia	**10**	**3**	**1**	**10**	**20+**
Canada	**14**	**0**	**0**	**20**	**75**
France	**6**	**0**	**0**	**2**	**8**
Germany	**11**	**0**	**0**	**3**	**14**
India	**21**	*	*	*	***[21]*** *
Japan	**5**	**5**	**0**	-	- ***[5]***
Netherlands	**1**	**0**	**0**	-	- ***[1]***
UK	**33**	**10**	**2**	**~5**	**>30**
USA	**12**	**0**	**0**	**12**	**~ 50**
TOTALS	**113**	**18**	**3**	**52**	**~ 224**

* *Details not known at time of preparation of this paper. Figures in square brackets assume current levels of participation are maintained*

It will be noted that even with the planned 2005 recruitments, the target of 200 ships is unlikely to be realized this year; however, if all the promised target recruits materialize, then it would be reasonable to expect the target to be achieved at some point during 2006.

It will be noted that only seven ships have been withdrawn from the project since recruitment commenced almost four years ago.

3.1 *Project participants are invited to confirm that the accuracy of their Ship List details.*

4. One of the main contributory reasons for the slow progress since the last session is the fact that VOS operators are being faced with increasing resource limitations, which in some cases have led to reduced PMO numbers and consequently less frequent ship inspections. Notwithstanding, the majority of countries that undertook to recruit ships at the outset of the project have now done so; since VOSClim-IV both Japan and France have recruited ships to participate in the project.

5. In addition there have been several changes in project focal points over the last year which does not help the project to maintain its momentum. Although the main VOS operators are represented on the project team, it is hoped that other VOS operating countries will be willing to contribute ships to participate in the project and that existing members will increase their participation.

5.1 *Project Focal Points are invited to confirm that their contact details are correct. [Note – at the meeting consideration will also be given to the possibility of establishing a VOSClim Task Team under the direction of SOT.]*

5.2 *The meeting is invited to consider strategies for increasing participation in the project. SOT members, that are not presently involved in the project, will be invited to propose candidate ships.*

Real Time Data

6. The real time transmission of VOSClim ship observations from the Real Time Monitoring Centre (RTMC based at the Met Office, Exeter, UK) to the project Data Assembly Center (DAC based at the NCDC, Asheville NC, USA) is operating in accordance with the project requirements. The ship reports are transmitted by the ships (normally via Inmarsat C) in WMO Ship Code, in the same manner as for normal VOS. The RTMC thereafter appends the six prime model parameters from the forecast model – pressure, relative humidity, air temperature, sea temperature, wind speed and wind direction – to the ship report. These data have been transferred (in BUFR Code) to the DAC since July 2002.

Delayed Mode Data

7. The delayed mode observations from VOSClim ships (including the additional project IMMT-2 code groups) are recorded on the electronic logbooks (e.g. TurboWin, SEAS or OBSJMA) which are recommended for use by project ships. These data are subsequently downloaded by visiting Port Meteorological Officers, on a recommended three monthly basis. Ideally minimum quality control procedures (MQCS version IV) are applied to the collected delayed mode observation datasets before they are sent to the two Global Collecting Centres (located in Hamburg and Edinburgh).

7.1 *Project focal points will be invited to confirm that delayed mode project data is being collected with minimum delay, and that it is being quality controlled prior to submission to the GCC's.*

8. Having checked the data quality flags, and clarified any problems bilaterally, the GCC's then send the delayed mode data to the DAC. This has been done on a quarterly basis since March 2003. A separate GCC report on the processing of delayed mode VOSClim data will be submitted under VOSP agenda item III-A 5.2.2.

Data Availability

9. Although the real time and delayed mode data transmission routes to the DAC appear to be operating correctly there have been some problems with the collection and display of the data on the project website which is hosted by the DAC. In particular there are discrepancies between the number of delayed mode observations being sent by the GCC's and the number appearing on the website. Similarly it appeared that not all the model data files sent by the RTMC were appearing on the website; this discrepancy was subsequently confirmed by closer comparison of the actual BUFR files being sent with those available via the website. More details are given under III-B agenda item 1.3. However some data for the participating ships are now available for browsing (via new interactive browser) from the website.

9.1 *In conjunction with the DAC report (agenda item III-B 2.2), the project team will be invited to consider how these discrepancies can be resolved.*

10. At this time we are therefore unable to reliably confirm the number of VOSClim reports that have been collected, but examination of the RTMC monitoring reports shows that about 160,000

reports have been submitted. However all reports have been archived and we are confident that no data have been lost.

11. Scientific analysis of the VOSClim dataset has been delayed by these data availability issues.

Metadata

12. Metadata for the VOSClim ships, which includes details of each ships' arrangements and information about the meteorological instruments, are being collected by the Port Meteorological Officers at the time of recruitment using the dedicated VOSClim recruitment form. These metadata are being used by the scientific advisers to the project in order to quantify the random and systematic errors associated with the ships instruments and observations, and has already been used as the basis for a scientific paper (see agenda item III-B item 1.3).

13. As the VOSClim recruitment form is currently only available in hardcopy format, most National Met Services have to transcribe the collected metadata into the required text delimited format prescribed by WMO (for WMO Publication 47). Although a DOS based electronic metadata collection programme was developed by Australia, it is not in general use as individual countries tend to have their own data entry and archival systems. As the VOSClim recruitment form and metadata format are the same as for the wider VOS, it is considered that this is an issue for the wider VOS Panel.

13.1 *It is suggested that the need for electronic metadata collection systems should be reconsidered by the meeting. In this regard consideration could also be given to the inclusion of a metadata module within electronic logbooks, like TurboWin, thereby allowing a permanent record of the metadata to be retained on board, updated as necessary, and downloaded by the Port Met Officers when required.*

14. Due to prolonged delays in making WMO Pub 47 available via the WMO website, VOSClim members were originally requested to provide their ships metadata direct to the DAC in spreadsheet or text delimited format. However, the Pub 47 metadata for all VOS & VOSClim ships was eventually made available on WMO website in 2004.

14.1 *The meeting is therefore invited to consider whether there remains a need for the metadata to be made available to the DAC, or whether a simple link from the VOSClim website to the WMO Publication No. 47 website will suffice in the future. The meeting should also note proposals for the development of a VOS metadata database.*

14.2 *The DAC under, its terms of reference, is required to archive hard copies of the completed ship survey forms. The meeting should consider whether the DAC Terms of Reference should be changed such that the hard copy reports are archived at the National Met. Services and made available as required. Such a change will necessitate amendments to the Project Document.*

15. At the last session a number of areas were identified where the codes used in Publication No 47 were in need of revision (e.g. the need to revise the vessel type codes, the need to have fields to record the use of electronic logbooks and automatic weather systems, etc.). Revised and extended codes were subsequently drafted in close cooperation with the SOT Task Team on Pub47. The proposed new codes were subsequently presented by the Project Leader to the JCOMM Expert Team on Marine Climatology. The proposals will be finalized by SOT at this session, with a view to their being forwarded to JCOMM-II for approval.

16. In accordance with the project and latest metadata requirements VOSClim operators are also requested to take digital images of the ships they recruit, of the instruments demonstrating their exposure, and to make schematic diagrammes from the ship arrangement plans. At the last

session it was agreed that these should be submitted to the DAC for archive only, as it was considered that inclusion of such digital imagery on the website could require considerable manual intervention.

16.1 *The meeting will be invited to confirm that they are making such imagery available to the DAC.*

16.2 *The meeting will be invited to consider whether the current procedures are satisfactory or whether a new mechanism for the storage and dissemination of ship's digital image metadata should be agreed and implemented.*

Monitoring Statistics

17. Monthly monitoring statistics for the real time observed data continue to be produced by the RTMC and made available on the Project website. In May 2002 the RTMC began producing monthly 'suspect' lists of ships whose observations failed to meet the monitoring criteria specified for the project. The criteria used for monitoring the six observed variables (listed in para 6) were established at the last session and appear to have been set at approximately the correct levels (further discussion of this point will be invited under Agenda Item III-B 2.1). Monitoring was recently extended to include those ships notified to the DAC as being 'candidate' VOSClim ships.

18. VOSClim ship operators are encouraged to take early remedial action to resolve any monitoring problems for ships flagged as having reported suspect observations. However, in the absence of a mechanism to record the remedial actions that have been taken, it is unclear exactly how many operators are doing this.

18.1 *The meeting is invited to consider whether a system for reporting/recording remedial actions is feasible – bearing in mind that it could help to avoid duplication of effort by Port Met Officers, and could be used to assess any bad observing trends that may be developing or faults with certain types of instrumentation.*

Project Website

19. The project website (http://lwf.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html) is maintained by the DAC. It is intended to act as the main focal point for the project, providing users with easy access to the necessary data. It includes up-to-date lists of all the participating ships, the monthly observation monitoring statistics supplied by the RTMC, downloadable datasets of the observations and associated model data, and copies of the necessary project documentation and certification. Limited metadata (based on the earlier pre-extended format) is also available via the website. Although the website has been active for approximately three years now its appearance has not changed greatly in that time, although an interactive browser was added during 2004.

19.1 *Members will be invited to consider whether the website is adequately fulfilling its function and invited to suggest potential improvements.*

Project promotion

20. Copies of the project brochure were published at the outset of the project and soft copies can also be downloaded for printing from the website. This brochure is essential for promoting the project to potential ship recruits, shipping companies and other interested parties. The brochure has also been incorporated electronically into the TurboWin software as a pdf download.

20.1 *Members will be invited to consider whether the information given in the project brochure remains accurate, or whether any amendments are needed.*

21. The first issue of the project newsletter was issued in October 2003 and was made available for download via the project website. The newsletter is intended as a means for

exchanging information and for keeping all those involved in the project – both ashore and at sea – aware of the latest developments.

21.1 *The meeting will be invited to consider whether a second issue of the Newsletter should be prepared – or whether the VOSClim Newsletter should be incorporated into the SOT newsletter being considered by the SOT Task Team on VOS Recruitment and Programme Promotion.*

22. The format for the Certificate of Appreciation (for presentation, unsigned, to ships observers) and the Certificate of Participation (for presentation, signed, to participating ships) was finalized in July 2002, and copies are available for pdf download from the project website. Several framed Certificates of Participation have already been issued although it is unclear exactly how many certificates have been issued to VOSClim observers and ships.

22.1 *Project focal points will be invited to confirm whether they are keeping records of issued certification, and the meeting is invited to consider the need to record such issues centrally.*

23. In addition to providing a high quality data set, the VOSClim project also offers an opportunity to act as a model for ordinary VOS, and to test out potential VOS improvements. Consequently, as the scientific analysis gains pace, the project team is increasingly going to be in a position to make proposals about upgrading the standards of ordinary VOS. For instance consideration could now be given to increasing the number of VOS, or requiring all VOS to report the additional VOSClim delayed mode data. For ships equipped with electronic software like TurboWin this would be relatively simple. It would require little extra work by the observers, and would help to raise the level of participation in the project.

23.1 *The meeting will be invited to consider the feasibility of requiring all VOS using electronic logbooks to report the additional VOSClim parameters.*

24. The project is therefore at a critical stage in its development and detailed consideration will need to be given to its future development, and assessment of its value as a high quality dataset. A separate paper containing proposals on how the project should be progressed will be submitted under Agenda item III B 3.1.

25. As the project is now largely implemented it is recommended that the VOSClim panel should now be incorporated into the VOS Panel, with the VOS Terms of Reference amended as necessary (see agenda items III-A 8.1 and III-B 4.2).

Annex XI

Report of the VOSClim Scientific Advisers

Elizabeth C. Kent and David I. Berry
Southampton Oceanography Centre, Southampton, UK.

Summary and Status

- The VOSClim data streams are not currently reliably available from the Data Assembly Center (see Doc III-B-1.3(2)). No analyses are therefore presented in this report.
- We are pleased to report that the delivery of Publication No. 47 metadata has been significantly improved since VOSClim-IV. Metadata are currently available covering the period from the start of VOSClim to June 2004. We urge the WMO to make the provision of metadata with minimum delay a priority.
- We welcome the modifications to TurboWin in version 3.5 to remove the height correction of wind speeds for VOS.
- We welcome the participation of Japan and France in VOSClim.
- A paper analysing the exposure of screens using the VOSClim digital images has been accepted by the International Journal of Climatology.
- Software to merge the delayed mode data with model parameters has been written and its implementation awaits the resolution of data delivery problems at the DAC.

1. INTRODUCTION

The scientific background to the Voluntary Observing Ship Climate Project (VOSClim) was described in detail in the last scientific advisers report to VOSClim-IV[3].

2. SCIENTIFIC STATUS OF THE PROJECT

2.1 Data Availability

At VOSClim-IV (July 2003) results of scientific analysis were presented using VOSClim data obtained from the Climate Diagnostics Centre (CDC) as the data were not available from the VOSClim Data Assembly Center (DAC). Although a webserver[4] has been implemented at the DAC the data delivery has been unsatisfactory (see Doc III-B-1.3(2)). The DAC are working to deliver the VOSClim data streams, but have not yet been able to do so. If data are available by mid-February it is expected that some analysis will be presented at the meeting.

2.2 Metadata Availability

We are pleased to report that the delivery of Publication No. 47 metadata has been significantly improved since VOSClim-IV. Metadata are currently available covering the period from the start of VOSClim to June 2004. Increased speed of metadata delivery is extremely desirable.

2.3 Project Participation

Since VOSClim-IV two more countries have recruited ships to VOSClim. France now have 6 participating ships and Japan 5 ships which add to the contributions of Australia, Canada, Germany, India, the Netherlands, UK and US.

---

[3] JCOMM Meeting Report No. 23, Annex IV, http://www.wmo.ch/web/aom/marprog/Publications/publications.htm

[4] http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html

2.4 Revision of Project Document

As some changes have been made to VOSClim operation (and others put to this meeting for approval), it is suggested that the project document (JCOMM, 2002) be revised. Modifications will be required, *inter alia,* to the ship recruitment requirements and to the terms of reference of the DAC.

2.5 Scientific Issues

2.5.1 Recruitment

Although the numbers of VOSClim ships has grown over the project, recruitment is still only about half of the target minimum. Although VOSClim-IV "concluded that a greater number and variety of ships, irrespective of their observation methods and routes, should be welcomed to the project" this has not resulted in a significant number of new recruits. It should therefore be restated that all ships thought to provide good quality observations will make an important contribution to VOSClim and that without a significant increase in ship recruitment the value of VOSClim will be more limited than envisaged at the project outset.

Project participants are reminded that ships recruited to VOSClim should:
1) Have a good reporting history
2) Automated coding software and the ability to provide the extra VOSClim parameters
3) Provide complete metadata for Publication No. 47 and ideally digital images

2.5.2 Scientific Analyses

We are pleased to report that the first scientific paper using the VOSClim data and metadata has been accepted by the International Journal of Climatology (Berry and Kent 2005). This paper compared visual assessments of air temperature screen exposure using photographs available as part of the VOSClim project with statistics of the differences between ship and model air temperatures from the VOSClim model data stream. It should be noted that this analysis was performed with a dataset downloaded from the DAC which was subsequently found to be incomplete and to contain some data that should have been in a different stream. However as only data containing both ship and model parameters were included in the analysis this should have minimised the impact, it is therefore not expected to have had a major impact on the conclusions presented.

2.5.3 Monitoring Limits and Suspect Ship Lists

A number of ships flagged as suspect are operating in areas where we would not expect the model to be representative, such as: coastal regions, inland seas and lakes and the high latitudes. An example of this can be seen in the suspect ship lists for November and December 2004. All the ships listed as having suspect air temperature values are from Canadian ships operating in and around the Canadian coast and the Great Lakes. We would only expect the model to give representative values for the marine environment in regions which are not influenced by land or sea ice. Hence, to prevent ships being falsely labelled as suspect it is recommended to exclude from the monitoring statistics observations where the model surface type is not ocean.

2.5.4 Scientific Advisers

We recommend that Mr Scott Woodruff of the Climate Diagnostics Centre be brought into the VOSClim project as a Scientific Adviser. He has already contributed significantly to the project and will bring valuable expertise. Dr Peter Taylor will stand down as a Scientific Adviser and it is recommended that he is replaced by Mr David Berry also of the Southampton Oceanography Centre. The panel should also consider the worth of setting up a VOSClim Scientific Users Group who could provide advice and feedback on the development of the proposed high quality dataset.

2.5.5 VOSClim Evaluation

The future development of VOSClim is to be discussed under agenda item III-B 3.1. We recommend that VOSClim enters an evaluation phase now that its implementation is almost complete. The quantity of data and number of ships participating in VOSClim have both been smaller than had been hoped. It is important that the role of VOSClim in improving VOS data quality be assessed. We therefore propose that an evaluation phase for VOSClim should:

1) Produce a combined dataset containing the ship report, model output and delayed mode parameters, the 'VOSClim Analysis Dataset'.

2) Compare this analysis dataset with data from the wider VOS to quantify whether VOSClim has improved data quality.

3) If data quality is higher then recommendations will be made on how improvements can be extended to the wider VOS.

4) The value of the delayed mode parameters will be assessed.

5) A strategy for the development of a high-quality dataset will be developed and a dataset produced and made available for general use.

3. RECOMMENDATIONS

1) Data delivery problems should be resolved as a matter of urgency

2) Publication No. 47 metadata should be available within a month of the quarter end.

3) VOSClim should enter an evaluation phase (to be discussed under agenda item III-B-3.1)

4) The VOSClim monitoring procedure should be reviewed.

5) The VOSClim scientific advisers should be E. C. Kent, S. D. Woodruff and D. I. Berry. A VOSClim Scientific Users Group should be considered.

6) The VOSClim project document should be rewritten including a modification of the terms of reference for the DAC. A reduced metadata responsibility is recommended for the DAC (t.o.r. items 4 and 5). Responsibility for the Pub. 47 metadata should remain with the WMO, responsibility for completed inspection and survey forms should remain with the VOS operators and a mechanism for the storage and delivery of VOSClim digital images should be developed.

7) Increased recruitment to VOSClim should be a priority, the recruitment of ships with a good reporting history is more important than sophisticated instrumentation. The goal should be a subset of ships with instrumentation representative of the wider VOS but whose reporting history has been for complete and reliable observations.

REFERENCE

Berry, D. I. and E. C. Kent, 2005: The Effect of Instrument Exposure on Marine Air Temperatures: An Assessment Using VOSClim Data International Journal of Climatology (CLIMAR-II Special Issue), in press.

Annex XII

Report of the Real Time Monitoring Centre of the VOSClim

1. At the second meeting of the VOS Climate Project (VOSClim-II), the Met Office agreed to act as the Real Time Monitoring Centre (RTMC) for the project.

2. In accordance with the Terms of Reference agreed for the RTMC the observed project variables (i.e. pressure, air temperature, relative humidity, sea surface temperature, wind speed and wind direction) are required to be extracted from the GTS for each project ship and co-located with the associated model field values prior to transfer to the Data Assembly Centre (DAC). In addition, ship monitoring statistics are to be produced by the RTMC and provided to the DAC on a monthly basis.

3. Further information is given below.

Monitoring Statistics

4. At the last project meeting (VOSClim-IV) it was agreed to keep the values for the real time monitoring of the first four observed variables at the levels given in Appendix A to this report. Whereas the meeting decided that the monitoring criteria for the two new variables of temperature and humidity should be tightened somewhat, to those shown in Appendix A.

5. Since the VOSClim-IV meeting:

- In July 2003 the RTMC started to use the new monitoring criteria for air temperature and relative humidity agreed at VOSClim-IV.

- The RTMC has also started to produce monthly statistics for the list of prospective (or candidate) ships held on the project web site. This should help with deciding whether to formally recruit these ships into the project.

6. The RTMC produces the following monitoring statistics for project ships:

- **Monthly Ship Statistics** - A list of monitoring statistics for all participating project ships, based upon the criteria given in Appendix 1, is sent by email to the DAC on a monthly basis for inclusion on the project web site. A recent example of these statistics, for December 2004, is given in Appendix B. Similar statistics are now produced for the list of prospective ships.

- **Monthly 'Suspect' List** - A list of monitoring statistics for project ships identified as having submitted 'suspect' observations is sent to the project focal point in each participating National Met. Service (NMS) on a monthly basis. The list is also sent to the DAC each month for inclusion on the project web site. The suspect lists are based upon the criteria established for the six observed variables (in Appendix 1). NMS's and their associated PMO networks should use the lists to resolve any quality problems. A recent example of the suspect list, for December 2004, is given in Appendix C.

7. At the VOSClim-IV meeting it was decided that weekly suspect lists were not needed, due to pressure on PMO resources.

8. In order to ensure that the monitoring process operates effectively it continues to be essential that:

- National focal points are clearly identified, with contact and e-mail addresses maintained up-to-date on the project web site, to enable the dissemination of the monitoring statistics.

- The call signs of ships participating in the project are maintained up-to-date on the project web site, as this list is used as the basis for generating monitoring statistics. It would be useful if updates to this list were also sent to the RTMC - very few updates have been received by the RTMC since VOSClim-IV.

9. After nearly 3 years of monitoring, the RTMC considers that most of the criteria for the real time monitoring (in Appendix A) have been set at approximately the correct levels. Does this meeting agree?

10. It has been noticed that many of the ships which are flagged are often operating either near the coasts or in the Great Lakes of North America. The model values may not be very representative in these areas, where model grid boxes may be mixed ocean/land or ocean/ice. It has been suggested that we consider excluding these 'mixed grid box' observations from the data used in the monitoring. Does the meeting agree with this suggestion?

11. The RTMC would be interested to see details of any remedial action taken by the PMOs in response to the monitoring information provided.

Data Transfer

12. The RTMC is also responsible for ensuring the transfer of project ships' observations along with co-located model background data to the DAC, at the National Climatic Data Center, USA.

13. Since July 2002 the Met Office has been producing the VOSClim BUFR data on a daily basis and transmitting it to Washington via the GTS. This data has been transmitted on to the DAC since April 2003.

14. The 47 elements included in the BUFR messages have not changed since they were agreed at the third VOSClim meeting in January 2002. For ease of reference the list is attached as Appendix D.

Appendices: A. Monitoring criteria for suspect ships

B. Monitoring statistics for VOSClim ships for December 2004

C. VOSClim ship suspect list for December 2004

D. BUFR Code Template

Appendix A to Annex XII

Monitoring criteria for suspect ships

1. For each ship and each variable there should be at least 20 reports during the period (if there are less than ~20 reports the statistics may be unreliable and no action need be taken).

2. Then, either:

   a) The number of gross errors should exceed 10% of the number of observation reports (where the observation-background (o-b) limits for individual gross errors are shown in column 4 of the following table); or,

   b) One of the limits shown in columns 2 and 3 in the table should be exceeded for either:
      (i) the mean value of o-b over the period (absolute value), or
      (ii) the standard deviation of o-b over the period

(1) **Variable**	(2) **Mean o-b limit**	(3) **Std. Dev. o-b limit**	(4) **Gross error limit**
Pressure (hPa)	**2.5**	**5.0**	**15.0**
Wind speed (m/s)	**5.0**	**10.0**	**25.0**
Wind direction (degrees)	**30.0**	**60.0**	**150.0**
Air Temperature (^{0} C)	**2.0**	**4.0**	**15.0**
Relative humidity (%)	**10.0**	**20.0**	**50.0**
Sea surface temp. (^{0} C)	**2.0**	**4.0**	**10.0**

3. If either of the limits on o-b statistics in columns 2 and 3 are exceeded the project ship's observations will be considered 'suspect' and corrective action will need to be taken (e.g. by the Port Met Officers). Column 4 contains the o-b limits for each ship observation beyond which the observation will be regarded as a 'gross error'.

Appendix B to Annex XII

Monitoring statistics for VOSClim ships for December 2004

Standard of comparison: 6-hour forecast (background) from the Met Office Global NWP Model.
Column headings:

CallSign - Ship's call sign.
NumObs - Number of observations from each ship received during the period of the report.
%GrEr - Percentage of observations with 'gross errors' (excluded from the statistics).
Bias - Mean value of the observation-minus-background (o-b) values.
RMS - Root mean square of the o-b values.
StdDev - Standard deviation (SD) of the o-b values.
NormSD - Normalised standard deviation (SD relative to other observations in the area).
TrueBias - Bias relative to all marine surface observations in the region over the past 3 years.

Note. The normalized standard deviation and 'true bias' give a measure of the standard deviation and bias of the differences of observations from the background values relative to marine surface observations (from ships and buoys) made in the region over the previous 3 years. A value of 1.0 for the normalised SD means that the SD is the same as the average for all other ships and buoys in the region, while a value of 2.0 means that it is twice as large, and so on. (This statistic and the 'true bias' are not yet available for the more recent additions of wind direction, air temperature and relative humidity.)

Pressure (hPa)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev	NormSD	TrueBias
CFD3659	461	0.0	-0.3	1.1	1.1	0.9	0.0
CGDS	245	0.4	-2.7	4.7	3.9	4.7	-1.8
CGDX	37	0.0	1.5	1.7	0.9	1.2	2.4
CGJK	352	0.0	0.0	0.9	0.9	0.9	0.2
CGSB	185	0.0	1.2	1.9	1.5	1.7	2.1
CG2958	205	0.0	0.0	0.9	0.9	0.9	0.2
CG2960	193	0.5	0.2	1.6	1.6	1.9	1.1
C6HS4	6	0.0	0.0	0.8	0.8	0.7	-0.3
C6KD6	47	0.0	0.1	0.9	0.9	0.7	0.2
C6KD7	31	3.2	-0.1	0.8	0.8	0.5	-0.1
C6KD9	47	0.0	-0.3	0.9	0.9	0.6	-0.3
DQVH	51	0.0	-0.5	1.4	1.3	0.9	-0.1
DQVI	49	0.0	-0.5	1.3	1.2	1.0	-0.5
DQVJ	22	0.0	-0.6	1.0	0.8	0.7	-0.5
DQVK	49	0.0	0.3	1.2	1.2	1.0	0.5
DQVL	8	0.0	-0.9	1.2	0.8	0.5	-1.2
DQVM	55	0.0	-0.1	2.1	2.1	2.0	-0.1
DQVN	39	0.0	-0.1	0.8	0.8	0.5	0.2
DQVO	51	0.0	-0.5	1.2	1.1	0.7	-0.3
ELVG7	23	0.0	-0.7	1.4	1.2	0.9	-0.6
ELXS8	48	0.0	-0.6	1.1	0.9	0.7	-0.5
FNCI	150	0.0	-0.4	0.9	0.8	0.8	-0.2
FNCM	163	0.0	0.1	0.7	0.7	0.5	0.6
FNFD	60	0.0	-0.6	0.9	0.7	0.7	-0.6
FNIN	209	0.0	-0.4	0.9	0.8	0.7	-0.4
FNJI	146	0.0	-0.2	0.7	0.7	0.8	0.0
FNVA	119	0.0	0.1	0.5	0.5	0.6	0.1
GBTT	8	0.0	-1.8	3.0	2.4	2.1	-2.1
GLNE	82	0.0	0.1	1.1	1.1	0.8	0.2
GXUP	31	0.0	-0.7	2.3	2.2	1.9	-0.7
JPBN	83	0.0	0.2	0.6	0.6	0.3	0.6

MHCQ7	40	0.0	-3.4	4.0	2.1	1.5	-3.0
MQEC7	52	0.0	-0.1	0.8	0.8	0.5	-0.3
MSTM6	69	0.0	0.4	1.8	1.8	1.2	0.8
MXBC6	22	0.0	-3.0	3.7	2.2	1.9	-2.7
MXMM5	65	0.0	0.0	1.3	1.3	0.9	0.2
MYMX5	34	0.0	1.6	2.9	2.4	1.6	1.8
MZHC8	35	0.0	1.0	1.3	0.9	0.9	1.1
OVZV2	32	0.0	3.4	3.7	1.5	1.3	3.4
S6TS	59	0.0	0.7	1.8	1.7	1.2	1.0
VCLM	181	0.0	-0.2	1.1	1.1	1.0	0.5
VJNV	51	0.0	0.0	1.0	1.0	0.8	0.1
VQBW2	63	0.0	-1.1	1.6	1.2	0.9	-0.8
VQEN2	18	0.0	0.3	1.0	1.0	0.9	0.6
VRYO3	15	0.0	1.0	1.6	1.3	0.9	1.1
VTXG	12	0.0	4.9	5.6	2.8	2.2	5.1
VTXK	86	0.0	3.3	3.8	1.8	1.5	3.2
VTXT	5	0.0	1.4	1.5	0.5	0.3	1.0
V2FM	32	0.0	-0.4	1.7	1.7	1.3	0.1
WCX8812	61	0.0	-1.4	2.3	1.8	1.2	-1.0
WCX8882	49	0.0	0.3	0.9	0.8	0.5	0.7
WCX8883	22	0.0	-1.6	2.2	1.5	1.0	-1.1
WCX8884	32	0.0	-1.0	1.5	1.1	0.7	-0.5
WFLG	46	0.0	-1.6	1.8	0.9	0.7	-1.3
WNDP	59	0.0	-2.0	2.7	1.8	1.1	-1.8
WRYC	23	8.7	-1.4	2.1	1.6	1.1	-1.1
WRYD	23	0.0	0.2	2.8	2.8	1.7	0.6
WRYW	43	0.0	-1.3	2.1	1.6	1.1	-0.9
ZCBD3	22	4.5	0.7	1.4	1.2	0.8	0.7
ZCBD4	8	0.0	3.5	3.7	1.3	0.9	3.5
ZCBN5	43	0.0	-0.4	1.3	1.2	0.9	-0.2
ZCBP5	29	0.0	1.4	3.0	2.6	2.0	1.6
ZCDH7	44	0.0	0.9	2.5	2.3	1.7	1.1
ZCGH	47	0.0	-0.5	1.6	1.5	1.4	-0.5
ZCGL2	84	0.0	1.9	3.1	2.5	2.2	1.9
ZDLP	73	0.0	-0.2	1.5	1.5	1.0	-0.2
ZDLS1	95	0.0	-0.1	1.6	1.6	1.2	0.2
ZIZP9	10	0.0	2.2	2.9	1.9	1.6	2.5
ZQAY4	50	0.0	1.4	2.4	2.0	1.9	1.4
ZQYC5	31	0.0	0.4	1.1	1.0	0.6	0.2
9KKS	63	0.0	-0.1	1.5	1.5	1.2	-0.2
9KWH	15	0.0	-0.5	0.9	0.7	0.4	-0.4
9KWP	21	0.0	-0.2	0.8	0.8	0.7	-0.2

Wind Speed (m/s)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev	NormSD	TrueBias
CFD3659	404	0.0	1.0	3.4	3.2	1.0	-0.7
CGJK	74	0.0	0.6	2.8	2.7	1.2	0.7
CG2958	5	0.0	3.4	3.9	1.9	0.8	3.2
C6HS4	6	0.0	-0.6	2.5	2.4	1.1	-1.4
C6KD6	47	0.0	-0.8	2.3	2.2	0.8	-2.1
C6KD7	31	0.0	2.0	2.9	2.1	0.8	0.6
C6KD9	47	0.0	1.4	3.0	2.6	1.0	0.1
DQVH	47	0.0	2.5	4.8	4.1	1.4	1.2
DQVI	45	0.0	-0.2	2.6	2.6	0.9	-1.2
DQVJ	21	0.0	1.0	1.9	1.6	0.7	-0.5
DQVK	41	0.0	1.5	5.0	4.8	1.8	0.3

DQVL	6	0.0	-0.4	1.4	1.3	0.6	-1.2
DQVM	49	0.0	0.5	2.0	1.9	0.7	-0.5
DQVN	38	0.0	1.0	2.5	2.3	0.8	-0.6
DQVO	49	0.0	0.5	2.5	2.4	0.9	-1.0
ELVG7	23	4.3	3.5	5.9	4.7	1.8	2.2
ELXS8	45	0.0	-0.2	1.5	1.5	0.5	-1.2
FNCI	95	22.1	6.3	8.9	6.3	2.3	5.1
FNCM	137	0.0	1.2	2.0	1.6	0.6	-0.1
FNFD	56	0.0	1.0	2.4	2.2	0.8	0.2
FNIN	163	0.0	0.9	2.8	2.6	1.0	-0.3
FNJI	121	0.0	0.5	3.3	3.3	1.2	-0.5
FNVA	35	0.0	3.3	4.0	2.2	0.8	3.2
GBTT	8	0.0	2.7	4.0	3.0	1.3	1.6
GLNE	82	0.0	1.0	3.1	2.9	1.3	-1.7
GXUP	29	0.0	-0.8	2.6	2.5	1.0	-1.6
JPBN	76	0.0	1.6	2.6	2.0	0.7	0.2
MHCQ7	38	0.0	1.3	2.5	2.1	0.8	-0.3
MQEC7	48	0.0	-0.3	2.3	2.3	0.8	-1.3
MSTM6	69	0.0	3.1	6.1	5.2	1.8	1.6
MXBC6	22	0.0	1.4	2.4	1.9	0.7	-0.2
MXMM5	62	0.0	1.4	3.0	2.6	0.9	0.0
MYMX5	35	2.9	1.7	2.9	2.3	0.8	0.2
MZHC8	29	0.0	0.1	2.4	2.4	1.0	-0.9
OVZV2	28	0.0	1.3	2.3	1.9	0.9	0.4
S6TS	59	0.0	2.4	3.1	1.9	0.7	0.8
VCLM	85	0.0	1.4	3.0	2.6	0.9	-0.3
VJNV	49	0.0	2.2	4.5	3.9	1.5	1.3
VQBW2	61	0.0	1.4	2.9	2.5	1.0	0.1
VQEN2	18	0.0	2.8	3.4	2.0	1.1	2.1
VRYO3	15	0.0	1.5	2.6	2.1	0.9	-0.4
VTXG	10	0.0	0.7	3.2	3.1	1.1	-0.6
VTXK	75	0.0	0.1	2.2	2.2	0.9	-0.8
VTXT	5	0.0	5.1	5.6	2.2	0.8	4.2
V2FM	26	0.0	-1.0	2.5	2.3	0.8	-1.5
WCX8812	60	0.0	2.9	3.7	2.3	0.9	1.4
WCX8882	49	0.0	2.3	3.3	2.3	0.8	0.5
WCX8883	22	0.0	1.8	2.3	1.5	0.6	0.4
WCX8884	31	0.0	4.0	5.5	3.8	1.4	2.3
WFLG	26	0.0	1.4	2.7	2.3	0.9	0.4
WNDP	59	1.7	2.1	4.1	3.5	1.1	0.3
WRYC	23	0.0	0.8	2.9	2.8	1.0	-0.6
WRYD	24	0.0	2.8	4.1	3.0	1.1	1.2
WRYW	43	2.3	3.6	4.8	3.1	1.3	2.2
ZCBD3	21	0.0	0.2	2.7	2.7	1.3	-1.2
ZCBD4	8	0.0	2.9	4.3	3.2	1.3	1.8
ZCBN5	43	0.0	-0.5	3.9	3.9	1.3	-2.1
ZCBP5	30	0.0	0.9	3.6	3.5	1.1	-0.6
ZCDH7	43	0.0	3.1	4.3	3.0	1.0	1.6
ZCGH	47	0.0	-0.1	2.1	2.1	0.8	-0.9
ZCGL2	82	0.0	0.5	1.5	1.4	0.6	-0.2
ZDLP	72	1.4	1.0	2.1	1.9	0.6	0.1
ZDLS1	95	0.0	1.1	3.7	3.5	1.2	0.2
ZIZP9	9	0.0	2.2	3.8	3.1	1.0	1.0
ZQAY4	45	0.0	0.5	2.2	2.1	0.8	-0.4
ZQYC5	30	0.0	-0.4	2.2	2.2	0.8	-1.5
9KKS	63	0.0	1.2	2.5	2.2	1.0	0.4
9KWH	15	0.0	1.4	2.2	1.7	0.7	0.5
9KWP	21	0.0	1.5	1.9	1.1	0.4	0.7

Wind Direction (deg)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev
CFD3659	345	0.0	-7.7	17.0	15.2
CGJK	49	0.0	-46.4	53.5	26.6
CG2958	5	0.0	3.3	18.8	18.5
C6KD6	40	0.0	-15.8	35.2	31.5
C6KD7	23	0.0	-6.2	21.5	20.6
C6KD9	32	0.0	-0.8	29.1	29.1
DQVH	37	0.0	-3.0	25.1	24.9
DQVI	28	0.0	6.0	42.0	41.6
DQVJ	13	0.0	5.6	20.8	20.0
DQVK	33	0.0	-21.0	67.9	64.6
DQVM	26	0.0	9.6	33.2	31.8
DQVN	29	0.0	6.1	25.7	25.0
DQVO	41	0.0	1.7	38.6	38.6
ELVG7	16	0.0	17.8	37.7	33.2
ELXS8	29	0.0	-0.3	31.0	31.0
FNCI	51	0.0	49.2	****	88.8
FNCM	109	0.0	1.4	15.5	15.4
FNFD	49	0.0	-10.5	30.9	29.1
FNIN	110	0.0	0.1	16.2	16.2
FNJI	89	0.0	-6.0	19.3	18.3
FNVA	22	0.0	-5.4	15.8	14.9
GBTT	6	0.0	26.5	50.8	43.3
GLNE	70	0.0	11.5	29.2	26.8
GXUP	12	0.0	9.3	17.9	15.3
JPBN	65	0.0	3.2	26.8	26.6
MHCQ7	26	0.0	-1.0	20.7	20.7
MQEC7	29	0.0	-4.1	24.9	24.6
MSTM6	51	0.0	-5.7	17.9	17.0
MXBC6	20	0.0	-11.7	23.2	20.0
MXMM5	31	0.0	1.5	33.1	33.1
MYMX5	30	0.0	0.7	20.5	20.5
MZHC8	18	0.0	-7.9	24.1	22.8
OVZV2	23	0.0	2.2	20.7	20.6
S6TS	52	0.0	8.1	19.7	18.0
VCLM	66	0.0	5.1	16.7	15.9
VJNV	24	0.0	-22.4	50.1	44.8
VQBW2	42	0.0	2.2	29.2	29.1
VQEN2	16	0.0	-12.7	26.1	22.8
VRYO3	13	0.0	-4.7	18.2	17.6
VTXG	8	0.0	-1.7	21.7	21.6
VTXK	33	0.0	-1.2	28.0	28.0
V2FM	9	0.0	12.0	52.5	51.1
WCX8812	47	0.0	2.2	20.6	20.5
WCX8882	34	0.0	-3.2	13.9	13.5
WCX8883	20	0.0	2.0	16.6	16.5
WCX8884	23	0.0	9.7	34.7	33.3
WFLG	22	0.0	-3.4	20.8	20.5
WNDP	43	0.0	-1.9	16.9	16.8
WRYC	20	0.0	12.4	28.4	25.6
WRYD	23	0.0	-0.4	29.2	29.2
WRYW	39	0.0	7.5	34.2	33.4
ZCBD3	18	0.0	-0.6	13.0	13.0
ZCBD4	7	0.0	-12.0	57.5	56.2
ZCBN5	27	0.0	1.4	46.9	46.9

ZCBP5	27	0.0	-4.4	36.4	36.1
ZCDH7	37	0.0	-2.5	14.8	14.6
ZCGH	24	0.0	-3.1	24.1	23.9
ZCGL2	49	0.0	-7.6	28.0	27.0
ZDLP	52	0.0	4.3	39.4	39.2
ZDLS1	52	0.0	-1.3	24.2	24.2
ZIZP9	6	0.0	-9.7	22.2	20.0
ZQAY4	25	0.0	-3.8	19.5	19.1
ZQYC5	14	0.0	0.3	33.9	33.9
9KKS	31	0.0	4.2	21.0	20.6
9KWH	12	0.0	4.7	19.8	19.2
9KWP	17	0.0	11.5	21.6	18.3

Air Temperature (deg C)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev
CFD3659	461	0.0	-1.1	1.7	1.3
CGDS	245	0.0	0.7	2.7	2.6
CGDX	37	0.0	2.5	3.3	2.2
CGJK	352	0.0	0.8	2.3	2.2
CGSB	185	0.0	3.0	3.9	2.5
CG2958	205	0.0	1.0	2.5	2.3
CG2960	193	0.0	0.8	2.2	2.1
C6HS4	6	0.0	0.6	1.7	1.6
C6KD6	46	0.0	0.2	0.7	0.7
C6KD7	31	0.0	-0.2	0.7	0.7
C6KD9	47	0.0	-0.1	0.5	0.5
DQVH	51	0.0	-0.1	0.9	0.9
DQVI	47	0.0	-0.2	1.3	1.3
DQVJ	22	0.0	0.6	1.9	1.8
DQVK	49	0.0	0.2	1.7	1.7
DQVL	8	0.0	-1.0	1.1	0.4
DQVM	55	0.0	-0.1	0.9	0.9
DQVN	39	0.0	-0.4	1.1	1.0
DQVO	51	0.0	-0.2	1.2	1.2
ELVG7	23	0.0	0.0	0.8	0.8
ELXS8	48	0.0	0.2	1.2	1.2
FNCI	150	0.0	0.2	1.4	1.4
FNCM	163	0.0	-0.3	0.7	0.6
FNFD	60	0.0	-0.4	0.7	0.6
FNIN	209	0.0	0.2	0.9	0.9
FNJI	146	0.0	-0.2	1.1	1.1
FNVA	119	0.0	0.7	1.6	1.4
GBTT	8	0.0	0.4	1.3	1.2
GLNE	82	0.0	0.0	0.9	0.9
GXUP	31	0.0	0.3	1.5	1.5
JPBN	83	0.0	-0.9	1.4	1.1
MHCQ7	40	0.0	-0.6	1.2	1.0
MQEC7	52	0.0	0.2	1.1	1.1
MSTM6	69	0.0	-0.2	1.0	1.0
MXBC6	22	0.0	0.0	1.0	1.0
MXMM5	65	0.0	0.5	2.0	1.9
MYMX5	35	0.0	-0.8	2.0	1.8
MZHC8	32	0.0	0.4	1.0	0.9
OVZV2	32	0.0	0.2	1.3	1.3
S6TS	59	0.0	0.0	1.0	1.0
VCLM	181	0.0	-0.9	3.7	3.6

VJNV	51	0.0	0.1	1.5	1.5
VQBW2	63	0.0	-0.3	1.9	1.9
VQEN2	18	0.0	0.6	1.5	1.4
VRYO3	15	0.0	0.5	1.5	1.4
VTXG	12	0.0	2.2	4.2	3.6
VTXK	86	0.0	0.7	2.1	2.0
VTXT	5	0.0	1.2	2.2	1.8
V2FM	32	0.0	-0.1	1.2	1.2
WCX8812	61	0.0	0.2	1.3	1.3
WCX8882	49	0.0	0.6	1.6	1.5
WCX8883	22	0.0	0.4	1.6	1.6
WCX8884	31	0.0	-0.1	1.2	1.2
WFLG	47	4.3	-0.6	1.7	1.6
WNDP	59	0.0	0.7	1.8	1.7
WRYC	23	0.0	-0.6	1.6	1.5
WRYD	24	0.0	0.1	1.1	1.1
WRYW	43	0.0	0.5	1.7	1.6
ZCBD3	22	4.5	-0.2	0.9	0.9
ZCBD4	8	0.0	0.2	1.1	1.1
ZCBN5	42	0.0	-0.6	1.5	1.4
ZCBP5	30	0.0	-0.2	2.8	2.8
ZCDH7	44	0.0	0.0	1.9	1.9
ZCGH	47	0.0	-0.1	0.9	0.9
ZCGL2	84	0.0	-0.1	1.2	1.2
ZDLP	73	0.0	0.1	1.3	1.3
ZDLS1	95	0.0	0.7	1.9	1.8
ZIZP9	10	0.0	0.5	1.5	1.4
ZQAY4	50	0.0	0.3	1.5	1.5
ZQYC5	31	0.0	0.4	1.1	1.0
9KKS	63	0.0	0.5	1.6	1.5
9KWH	15	0.0	0.1	0.9	0.9
9KWP	21	0.0	0.2	0.9	0.9

Relative Humidity (%)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev
CFD3659	461	0.0	1.9	9.4	9.2
CGDS	243	0.0	-6.5	11.8	9.8
CGDX	37	0.0	-8.6	12.1	8.5
CGJK	352	0.0	-1.8	9.4	9.2
CGSB	184	0.0	-12.3	15.2	9.0
CG2958	205	0.0	-3.4	9.3	8.7
CG2960	193	0.0	-8.5	13.0	9.8
C6HS4	6	0.0	8.7	11.6	7.6
C6KD6	46	0.0	2.9	7.2	6.6
C6KD7	31	0.0	4.7	8.6	7.2
C6KD9	47	0.0	9.1	14.9	11.8
DQVH	49	0.0	-2.3	11.1	10.9
DQVI	47	0.0	5.9	13.1	11.7
DQVJ	22	0.0	-1.8	10.1	9.9
DQVK	49	0.0	-3.7	10.3	9.6
DQVL	8	0.0	5.1	8.3	6.6
DQVM	55	0.0	1.4	8.3	8.2
DQVN	39	0.0	-2.8	8.1	7.6
DQVO	51	0.0	-2.9	9.8	9.4
ELVG7	23	0.0	3.9	7.4	6.3
ELXS8	48	0.0	1.7	13.4	13.3

FNCI	150	0.0	-0.3	8.3	8.3
FNCM	163	0.0	-3.8	6.6	5.4
FNFD	60	0.0	-0.2	8.7	8.7
FNIN	209	0.0	-2.4	6.8	6.4
FNVA	119	0.0	-5.2	8.5	6.7
GBTT	8	0.0	4.4	6.7	5.1
GLNE	82	0.0	-1.9	7.8	7.6
GXUP	31	0.0	3.3	8.6	7.9
JPBN	83	0.0	-5.6	8.1	5.8
MHCQ7	38	0.0	7.5	11.0	8.0
MQEC7	52	0.0	-3.9	10.1	9.3
MSTM6	69	0.0	-3.3	11.1	10.6
MXBC6	22	0.0	-3.9	8.1	7.1
MXMM5	65	0.0	-2.1	9.7	9.5
MYMX5	34	0.0	3.4	8.5	7.8
MZHC8	31	0.0	4.6	7.2	5.5
OVZV2	32	0.0	4.6	9.2	8.0
VCLM	149	0.0	-0.6	9.0	9.0
VJNV	50	0.0	5.5	11.3	9.9
VQBW2	63	0.0	1.6	8.4	8.2
VQEN2	18	0.0	-7.3	10.5	7.6
VRYO3	15	0.0	-2.7	12.5	12.2
VTXG	12	0.0	7.9	10.5	6.9
VTXK	86	0.0	-4.9	10.8	9.6
VTXT	5	0.0	-11.4	17.7	13.6
V2FM	32	0.0	3.3	7.6	6.9
ZCBD3	22	0.0	6.4	9.6	7.1
ZCBD4	8	0.0	12.0	13.0	5.1
ZCBN5	42	0.0	7.3	10.0	6.9
ZCBP5	29	0.0	12.7	18.2	13.1
ZCDH7	43	0.0	6.3	12.9	11.3
ZCGH	47	0.0	0.0	6.3	6.3
ZCGL2	84	0.0	5.7	10.2	8.5
ZDLP	73	0.0	1.5	10.9	10.8
ZDLS1	47	0.0	-0.9	15.8	15.8
ZIZP9	10	0.0	-4.1	14.9	14.3
ZQAY4	50	0.0	3.4	10.8	10.2
ZQYC5	31	0.0	-1.8	5.9	5.6
9KKS	63	0.0	-2.2	7.0	6.6
9KWH	15	0.0	-3.3	7.3	6.5
9KWP	21	0.0	1.1	5.4	5.3

Sea Surface Temperature (deg C)

CallSign	NumObs	%GrEr	Bias	RMS	StdDev	NormSD	TrueBias
CFD3659	407	0.0	-0.3	0.7	0.6	0.5	-0.4
CGDS	76	0.0	-0.9	1.5	1.2	1.4	-0.8
CGJK	149	0.0	0.2	0.5	0.5	1.0	0.2
CG2960	67	0.0	-0.9	2.1	1.9	1.0	-1.0
C6HS4	5	0.0	-0.1	1.4	1.4	1.0	-0.3
C6KD6	25	0.0	-0.1	1.1	1.1	0.7	-0.1
C6KD7	29	0.0	0.1	1.3	1.3	0.9	0.1
C6KD9	47	0.0	-0.4	1.0	0.9	0.6	-0.4
DQVH	48	0.0	0.4	0.9	0.8	0.5	0.3
DQVI	41	0.0	0.8	0.9	0.5	0.4	0.8
DQVJ	19	0.0	0.6	2.4	2.3	1.3	0.5
DQVK	47	0.0	0.4	1.0	0.9	0.5	0.4

DQVL	8	0.0	1.2	1.3	0.4	0.3	1.1
DQVM	56	0.0	1.2	1.4	0.7	0.4	1.1
DQVN	35	0.0	1.7	1.8	0.7	0.5	1.6
DQVO	53	0.0	1.3	1.6	1.0	0.6	1.2
ELVG7	20	0.0	0.6	1.3	1.1	0.7	0.6
ELXS8	7	0.0	-0.3	0.9	0.8	0.9	-0.4
FNCI	142	0.0	0.2	0.6	0.6	0.6	0.2
FNCM	159	0.0	-0.7	1.0	0.7	0.6	-0.8
FNFD	59	0.0	0.3	0.5	0.4	0.3	0.3
FNIN	201	0.0	0.3	0.9	0.8	0.5	0.1
FNJI	142	0.0	0.4	0.7	0.6	0.6	0.3
FNVA	112	0.0	0.1	1.1	1.1	1.2	0.2
GBTT	8	0.0	-0.9	1.0	0.5	0.4	-1.0
GLNE	82	0.0	0.0	0.9	0.9	1.1	-0.2
GXUP	29	0.0	-0.2	0.5	0.5	0.4	-0.3
JPBN	78	0.0	-1.5	1.6	0.5	0.3	-1.5
MHCQ7	40	0.0	0.0	0.8	0.8	0.5	0.0
MQEC7	50	0.0	-0.3	0.6	0.5	0.3	-0.4
MSTM6	67	0.0	-0.1	1.2	1.2	0.6	-0.2
MXBC6	22	0.0	-0.2	0.5	0.5	0.3	-0.4
MXMM5	64	0.0	-0.1	0.9	0.9	0.5	-0.1
MYMX5	32	0.0	1.0	2.6	2.4	1.5	1.0
MZGK7	5	0.0	0.6	1.1	0.9	0.6	0.7
MZHC8	8	0.0	-0.3	0.9	0.8	0.5	-0.3
OVZV2	28	0.0	0.6	0.8	0.6	0.5	0.4
S6TS	7	0.0	1.5	1.9	1.2	0.8	1.4
VCLM	97	0.0	0.6	1.7	1.6	1.8	0.3
VJNV	33	0.0	0.2	1.2	1.2	0.9	0.3
VQBW2	60	0.0	1.6	1.9	1.1	0.7	1.6
VQEN2	17	0.0	1.6	2.2	1.5	1.1	1.3
VTXG	11	0.0	-0.7	1.8	1.7	1.0	-0.5
VTXK	84	1.2	0.3	0.7	0.6	0.6	0.3
VTXT	5	0.0	-0.5	0.9	0.7	0.4	-0.5
WCX8812	13	0.0	0.8	1.1	0.7	0.5	0.7
WCX8882	47	0.0	-0.9	1.6	1.3	0.7	-1.0
WCX8883	18	0.0	-1.6	2.4	1.8	1.1	-1.7
WFLG	29	0.0	-0.1	1.2	1.2	1.0	-0.2
WNDP	56	0.0	0.4	1.5	1.4	0.8	0.3
WRYC	25	0.0	-2.3	2.6	1.2	0.8	-2.4
WRYD	23	0.0	-1.1	1.6	1.2	0.7	-1.2
WRYW	41	0.0	0.4	0.8	0.7	0.4	0.3
ZCBN5	22	0.0	-0.1	1.8	1.8	1.2	-0.2
ZCGH	45	0.0	-0.6	0.9	0.7	0.4	-0.6
ZCGL2	82	0.0	0.4	0.7	0.6	0.5	0.4
ZDLP	70	0.0	0.6	1.0	0.8	0.9	0.3
ZDLS1	89	0.0	-0.1	0.7	0.7	1.0	-0.2
ZIZP9	8	0.0	-0.9	2.6	2.4	1.2	-1.1
ZQAY4	50	0.0	0.5	1.1	1.0	0.7	0.5
ZQYC5	30	0.0	0.4	0.6	0.4	0.3	0.4
9KKS	41	0.0	0.3	1.4	1.4	1.1	0.1
9KWH	18	0.0	0.7	1.8	1.7	1.0	0.5
9KWP	29	0.0	0.5	1.5	1.4	1.2	0.4

Appendix C to Annex XII

VOSClim ship suspect list for December 2004

All VOSClim ship data is monitored against background 6-hour forecast fields for all variables except SST, for which analyzed fields from the previous day are used.

Key to table below

NumObs : number of observations (obs) from the ship during the month
%GE : percentage of obs with gross errors (for GE limits see below)
StdDvn : standard deviation of obs-background, excluding obs with gross errors
Bias : mean obs-background, excluding obs with gross errors
RMS : root mean square of obs-background, excluding obs with gross errors

Suspect selection criteria for each variable:
at least 20 observations from the ship and one or more of the following:-
%GE > 10%
|Bias| > Bias limit (see below)
StdDvn > StdDvn limit (see below)

Limits:	Press. (hPa)	Wind Speed / Direct. (m/s)	Wind Speed / Direct. (deg)	Air Temp. (deg C)	Rel.Hum. (%)	SST (deg C)
Bias limit	2.5	5	30	2.0	10	2.0
StdDvn limit	5.0	10	60	4.0	20	4.0
GE limit	15.0	25	150	10.0	50	10.0

Callsign	Element	NumObs	%GE	StdDvn	Bias	RMS
CGDS	Press	245		0	3.9	-2.7	4.7
MHCQ7	Press	40	0	2.1	-3.4	4.0	
MXBC6	Press	22		0	2.2	-3.0	3.7
OVZV2	Press	32		0	1.5	3.4	3.7
VTXK	Press	86		0	1.8	3.3	3.8
FNCI	Speed	95	22	6.3	6.3	9.0	
CGJK	Direc	49		0	26.6	-46.4	53.5
DQVK	Direc	33		0	64.6	-21.0	67.9
FNCI	Direc	72	29	88.8	49.2	101.6	
CGDX	Temp	37		0	2.2	2.5	3.3
CGSB	Temp	185		0	2.5	3.0	4.0
CGSB	RelHu	184		0	9.0	-12.3	15.3
ZCBP5	RelHu	29		0	13.1	12.7	18.3
WRYC	SST	25		0	1.2	-2.3	2.6

Appendix D to Annex XII

BUFR Code Template

CALL_SIGN
LTTD
LNGD
YEAR
MNTH
DAY
HOUR
MINT
COLTN_CNTR
BLTN_IDNY
MSL_PESR
SRFC_WIND_SPED_RCRDG_IDNY
SRFC_WIND_DRCTN
SRFC_WIND_SPED
SRFC_WIND_U
SRFC_WIND_V
SRFC_AIR_TMPR
WET_BULB_RCRDG_IDNY
WET_BULB_TMPR
SRFC_DEW_PONT_TMPR
SRFC_RLTV_HUMDY
HRZL_VSBLY
CRNT_WTHR_TYPE
PRMY_PAST_WTHR_TYPE
TOTL_CLOD_AMNT
LWST_CLOD_AMNT
LWST_CLOD_BASE_HGHT
LOW_CLOD_TYPE
MEDM_CLOD_TYPE
HIGH_CLOD_TYPE
Q3HOUR_SHIP_DRCTN
Q3HOUR_SHIP_SPED
SEA_SRFC_TMPR_RCRDG_IDNY
SEA_SRFC_TMPR
BCKD_YEAR
BCKD_MNTH
BCKD_DAY
BCKD_HOUR
BCKD_FRCT_LNGH
MODL_SRFC_TYPE
MODL_SRFC_HGHT
BCKD_MSL_PESR
BCKD_SRFC_WIND_U
BCKD_SRFC_WIND_V
BCKD_SRFC_AIR_TMPR
BCKD_SRFC_RLTV_HUMDY
BCKD_SEA_SRFC_TMPR

Annex XIII

Report of the Data Assembly Centre (DAC)of the VOSClim

Submitted by Alan D. Hall and Daniel Manns on behalf of the DAC

1. Data Assembly

The National Climatic Data Center (NCDC) is the Data Assembly Center for the VOSClim Project. NCDC maintains several archives in support of the VOSClim Project and hosts a web presence[5] for access to project information and data.

The archive consists of three data streams:

- GTS - near-real time collection of ship observations
- BUFR – ship observations plus model fields
- GCC – Global Collection Centers delayed mode ship observations with some additional fields

The GTS stream of ship, buoy, and CMAN observations are received from primary and secondary sources, merged and decoded into the International Maritime Meteorological Archive (IMMA) format[6]. During the decode of the GTS data, VOSClim observations are flagged for later retrieval and loaded into the web page database. The GTS stream of observations ("raw"archive) and the decoded IMMA observations are archived on a monthly basis.

The BUFR ship observations were received weekly from the UK Met Office (Colin Parrett) via email beginning the week of November 1, 2001. This continued until the week of April 27, 2003 when daily data was transmitted via GTS. At this point there is a gap in the archive until approximately August 29, 2003. We have requested the missing BUFR data from the UK Met Office and will fill in where needed and archive when the data is received.

Data received from the GCCs have not been reloaded into the web page database at this time. I am not confident all of the VOSClim data from the Centers have been received and properly archived. I am formally requesting the VOSClim data be resubmitted from the Centers so I can make sure the data is properly archived and loaded into the web page database upon my return from the meeting.

GTS and BUFR data streams were re-loaded into the web page database. Software was written to extract VOSClim observations from the GTS IMMA archive based on the ship call sign and the active and inactive dates. Beginning with January 1, 2001, all GTS VOSClim observations through February 28, 2005 have been extracted and loaded into the web page database. Beginning with the weekly BUFR files from November 1, 2001, all BUFR files through February 28, 2005 were decoded and loaded into the web page database.

Currently, through February 28, 2005, the web page database holds 341,717 observations. GTS data is identified with a SOURCE_ID of 114 and/or a DECK of 992 while BUFR data is identified with a SOURCE_ID of 110 and/or a DECK of 700. The database contains 197,058 GTS observations and 144,659 BUFR observations. VOSClim observations are identified in the IMMA format with a national source indicator of ' 1'.

---

[5] http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html

[6] http://www.ncdc.noaa.gov/oa/documentlibrary/vosclim/imma.pdf

Some confusion may have arisen when other sources of observations where inadvertently added to the web page database. These other sources would have had a SOURCE_ID of 111 or 113. These have been removed and will not be added in the future.

2. Other DAC Responsibilities

The DAC was also charged with providing access to monitoring statistics and suspect lists generated by the UK Met Office acting as the Real Time Monitoring Center (RTMC)[7], metadata, inspection and survey forms, and update of the master VOSClim ship list[8].

The DAC has received and posted all the monthly monitoring statistics and the ship suspect lists from the UK Met Office (Colin Parrett).

The DAC did agree to update the metadata when received in the agreed upon digital format. Some confusion exists on where the metadata database is to be maintained. Emails over the past three years indicate the WMO office had developed software to maintain the metadata. More recently the US National Data Buoy Center (NDBC) indicated they were going to maintain metadata information. Currently, the 1999 version of the WMO Pub47 is loaded into the web page database. A more current version of the WMO Pub47 is being loaded. The DAC loads any metadata update files into the web database that are received in the digital format over the past 2 years.

The DAC was requested to post ship photos, instrumentation photos, and pictures of awards/presentations. Of the 128 participating VOSClim ships, we have received less than 15 photos; two US ships, one unidentified Australian ship, one picture of Graeme Ball, a few thumbnails, and even fewer “other” pictures. Considering the lack of participation in this effort, we did not to make much effort to place any pictures online. Since this was pointed out as a failure by the DAC, we went ahead and added the awards pictures and the pictures from the 2 US ships and the one Australian ship to the web page.

The DAC was requested to provide access to inspection and survey forms. We said we would provide this information if it was received "digitally". We have received paper forms from the US office but to this date we have not received survey forms information, paper or digital, from any other VOSClim office. If we were to receive funding we could possibly have the survey forms digitized by a contractor, however, digital files would be the recommended approach.

The DAC receives emails from most countries with updates to the VOSClim ship list and these are posted to the master ship list whenever files are received.

3. DAC Recommendations

The meeting is invited to discuss the following recommendations.

3.1 A secondary source for BUFR encoded observations. Currently daily BUFR data is transmitted via GTS once a day with no backup. The files should be placed on an ftp server and held for a minimum of 72 hours. Details can be worked out with the RTMC.

3.2 Formalize GCC delayed mode data delivery to the DAC. Currently we are not sure if both Centers send data, or one sends data for both.

---

[7] http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim-stats.html

[8] http://www.ncdc.noaa.gov/oa/documentlibrary/vosclim/vosclimshiplist.xls

3.3 Should data delivery be simplified? Options would be to place monthly, weekly, and/or daily files on an ftp server as the data are received. The data stream is relatively small and this would make the data available for automated retrievals.

3.4 Could delivery of the monthly statistics and suspect lists be sent to the DAC ftp server instead of email? This will allow for automation of the collection and posting.

3.5 Who will maintain and provide metadata to the DAC?

3.6 Should funding be provided for digitizing survey/inspection forms? If not, a single digital format must be agreed upon.

Annex XIV

SOOP Line Responsibilities

Line		UOT type	Responsible Agency or country	Also participating	Comment & national requirements
AX03	Europe - New York	HDX	BSH	IRD-Nouméa	
AX07	Florida Straits - Gibraltar	HDX	US-GOOS		US-GOOS LDX=347
AX08	New York - Cape Town	FHD	US-GOOS		US-GOOS LDX=640
AX10	New York - Puerto Rico	FHD	US-GOOS		US-GOOS LDX=133
AX11	Europe - Brazil	FRX	BSH	IRD-Brest	Could be part of Brazilian effort
AX15	Europe - Cape of Good Hope	FRX	IRD-Brest		
AX18	Buenos Aires - Cape of Good hope	HDX	US-GOOS		US-GOOS HDX=700
AX20	Europe - French Guyana	FRX	IRD-Brest		Forced to N/S line
AX22	Drake Passage	HDX	SIO	US-GOOS	US-GOOS HDX=200
AX25	Cape of Good Hope - Antarctica	HDX	US-GOOS		US-GOOS HDX=440
AX29	Antigua - Cabo de Sao Roque, Brazil	FRX	US-GOOS		US-GOOS FRX=540
AX34	Gulf of Guinea - Caribbean	FRX	IRD + US		Investigation needed, South Africa?
IX01	Fremantle - Sunda Straits	FHD	BOM	IRD-Nouméa	BOM to sample in FRX+ mode only
IX06	Mauritius/La Réunion - Malacca Strait	FRX	Japan + Kenya		Japan? Forced to N/S line
IX07	Cape of Good Hope - Persian Gulf	FRX	IRD-Brest		Red Sea - La Reunion ship, Kuwait oil tanking company (Rotherdam: 6 months rotation, Le Havre: 6 months, Japan: 6 months), Iran?
IX08	Mauritius - Bombay	FRX	NIO		Kenya?
IX09S	Fremantle - Sri Lanka	FRX	UKMO		No ship, may not be possible; Japan: IX09N
IX10	Red Sea - Malacca Strait/Singapore	HDX	UKMO, JMA	JAMSTEC, IRD-Nouméa	Japan=> Eastern part; South Africa
IX12	Fremantle - Red Sea	FRX	BOM		Considered E/W, 4-hourly sampling
IX15	Mauritius - Fremantle	HDX	CSIRO/SIO		
IX21	Cape of Good Hope - Mauritius	HDX	Kenya		
IX22	Shark Bay - Timor Strait/Banda Sea	FRX	BOM		

Line		UOT type	Responsible Agency or country	Also participating	Comment & national requirements
IX28	Hobart, Tasmania - Dumont d'Urville	HDX	CSIRO		
PX02	Flores Sea - Torres Strait	FRX	BOM		BOM aiming FRX; 4-hourly sampling (=>oversampled)
PX04	Japan - Kiribati - Fiji/Samoa	FRX	IRD-Nouméa		
PX05	Japan - New Zealand	FHD	JMA	JAMSTEC, IRD-Nouméa	
PX06	Suva, Fiji - Auckland, New Zealand	HDX	SIO	US-GOOS	US-GOOS LDX=107
PX08	Auckland, New Zealand - Panama	FRX	US-GOOS		Forced N/S, US-GOOS FRX=1050
PX09	Hawaii - Fiji/Auckland	FHD	SIO	US-GOOS	US-GOOS LDX=293
PX10	Hawaii - Guam/Saipan	HDX	SIO	US-GOOS	US-GOOS LDX=293
PX11	Flores Sea - Japan	FRX	BOM		BOM stopped in 06/2003, might be re-instated in future
PX13	New Zealand - California	FRX	US-GOOS		US-GOOS LDX=770
PX17	Tahiti/Maruroa - Panama	FRX	IRD-Nouméa		Forced to N/S line, 795 FRX?
PX18	Tahiti - California	FRX	US-GOOS		US-GOOS FRX=660
PX21	California - Chile	FRX	???		Might not be possible; ask OOPC for alternatives; Shipping turned coastal. Has to be done through R/V
PX30	Brisbane/Sydney - Noumea -Fiji	HDX	CSIRO	IRD-Nouméa	
PX31	Nouméa/Suva, Fiji - California	FHD	IRD-Noumea		
PX34	Sydney - Wellington	HDX	CSIRO		
PX36	Christchurch - McMurdo	HDX	US-GOOS		
PX37	Hawaii - California	HDX	SIO	US-GOOS	US-GOOS LDX=227
PX38	Hawaii - Alaska	HDX	SIO		
PX40	Hawaii - Japan	HDX	SIO	US-GOOS, TOHOKU-U	US-GOOS LDX=148
PX44	Guam - HongKong/Taiwan	HDX	SIO	US-GOOS	372 HDX?, US-GOOS LDX=107
PX50	Valparaiso - Auckland	HDX	MSNZ, SIO		768 HDX?
PX81	Honolulu - Coronel (Chile)	HDX	US-GOOS	SIO	US-GOOS LDX=272

Annex XV

Proposed Terms of Reference of JCOMMOPS

Terms of Reference
JCOMM in situ Observing Platform Support Centre (JCOMMOPS)

The JCOMMOPS was established by JCOMM-I in 2001 to facilitate the implementation of operational in situ ocean and marine meteorology observing systems associated with the Data Buoy Cooperation Panel (DBCP), the Ship Observations Team (SOT), and the Argo Science Team (AST). Under the overall guidance of the JCOMM Observations Coordination Group and following the direction of the DBCP, SOT and AST the JCOMMOPS shall:

(i) Act as a focal point for implementation and operation of observing platforms monitored by the above programmes and provide assistance to platform operators for free and unrestricted exchange of data by, inter alia, providing information on telecommunications systems, clarifying and resolving issues between platform operators and telecommunications system operators, and encouraging the implementation of standard formats;

(ii) Maintain information on relevant data requirements for observations in support of GOOS, GCOS, and the WWW as provided by the appropriate international scientific panels and JCOMM Expert Teams and Groups, and routinely provide information on the functional status of the observing systems;

(iii) Provide a Gateway for information on instrumentation deployment and servicing opportunities, and on operator contact information; and

(iv) Provide information on the observational programme, including on instrumentation, on instrument evaluation, and on data quality.

Annex XVI

World Meteorological Organization

Data Buoy Co-operation Panel

Final Statement of Account as at 31 December 2003

	US$	US$
Balance from 2001		(1,984)
Contributions Paid for Current Biennium		424,327
Total Funds Available		422,343
Obligations Incurred		
Consultants	222,536	
Travel- WMO staff	5,302	
Travel- non-WMO staff	52,735	
Bank charges	46	
Publication of Reports	516	
Mailing charges	847	
Financial support	15,000	
		296,982
Balance of Fund	US $	125,361
Represented by.		
Cash at Bank		135,352
Less:		
Unliquidated obligations-current year		9,991
	US $	125,361

CONTRIBUTIONS	Received 2002	Received 2003	TOTAL
Australia	13,500	12,500	26,000
Canada	12,015	10,000	22,015
CLS/France (for ARGOS JTA Chairman)	10,000	10,000	20,000
EGOS Trust Fund	-	11,876	11,876
FAO	10,000	-	10,000
Germany	5,000	5,000	10,000
Greece	2,200	2,200	4,400
Iceland	1,500	1,500	3,000
Ireland	1,118	1,290	2,408
Japan	10,000	10,000	20,000
Netherlands	1,575	1,575	3,150
New Zealand	1,000	719	1,719
Norway	1,575	3,150	4,725
South Africa	3,000	3,000	6,000
United Kingdom	19,000	16,000	35,000
USA	86,000	158,000	244,000
CHF/USD translation adjustment			34
TOTAL	177,483	246,810	424,327

World Meteorological Organization

Data Buoy Co-operation Panel

Interim Statement of Account as at 31 January 2005

	US$	US$
Balance from 2003		125,361
Contributions Paid for Current Biennium		146,484
Total Funds Available		271,845
Obligations Incurred		
Consultants	9,991	
Travel	9,459	
Transfer to Marine Programe	12,000	
Contribution to JCOMMOPS Data Devt	6,527	
Payment to IOC/ Logistic Support	204,000	
Bank charges	171	
Support Cost	2,420	
		244,568
Balance of Fund	US $	27,277
Represented by.		
Cash at Bank		11,895
Exchange Adjustments		15,382
	US $	27,277

CONTRIBUTIONS RECEIVED	2004	2005	Total
Australia	16,875	13,500	30,375
Canada	12,500		12,500
CLS Service ARGOS	10,000		10,000
France*	36,632		36,632
Germany	5,000		5,000
Greece	2,200		2,200
Iceland	2,250		2,250
India		3,000	3,000
Ireland	1,517		1,517
Japan	10,000		10,000
Netherlands	1,970	2,000	3,970
New Zealand	2,395		2,395
Norway	395		395
South Africa	3,750		3,750
USA	22,500		22,500
TOTAL	127,984	18,500	146,484

*The contributions from France received in 2004 includes their contributions for the years 2002-03.

Prepared on 22 February 2005

EXPENDITURES AND INCOME FOR 2002-2005 (USD)

	Actual 2002 and 2003 (2 years)	Estimated 2004 (1 year)	Estimated 2005 (1 year)
Expenditures			
Payment to IOC for Technical Coordinator's (TCs) employment	200,000	100,000+ 67,000	147,500
Payment to IOC for TC's Travel	34,000	16,000+11,000	16,000
Payment to IOC for CLS logistic support	10,000	(10,000 +15,024)	15,024 (=euro 12,200)
Travels except for TC including JTA chair	24,037	(10,000)	
JTA activities including JTA chair salary			15,000
JTA chairman's salary	18,433	9,991	
UN Atlas	4,102		
Publications	1,363		2,500**
JCOMMOPS development	5,000	6,527	3,473
Refund to WMO		12,000	
Contingencies			316
sub-total	296,982	257,542	199,813
WMO support cost	1% (2,970)*	1% (2,575)*	7% (13,986)*
TOTAL	299,952	260,117	213,800

* to be confirmed
** additional 3,500 required is expected to be recovered from the WMO support cost

Income achieved/required to balance expenditures

Contributions	326,752	(200,960+24,630*+7,000**)	216,511
Carry forward from previous biennium	-1,984	24,816	-2,711
Carry over to next biennium (year)	24,816	(-2,711)	
TOTAL	299,952	(260,117)	213,800

*: arrear contribution from France for 2002-2003 (euro 20,000, ca USD 24,630)
** supplementary contribution from JTA for JTA chiar travels in 2004

DRAFT TABLE OF PROVISIONAL CONTRIBUTIONS

DBCP

	2003-2004	**2004-2005**	**2005-2006**
AUSTRALIA	12,500	13,500+3,375	13,500
CANADA	10,000	10,000+2,500	12,500
FRANCE	12,315(€10,000)	12,033(€ 10,000)	E-SURFMAR
GREECE	2,200	2,200	E-SURFMAR
ICELAND	1,500	1,500+750	E-SURFMAR
INDIA			3,000
IRELAND	1,290 (Euro 1,000)	1,517 (Euro1,000+250)	E-SURFMAR
JAPAN	5,000	5,000	5,000
NETHERLANDS	1,575	1,575+395	E-SURFMAR
NEW ZEALAND	1,114	1,000+1,000	2,000
NORWAY	1,575	1,575+395	E-SURFMAR
SOUTH AFRICA	3,000	3,000+750	3,750
UNITED KINGDOM	19,000	16,000	E-SURFMAR
USA	68,000	70,000+20,000	90,000
E-SURFMAR			49,261* (Euro 40,000)
JTA (for JTA chair support)	10,000	17,000	15,000
TOTAL	**149,069**	**(185,065)**	**(194,011)**

* to be confirmed

SOOPIP

	2003-2004		**2004-2005**		**2005-2006**	
Germany	5,000		5,000		5,000	
Japan	5,000		5,000		5,000	
USA	10,000		10,000+2,500		12,500	
TOTAL	**20,000**		**22,500**		**22,500**	

TOTAL INCOME FROM CONTRIBUTIONS

	2003-2004		**2004-2005**		**2005-2006**	
Total	169,069		207,565		216,511	

Annex XVII

WORLD METEOROLOGICAL ORGANIZATION

ASAP TRUST FUND

Statement of Account as at 31 December 2003

		SFR
Balance from 2001		3,181
Contributions received		29,578
Contributions received for WRAP project		90,385
Prior Years' Adjustment for Support cost overcharge in 2001		2,933
Total Receipts		126,077
Obligations		
Consultancy WRAP Proj	22,205	
Travel	15,197	
Travel - WRAP Proj	4,660	
E-ASAP Project Manager	15,033	
Printing	1,344	
Equipment-Other (WRAP proj. -Palliser Bay)	12,214	
Support Costs (7%)	4,946	
Total Obligations Incurred		75,599
Total funds available		50,478
Represented by:		
Cash at Bank		62,683
Less: Accounts payable	12,205	
		50,478

Contributions	**2002**	**2003**	**Total**
Denmark	2,000	-	2,000
Iceland	500	500	1,000
United Kingdom	-	1,500	1,500
USA	20,078	5,000	25,078
Total	22,578	7,000	29,578

WORLD METEOROLOGICAL ORGANIZATION

ASAP TRUST FUND

Interim Statement of Account as at 31 January 2005

		SFR
Balance, 1 January 2004		50,478
Contributions received		2,000
Total Receipts		52,478
Obligations		
Consultancy	10,946	
Travel	1,139	
Equipment-Other	21,628	
Support Costs (7%)	2,360	
Total Obligations Incurred		36,073
Total funds available		16,405
Represented by:		
Cash at Bank		16,826
Less: Unliquidated Obligations		421
		16,405

Contributions	**2004**	**Total**
Iceland	500	500
United Kingdom	1,500	1,500
Total	2,000	2,000

Prepared on 22 February 2005

ASAPP ESTIMATED INCOME AND EXPENDITURE 2005

Income

	SFR
Funds available at 31 January 2005	16,405
Contributions 2005	9,000
WRAP contribution	44,000
TOTAL	69,405

Expenditure

Publication (annual report)	1,000
Travel, promotion and general support activities	8,000
Contract for WRAP Project Leader	12,000
WRAP (consumables, etc.)	40,000
WMO charges and contingencies	4,270
Carry over to 2006	4,135
TOTAL	69,405

Table of Provisional Contributions 2005

Iceland	500
USA (USD 5,000)	8,500
TOTAL	9,000

Annex XVIII

Overarching Implementation Plan

1. Structure

1.1. The Ship Observations Team (SOT) consists of a group of enduring and successful data collection programmes, comprising:

1.1.1. The Voluntary Observing Ships (VOS) scheme,

1.1.2. The Ship-of-Opportunity Programme (SOOP),

1.1.3. The Automated Shipboard Aerological Programme (ASAP).

2. Objectives

2.1. To manage, coordinate and, wherever possible, integrate these programmes to support a range of well defined operational and research applications.

2.2. To liaise and coordinate with other groups that use volunteer ships as environmental observing platforms, with a view to their participation in SOT.

2.3. To foster greater national coordination between agencies involved in similar or related marine observing programmes.

3. Working Arrangements

3.1. SOT meets approximately every eighteen months and incorporates separate, but plenary sessions of:

3.1.1. The Voluntary Observing Ship Panel (VOSP), including the VOS Climate Project (VOSClim),

3.1.2. The Ship-of-Opportunity Implementation Panel (SOOPIP),

3.1.3. The Automated Shipboard Aerological Programme Panel (ASAPP).

3.2. Issues and reports that are of interest to all programmes are addressed during the Common Session of SOT.

3.3. The Common Session of SOT is presided over by the chairperson of SOT.

3.4. Issues and reports that are relevant to a particular programme or special project are addressed during the Panel Session appropriate to that programme or project.

3.5. The Panel Sessions are presided over by the chairperons of VOSP, SOOPIP or ASAPP, or the VOSClim Project Leader as appropriate.

3.6. Much of the work of SOT is achieved during the inter-sessional period by Task Teams established to examine and make recommendations about specific issues. Task Teams work by email and report at SOT.

3.7. Scientific advice and guidance to SOT is provided by panels and bodies for climate and operational meteorology, including;

3.7.1. GCOS/GOOS/WCRP Ocean Observations Panel for Climatology (OOPC),

3.7.2. CLIVAR Global Synthesis and Observations Panel (GSOP)

3.7.3. WMO Commission for Basic Systems (CBS).

4. Status

4.1. The three programme panels of SOT continue to explore opportunities to integrate their sampling programmes. An example of this, although still in its infancy, is the work by the *Task Team on VOS Recruitment and Programme Promotion* to develop design guidelines for ship builders that will provide the infrastructure on new ships to meet a variety of current and future sampling requirements.

4.2. Greater cooperation and coordination between the programmes is providing increased opportunities to deploy drifting buoys and profiling floats. National VOS, SOOP and ASAP operators are encouraged to provide JCOMMOPS (JCOMM in-situ Observing Platform Support Centre) with details about potential deployment opportunities that may be provided by their ships.

4.3. The traditional role of the PMO in servicing only VOS vessels is changing as a result of programme integration. This is particularly evident in countries where the PMOs also provide a ship-greeting service to oceanographic observation ships.

4.4. PMOs also support regional buoy and float deployment programmes in addition to their own national programmes. This directly supports the objectives of the Data Buoy Cooperation Panel (DBCP) and its Regional Action Groups, and also the Argo Science Team (AST).

4.5. Cooperation and coordination between the programmes, as well as with other groups that use volunteer ships as observing platforms, is helping to ensure that the better reporting and more obliging vessels are not being over-tasked.

4.6. A benefit of improved national coordination, although this might be a long-term strategy in some participating countries, combined with the greater use of PMOs to recruit sampling vessels, is the reduction in the number of visitors to ships with sampling programme requests.

4.7. Cooperation with other groups that use ships as observing platforms is raising the awareness of:

4.7.1. The need for comprehensive observer/operator training and re-training.

4.7.2. Data standards.

4.7.3. Equipment standards.

4.7.4. Equipment calibration.

4.7.5. Data processing methods, including quality control and quality monitoring,

4.7.6. Data reporting methods.

4.8. SOT, through the Secretariat, liaises with the relevant international bodies such as the International Ocean Carbon Coordination Project (IOCCP), and Seakeepers International.

4.9. JCOMMOPS provides monitoring and on-going programme support to SOOPIP (and DBCP), and is becoming increasingly active in supporting the VOS Scheme.

Annex XIX

Terms of Reference of Ship Observations Team (SOT)

The Ship Observations Team shall:

1. Review and analyze requirements for ship-based observational data expressed by relevant existing international programmes and/or systems and in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;

2. Provide continuing assessment of the extent to which those requirements are being met;

3. Develop methodology for constantly controlling and improving the quality of data;

4. Review marine telecommunication facilities and procedures for observational data collection, as well as technology and techniques for data processing and transmission, and propose actions as necessary for improvements and enhanced application;

5. Coordinate PMO/ship greeting operations globally, propose actions to enhance PMO standards and operations, and contribute as required to PMO and observers training;

6. Review, maintain and update as necessary technical guidance material relating to ship observations and PMOs;

7. Liaise and coordinate as necessary with other JCOMM Programme Areas and expert teams, as well as with other interested parties;

8. Participate in planning activities of appropriate observing system experiments and major international research programmes as the specialist group on observations based onboard ships, including voluntary observing ships, ships-of-opportunity and research ships;

9. Seek for opportunities for deploying various kinds of measuring devices and widely publicize those opportunities;

10. Develop as necessary new pilot projects and/or operational activities and establish new specialized panels as required;

11. Carry out other activities as agreed by participating members to implement and operate the SOT programme and to promote and expand it internationally;

Terms of Reference of Component Panels

SOOP Implementation Panel

1. Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and in situ observing practices, taking into account the OOPC sampling strategies;

2. Coordinate the exchange of technical information on relevant oceanographic equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices;

3. Ensure the distribution of available programme resources to ships to meet the agreed sampling strategy in the most efficient way;

4. Ensure the transmission of data in real time from participating ships; ensure that delayed mode data are checked and distributed in a timely manner to data processing centres;

5. Maintain, through the SOOP Coordinator, appropriate inventories, monitoring reports and analyses, performance indicators and information exchange facilities;

6. Provide guidance to the coordinator in his support for the SOOP;

7. Prepare annually a report on the status of SOOP operations, data availability and data quality

ASAP Panel

1. Coordinate the overall implementation of the ASAP, including recommending routes and monitoring the overall performance of the programme, both operationally and in respect of the quality of the ASAP system data processing;

2. As may be required by some members, arrange for and use funds and contributions in kind needed for the procurement, implementation and operation of ASAP systems and for the promotion and expansion of the programme;

3. Coordinate the exchange of technical information on relevant meteorological equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices;

4. Prepare annually a report on the status of ASAP operations, data availability and data quality

VOS Panel

1. Review, recommend and coordinate the implementation of new and improved specialized shipboard meteorological instrumentation, siting and observing practices, as well as of associated software;

2. Support the development and maintenance of new pilot projects;

3. Oversee the efficient performance and operation of the VOSClim Project

4. Develop and implement activities to enhance ship recruitment, including promotional brochures, training videos, etc.

5. Prepare annually a report on the status of VOS operations, data availability and data quality

Annex XX

List of Action Items

para	Action	Responsible	when
I/2.3.4	In order to integrate observations under the coordination of SOT, representatives from the biological and chemical data communities of observations to be invited to SOT-IV	SOT chairperson and Secretariat	
I/3.4.4	The Observations PA Coordinator to recommend to JCOMM-II, as an explicit statement, that the GCOS Monitoring Principles be integrated into the revised terms of reference for relevant subsidiary bodies of JCOMM	Observations PA Coordinator	at JCOMM-II
I/3.5.3	SOT Task Team of Codes, chaired by Craig Donlon, to propose BUFR descriptors for a new set of reporting codes to enable the new class of observations to be used in operational agencies.	Task Team on Coding	
I/4.1.2	A single page recruitment flyer to be made available on the JCOMMOPS and VOS web sites	JCOMMOPS Coordinator and BoM	
I/4.1.3	Recruitment Power Point Presentation to be kept under review; used whenever appropriate, and made available on the JCOMMOPS and VOS web sites	JCOMMOPS Coordinator and BoM	
I/4.1.4	Task Team on VOS Recruitment and Programme Promotionto present draft design stards proposal to the classification society for comments and input.	Sarah North, Steven Cook	
I/4.1.5	The generic SOT certificate be made available on the JCOMMOPS and VOS web sites.	JCOMMOPS Coordinator and BoM	
I/4.1.6	International newsletter to be kept under review; consideration could be given to make articles available electronically	Task Team on VOS Recruitment and Programme Promotion	
I/4.2.8	SOT chairperson and WMO Secretariat asked to take necessary actions so that WMO EC-LVII be informed of the results of the Accounting Authority solution to a global cost sharing scheme for members	WMO Secretariat	June 2005
I/4.2.9	Task Team on Telecommunication Costs to monitor the problem of cost burdens to members	Task Team on Telecommunication Costs	Ongoing
I/4.3.4	WMO Secretariat to implement a mechanism to identify updated records in Pub. 47	WMO Secretariat	
I/4.3.4	Send out a formal letter to PRs of VOS asking they send the latest updated information so that outdated metadata can be excluded in future updated versions of the Pub. 47.	WMO Secretariat	
I/4.3.5	WMO Secretariat to send quarterly reminder to VOS focal points, using VOS focal point mailing list, mentioning importance of metadata to encourage metadata submission. VOS operators to ensure that up-to-date metadata are regularly provided to the WMO Secretariat.	WMO Secretariat and VOS operators	
I/4.3.8	WMO to investigate the possibility of making the Pub. 47 database available to VOS operators in read-only mode.	WMO Secretariat	
I/4.3.9	SOT chairperson to raise the issue of electronic version of Pub. 47 to be a priority issue in the WMO Secretariat.	SOT chairperson	JCOMM-II
I/4.3.11	JCOMMOPS to upgrade their unofficial version of WMO Pub. 47 to include all available fields.	JCOMMOPS	

para	Action	Responsible	when
I/5.2.4	SOT should be kept informed of any relevant development regarding telecommunication facilities in its future sessions.	Inmarsat, Argos, EUMETSAT	
I/8.2	The ad hoc Task Team to thoroughly review the contents and template for the SOT Annual Report so that the 2004 Annual Report can be published. SOT members to send their comments to Mr Graeme Ball as soon as possible	ad hoc Task Team and SOT members	middle of 2005
I/9	The Secretariat to submit the proposed revised version of TORs to JCOMM-II for consideration and approval.	Secretarial	
I/9.2	OPA chairperson to provide guidance to the SOT on if and how in situ data which is collected by fishery organizations, coastal moorings and navies but not currently part of established groups (DBCP, Argo, etc.) might be included.	OPA chairperson	
I/10	National reports received at the SOT-III together with other written national reports received by the Secretariat to be published in the SOT National Report.	Secretariat and participants	mid- 2005
I/11.2	The exact dates and venue for SOT-IV to be finalized as soon as possible.	chairpersons and Secretariat	
II/1	A scientific and technical workshop to also be organized in conjunction with SOT-IV. Participants to submit papers to next workshop.	Secretariat and SOT chairperson	
III-A/2.3.2	Barometer calibration practices of countries to be made available on VOS web site.	VOS operators and BoM	
III-A/2.4.7	Météo-France to take action to extend the monitoring period from 14 to 21 days, if appropriate, and possible.	Météo-France	
III-A/3.1.2	KNMI to investigate possibility of enhancing TurboWin by developing a self-training tool such as a video on how to use TurboWin.	KNMI	
III-A/3.1.3	TurboWin to be modified to save an archived copy of the IMMT-2 log data when the option to transfer the data to disk is selected.	KNMI	
III-A/3.2.1	VOS Panel chairperson to collate information on global VOS automation for presentation at subsequent VOS Panel sessions.	VOS Panel chairperson	
III-A/3.2.4	Status information of VOS automation to be kept updated. The list to be included in the SOT Annual Report	VOS Panel chairperson	
III-A/3.3.2	SAMOS ships, not yet doing so, to contribute to the VOS programme, and where appropriate to VOSClim	SAMOS ships	
III-A/3.3.2	SOT members to consider possible interactions with SAMOS programme and to contact SAMOS directly, if appropriate	SOT members	
III-A/4.1.3	VOS Panel members to take any possible actions to prevent making the ship positions available on web sites	VOS operators, SOT chairperson	
III-A/4.1.3	WMO Secretariat to inform NMS about the security risk by making ship data available on web sites so that they can monitor the situation and take appropriate actions.	WMO Secretariat	
III-A/4.1.3	WMO Secretariat to advise the WMO Executive Council (EC) about the risk by making ship data available on web sites and that the problem will continue to exist whilst FM-13 SHIP is included as “essential data” in the Resolution 40 (Cg-XII)	WMO Secretariat	Issue to be discussed at WMO EC-LVII, June 2005
III-A/4.1.4	Weather charts issued by NMS on their web sites should not display Ship Data and callsigns as it exposes ships to a security risk.	NMS	

para	Action	Responsible	when
III-A/4.2.2	VOS chairperson and WMO Secretariat to prepare an updated version of the Annex to MSC Circular 1017; and WMO Secretariat to request the IMO Secretariat to issue a MSC Circular Accordingly	VOS Panel chairperson, WMO Secretariat	
III-A/4.2.2	PMO and VOS operators encouraged to show of the MSC circular, once issued, to mariners as it oftentimes does not reach mariners on ships	PMO and VOS operators	
III-A/4.2.3	WMO to raise the issue of having masters' standing orders to include the statement "the making of weather observations, when it is safe to do so, should be undertaken" with the International Chamber of Shipping (ICS) that represents the Shipowners/Operators worldwide	WMO Secretariat	
III-A/4.2.4	Tools developed by the Task Team on VOS Recruitment and Programme Promotion (e.g. flyer, power point presentation) to be used to promote VOS through shipping companies	Task Team on VOS Recruitment and Programme Promotion	
III-A/4.2.4	WMO to enhance the relationship with IMO on issues such as future ship design.	WMO Secretariat	
III-A/4.3.3	A list of PMOs and their details to be lodged with the Port Security Committee (PSC) to allow an easier PMO access	PMOs, VOS operators as appropriate	
III-A/4.3.4	Monitor and take appropriate action to get NMS personnel accepted as bona fide visitors acting on Government business.	VOS Panel and SOT chairpersons, WMO Secretariat	
III-A/4.4.1	VOS operators need to be familiar and comply with their National Customs requirements to ensure ongoing VOS operations.	VOS operators	
III-A/4.5.3	VOSP to provide to the VOSP chairperson a list of other improvements to the marine meteorological services monitoring questionnaire to be passed to the ETMSS for inclusion in the next questionnaire.	VOSP chairperson, Task Team on VOS Recruitment and Programme Promotion	
III-A/4.6.2	In the short term, provide regular lists of ships which are declared as being recruited by more than one country	Dr Elizabeth Kent	
III-A/4.6.2	Lists of ships which are declared as being recruited by more than one country to be published on the E-SURFMAR web server	Mr Pierre Blouch	
III-A/4.7.3	Liaise with the CBS Expert Team on GTS-WIS Operations and Implementation (ET-OI) of the CBS OPAG ISS to consider requirements for the exchange of test SHIP reports	Mr Pierre Bloch as SOT focal point	
III-A/5.1.3	The current format for the criteria for the six variables being monitored to be amended to highlight the actual criteria being flagged.	RSMC Exeter	
III-A/5.1.4	Discuss and decide the details of a procedure to inform RSMC Exeter of remedial actions taken by PMOs based on suspect ship lists, based on the feedback system used for buoy monitoring.	RSMC Exeter, JCOMMOPS Technical Coordinator, VOS Panel chairperson	
III-A/5.1.5	Review the format of the six-monthly reports.	RSMC Exeter, VOS Panel chairperson	
III-A/5.1.6	Advise the RSMC Exeter (Met Office) of e-mail address to be added to distribution list for monthly monitoring statistics for VOS.	VOS focal points and ship operators	
III-A/5.1.6	RSMC Exeter (Met Office) to use national ship lists for monthly monitoring statistics for VOS as appropriate, since Pub. 47 is updated on quarterly basis.	RSMC Exeter	

para	Action	Responsible	when
III-A/5.1.7	RSMC Exeter (Met Office) to include timeliness information on the VOS as a whole in its monthly reports to produce timeliness plots for all VOS national fleets listed in WMO Pub. 47 and make available on the Met Office web site.	RSMC Exeter, VOSP chairperson	
III-B/1.3.2	DAC to link to the latest version of Pub. 47 on the WMO web site and the JCOMM VOS web site, and the tools for metadata display and interrogation on the JCOMMOPS website.	DAC	
III-B/1.3.2	Scientific Advisers to be responsible for the association of metadata with individual VOSClim reports. A mechanism for the provision and storage of VOSClim digital images to be investigated.	Scientific Advisers and DAC	
III-B/1.3.3	Increased recruitment of VOSClim ships.	VOSClim operators, VOS operators who have yet to contribute	
III-B/2.1.2	RMTC to take appropriate actions so that only reports received in ocean areas (model surfact type ‘ocean’) would be included in the monitoring statistics.	RTMC	
III-B/2.1.2	Operators who had responded to the monitoring statistics to provide feedback on remedial actions.	VOSClim operators	
III-B/2.1.2	Once the VOS monitoring feedback system is established, using JCOMMOPS facility, mechanism to be extended to VOSClim project.	RTMC, JCOMMOPS Coordinator, VOSClim operators	
III-B/2.1.2	An up-to-date list of the project focal points to be maintained on the web site.	VOSClim operators	
III-B/2.1.2	Modifications to the list of participating ships to be sent to the RTMC and VOSClim Data Assembly Centre	VOSClim operators	
III-B/2.2.1	DAC and RTMC to take actions to recover data from the Met Office to fill the gap in the BUFR data stream between the end of April and the end of August 2003 due to the transition from e-mail to GTS transmission of the BUFR data stream.	DAC and RTMC	
III-B/2.2.2	DAC and the RTMC to agree on improved mechanisms which will be put in place to avoid RTMC BUFR data loss.	DAC and RTMC	
III-B/2.2.2	Mechanisms for simplifying data delivery between RTMC and the DAC, such as ftp, to be considered	DAC and RTMC	
III-B/2.2.2	DAC to simplify data delivers to users using ftp site.	DAC	
III-B/2.2.2	RTMC to investigate whether the monthly statistics and suspect lists can be transferred to the DAC by ftp rather than e-mail.	RTMC	
III-B/2.3	VOSClim operators to ensure implementation of the latest version of IMMT.	VOSClim operators	
III-B/2.3.2	All contributing members of the VOSClim project to review their delayed mode data submission processes to the GCCs in IMMT-2 or IMMT-3, and ensure or work toward their processes and submissions being up-to-date	VOSClim operators	
III-B/2.3.3	France to attempt to revise the BATOS system.	France	
III-B/3.1.1	Since the lack of delayed mode data for the VOSClim project is a problem, as an interim measure VOSClim operators to provide raw data from the data entry softward direct to the Scientific Advisers.	VOSClim operators	
III-B/3.1.2	Scientific Advisers to convene an informal ‘Scientific Users Group’ to widen expertise, inform the development of the high-quality dataset and guide the assessment and exploitation of the value of VOSClim datasets.	Scientific Advisers	

para	Action	Responsible	when
III-B/3.1.2	A strategy for the future production and maintenance of a high-quality dataset to be developed and agreed based on results of assessment of value of VOSClim datasets. The strategy to include a determination of how many ships and observations will be needed to ensure the quality of the dataset.	Scientific Advisers	
III-B/3.1.3	JCOMMOPS to set up and maintain a VOSClim Task Team mailing list.	JCOMMOPS	
III-B/3.1.4	New Task Team on VOSClim to prepare a report to SOT-I on, inter-alia, overarching VOSClim issues.	Task Team on VOSClim	
III-B/3.1.5	Scientific Advisers to produce a VOSClim dataset for presentation at SOT-IV. Mechanisms for the maintenance of the dataset to be developed.	Scientific Advisers	SOT-IV
III-B/3.1.5	VOSClim operators who are currently not providing delayed mode data in IMMT-2 and IMMT-3 formats to the GCC to contact the Scientific Advisers (eck@soc.soton.ac.uk) to arrange delivery of delayed mode data as a temporary measure to allow scientific assessment to proceed.	VOSClim ship operators	
III-B/3.2.2	As an alternative to issuing a VOSClim Newletter, Robert Luke (USA) to include an updated VOSClim article in a coming edition of the US Mariner Weather Log. NMS encouraged to take similar actions.	Robert Luke, NMS	
III-B/3.2.3	DAC to review the front page of the VOSClim web site and make revisions as appropriate. The Task Team on VOSClim to advise the DAC regarding any web site enhancement.	DAC and Task Team on VOSClim	
IV/1.1.5	XBT community to review and comment to the SOOPIP chairperson on the two Japanese papers concerning the comparison between TSK and Sipican T5 probes and possible changes in the fall rate equation.	XBT community	
IV/1.2.4	SOOP Coordinator to continue to work on the number of probles for the global climate line requirements.	SOOP Coordinator	
IV/1.2.6	Refine reporting to identify ships sending old JJXX codes, for targeted upgrading	Bob Keeley/MEDS	
IV/1.2.6	Add to the technical documents list on the SOOPIP website, taking note of 2 papers brought by Kanno (Japan)	All, via the SOOP coordinator	
IV/1.2.6	Panel members urged to submit updates for the technical report and papers section of the SOOP/JCOMMOPS web site.	SOOPIP members	
IV/1.3.1.4	Improve the timeliness, where possible, of reports to the SOOP coordinator for Semestrial Reports	All XBT operators	
IV/1.3.1.5	SOOP Coordinator to investigate feasibility of specific monitoring products in order to discriminate between the two modes of operation and report at the next SOT meeting.	SOOP Coordinator	SOT-IV
	Report separately, if possible, the number of XBT drops outside the SOOP-identified lines, such as the German moorings, Japan regional surveys	SOOP Coordinator	
IV/1.4.2.2	Exchange technical information: Robert Luke will be a focal point for e-mail dissemination of information on new technical developments impacting SOOP observations to the small group of interested parties	Rober Luke SOOPIP chairpserson	
IV/2.2.2	Efforts to be renewed to recruit ships on indicated lines.	SOOP operators	
IV/2.2.2 IV/2.3.1	Target recruitment of SOOP ships on lines identified in the line responsibility discussions (IV/2.2.2); and liaise with the two groups identified in IV/2.3.1	As indicated	

para	Action	Responsible	when
IV/2.2.2	Identify opportunities for cooperation on drifting buoy deployments: The Gulf of Guinea was identified as an area with poor deployment opportunities, IRD will approach the ship on the AX15 line to see if this is a possibility	IRD	
IV/3.3.5	Identify common consistent set of metadata that is of use to the XBT operators, and what can be provided to scientific users, in advance of the JCOMM OCG workshop on the real-time provision of metadata	SOOPIP chairperson to initiate with XBT operators	
IV/3.4.5	Addition of GTSPP unique tag in BUFR tables and template	SOOP coordinator	
IV/3.4.5	Investigate the requirements for migration to BUFR reporting for XBTs, including status, what will be required to do it, whether countries are ready to move to it	SOOPIP chairperson to initiate with XBT operators	for report by end of 2005
IV/3.4.7	Designate appropriate contact points to work with the SOOP Coordinator in order to work on potential impact of developing BUFR encoding/distribution capability and to work out a proposed BUFR template for ADCP data	XBT operators	
IV/3.4.7	Submit proposed ADCP BUFR template to the CBS Expert Team on Data Representation and Codes (ET/DRC)	SOOP coordinator	
IV/4.1.1	Send XBT sampling plans for each route maintained	XBT operators, to chair and SOOP coordinator	
IV/4.1.1	Ask OOPC to review N-S vs. E-W line assignment vs. required horizontal resolution	SOOPIP chairperson	
IV/5.1.3	Proposed JCOMMOPS Terms of Reference to be submitted to JCOMM-II for adoption.		
IV/5.1.6	OCG to investigate the possibility to eventually establish a JCOMM Trust Fund dedicated to JCOMMOPS development and operations	OCG	after JCOMM-II
IV/5.1.7	Secretariat to investigate if Member States presently contributing to DBCP/SOOP and AIC Trust Funds would agree in principle that their contributions be made to a JCOMM Trust Fund dedicated to JCOMMOPS instead.	Secretariat	
IV/5.1.8	VOS and ASAP Panels or Members/Member States participating in SOT to investigate making contributions to the trust fund once/if established.	Members/Member States participating in SOT	
V/5.1.1	JCOMMOPS Coordinator to prepare a simple static web page, accessible through JCOMMOPS and the SOT page, in coordination with the ASAPP chairperson.	ASAP chairperson and JCOMMOPS Coordinator	
V/5.2.2	ASAP brochure to be kept under review at future ASAP Panel sessions as appropriate	ASAP chairperson and Secretariat	
V/5.3.2	E-ASAP store high-resolution data, if appropriate and possible.	E-ASAP	

Annex XXI

List of Acronyms and Other Abbreviations

AIC	Argo Information Cerntre
AOPC	Atmospheric Observations Panel for Climate (GCOS/WCRP)
Argo	Array for Real-time Geostrophic Oceanography programme
ASAP	Automated Shipboard Aerological Programme
ASAPP	Automated Shipboard Aerological Programme Panel
BATHY	Bathythermograph report
BUFR	Binary Universal Form for Representation of Meteorological Data
BSH	Bundesamt für Seeschifffahrt und Hydrographie
BUOY	Report for Buoy Observations (GTS)
CAVASSO	Project for Atlantic VOS pCO_2 measurement
CBS	Commission for Basic Systems (WMO)
CDIAC	Carbon Dioxide Information Analysis Centre
CIMO	Commission for Instruments and Methods of Observation (WMO)
CLIVAR	Climate Variability and Predictability (WCRP)
CLS	Collecte Localisation Satellites
CMM	Commission for Marine Meteorology (WMO)
CNRS	French National Centre for Scientific Research
COAPS	Center for Ocean Atmosphere Prediction Studies
COP	Conference of the Parties
CSIRO	Commonwealth Scientific and Industrial Research Organization (Australia)
CTD	Conductivity-temperature-depth probe
DAC	Data Assembly Centre
DBCP	Data Buoy Cooperation Panel (WMO-IOC)
DCS	Data Collection System
DMCG	Data management Coordination Group
DODS	Distributed Oceanographic Data System
E-ASAP	EUMETNET ASAP
E-SURFMAR	EUCOS Surface Marine Programme
ECMWF	European Centre for Medium-Range Weather Forecasting
EEZ	Exclusive Economic Zone
EGC	Enhanced Group Code
EGOS	European Group on Ocean Stations
ET	Expert Team
ETMC	Expert Team on Marine Climatology
ETMSS	Expert Team on Maritime Safety Services
EUCOS	EUMETNET Composite Observing System
EUMETNET	The Network of European Meteorological Services
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
GARP	Global Atmospheric Research Programme
GCC	Global Collecting Centre (for the MCSS)
GCOS	Global Climate Observing System
GDPFS	Global Data Processing and Forecasting System (CBS)
GHRSST-PP	Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project
GMDSS	Global Maritime Distress and Safety System
GNI	Gross National Income
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GOS	Global Observing System (WWW)
GPS	Global Positioning System
GTS	Global Telecommunication System (WWW)
GTSPP	Global Temperature Salinity Profile Programme
ICSU	International Council for Science

IFREMER	Institut Francais de Recherche pour l`Exploitation de la Mer
IGOSS	Integrated Global Ocean Services System
IMET (program)	Improved Meteorology program
IMO	International Maritime Organization
IMO	Icelandic Meteorological Office
IMSO	International Mobile Satellite Organization
INMARSAT	International MobileSatellite Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCCP	International Ocean Carbon Coordination Project
IODE	International Data and Information Exchange (IOC)
IRD	Instituit francais de recherche scientifique pour le dévelpment en coopération (ex ORSTOM)
ISS	Information Systems and Services (CBS)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM in situ Observing Platform Support Centre
JMA	Japan Meteorological Agency
LES	Land Earth Station (Inmarsat)
MCSS	Marine Climatological Summaries Scheme
MEDS	Marine Environmental Data Service (Canada)
MQCS	Minimum Quality Control Standards
MSC	Mediterranean Shipping Company
MSG	METEOSAT Second ¨Generation
NDBC	National Data Buoy Centrer (NOAA)
NCDC	National Climatic Data Center (NOAA)
NCEP	National Centers for Environmental Prediction (NOAA)
NMS	National Meteorological Service
NOAA	National Oceanographic and Atmospheric Administration (USA)
NODC	National Oceanographic Data Centre
NWS	National Weather Service (NOAA)
OceanObs	First International Conference for the Ocean Observing System for Climate
OCG	Observations Coordination Group
ODAS	Ocean Data Acquisition Systems
ONR	Office of Naval Research (UN Navy)
OOPC	Ocean Observation Panel for Climate (of GOOS, GCOS, WCRP)
OPAG	Open Programme Area Group (CBS)
OSEs	Observing System Experiments
OSSEs	Observing System Simulation Experiments
PMO	Port Meteorological Officer
QC	Quality Control
RCC	Rescue Coordination Centres
RIC	WMO Regional Instrument Centre
RM	Responsible Members (MCSS)
RTMC	Real Time Monitoring Center
RSMC	Regional Specialized Meteorological Centre
SAMOS	Shipboard Automated Meteorological and Oceanographic System
SBSTA	Subsidiary Body for Science and Technological Affairs (UN FCCC)
SCOR	Scientific Committee on Oceanic Research
SEAS	Shipboard Environmental Data Acquisition System (USA)
SHIP	Report of Surface Observation from Sea Station
SMHI	Swedish Meteorological and Hydrological Institute
SOC	Southampton Oceanography Centre (U.K.)
SOLAS	International Convention for the Safety of Life at Sea
SOO	Ship-of-Opportunity
SOOP	Ship-of-Opportunity Programme
SOOPIP	JCOMM Ship-of-Opportunity Programme Implementation Panel
SOT	Ship Observations Team

SSS	Sea Surface Salinity
SST	Sea Surface Temperature
SURFA	Surface Flux Analysis Project
TEMP-SHIP	Upper-level temperature, humidity and wind report from a sea station
TESAC	Temperature, Salinity and Current Report
THORPEX	THe Observing system Research and Predictability EXperiment
TIP	Tropical Moored Buoy Implementation Panel
TOGA	Tropical Ocean and Global Atmosphere (WCRP)
TOR	Terms of Reference
TRACKOB	Code for reporting marine surface observations along a ship's track
TSG	Thermosalinograph
TT/QCAS	Task Team on Quality Control and Automated Systems (SOOPIP)
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
UOP	Upper Ocean Panel (CLIVAR)
UOT	Upper-Ocean Thermal Project (WOCE)
UOT-1999	Upper Ocean Thermal Review
URL	Universal Resource Locator
VOS	Voluntary Observing Ship
VOSP	Voluntary Observing Shop Panel
VOSClim	Voluntary Observing Ships Climate Subset Project
VSOP-NA	VOS Special Observing Project-North Atlantic
WCRP	World Climate Research Programme (WMO/IOC/ICSU)
WIS	WMO Information System
WMO	World Meteorological Organization
WRAP	Worldwide Recurring ASAP Project
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph
XCTD	Expendable conductivity-temperature-depth probe