

**SHIP OBSERVATIONS TEAM
SIXTH SESSION**

Hobart, Australia
11-15 April 2011

FINAL REPORT

JCOMM Meeting Report No. 84

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NOTES

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EXECUTIVE SUMMARY

The Sixth Session of the JCOMM Ship Observations Team (SOT) was held at the auditorium of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Marine and Atmospheric Research (CMAR), Hobart, Australia, from 11 to 15 April 2011 at the kind invitation of the Government of Australia. The Session was co-sponsored by the Australian Bureau of Meteorology (BOM) and CSIRO.

As for previous SOT Sessions, a technical and scientific workshop focusing on new initiatives and / or new developments in shipboard meteorological or oceanographic instrumentation, observing practices, data management procedures, and quality control and ocean products was organized during the first day of the meeting. Eight presentations were delivered during the workshop, which covered each of the theme areas, and permitted to prepare further discussions at the main SOT Session.

The Team reviewed requirements for ship-based observations in support of climate applications as expressed by the WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS) and the Ocean Observing Panel for Climate (OOPC), as well as in support of non-climate applications (e.g. Numerical Weather Prediction, maritime safety). The Team agreed to review the SOT overarching implementation plan that was adopted at SOT-III, and to include in it an SOT strategy for addressing the full range of observational data requirements (drawn essentially from the RRR, and including those of WMO, OOPC, GCOS, operational oceanography and other applications) and gaps in terms of ship observations.

The meeting reviewed the collaboration with associated programmes, including (i.) the International Ocean Carbon Coordination Project (IOCCP) and its relationship with the SOT; (ii.) the Shipboard Automated Meteorological and Oceanographic System (SAMOS); (iii.) the Ferrybox Project; (iv.) the Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP); (v.) the Scientific Committee on Oceanic Research (SCOR) Working Group 133 "OceanScope"; and (vi.) the Group for High-Resolution SST (GHRSSST). Issues of common interest were discussed, including logistical aspects, and the sharing of the data.

The SOT Task Teams reported on their activities and made a number of recommendations to the Team, including:

- (i.) The Task Team on Satellite Communication Systems. The Team reviewed available means and techniques for the transmission of ship observations from ship to shore (e.g. Iridium SBD, email, AIS), and recommended the use of Iridium SBD for AWS, and to restrict the use of SAC 41 to manual observations;
- (ii.) The Task Team on ASAP. About 20 ships (6011 soundings received in 2010) are making ASAP soundings worldwide; most of them belong to the E-ASAP. SOT members were encouraged to develop ASAP fleets;
- (iii.) The Task Team on VOS Recruitment and Programme Promotion. The Team recommended resuming high-level discussions with the IMO to promote VOS issues. VOS promotion materials will be updated. The Terms of Reference of the Task Team was amended to put emphasis on the VOSclim requirements, and a VOSclim Focal Point was appointed to participate in the Task Team;
- (iv.) The Task Team on Metadata for WMO Publication No. 47. The Team recommended the use of a metadata element describing satellite data collection system being used (prST element). A new metadata element spd was proposed to indicate the maximum operating speed of the vessel on normal service. The Team made some recommendations regarding the management of Rigs and Platform metadata;
- (v.) The Task Team on Instrument Standards. The Team recommended to undertake an intercomparison of shipboard AWS;
- (vi.) The Task Team on Callsign Masking and encoding. The Team agreed on a plan for an ENCODE solution of ship's callsign using AES encryption to be submitted to the CBS IPET-DRC;

- (vii.) The Task Team on VOSCLim no longer exists and its activities were merged into the Task Team on VOS Recruitment and Programme Promotion, with a VOSCLim focal point added in the latter.

The Seventh Session of the Voluntary Observing Ship (VOS) Panel reviewed the status of Voluntary Observing Fleet (VOF). The Panel reviewed and agreed with the recommendations from the Fourth International PMO workshop (Orlando, USA, December 2010), including in particular the VOS Donation Programme (VOS-DP) and the “Buddy” PMO programme. The Team proposed action for promoting those two programmes. The Panel reviewed the status and implementation of the VOS fleet, and received a report from the EUMETNET Surface Marine Observation Programme (E-SURFMAR). About 25 countries operated VOS fleets, with approximately 4000 ships listed as being part of the global VOS. During any one month, about 2000 ships report, providing around 151,000 observations per month. In March 2011, there were 368 VOSCLim class ships, about 9% of global VOS. VOS operators and PMOs were urged to upgrade as many ships as possible to VOSCLim class standard. Key Performance Indicators (KPI) were proposed for the VOS and VOSCLim. The Panel reviewed the status of VOS automation, and the use of electronic logbooks.

The Ship of Opportunity Programme Implementation Panel session focused on the technical coordination of the Expendable Bathythermograph (XBT), transect network and the growing Thermosalinograph (TSG) network. The Panel addressed the status of implementation, XBT transect responsibilities, coordination within the SOOP communities and with others, monitoring and data management, and the future of the SOOP network. The XBT network was taking about 18,000 profiles per year, about two thirds of the lines called for by the scientific community. While some lines were constrained by logistical issues, the largest constraint to full implementation was funding. The Panel made a number of recommendations on resolving XBT errors and biases, improving real-time data transmission and quality control procedures, coordinating with other groups working towards improved commercial ship observations of the ocean.

The SOT reviewed the operations of the JCOMM *in situ* Observing Platform Support Centre (JCOMMOPS). The Team took note of the progress in the development of the Centre and of the fact that JCOMMOPS was in a transitional period affecting medium term developments and services. It also took note of the efforts made by JCOMMOPS to develop the ship related activity on the long run. In particular, it welcomed the successful experiment of ship chartering by JCOMMOPS, and invited SOT participants to consider providing VOS equipment to the ship.

The Team noted with appreciation that collaboration between the SOT, the DBCP, and the DMPA Task Team on Table Driven Codes (TT-TDC) has been quite effective on GTS coding issues, and changes proposed to the XBT/XCTD, and VOS BUFR templates

The Team reviewed its Terms of Reference, and proposed some changes that will be proposed to the fourth Session of JCOMM. The next Session of the SOT is tentatively planned to be held in Canada in 2013.

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE SESSION

1.1 Opening of the Session

1.1.1 The sixth session of the JCOMM Ship Observations Team (SOT-VI) was opened by the chairperson of the Team, Mr Graeme Ball (Australia), at 0900 hours on Monday, 11 April 2011, at the auditorium of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Division of Marine and Atmospheric Research (CMAR), Hobart, Australia.

1.1.2 Bruce Mapstone, Chief, CSIRO Marine and Atmospheric Research (CMAR), and Neville Smith, Deputy Director, Research and Systems (DDR), Bureau of Meteorology (BOM), and Peter Dexter (Australia, BOM), JCOMM Co-President also welcomed the participants to the Session and to Hobart.

1.1.3 On behalf of the Secretary-General of the WMO, Mr Michel Jarraud, and the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), the WMO Secretariat Representative, Mr Etienne Charpentier also welcomed the participants to the session, and to Hobart.

1.1.4 During the opening remarks, it was recalled that Met-ocean applications, while providing the means to prevent, mitigate, and adapt to the impacts of ocean phenomena, weather, and climate on the environment and human activities in coastal regions and beyond, they rely heavily on in situ and satellite meteorological and oceanographic observations. The SOT plays a crucial role within JCOMM for providing the ship-based observation component of that effort by providing an international coordination mechanism for addressing the required standardization, harmonization, and optimization of ship-based observation implementation and operations serving the needs of WMO and IOC Members applications.

1.1.5 It was also recalled the achievements of the SOT since the first SOT meeting in Goa, India in 2002, working pro-actively at achieving better integration and building on synergies between the three Panels involved in coordinating global ship-based observing programmes, i.e. the VOS, the SOOP, and the ASAP. The Team noted some of the key challenges for this Session, e.g. support to the developing Global Framework for Climate Services (GFCS), and contribution to the implementation of the WMO Integrated Global Observing System (WIGOS) during the period 2012 to 2015 after the WMO Sixteenth Congress. In this context, the demand for high quality, documented, and traceable observations of known uncertainty is increasing, and there is no doubt that the SOT can contribute to such improvements concerning ship-based observations, in particular through the further development of the VOSCLIM fleet, and the continuation of the making of manual and visual observations, in particular to ensure the continuity of the marine climate record.

1.1.6 The SOT chairperson, Mr Graeme Ball, thanked the BOM and CSIRO for their support to the meeting, recalled the objectives of the SOT, and provided an overview of the SOT and of the goals for the meeting. Mr Graeme Ball indicated that key objectives for the meeting included:

- (1) Reviewing the transition from character-based FM-13 SHIP code to BUFR;
- (2) Promoting the PMO buddy program, initiated at PMO-IV, as a general PMO mentoring program;
- (3) Promoting the DBCP/SOT donor buoy program, initiated at PMO-IV for VOS start-up countries;
- (4) Reviewing the performance of the major ship-based networks against key metrics;
- (5) Promoting the upgrading of suitable ships to VOSCLIM class;
- (6) Reviewing and assessing enhancements to technology and data management;
- (7) Enhancing international collaboration.

1.1.7 The list of participants in the meeting is provided in [Annex II](#).

1.2 Adoption of the Agenda

1.2.1 The SOT adopted its agenda for the session based on the provisional agenda with some changes. The adopted agenda is reproduced in [Annex I](#).

1.3 Working Arrangements

1.3.1 The meeting agreed its hours of work and other practical arrangements for the session. The Secretariat introduced the documentation.

2. SCIENTIFIC AND TECHNICAL WORKSHOP, NEW DEVELOPMENTS

2.1 Ms Ann Thresher (CSIRO, Australia), Chairperson of the Scientific and Technical Workshop, opened the Scientific and Technical Workshop. The workshop introduced and reviewed new initiatives and / or new developments in shipboard meteorological or oceanographic instrumentation, observing practices, data management procedures, and quality control and ocean products. Members of the Team were invited to report on systems and related technical developments relevant to SOT, either within their own services and operations or with which they have otherwise been directly involved.

2.2 The following presentations were made during the workshop:

1) The Southern Ocean Observing System (SOOS) by Steve Rintoul (CMAR, Australia)

- Steve Rintoul briefed the Team on SOOS, the Southern Ocean Observing System, and demonstrated how vital improved data streams in the Southern Ocean are in many fields. The International Polar Year demonstrated that these observations are possible and should be supported. It was stressed that (i) the Southern Ocean has a profound influence on the earth system; (ii) changes in the Southern Ocean will affect climate, sea level and biological productivity; (iii) sustained observations are required to anticipate and respond to the effects of a changing Southern Ocean; and (iv) a Southern Ocean Observing System is feasible and needed now.
- The Team noted the contribution SOOS can make to the global ocean observing system, and agreed that the SOT had a role to play. The Team invited its members to review the Initial Science and Implementation Strategy and assist in the implementation and experimental design of SOOS (**action; SOT members; SOT-VII**).
- The Team agreed that the VOSP could take the lead in approaching Tourism ships sailing to Antarctica, and liaise with the Chairs of the SCAR/SCOR Expert Group in Oceanography, John Gunn (Antarctic Division, Australia) and Mike Meredith (BAS, United Kingdom), and the SOOPIP in the view to agree on a common SOT/SOOP strategy for having some of those vessels participate in the SOT and contribute data to the SOOS (**action; VOSP members; ongoing**).

2) The Australian Integrated Marine Observing System (IMOS) by Tim Moltmann (IMOS Director, Australia)

- Tim Moltmann described the Australian IMOS (Integrated Marine Observing System) initiative, which provides infrastructure and high quality data for marine systems. Through considerable investment by the Australian Government, leveraged by co-investment by our national and international partners, IMOS makes a significant contribution to global observing systems. The IMOS is a national, collaborative, research infrastructure program for sustained observing in the marine environment, seeking to

integrate from open ocean, onto the continental shelf, and into the coast. It also seeks to integrate across physics, chemistry, and biology, and make all the data discoverable and accessible for free.

- 3) The Argo profiling float programme by Susan Wijffels (CMAR, Australia)
 - Susan Wijffels described the Argo program and how the very high quality data streams provided by profiling floats has changed the face of ocean data in the last 10 years, particularly in areas that have historically been under-sampled. The Team recognized the Argo challenge to deploy over 1000 floats this year to prevent further degradation of the global array, and that the Northwest Indian and the Southern Ocean remain problematic.
 - To reach gaps in the array Argo programs work together to lease time on inexpensive platforms to reach regions SOOP do not visit – an opportunity for some SOT programs. The Team noted the potential to share the costs in this regard and invited its members to collaborate if and where appropriate (**action; SOT members; SOT-VII**).
 - The Team agreed that the JCOMMOPS should be strengthened in order to build on the synergies between Argo and the SOT. From that perspective, the Team invited its members to consider contributing to JCOMMOPS funding (**action; SOT members; SOT-VII**).
 - The Team also agreed that collaboration with Argo could be enhanced regarding intercalibration of data streams; Argo providing high quality ground truthing for surface data streams e.g. GHRSSST and drifter data, GO-SHIP key calibration source for Argo. Rapid (or near-real-time) access to the data is needed.

- 4) OCEANET-Atmosphere Observatory - The Autonomous Measurement Container by Henry Kleta (DWD, Germany)
 - Henry Kleta described the development of containers that hold a suite of instruments for atmospheric measurements that make collecting this complex data much easier. OCEANET-Atmosphere is a joint venture project of IFM-GEOMAR and IFT to study the mass and energy transfer of ocean and atmosphere by introducing a special measurement container, which is suitable to perform a large spectrum of atmospheric underway measurements on offshore research vessels and cargo ships.
 - The system includes (i) a Lidar to determine the vertical aerosol distribution; (ii) a microwave Radiometer to determine the liquid water path and integrated water vapour; (iii) a Skyimager to determine total cloud cover, cloud type and direct sun; (iv) an Automatic Weather Station to determine meteorological parameters; and (v) Turbulence Measurements to determine heat fluxes (sensible and latent).
 - Mr Kleta also presented the SCaleable Automatic Weather Station (SCAWS) a system for the autonomous acquisition of meteorological parameters.

- 5) The GODAE Observing System Evaluation Project by Peter Oke (CMAR, Australia)
 - Peter Oke showed how international efforts to evaluate the importance of ship data to the various models are proceeding. This highlights the value of the data the SOT provides to the GTS. The Team noted that the GODAE OceanView Observing System Evaluation Task Team (OSEval-TT) had been established to formulate more specific requirements for observations on the basis of improved understanding of data utility. The Task Team has been jointly formed by GODAE OceanView and the Ocean Observation Panel for Climate. Its focus is on short-range forecasting of the mesoscale ocean circulation seeking better engagement with the broader community.
 - Several activities such as response to observing system events, and delayed-mode OSEs have begun. Activities such as Near Real-Time (NRT) Observing System Experiments (OSEs) and inter-comparison of assimilation statistics are now starting. These will eventually lead to Observation Impact Statements.

- 6) The World Ocean Council (WOC) by Paul Holthus (World Ocean Council) (see also agenda item 5.2.7)
- Paul Holthus from the World Ocean Council introduced the SOT to this relatively new international business organization and its goal to provide assistance in coordination and liaison at higher levels within shipping and other ocean industries, e.g. vessel management and owners. The Team noted that the WOC is a global, multi-Industry organization that is working to, inter alia, expand the ships and platforms of opportunity. It is an international, cross-sectoral business leadership alliance bringing ocean industries together, e.g. shipping, oil/gas, fisheries, aquaculture, tourism, offshore renewables, etc. The WOC is catalyzing leadership and collaboration in addressing ocean sustainability. The goal is to promote a healthy and productive global ocean and its sustainable use, development and stewardship by a responsible ocean business community.
 - The Team recognized that the WOC is developing an opportunity for a wide range of ocean industry vessels and platforms to provide routine and sustained information on the ocean and atmosphere to contribute to WMO and IOC Applications.
 - The Team agreed that the roles of JCOMM and OceanScope with regard to the WOC had to be clarified relatively quickly (**action; SOT Chair; June 2011**).
- 7) The Higher-Level Quality Control (HQC) software for the Marine Climatology Summaries Scheme (MCSS) by Gudrun Rosenhagen (DWD, Germany) (see also agenda item 9.4)
- Gudrun Rosenhagen demonstrated the actual status of the development of a new HQC software for higher level QC which ensures that the data distributed is of the highest quality. The development of the HQC by the Global Collecting Centres (GCCs) is a key requirement for the Modernization of the Marine Climatological Summaries Scheme (MCSS) for operation prior to data archival. The HQC will provide changes and additions to existing MQCS checks, including: (i) on-land position checks, (ii) additional element inter-comparisons, and (iii) many more time-sequence checks, and (iv) comparisons with the 40 years' ECMWF reanalysis. Comparisons with (i) real-time monitoring data, (ii) NWP model output, and (iii) satellite data are projected.
- 8) Marine data requirements for forecasting for the Southern Ocean and Antarctica by Neil Adams (BOM, Australia)
- Mr Adams presented an overview of how ocean data are used in operational Southern ocean and Antarctic forecasting, and impact the performance of the Southern Ocean and Antarctic forecasting, as well as future data needs in this regard; including in particular a concerted push for a marine radiosonde program across the Southern Ocean. It was noted that reliable open ocean in situ sea and swell state observations continue to be a Challenge. Neil Adams showed how restricted data sets from the Southern Ocean and Antarctica limit predictive ability in that area. The maintenance of the Buoy program and installation of a wave rider buoy should be high priority.

3. REPORTS BY THE SECRETARIAT, OPA COORDINATOR, SOT CHAIRPERSON AND SOT TECHNICAL CO-ORDINATOR

3.1 Report from the Secretariat

3.1.1 *Forty-Third Session of the IOC Exec Council*

3.1.1.1 The IOC Secretariat representative reported on the outcome of the Forty-Third Session of the IOC Executive Council (Paris, France, 8-16 June 2010)¹. The decisions and

1: http://ioc-unesco.org/index.php?option=com_oe&task=viewDocumentRecord&docID=5721

recommendations from the JCOMM-III (November 2009, Marrakesh) were endorsed by the IOC-EC (IOC Resolution EC-XLIII.5). The IOC Executive Council took note of 'moderate' progress over the period 2004-2008 for both improved climate measurements from Voluntary Observing Ships, and implementation of repeat trans-oceanic temperature sections from volunteer ships [SOOP], urging Member States to address identified priorities and gaps, and to ensure the sustained long-term operation of essential ocean observing networks. At its upcoming 26th session of the IOC Assembly (22 June - 6 July 2011), IOC Member States will address a streamlining of the governance of the Global Ocean Observing System (GOOS).

3.1.2 Sixty-Second Session of the WMO Executive Council

3.1.2.1 The WMO Secretariat representative reported on the outcome of the sixty-second WMO Executive Council (EC-LXII, Geneva, Switzerland, 8-18 June 2010)². In particular, the Council recalled the outcome of the third Session of JCOMM (Marrakech, Morocco, 4-11 November 2009), and noted with appreciation a number of highlights of the Session. Of interest to the SOT, these included in particular (i) the role of JCOMM regarding progress achieved in the last 10 years concerning the development of the initial global ocean observing system in support of climate requirements (i.e. from 30% to 61% completion in 10 years); (ii) JCOMM Capacity Building activities some of which focusing on ocean data buoy technology measurements; and (iii) JCOMM's contribution to the WIS and WIGOS and the JCOMM Pilot Project for WIGOS. EC-LXII recorded its decisions on the recommendations of JCOMM-III in WMO EC Resolution 4 (EC-LXII).

3.1.2.2 The Team noted that any resources possibly made available via the WMO VCP by developed countries in support of PANGEA Capacity Building workshops could complement in-kind resources also made available by the SOT in this regard through the commitment of experts and training material. The Team invited its members to discuss the issue nationally in the view promote the commitments of WMO Members to PANGEA activities through the VCP (**action; SOT members; ongoing**).

3.1.3 Global Framework for Climate Services (GFCS)

3.1.3.1 The Team recalled that the Global Framework for Climate Services (GFCS) initiated by WCC-3³ was seeking to integrate climate observations, research, assessments and predictions in order to generate information and services required for factoring climate variability and change into socio-economic decision-making. This should in turn permit to boost climate adaptation, which is intended to bridge the gap between climate information providers and users.

3.2.3.2 The Team recognized the considerable importance of the GFCS to WMO and UNESCO/IOC, and to their Members/Member States, as well as the potential role for JCOMM in climate services. The Team therefore agreed to follow the future developments of the GFCS closely and to address GFCS observational data requirements that can be met through the use of high quality ship-based observations such as VOSCLIM, SOOP, and ASAP.

The meeting made the following recommendations:

- (i.) The Team agreed that it should continue to be involved in Capacity Building activities, including through the regular organization of International Port Meteorological Officers workshops while noting that the success of such workshops was heavily depending on voluntary contributions from developed countries through the WMO Voluntary Cooperation Programme (VCP).
- (ii.) The Team agreed that it should continue to contribute to the development of WIGOS by providing assistance, as required, on (i) instrument standards and practices issues, (ii) data and instrument/platform metadata exchange, and (iii) quality management issues.

2: http://www.wmo.int/pages/governance/ec/ec_docs_en.html

3: <http://www.wmo.int/wcc3>

3.1.4 JCOMM Activities

3.1.4.1 The Secretariat reported briefly on activities under or associated with JCOMM that had taken place since SOT-V, and were of direct interest to the Team. Several meetings had taken place during the intersessional period, involving JCOMM Panels and Programmes, as well as other relevant bodies.

JCOMM-III Session

3.1.4.2 The Team was pleased to note that its recommendation to integrate the VOSClm into the wider VOS has been endorsed by JCOMM-III, including required changes to the *Guide to Marine Meteorological Services* (WMO-No. 471) as proposed by the VOS Panel. The Commission recognized that the VOS data were now of as great a value to global climate studies as they were to NWP and operational meteorology and oceanography. The Commission endorsed the recommendations from the SOT, as documented in the final report of SOT-V, to improve coherence and quality of the data, resulting from the conduct of an e-logbook intercomparison, and urged Members/Member States to implement the recommendations.

3.1.4.3 On specific issues of interest to the SOT, the Team noted and acknowledged the recommendations from JCOMM-III and agreed with the following actions:

- (a) VOS operators should pay particular attention to the issue of producing, collecting, and recording the VOSClm additional metadata and quality control elements (**action; VOS operators; SOT-VII**);
- (b) VOS operators to consider the requirements for recording the traditional manually observed variables from the VOS (**action; VOS operators; SOT-VII**);
- (c) The Task Team on Instrument Standards to complete the production of a JCOMM Technical Report to include guidelines on standards for instruments (including a list of related WMO, UNESCO/IOC, and national publications for each of the SOT programme components) and high quality best practices for the Voluntary Observing Fleet (VOF) and the Ship Of Opportunity Programme (SOOP) (**action; TT-IS; end 2011**);
- (d) SOT members to continue and expand, where possible, the PMO network (**action; SOT members; SOT-VII**);
- (e) The Task Team on Satellite Data Telecommunication Systems to consider the technical implications related to the compatibility between AIS equipments and observation stations (**action; TT-SATCOM; end 2013**).

JCOMM-III priority activities for this intersessional period

3.1.4.4 The Team noted in particular the recommendations from the third Session of JCOMM (JCOMM-III, Marrakech, Morocco, 4-11 November 2009), including priority activities for this JCOMM intersessional period. The Team agreed to carry out activities contributing to those priority activities in the following way:

- (a) Continued development of the VOSClm fleet to maximize the number of VOSClm class vessel within the VOS Fleet (**action; VOS operators; ongoing**);
- (b) Continued review of relevant chapters of the WMO Publications No. 8 (Guide to Meteorological Instruments and Methods of Observation), No. 471 (Guide to Marine Meteorological Services), and No. 488 (Guide to the Global Observing System) (**action; TT-IS; SOT-VII**);
- (c) VOS Operators are encouraged to make as many visual observations possible, including waves (**action; VOS operators; ongoing**);
- (d) Increased use of high data rate satellite data telecommunication on-board ships (e.g.

Iridium) (**action; SOT members; ongoing**);

- (e) Regular organization of International Port Meteorological Officers (PMO) workshops as a mean to assist developing countries to establish and maintain national VOS programmes that follow international standards and practices. The Team also strongly supported the DBCP/SOT drifter donation programme in support of the VOS Scheme for developing countries (VOS-DP) and requested the Programme Evaluation Committee (PEC) of the VOS-DP to act proactively in this context (**action; PEC; ongoing**);
- (f) Support of the JCOMMOPS function, including through voluntary SOT contributions to the DBCP Trust Fund. The Team agreed that recommendation should be made through the WMO and IOC Executive bodies in this regard (**action; Secretariat; SOT-VI**); Recommendation to the EC.
- (g) Contribute to the completion and updating of the JCOMM Cookbook for the submission of ocean data in real time and delayed mode (**action; TT-IS; asap & ongoing**).

Rigs and Platform metadata

3.1.4.5 The Team recalled the importance of collecting instrument/platform metadata for marine climatology purposes, and JCOMM-III recommendations regarding the management of rigs and platforms metadata. This resulted in discussions at the third Session of the JCOMM Expert Team on Marine Climatology (ETMC – Melbourne, Australia, 8-12 February 2010), the Fourth Session of the JCOMM Data Management Coordination Group (DMCG – Ostend, Belgium, 8-9 April 2010), the Twenty-sixth Session of the Data Buoy Cooperation Panel (DBCP – Oban, UK, 27-30 September 2010), and the Eighth Session of the JCOMM Management Committee (MAN – Paris, 16-19 November 2010).

3.1.4.6 The Team noted that MAN-VIII concurred with the DMPA and WMO-IOC Data Buoy Cooperation Panel (DBCP) recommendation to update the DBCP Terms of References (ToR) and workplan so that the DBCP would become responsible for the Rigs and Platforms, including for the management of relevant metadata. MAN-VIII has requested the DBCP to work with the Secretariat to prepare a report to JCOMM-IV for a revision of the DBCP Terms of Reference. MAN-VIII strongly recommended that the DBCP and Ship Observations Team (SOT) establish appropriate coordination mechanisms for addressing the best practices for the manned Rigs/Platforms making visual observations.

3.1.4.7 The Team concurred with these developments and urged VOS operators currently submitting their ship metadata to the WMO Publication No. 47 to submit them to the JCOMM ODAS Metadata Services (ODASMS, China) from now on (**action; VOS operator; ongoing**). See also agenda item 6.4 for further discussion and decisions in this regard.

Extreme-Wave Database

3.1.4.8 The Team recalled the Extreme-Wave Database developed in collaboration with the SOT, the DBCP, ETMC, and the ETWS of the SFSPA, and now operated by the US National Oceanographic Data Centre (NODC). The Team agreed that ship-based observations relevant to the database should be submitted by Team Members as appropriate.

Codes

See item 9.2.

Integration of data management centres

3.1.4.9 The Team noted that at its fourth Session, Ostend, Belgium, 8-9 April 2010, the Data Management coordination Group (DMCG), agreed that it would be useful to address the integration of the JCOMM Specialized Oceanography Centres (SOCs), the IODE Responsible National Oceanographic Data Centres (RNDOCs), and the VOSclim Real Time Monitoring Centre (RTMC), and proposed an evaluation of their functions in the view to possibly propose a plan in the future for their integration under JCOMM. The integration of in situ/satellite/model field data management, including match-up databases (e.g. ICOADS) was also discussed and better collaboration with the satellite community proposed. The Team requested the RTMC to collaborate actively in this process (*action; RTMC; JCOMM-IV*).

3.1.5 Day to day activities of the Secretariat in support of the SOT

3.1.5.1 The Team noted with appreciation the following day-to-day activities of the Secretariat in support of the SOT:

- (i.) Overall coordination and liaison with WMO and IOC Executive Bodies, JCOMM Expert Teams, and other Groups as appropriate;
- (ii.) Maintenance of SOT, VOS, VOSclim, ASAP, SOOPIP, PMO, and SOT Task Teams contact points on the JCOMM web site⁴;
- (iii.) Issuing letters as needed or requested by the Chair of the SOT following recommendations from SOT-V;
- (iv.) Coordination, editing, and publishing of the SOT Annual reports. Annual reports for 2008 and 2009 were published as JCOMM Technical Reports No. 46⁵ and 51⁶ respectively. Annual report for 2010 is about to be published as JCOMM Technical Report No. 54;
- (v.) Maintenance of the list of Inmarsat LES Stations accepting Code 41⁷;
- (vi.) Maintenance of the International List of Selected, Supplementary and Auxiliary Ships (WMO No. 47)⁸, and collection of national submissions for inclusion in the Publication;
- (vii.) Maintenance of specific web pages of interest to the SOT, including in particular the list of Algorithms used for the computation of Dew Point Temperature using e-logbooks⁹.

3.2 Report from the Observations Programme Area Coordinator

3.2.1 The OPA vice-coordinator, Mr David Meldrum, on behalf of the JCOMM Observations Programme Area (OPA) and the OPA coordinator Candyce Clark, noted that the Implementation Goals for the OPA are based on the GCOS Implementation Plan for Climate (GCOS IP), and should be updated by SOT and other panels to respond to the 2010 update and input from the OceanObs'09 conference (September 2009, Venice). The OPA Implementation Goals are designed for climate but also serve global and coastal ocean prediction, marine transportation, marine hazards warning, marine environmental monitoring, naval applications, and many other non-climate users. It was reported that the global system has remained about 62% complete for several years, as measured against the implement targets identified in the GCOS IP; and that new resources will be necessary to advance system-wide implementation in deployment of data buoys, profiling floats, tide gauge stations, and ship-based systems.

3.2.2. The SOT contribution to this global observing system comes from VOS including the VOSclim programme and from the SOOP network of XBT lines. These SOT contributions are central to the global ocean system operations, not only because of the met-ocean data sets delivered from voluntary observing ships, but also because the voluntary fleet provides the platforms of opportunity necessary for deployment of the drifting arrays, and the platforms of opportunity that support underway carbon dioxide air-sea flux measurements. As VOSclim does not have a clear target or metric under the GCOS IP, and the SOOP trans-oceanic sections need updating, those SOT panels were challenged to develop clear and measurable targets that could

4 : http://www.jcomm.info/index.php?option=com_oe&task=people&Itemid=18

5 : <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-46-SOT-ANN-2008/index.html>

6 : <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-51-SOT-ANN-2009/index.html>

7 : http://www.wmo.int/pages/prog/amp/mmop/inmarsat_les.html

8 : <http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm>

9 : <http://www.wmo.int/pages/prog/amp/mmop/JCOMM/OPA/SOT/dewpoint-algo.html>

be incorporated into the JCOMM Observing System Monitoring Centre (OSMC). Discussion under agenda item 5.1 will be focused on SOT response to ship-board requirements as presented by OOPC and the Rolling Review of Requirements; SOT input will be used to update the OPA Implementation Goals to be discussed at the fourth Observations Coordination Group meeting immediately following SOT-VI.

3.2.3. The fourth International Port Meteorological Officer Conference (PMO-IV), and support to Global Ocean Observations using Ship Logistics (8-10 December 2010, Orlando, Florida, USA) recommended the initiation of a DBCP/SOT drifter donation programme (VOS-DP). SOT was asked to support this assistance to developing countries to help set up embryo national VOS Scheme programmes whereby the donated drifter would be installed onboard a newly recruited ship as an autonomous AWS to provide a low cost, quality observation solution.

3.2.4. Both JCOMM-III (November 2009, Marrakesh) and OCG-III (March 2009, Paris) made requests for SOT actions, including to continue to build and sustain the current system coordinated under the SOT to agreed standards (including updating the *JCOMM Catalogue of Standards and Best Practices*), and near-real-time data reporting; and broadening the base of national participation. SOT members are urged to support technical coordination through activities of their activities at JCOMMOPS (agenda item 11.2).

3.2.5. The SOT made note of the issues raised by the OPA report. The future requirements and specific recommendations and actions for VOS and SOOP were addressed during the agenda items focused on each panel.

3.3 Report from the SOT Chairperson

3.3.1 Mr Graeme Ball reported on the intersessional activities of the SOT Chairperson and the major activities of the Team. He noted the major activity of the SOT during the intersessional period had been the very successful PMO-IV, Orlando, USA, 8-10 December, 2010. Some key initiatives from that workshop were the “start-up” program for new VOS countries using donated SVP-B as simple AWS, and the PMO buddy program that paired experienced and inexperienced PMOs together for mentoring purposes. Although both of these initiatives are in their infancy, they both show great potential and should be encouraged in the broader domain.

3.3.2 Mr Ball also noted the work of the Task Team on Callsign Masking and Encoding, particularly Scott Woodruff and his colleague Eric Estes at NOAA/ESRL, to develop an **ENCODE** strategy to encrypt callsigns, thus completing the **SHIP**, **MASK** and **ENCODE** masking methods.

3.3.3 Other key results for the SOT were (1) the apparent smooth transition of VOSClim from its former project status to a VOS class, (2) the announcement of the first XBT Science Workshop to be held in Melbourne, 7-8 July 2011, and (3) the development of Key Performance Indicators (KPIs) for reporting the performance of VOSClim to the JCOMM Observations Coordination Group (OCG).

3.3.4 Mr Ball attended several meetings during the intersessional period (OceanObs'09, Venice, Italy, September 2009, the twenty-fifth and twenty-sixth Sessions of the Data Buoy Cooperation Panel – DBCP – in Paris, France, and Oban, United Kingdom, in September 2009 and September 2010 respectively, and the fourth International workshop of Port Meteorological Officers – PMO-IV – in Orlando, USA, December 2010) and represented the SOT, although PMO-IV was the only meeting attended in an official capacity as SOT Chair. Mr Ball reviewed and updated a range of documents, including WMO manuals, some of which were done in collaboration with VOSP Chair.

3.3.5 The major activities performed by Mr Ball during the intersessional period were (1) the planning and participation at PMO-IV, including preparing the original draft program and approving the final program, (2) the planning of SOT-VI, including preparing the original draft program and approving the final program and timetable, appointing the Chairs for the National Reports and

Technical Workshop sessions, (3) identifying a suitable replacement to chair the Task Team on Instrument Standards following the sudden death of Robert Luke (USA), (4) participation in a joint DBCP/SOT discussion about Rigs and Platform metadata at DBCP-26 that resulted in a proposal to the JCOMM Data Management Coordination Group (DMCG) that Rigs and Platforms should report to the DBCP.

3.3.6 Mr Ball participated in the work of the Task Team on Instrument Standards (TT-IS) and the Task Team on VOS Recruitment and Programme Promotion (TT-VRPP), and he chaired the Task Team on Metadata for WMO Publication No. 47 (TT-Pub47) and also the Task Team on Callsign Masking and Encoding (TT-Masking). He also maintained the VOS website¹⁰ and the **Find-a-PMO** Google Earth application that is available on the VOS website. He also prepared the 2009 and 2010 SOT Annual Report templates that WMO sends to SOT National Focal Points in December each year.

3.4 Report from the SOT Technical Co-ordinator

3.4.1. The SOT Technical Coordinator (TC), Mathieu Belbéoch presented his activities on behalf of the SOT during the last intersessional period, including key tasks undertaken, meetings and visits, monitoring products, information exchange and additional tasks completed.

3.4.2. The TC reported that the support he provided directly to SOT has been relatively limited during the last intersessional period. This was mainly due to (i.) the lack of resources provided by SOT to the JCOMMOPS infrastructure; and (ii.) to the transitional period that is facing JCOMMOPS (See Doc 11.2 for further details).

3.4.3 The Team noted that the time invested by the TC on JCOMMOPS development, and the clarification of the use of the SOT funds will greatly facilitate the technical coordination for the SOT during the next intersessional period (See Doc 11.2 for further details).

3.4.4. The Team noted that a set of minimal activities had however been maintained, as far as possible, including:

- SOT database update (GTS archives now available);
- Monthly/yearly maps and statistics, including new products;
- Mailing lists maintained, and created as required;
- SOOP Survey 2009 metadata gathered;
- MASK/REAL list maintained.

3.4.5. The Team noted that the TC attended the following SOT related meetings:

- The 2010 GTSP yearly Meeting;
- The 4th international PMO workshop (Orlando, USA, December 2010).

3.4.6. The Team noted that the TC did set up a “ship time service” , and has documented the need for a cross program “Cruise Coordinator” position within JCOMMOPS in support of all ship based activities, including the SOT; in particular ship metadata management and charters recruitment in cooperation with PMOs (see Doc 11.2 for further details).

3.4.7. The Team noted that the WMO Publication No. 47 (Pub47) was missing information and lacking homogeneity, and that the submission of REAL/MASK lists to JCOMMOPS was irregular.

3.4.8. The meeting made the following recommendations:

- (i) The TC to secure routine production of core SOT monitoring products;
- (ii) The TC to continue efforts for developing the cross program ship based activities and

10 : <http://www.bom.gov.au/jcomm/vos/>

in particular for establishing a Cruise Coordinator Position;

- (iii) The VOS operators to submit their Pub47 metadata to the WMO Secretariat in a more consistent way, and the REAL/MASK cross-reference lists more regularly.

3.4.9. The meeting decided on the following action items:

- (i) The SOT Chair to consult with the VOSP Chair, the SOOPIP Chair, and the ASAP Task Team Chair, and provide a list of reasonable priorities to the SOT TC (**action; SOT Chair; April 2011**)
- (ii) The SOT TC to propose a list of essential and mandatory metadata for Pub47 to the SOT Task Team on Metadata for Pub47 (**action; SOT TC; May 2011**)

3.4.10 The Team reviewed and agreed on the JCOMMOPS operations budget for the SOT as provided in [Annex XVII](#).

3.4.11 The Team requested JCOMMOPS to issue quarterly reminders to Team members through the SOT mailing list, with information about the REAL/MASK scheme and related requirements, including how to submit appropriate information to JCOMMOPS (**action; JCOMMOPS; ongoing**).

3.4.12 The Team agreed that the mailing lists need to be synchronized between those maintained by JCOMMOPS and those maintained on the JCOMM web site, and requested the Secretariat and JCOMMOPS to discuss the issue and propose practical solution (**action; Secretariat & JCOMMOPS; SOT-VII**).

3.4.13 The Team requested the Technical Coordinator to assist in making Research Vessel marine meteorological and oceanographic data available on GTS (**action; TC; ongoing**).

3.4.14 The Team recognized that work priorities for the Technical Coordinator should be more clearly defined, and requested the VOSP and SOOPIP Chairs to discuss and make proposals later during this Session under agenda item 13.2.

4. REVIEW OF ACTION ITEMS FROM SOT-V

4.1 The Secretariat reviewed the list of action items from the fifth Session of the SOT, Geneva, Switzerland, 18-22 May 2009 (annotated with completion status in [Annex III](#)). The meeting noted that about 71% of the actions had been successfully completed, or addressed. A number of the open or ongoing action items are being addressed during this Session (SOT, VOSP, SOOPIP chairpersons' reports, reports by the Task Teams).

5. REPORTS ON ASSOCIATED PROGRAMMES AND REQUIREMENTS FOR SHIP-BASED OBSERVATIONS

5.1 Requirements for ship-based observations

5.1.1 GCOS / GOOS / WCRP Ocean Observing Panel for Climate (OOPC)

5.1.1.1 Albert Fischer provided a report on behalf of the Ocean Observation Panel for Climate (OOPC). The Ocean Observations Panel for Climate (OOPC) is a scientific expert advisory group, charged with making recommendations for a sustained global ocean observing system for climate in support of the goals of its sponsors: the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the World Climate Research Programme (WCRP). It also reports to JCOMM on requirements; JCOMM groups including the Ship Observations Team (SOT) coordinate a number of the in situ networks of the global module of GOOS, also the ocean

component of GCOS. The OOPC thanked the members of the SOT and those contributing to SOT networks as implementers. The global ocean observing system, though incomplete in important respects, is providing essential information to users.

5.1.1.2 Mr Fischer briefly presented the work OOPC is doing to present ocean climate indices calculated in real time from the observing system, as a tool for advocacy of ocean observations. He encouraged the proposal made by Susan Wijffels that XBT science community to develop indices of transport from repeat lines, and offered to link them to the OOPC site at <http://ioc-goos-oopc.org/>

5.1.1.3 The OOPC has written its latest recommendations on ocean observations for climate in the GCOS 2010 Implementation Plan¹¹. These reflect a mild evolution of previous recommendations, expanding the number of Essential Climate Variables for the ocean and emphasizing integration. Of note for the Ship Observations Team were the following requested actions:

- [GCOS Action O3] Improve the number and quality of climate-relevant marine surface observations from the VOS [for both marine meteorological and oceanographic Essential Climate Variables]. Improve metadata acquisition and management for as many VOS as possible through VOSclim, together with improved measurement systems. Performance indicator: increased quantity and quality of VOS reports
- [Action O11] Implement a programme to observe sea-surface salinity to include Argo profiling floats, surface drifting buoys, SOOP ships, tropical moorings, reference moorings, and research ships. Performance indicator: data availability at International Data Centres.
- [Action O21] Establish plan for, and implement, global Continuous Plankton Recorder (CPR) surveys [towed from commercial vessels]. Performance indicators: publication of internationally agreed plans; establishment of agreements/frameworks for coordination of sustained global Continuous Plankton Recorder surveys; implementation according to plan. Fischer noted that the Sir Alistair Hardy Foundation for Ocean Science (SAHFOS) had prepared a proposal to expand the CPR network globally, which if successful would create a focal point for CPR observations.
- [Action O25] Sustain the Ship of Opportunity XBT/XCTD transoceanic network of about 40 sections. Performance indicator: data submitted to archive. Percentage coverage of the sections.

5.1.1.4 At its 14th session (19-22 January 2010, NOAA/AOML, Miami FL, USA), the OOPC commended the high level of effort in the XBT and Argo communities in examining error budgets for ocean temperature profiles. It decided that in 2011 it would devote its meeting to a workshop on a Deep Ocean Observing Strategy, but that in 2012 it would revisit Ocean Thermal observation requirements. This plan was reconfirmed by the 15th session of the OOPC (1-2 April 2011, Paris, France). The planned action will try to reconcile ocean heat content, sea level, and energy imbalances, and would have a focus on the error budget and sampling requirements. The action would attempt to involve both the scientific community and funders of the ocean observing system, in a pilot activity to better engage funders. This workshop is expected to have a high level of participation from the SOOP XBT community. The Panel also asked the JCOMM Observations Programme Area Coordination Group (OCG) to develop complementary metrics of the ongoing intensity of effort in maintaining different components of the ocean observing system.

5.1.1.5 The Team took note of the points from the OOPC above, and addressed them with specific recommendations and actions during the agenda items focused on each panel.

5.1.1.6 The meeting made the following recommendations:

11: Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (2010 update), GCOS-138, GOOS-184, <http://www.wmo.int/pages/prog/gcos/Publications/gcos-138.pdf>

- encourage the SOOP science community to develop XBT-based indices of currents and subsurface ocean state, and think about how they link to climate impacts on land, as a way of boosting interest in the climate community in XBT data,
- encourage the Southern Ocean Observing System (SOOS) and OOPC to develop an observing strategy for the seasonal ice and under-ice zones
- encourage development at JCOMM level of metrics dealing with data quality and flow from VOS and from SOOP
- identify tracking of poorly-covered VOS areas to target ship recruitment for global coverage - through reinforcement of new efforts at JCOMMOPS

5.1.1.7 The meeting decided on the following action items:

- **Action (for the SOT, VOSP, SOOPIP chairs, and SOT TC; ahead of JCOMM-IV)** to work with the JCOMM OPA Coordinator develop metrics of intensity of effort in maintenance of the observing networks - on the PMO network, on VOSclim class growth, or on SOOP line maintenance, recalling the need to keep the metrics simple to calculate

5.1.2 **WMO Rolling Review of Requirements update**

5.1.2.1 The Team discussed the WMO Rolling Review of Requirements (RRR) and how non-climate requirements can be addressed. In particular, Taking into account the respective Statements of Guidance, the Team reviewed variables of interest to JCOMM that are not adequately measured *in situ* at present for the following application areas, or variables which are not properly being addressed within the existing JCOMM OPA workplan through the climate requirements:

- Seasonal to Inter-annual Forecasts (SIAF);
- Ocean Applications;
- Global Numerical Weather Prediction (GNWP);
- High Resolution Numerical Weather Prediction (HRNWP);
- Nowcasting and Very Short Range Forecasting (NVS RF).

5.1.2.2 The Team agreed that the SOT could respond to those requirements for the following variables where gaps have been identified for one or more of the above applications in the following way:

- Increasing the number of aerological profiles for GNWP can be achieved through enhanced cooperation with institutions operating Research Vessels, and with the navies (see agenda item 6.2);
- Increasing the number of VOS will permit to address the requirements for more surface meteorological data required by GNWP, HRNWP, and NVSRF, and for heat surface flux as required by SIAF;
- Precipitation, snow, ice thickness are measurements that cannot realistically be easily achieved by the VOS operators;
- Automated wave/sea state sensors required for Ocean Applications and GNWP & HRNWP could be developed by the community. The Team requested the Task Team on Instrument Standards to address feasibility (**action; TT-IS; SOT-VII**);
- Ocean surface currents (required for SIAF) derived from the ship's position could be distributed provided the BUFR template for VOS data accommodates for this. The Team invited the DMPA Task Team on Codes to address the inclusion of VOS current data as part of the BUFR template for VOS data (**action; DMPA TT-TDC; asap**).

5.1.2.3 The Team agreed to review the SOT overarching implementation plan that was adopted at SOT-III, and to include in it an SOT strategy for addressing the full range of observational data requirements (drawn essentially from the RRR, and including those of WMO, OOPC, GCOS, operational oceanography and other applications) and gaps in terms of ship observations, and

requested the Chair, in liaison with the VOSP and SOOPIP Chairs, and the Secretariat to update the document for review at SOT-VII (**action; SOT Chair; SOT-VII**).

5.2 Reports by associated programmes

5.2.1 International Ocean Carbon Coordination Project (IOCCP)

5.2.1.1 Maciej Telszewski (Deputy Director, IOCCP) presented a report describing the International Ocean Carbon Coordination Project (IOCCP) and its intersection with the SOT.

5.2.1.2 The IOCCP is co-sponsored by the IOC and the Scientific Committee on Oceanic Research (SCOR) and promotes the development of a global network of ocean carbon observations for research through technical coordination and communications services, international agreements on standards and methods, and advocacy and links to the global observing systems.

5.2.1.3 The current IOCCP goal for ship-based surface pCO₂ observations is to develop and implement a strategy that is comprised of a well-planned integrated global network of surface ocean carbon measurements, sampling at monthly or higher timescales. There are two issues, which the IOCCP would like to address within the JCOMM SOT context:

1. Obtaining access to the ships poses a significant challenge. A more coordinated interaction with shipping companies is needed. On several occasions there are multiple entities involved in a vessel management which makes it very difficult (and often frustrating for our industrial partners) to establish who has the authority in the instrument installation context. Access to geographically desirable platforms (SOOP, VOS) remains challenging because the ships only ply certain routes and also the routes often get cancelled, sometimes on a yearly basis which significantly decreases the cost efficiency of our efforts. The IOCCP will start a systematic gathering of the related information within the carbon community and will coordinate these efforts with other observational networks.
2. The parameters most often measured on ships and moorings are pCO₂, sea surface temperature, and sea surface salinity. A considerable investment is needed in sensor development in order to add important ocean surface parameters like total dissolved inorganic carbon, total alkalinity, dissolved nutrients, dissolved oxygen and carbon isotopes to routine measurements curricula. Development of sensors and alternative platforms like drifters, wave riders, and robotic boats is also needed to reduce ship time (costs) and provide the spatial and temporal coverage needed to resolve the seasonal and inter-annual variability in carbon fluxes for all ocean basins.

5.2.1.4 The Team noted that the IOCCP was also making Temperature and Salinity measurements from ships, and that it would be desirable to establish a collaboration of the SOT with the IOCCP to permit real-time distribution of such data on the GTS. For example, things would be facilitated if SOT members could support the cost of transmitting these data from ship to shore, and assist for their automatic quality control, encoding in appropriate GTS formats, and effective GTS distribution in real-time. The Team invited its members to consider making such commitments, and requested Maciej Telszewski to bring this information to the IOCCP and provide feedback to the SOT Chair on practical steps that might then be taken to permit this collaboration (**action; Maciej Telszewski; SOT-VII**)

5.2.1.5 The Team also encouraged the SOOPIP Chair and the IOCCP Director to communicate on common issues during the next intersessional period (**action; G. Goni & Telszewski; SOT-VII**).

5.2.2 Shipboard Automated Meteorological and Oceanographic System (SAMOS) Project

5.2.2.1 Mr Shawn Smith (Florida State University, USA) reported on the recent developments of the Shipboard Automated Meteorological and Oceanographic System (SAMOS) initiative. SAMOS aims to improve the quality of meteorological and near-surface oceanographic observations collected in-situ on research vessels (R/Vs).

5.2.2.2 The SAMOS initiative currently focuses on meteorological and near-surface oceanographic data collected by the scientific instrument system (a SAMOS) permanently installed on R/Vs. The SAMOS data centre at the Florida State University (FSU) currently receives data transmissions from 26 U. S. operated R/Vs and two Australian R/Vs. Additional recruitment is underway in the U.S.

5.2.2.3 The Team recognized that, although the SAMOS initiative was not originally designed to provide meteorological and ocean observations to national oceanographic or meteorological services, the demand to have access to high-quality SAMOS data via traditional services (e.g., GTS) has grown. Mr. Smith acknowledged that resource limitations did not allow any activity to address this issue since SOT-V. Mr. Smith outlined a plan to select a subset of the R/Vs participating in SAMOS to develop and test procedures for placing SAMOS data on the GTS. Vessels would be selected based on the lack of availability of observations from the vessel on the GTS and metadata quality. Mr. Smith will coordinate this activity with the U.S. VOS program (**action; Smith and US VOS program manager; August 2011**).

5.2.2.4 Metadata collection for SAMOS vessels continues to be a challenge. Mr. Smith noted where improvements have been made in communications with R/V operators and changes that have been made to NOAA R/V metadata acquisition practices. The problem is exacerbated by the inability of SAMOS personnel to visit all participating vessels. Mr. Smith asked SOT for input on leveraging the U.S. PMO network to collect SAMOS metadata when visiting R/Vs, including identifying challenges and benefits of a potential joint activity (**action; SOT members; SOT-VII**).

5.2.2.5 The Team noted with appreciation that SAMOS collaborated with the Marine Advanced Technology Education Center (Monterey, CA, USA) to develop knowledge and skills guidelines for oceanographic instrumentation technicians (see supplemental material). The SAMOS data centre is creating a professional development program for in-service marine technicians, in partnership with the NOAA Earth System Research Laboratory. The program will focus on best practices and techniques for collection of marine meteorological observations on R/Vs to support ocean, atmosphere, and climate research. The Team invited its members to contact Mr. Smith if they wish to contribute to this professional development activity (**action; SOT members; June 2011**).

5.2.2.6 Mr. Smith noted that the SAMOS data centre routinely receives underway sea temperature, conductivity, and salinity observations from all vessels equipped with a Thermosalinograph (or salinometer). Current automated quality control verifies that the data are within the ranges outlined by GOSUD. The data centre is willing to implement the full GOSUD automated quality control (if desired), but requires up-to-date quality procedures and codes from GOSUD (**action; SOOP Chair; August 2011**).

5.2.2.7 Regarding the SAMOS systems installed on NOAA vessels, the Team noted that the data are being submitted to GOSUD but that unified criteria were needed on how to address the duplication of observing systems, and identify what data to transmit on the GTS. The Team requested Gustavo Goni and Shawn Smith to discuss the issue and propose solutions (**action; G. Goni & S. Smith; SOT-VII**).

5.2.2.8 The Team requested the SOT Chair to contact the US VOS Program Manager in relation to the SAMOS Project and encourage a close cooperation between the US PMOs and SAMOS ships (**action; G. Ball; SOT-VII**).

5.2.3 Ferrybox Project

5.2.3.1 The Team reviewed a written report from Wilhelm Petersen (Centre for Materials and

Coastal Research – HZG, Germany) on the status of the Ferrybox project and recent achievements.

5.2.3.2 The Team recalled that the FerryBox¹² concept has been developed as a partnership between scientists and the companies operating ferries in waters around the world. Many of the systems have been developed to support the requirements for both scientific and marine management data.

5.2.3.3 The evolution of FerryBox systems reached a status of maturity that could be proven during many years of operation at different sites. There are worldwide increasing activities operating FerryBoxes and other systems on ships of opportunities (e.g. 15 ships in Europe, and some in Japan and Australia). However, most of them are temporary activities and are on a volunteer basis. There is no sustained funding in order to get reliable and comparable data over longer time periods.

5.2.3.4 The Team noted that the monitoring of air-sea fluxes of carbon dioxide (CO₂) by FerryBoxes has been coordinated through the International Ocean Carbon Coordination Project (IOCCP). It is important that this work is continued and expanded in shelf seas, whose contribution to the carbon budget is particularly difficult to predict from existing models. The FerryBox/VOS approach provides a unique way for monitoring coverage of both carbon import and export in shelf seas and acidification in the coastal zone in a cost effective manner. Links are also being made with the OceanSCOPE¹³ for the future.

5.2.3.5 The Team noted that the FerryBox and other underway data are suggested to be integrated in the *in-situ* TAC of the EU project MyOcean¹⁴. However, not all data owners are a member of the MyOcean consortium as there are many of these activities related to research institutions. The provision of data from outside of the consortium is not finally clarified. Nevertheless, it is highly desirable for MyOcean applications that these data would be available at least in a delayed mode.

5.2.3.6 The Team noted that consolidation of FerryBox systems into operational Marine Core Services (MCS) is feasible and should be considered quickly. This will push forward the MCS not only in the way of getting more data but to get much more reliable data and a new dimension of chemical/biological information. In addition, there will be a high potential for evolution. However, a mechanism has to be found for a sustainable funding of such “routine measurements” in order to guarantee the long-term operation.

5.2.4 Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP)

5.2.4.1 Bernadette Sloyan (CSIRO, Australia) presented a report on the Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP). The principal scientific objectives for a sustained ship-based hydrography program have two closely linked components: (1) understanding and documenting the large-scale ocean water property distributions, their changes, and drivers of those changes, and (2) addressing questions of how a future ocean that will increase in dissolved inorganic carbon, become more acidic and more stratified, and experience changes in circulation and ventilation processes due to global warming, altered water cycle and sea-ice will interact with natural ocean variability.

5.2.4.2 Ms Sloyan reported that a high priority for the new GO-SHIP program was to revise the 1994 WOCE Hydrographic Programme manual. The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines provides detailed instructions for the high quality collection and analysis techniques of numerous ocean parameters. The goal of this effort is to promote standardized methods for a core set of parameters measured on the GO-SHIP

12: <http://www.ferrybox.org>

13: http://www.scor-int.org/Working_Groups/wg133.htm

14: <http://www.myocean.eu.org/>

hydrographic reference sections, although the hope is that the techniques described in this manual will be adopted by others wishing to make high quality measurements. The JCOMM has highlighted the importance of the GO-SHIP revision of the 1994 WOCE hydrographic Programme Manual. This was completed due to the efforts of expert authors and reviewers.

5.2.4.3 She highlighted the GO-SHIP development plan for the period 2010 to 2015. The plan is to start with the establishment of a Program Office and a Scientific Steering Committee; and reach agreements on benchmarks and timeframe for development. Network evaluation from CLIVAR decadal survey will have to be initiated as possible (2000-2010). Joint planning exercises based on network evaluation to prepare for the next decadal survey (Atlantic 2012-2014, Pacific 2015-2017, Indian 2017-2019) will also be initiated. A Data Management Committee will be established to propose a way forward for an international system of Data Assembly Centres and adopt or recommend standards for data calibration, QC, and metadata recording to be used for the next survey.

5.2.4.4 The Team noted that surface weather observations can be made from ships participating in GO-SHIP using the SAMOS system and encouraged GO-SHIP to use the system and eventually make these observations available through the GTS in real-time.

5.2.5 Scientific Committee on Oceanic Research (SCOR) Working Group 133 "OceanScope"

5.2.5.1 Albert Fischer (IOC Secretariat) presented a report on the recent activities of the Scientific Committee on Oceanic Research (SCOR) Working Group 133 "OceanScope" of the Scientific Committee on Oceanic Research (SCOR) and the International Association for the Physical Sciences of the Oceans (IAPSO), on behalf of Tom Rossby, its co-chair. The objective of the WG is to develop the concept of the merchant marine vessel as a platform for integrated monitoring of the global ocean water column. Close cooperation between the shipping industries and ongoing physical, chemical, and biological programs will be needed to implement these objectives. A proposed OceanScope office will work with the shipping industry to identify vessels for various routes, arrange for single-point contacts between the vessel operator and instrument service people. All data will be forwarded to the user communities as quickly as possible. The report of the WG will soon be submitted to SCOR and IAPSO for review.

5.2.5.2 The Team noted the positive energy of the OceanScope Working Group, but stressed that it was important to build a future program also based on existing infrastructure and institutions, including the work of the Team. It was desirable to present a unified voice of all actors in ocean observations from commercial ships to the shipping industry. The Team decided to comment along these lines when the OceanScope report was made public for comment (**action; SOOPIP, VOSP, and SOT chairs; by OceanScope comment deadline presumed mid-2011**). See also Section 10.1 for further discussion of this point.

5.2.6 Group for High-Resolution SST (GHRSSST)

5.2.6.1 Ian Barton (CSIRO, Australia) presented a report on the activities of the Group for High-Resolution SST (GHRSSST). The origins and history of the GHRSSST project was presented with emphasis on the successes of the project. These were based on the coordination of the many international weather services to provide a "best" suite of Sea Surface Temperature (SST) fields over the global oceans. The mechanics of the GHRSSST processing were presented.

5.2.6.2 The methods used to extract the SST from satellite data streams were presented along with the data validation that is based on using in situ data from a range of surface platforms, including Ships of Opportunity. Some problems and difficulties associated with the use of ship SST measurements were identified and a collection of recommendation to the Meeting was presented to maximise the impact and benefit of future SST measurements from ships:

- Adding the provision of radiometric skin SST data to its portfolio of measurements. Participating vessels should also provide a radiosonde capability;
- Encouraging ships currently providing high quality in situ SST data to also expand their provision of meteorological meta-data. Wind speed, history of wind speed, air temperature and local humidity are the most important;
- That regular accurate calibration of in situ data instrumentation is carried out, preferably against a standard that is traceable to an SI measurement;
- Establishing a working group to collaborate with GHRSSST to better define requirements for measurements of SST and meteorological data from ships, and to identify new vessels that may assist with a more uniform coverage of the global oceans;
- Planning to obtain ship of opportunity participation in future SST measurement inter-comparison experiments;
- Encourages JCOMM vessels to use the GHRSSST data set to assess the accuracy and performance of their SST measurement instruments.

5.2.6.3 The Team requested Ian Barton and the SOT Chair to identify people for the proposed *ad hoc* working group and decide on the opportunity to establish a pilot project (**action; I. Barton & G. Ball; SOT-VII**).

5.2.6.4 The presentation concluded with a response to an Action Item from the previous SOT meeting in Geneva. Comparisons between different ship SST measurements and those extracted from the AATSR instrument on the ENVISAT satellite showed that the best ship measurements were derived from bucket data.

5.2.6.5 The Team noted that GHRSSST is supporting the AWS intercomparison that will be conducted by the SOT (see agenda item 6.5).

5.2.6.6 Helen Beggs (BOM, Australia) made a presentation on IMOS ship SST observations to complement the lack of drifting buoy observations in data sparse regions and for improving the validation of SST analysis and forecasts. She stressed that improving the availability and accuracy of SST depth observation from VOS ships reporting on the GTS was important. An IMOS ship of opportunity SST sub-facility was designed with the goal to significantly enhance quality, quantity, and timeliness of ship SST data in the Australian region. This showed that SST from Research Vessel and commercial vessel hull mounted temperature sensors have comparable performances than drifting buoys (RMS (AVHRR SST – *in situ* SST) < 0.5K).

5.2.7 Other associated programmes

5.2.7.1 The World Ocean Council (WOC)

5.2.7.1.1 The Team recalled the presentation by Mr Paul Holhtus (Executive Director, World Ocean Council) during the Scientific and Technical Workshop under item 4 on the World Ocean Council (WOC).

5.2.7.1.2 Mr Holhtus recalled that the World Ocean Council (WOC) is the international, cross-sectoral business leadership alliance on “Corporate Ocean Responsibility”. The WOC brings together a range of ocean industries, e.g. shipping, oil/gas, fisheries, aquaculture, renewable energy, tourism, insurance, etc. to collaborate in working towards a shared goal of healthy and productive seas and their sustainable use and stewardship by a responsible ocean business community. Cross-sectoral industry working groups are addressing priority shared issues: e.g. ocean data/science, marine spatial planning, invasive species, water pollution, ocean noise, marine debris, the Arctic, the Convention on Biological Diversity.

5.2.7.1.3 He further explained that an increasing number of companies from a broad range of ocean industries are distinguishing themselves by becoming members of this unprecedented business leadership alliance for ocean sustainability - and are calling on others in the private sector to join in becoming a part of the solution to securing the health of the ocean.

5.2.7.1.4 Mr Holthus reported that the WOC is uniquely positioned to develop and coordinate expanded, improved and better coordinated ocean science and ocean observations by the private sector. The WOC is beginning efforts to catalyze an international, multi-sectoral system for engaging ocean industries in coordinated contribution to ocean data collecting, sharing and use. This will learn from/build on ships of opportunity programs and create a program to engage a range of industries in ocean observations at a whole new scale, i.e. major fleets of vessels and offshore platforms participating in long term, integrated data collection. A number of companies from oil/gas, shipping, marine technology, insurance are strongly encouraging WOC to explore this potential.

5.2.7.1.5 The Team noted that the WOC is working at building the relationships with the key national and international agencies and individuals in the scientific/ocean observations community in developing a global, multi-industry framework to expand the ships and platforms of opportunity.

5.2.7.1.6 The Chair SOT reported on an informal meeting with Paul Holthus (WOC) to progress the cooperation between the WOC and JCOMM (and the broader level), and WOC and SOT (at the implementation level). The meeting was also attended by Julie Fletcher (New Zealand), Chair VOSP; Gustavo Goni (USA), Chair SOOPI; Sarah North (United Kingdom) and Albert Fischer (IOC).

5.2.7.1.7 It was agreed that WOC should act as an advocate for JCOMM and all of its sampling programmes to the shipping industry and other ocean industries, and to be a supporting voice for the SOT to industry bodies, including major shipping organisations such as ICS. It was agreed that JCOMM and its implementation panels should be represented at the WOC meeting on ocean observations that is being explored for later in 2011. The main points of contact for JCOMM will be the OPA Coordinator, Ms Candyce Clark (USA), and the SOT Chair.

5.2.7.1.8 It was recognised that whilst an alliance between WOC and SOT might lead to a significant resource issue for NMHS in their capacity to recruit the potential influx of new ships and platforms that provide data, the WOC could play a valuable role in improving industry involvement in observations by (1) encouraging shipping and other companies to invest in certified meteorological equipment, (2) encouraging shipping and other companies to liaise with the NMHS with respect to training, and (3) informing shipping and other companies of the need for regular equipment calibration against international standards using NMHS resources, i.e. PMOs.

5.2.7.1.9 The WOC will also assist SOT by engaging with other groups such as SeaKeepers and OceanScope.

5.2.7.2 OceanoScientific® Programme

5.2.7.2.1 Mr Pierre Blouch (France) reported on the status of the *OceanoScientific® Programme* on behalf of the *OceanoScientific® Programme* Manager, Mr Martin Kramp (France). The aim of the programme is to collect and transmit scientific data from the ocean-atmosphere interface from aboard the 16 metres long sailing yachts of the *Soloceans One-design Class* (branded NAVOSE® - sailing vessel for scientific observation of the environment) during regularly starting around-the-world sailing races.

5.2.7.2.2 The Team noted that a system to pump seawater from the surface of the ocean for oceanographic measurements into the vessels was successfully developed and the prototype installed in October 2009. These flow-through-systems and Météo-France's Automated Weather Station BATOS are the mayor elements of the fully automatic *OceanoScientific® Kit*. In a first step, parameters were (i) wind speed and direction, (ii) air relative humidity, (iii) air temperature, (iv) sea level pressure, (v) SST, (vi) SSS, and (vii) $p\text{CO}_2$.

5.2.7.2.3 The *OceanoScientific® Kit* was successfully tested in December 2009 during a challenging voyage in heavy weather from France to Portugal. The atmospheric data fulfil the

VOSclim recommendations and salinity data contribute to the calibration of satellite systems such as SMOS and AQUARIUS for salinity measurements from space.

5.2.7.2.4 A second version of the *OceanoScientific*[®] Kit has been developed which is now completely autonomous from the other ship systems, and successfully tested in August 2010. The new power supply is an emission free hydro generator at the back of the vessels. Further parameters have been integrated: (viii) photoactive radiation, (ix) fluorescence, (x) pH and (xi) turbidity. The second version was successfully tested in August 2010.

5.2.7.2.5 The vessels of the *Soloceans One-design Class* will participate in already existing and regularly starting mayor offshore races around-the-world, such as Vendée-Globe and Velux-5-Oceans. Additional races, called *OceanoScientific*[®] Challenges, will be organized in the entire Atlantic Ocean and will use scientific reference buoys (such as PIRATA - Prediction and Research Moored Array in the Tropical Atlantic) as waypoints. With this agenda, the *Soloceans One-design Class* will be sailing in the Southern Ocean every year from 2012.

6. REPORTS AND RECOMMENDATIONS BY THE TASK TEAMS

6.1 Task Team on Satellite Communication Systems

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site¹⁵)

6.1.1 The Chairperson of the SOT Task Team on Satellite Communication Systems (TT-SatCom), Mr Pierre Blouch (Météo-France), reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V.

6.1.2 The team revised the list of Inmarsat-C Land Earth Stations (LES) accepting Special Access Code (SAC) number 41 (SAC-41) messages and proposed a new presentation of it. No new LES station was added but the new table clarifies which national meteorological services are incurring the costs. Météo-France built a couple of tables showing the GTS data-flow of VOS observations, according to the country of recruitment and the LES stations. The table is given in Appendix A of SOT-VI preparatory document No. 6.1.

6.1.3 In order to assess the amount of communication costs borne by each National Meteorological Service (NMS), the TT-SatCom needs to know which system is mainly used by each individual VOS. A list of communications types for WMO Publication No. 47 (Pub47) metadata element psST (satellite system for transmitting observations) was proposed to the Task Team on WMO Publication No. 47 metadata (TT-Pub47) which endorsed it. E-SURFMAR accepted to maintain this list on the E-SURFMAR website¹⁶.

6.1.4 The Team noted the increasing use of Iridium Short Burst Data (SBD) to report Shipboard Automatic Weather Station (S-AWS) data. As for drifting buoys, the system appears being very efficient in terms of cost, reliability and timeliness. The bi-directional communication is also very convenient to remotely change configurations.

6.1.5 Mr Blouch finally reported on the different ways, which may be used to report VOS observations onto the Global Telecommunication System (GTS) in BUFR¹⁷. The costs of transmissions as well as the requirements of users in terms of metadata and VOSclim parameters in addition to the usual observed data have been considered. The Team made a few recommendations, which are listed here below.

15 : <http://www.jcomm.info/sot-tt-satcom>

16: <ftp://esurfmar.meteo.fr/pub/Pub47/>

17: FM-94 BUFR: Binary Universal Form for the Representation of Meteorological Data

6.1.6 The meeting noted that Météo-France started the transmission of VOS data in BUFR onto the GTS for BATOS and BAROS S-AWS according to the B/C10¹⁸ template (about 80 stations, 25,000 observations per month). The data are still transmitted in FM13-SHIP code, in parallel.

6.1.7 The meeting made the following recommendations:

- (i) VOS operators should endeavour to restrict the use of SAC 41 to manual VOS observations.
- (ii) VOS operators to invite shipmasters (and shipowners) to report their observations by emails if they wish (if observations can be sent immediately).
- (iii) VOS operators to consider the use of the “half compression” technique¹⁹ to report manned observations ashore through TurboWin and Inmarsat-C in conjunction with financial arrangements and the procurement of dedicated SACs by communication providers (the Team noted that the “half compressed” technique particularly permits the transmission of the extra VOSclim parameters).
- (iv) VOS operators to use cost effective communication systems such as Iridium SBD for their Automatic Weather Stations

6.1.8 The meeting decided on the following action items:

- (iii) The new list of Inmarsat-C Land Earth Stations accepting SAC-41 messages to be published on the WMO website (**action; Secretariat; asap**);
- (iv) TT-SatCom to establish comprehensive statistics on the ways used by VOS to report their observations ashore, thanks to the prST communication types entered into Pub47 by VOS operators (**action; TT-SatCom; SOT-VII**).

6.1.9 Satellite data telecommunication issues are further discussed under agenda item 11,1.

6.2 Task Team on ASAP

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²⁰)

6.2.1 The SOT Task Team Chairperson on ASAP, Mr Rudolf Krockauer (DWD, Germany), reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V. His report focused on the EUMETNET ASAP (E-ASAP) as E-ASAP is the only programme worldwide which is based on a fleet of commercial vessels (except two research ships and one hospital ship). Mr Krockauer reported that the number of ships which routinely provide upper air soundings on the GTS throughout the year is about 20 worldwide.

6.2.2 So far, there were two significant ASAP programmes: The European programme E-ASAP with 12-18 ships in 2009-2010 and the Japanese programme with 5 ASAP stations on research ships. Since the Japanese fleet was reduced to 2 ships in 2010, E-ASAP is currently the only considerable fleet worldwide.

6.2.3 The number of E-ASAP stations was increased from 12 in January 2009 to 18 in December 2010 by re-installation of ‘laid up’ stations and acquisition of replacement ships.

18: BC/10: Regulations for reporting SHIP data in TDCF (TM308009) - http://www.wmo.int/pages/prog/www/WMOCodes/BC_Regulations/BC10-SHIP.pdf

19: http://esurfmar.meteo.fr/doc/o/vos/E-SURFMAR_VOS_formats_v011.pdf

20: <http://www.jcomm.info/sot-tt-asap>

Additionally, the Icelandic ASAP station ASIS01 was re-installed as temporary land station Egilsstadir in NE-Iceland. All E-ASAP ships are reporting their observations through Iridium satellite data telecommunication system. By February 2011, eleven ships were reporting high resolution data in BUFR and TEMP-SHIP format. The total number of E-ASAP soundings on the GTS was around 4950 in 2010. 87% of the launches were received from the GTS. The main reasons for failed launches are (i) technical problems of the equipment due to the permanent vibrations on board; (ii) unfavourable wind conditions at 15-20 knots sailing speed; (iii) un-experienced operators; and (iv) poor satellite communication.

6.2.4 In 2010 the Japanese ASAP fleet was reduced from 5 to 2 stations. Due to financial constraints, no launches were performed on board the South African ASAP ship SA Agulhas in 2009-2010. The Norwegian weather ship POLARFRONT used to perform 4 soundings per day (around 110 per month), but terminated all sounding operations in Nov 2009 due to financial reasons. Occasionally there are some research vessels, which perform soundings during certain research campaigns. However, these activities are usually limited to some weeks.

6.2.5 Mr Krockauer recalled the basic differences between land-based and ship-based ASAP sounding operations, and presented the Shed Launcher prototype, which provides shelter against wind and rain when rotated in leeward position, requires no regular maintenance, and is in operations by E-ASAP since January 2010.

6.2.6 The Team noted that 6011 soundings were received in 2010 from all ASAP stations worldwide (82% from E-ASAP, 7% from R/V POLARSTERN, and 11% from all other ships).

6.2.7 The Team noted the trials for a Data Targeting System (DTS) experienced by the UK Metoffice and ECMWF, and which aim is to deliver additional meteorological observations over key sensitive regions, which are defined on a case by case basis. Extra launches were performed by E-ASAP as part of the DTS trial, which confirmed the capabilities of targeted observations. However, special procedures would have to be implemented in an operational DTS to take into account the movement of the ASAP stations.

6.2.8 Several impact studies confirm the positive impact of ASAP soundings on Numerical Weather Prediction (NWP). According to such studies, The Team agreed that even small ASAP fleets can help to mitigate the impact of extreme weather. The Team encouraged its members to investigate potential co-operations with other Met Services to set up and operate ASAP stations on board merchant vessels in line service (**action; SOT members; ongoing**).

6.2.9 ASAP monitoring issues are discussed under the VOS Panel session in agenda item 9.1.5. ASAP Trust Fund issues are discussed under agenda item 13.3.

6.2.10 The Team agreed that Research Vessels, and navy ships should be more often used as platforms for the making of ASAP soundings, and their data reported on GTS, and invited Shawn Smith to coordinate the effort – with assistance from Team members – of contacting Research Organizations and Navies in order to seek their cooperation in this regard (**action; S. Smith; SOT-VII**). The Team noted that wind profiler data should also be of value and could be investigated.

6.3 Task Team on VOS Recruitment and Programme Promotion

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²¹)

6.3.1 The Chair of the Task Team on VOS Recruitment and Programme Promotion, Ms Julie Fletcher (Meteorological Service, New Zealand) reported on the activities of the Task Team during the last inter-sessional period. The two Action Items from SOT-V have been completed, and the

²¹ : <http://www.jcomm.info/sot-tt-vosrpp>

Team reviewed the current status and ongoing practices, which support each of the terms of reference (ToRs) for the Task Team.

6.3.2 With regards to the first ToR (i.e. the ship design standard), the Team noted with concern that the high level discussions between WMO and IMO are slow but encouraged the WMO Secretariat to continue promoting the issue with the IMO through appropriate channels. An informal meeting between UKMO and ICS in March 2011, signalled that it might be preferable to raise the issue within one of their ICS committees in an attempt to bring their member associations on side before any formal submission is made to IMO.

6.3.3 In reviewing the VOS promotional aids (second ToR), it was agreed that the VOS brochure needs to be updated to include VOSClim as a class of VOS, and reference added to other ocean observing systems, e.g. ASAP, SOOP etc. Some more scientific studies showing the impact of VOS data had been identified and put on the VOS web site.

6.3.4 The Team had reviewed several JCOMM publications (sixth ToR), in particular updating them with regards to the new VOS classes, but other publications still await review.

6.3.5 Ms Fletcher reported on discussion with the Chair of the Task Team on VOSClim (TT-VOSClim), Mr Alan Hall (USA) about the continued need for a TT-VOSClim, now that the VOSClim project has finished and VOSClim has been incorporated as a class of VOS. In order to support climate quality data, it was agreed that it was important to keep the profile of VOSClim at a high level, and whilst the TT-VOSClim could be dispensed with, someone was still required to champion and promote the cause of VOSClim. This person is hereafter referred to as the VOSClim Focal Point (VOSClim FP). The Team agreed that including a VOSClim FP under the TT-VRPP would make good sense, as this TT is focused on recruitment and promotion.

6.3.6 The team proposed some changes to the TT TOR and agreed that the VOSClim FP, the DAC and the scientific advisors become members of the TT. The new adopted Terms of Reference and membership for the Task Team are provided in [Annex V](#).

6.3.7 The Team made the following **recommendations**:

1. WMO to resume high level discussions on a regular basis with IMO to promote VOS issues (**action; WMO; ongoing**). The JCOMM Management Committee was invited to support this initiative (**action; MAN; Sept 2011**).
2. The VOS brochure and/or a Poster to be updated by the Secretariat to reflect current VOS status and other related activities, and new draft version submitted to the TT-Chair for review, further editing, and approval by the Task Team (**action; WMO Secretariat; Dec 2011**);
3. That a VOSClim Focal Point be appointed to join the TT-VRPP (**action; TT-VRPP; asap**);
4. The TOR for the TT-VRPP be amended to include an emphasis on VOSClim class requirements (**action; TT-VRPP; asap**);
5. The TT-VRPP membership to be expanded to include that the VOSClim FP, the DAC and the scientific advisors (**action; TT-VRPP; asap**);
6. The new focal point on VOSClim was requested to contact the scientific advisors for further advice, in particular regarding the need to continue to maintain the list of VOSClim National Focal Points (**action; VOSClim FP; SOT-VI**).

6.4 Task Team on Metadata for WMO-No. 47

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²²)

6.4.1 The Chair of the Task Team on Metadata for WMO Publication No. 47 (TT-Pub47), Mr Graeme Ball (BOM, Australia), reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V. The Team reviewed the status of national submissions of metadata to WMO and was invited to support a proposal to voluntarily use a recommended list of communications types for Pub47 metadata element **prST** (satellite system for transmitting observations).

6.4.2 The TT-Pub47 collaborated with the Task Team on Satellite Communication Systems (TT-Satcom) regarding a proposal to introduce a table for the element prST, the satellite system for transmitting observations from ship to shore. Both Task Teams agreed on the need for a table. However, the logistics and time to implement a new table resulted in a suggested list of communication types being proposed rather than a mandatory table.

6.4.3 The TT-Pub47 also reported that most countries were now using XML to send their quarterly Pub47 lists to WMO and that only New Zealand and Australia had responded to the call at SOT-V to regularly submit monthly Pub47 files.

6.4.4 Mr Ball also reported that he and Ms Fletcher (Chair, VOSP) had updated the WMO Guide to Marine Meteorological Service (WMO No. 471, Ch 8), primarily for the changes in VOS classes approved at SOT-V in preparation for approval at JCOMM-III.

6.4.5 WMO No 47, Version No. 3 (document revision 3.4) was issued on 25 February 2010. This release incorporated the changes endorsed at SOT-V and subsequently approved at JCOMM-III.

6.4.6 The Team made the following recommendations:

- i. VOS Operators to use the list of approved prST communication types when submitting their national VOS lists to WMO (**action; VOS members; ongoing**).
- ii. The TT-Satcom to maintain the list of prST communication types on the E-SURFMAR website (**action; TT-Satcom; asap & ongoing**);
- iii. VOS Operators to contact the TT-Satcom if additional communication types are required (**action; VOS members; ongoing**);
- iv. The TT-Pub47 to publish the URL of the prST list in the next update of WMO No. 47 (**action; TT-Pub47; asap**).
- v. To include spd (*maximum operating speed of the vessel on normal service*) as a new Pub47 metadata element (to come into force after JCOMM-IV approval).
- vi. The Task Team TT-Pub47 to prepare a submission to JCOMM-IV regarding the proposed changes to Pub47 for (1) spd – maximum operating speed of the vessel on normal service, and (2) changes to the element prST from a text field to a formal table and the introduction of an associated footnote field (**action; TT-Pub47; JCOMM-IV**)
- vii. The Team reaffirms that VOS Operators, in particular those outside of E-SURFMAR, submit their national VOF list monthly if possible (**action; VOS members; ongoing**);
- viii. The ETMC should continue being responsible for proposing metadata elements as part of the ODAS metadata format (**action; ETMC; ongoing**);

22 : <http://www.jcomm.info/sot-tt-pub47>

- ix. Replacing Yvonne Cook (CA) and Robert Luke (USA) with Gerie Lynn Lavigne (CA) and John Wasserman (USA) respectively.

6.4.7 The Team requested the TT-Pub47, the ETMC, and the DBCP TT on Moored Buoys to coordinate between themselves in liaison with the DMCG and make sure that the requirements for Rigs and Platforms metadata and for automated systems installed on offshore platforms in particular are well considered (**action; TT-Pub47; SOT-VII**)

6.5 Task Team on Instrument Standards

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²³)

6.5.1 The Chair of the Task Team on Instrument Standards (TT-IS), Mr Henry Kleta (DWD, Germany), reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V.

6.5.2 The report addressed the key issues assigned to the Team in its Terms of Reference and identified the key areas where progress has been made since SOT V. The report invites the SOT to consider carefully how the project should develop in the future, so that it can help to raise the climate quality of data within VOS, and thereby contribute to the Global Climate Observing System (GCOS). The report included information on (i) Instrument Standards Guidelines, (ii) Instrument Standards Equipment Status Report, a proposal for an AWS Intercomparison, and the Status of actions agreed at SOT V.

6.5.3 The Team agreed in principle with the proposal of an AWS intercomparison study. However, the team recognized that the amount of information available at this point is not sufficient to perform a meaningful intercomparison. The Team requested the TT-IS to continue to collect information from AWS systems used by SOT members in the view to have sufficient materials to eventually perform the intercomparison and be able draw significant conclusions from the available information (**action; TT-IS; SOT-VII**).

6.5.4 Furthermore the Task Team proposes an in-field intercomparison. For this purpose systems could i.e. get provided to the chair of the Task Team, as he has permanent access to a land based test facility (located in Hamburg, Germany at DWD premises) and possibly even to a Research Vessel.

6.5.5 The Team encouraged members to continue to update their equipment information and instrumentation standards to the TT-IS.

6.5.6 The Team noted and agreed with the changes to the chairmanship (i.e. now Mr Henry Kleta – Germany) and the membership of the Task Team. The Team revised the Task Teams Terms of Reference, to reflect the proposed changes to the project. New Terms of Reference and membership for the Task Team are given in [Annex V](#). The Team recalled that the management of the Task Teams membership is the responsibility of the Task Team chairs.

6.5.7 The Team invited Japan to provide information on their AWS to the Chair of the Task Team (**action; Japan; end 2011**).

6.6 Task Team on Call Sign Masking and Encoding

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²⁴)

23 : <http://www.jcomm.info/sot-tt-is>

24: <http://www.jcomm.info/sot-tt-masking>

6.6.1 The Chair of the Task Team on Call Sign Masking and Encoding, Mr Graeme Ball (BOM, Australia) reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V. The Meeting particularly reviewed the status of ship masking schemes implemented by Members in line with WMO Executive Council Resolution 27 (EC-LIX).

6.6.2 The major activity of the Task Team during the intersessional period was the development of the **ENCODE** encryption strategy, under the lead of Scott Woodruff. The **ENCODE** strategy was developed as part of a future scheme that will have to be universally accepted by all parties. In particular, the Team agreed that except for the navies, those Members currently using **SHIP** for the real-time distribution of VOS reports on GTS should eventually switch to using **ENCODE**, a solution that will satisfy their concerns while being more acceptable to the quality monitoring centres, and long-term archives. The Team also agreed that those Members currently using **REAL** or **MASK** should be able to continue to do so.

6.6.3 **ENCODE** produces a unique and non-repeating identifier and is derived by encrypting the callsign²⁵. This identifier replaces the callsign in BUFR and is inserted – on shore – in BUFR GTS reports by the NMS receiving the original data from the ship for GTS distribution of the data in real-time.

6.6.4 On receipt of an **ENCODE** BUFR message, the receiving agency must be in possession of a decoding key to be able to decode the callsign. An agency without the decoding key cannot decode the callsign.

6.6.5 The Team agreed that standard, preferably open-source (non proprietary), software permitting to decode the data shall be made available to end users free of charge. The Team noted that Governance for the management of keys, based on formal authorization from the Permanent Representatives of countries with WMO would have to be proposed and agreed upon.

6.6.6 The Team agreed with the Expert Team on Marine Climatology (ETMC) perspective emphasizing that incorporating un-masked VOS GTS data historically²⁶ eventually into key climate databases including ICOADS remains a critical requirement to support the research community but also a significant challenge (and not adequately resourced at present).

6.6.7 The TT-Masking also considered a **MASK** proposal from the Korea Meteorological Administration (KMA). KMA was approved to use the **MASK** scheme B2K0000 – B2K9999.

6.6.8 The Team agreed on the following actions:

1. The Team provisionally endorsed the **ENCODE** proposal as an eventual replacement for the **SHIP** scheme, and optionally also for the **MASK** scheme (used exclusively for callsign masking), and requested the Task Team on Callsign Masking and Encoding to liaise with the JCOMM DMPA Task Team on Table Driven Codes (TT-TDC), consult with operational users of the data and GTS routing centres (e.g. AOML/SEAS, NOAA Gateway, ECMWF), Japan, and update the proposal to reflect the SOT preference for option 'b' and to elaborate in more detail the governance regarding the management of the keys (**action; TT-Masking; Aug. 2011**). The TT was also invited to consider whether it would be realistic to propose that all automated systems eventually use MASK.
2. The new BUFR descriptors, templates, and BUFR table entries constituting the proposal shall then be submitted to the CBS Inter Programme Expert Team on Data Representation and Codes (IPET-DRC) for its meeting in Geneva, Switzerland, September 2010 (**action;**

25: Originally it was envisioned the ENCODE encryption might require also utilizing other elements in the message in order to introduce "variability, e.g. latitude + longitude + date + time, however the methods that have been reviewed take care of this automatically.

26: i.e. primarily back to –Dec. 2007 when masking accelerates in available GTS data

SOT Chair; Sept 2011) in the view to have the proposal endorsed by the CBS-XV in 2012 for inclusion of appropriate elements in the WMO Manual on Codes.

3. The Team also requested the TT-Masking to find, or possibly develop, and propose standard software for the encoding and decoding of encrypted callsigns (**action; TT Masking; Sep 2011**).
4. The TT-Masking recommends to replace Hester Viola (former SOT TC) with Mathieu Belbéoch (current SOT TC) and Robert Luke (USA) with John Wasserman (USA) in its membership.

6.6.9 The Team noted that the universally accepted solution – once agreed – may take some time to implement because of required the re-negotiations with the shipping companies in some countries.

6.7 Task Team on VOSClim

(The Terms of Reference and membership of the Task Team are detailed on the JCOMM web site²⁷)

6.7.1 The Chair of the Task Team on VOSClim, Mr Alan Hall (NOAA/NCDC, USA), reported via teleconference on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-V. The VOSClim project is now and has been operationally mature for many years. Levels of ship participation set by the SOT have been met (there are now 368 VOSClim ships in the VOS fleet) and the data flow processes are now operating as required with the relevant datasets readily available to users via the project website.

6.7.2 Mr Hall recalled that several exciting recommendations and adaptation of VOSClim as a new Class of reporting ship within the VOS Scheme was accepted by JCOMM-III. Promotion of the VOSClim within the intercessional has been on-going. Papers and posters were presented at two conferences demonstrating the need for better ocean observations. The U.S VOS program has implemented VOSClim elements and IMMT III into their shipboard software (SEAS); and the UK VOS program has adopted a multi-year plan to enhance all of their VOS fleet to VOSClim where appropriate. The Team noted, however, that although in the initial phases of the project the value of VOSClim observations is better than other VOS reporting ships; little more has been accomplished to further this assertion.

6.7.3 The Team recommended broadening efforts of the UK VOS program to other Member/Member states in order to raise the climate quality of data from the wider VOS, and thereby contribute to the Global Climate Observing System (GCOS). The Team therefore invited VOS operators to consider adapting the UK plan as detailed in Annex 4 of [Annex VII](#) to their needs as appropriate (**action; VOS members; ongoing**).

6.7.4 Recalling the discussions under item 6.3, the Team concurred with the TT-VOSClim recommendation to include a VOSClim Focal Point, the DAC representative, and the Scientific Advisers as members of the TT-VRPP. Recognizing that the VOSClim has been a good example of how research activities transitioned into an operational activity, the Team also agreed that the TT-VOSClim should now come to an end.

6.7.5 Regarding the VOSClim Data Assembly Centre (DAC), the Team recalled that during the project phase of VOSClim it was important to keep the collected data readily available for the science team and others. However, now that the VOSClim project phase has come to an end, the Team wondered whether there is still a need for a separate collection of the data. After discussion, the Team agreed that it would be useful to keep all relevant information and activities related to VOSClim with the DAC (currently NOAA's National Climatic Data Center in Asheville, NC USA).

27 : <http://www.jcomm.info/sot-tt-vosclim>

6.7.6 The Team agreed with the Task Team recommendation that any observational data be made available via normal distribution methods (e.g. via the ICOADS²⁸) and discontinue the separate collection at the DAC. Distinctions within ICOADS and IMMT have already been employed to identify an observation is of the VOSclim class. The Team agreed that there is no longer any need keep a separate collection.

6.7.7 The Team discussed the status of the VOSclim project, and whether the VOSclim logo, certificate, website, ship list, and contact points should be maintained, and agreed with the following:

- Logo and certificate: a new logo should be proposed by the new VOSclim Focal Point (VFP). The certificate is useful and should be preserved. The VFP was invited to redesign the logo and certificate (**action; VFP; end 2011**);
- Website: should be maintained for the time being;
- Ship list: the list is still needed. E-SURFMAR was invited to provide sub-lists of VOSclim ships to the DAC (**action; new focal point to liaise with Pierre Blouch**). When IMMT-4 will be used more widely it will be possible to identify observations as VOSclim;
- Contact points: the list of VOSclim contact points should continue to be maintained in the JCOMM web site.

6.7.8 Detailed report by the Task Team is provided in [Annex VII](#). See also the discussion about the VOSclim DAC under agenda item 9.1.4.

7. SEVENTH SESSION OF THE VOS PANEL (VOSP-VII)

7.1 Programme Review

7.1.1 Report by the VOSP Chairperson

7.1.1.1 The VOS Panel Chairperson, Ms Julie Fletcher (MetService, New Zealand), opened the seventh Session of the VOS Panel. She reported on activities undertaken during the last intersessional period (May 2009 – April 2011). There has been a lot of activity within the Panel, with most work being achieved by email, but meetings with the SOT Chair, WMO Secretariat and some Panel members took place at DBCP-25, Paris, October 2009, Australian Port Meteorological Agent (PMA) Workshop, Melbourne, Australia, April 2010 and the fourth International Workshop of Port Meteorological Officers (PMOs / PMO-IV), Orlando, USA, December 2010. Of the work undertaken, two of the most significant achievements were the introduction of the new VOS classes, and the very successful International PMO Workshop.

7.1.1.2 Ms Fletcher commented that two years ago, world shipping was in a state of dire retrenchment, but since then there has been a gradual recovery with new builds coming into service and more stability as shipping companies consolidated fleets and routes. The recent practice of slow steaming to save fuel costs has increased the numbers of ships on the major trade routes. The VOS Panel needs to work hard to promote the VOS programme and to get ship owners to incorporate space for meteorological/scientific instruments at the build stage. While shipping numbers remain flat, National Meteorological Services (NMS) and PMOs were urged to maximize the effectiveness of their existing fleets by encouraging observers to maintain a six hourly reporting regime throughout their entire voyage.

7.1.1.3 Ms Fletcher reported on the status of the PMO Global network. She recalled that at the fifth SOT Session (SOT-V, Geneva, May 2009), the VOS Panel again reinforced the view that PMOs play an important role in all of the observing programs of the SOT. In terms of the VOS Scheme, they play a vital role in maintaining the strength of the VOS Scheme, as well as

28: International Comprehensive Ocean Atmosphere Data Set - <http://coads.noaa.gov/>

contributing to the volume and frequency of accurate observations. Port Meteorological Officers' Roles and Responsibilities are provided in Appendix A of SOV-VI preparatory document No. 7.1.

7.1.1.4 The completion of the VOSclim Project and the integration of VOSclim as a class of VOS was a significant development for the VOS scheme. The classes used to describe the type of meteorological reporting ship were expanded from the traditional three classes (Selected, Supplementary and Auxiliary) to include VOSclim, and four sub-classes of Automatic Weather Stations (AWS). A new Pub47 metadata table was developed for these classes and the new classes became effective from 1 July 2010. NMS are urged to upgrade as many of their ships as practicable to VOSclim class, and the plan by the UKMO to greatly increase their VOSclim numbers could be used as an example of how to implement this (**action; VOS operators; ongoing**).

7.1.1.5 The range and capability of the VOS quality monitoring tools developed by Météo France and the Regional Specialized Meteorological Centre (RSMC) of Exeter, United Kingdom, has further improved during the last two years. Ms Fletcher reported that these tools were given good exposure at PMO-IV and that as a result, usage of the tools is expected to increase. New tools such as the Network of European Meteorological Services (EUMETNET) generated 'Observations Monitoring Report' for individual ships, and the UK VOS ranking lists, were demonstrated and VOS operators were urged to become familiar with the tools and use them as appropriate (**action; VOS operators; ongoing**).

7.1.1.6 There has been frustration in the past that the WMO Publication No. 47 (Pub47) metadata on the WMO website has been out of date. The situation has improved recently and at March 2011, the latest dataset available was for the third quarter of 2010. Since July 2009, WMO has been copying the national metadata submissions to EUMETNET Surface Marine Programme (ESURFMAR) and the JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS), so current metadata can be sourced on a daily basis from the E-SURFMAR database. Forms to collect the Pub47 metadata, and tools to generate the XML output are available on the VOS website²⁹ for countries, which do not have a database to produce the required outputs.

7.1.1.7 JCOMMOPS has developed some new maps and graphical products to display VOS numbers, global coverage, and variables reported. Resource issues have meant that unfortunately these products have not been routinely available every month.

7.1.1.8 This year much work will be done in readiness for the transition to the BUFR³⁰ code. NMS are urged to follow the timetable proposed by the JCOMM Data Management Programme Area (DMPA) Task Team on Table Driven Codes. Details can be found in SOT-VI preparatory document No. 9.2 "Coding Requirements" and in the SOT Task Team on Satellite Data Telecommunication Systems (TT-Satcom) report at Annex 3 entitled "Migration of Ships Data to BUFR." VOS operators need to understand the options for encoding data into BUFR and discussion on this topic during SOT-VI should help this process.

7.1.2 Recommendations from the Fourth International PMO workshop

7.1.2.1 The Fourth International PMO Conference (PMO-IV) and support to Global Ocean Observations using Ship Logistics meeting in Orlando, 8-10 December 2010, was successful in promoting common standards and practices and strengthening co-operation between PMOs. The workshop was officially co-sponsored by the WMO and the National Weather Service of the National Oceanic and Atmospheric Administration (USA). It was attended by 67 participants from 25 countries, of which, 13 countries had existing VOS programmes. The Panel thanked USA for having organized and hosting the workshop.

7.1.2.2 The agenda covered developments since the third PMO workshop (PMO-III), Hamburg, Germany, March 2006, and provided in depth information on all aspects of operating a VOS

29 : <http://www.bom.gov.au/jcomm/vos/resources.html>

30 : FM-94 BUFR: Binary Universal Form for the Representation of meteorological data

programme from recruitment to quality control of data. In addition to the traditional VOS functions, other marine activities where PMOs could provide support and logistics, e.g. Argo, Buoys, SOOP and ASAP were highlighted. The Workshop resulted in a greater awareness of standard global VOS practices, tools and methods.

7.1.2.3 As a result of the discussions, 21 recommendations were made, plus one advisory to PMOs, and 13 recommendations by the workshop in terms of ship support to global ocean observations. As a capacity building measure, the workshop recommended the establishment of a DBCP/SOT drifter donation programme (VOS-DP) to assist countries with no VOS programmes to get started. The donated drifter would be installed onboard a newly recruited ship as an autonomous AWS to provide a low cost, quality observation solution. The Panel endorsed all of the workshop's recommendations, which are summarized in Appendix F of SOT-VI preparatory document No. 2.1. The Team requested the Secretariat to promote the VOS-DP with WMO Members by mean of a letter to the Permanent Representatives of the WMO (**action; WMO Secretariat; SOT-VII**).

7.1.2.4 The Panel agreed that a Fifth International PMO Workshop should be organized in 2014 or 2015. The Panel noted the kind offer made by Chile at PMO-IV to host the workshop in Chile and agreed with the proposal in principle. It asked the Secretariat to liaise with Chile in this regard (**action; Secretariat and Chile; 2014**). Recognizing that the success of PMO workshops also relies on the availability of financial resources to permit the participation of PMOs from developing countries, the Team invited its members to consider providing financial resources through the VCP in support of PMO workshops (**action; SOT members; 2014**).

7.1.2.5 The Team agreed that the VOS strategies should be adjusted to address the requirements for sea surface meteorology, and promote the VOS programme in particular for the making of higher quality measurements to address new requirements such as GFCS. This will be done as part as the updated SOT implementation strategy as discussed under agenda item 5.1.2.

7.1.3 Report on the E-SURFMAR VOS Technical Advisory Group (VOS-TAG)

7.1.3.1 Mr Pierre Blouch (France) reported on the activities by the Surface Marine Observation Programme (E-SURFMAR), an optional programme of the Network of European Meteorological Services (EUMETNET) Composite Observing System (EUCOS), and in particular on its VOS Technical Advisory Group (VOS-TAG).

7.1.3.2 Although some of the topics were discussed in detail under other agenda items, Mr Blouch drew the meeting's attention to a number of developments carried out since SOT-V. In particular:

- (i.) The recent decision of EUMETNET members to extend the scope of EUCOS observations to climatology and 1km scale Numerical Weather Prediction (NWP) model requirements.
- (ii.) The automation of the observation onboard ships, which is a priority for the programme.
- (iii.) The existence of an E-SURFMAR fleet of Shipborne Automatic Weather Stations (S-AWS) for the objectives of the programme.
- (iv.) The preparation of a common call for tender for the procurement of S-AWS satisfying the programme as well as participant members for their own needs.
- (v.) The use of specific data formats to transmit observation data ashore, both for S-AWS (BATOS and BAROS for the time being) and conventional VOS. These latest should use the "half compression" technique developed a few years ago and which allows reducing communication costs. KNMI plans to deploy it on their VOS. TurboWin may generate such messages which are sent to dedicated Special Access Codes (SAC) through Inmarsat-C.
- (vi.) The proper functioning of the E-SURFMAR metadata database, which is continuously improved. New developed functions include: management of inspection reports, issuing

- of quality reports (feedback to observers), access to monitoring tools, management of recruitment requests, etc.
- (vii.) The improvements of E-SURFMAR monitoring tools for VOS and data buoys, which are not restricted to EUMETNET members/platforms. New features include the monitoring of transmission delays as well as a blacklist of ships having reported more than 1.5 % of dubious positions over the past two weeks.
 - (viii.) The results of studies made by the United Kingdom Met Office and the European Centre for Medium-Range Weather Forecasts (ECMWF) on the quality and impact of surface marine data on NWP models.

7.1.3.3 Mr Blouch also informed the meeting that Météo-France has been reporting all BATOS and BAROS S-AWS data in BUFR³¹ onto the Global Telecommunication System (GTS) – in parallel of FM13-SHIP messages –, for a few weeks according to the B/C10³² BUFR template (about 80 stations at all, 25,000 observations per month).

7.1.3.4 The meeting noted again that about fifty percent of the operational VOS worldwide were recruited by E-SURFMAR and that all VOS operators could benefit from the E-SURFMAR experience.

7.1.3.5 The Team noted with interest the recent decision of E-SURFMAR to manage the Pub47 metadata of European fixed platforms and rigs in their database. Two non-official VOS classes were created for that purpose: 90 for manned platforms and rigs; 95 for platform and rig AWSs. The related metadata will not be officially submitted to WMO but will be made available on the E-SURFMAR FTP site among the VOS Pub47 metadata.

7.2 Programme Status and Implementation

7.2.1 VOS status, trends and developments

7.2.1.1 The Panel reviewed the status of the VOS fleet, including trends in recent years, and considered proposals for the evolution of the fleet, in particular taking into account the integration of the VOSclim fleet in the wider VOS, and the increasing demand for high quality observations to serve the needs of the developing Global Framework for Climate Service (GFCS).

7.2.1.2 The panel noted that about 25 countries operated VOS fleets, with approximately 4000 ships listed as being part of the global VOS. During any one month, about 2000 ships report, providing around 151,000 observations per month (figure based on February 2011). In March 2011, there were 368 VOSclim class ships, about 9% of global VOS. PMO-IV (Orlando) discussed strategies to increase numbers of ships and observations, such as getting ‘inactive’ ships to report, and increasing the numbers of observations prepared per day by existing ships.

7.2.1.3 VOS operators and PMOs were urged to upgrade as many ships as possible to VOSclim class standard (**action; VOS operators & PMOS; ongoing**). The descriptions of the new VOS classes for Pub47 Table 2202 are given in [Annex XVIII](#). Recalling the discussion under item 6.7, at PMO-IV, the UKMO presented an initiative to upgrade their fleet from 50 VOSclim class ships to a target of 200 VOSclim class ships over the next three years. This model could be used as an example for other NMS to follow (see proposed action under section 6.7). The full report of the UK VOSclim proposal is detailed in Annex 4 of [Annex VII](#).

7.2.1.4 The panel reviewed the maps and graphs prepared by JCOMMOPS showing VOS status, coverage and the variables reported. These SOT products are available from the web³³.

31: FM-94 BUFR: Binary Universal Form for the Representation of meteorological data

32: BC/10: Regulations for reporting SHIP data in TDCF (TM308009) - http://www.wmo.int/pages/prog/www/WMOCodes/BC_Regulations/BC10-SHIP.pdf

33: <ftp://ftp.jcommops.org/sot/VOS/Maps>
<ftp://ftp.jcommops.org/sot/Maps>

7.2.1.5 The panel considered a range of metrics, which could be used to measure the uptake of VOSclim class. Because of the voluntary nature of the ship observing programme, and the fact that PMOs have no influence over global shipping trends, it was agreed that any metrics should not be too prescriptive. Performance metrics to quantify quality, quantity and timeliness of the VOS observations were proposed. **See recommendations 7.2.4.**

7.2.1.6 The Team requested that national VOS Programme Managers ensure that the monthly VOSclim suspect list is provided to PMOs for immediate action as necessary (**action; VOS operators & PMOs; ongoing**).

7.2.1.7 The Team requested JCOMMOPS to develop and make routinely available dedicated monitoring tools for the VOSclim status (**action; TC; SOT-VII**).

7.2.2 VOS automation and electronic logbook software

7.2.2.1 The VOSP recognized the importance of enhancing the automation of all aspects of shipboard procedures, from observation through to message transmission using readily available software and hardware. The number of e-logbooks in use increased steadily between 2003 and 2008, but numbers have remained mostly steady over the last two years, as operators have now equipped the majority of their fleets. The number of operational AWS shipboard systems has continued to increase slowly, and plans for 2011 indicate continued growth. The VOS Panel has been working to increase the usage of e-logbooks and recommended that Members should increasingly implement automated systems on their fleets, while at the same time recognizing the requirements expressed by the Expert Team on Marine Climatology (ETMC) that traditional variables which can only be observed manually should continue to be submitted.

7.2.2.2 With regards to the introduction of BUFR, the three E-logbook manufacturers (NOAA, JMA and KNMI) indicated that at this stage they do not intend to change their software to enable BUFR messages to be sent from ship to shore, but rather that the BUFR messages will be compiled at the NMS processing centres. Further discussion on this topic is encouraged under SOT-VI Agenda item 9.2.1 on BUFR coding.

7.2.2.3 The Panel Chairperson reported on the present status of the VOS Automation and associated problems as reported by VOS operators in their annual reports to SOT. The Panel considered initiatives for the enhancement of automation.

7.2.2.4 With many AWS systems reporting hourly data, and some manual VOS ships reporting at non-synoptic hours to suit their duty schedules, it was recommended that NMS ensure that all observations, including hourly and non-synoptic observations are inserted onto the GTS for global dissemination, using the correct Bulletin Header Data Designator T₁T₂A₁A₂ii starting with SNV (action; NMS and GTS insertion centres; ongoing).

7.2.2.5 The 2010 Automation report is at [Annex XII](#).

7.2.3 Review of WMO and related publications

7.2.3.1 The Panel noted that in recent years substantial changes have been made to the relevant chapters of the following WMO and related publications, addressing the making of marine meteorological observations from ships:

- WMO Guide to Meteorological Instruments and Methods of Observation (WMO No. 8) – substantial changes proposed to Part II, Chapter 4, Marine Observations, Section 4.2, Observations from Ships, by the SOT in the framework of the JCOMM Pilot Project for WIGOS, and approved by the WMO Commission for Instruments and Methods of Observations at its fifteenth Session in Helsinki, Finland in September 2010.

- WMO Guide to Marine Meteorological Services (WMO No. 471) – changes proposed by the SOT essentially to reflect modern practices, and the integration of the VOSclim fleet into the wider VOS, and agreed upon by JCOMM-III;
- The VOS Scheme, a Framework Document (JCOMM TR No. 4, revision 2) – changes proposed by the SOT and VOSP Chairs during the last intersessional period to keep consistency with the changes made in the two publications above.

7.2.3.2 In view of the need to integrate marine meteorological and other appropriate oceanographic observations into the WMO Integrated Global Observing System (WIGOS), the Panel agreed that these publications should continue to be reviewed and updated according to the current practices. See agenda items [10.2](#) (WIGOS) and [12.4](#) (Publications and Brochures) for further discussion, and decisions in this regard.

7.2.4. Key Performance Indicators

7.2.4.1 The meeting agreed on Metrics or Key Performance Indicators (KPIs) for VOS and VOSclim as listed below and synthesised in [Annex XIII](#):

1. That the Panel works to upgrade as many ships as practicable to VOSclim class with the aim that 25% of global active VOS³⁴ will be VOSclim class by SOT-7. (Quantity) (**action; VOS operators; 2015**);
2. That all VOS ships aim to meet the reporting criteria of an 'Active ship' by providing an average of 20 Observations per month. (Quantity) (**action; VOS operators; SOT-VII**);
3. That the Panel aims for less than 3% of VOSclim class ships per month being flagged on the Suspect List for Air Pressure. (Quality – this is something PMOs can directly influence) (**action; VOS operators & PMOs & RTMC; SOT-VII**);
4. That the Panel aims for 95% of VOSclim class observations to be received within 120 minutes. (Timeliness) (**action; VOS operators & RTMC; SOT-VII**).

7.2.4.2 The Team noted that currently 18% of the VOS fleet are VOSclim class vessels (out of 2000 active VOS).

7.3. Issues for the VOS

7.3.1 Report on trial of IMO numbers as REAL

7.3.1.1 The Panel reviewed the results of the trial to use Ships IMO numbers to replace the ITU³⁵ callsign for the reporting of un-masked VOS observations in FM-13 SHIP format through the Global Telecommunication System (GTS). Some nine countries participated in the trial during July and August of 2009, and observations identified with IMO numbers were sent through a variety of Inmarsat Land Earth Stations (LES) to National Meteorological Services (NMS) for GTS distribution.

7.3.1.2 The trial use of IMO number instead of ITU callsign demonstrated the ability of most LES and some NMS to deliver receive and process ship observations using this identifier.

7.3.1.3 However, the ingest systems of a number of NMS were unable to recognise the 7-digit IMO identifiers and these NMS advised that significant software changes would be required to

34: The global active VOS is defined as the number of VOS registered in the Pub47 and reporting at least once per month – Today there are about 2000 such ships.

35: ITU: International Telecommunication Union

enable ingest of these messages. With the imminent implementation of BUFR, this work could not be justified.

7.3.1.4 It was therefore recommended that SOT does not proceed with the IMO identifier scheme at this time.

7.3.1.5 Because of the advantages of the use IMO number instead of ITU callsign, e.g. same identifier for the lifetime of a ship, the panel agreed the scheme should be kept under review and revisited when BUFR is implemented.

7.3.2 IMO – report on WMO / IMO actions, progress on MSC circular, etc.

7.3.2.1 The Secretariat reported on activities undertaken in liaison with the International Maritime Organization (IMO) with regard to the promotion of the VOS Scheme and ship design issues.

MSC Circ 1293

7.3.2.1 The Secretariat recalled that the Maritime Safety Committee (MSC) Circular No. 1293, Participation in the WMO Voluntary Observing Ship's (VOS) Scheme had been issued by the International Maritime Organization (IMO) in December 2008. This had been discussed at the previous SOT Session. Some feedback has been received from some maritime companies willing to join the VOS, and these have been invited to liaise with National Focal Points for the VOS, and PMOs as appropriate. A copy of MSC Circ. 1293 is reproduced in Appendix B of SOT-VI document No. 7.3.

Ship design

7.3.2.3 Sarah North reported on the outcome of discussions with the IMO and the International Chamber of Shipping (ICS). The goal is to seek the IMO's classification for a voluntary class of vessel which would consider ship design aspects *fitted* for the installation of meteorological and/or oceanographic equipment on board ships. Some discussions also took place between the WMO Secretariat and the IMO, as a follow-up of a broader IMO-WMO cooperation. In order to obtain a successful support for any proposal that will be submitted to the IMO - Sub-Committee on Ship Design and Equipment, sufficient background information (e.g. "best practices" for observing systems/practices on board ships) will have to be provided, and a previous discussion with key players to support the submission (e.g. ICS and Classification Societies, Maritime Member States) is required. The SOT while recognizing that this process would take time, requested Sarah North to pursue and lead these developments with the support of the WMO Secretariat and report on progress at the next SOT Session (**action; Secretariat / S. North SOT-VII**).

Global Maritime Distress and Safety System (GMDSS)

7.3.2.4 The Team noted the successful expansion of the GMDSS to include five new Arctic Ocean METAREAs, thus enabling provision of weather and sea ice safety information service. WMO has worked in very close collaboration with IMO and IHO to expand the Global Maritime Distress & Safety System (GMDSS) into Arctic waters. The expansion means that ships operating in the harsh Arctic environment can automatically receive vital information about navigational and meteorological hazards and other urgent information to shipping, via five new navigational areas (NAVAREAs) and meteorological areas (METAREAs), as delineated by IMO and WMO respectively, with Canada, the Russian Federation and Norway acting as meteorological Issuing Services for new METAREAs. Following their establishment, in June 2010, the five Arctic NAVAREAs/METAREAs are currently in an "Initial Operational Capability" phase with a transition to "Full Operational Capability" expected in the coming June.

7.3.2.5 The Team noted that the 2010 Edition of the revised IMO/IHO/WMO Manual on Maritime Safety was consistent with the review of the GMDSS. The Team further noted the ongoing

development of an IMO/WMO Worldwide Met-ocean Information and Warning Service (WWMIWS) to complement the existing IMO/IHO Worldwide Navigational Warning Services (WWNWS). The process is expected to be completed in November 2011 with the adoption of an IMO resolution on the subject. The Working Paper approved by the Sub-Committee on Radio-communications and Search and Rescue, at its 15th session is available from the SOT-VI web pages as background material (COMSAR 15/WP.8).

7.3.3 Technology challenges (AIS, LRIT, etc.)

7.3.3.1 The Panel addressed the potential for Automatic Identification System (AIS) to be used for transmitting VOS weather reports. It was noted that following the SOT's participation in the IMO Correspondence Group on AIS, new binary message formats had been issued by IMO as Safety of Navigation Circular SN.1/Circ.289. This Circular contains detailed Guidance on the use of AIS binary messages (now referred to as Application-Specific Messages), which are recommended for international use from 1 January 2013.

7.3.3.2 The AIS message format for the WMO weather observation reports is contained in Table 10.2 to this circular and is can be found in Appendix C of SOT-VI preparatory document No. 7.3. It is considered that the new format, which accords closely with BUFR coding, may in future allow weather observations to be sent via the Very High Frequency (VHF) based AIS system currently required to be carried on International Convention for the Safety of Life at Sea (SOLAS) Convention ships.

7.3.3.3 The Panel also noted that AIS messages are now also being received via low orbiting satellites, such as Orbcomm, thereby allowing real-time vessel tracking in the deep ocean regions that lie beyond VHF coverage. With respect to tracking of ships in the open oceans it was recalled that a SOLAS Chapter V regulation on long-range identification and tracking (LRIT) had entered into force on 1 January 2008, with compliance by 31 December 2008. LRIT is therefore now mandatory for the following ships on international voyages: passenger ships, cargo ships, including high-speed craft, of 300 gross tonnage and upward; and mobile offshore drilling units. The regulations require these ships to automatically, transmit their identity, position and date/time at 6-hour intervals.

7.3.3.4 Noting that E-SURFMAR was planning to use and evaluate the AIS binary format for the collection of VOS data from ship to shore, the Panel requested E-SURFMAR to report back to the Panel via its Chair on its experience and recommendations (**action; P. Blouch; SOT-VII**).

8. NINTH SESSION OF THE SOOP IMPLEMENTATION PANEL (SOOPIP-IX)

8.1 Programme Review

8.1.1 Report by the SOOPIP Chairperson

8.1.1.1 The Panel Chairperson, Dr Gustavo Goni, opened the Ninth Session of the SOOP Implementation Panel (SOOPIP) and reported on his activities on behalf of the Panel during the last intersessional period.

8.1.1.2 It was stressed that the Ship Of Opportunity Program (SOOP) continues being a critical player in the implementation and maintenance of the sustained ocean observing system for climate SOOP works on logistics of working with commercial vessels, data transmission, quality control, and management for XBTs. Following recommendations by the scientific and operational communities ships of the SOOP deploy approximately 25,000 XBTs per year, representing approximately 20% of the upper ocean thermal observations (excluding moorings). A large number of profiles continue to be transmitted in real-time: 18614 in 2009; and 18159 in 2010 with the new implementation of transmissions in real- or near real-time by several countries, particularly Brazil and South Africa.

8.1.1.3 In addition, the SOOP serves as a platform for the deployment of other observational platforms, such as surface drifters and profiling floats, and installation of equipment, such as ThermoSalinoGraphs (TSGs) and pCO₂ systems. Projects originally developed in support of SOOP also serve to help other programs, such as the NOAA SEAS (Ship Environmental Acquisition System), which is used by approximately 1,400 ships to acquire and transmit marine meteorological observations. In addition, the Amver component of SEAS is also widely used by the U.S. Coast Guard in support of search and rescue efforts.

8.1.1.4 Dr Goni particularly reported on the following SOOPIP activities:

- (i.) With the full implementation of Argo floats, the XBT network remains concentrated in the implementation of mostly High Density transects. About half of the plan of XBT lines presented at OceanObs'09 are fully occupied, but financial and logistical constraints are preventing full implementation on all desired lines. A particular loss in 2010 were XBT lines in the North Pacific due to budget constraints.
- (ii.) SOOPIP continues to encourage and facilitate the interaction between the scientific and operational communities operating different ship based multidisciplinary observing platforms, such as pCO₂, XCTDs, TSGs, CPRs, etc.
- (iii.) A strong scientific and operational collaboration has been enhanced in the international community, by: a) sharing the costs of implementing and maintaining XBT transects, b) participation in international efforts to assess XBT biases, c) organizing the First XBT Science Workshop in Melbourne (Australia) in July 2011. XBT observations are being used in scientific studies for variability of western boundary currents, undercurrents, heat transport and heat content. A first draft of a global XBT bibliography is being held on the AOML web page.
- (iv.) The second Fall Rate Equation (FRE) meeting was held in Hamburg (Germany) in September 2010 to review and discuss results obtained from several experiments carried out to evaluate the current FRE since the first XBT FRE workshop held in Miami in 2009.
- (v.) SOOPIP continues to support additional XBT FRE experiments, such as during the PIRATA Northeast Extension cruises, and is currently supporting additional experiments in water tanks, swimming pools, and shallow ocean regions to investigate in more detail the descent of the probes in the upper 30 meters.
- (vi.) SOOPIP continues to support the testing of BUFR format for XBT data transmissions. The first transmission test took place in 2008 and additional testing with NOAA/NCEP and ECMWF started in 2010.
- (vii.) A community white paper (CWP) was presented at the OceanObs'09 conference held in Venice, Italy, 21-25 September, 2009. This paper evaluated the XBT network and made recommendations for future work, including logistics, technology, data transmissions and storage. Members of the SOOPIP also took active participation in other related OceanObs'09 manuscripts, such as those covering GOSUD, VOS, and pCO₂.
- (viii.) A science and technical presentation on the SOOP operations was made at the Global Ocean Surface Underway Data (GOSUD) Pilot Project, held in Ostende (Belgium) in May 2010.
- (ix.) Scientific and technical presentation of the SOOP operations were made at the U.S. International Port Meteorological Offices (Orlando, December 2010), and NOAA Climate Program Office/Climate Observations Division annual meeting (Washington, October 2008). The SOOP panel works with PMOs and specific technical staff to implement lines.

- (x.) The difference among different transmission systems in XBT transects, such as Inmarsat, Iridium and Argos, was evaluated during 2010, and results will be presented at the meeting.
- (xi.) Two U.S. Ship Of Opportunity workshops, hosted by NOAA at AOML were held in the spring of 2009 and 2010, to bring together several U.S. components of the U.S. scientific and operational components of the SOOP and VOS.
- (xii.) With the support of the NOAA's Climate Program Office, the XBT pool for SOOP international partners was maintained to continue with a strong international participation the XBT network. These partners currently receive approximately 2200 probes per year. Major international NOAA partners receiving XBT probes include South Africa (University of Cape Town), France (IRD and University of Paris), Brazil (Federal University of Rio Grande), and Australia (Bureau of Meteorology). In addition, Italy received XBTs to carry out FRE experiments.
- (xiii.) SOOPIP continues a strong interaction with the VOS panel, particularly with aspects of the logistics, recruitment, and operations of several XBT transects.
- (xiv.) SOOPIP continues a strong support of data acquisition and transmission systems, which are used by other programmes (e.g. VOS) and projects (GOSUD).
- (xv.) SOOPIP continues supporting the monitoring of data collected from different platforms, such as surface drifters (ZZYY), TSGs (TRACKOB-NNXX), and sea stations for CTD, Argo floats and ADCP (TESAC-KKYY/KKXX).
- (xvi.) SOOPIP supported the improvement of tools for new near real-time data visualization, such as using Google Earth API to embed operations information from the various components of the Ocean Observing System on a webpage.
- (xvii.) The critical contribution of several shipping companies to the SOOP was acknowledged with the award of plaques.

8.1.1.5 The Panel considered the recommendations proposed by Dr Goni and made the following **recommendations**:

- i. Continue the enhancement of capabilities for real-time transmissions and encourage all countries to transmit data in real-time, to enhance the value of assimilating data in models and to reduce risk of loss of data.
- ii. Continuing the strong working relationship with other scientific and operational communities and continue communicating the value of XBT observations (see also Section 10.1);
- iii. Continue active participation in international meetings, technical, operational and scientific;
- iv. Implementing XBT transects as recommended by the scientific and operational communities, with stronger international collaboration efforts;
- v. Supporting the continuation of contributions of XBTs by NOAA;
- vi. Supporting the continuation of experiments to evaluate XBT biases. Implementing a new fall rate equation (FRE) if/as recommended by the scientific community. Adopting a new FRE if recommended by scientific community;
- vii. Strongly support the creation of a prototype of probes, similar to an XBT, with pressure switches and improved temperature sensors;
- viii. Supporting the construction of a prototype of a self-contained XBT auto launcher;
- ix. Supporting the maintenance of a database of all scientific and technical publications that

have used XBT observations;

- x. Increasing the international participation by supporting training of technicians and scientists in developing countries;
- xi. Supporting the maintenance of the Global Temperature Salinity Profile Program (GTSP);
- xii. Enforcing the creation of a global XBT metadata pool. This dataset will be used in conjunction with information from other available sources (Coriolis, GTS, GTSP, and SIO) to create global reports displaying the activities of the various programs obtaining XBT data. . These reports, whose first version has been already been released, will be updated on a 6-month basis.

8.1.2 Outcome and recommendations from the XBT Bias and Fall-rate Workshop

8.1.2.1 The Panel reviewed recent work on XBT biases and fall-rate equations (FRE) presented by Rebecca Cowley and Lijing Cheng, focused on matching CTD and XBT observations (within 3 km and 3 hours). The historical database of metadata for XBT profiles is lacking which contributes to problems in quality control of the datasets. With the standard depth corrections on the XBT dataset, the biases compared to CTD data can be limited to 0.05°C for Sippican probes, 0.04°C for post-1985 probes. The TSK T4/T6 probes had higher temperature biases. Even after depth correction, XBTs tend to be warmer than CTD casts. The XBT error has varied in time. There is no dependency on temperature of the fall rate in T4/T6 probes, and only a very slight dependence discernible in T7/DB probes. Around 60-70 XBT/CTD pairs are required to drive bias down to 0.2%, the same accuracy as CTD pairs. Further work has shown a temperature-dependence on the FRE bias. The Panel congratulated CSIRO on the work in correcting historical XBT biases.

8.1.2.2 The Panel also reviewed the outcome of the XBT Bias and Fall-rate Workshop, Hamburg, Germany, 25-27 August 2010. The main conclusion of this workshop was to support additional studies, in particular of simultaneous XBT and CTD observations, in order to obtain better values of FRE coefficients, temperature bias, and offsets, to make XBTs an observational platform that is adequate to monitor global temperature and heat content trends. New field programs should identify a minimum of 50-60 pairs to have the best statistics, or about 30 for good statistics. There is a lot of natural noise in the instruments, and this large number of pairs is needed. The Panel agreed to contact XBT groups to identify a common pool of old probes that could be used in further experiments (**Action; SOOPIP chair and secretariat; end 2011**). The representative from Sippican also agreed to identify if they had any old probes that could be used (**Action; SOOPIP chair to follow up; end 2011**), and also noted that record-keeping had since been improved to help with future calibration exercises.

8.1.3 XBT Science Team

8.1.3.1 The Panel recalled that the SOT-V had endorsed an XBT Science Team to (i.) provide scientific guidance to the SOOPIP on the implementation of the global XBT network; (ii.) receive advice from CLIVAR Panels and from international scientific teams on scientific issues associated with the monitoring of the upper ocean thermal structure; (iii.) collaborate with the Argo Steering Team, on the implementation of the upper ocean thermal network; (iv.) collaborate with other teams involved in sustained ocean observations (such as the Ocean Topography Science Team, the Global Ocean Surface Underway Data Pilot Project, the Tropical Atlantic Circulation Experiment, the Tropical Moored Buoy Implementation Panel, OceanSites, etc.); (v.) periodically meet to discuss and communicate scientific and operational results obtained using the XBT global network; (vi.) collaborate in the development of ocean systems experiments to evaluate and improve the design of the XBT network; and (vii.) provide regular reports to the SOT on its work.

8.1.3.2 Dr Goni presented the plans for invigorating the XBT Science Team, including organization of a first XBT workshop in Melbourne, Australia, 7-8 July 2011, organized by Molly Baringer, Gustavo Goni, Ken Ridgway, and Susan Wijffels. The Bureau of Meteorology is hosting

the XBT Science Workshop, and logistic support is being provided by Lisa Krummel and Graeme Ball from the Bureau of Meteorology.

8.1.3.3 The expected outcomes of the workshop are to:

- communicate the key contribution of XBT observations for science studies
- stress the current synergy between XBT and Argo observations
- improve global data management practices for XBT line

8.1.3.4 Dr Goni suggested that this workshop could evolve into a standing XBT Science Team as endorsed by SOT-V, that could perhaps meet on occasion alongside with the Argo ST to maximize the interactions between the teams. This will be further discussed at the workshop in Melbourne. Wijffels noted that the Argo Steering Team focused on the logistics and data quality issues for Argo, while also sponsoring separate scientific workshops for Argo science.

8.1.3.5 Dr Goni also presented some a series of scientific results using XBT data, on heat transports, fronts, and upper ocean heat content. Resolving some of the biases presented in the previous section was key in maximizing the results from XBTs.

8.1.3.6 The Panel **recommended**:

- The development of material to advertise the importance of XBT observations as an outcome of the XBT workshop and future Science Team meetings;
- The workshop consider development of more stringent rules for compliance to be part of the SOOP program, in terms of standards for instruments, equipment, deployment and data management;
- The workshop and the Panel consider developing web pages of major circulation metrics, using the XBTs to show short timescale changes in heat and mass fluxes through basins **(Action for all SOOPIP members; by SOT-VII)**.

8.2 Programme Status and Implementation

8.2.1 Status of SOOP implementation, sampling scheme, and user requirements

8.2.1.1 Dr Goni presented metrics of the performance of SOOP lines in the Indian, Pacific, and Atlantic Oceans that had been prepared at NOAA/AOML. Some transects were only partially being done, while some transects not in the recommendations were being done. Funding was the primary constraint in not being able to meet the full targets set by OceanObs'99 and OceanObs'09. The lack of ship on some routes (in particular PX50 and AX18) prevented their being done. The 2008 global recession affected ship traffic, complicating the recruitment and maintenance of some lines.

8.2.2 Science and operational applications from the Australian XBT Frequently Repeated and High Density network

8.2.2.1 The Panel received a report by Ken Ridgway on the Australian XBT program. A large number of current systems around Australia are sampled by XBT lines. Frequently repeated lines between Western Australia and Indonesia (IX1) are repeated every week to two weeks on two ships, capturing the high-frequency variability. IX1 is done by the crew. The high temporal resolution is needed to capture low-frequency variability, in particular of the Indonesian Through Flow variability, which has seasonal, interannual, and decadal components. There is also a 20-25 year history of high-density XBT lines in the Tasman sea, the western end of the South Pacific gyre, which are analyzed in complement to altimetry and time series data. The Tasman front and East Australian Current extension have decadal variability that represents gyre strength. Where exact repeats exist, small-scale spatial structures can be captured. The XBT program is also part of the Australian IMOS (see also Section 2). The IMOS SOOP facility is a comprehensive underway network including all commercial ship observations.

8.2.3 Review of XBT transect responsibilities and International Collaborations

8.2.3.1 The Panel received a report by Francis Bringas on the status of the XBT networks, and the lines recommended by the international community.

Current Status and Implementation of XBT Transects (2010)

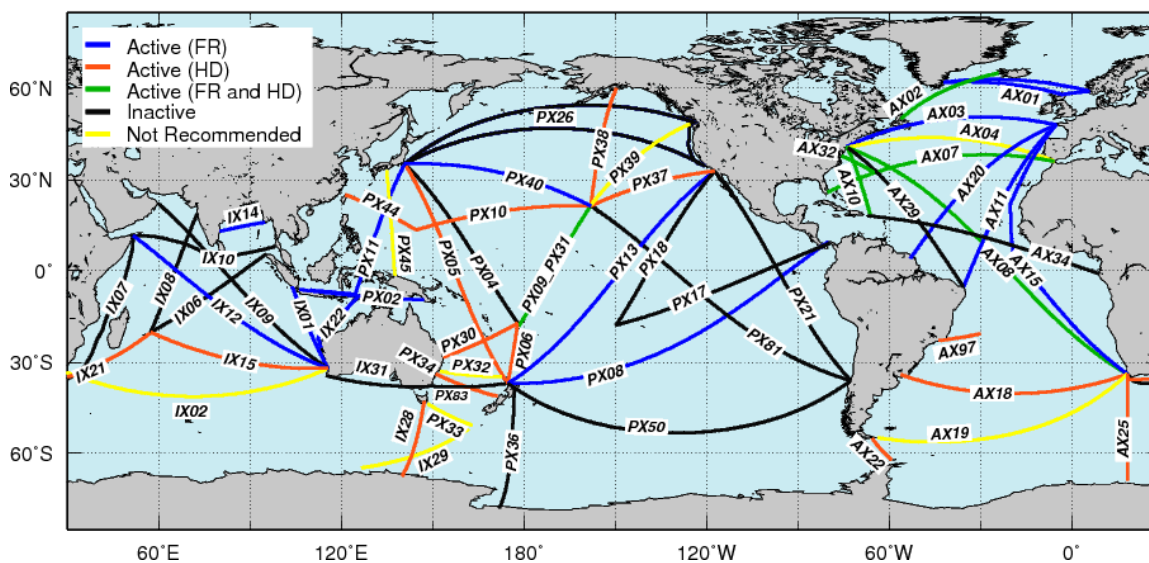


Figure NN. Status and implementation of XBT transects in 2010, prepared by NOAA/AOML, showing the lines recommended by the OceanObs'09 XBT Community White Paper and their implementation status.

8.2.3.2 The status of implementation of OceanObs'09 recommended transects for XBT deployments was discussed. From a total of 53 transects recommended by the international scientific community, a total of 35 (66%) were active during 2010, with deployments in frequently repeated (FR) mode in 54% of these and deployments in high density (HD) mode in 63%, including several transects with deployments in both modes. The number of active transects during 2010, by basins, was as follows:

- a) Atlantic Ocean: 14 (78%) active, with 64% in FR and 64% in HD
- b) Indian Ocean: 7 (54%) active, with 57% in FR and 43% in HD
- c) Pacific Ocean: 14 (58%) active, with 43% in FR and 71% in HD

8.2.3.3 Additionally 11 non-recommended transects were active in 2010, some of them for specific scientific interest.

8.2.3.4 The XBT network implementation continues to be mostly a multi-institutional and international collaboration. There were 12 countries participating in XBT deployments during 2010: Argentina, Canada, Germany, Japan, Australia, Cyprus, India, South Africa, Brazil, France, Italy, and USA. These countries were involved in one or more aspects of the operation, providing probes, equipments, logistics, riders and/or data management, quality control and distribution. From the active transects during 2010, 51% were implemented with the participation of more than one institution or country. The strengthening of these collaborations is critical for the maintenance of the SOOP operation.

8.2.3.5 SOOP transects also provided platforms for the deployment of DBCP surface drifters and Argo floats. Increasing this collaboration will help all. The PMO workshop and collaboration with the VOS program had also been fruitful.

8.2.3.6 The Panel reviewed the provisional table provided in [Annex XVI](#) with information on the institutions taking the lead in one or more aspects of the implementation of the XBT transects. The Panel asked the Chairperson to update the table of transect responsibilities periodically (**action; Chairperson; once yearly**).

8.2.4 **Operational XBT systems and development**

8.2.4.1 Based on a presentation by Dr Goni, the Panel discussed new probe development, equipment, data acquisition systems, and on-board software related matters including the use and further development of XBT auto-launchers. The Panel took note of a new auto-launcher system developed at WHOI by D. Fratantoni that can handle XCTDs and uses Iridium technology, and the new wireless auto-launcher under development at CSIRO. Dr Goni also reported on drop experiments to understand the first few meters of the XBT fall.

8.2.5 **Other ocean SOOP observation operations (TSG, pCO₂, etc.)**

8.2.5.1 Dr Goni led a discussion of collaboration with other communities. The largest collaboration is with the VOS program. The SEAS program provides about 40% of marine meteorological observations in the US.

8.2.5.2 The SOOP also coordinates with other ship-of-opportunity based observing systems, including Thermosalinograph (TSG) operations. Data are distributed under GOSUD and SAMOS standards. Dr Goni suggested the teamwork on requirements. The use of TSG data in models and in science applications was not clear. Additionally, there is an issue with the way TSG data is put on the GTS, as assimilation systems may reject them as profiles with one depth, and therefore faulty data. The greatest barrier for use of TSG data was the lack of calibration of many lines against bottle data for salinity, reducing its accuracy as an absolute standard of comparison. Many TSG lines were associated with pCO₂ underway measurements.

8.2.5.3 The Panel **recommended**

- emphasizing the importance of regular complementary bottle data for absolute calibration of TSG salinity data;
- promoting the use of TSG data for GHR SST by:
 - Explore how to start collaboration with GHR SST group by providing observations of underway SSTs with SBE 38 and SBE 48 external temperature sensors a) within the NOAA fleet, and b) within the current SOOP fleet, which may be enhanced if the data is acknowledge having an impact in GHR SST work. **(Action for SOOPIP chair and members; by SOT-VII)**
- promoting the use of TSG data for Sea Surface Salinity applications, in complement to new satellite missions;
- standardizing data management practices for insertion into the GTS, quality control, and archiving at Coriolis in the GOSUD program **(Action; SOOPIP members; report by SOT-VII)**;
- creating and maintaining a bibliography of publications using TSG data **(Action for SOOPIP members to provide lists to AOML; by SOT-VII)**;
- Initiate interaction with IOCCP to provide collaboration for the installation of pCO₂ systems in cargo ships (see also Item 10.1; **Action for SOOPIP chair and IOCCP; by SOT-VII**); and
- encouraging the development, testing, and implementation of new technologies for measuring parameters underway or in the water-column

8.3 **Issues for the SOOP**

8.3.1 **Reporting of SOOP observations in real-time onto the GTS**

8.3.1.1 The Panel received a presentation by Joaquin Trinanes focused on describing the procedures applied to collect, QC and distribute SEAS XBT data onto the GTS. He described the tools and utilities to monitor the operations of the system and the flow of information, and to provide support to data tracking activities and general users. Finally, monthly and annual XBT SEAS/Global reports were presented. They cover the operations of the XBT network, and allow

measurement of the performance of the network at various levels, such as number of ships, type and number of transects, and number of deployments.

8.3.1.2 The Panel noted that these reports were done monthly for all AOML lines, but only annually for the complete XBT network. JCOMMOPS also had some rudimentary monitoring tools, but these were not actively being monitored.

8.3.1.3 The Panel noted the importance of such real-time monitoring of the status of implementation, so that lines with gaps could be investigated immediately. Noticing the gaps on a yearly basis did not allow for the long-term climate record to be sustained.

8.3.1.4 The Panel decided the following actions towards implementation of more regular real-time (monthly) monitoring of all XBT lines:

- to investigate possibilities of funding such a comprehensive monitoring effort (**Action; for SOOPIP chair and SOT TC; by SOT-VII**)

8.3.2 Science results from the SIO High Density XBT transects

8.3.2.1 Janet Sprintall gave the Panel a report on science being done with the lines in the Pacific and Indian Oceans coordinated by the Scripps Institution of Oceanography. The lines have 50 km or less in the interior, and in boundary currents this is increased to 10-15 km. These lines are done nominally quarterly, and have a ship rider.

8.3.2.2 The science objectives are to look at the annual cycle, interannual variability, and long-term mean of temperature, geostrophic velocity and transport. Because of the long record, spatial and temporal variability can be extracted. The lines span ocean basins.

8.3.2.3 The network increases the value of the combined observing system, and complements these by supplying repeat high-resolution measurements in boundary currents, eddies and fronts.

8.3.2.4 The major challenge in maintaining the lines is the transient nature of the commercial shipping nature. PX50 was inactive because there is no ship between New Zealand and Chile. The Scripps highest priority is maintaining the Pacific network. IX15/IX21 would be the first lines to go in a reduced budget situation. It has been a logistically challenging line.

8.3.2.5 The Panel appreciated the effort of the Scripps team, and noted that cooperation has led to being able to close heat budgets in large parts of the oceans.

8.3.3 Sippican Ocean Probes

8.3.3.1 The Panel received a report from Mr Wolfgang Schlegel on Sippican ocean probes. The XBT was developed by Sippican in the mid-1960s. The production goes on daily - there are many academic and navy users. Even with the development of new observing system, there is still a place for XBTs.

8.3.3.2 Sippican is an ISO manufacturing organization, working to high QC standards. About 1% of production is destroyed and taken apart in QC for verification purposes. Sippican was involved in the Fall Rate Equation workshop in Hamburg, and aware of the difficulties with XBT probes used for climate application. Sippican has implemented testing of the probes and is also working on developing a probe with a pressure switch.

8.3.3.3 XBTs were developed not for climate purposes, but for quick readings for understanding the acoustic properties.

8.3.3.4 Mr Schlegel encouraged the XBT community to stay in close contact with Sippican for requirements, and give feedback on demand for improvements to XBT-type devices. For Sippican better market potential data will help develop better investment in new probes.

8.3.3.5 Dr Goni asked if Sippican was prepared to help with fall rate studies, through the donation of XBTs (new or particularly old), participation of the scientific community in the Sippican tests in Florida, or funding of such studies. Mr Schlegel expressed willingness to explore potential solutions. The Panel expressed willingness to find ship time with a CTD to work cooperatively with Sippican on their tests He also requested feedback on technical requirements and potential market for improved probes. **(Action; for SOOP to explore cooperation and provide feedback to Sippican through SOOPIP chair; continuous with report by SOT-VII)**

8.3.3.6 Alex Papij gave the session a presentation on the Quoll XBT system, which was launched at OI'10. (The Quoll is a Tasmanian marsupial). The Quoll has an Ethernet controller onboard as well as a USB interface as on the Devil XBT system, and can be configured in multiple ways.

8.3.4 XBT data tracking

8.3.4.1 The panel received a presentation from Francis Bringas on XBT data tracking efforts at NOAA/AOML, to check the integrity of the data stream leading to submission to the GTS. The daily reports are available at <ftp://ftp.aoml.noaa.gov/phod/pub/bringas/DT/> . Tests include server and process updating files in real-time, possible truncated message (Drifter, TAO-PIRATA, CTD, ADCP, Argo, XBT, and TSG), format error, transmission with wrong date/time/location, submission of duplicated data, and a check for non-ASCII characters between the ASCII bulletins.

8.3.4.2 Recent errors identified have included drifters with wrong headers, buoys with bad T and S values, truncated messages, and XBT messages with wrong formats. These issues appear several times a month. These tests provide a check on the automated GTS injection procedures.

8.3.4.3 Mr. Bringas also demonstrated real-time XBT quality tools, to give feedback in real time to riders on ships.

8.3.4.4 The Panel noted that data tracking activities are necessary for the verification of data flows from the source (observation platform) to the processing centres, where the data is analyzed, quality controlled, and sent to the GTS. The tracking of these data ensure that the observations obtained by different platforms are received and correctly disseminated through the GTS with the appropriate format. Otherwise, the data cannot be used or, if communication problems are not detected, lost. Although a process monitoring the data flow in the GTS minimize data loss in real-time operations, it is critical that institutions producing the data made delayed-time data available. Otherwise, the complete data tracking as well as the assessment of data drops is not possible.

8.3.4.5 The Panel decided the following actions to improve success of insertion of XBT data onto the GTS and to improve quality control of real-time and delayed-mode data streams and to establish a unified monitoring effort of XBT deployments, data transmission, and data distribution:

- AOML to transmit identified problems with XBT deployment to the responsible centre **(Action; AOML; continuous)**
- Encourage all agencies to transmit their data into the GTS. AOML will collaborate in the training and/or insertion of data **(Action; SOOPIP chair; report by SOT-VII)**
- Continue collaboration with GTSP and WOA projects to provide quality controlled data **(Action for all SOOP members; report by SOT-VII)**

8.3.5 Test of XBT BUFR data at NOAA

8.3.5.1 The Panel received a presentation by Mr Joaquin Trinanes (USA) on efforts underway at NOAA/AOML to perform the migration from the Traditional Alphanumeric Codes into BUFR. We report the results of testing the current template under validation with NOAA/NCEP and ECMWF, including the problems/solutions encountered during local encoding/decoding activities, transmission to the GTS, and decoding by third parties. We finally propose to modify the template

under validation to minimize the problems that future users could face when working with the XBT data in BUFR format.

8.3.5.2 The Panel decided to take the following actions:

- Start the immediate implementation by SEAS of data transmission in BUFR format:
 - AOML will provide assistance and training to implement BUFR tables, **(Action for AOML; continuous)**
 - Establish a list of parameters that each agency making XBT deployments (BOM, CSIRO, SIO, NOAA, ...) needs to submit (may be as deployment logs), containing for each deployment: date, time, call sign, transect No., mode, probe type, launch height, operator name, sea state, etc. **(Action for SOOPIP members; end 2011)**
 - Identify main players to accomplish a successful transition (AT, JT, Japanese, French, etc) **(Action for SOOPIP chair and members; as soon as possible)**
 - Modify SEAS and other software to transmit in BUFR format **(Action for AOML and other SOOPIP members; by 2012)**
- Study and evaluate the need for the enhancement of the current BUFR tables to accommodate for new data sets (underway data, TSG, pCO₂, color, etc). **(Action for SOOPIP led by chair; by SOT-VII)**

9. MONITORING, CODING AND DATA MANAGEMENT

9.1 Monitoring and data centre reports

9.1.1 *VOS Monitoring Report from the Exeter (UK) Regional Specialized Meteorological Centre (RSMC)*

9.1.1.1 Ms Sarah North reported on the activities of the Regional Specialized Meteorological Centre (RSMC) Exeter, acting as CBS Lead Centre for monitoring the quality of surface marine observations. It routinely produces monthly and biannual quality reports as well as providing essential feedback to VOS operators regarding the quality of the data delivered by VOS ships.

9.1.1.2 The Met Office (RSMC Exeter) continues to compile lists of ships that have produced suspect observations each month, which are sent to the WMO Secretariat. They are also available via the Met Office web site³⁶. The Team agreed that the monitoring criteria are set at the correct levels as shown in Appendix B of SOT-VI preparatory document No. 9.1.

9.1.1.3 The Met Office also produces monthly lists of monitoring statistics for all VOS. To maintain up to date lists of ships, the Met Office advised that it was using the latest data downloaded from the online E-SURFMAR metadata database, as well as the latest WMO Pub47 data. In addition, it uses the masked call sign data available from the JCOMMOPS FTP site³⁷.

9.1.1.4 The RSMC (UK MetOffice) representative reported that it was still unable to monitor ships, which reported under the SHIP masking scheme. This was primarily due to the fact that it could not guarantee the security of the unmasked SHIP data.

9.1.1.5 It was noted that the lists of VOS monitoring statistics available on the Met Office monitoring web-site had been modified during 2009 to replace masked call-signs with real call-signs for those ships with unique masked call-signs, and the ship names and country identifiers were also included (this was an action from SOT-5).

9.1.1.6 Timeliness information for VOS reports received at the Met Office is also made available from the observation monitoring web site³⁸ in graphical format. This information showed that the majority of ship reports continue to be received promptly, with over 50% received within 15 minutes

36 : <http://research.metoffice.gov.uk/research/nwp/observations/monitoring/index.html>

37 : <ftp://mask2real.vosmask@ftp.jcommops.org/mask2real.csv>

38 : <http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/index.html>

and 90% within 60 minutes of the observation time. Timeliness information for individual ships is also available from the website.

9.1.1.7 The Team noted that the Met Office had made its annual VOS ranking scheme results available on their website for all VOS (an action from SOT-5). The scheme ranks the VOS ships in terms of the timeliness, quantity and quality of their reports. This has been used to assess the annual performance of UK VOS and for determining which individual ships should be presented with awards. Details of the scheme are shown in Appendix E of SOT-VI preparatory document No. 9.1. VOS operators were invited to consider the value of the proposed performance ranking system and to advise the Met Office if they considered that the parameters used were appropriate (**action; VOS operators; end 2011**). VOS operators were also invited to consider performance rankings when issuing awards to their individual VOS fleets (**action; VOS operators; ongoing**).

9.1.1.8 The full report by the RSMC, Exeter, is provided in [Annex VI](#).

9.1.1.9 The Team stressed that the JCOMMOPS REAL vs. MASK Database needs to be kept up to date. The Team requested VOS operators using REAL masking scheme to routinely provide up to date information on REAL vs. MASK to JCOMMOPS (**action; VOS operators; ongoing**).

9.1.1.10 The Team also requested the WMO Secretariat to share the list of contact points authorized to access the JCOMMOPS database of REAL vs. MASK callsigns with JCOMMOPS (**action; WMO Secretariat; ongoing**).

9.1.1.11 Instead of sending links to those lists, the Team requested the RSMC, Exeter to send the list of monthly monitoring statistics, and the list of ships reporting suspect observations to the VOS Focal Points (**action; RSMC Exeter; ongoing**).

9.1.1.12 The Team also requested the VOS Focal Points to make sure that these lists are forwarded to the PMOs for immediate action (**action; VOS Focal Points; ongoing**).

9.1.1.13 The Team agreed that it would be useful to introduce separate graphs/tables on the UK Metoffice website to show the relative performance of national VOS fleets, and requested the RSMC to investigate this possibility (**action; RSMC; SOT-VII**).

9.1.1.14 The Team invited the RTMC to review the possibility of tightening the criteria for the VOSclim and AWS, and to propose new criteria if needed (**action; RTMC; SOT-VII**). The Team noted that Australia is also using tighter criteria, and requested G. Ball to provide these criteria to the RTMC (**action; G. Ball; asap**).

9.1.1.15 The Team noted that the E-SURFMAR database could be used for obtaining the list of VOSclim ships, and was questioning the need to maintain such a list on the VOSclim web site. The Team requested the VOSclim Focal Point to consider whether the VOSclim website should be closed, related information included in the VOS web site, including monitoring information, and list of ships (**action; VOSclim FP; SOT-VII**).

9.1.2 Monitoring Report from the Real-Time Monitoring Centre (RTMC) for the VOSclim project

9.1.2.1 Ms Sarah North reported on the activities of the Real-Time Monitoring Centre (RTMC) for the VOSclim project, which is operated by the Met Office, United Kingdom. The RTMC continues to produce monthly suspect lists and monitoring statistics for all project ships using the ship lists maintained on the VOSclim website and the criteria shown at Appendix A of SOT-VI preparatory document No. 9.1. The Team agreed that these values were set at the appropriate level.

9.1.2.2 The Team also agreed that the VOSclim suspect lists should be sent to the JCOMMOPS mailing lists (PMO and VOS).

9.1.2.3 The Team noted that the Met Office continued to transfer VOSClim ships' observations and the associated co-located model data to the VOSClim Data Assembly Center (DAC) for inclusion on the VOSClim website.

9.1.2.4 The Team noted that the Met Office has agreed to extend the BUFR data sent to the DAC to encompass all ship and buoy reports and their co-located model field values, with the work scheduled for 2011³⁹.

9.1.3 Global Collecting Centres (GCCs) report on the VOS and VOSClim

9.1.3.1 The meeting recalled that under the revised Marine Climatological Summaries Scheme (MCSS), adopted by the eleventh session of the Commission for Marine Meteorology (CMM) (Lisbon, Portugal, April 1993), through Recommendation 11 (CMM-XI), the two Global Collecting Centres (GCCs) were established, in Germany and the United Kingdom, to: (i) collect all marine climatological data observed worldwide; (ii) ensure that minimum quality control procedures are applied; (iii) generate complete and duplicate global data sets; and (iv) provide these data sets to the Responsible Members under the MCSS.

9.1.3.2 The Team reviewed a consolidated report from the two GCCs. The report included a status on the volume and frequency of delayed-mode data being forwarded to the VOSClim Project Data Assembly Centre. The GCCs also reported on how masking schemes implemented per WMO Executive Council Resolution 27 (EC LIX) - both SHIP and MASK - had impacted on their operations.

9.1.3.3 The Team considered the role of the GCCs in processing the delayed-mode IMMT (International Marine Meteorological Tape-format) data and the associated quality control standards.

9.1.3.4 The meeting made the following recommendations:

- (i) All CMs are recommended to begin recording observations in IMMT-4 format quality checked to MQCS-6 making use of its increased coding capabilities (**action; CMs; asap**).
- (ii) We would like to encourage all CMs to submit their observations, and if their ships do not record in a logbook, they should submit their MQCS checked GTS data. This will give RMs the opportunity to check data with higher quality control for their archives and further processes.

9.1.3.5 The meeting decided on the following action items:

- (i) Electronic logbook programmers to upgrade logbook software to allow coding in IMMT-4 format (**action; e-logbook developers; asap**)
- (ii) All CMs that did not submit data during 2010 should so in 2011 or alternatively contact the GCC for advice (action; CMs; July 2012)

9.1.3.6 The Team requested the SOT and VOSP Chairs to play an active role in the TT-DMVOS discussions and provide SOT input as appropriate regarding the modernization of the MCSS (**action; G. Ball & J. Fletcher; asap**).

9.1.4 VOSClim Data Assembly Centre (DAC) report

39: The RTMC agreed to provide augmented daily files (via GTS and FTP) to the DAC. The tentative plan is to provide two files per day – one to include all ships and moored buoys received in FM 13-X (SHIP; surface observations for a sea station) and the other to include all drifting and moored buoys received in FM 18-IX (BUOY). The SHIP file will be about 15 times larger than the current VOSClim data files and the BUOY file about 40 times larger.

9.1.4.1 The US NOAA National Climatic Data Centre (NCDC), acting as the Data Assembly Centre (DAC) for the VOSClim project, reported via teleconference by Alan Hall (USA) on the present status of the DAC activities in accordance with its Terms of Reference. The DAC reported on the status of the project website, including the collection and provision of real-time and delayed-mode observation data, metadata, ship listings and other project information.

Data Assembly

9.1.4.2 NCDC maintains several archives in support of the VOSClim Project and hosts a web presence⁴⁰ 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 Centres delayed mode ship observations

9.1.4.3 VOSClim observations from all streams are captured based on the most current ship list⁴¹ available. Ship observations are transmitted over the Global Telecommunication System (GTS) under a variety of WMO bulletin headers. BUFR⁴² ship observations are transmitted daily via GTS under WMO abbreviated header “IZZX40” from the United Kingdom Met Office.

9.1.4.4 The DAC continues to report quarterly to the Global Collecting Centres (GCCs) on the number of delayed mode VOSClim observations parsed from the delayed mode files distributed to the Responsible Members (RM). This information is used in the GCC annual reports.

9.1.4.5 All observations are decoded into the International Maritime Meteorological Archive (IMMA) format⁴³ and placed on the project web site⁴⁰.

VOSClim Web Page and Data Access

9.1.4.6 NCDC reported that the VOSClim web page retained its user-friendly format and continued to receive positive feedback from researchers and others interested in the VOSClim project. Data access is available in text file format and anonymous FTP. The text files are kept on an FTP server divided by data source, year, and month. This simpler access is easier to maintain by the DAC and supports automated download of data.

9.1.4.7 The URL for web access⁴⁴ allows viewing of the data directly by any browser. For an automated download, the data is available on an anonymous FTP site⁴⁵. In either location, separate folders exist for each year beginning with 2001. The data is not duplicated in any way. Also available for download from the FTP site is the VOSClim Ship List in MS Excel format; award pictures; ship pictures; and the statistics and suspect ship reports.

VOSClim Ship List and Participation

9.1.4.8 The Team noted with appreciation that the number of recruited ships was up to 368. Participation in VOSClim continues to increase. Ninety-five ships were recruited since SOT-V (May 2009) while only 13 vessels were withdrawn during the same period.

9.1.4.9 The DAC commends International Port Meteorological Officers (PMO) for timely updates and notifications of new VOSClim recruits/withdrawals.

9.1.4.10 The Team noted that:

40: <http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>
 41: <http://www1.ncdc.noaa.gov/pub/data/vosclim/vosclimshiplist.xls>
 42: BUFR: Binary Universal Form for the Representation of Meteorological Data
 43: http://www.ncdc.noaa.gov/oa/documentlibrary/vosclim/R2.5-imma_short.pdf
 44: <http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclimdata.html>
 45: <ftp://ftp.ncdc.noaa.gov/pub/data/vosclim>
 (anonymous FT site)

- Self-recruited ships are not tracked by the DAC.
- The new TurboWin version will be password protected to avoid self-recruiting.
- Delayed mode data are not masked.

9.1.4.11 See also the discussion under agenda item 6.7 (report by the Task Team on VOSCLim).

9.1.5 ASAP QC Monitoring report

ECMWF ASAP Monitoring

9.1.5.1 The Team reviewed a written report from the European Centre for Medium-Range Weather Forecasts (ECMWF) on the ECMWF monitoring activities for ASAP. ECMWF is monitoring ASAP data on a daily and monthly basis. The Team noted that:

- The number of reports received at mid tropospheric levels during 2010 was slightly larger than in 2009 at 00 and 12 UTC and reduced by 35% and 15% at 06 and 18 UTC.
- The percentage of ascents reaching 100 hPa down to values of around 85% in the second half of 2010.
- The problem of wrongly located reports is still there although in smaller numbers than in 2009. This problem is absent in the Japanese ASAP.
- The quality of the ASAP data has continued to be good and extremely valuable.

ASAP Monitoring Centre (Météo France)

9.1.5.2 The representative from Météo-France, Mr Gérard Rey (France), reported via teleconference on the status of the ASAP monitoring centre, as well as on future plans. The ASAP monitoring centre was established by Météo France, as agreed at the Seventh Session of the former ASAP Co-ordination Committee in 1995. Since that time, Météo France has been routinely providing annual monitoring report on behalf of the ASAP.

9.1.5.3 The Team reviewed the monitoring reports, noting in particular the operational performance and data quality of the ASAP.

9.1.5.4 The Team noted that a quarterly report and an annual report have been provided in 2009 and 2010. The quarterly frequency is more appropriate to give to the ASAP operators the opportunity to correct quickly difficulties in the data dissemination. During 2010, Météo-France Toulouse received 6632 upper air message (TEMP) from ships and platform. This number of messages received is lower than in 2009 (7541) due to the closure of platform Mike (LDWR) (which was managing 4 ascents a day). The reports were received from 27 different call signs.

9.1.5.5 The Team noted that according to the monitoring report, the quality of the ASAP reports was generally of a high standard, with only a small percentage of erroneous data. Few corrupted call signs can be seen from time to time. Japanese ships follow a different procedure with an important shift between the sending of the message and the synoptic hour. It took a few months for the two new French ASAP ships (ASFR3 and ASFR4) to have a nominal delay of transmission. There is no significant degradation on the delay for the other ASAP ships.

9.1.5.6 The Team made the following recommendations:

- (i) ASAP ship operators should be very careful about setting their software to prevent incorrect positioning of the launching point.
- (ii) ASAP ship operators should try to update their transmission systems in order to be able to transmit high-resolution BUFR messages.

9.1.6 Global temperature and Salinity Profile Programme (GTSP)

9.1.6.1 Dr Ann Thresher (Australia) presented a report on the development and activities of the Global Temperature and Salinity Profile Programme (GTSP), including GTSP data formats, on behalf of the GTSP Chair, Dr Charles Sun (USA). She recalled that the GTSP was a joint program of the International Oceanographic Data and Information Exchange committee (IODE) and JCOMM.

9.1.6.2 In terms of data volumes GTSP continued to deal in greater volumes of data over past two year period. The number of real-time data handled was 4,541,361 covering the period of 2009 – 2010, increased about 77% from the period of 2007 – 2008; while the number of delayed-mode data added to the archive increased about 48% to 111,004 at the end of 2010. Since July 2008, GTSP started to manage the data set of CTD (Conductivity, Temperature and Depth) profiles derived from marine mammals. The number of the marine mammal-borne CTD profiles acquired by GTSP was 9,915 in 2008 and has grown significantly to 47,111 and 40,221 in 2009 and 2010, respectively.

9.1.6.3 The Committee of the IODE-XX noted that CRC (Cyclical Redundancy Check) is a good candidate to be used as a tool for producing unique identifiers for oceanographic data and for submission to the Ocean Data Standards Pilot Project. GTSP has incorporated the CRC algorithm into its data processing stream. Countries implementing the CRC into their XBT data processing systems are Australia, Canada, France and U.S.A. NODC continued to monitor the usefulness of the CRC tag to identify duplicates. The results to date are very satisfactory. However, it is clear that care must be taken to ensure software and procedures are carefully carried out.

9.1.6.4 GTSP managed the XBT (Expendable Bathythermograph) data collected by the operators of the Ship-of-Opportunity Programme, which is a subprogram of the SOT. The monitoring that was done to the real-time GTS data is an important contribution to Argo. GTSP also continued to collaborate with WOD (World Ocean Database) and CCHDO (CLIVAR & Carbon Hydrographic Data Office) in support of Argo reference data set.

9.1.6.5 GTSP is an active contributor and partner in a number of other international programs. In particular, GTSP worked with the IODE Ocean Data Portal (ODP) project to make the GTSP data available at ODP's Web site⁴⁶, and collaborated with NOAA's Environmental Research Division's Data Access Program (ERDDAP) to make the data available via the web⁴⁷.

9.1.6.6. The meeting invited the GTSP to:

- (i) Continue its operations, and in particular to acquire profiles and make real-time & delayed mode profile data available (**action; GTSP Steering Group; ongoing**);;
- (ii) Continue the production of metrics in support of the JCOMM Observations Programme Area (OPA) and the SOT (**action; GTSP Steering Group; ongoing**);
- (iii) Convene a three-day workshop for design and requirements of the GTSP NetCDF format revision (**action; GTSP Steering Group; June 2011**);
- (iv) Complete the evaluation of the use of a CRC in real-time and delayed mode duplicates identification (**action; US NODC; September 2011**);
- (v) Design the GTSP DVD for using in the IODE training/outreach programs. (**action; US NODC; March 2012**); and
- (vi) Complete the bi-annual GTSP report for 2009-2010. (**action; US NODC; April 2011**).

9.1.6.7 The Team highlighted the need for ongoing Scientific QC of the global collection of upper ocean temperature data. It agreed that funding limitations might restrict the quality of the data archived by NODC. In the WOCE period, AOML (Atlantic Ocean), Scripps (Pacific Ocean) and CSIRO (Indian Ocean) performed Scientific-standard QC of all UOT data in their respective ocean basins. They currently provide high quality QC of their own data stream, unfortunately

46 : <http://odp.oceandataportal.net/odp/>

47 : <http://coastwatch.pfeg.noaa.gov/erddap/tabledap/erdGtsppBest.html>

leaving many profiles in the data base of questionable quality. The SOT encouraged national funding bodies to consider on-going funding of this QC a high priority because of the importance of this data globally (**action; AOML & SIO & CSIRO; SOT-VII**).

9.1.7 Global Ocean Surface Underway data Pilot Project (GOSUD)

9.1.7.1 Mr Pierre Blouch (France) presented a report on the development and activities of the Global Ocean Surface Underway Data Pilot Project (GOSUD) on behalf of the GOSUD Chairperson, Mr Loic Petit de la Villéon (France). In the name of the GOSUD partners, he thanked Robert Keeley very much for his highly significant contribution to the project. Robert Keeley led the project as chairman since it began in 2001.

9.1.7.2. The GOSUD Project is an Intergovernmental Oceanographic Commission (IOC) programme designed as an end-to-end system for data collected by ships at sea. The goal of the GOSUD Project is to develop and implement a data system for surface ocean data, to acquire and manage these data. For the moment, the parameters concerned are sea surface salinity and sea surface temperature.

9.1.7.3. During the reporting period major work has been done on tools and methods that enable production of delayed mode datasets of a higher quality and to visualize existing (near real time datasets). The GOSUD project is looking for scientists or data managers that could help on data assessment. Using their regional expertise and with the help of the tools developed within the project. They could be direct partners of the project or contribute from outside the project.

9.1.7.4. As highlighted in the Global Climate Observing System (GCOS) Implementation Plan (GCOS-138), there is an important need of surface data and sea surface salinity data. Mr Blouch explained that GOSUD has proven the feasibility of data collection, quality control maintaining a global archive of Sea Surface Salinity. Robustness of the project is effective. However, most of the partners joined the Project since it began. The partnership of the project must be enlarged. The objective of the 2 coming years is to recruit research vessels that could transmit SSS data either in near real time or after the ship reached the port. This could be either non quality controlled data or processed in delayed mode data. The GOSUD project requires that IODE national representatives support the project by providing SSS data either by opening their archives or by providing recent data. First priority will be put on research vessels or on merchant ships that operate on regular lines.

9.1.7.5. The GOSUD web site⁴⁸ has been updated using a content management system⁴⁹.

9.1.7.6. The meeting made the following recommendations:

- (i) The SOT recommends that its members support the project by distributing the GOSUD report presented at this SOT Session in their country and to identify potential contributors either by providing data to the project or by providing scientific or data management expertise that could enhance the quality of the GOSUD dataset and /or enlarge the network. First priority must be put on research vessels or on merchant ships that operate on regular lines (**action; SOT members; SOT-VII**);
- (ii) The SOT recommends to distribute the software that has been developed by IRD –France- to produce the delayed mode dataset;
- (iii) The SOT recommends that regional expertise as required in the Oostende workshop to be provided in support to GOSUD activities

9.1.7.7. The meeting decided on the following action items:

- (i) Loic Petit de la Villéon and Francis Bringas to set back the connection in order to deliver

48 : <http://www.gosud.org>

49 : See <http://projets.ifremer.fr/gosud> until the web site is itched to <http://www.gosud.org>

again data from NOAA ships to GOSUD (**action; L. Petit de la Villeon / F. Bringas; Dec 2011**);

- (ii) Loic Petit de la Villéon to investigate the link between IMOS⁵⁰ (Australia) and GOSUD (**action; L. Petit de la Villeon; Dec 2011**).

9.1.8 **Global temperature data distribution by Coriolis**

9.1.8.1 No report was presented to the meeting by the Coriolis data centres.

9.2 **Coding requirements**

9.2.1 **BUFR Template for VOS data**

9.2.1.1 The Team noted with appreciation that collaboration between the SOT, the DBCP, and the DMPA Task Team on Table Driven Codes (TT-TDC) has been quite effective on GTS coding issues, and changes proposed to the XBT/XCTD, and VOS BUFR templates. The Team noted that the TT-TDC was now looking at BUFR common sequences that are needed to report oceanographic and meteorological information from marine platforms, including required metadata.

9.2.1.2 The Team noted that the CBS has recommended that the observation practice elements of the Manual on Codes be identified and passed to the OPAG-IO for inclusion in observing standards documentation. The Team requested the Task Team on Instrument Standards to look at those ship-based related practices elements, identify appropriate publication(s) to which the identified observation practices should be relocated, and make recommendations to the CBS as appropriate (**action; TT-IS; Sep 2011**).

9.2.1.3 The Meeting reviewed the status of the BUFR template for VOS data and agreed with the following workplan:

- January – June 2011: Validation of BUFR template for VOS data (**action; candidate operational centres; end 2012**);
- July – December 2011: Software developments by SOT members for the adaptation of national data processing systems to permit the encoding of BUFR reports for VOS data; and beginning of operational distribution of VOS reports in BUFR format (**action; members; end 2011**);
- 2012: Transition period where the VOS data will be distributed in both FM-13 SHIP and FM-94 BUFR format (**action; members; end 2012**);
- End of 2012: Migration to BUFR completed, and stopping of GTS distribution of VOS data in FM13 SHIP format (**action; members; end 2012**).

9.2.1.4 Following the recommendations from PMO-IV in this regard, the Team requested its members to alert their PMOs about the following (**action; PMOs; end 2012**):

- Understanding the basics of BUFR and the requirements for the reporting of new variables;
- Providing feedback as appropriate on possible problems and issues to the JCOMM Task Team on Table Driven codes through their SOT National Focal Points.

9.2.1.5 The Team agreed that the use of the B/C10 could be regarded as a first practical step to ensure migration to BUFR for the VOS data but recommended to start using the new BUFR template for VOS data instead as far as practicable, since the latter includes many metadata fields that are most useful to the end users (e.g. anemometer height).

9.2.1.6 The Team noted the potential difficulty of inserting in real-time the new required metadata fields in BUFR reports when a country is inserting VOS report of ships recruited by another country. The Team noted that the metadata fields could be included in the transmission of

50: IMOS: Australian Integrated Marine Observing System - <http://www.imos.org.au/>

VOS reports from ship to shore but that this would increase the cost of such transmissions. The Team requested Pierre Blouch (France), Etienne Charpentier (WMO Secretariat), Julie Fletcher (New Zealand), and Graeme Ball (Australia) to consider the essential additional metadata elements to be sent by TurboWin in real-time (**action; P. Blouch, J. Fletcher, G. Ball, E. Charpentier; end June 2011**).

9.2.5.7 The Team noted that the E-SURFMAR metadata database could be used for accessing the metadata in real time. The Team invited E-SURFMAR to make its database of VOS metadata available in real-time to all VOS operators for the benefit of the WMO and IOC Applications, and requested the WMO Secretariat to write to E-SURFMAR in this regard (**action; WMO Secretariat; asap**).

9.2.5.8 The Team encouraged the VOS operators / NMHSs to download VOS metadata from the E-SURFMAR database via FTP for inserting appropriate metadata into the new BUFR template for VOS (**action; VOS operators / NMHSs; 2012**).

9.2.2 BUFR Template for XBT/XCTD data

9.2.2.1 The Meeting reviewed the status of the BUFR template for XBT and XCTD data, agreed that it reflected the requirements for GTS distribution of XBT data and metadata well, pending formal validation of the Template by the CBS.

9.2.3 BUFR coding requirements for other types of data (e.g. TSG)

9.2.3.1 Joaquin Trinanes (USA) reported on the work performed to distribute TSG data onto the GTS in BUFR format. Using a WMO prescribed template, the data have been encoded/decoded, the transmission to the GTS tested, and interaction with NWP centres undertaken in order to learn about their decoding experiences concerning these bulletins. Mr Trinanes also reported on the main problems encountered during testing and discussed the possibility to start defining new templates for associated data types currently not being transmitted to the GTS (e.g. pco2sw).

9.2.4 General coding issues

9.2.4.1 The Meeting reviewed the latest developments from the JCOMM Data Management Programme Area (DMPA) Task Team on Table Driven Codes (TT-TDC) regarding the introduction of ocean variable based BUFR sequences to include data and instrument/platform metadata to be reported in real-time.

9.2.4.2 The Team invited SOT members to access and decode those distributed reports encoded according to the BUFR templates in validation, and to report any issue and/or discrepancy to the JCOMM Task Team on Table Driven Codes (TT-TDC) Chair, Mr Bill Burnett (USA, Bill.Burnett@noaa.gov) (**action; SOT members; ongoing**).

Preservability of VOS data

9.2.4.3 The Team reviewed a comprehensive preliminary report on the Preservation of Voluntary Observing Ship (VOS) Data as Reported at Three Levels⁵¹, and prepared by the ETMC *ad hoc* group (Frits Koek – lead, Netherlands –, Gudrun Rosenhagen – Germany –, Shawn Smith – USA –, Elizabeth Kent – UK –, Nicola Scott – UK –, and Scott Woodruff – USA) that was established by ETMC-III. Based on the *ad hoc* group recommendations, the Team agreed with the following:

51: At the ETMC-III meeting it was recognized that, with respect to the preservation of the real-time data, there are three different levels of observations (A) Observing practices and the recording of the observations on-board the ship; (B) Transmission of the observations in real-time from ship to shore. While it was not proposed to standardize the format(s) used for the transmission of VOS data from ship to shore, ETMC felt that it would be useful to provide guidance regarding the elements that should be transmitted, on a variable-by-variable basis; and (C) Transmission of the observations in real-time onto the GTS in BUFR format.

9.2.4.4 Regarding Observing practices and the shipboard recording of observations:

- i. The Team agreed to continue to advocate for improved “best practices” and archival policies by WMO in terms of (a) publication maintenance (e.g. updating through the use of supplements), and (b) historical publication preservation.
- ii. The Team endorsed continuing efforts by NOAA’s Climate Database Modernization Program (CDMP) and related international initiatives, e.g. RECOVERY of Logbooks And International Marine data (RECLAIM; Wilkinson et al. 2010) and Atmospheric Circulation Reconstructions over the Earth (ACRE), to rescue and make publicly available historical national and international documentation related to VOS observing practices.
- iii. The Team emphasized the importance for marine climatology of safeguarding old (expired) e-logbook documentation, formats, and software, including through the efforts of the Task Team on Instrument Standards (**action; TT-IS & ETMC; SOT-VII**).

9.2.4.5 Regarding the transmission of observations in real-time from ship to shore:

- i. The Team agreed to liaise with the E-SURFMAR’s VOS Technical Advisory Group (VOS-TAG) and try to tune the different views and methods (**action; TT-IS; SOT-VII**). It is important to limit the number of formats to a manageable set that is properly documented at a central location, preferably JCOMMOPS.
- ii. The Team agreed that it would be acceptable to continue an informal utilization of an FM 13-like code (i.e. essentially assuming “ownership” of the code after WMO/CBS officially discontinues it, and thus including the potential for future expansions and modifications) as a useful component of the proposed solutions.
- iii. The Team requested the Task Team on Instrument Standards to liaise with the ETMC ad hoc group in the view to make further recommendations to the Team at its Seventh Session (**action; TT-IS; SOT-VII**)

9.2.4.6 Regarding Real-time GTS transmission of observations in BUFR format:

- i. The Team strongly recommend the adoption of features of the new VOS BUFR template that support recommendations from the JCOMM Data Management Strategy including for BUFR to “more fully incorporate JCOMM considerations, including software reliability, human readability, and the archival and exchange of historical and delayed-mode data in its originally reported form.” The Team requested the DMPA Task Team on Table Driven Codes to address these issues (**action; DMPA TT-TDC; SOT-VII**).
- ii. The Team agreed that it should seek to better connect all JCOMM-related groups that currently work on this problem and try to reach a consensus, as well as designating clear leadership (e.g. possibly to TT-TDC). Expanded use of modern electronic collaboration systems (e.g. Google Docs, ThinkFree, etc.) could potentially be very useful and speed up the results.

9.3 Metadata requirements

9.3.1 The Meeting reviewed latest developments within JCOMM regarding the management of instrument/platform metadata and their requirements for exchange in real-time and delayed mode. The Team recalled that the proper management of instrument/platform metadata is an important component of the integration effort promoted by the WMO Integrated Global Observing System (WIGOS). Standardization is necessary for all data and associated metadata so that the measurements from individual systems can be integrated into accurate and coherent data sets that allow for the development of unbiased, homogeneous long-term time-series.

WMO Publication No. 47

9.3.2 The meeting recalled that the *International list of selected, VOSCLim, supplementary and auxiliary ships* (WMO Publication No. 47, Pub47) is a mandatory Publication of the WMO, and that according to the WMO Guide to Marine Meteorological Services (WMO No. 471), *Members are asked to provide to the WMO Secretariat at least every quarter, but preferably every month, updates of their list of Selected, VOSCLim, Supplementary and Auxiliary ships, as an email attachment in approved format. This is the most efficient means of keeping the master list updated, as no retyping is required. The Secretariat makes available the master list through its web page (<http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm>).*

Informal copies of Pub47 at E-SURFMAR and JCOMMOPS

9.3.3 The Team noted with appreciation that following its recommendation at SOT-V, the WMO Secretariat is now automatically forwarding on a routine basis the monthly and quarterly submissions of SOT members to the Pub47. It thanked the WMO Secretariat, the Surface Marine programme (E-SURFMAR) of the Network of European Meteorological Services (EUMETNET), and JCOMMOPS for their efforts in realizing this and making the VOS metadata available in a more timely fashion.

9.3.4 The meeting invited its members to provide feedback to the WMO Secretariat, E-SURFMAR, and JCOMMOPS regarding any remaining timeliness or residual WMO resource issues to ensure continuing satisfactory metadata availability for marine climatology in the future (**action; SOT members; ongoing**).

Marine Climatology requirements

9.3.5 The Team reviewed the metadata requirements for Marine Climatology, noted some deficiencies to address those requirements properly, and invited JCOMM through the SOT, the Data Buoy Cooperation Panel (DBCP), the Expert Team on Marine Climatology (ETMC), the JCOMM Data Management Coordination Group (DMCG), and other relevant bodies) to (i) refine the scope of metadata to be targeted for the collection and availability at the ODAS Metadata Service (ODASMS); and (ii) promote a more integrated ODAS metadata collection/delivery/archival solution with ODASMS acting together with linkages as appropriate with JCOMMOPS, the Water Temperature Metadata Pilot Project (Meta-T), and E-SURFMAR. The Team requested the Task Team on Pub47 metadata to liaise with the DBCP, the ETMC, and the DMCG as appropriate in the view to make progress on these issues (**action; TT-Pub47; SOT-VII**).

9.3.6 The Team noted that the third Session of the ETMC (Melbourne, Australia, February 2010) recommended an initial test of the scope and usability of ODAS metadata obtained from ODASMS — as well as the operation of the web-based interface (e.g. if it permits efficient large-scale metadata transfers) — by means of a comparison with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) sample marine reports (from buoys, etc.). However, it was reported that the test has not yet proved feasible, because the Ocean Data Acquisition system (ODAS) Metadata Service (ODASMS) system does not yet appear to be fully functional. The Team invited the NMDIS to provide the ICOADS with a suitable sample of representative sample metadata (e.g. two years of all archived metadata for each of those years, with the years possibly bracketing the full available period of record of the stored metadata; i.e. separately from the ODASMS web-based interface, such as via ftp) (**action; NMDIS; end 2011**).

9.3.7 In line with the recommendation from the third JCOMM Session, the Team requested the National Marine Data and Information Service (NMDIS, China) to ensure that the ODASMS has taken over metadata formerly managed in the *On-line Information Service Bulletin on Non-drifting ODAS* and operated by the Integrated Science Data Management (ISDM, Canada) (**action; NMDIS; asap**).

9.3.8 The Team emphasized again the importance of the rescue of historical buoy and ODAS metadata, which may be at risk of permanent loss due to media degradation, organizational changes, etc. The Team invited its members, and DBCP members to make sure that those metadata are properly rescued (**action; SOT & DBCP members; ongoing**).

Meta-T and real-time distribution of metadata

9.3.9 The Team noted the termination of the Water Temperature Metadata Pilot Project (Meta-T), and agreed with the strategy recommended by the META-T to include as much metadata as is practically available at the time of Global Telecommunication System (GTS) encoding in the BUFR⁵² templates. The design of BUFR templates is of primary importance to the overall management and distribution of data and metadata. This is discussed in more detail under agenda item 9.2. The Team also concurred with the following recommendations from the META-T:

- (i.) The JCOMM Data Management Programme Area (DMPA) Task Team on Table Driven Codes (TT-TDC) should be the primary group concerned with GTS message encoding and template development. The TT-TDC should include at least one member from each of the JCOMM Observation Panels. The TT-TDC should develop the necessary BUFR templates to include as much metadata as is accurately known at the time of encoding. Technical issues such as satellite transmission costs or current operational realities should not negatively influence this design goal. If there is a place to put the metadata, then there is a hope that operational collection and distribution can happen but if there is no place to record the metadata, it will not be included.
- (ii.) DMCG should be invited to establish a JCOMM DMPA Task Team focused on exploring web based technologies and that could leverage the TT-TDC efforts and extend them with web-services that provide deeper functionality than the GTS can currently deliver (**action; DMCG; SOT-VII**).

Automated Shipboard Aerological Programme (ASAP) Metadata

9.3.10 The Team recalled that there is no central database for ASAP metadata at this point. The possible need for a dedicated ASAP metadata database has been discussed at previous sessions of the SOT and the ETMC, although no definite actions were agreed. An option considered at SOT-IV was for JCOMMOPS to maintain an online ASAP metadata database. Some progress was reported at SOT-V and a web page⁵³ maintained at JCOMMOPS. However, the web page only provides for a link to the European Centre for Medium-Range Weather Forecasts (ECMWF) monitoring information, and an outdated monitoring report of the EUMETNET ASAP (E-ASAP).

9.3.11 The Team requested JCOMMOPS to become more pro-active in this regard by (i) discussing format issues with the WMO Secretariat for the integration of ASAP metadata in the WMO Publication No. 9, Volume A, Observing Stations and the WMO Catalogue of Radiosondes and Upper-air wind Systems⁵⁴ taking into account the specificities of ASAP, and (ii) proposing a mechanism for the collection of metadata from ASAP operators and other sources, including on-line tools, and their submission to the WMO No. 9, and the WMO Catalogue as appropriate. The proposed scheme should also include a proposal for a metadata access policy taking into account the [ship security and commercial] sensitivity of maritime companies with regard to the availability of certain metadata fields to the general public. The Team invited JCOMMOPS to discuss the details of the proposal with the ASAP Task Team, and the WMO Secretariat in the view to submit it at the next SOT Session and later to the CBS (**action; JCOMMOPS; SOT-VII**).

9.3.12 The Team requested the Secretariat to consult with operational users of the ASAP data (e.g. NWP, seasonal to inter-annual climate forecasting) and research users of the historical data (e.g. climate change), as well as the Commission for Basic Systems (CBS) Expert Team on the

52: FM 94–XIV BUFR - Binary universal form for the representation of meteorological data

53: <http://www.jcommops.org/sot/asap-monitoring.html>

54: <http://www.wmo.int/pages/prog/www/obs/volume-a/vola-home.htm>

Evolution of the Global Observing System (ET-EGOS) in the view to receive information about their requirements for ASAP metadata and permit the integration of ASAP metadata in the WMO No. 9 and the WMO Catalogue (**action; Secretariat; end 2011**).

SOOP Metadata

9.3.13 The Team recalled that a metadata collection mechanism has been established by SOOP through the SOOP annual XBT survey⁵⁵ coordinated by JCOMMOPS. A dedicated metadata format⁵⁶ has been developed for SOOP operators to submit the ship metadata for every XBT profile on a yearly basis.

Ship metadata other than VOS, ASAP, and SOOP

9.3.14 Beyond the VOS, ASAP, and SOOP metadata as discussed above, the collection of metadata concerning ship-based observations are managed independently through individual programme, whether there are national or coordinated in some way internationally (e.g. FerryBox, GO-SHIP). The Team acknowledged that no integration effort has been realized in this regard yet but that there would be a benefit to do so as many of those observations are feeding in real-time and/or delayed mode into the WMO and IOC Applications.

9.3.15 Rigs and platforms metadata are discussed under agenda item 2.1.

Discovery metadata

9.3.16 The Team invited agencies holding ship observation data-sets, including surface underway data from the Global Ocean Surface Underway Data Pilot Project (GOSUD) and ocean carbon data from the International Ocean Carbon Coordination Project (IOCCP), to make sure that those data-sets are properly documented, and the discovery metadata made available to the Ocean Data Portal (ODP) and/or the WMO Information System (WIS) using the appropriate ISO 19115 compatible profiles.

9.3.17 The Team requested the Task Team on Pub47 metadata to liaise with the Center for Ocean-Atmospheric Prediction Studies (COAPS) and continue to work towards a more suitable integrated and interoperable scheme for the management of Research Vessel metadata as related to SOT and WMO Pub. 47 and to report on progress at the next SOT Session (**action; TT-Pub47; SOT-VII**).

9.3.18 The Team requested Gustavo Goni (USA) to address the issue of collecting and exchanging SOOP ship metadata, liaise with the TT-Pub47 and JCOMMOPS, and report at the next SOT Session on recommended actions (**action. G. Goni; SOT-VII**).

9.4 Review of the Marine Climatological Summaries Scheme (MCSS)

9.4.1 Ms Gudrun Rosenhagen (Germany) reported on behalf of the Chairperson of the Expert Team on Marine Climatology (ETMC), Mr Scott Woodruff (USA) on ongoing work to modernize the data-flow component of the Marine Climatological Summaries Scheme (MCSS), which is being undertaken by the Cross cutting Task Team on Delayed Mode Voluntary Observing Ship Data (TT-DMVOS). Priorities for modernisation include streamlining the existing data flow (which proposes to include real-time data management with new roles and responsibilities), development of an advanced QC system and identification of a single-point data store with improved data access. Among these activities, in addition to managing the updated IMMT format, the GCCs began in 2010 to offer data in the International Maritime Meteorological Archive (IMMA) format, thus offering greater flexibility and direct compatibility with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS⁵⁷).

55: http://www.jcommops.org/soop/soop_report.html

56: http://www.jcommops.org/doc/metadata/submission_format.html

57 : <http://icoads.noaa.gov>

9.4.2 In the future, the ETMC is planning to increasing convergence and enhancement of the IMMT and IMMA formats, full implementation of Higher-Level Quality Control (HQC; as described by Gudrun Rosenhagen in the Scientific and Technical Workshop), and the future possibility of tapping GTS data.

9.4.3 Another aspect of MCSS modernization concerns outdated requirements for preparation of marine climatological summaries (MCS) in tabular and chart form. In this regard, Ms Rosenhagen briefly reported on the status of the ETMC Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS). While TT-MOCS remains at an earlier stage of development and without a permanent Chair, as a near-term goal we intend to suggest limited revisions to the *Manual on* and *Guide to Marine Meteorological Services* (WMO-Nos. 558/471) in regard to partly updating the legacy MCS requirements, for proposed adoption by JCOMM-IV.

9.4.4 Also related to the proposed future work of TT-MOCS, the ETMC Chairperson and ETMC member Elizabeth Kent (UK) presented *Marine climate indices: a data management perspective* at the Fourth Session of the CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI-IV, 23-25 February 2011, Victoria, Canada).

9.4.5 The Team endorsed the updated MCSS modernization plan as outlined by Ms Rosenhagen and agreed on the following:

- (i) That SOT continues to take an active role in the TT-DMVOS activities, and engage with TT-MOCS in the future as appropriate (**action; SOT; ongoing**);
- (ii) That the ETMC continues to investigate appropriate archiving format(s) at the GCCs taking into account the IMMT format and the modernized IMMA format (**action; TT-DMVOS; GCCs, ongoing**).
- (iii) That the SOT in collaboration with the ETMC provides views on the emerging new HQC standard, and also continues to suggest how data and products will most effectively be served to a broad spectrum of users, e.g., through possibly complementary roles of the GCCs, RMs, and ICOADS (**action; SOT, TT-DMVOS, TT-MOCS; ongoing**).

10 FUTURE WORK PROGRAMME

10.1 Partnership and integration with other ship-based observation programmes

10.1.1 Dr Fischer led an opportunity to revisit the discussions in the VOS and SOOP panels as well as in common session on the associated programs, and how to best partner with them. Focusing on collaboration with IOCCP and OceanScope in working with the shipping industry, including through the World Ocean Council, the Team recalled that its goal was to improving ship recruitment possibilities and communication with shipping companies for SOT and associated programs. On the industry side, the Team sought to improve understanding, communication, and willingness.

10.1.2 The Team agreed to the following actions, with the goal of facing industry with a common voice, and improving the communication between all the key communities: VOS and SOOP within JCOMM SOT, ocean carbon VOS/SOOP community via IOCCP, WG OceanScope, SAHFOS, driving collaboration where it makes sense:

1. Develop simple information to bring to industry at a high level on what is being done by which companies, what the potential is, where the scientific need is; (**Action for SOT, VOSP, and SOOPIP chairs in collaboration with IOCCP, OceanScope, and World Ocean Council; by Sept. 2011**)

2. Try to positively use the energy of all the initiatives to approach the shipping industry, the IMO and ICS in a coordinated way (**Action for same as above; by SOT-VII**).

10.1.3 The Team encourage all efforts to provide physical data on GTS in real-time if practicable, and noted that JCOMM has information to help with this through a data management cookbook.

10.2 WMO Integrated Global Observing Systems (WIGOS)

10.2.1 The Secretariat reported on recent developments with regard to the WMO Integrated Global Observing System (WIGOS), in particular expected decisions of the WMO Sixteenth Congress with regard to WIGOS Implementation during the next financial period (2012-2015). The Meeting discussed the role of the SOT with regard to the integration of marine meteorological and other appropriate oceanographic observations into WIGOS. In particular, the Team reviewed the outcome and legacy recommendations of the JCOMM Pilot Project for WIGOS and the role that the SOT should play in this framework and the WIGOS Implementation Phase (2012-2015). In particular,

- (i.) Referring to legacy recommendation 2, the Team agreed to contribute to the review of WMO and IOC Publications through its Task Team on Instrument Standards, and other Task Teams as appropriate (**action; TT-IS; SOT-VII**);
- (ii.) Referring to legacy recommendation 3, the Team invited its members to make sure that instrument/platform metadata related to ship-based observations are properly collected and made available through the appropriate channels, taking particular attention to SST and SSS data (**action; SOT members; ongoing**).
- (iii.) Referring to legacy recommendation 4, the Team agreed to contribute to the development of JCOMM guidelines for marine instrument intercomparisons through its Task Team on Instrument Standards, and liaise with the JCOMM Observations Coordination Group (OCG) as appropriate (**action; TT-IS; SOT-VII**);
- (iv.) Referring to legacy recommendation 5, the Team invited its members to use the facilities offered at the WMO-IOC Regional Marine Instrument Centres (RMIC) in the view to ensure better traceability of ship observations to international standards (**action; SOT members; ongoing**);
- (v.) Referring to legacy recommendation 6, the Team invited the manufacturers of ship-based observation instrumentation to participate in the HMEI (**action; manufacturers; asap**);
- (vi.) Referring to legacy recommendation 9, the Team invited its members to make sure that discovery metadata about ship-based observational data-sets, including in particular those collected through the associated programmes (IOCCP, GO-SHIP, FerryBox, OceanScope, etc.), are properly compiled and made available through the ODP and the WIS using the required ISO-19115 profiles (**action; SOT members; ongoing**).
- (vii.) Referring to legacy recommendation 11, the Team invited its members to comply with the WMO Quality Management Framework (QMF) and quality management principles (**action; SOT members; ongoing**);
- (viii.) Referring to legacy recommendation 12, the Team invited the satellite data telecommunication system operators used for the collection of ship-based observations to participate in the international forum of users of satellite data telecommunication systems for environmental use once established (**action; satcom operators; SOT-VII**);
- (ix.) Referring to legacy recommendation 14, the Team agreed that organizing regular PMO

workshop was an efficient mean of realizing the JCOMM PANGAEA concept;

Instrument practices and traceability

10.2.2 The Team noted the development of a network of WMO-IOC Regional Marine Instrument Centres (RMICs) per JCOMM-III Recommendation 1 aiming at facilitating adherence of observational data, metadata, and processed observational products to higher level standards for instruments and methods of observation, by providing: (1) facilities for the calibration and maintenance of marine instruments and the monitoring of instrument performance; and (2) assistance for instrument inter-comparisons, as well as appropriate training facilities.

10.2.3 The Team noted with appreciation that a RMIC for the WMO Regional Association IV has been established at the National Data Buoy Centre (NDBC) in the USA, and the plans to establish two other RMICs in China and Morocco are underway. The Team thanked USA, China, and Morocco for their contributions in this regard, and encouraged SOT members from these respective regions to participate at the workshops once organized (**action; SOT members; ongoing**). The Team invited all RMICs to take into account standard instrument practices for ship-based observations when developing their activities (**action; RMICs; SOT-VII**).

10.2.4 The Team also noted the successful outcome of the JCOMM Marine Instrumentation workshop for the Regional Association IV (Bay St Louis, USA, 13-15 April 2010) organized and hosted at the NDBC, and the plans to organize another workshop for the Asia-Pacific region at the National Centre for Ocean Standards and Metrology (NCOSM), in Tianjin, China, from 11 to 13 July 2011.

10.2.5 With regard to the recommendations from the joint WMO-BIPM Workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty that was held in Geneva, Switzerland, from 30 March to 1 April 2010 (see Appendix E of SOT-VI document No. 10.2 for excerpts of the final report⁵⁸), the Team encouraged its members to install infrared radiometers on-board ships and sustain such observations in the view to support Satellite calibration and validation strategies and provide observations which are independent of individual satellite instrument programmes to ensure the ability to link climate records across potential satellite data gaps (**action; SOT members; ongoing**).

Updating of relevant WMO and IOC Publications

10.2.6 The Team recalled that, as part of its contribution to the JCOMM Pilot Project for WIGOS, it has already been contributing substantially to the recent review of the appropriate ship-based observation chapters of the following WMO Publications:

- WMO No. 8, Guide to Meteorological Instruments and Methods of Observations - CIMO Guide⁵⁹ -; Chapter 4 (Marine Observations), Part II was updated in particular to reflect current practices with regard to VOS observations
- WMO No. 471, Guide to Marine Meteorological Services; Chapter 6⁶⁰, the VOS Scheme was updated in particular to reflect the integration of the VOSclim in the wider VOS;

10.2.7 The SOT requested the Task Team on Instrument Standards, in liaison with other Task Teams as appropriate, and in a way consistent with the strategy proposed by the JCOMM Pilot Project for WIGOS, to participate in the efforts to further update the above publications as well as the following ones (**action; TT-IS; SOT-VII**):

- IOC Manual and Guides No. 4, Guide to Oceanographic and Marine Meteorological Instruments and Observing Practices⁶¹

58: <http://www.bipm.org/utis/common/pdf/rapportBIPM/2010/08.pdf>

59: http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/CIMO_Guide-7th_Edition-2008.html

60: http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=6423

- IOC Manual and Guides No. 26, Manual of Quality Control Procedures for Validation of Oceanographic Data⁶²
- WMO No. 544, WMO Manual on the Global Observing System (GOS)⁶³;
- WMO No. 488, WMO Guide to the Global Observing System (GOS)⁶⁴;

Interoperability of ocean data systems with the ODP and WIS

10.2.8 Publications are also discussed under agenda items [7.2.3](#) and [12.4](#).

10.2.9 The Team noted that the JCOMM Pilot Project for WIGOS has considered the following data sets as key ones for which interoperability with the IODE Ocean Data Portal (ODP) and/or the WMO Information System (WIS) should be developed. Status of the developments is provided in the table below.

Datasets	Agency(ies)	Target⁶⁵/Status
Global Temperature and Salinity Profiles from the GTSP ⁶⁶	US NODC	Done
Marine Climatological Summaries and Delayed-mode VOS data collected by the Global Collecting Centres (GCCs)	UK Met Office, and DWD, Germany	Done ⁶⁷
Blended-quality climatology products (ICoads ⁶⁸ monthly summaries) - currently extending through May 2007 in NetCDF format	US NOAA/NCDC, and NOAA/ESRL	End 2010/Under discussion

10.2.10 The Team requested the SOT Technical Coordinator to investigate whether Morocco could be interested to participate in the VOS-DP before the RMIC workshop in Morocco in 2012 (**action; SOT TC; Jan 2012**).

11. SUPPORT INFRASTRUCTURE

11.1 Telecommunication facilities

11.1.1 INMARSAT and IMSO

(No report has been submitted by INMARSAT)

11.1.1.1 The Team recalled that the International Mobile Satellite Organization (IMSO) is an inter-governmental organization that oversees maritime distress, safety and security communication services provided via Inmarsat and other mobile satellite service operators worldwide. These public interest services are dedicated to maritime safety within the Global Maritime Distress and Safety System (GMDSS) established by the International Maritime Organization (IMO), and include distress alerting, search and rescue co-ordinating communications, maritime safety information (MSI) broadcasts, and general communications. IMSO is also acting as the International LRIT Co-ordinator, appointed by IMO to coordinate the establishment and operation of the international system for the Long Range Identification and Tracking of Ships (LRIT) world-wide.

11.1.1.2 The Team recalled that many ship-based observations are transmitted to shore via Inmarsat. In particular, sending a message to SACs is a standard service that is supported by all Inmarsat C and mini-C maritime terminals, SOLAS and non-SOLAS compliant. The Team recalled that the provision of some Short Access Codes (SACs) defined for distress and safety purposes is

61: <http://unesdoc.unesco.org/images/0005/000599/059947eo.pdf>

62: <http://unesdoc.unesco.org/images/0013/001388/138825eo.pdf>

63: http://www.wmo.int/pages/prog/www/OSY/Manuals_GOS.html

64: ftp://ftp.wmo.int/Documents/MediaPublic/Publications/WMO488_GOSguide/488_Guide_2007.pdf

65: Date when the connection should be realized for those centres that recently provided positive response

66: GTSP: Global Temperature and Salinity Profile Programme, <http://www.nodc.noaa.gov/GTSP/>

67: For the UK GCC

68: ICoads: International Comprehensive Ocean-Atmosphere Data Set, <http://icoads.noaa.gov/>

a national, optional matter. Routing arrangement of all SAC codes, existing and new, is a national matter of each LES.

11.1.1.3 The Team recalled that decision about the revised list of Inmarsat-C Land Earth Stations (LES) accepting Special Access Code (SAC) number 41 (SAC-41) messages are recorded under agenda item 6.1.

11.1.1.4 The Team recalled that the LRIT system could potentially be used by the PMOs to know where the VOS ships are, provided they have access to the system. The Team requested the WMO Secretariat to contact IMSO and investigate under what condition the PMOs could access ship's location carrying LRIT (**action; WMO Secretariat; Oct 2011**).

11.1.2 EUMETSAT

11.1.2.1 The Team noted the written information provided by EUMETSAT regarding the new High Rate Data Collection Platform (HRDCP) planned for service during 2011. In particular, the new system of HRDCPs will transmit at 1200 baud and there are several design improvements, which provide further significant advantages over the standard rate DCP⁶⁹ (100 baud):

- The use of Offset QPSK modulation scheme allows significantly improved bandwidth efficiency and phase noise tolerance;
- Concatenated Forward Error Correction (FEC) using Consultative Committee for Space Data Systems (CCSDS, 2006) recommended convolution coding & Reed-Solomon codes provide robustness against data loss due to pulsed interference;
- The binary message system with error checking using a 32 bit Cyclic Redundancy Check (CRC), is suited to compressed or uncompressed data of any type.

11.1.2.2 SOT members interested to receive information regarding the new HRDCP are invited to contact Mr Sean Burns of EUMETSAT.

11.1.3 Argos

11.1.3.1 Under this agenda item, Mr David Meldrum (United Kingdom) reviewed the status of the Argos satellite system. The basic system (Argos2) had been in operation for more than 30 years and was carried on board five NOAA polar orbiters and the European Metop-A. Data collected by the system were stored on board the satellites for subsequent downloading to the two global ground stations in North America, and were also rebroadcast in real time for collection by a large network of regional direct readout stations. All data were forwarded to processing centres in France and the USA for QC and GTS insertion. The system had proved to be very reliable and the data were of good quality, largely due to the efficient real-time and offline QC procedures that were implemented and maintained by the JCOMMOPS team located at the French processing centre. Nonetheless, the delays that existed between the time of observation and GTS transmission, typically one hour, continued to cause concern. In some important regions, notably the S Atlantic and S Pacific, average delays were much larger, both because of gaps in the direct readout station network and because of the blind orbit, issue that affected downloads to the global ground stations. These problems were in part being addressed by the planned installation of new direct readout stations, and by the use of the Metop antenna in Svalbard to collect some of the blind orbit datasets.

11.1.3.2 A new 2-way system, Argos3, offering better data integrity and higher data rates, was gradually being rolled out, and plans were well advanced for the follow-on Argos4 system. The future reliance on NOAA platforms to carry the Argos system was being reduced through planned launches on board Metop-B and the Indian SARAL satellite.

69: The Data Collection Service (DCS) is one of the core services operated by EUMETSAT in support of meteorology and weather prediction. The service enables data collection platform (DCP) operators to use the Meteosat system to receive environmental data collected from DCP platforms, including ships.

11.1.4 Iridium

11.1.4.1 The JCOMM Observations Coordination Group (OCG) vice-Chairperson, Mr David Meldrum (United Kingdom) provided an overview of commercial satellite communication systems currently available for the data collection of ship-based observations.

11.1.4.2 Mr Meldrum noted the increased use of the sophisticated 66-satellite Iridium constellation for real-time data collection and its increasing presence on board ships for routine telephony. Many oceanographic observing systems (drifters, floats, gliders, AWSs) were migrating to Iridium because of the advantages it offered in terms of delivery speed, data volume, energy consumption, remote control of the mobile platform and cost. Data were typically delivered to the user in less than 30 seconds, allowing dramatic improvements to be made in GTS delays (fig 1 below, courtesy of Pierre Blouch, Météo France).

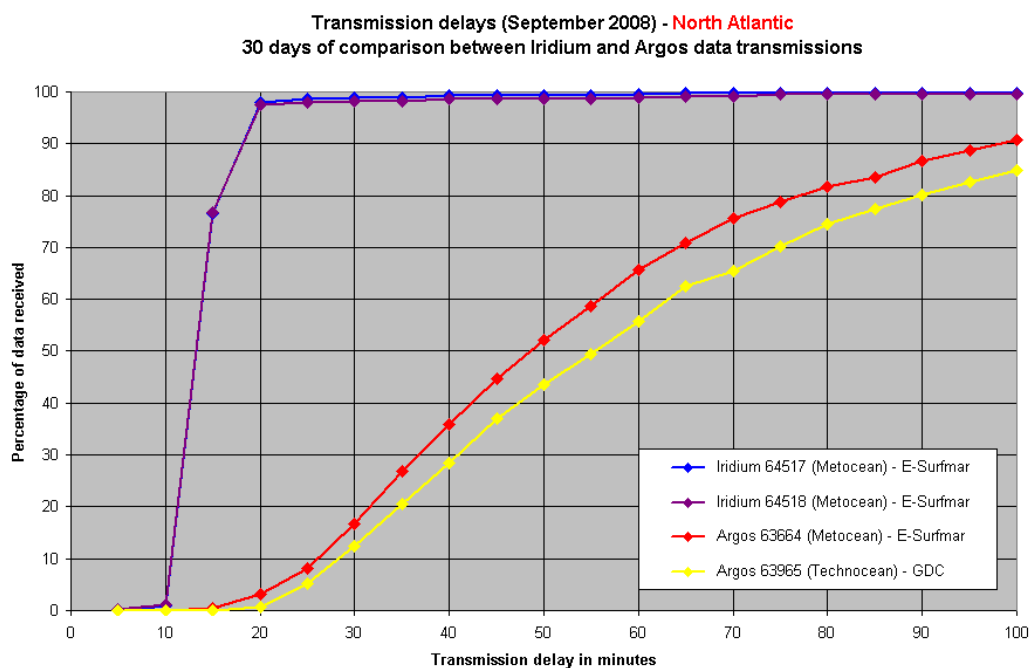


Figure 1: Transmission delays (September 2008) – North Atlantic – 30 days of comparison between Iridium and Argos data transmissions

11.1.4.3 The future of the Iridium system had also been secured through the funding of a complete replenishment constellation, Iridium ‘Next’, to be built by the European aerospace contractor Thales Alenia Space. Recent products included a broadband terminal and a new data modem, the matchbox-sized 9602. Mr Meldrum also noted that plans were being developed within the DBCP to invite proposals from Iridium resellers to provide an end-to-end Iridium-GTS service along the lines currently in place for Argos. The eventual package would include some measure of revenue sharing with the provider in support of JCOMMOPS.

11.1.5 Review of satellite data telecommunication systems

11.1.5.1 Moving finally to a review of other satellite systems that might be of interest to the SOT and SOOIP, Mr Meldrum noted the rapidly expanding interest in Satellite AIS (S-AIS) as a means of global ship tracking and data collection. Although the AIS system had never been designed with satellite surveillance in mind, a number of players were currently offering S-AIS services, notably the Orbital Sciences Corporation, operators of the 27-satellite Orbcomm constellation, and the exactEarth organization. S-AIS had the potential to be used for routine data collection if suitable standards were agreed.

11.1.5.2 Inexpensive data collection services were also offered by other satellite systems, notably

Globalstar and Thuraya, but neither of these systems so far featured global coverage, and so were for the time being unlikely to be of interest to ship operators. However, many ships now implemented VSAT systems to ensure continuous Internet, e-mail and phone services, and the potential of these services could and should be exploited for real-time data collection and feedback to the ship's officers. Many officers now used the third-party Sailwx⁷⁰ website to monitor GTS insertion of their observations, and Mr Meldrum urged the meeting to make use of the expanding Internet capability of ships to establish an official feedback service, both in the interests of improved data quality and to encourage and reward the vital participation of the ship's officers in marine data collection.

11.1.5.3 The Team noted that many of the VOS observations currently available via the Sailwx web site are almost available in real-time while it was agreed at SOT-V that an artificial 48h delay should be introduced in order to address the ship security issue and ship owners and masters concerns regarding the availability of ship's position and identification information on public web sites. The team requested Candyce Clark (USA) to follow up why there is no 48h delay introduced for making the GTS VOS data available via this website (**action; C. Clark; asap**).

11.2 JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS)

11.2.1 The Argo/SOT Technical Co-ordinator, Mr Mathieu Belbéoch, reported on the operations and development of the JCOMMOPS in general, and highlighted items of interest to the Team, including details on an integrated database and monitoring tools, deployment opportunities for buoys, floats and other oceanographic devices, as well as on the JCOMMOPS integrated database.

11.2.2 The Team took note of the progress in the development of the Centre and of the fact that JCOMMOPS was in a transitional period affecting medium term developments and services.

11.2.3 The Team took note of the efforts made by JCOMMOPS to develop the ship related activity on the long run. In particular, it welcomed the successful experiment of ship chartering by JCOMMOPS, and invited SOT participants to consider providing VOS equipment to the ship.

11.2.4 The Team invited the IOC, in liaison with the WMO Secretariats to prepare the renewal of the MoU between UNESCO and France for the hosting of JCOMMOPS taking into account the requirements of both WMO and IOC Organizations. In particular, the Team invited the representatives for France, to act in liaison with Ifremer and CLS to strengthen the centre resources.

11.2.5 The Team discussed and agreed on JCOMMOPS activities and, where possible, on areas of potential development during the next intersessional period, including in particular:

- (i) The development of an integrated database, web based services and monitoring products in support of SOT;
- (ii) The establishment of a Cruise Coordinator position in support of all ship related activities.

11.2.6. The meeting decided on the following action items:

- (i) Team members to review the proposal for the establishment of a Cruise Technical Coordinator position within JCOMMOPS, provide feedback to the SOT Chair, and consider funding part of it as of 2012. (**action; Team Members, end 2011**);
- (ii) The SOT Chair to encourage SOT participating countries to augment their contributions to JCOMMOPS for eventually achieving appropriate support to the

70: <http://www.sailwx.info>

ship-based observation programmes (**action; SOT chair; on-going**);

- (iii) The SOT Chair to provide a reasonable list of priorities for JCOMMOPS for the next intersessional period, with regard to SOT support. (**action; SOT chair; end 2011**).

11.2.7 The Team reviewed and agreed on the JCOMMOPS operations budget for the SOT as provided in [Annex XVII](#).

11.2.8 The Team raised some concerns about the potential perception of maritime companies supporting the VOS on a voluntary basis while other private vessels are chartered in support global ocean observations, and stressed that such chartering is being made essentially to cover data sparse regions.

11.2.9 The Team requested Graeme Ball to contact the GDC in the view to possibly install a drifter onboard the Lady Amber and use it as a simple AWS (**action; G. Ball; asap**).

12. PROGRAMME PROMOTION, AND INFORMATION EXCHANGE

12.1 SOT Annual Report

12.1.1 The Team noted that the following SOT annual reports have been compiled by the WMO Secretariat and published on CD-Rom since the last SOT Session:

- SOT Annual Report for 2008 as JCOMM Technical Report No. 46 (WMO/TD-No. 1459). It is also available via the web⁷¹.
- SOT Annual Report for 2009 as JCOMM Technical Report No. 51 (WMO/TD-No. 1525). It is also available via the web⁷².

12.1.2 The annual reports contains a list of national reports that have been submitted to the Secretariat, as well as RSMC and VOSclim RTMC monitoring reports, the reports by the Task Teams (2008 report), the status of Global VOS Automation as at the end of the year, and URLs of web pages of interest (e.g. contact points listed on the JCOMM web site). The annual report for 2010 is about to be compiled on CD-ROM as JCOMM Technical Report No. 54 (WMO/TD-No. 1568) using the same structure as the previous issue.

12.1.3 The Team requested the VOSP, SOOPIP, and ASAP TT Chairpersons to comment and provide feedback to the SOT Chairperson regarding the format of the National Report (**action; VOSP, SOOPIP, ASAP TT chairs; asap**).

12.1.4 The Team requested JCOMMOPS to provide the WMO Secretariat with a link where the SOOP survey for 2010 will be available, and for inclusion in the SOT annual report for 2010 (**action; SOT TC; asap**). The Team urged the SOOP operators to provide the SOT TC as soon as possible with the required SOOP metadata permitting the compilation of the SOOP survey (**action; SOOP operators; asap**).

12.2 Websites

12.2.1 Mr. Mathieu Belbéoch (JCOMMOPS) reported on the status of the websites maintained at JCOMMOPS including the JCOMMOPS⁷³, SOT⁷⁴, SOOPIP⁷⁵, and ASAP⁷⁶ web sites.

71: <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-46-SOT-ANN-2008/index.html>

72: <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-51-SOT-ANN-2009/index.html>

73: <http://www.jcommops.org/>

74: <http://sot.jcommops.org>

75: <http://www.jcommops.org/soopip/>

76: <http://www.jcommops.org/sot/asap/>

12.2.2 He presented the web mapping applications supported by JCOMMOPS as well as recent developments for the SOT, SOOPIP, and ASAP Websites.

12.2.3 Mr G. Ball, webmaster of the JCOMM VOS website⁷⁷, reported on the status of the website. The report included a brief background about the development of the website, an outline of the website's structure, a chronology of changes to the website since SOT-V and possible future improvements or changes to the website.

12.2.4 The Team requested JCOMMOPS to replace its list of SOOPIP contacts on the JCOMMOPS web site by a link to the same list maintained on the JCOMM web site (**action; JCOMMOPS; asap**).

12.2.5 The Team requested the VOS National Focal Points to provide Graeme Ball with links of national VOS or PMO web sites for their inclusion in the VOS website (**action; VOS NFP; ongoing**);

12.3 Focal Point mailing lists

12.3.1 The Team recalled that the SOT, VOS, VOSclim, PMO, and SOOPIP contact lists are being maintained by the Secretariat on the JCOMM web site⁷⁸. JCOMMOPS also maintains the corresponding electronic mailing lists as below, as well as mailing lists for the Task Teams.

<i>List</i>	<i>Email address</i>	<i>Comment</i>
General SOT contact points	sot@jcommops.org	
VOS focal points	vos@jcommops.org	
VOSclim focal points	vosclim@jcommops.org	To be discontinued
SOOPIP focal points	soopip@jcommops.org	
Useful PMO contact points	pmo@jcommops.org	
Task Team on Instrument Standards	sot-tt-is@jcommops.org	Created after SOT-V
Task Team on Metadata for WMO-No. 47	sot-tt-pub47@jcommops.org	Created after SOT-V
Task Team on Satellite Communications Systems	sot-tt-satcom@jcommops.org	Created after SOT-V
Task Team on VOS recruitment and programme promotion	sot-tt-vos-recruit@jcommops.org	Created after SOT-V
Task Team on Call Sign masking and encoding	sot-tt-masking@jcommops.org	
Task Team on ASAP	sot-tt-asap@jcommops.org	Created after SOT-V
Task Team on VOSclim	sot-tt-vosclim@jcommops.org	Created after SOT-V

12.3.2 The Team noted that the JCOMMOPS mailing lists were not consistent with the lists of contact maintained on the JCOMM web site. It requested the Secretariat and JCOMMOPS to find a solution to this problem (**action; Secretariat & JCOMMOPS; end 2011**).

12.3.3 The Team agreed that the VOSclim mailing list was no longer needed and requested JCOMMOPS to delete it (**action; JCOMMOPS; asap**).

77: <http://www.bom.gov.au/jcomm/vos/>

78: <http://www.jcomm.info>

12.4 Publications and brochures

12.4.1 The Team recalled the recommendations from the Task Team on VOS Recruitment and Programme Promotion, reviewed all current publications, and requested Sarah North to look at the suitability of using the UK Metoffice materials as a basis for SOT promotion (**action; S. North; SOT-VII**).

12.4.2 See also agenda items [7.2.3](#) (review of WMO and related Publications) and [10.2](#) (WIGOS)

13. ORGANIZATIONAL MATTERS

13.1 Review the Terms of Reference of the SOT, VOSP and SOOPIP

13.1.1 The Team recalled that through Resolution 2 (JCOMM-III), *Observations Programme Area*, JCOMM terminated the ASAP Panel and all of its outstanding and proposed future activities were passed to the SOT Task Team on ASAP.

13.1.2 In light of the discussions and recommendations arising during the week, the Team reviewed its Terms of Reference (Appendix G of SOT-VI Doc. 3.1), and agreed with the changes proposed in [Annex XV](#). The Team recommended that the proposed changes be submitted to JCOMM-IV for endorsement (**action; Secretariat; JCOMM-IV**).

13.1.3 Mr Ball reminded the Team that the positions of the Chairs, of SOT, VOSP and the SOOPIP were all of a 4-year appointment by JCOMM, and will be reviewed at JCOMM-IV, Yeosu, Republic of Korea, May 2012. The Team endorsed the re-nomination of Mr G. Ball as Chair of SOT, Ms J Fletcher as Chair of VOSP, and Mr G. Goni as the Chair of SOOPIP.

13.2 Review of the SOT Management Team (including the role of the SOT Technical Co-ordinator)

13.2.1 Mr Ball recalled that the Terms of Reference of JCOMMOPS have been expanded by JCOMM-III in 2009 to further enhance the synergies with other JCOMM Observations Programmes such as the International Ocean Carbon Coordination Project (IOCCP), the Global Sea Level Observing system (GLOSS), and the OceanSITES provided appropriate resources are identified to realize such support. New activities also include system performance monitoring, system design evaluation to improve system efficiency and effectiveness. Better links are being developed with the space agencies regarding the dissemination of information on satellite data requirements, and satellite information services through the JCOMMOPS web site.

13.2.2 The SOT Chair reminded the Team that the SOT-IV defined the role of the SOT TC as *“To provide ongoing support to meet the operational requirements of the component panels of the SOT, such as liaison and international focus, problem resolution, information exchange, quality monitoring, network monitoring and network review.* The SOT TC is currently employed and supervised by UNESCO, whilst the Chair of the SOT provides technical guidance and prioritising of tasks.

13.2.3 Mr Ball outlined the functions of the SOT TC and highlighted some new work requirements proposed by the SOT Chair and the sub-panel chairs. The SOT TC provides a valuable coordination and support service to the component programs of the SOT. More specifically the SOT TC:

- Maintains liaison with current VOS, SOOP and ASAP Operators;
- Provides a focus for contact by other international programmes and new programme operators;
- Provides problem resolution, in particular for problems related to GTS traffic;
- Facilitates information exchange, in particular through the JCOMMOPS website;

- Maintains the secure database of REAL/MASK callsigns;
- Maintains quality control systems, in particular the VOS QCRelay;
- Provides SOT network monitoring; and
- Provides a network review, in particular the XBT SOOP.

13.2.4 The Team endorsed the additional requirements proposed by the Chair of SOT and the sub-panel Chairs.

13.3 Funding issues (SOT Technical Co-ordinator, Ship Consumables Trust Fund, ASAP Trust Fund)

13.3.1 The Team recalled that the position of the SOT Technical Coordinator is occupied by Mr Mathieu Belbéoch (JCOMMOPS) who works in principle about 30% of his time for the SOT, and the rest for the Argo Programme as Argo Technical Coordinator. The Team noted that the incumbent's position, including salary and missions are entirely supported by the Argo programme through voluntary contributions made to the Argo Trust fund at the IOC, and agreed that Argo deserved some compensation in exchange of the time the Argo TC spends on SOT issues. At the same time, the national contributions to the SOT are made through the DBCP Trust Fund at the WMO, and about USD 30,000 was committed to the 2011 budget (see Appendix C of SOT-VI preparatory document No. 13.3).

13.3.2 The Team recalled that SOT-V had requested the SOT Chair to negotiate with the DBCP Chair the amount that should be allocated to the SOT within the DBCP budget, in view to make an agreeable proposal at DBCP-25. The negotiations finally resulted in an arrangement with the DBCP, to include an SOT budget line in the DBCP budget, and credit it with USD 20,000 for the 2011 budget. The Team concurred with this arrangement.

13.3.3 The Team also recalled that some of the JCOMMOPS expenditures such as logistical support, and JCOMMOPS Information System developments, are shared by the DBCP, Argo, and the SOT. All things considered (including benefits to all programmes of the synergies established), the Team agreed to fund the following Argo related 2011 activities to a level of USD 20,000 as a fair compensation to Argo: (i) directly supporting the Argo's share of JCOMMOPS Information System upgrade to a level of USD 15,000, and (ii) supporting some of the Argo Technical Coordinator's missions up to USD 5,000. The Team agreed to use the SOT budget line within the DBCP budget for that purpose. Assuming the SOT contributions will at least remain at the same level, the Team agreed to make similar arrangements in support of the cross programme JCOMMOPS infrastructure (USD 15,000) and SOT TC missions on behalf of the SOT (USD 5,000) for the budgets of the following years.

13.3.4 The Team agreed that contributions for the SOT TC would continue to be made to the DBCP Trust Fund at WMO. The Team invited its members to contribute to the Trust Fund to support the Technical Co-ordinator post and thus ensure that current services are maintained while also allowing for future development in support of the VOS, ASAP and SOOP. The Team requested the Secretariat to seek new contributions from Members/Member States in support of the SOT (**action; Secretariat; SOT-VII**). The Team requested the DBCP to credit any new SOT contribution, or increments to existing contributions, to the SOT budget line (**action; DBCP; ongoing**).

JCOMM Trust Fund for Ship Consumables

13.3.5 The Team considered contributing to the JCOMM Trust Fund for Ship Consumables.

13.3.5.1 The Team recalled Recommendation 3 (JCOMM-II, Halifax, Canada, September 2005), *Consumables for Ship-Based Observations*, which effectively established a common fund for ship consumables. This common fund, administered by WMO, provides Member States with a mechanism to pool financial resources for international programmes, therefore being able to take advantage of increased purchasing power to deliver (i.) better price for consumables, and (ii.)

increased quantity of consumables, thus enabling developing programmes to take advantage of any surplus consumables. Whilst the Trust Fund is initially focusing on XBT probes, other expendables could be added in the future.

13.3.5.2 The Team noted that no contribution had been made to the Ship Consumables Trust Fund at this point. The Team invited its member to investigate at the national level whether it would be appropriate for them to contribute to the Trust Fund (**action, SOT members, ongoing**).

ASAP Trust Fund

13.3.6 The meeting reviewed the final statements of account for the ASAP Trust Fund for the period 1 January 2009 to 31 December 2009, and for the period 1 January 2010 to 31 December 2010. These statements are given in Appendix A and B of SOT-VI preparatory document No. 13.2 respectively. The Team noted that some expenditures – approved by the ASAP Task Team Chair, Mr Rudolf Krockauer (Germany) - were made in support of the PMO-IV workshop (Orlando, USA, 8-10 December 2010). The Team accepted both statements of accounts.

13.3.7 The Team recalled that through Resolution 2 (JCOMM-III), *Observations Programme Area*, decisions regarding the management of the ASAP trust fund were transferred to the SOT. The Team therefore agreed that all future expenditures for the ASAP Trust Fund shall now be approved by the SOT Chair.

13.3.8 The Team agreed that no additional contributions were needed at this point.

13.3.9 The Team agreed again with the conditions proposed by SOT-V regarding the use of the remaining funds within the ASAP Trust Fund (i.e. SOT-V final report, paragraphs I-7.2.3.4 and I-7.2.3.5).

14. NATIONAL REPORTS

14.1 Mr Michail Myrsilidis (Greece) chaired the National Reports session. Written reports were presented by the following countries: Australia, Canada, China, Denmark, France, Germany, Greece, Hong Kong (China), Ireland, Italy, Japan, Malaysia, Netherlands, New Zealand, Poland, Singapore, South Africa, Spain, Sweden, Thailand, the United Kingdom, and the United States of America.

14.2 Additionally, a written report was submitted by E-SURFMAR⁷⁹.

14.3 These reports⁸⁰, included in the SOT Annual Report for 2010 (JCOMM Technical Report No. 54) summarized all the relevant activities in each country for all ship-based observations, including: the national objectives, planned activities, mechanisms for coordination between participating national agencies, instrumentation, new developments, data management, associated R&D and capacity-building. Countries operating a ship-of-opportunity programme (Australia, France, Germany, India, Japan, and USA) provided information regarding the status of sampling on each line. In addition, the following national presentations were made during the meeting:

- Australia, presented by Mr Graeme Ball (BOM) on VOS, and SOOP;
- China, presented by Mr Zhi Chen (SOA) on VOS, and SOOP;
- France, presented by Mr Jean-Baptiste Cohuet (Météo France) on VOS);

79: EUMETNET is the Conference of European Meteorological Services. E-SURFMAR and E-ASAP are two operational programmes of the ground based EUMETNET Composite Observing System (EUCOS). Although E-ASAP is a mandatory programme, seventeen EUMETNET Members are participating in E-SURFMAR which is optional. E-SURFMAR (Surface Marine Programme) concerns the European VOS and Data Buoys. EUMETNET members are Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Czech Republic, Montenegro, Former Yugoslav Republic of Macedonia.

80: ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-54-SOT-ANN-2010/national_reports.html

- Germany, presented by Gudrun Rosenhagen (DWD) on VOS and ASAP as well as SOOP (on behalf of Birgit Klein (BSH)).
- Greece, presented by Michail Myrsilidis (HNMS) on VOS;
- India, presented by Dr V.V. Gopalakrishna (NIO) on SOOP;
- Japan, presented by Mr Satoshi Ogawa (JMA) on VOS, SOOP, and ASAP;
- Netherlands, presented by Jan Rozema (KNMI) on VOS;
- New Zealand, presented by Ms Julie Fletcher (MSNZ) on VOS;
- UK, presented by Ms Sarah North (MetOffice) on VOS, ASAP, and SOOP;
- USA, presented by Gustavo Goni (NOAA/AOML) on SOOP, and on VOS on behalf of John Wasserman (NOAA/NDBC).

14.4 The Team agreed that the national reports provided by the Members to the WMO Secretariat as well as the PowerPoint presentations made at this meeting should eventually be published on CD-Rom within the SOT annual report for 2010 (**action; Secretariat; asap**).

15. NEXT SESSION OF THE SOT

15.1 The Team noted the kind offer from Canada to tentatively, host the next SOT meeting in either [Halifax](#), [Montreal](#), or [Vancouver](#), in April or May 2013. The Team agreed to tentatively, accept the offer of hosting the next SOT Session as proposed by Canada.

16. REVIEW OF THE SOT-VI SESSION REPORT, ACTION ITEMS AND RECOMMENDATIONS

16.1 The participants reviewed and approved the final report of the session, including action items and recommendations. Action items, including those noted in preceding paragraphs, are included in the SOT action list in [Annex IV](#).

17. CLOSURE OF THE SESSION

17.1 The Chairperson congratulated the Team for the meeting's achievements. He thanked the participants of the meeting, his co-chairs, and the Secretariat for their support. The Secretariat Representative thanked the SOT Chairperson, the VOSP, and SOOIP Chairpersons, and the participants of the meeting for their contributions to this Session and the activities of the SOT. The Sixth Session of the Ship Observations Team closed at 18:00 pm on Friday 15 April 2010.

ANNEX I

AGENDA

1. ORGANIZATION OF THE SESSION

- 1.1 Opening of the Session
- 1.2 Adoption of the Agenda
- 1.3 Working Arrangements

2. SCIENTIFIC AND TECHNICAL WORKSHOP, NEW DEVELOPMENTS

3. REPORTS BY THE SECRETARIAT, OPA COORDINATOR, SOT CHAIRPERSON AND SOT TECHNICAL CO-ORDINATOR

- 3.1 Report from the Secretariat
- 3.2 Report from the Observations Programme Area Coordinator
- 3.3 Report from the SOT Chairperson
- 3.4 Report from the SOT Technical Co-ordinator

4. REVIEW OF ACTION ITEMS FROM SOT-V

5. REPORTS ON ASSOCIATED PROGRAMMES AND REQUIREMENTS FOR SHIP-BASED OBSERVATIONS

- 5.1 Requirements for ship-based observations
 - 5.1.1 GCOS / GOOS / WCRP Ocean Observing Panel for Climate (OOPC)
 - 5.1.2 Rolling Review of Requirements update
- 5.2 Reports by associated programmes
 - 5.2.1 International Ocean Carbon Coordination Project (IOCCP)
 - 5.2.2 Shipboard Automated Meteorological and Oceanographic System (SAMOS) Project
 - 5.2.3 Ferrybox Project
 - 5.2.4 Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP)
 - 5.2.5 Scientific Committee on Oceanic Research (SCOR) Working Group 133 "OceanScope"
 - 5.2.6 Group for High-Resolution SST (GHRSSST)
 - 5.3.7 Other associated programmes

6. REPORTS AND RECOMMENDATIONS BY THE TASK TEAMS

- 6.1 Task Team on Satellite Communication Systems
- 6.2 Task Team on ASAP
- 6.3 Task Team on VOS Recruitment and Programme Promotion
- 6.4 Task Team on Metadata for WMO-No. 47
- 6.5 Task Team on Instrument Standards
- 6.6 Task Team on Call Sign Masking and Encoding
- 6.7 Task Team on VOSclim

7. SEVENTH SESSION OF THE VOS PANEL (VOSP-VII)

7.1 PROGRAMME REVIEW

- 7.1.1 Report by the VOSP Chairperson
- 7.1.2 Recommendations from the Fourth International PMO workshop
- 7.1.3 Report on the E-SURFMAR VOS Technical Advisory Group (VOS-TAG)

7.2 PROGRAMME STATUS AND IMPLEMENTATION

- 7.2.1 VOS status, trends and developments
- 7.2.2 VOS automation and electronic logbook software
- 7.2.3 Review of WMO and related publications

7.3. ISSUES FOR THE VOS

- 7.3.1 Report on trial of IMO numbers as REAL
- 7.3.2 IMO – report on WMO / IMO actions, progress on MSC circular, etc.
- 7.3.3 Technology challenges (AIS, LRIT, etc.)

8. NINTH SESSION OF THE SOOP IMPLEMENTATION PANEL (SOOPIP-IX)

8.1 PROGRAMME REVIEW

- 8.1.1 Report by the SOOPIP Chairperson
- 8.1.2 XBT biases
- 8.1.3 XBT Science Team

8.2 PROGRAMME STATUS AND IMPLEMENTATION

- 8.2.1 Status of SOOP implementation, sampling scheme, and user requirements
- 8.2.2 Science and operational applications from the Australian XBT Frequently Repeated and High Density network
- 8.2.3 Review of XBT transect responsibilities and International Collaborations
- 8.2.4 Operational XBT systems and new developments
- 8.2.5 Relation of SOOP observation operations to other observations

8.3 ISSUES FOR THE SOOP

- 8.3.1 Reporting of SOOP observations in real-time onto the GTS
- 8.3.2 Science results from the SIO High Density XBT transects
- 8.3.3 Sippican Ocean Probes
- 8.3.4 XBT data tracking
- 8.3.5 Test of XBT BUFR data at NOAA

9. MONITORING, CODING AND DATA MANAGEMENT

9.1 Monitoring and data centre reports

- 9.1.1 VOS Monitoring Report from the Exeter (UK) Regional Specialized Meteorological Centre (RSMC)
- 9.1.2 Monitoring Report from the Real-Time Monitoring Centre (RTMC) for the VOSclim project
- 9.1.3 Global Collecting Centres (GCCs) report on the VOS and VOSclim
- 9.1.4 VOSclim Data Assembly Centre (DAC) report
- 9.1.5 ASAP QC Monitoring report
- 9.1.6 Global temperature and Salinity Profile Programme (GTSP)
- 9.1.7 Global Ocean Surface Underway data Pilot Project (GOSUD)
- 9.1.8 Global temperature data distribution by Coriolis

9.2 Coding requirements

- 9.2.1 BUFR Template for VOS data
- 9.2.2 BUFR Template for XBT/XCTD data
- 9.2.3 BUFR coding requirements for other types of data (e.g. TSG)
- 9.2.4 General coding issues

9.3 Metadata requirements

9.4 Review of the Marine Climatological Summaries Scheme (MCSS)

10 FUTURE WORK PROGRAMME

- 10.1 Partnership and integration with other ship-based observation programmes
- 10.2 WMO Integrated Global Observing Systems (WIGOS)

11. SUPPORT INFRASTRUCTURE

- 11.1 Telecommunication facilities
 - 11.1.1 INMARSAT and IMSO
 - 11.1.2 EUMETSAT
 - 11.1.3 Argos
 - 11.1.4 Iridium
 - 11.1.5 Review of satellite data telecommunication systems
- 11.2 JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS)

12. PROGRAMME PROMOTION, AND INFORMATION EXCHANGE

- 12.1 SOT Annual Report
- 12.2 Websites
- 12.3 Focal Point mailing lists
- 12.4 Publications and brochures

13. ORGANIZATIONAL MATTERS

- 13.1 Review the Terms of Reference of the SOT, VOSP and SOOPIP
- 13.2 Review of the SOT Management Team (including the role of the SOT Technical Co-ordinator)
- 13.3 Funding issues (SOT Technical Co-ordinator, Ship Consumables Trust Fund, ASAP Trust Fund)

14. NATIONAL REPORTS

15. NEXT SESSION OF THE SOT

16. REVIEW OF THE SOT-VI SESSION REPORT, ACTION ITEMS AND RECOMMENDATIONS

17. CLOSURE OF THE SESSION

ANNEX II

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ANNEX III

ACTION ITEMS AND RECOMMENDATIONS FROM THE PREVIOUS SESSION WHICH STILL REQUIRE THE TEAM'S ATTENTION

TABLE 1: OUTSTANDING ACTION ITEMS FROM THE PREVIOUS SESSIONS

No	Ref	Action item	Lead	By	deadline	Status
1	SOT-V/I-2.5.6-(iii)	The new JCOMMOPS website should include new SOT and SOOPIP sites with better usability and consistency, plus an integrated Quality Information Relay tool (with up-to-date Publication 47 data) and an application to browse Callsign Masking information (both password protected)	Belbeoch	JCOMMOPS	SOT-VI	Started at JCOMMOPS
2	SOT-V/I-3.1.4.6-(v)	electronic logbook developers to consider adding the functionality to transmit periodic Admin messages containing all known category 1 and 2 metadata (META-T website will include the list of desired fields)	Koek	e-logbook developers	SOT-VI	Considered
3	SOT-V/I-4.1.14	Code 41 list in WMO Publication 9 Volume D should be revised to reflect the updated list of LES that accept Code 41 messages. Details should be promulgated by WMO to all VOS operating countries listed WMO Publication No 47	WMO Secretariat	Secretariat	end 2009	Not done
4	SOT-V/I-4.1.15	A review should be undertaken of relevant GTS bulletins for ship observations as listed in WMO Volume C1 (Catalogue of Meteorological Bulletins)	WMO Secretariat	Secretariat	end 2009	Not done
5	SOT-V/I-4.1.16	to invite members to check the accuracy of their entries in WMO Volume C1 to ensure that all ship observations are circulated on the GTS irrespective of the hour that they are sent or the geographical area they are sent from	WMO Secretariat	Secretariat	asap	Not done
6	SOT-V/I-5.3.6-(i)	to keep under review WMO Publications No. 544, 488, and 8 and make proposals through the WMO Secretariat and the JCOMM Focal Point on CIMO matters if necessary	Kleta	TT-IS	ongoing	Done for No. 8
7	SOT-V/I-6.2.4.4	to encourage marine observers to provide reports suitable for adding to the Marine Observers Log	PMOs	SOT members & PMOs	ongoing	Ongoing; discussed at PMO-IV
8	SOT-V/III-2.4.7	monitoring centres to report problems regarding VOS data through the QIR	Parrett	monitoring centres	ongoing	Occasional problems reported
9	SOT-V/III-3.6.5.1	only unmasked GCC and BUFR observations should be made available to the DAC, even if that means delaying BUFR observations	Scott	GCCs & RTMC	ongoing	Ongoing
10	SOT-V/III.4.5.10	to define guidelines for instrument certification, and inspection for inclusion as an annex in a future revised version of JCOMM TD No. 4	Kleta	TT-IS	SOT-VI	Permanent, ongoing task
11	SOT-V/IV-2.2.10	to provide regular updates to the Technical Coordinator of the list of ships operating XBT transects, for the maintenance of a centralized database or list	Belbeoch	all SOOPIP members and Technical Coordinator	ongoing	

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12	SOT-V/IV-2.2.7	to identify institutions and operators that are not currently transmitting XBT and GTS data in real time (see also SOT-V/IV-3.6.3)	Belbeoch	Technical Coordinator and SOOPIP Chairperson	ongoing	
13	SOT-V/IV-2.5.6	to request that the TESAC code table include TSGs as a defined recorder type, to allow transmission on the GTS under this format	Belbeoch	Technical Coordinator	immediate	
14	SOT-V/IV-4.2.2	to upgrade the SEAS software to correctly report salinity from xCTD drops (problem identified for PX37)	Trinanes	AOML	end 2009	Low priority
15	SOT-V/IV-3.1.7	to agree on how to define sampling indicators to ensure they accurately reflect the goals of each transect (i.e. some have lower time sampling goals). The Technical Coordinator is asked to monitor sampling indicators on a bimonthly basis.	Belbeoch	Technical Coordinator and SOOPIP Chairperson	end 2009	Not done
16	SOT-V/IV-3.1.8	to investigate discrepancy in indicators of almost contiguous transects, such as for PX11 and IX22	Belbeoch	Technical Coordinator	end 2009	Not done
17	SOT-V/IV-3.6.3	to generate a plot of missing delayed-mode data in order to identify the institutions that need to contribute. And to explore how to help these institutions	Belbeoch	Technical Coordinator and Chairperson; with GTSP and GOSUD for plot	ongoing	
18	SOT-V/IV-4.4.6	to evaluate the differences of the currently available XBT monthly reports (JCOMMOPS, AOML, ISDM), to investigate if collaborative work would be more effective	Belbeoch	Technical Coordinator, M. Ouellet, J. Trinanes	SOT-VI	
19	SOT-V/IV-1.1.5	to maintain an updated SOOPIP web page, containing recent SOOP activities as requested by the SOT and SOOPIP chairs	Belbeoch	Technical Coordinator	ongoing	Not done

TABLE 2: ONGOING RECOMMENDATIONS FROM PAST SOT-SESSIONS

No	Ref	Action item	Lead	By
1	SOT-V/I-2.1.6	to contribute to feeding the JCOMM extreme wave database events when such events are observed by data buoys and are recorded by Team Members	SOT members	SOT members
2	SOT-V/I-2.5.6-(i)	The Team invited its members to suggest information for the news section of JCOMMOPS website and provide feedback on re-developments of JCOMMOPS websites, particularly the Quality Information Relay Tool	SOT members	SOT members
3	SOT-V/I-2.5.6-(iv)	to routinely review the maps showing data sparse areas (drifting buoys, Argo floats) in order to assess if any deployment opportunities can be identified	SOT members	SOT members
4	SOT-V/I-2.5.6-(v)	to provide any deployment opportunities to the Technical Coordinators at JCOMMOPS using support@jcommops.org	SOT members	SOT members
5	SOT-V/I-3.2.3.3	to collaborate with GHRSSST in the view (i) to make additional radiometric skin SST measurements from ships	SOT members	SOT members

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6	SOT-V/I-4.1.18	other National Met Services that host LES to consider circulating similar information via the JCOMMOPS mailing lists	SOT members	relevant NMHSs
7	SOT-V/I-5.3.6-(ii)	Implementing those WIGOS agreed upon Best Practices and standards, and in particular, to provide the ship platform / instrument metadata to Pub 47, JCOMMOPS, META-T servers, and the ODASMS as appropriate	SOT members	SOT members
8	SOT-V/III-2.1.1.5	NMHS operating VOS AWS to make arrangements to ensure that all observations, including hourly observations are inserted onto the GTS for global dissemination	SOT members	NMHS
9	SOT-V/III-2.4.3	NMHSs to advise the RTMC (email to obsmon@metoffice.gov.uk) of investigations undertaken into the causes of bad data identified on the VOSClim Suspect List and to report on the corrective actions taken	SOT members	SOT members
10	SOT-V/III-2.5.1.3	members to use the VOS Pub-47 metadata generation tools within their own NMS as appropriate	SOT members	SOT members
11	SOT-V/III-3.1.8	to consider performance rankings when issuing awards to their individual VOS fleets	VOSP members	VOS operators
12	SOT-V/III-3.4.3	to join the VOSClim so their observations can be contributed	SOT members	SOT members
13	SOT-V/III-3.4.4	to ensure that the information is properly coded for automated stations	SOT members	SOT members
14	SOT-V/III-3.6.5.1	to not mask the VOSClim ships real time data, and to provide for the REAL callsign in the delayed mode data	VOSClim operators	VOSClim operators
15	SOT-V/III-3.6.5.2	To notify of new recruits to the DAC immediately upon initiation of the new vessel	SOT members	SOT members
16	SOT-V/III-3.6.5.5	VOSClim participants to submit the IMMT data to the GCCs	VOSClim operators	VOSClim operator
17	SOT-V/III-3.6.5.6	to upgrade as many ships as possible to VOSClim class	VOSP members	VOS operators
18	SOT-V/III-4.2.4	to investigate the option of establishing PMO offices in the Arctic region and discuss with maritime companies as appropriate	SOT members	SOT members
19	SOT-V/III-4.4.8	VOS operators and PMOs to provide ships with clear instructions on how to send data via an email	PMOs	PMOs
20	SOT-V/III-4.4.8	NMHSs receiving observations by this method or by non-LES, methods to ensure that the reports are inserted onto the GTS for global distribution	SOT members	NMHSs
21	SOT-V/IV-2.4.3	to consider contributing to the Trust Fund for consumables	SOOPIP members	all SOOPIP members
22	SOT-V/IV-2.2.4	all institutions operating XBT transects and TSGs to transmit data in real time or near-real-time onto the GTS, or to request the assistance of the chair to do so	SOOPIP members	All SOOPIP members
23	SOT-V/IV-3.1.9	to provide input to the SOT Technical Coordinator on a timely fashion in order for the results of the annual survey for the previous year to be provided early in the year	SOOPIP members	all SOOPIP members
24	SOT-V/IV-3.1.13	to provide feedback on the SOOPIP and JCOMMOPS websites and reports, particularly if it would be useful for new reports or content to be developed. In addition, specifically to comment on the usefulness of the Monthly SOOP BATHY report, and indicate wheth	SOOPIP members	all SOOPIP members, feedback to JCOMMOPS
25	SOT-V/IV-2.5.5	to identify if there are other observations (pCO ₂ , CPR, ADCP, etc.) that could benefit the operational community if they are transmitted on the GTS	SOOPIP members	SOOP members to report to SOOPIP Chairperson

ANNEX IV

ACTION LIST / WORKPLAN ARISING FROM THIS SESSION

No	Ref	Action item	By	Deadline
1	2.2(1-2)	to review the Initial Science and Implementation Strategy and assist in the implementation and experimental design of SOOS	SOT members	SOT-VII
2	2.2(1-3)	The Team agreed that the VOSP should take the lead in approaching Tourism ships sailing to Antarctica, and liaise with the Chairs of the SCAR/SCOR Expert Group in Oceanography, John Gunn (Antarctic Division, Australia) and Mike Meredith (BAS, United Kingdom), and the SOOPIP in the view to agree on a common SOT/SOOP strategy for having some of those vessels participate in the SOT and contribute data to the SOOS	VOSP members	ongoing
3	2.2(3-2)	To reach gaps in the array Argo programs work together to lease time on inexpensive platforms to reach regions SOOP do not visit – an opportunity for some SOT programs. The Team noted the potential to share the costs in this regard and invited its members to collaborate if and where appropriate	SOT members	SOT-VII
4	2.2(6-3) 10.1	The Team agreed that the roles of JCOMM and OceanScope with regard to the WOC had to be clarified relatively quickly	SOT Chair	June 2011
5	3.1.2.2	to discuss the issue nationally in the view promote the commitments of WMO Members to PANGEA activities through the VCP	SOT members	ongoing
6	3.1.4.3(a)	VOS operators should pay particular attention to the issue of producing, collecting, and recording the VOSclim additional metadata and quality control elements	VOS operators	SOT-VII
7	3.1.4.3(b)	VOS operators to consider the requirements for recording the traditional manually observed variables from the VOS	VOS operators	SOT-VII
8	3.1.4.3(c)	The TT-IS to complete the production of a JCOMM Technical Report to include guidelines on standards for instruments (including a list of related WMO, UNESCO/IOC, and national publications for each of the SOT programme components) and high quality best practices for the Voluntary Observing Fleet (VOF) and the Ship Of Opportunity Programme (SOOP)	TT-IS	end 2011
9	3.1.4.3(d)	SOT members to continue and expand, where possible, the PMO network	SOT members	SOT-VII
10	3.1.4.3(e)	The TT-Satcom to consider the technical implications related to the compatibility between AIS equipments and observation stations	TT-SATCOM	end 2013
11	3.1.4.4(a)	Continued development of the VOSclim fleet to maximize the number of VOSclim class vessel within the VOS Fleet	VOS operators	ongoing
12	3.1.4.4(b)	Continued review of relevant chapters of the WMO Publications No. 8, No. 471, and No. 488	TT-IS	SOT-VII
13	3.1.4.4(c)	VOS Operators are encouraged to make as much visual observations possible, including waves	VOS operators	ongoing
14	3.1.4.4(d)	Increased use of high data rate satellite data telecommunication on-board ships (e.g. Iridium)	SOT members	ongoing
15	3.1.4.4(e)	The Team also strongly supported the DBCP/SOT drifter donation programme in support of the VOS Scheme for developing countries (VOS-DP) and requested the Programme Evaluation Committee (PEC) of the VOS-DP to act proactively in this context	PEC	ongoing
16	3.1.4.4(g)	Contribute to the completion and updating of the JCOMM Cookbook for the submission of ocean	TT-IS	asap & ongoing

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No	Ref	Action item	By	Deadline
		data in real time and delayed mode		
17	3.1.4.7	The Team concurred with these developments and urged VOS operators currently submitting their ship metadata to the WMO Publication No. 47 to submit them to the JCOMM ODAS Metadata Services (ODASMS, China) from now on	VOS operator	ongoing
18	3.1.4.9	The integration of in situ/satellite/model field data management, including match-up databases (e.g. ICOADS) was also discussed and better collaboration with the satellite community proposed. The Team requested the RTMC to collaborate actively in this process	RTMC	JCOMM-IV
19	3.4.9(2)	The SOT TC to propose a list of essential and mandatory metadata for Pub47 to the SOT TT-Pub47	SOT TC	May 2011
20	3.4.11	JCOMMOPS to issue quarterly reminders to Team members through the SOT mailing list, with information about the REAL/MASK scheme and related requirements, including how to submit appropriate information to JCOMMOPS	JCOMMOPS	ongoing
21	3.4.12	The Team agreed that the mailing lists need to be synchronized between those maintained by JCOMMOPS and those maintained on the JCOMM web site, and requested the Secretariat and JCOMMOPS to discuss the issue and propose practical solution	Secretariat & JCOMMOPS	SOT-VII
22	3.4.13	the SOT TC to assist in making Research Vessel marine meteorological and oceanographic data available on GTS	TC	ongoing
23	5.1.1.7	to work with the JCOMM OPA Coordinator develop metrics of intensity of effort in maintenance of the observing networks - on the PMO network, on VOSclim class growth, or on SOOP line maintenance, recalling the need to keep the metrics simple to calculate	SOT, VOSP, SOOPIP chairs, and SOT TC	ahead of JCOMM-IV
24	5.1.2.2(4)	TT-IS to address feasibility of developing automated wave/sea state sensors	TT-IS	SOT-VII
25	5.1.2.2(5)	DMPA TT-TDC to address the inclusion of VOS current data as part of the BUFR template for VOS data	DMPA TT-TDC	asap
26	5.1.2.3	The Team agreed to review the SOT overarching implementation plan that was adopted at SOT-III, and to include in it an SOT strategy for addressing the full range of observational data requirements (drawn essentially from the RRR, and including those of WMO, OOPC, GCOS, operational oceanography and other applications) and gaps in terms of ship observations, and requested the Chair, in liaison with the VOSP and SOOPIP Chairs, and the Secretariat to update the document for review at SOT-VII	SOT Chair	SOT-VII
27	5.2.1.4	to consider making commitments to permit the transmission of Temperature and Salinity data of IOCCP ships from ship to shore, and requested Maciej Telszewski to bring this information to the IOCCP and provide feedback to the SOT Chair on practical steps that might then be taken to permit this collaboration	Maciej Telszewski	SOT-VII
28	5.2.1.5	SOOPIP Chair and the IOCCP Director to communicate on common issues during the next intersessional period	G. Goni & Telszewski	SOT-VII
29	5.2.2.3	Mr. Smith will coordinate this activity (SAMOS ship data on GTS) with the U.S. VOS program	Smith and US VOS program manager	August 2011
30	5.2.2.4	Investigating using the PMO to collect the R/V metadata, including identifying challenges and benefits of a potential joint activity	Smith & J. Wasserman	SOT-VII

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No	Ref	Action item	By	Deadline
31	5.2.2.5	to contact Mr. Smith if they wish to contribute to the SAMOS professional development program for in-service marine technicians	SOT members	June 2011
32	5.2.2.6	The SAMOS data center is willing to implement the full GOSUD automated quality control (if desired), but requires up-to-date quality procedures and codes from GOSUD	SOOP Chair	August 2011
33	5.2.2.7	Gustavo Goni and Shawn Smith to clarify the role between SAMOS and SOOP for thermosalinographs on NOAA vessels	G. Goni & S. Smith	SOT-VII
34	5.2.2.8	the SOT Chair to contact the US VOS Program Manager in relation to the SAMOS Project and encourage a close cooperation between the US PMOs and SAMOS ships	G. Ball	SOT-VII
35	5.2.5.2	The Team noted the positive energy of the OceanScope Working Group, but stressed that it was important to build a future program also based on existing infrastructure and institutions, including the work of the Team. It was desirable to present a unified voice of all actors in ocean observations from commercial ships to the shipping industry. The Team decided to comment along these lines when the OceanScope report was made public for comment	SOOPIP, VOSP, and SOT chairs	by OceanScope comment deadline presumed mid-2011
36	5.2.6.3	Ian Barton and the SOT Chair to identify people for the proposed ad hoc working group and decide on the opportunity to establish a SOT/GHRSSST pilot project	I. Barton & G. Ball	SOT-VII
37	6.1.7(1)	VOS operators should endeavour to restrict the use of SAC 41 to manual VOS observations.	VOS operators	asap
38	6.1.8(1)	The new list of Inmarsat-C Land Earth Stations accepting SAC-41 messages to be published on the WMO website	Secretariat	asap
39	6.1.8(2)	TT-SatCom to establish comprehensive statistics on the ways used by VOS to report their observations ashore, thanks to the pST communication types entered into Pub47 by VOS operators	TT-SatCom	SOT-VII
40	6.2.8	to investigate potential co-operations with other Met Services to set up and operate ASAP stations on board merchant vessels in line service	SOT members	ongoing
41	6.2.10	The Team agreed that Research Vessels, and navy ships should be more often used as platforms for the making of ASAP soundings, and their data reported on GTS, and invited Shawn Smith to contact the relevant US Research Organizations – with assistance from Team members – and US navy in order to seek their cooperation in this regard	S. Smith	SOT-VII
42	6.3.7(1/1)	WMO to resume high level discussions on a regular basis with IMO to promote VOS issues	WMO	asap
43	6.3.7(1/2)	The JCOMM Management Committee was invited to support the initiative of WMO resuming high level discussions on a regular basis with IMO to promote VOS issues	MAN	Sept 2011
44	6.3.7(2)	The VOS brochure and/or a Poster to be updated by the Secretariat to reflect current VOS status and other related activities, and new draft version submitted to TT-VRPP Chair for review, further editing, and approval by the Task Team	WMO Secretariat	Dec 2011
45	6.3.7(3)	That a VOSclim Focal Point be appointed to join TT-VRPP	TT-VRPP	asap
46	6.3.7(4)	The TOR for TT-VRPP be amended to include an emphasis on VOSclim class requirements	TT-VRPP	asap
47	6.3.7(5)	TT-VRPP membership to be expanded to include that the VOSclim FP, the DAC and the scientific advisors	TT-VRPP	asap
48	6.3.7(6)	The new focal point on VOSclim was requested to contact the scientific advisors for further	VOSclim FP	SOT-VI

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No	Ref	Action item	By	Deadline
		advice, in particular regarding the need to continue to maintain the list of VOSclim National Focal Points		
49	6.4.6(1)	VOS Operators to use the list of approved prST communication types when submitting their national VOS lists to WMO	VOS members	ongoing
50	6.4.6(2)	TT-Satcom to maintain the list of prST communication types on the E-SURFMAR website	TT-Satcom	asap & ongoing
51	6.4.6(3)	VOS Operators to contact TT-Satcom if additional communication types are required	VOS members	ongoing
52	6.4.6(4)	TT-Pub47 to publish the URL of the prST list in the next update of WMO No. 47	TT-Pub47	asap
53	6.4.6(6)	TT-Pub47 to prepare a submission to JCOMM-IV regarding the proposed changes to Pub47 for (1) spd – maximum operating speed of the vessel on normal service, and (2) changes to the element prST from a text field to a formal table and the introduction of an associated footnote field	TT-Pub47	JCOMM-IV
54	6.4.6(7)	The Team reaffirms that VOS Operators, in particular those outside of E-SURFMAR, submit their national VOF list monthly if possible	VOS members	ongoing
55	6.4.6(8)	The ETMC should continue being responsible for proposing metadata elements as part of the ODAS metadata format	ETMC	ongoing
56	6.4.7	TT-Pub47, the ETMC, and the DBCP TT on Moored Buoys to coordinate between themselves in liaison with the DMCG and make sure that the requirements for Rigs and Platforms metadata, and for automated systems installed on offshore platforms in particular are well considered	TT-Pub47	SOT-VII
57	6.5.3	TT-IS to continue to collect information from AWS systems used by SOT members in the view to have sufficient materials to eventually perform the intercomparison and be able draw significant conclusions from the available information	TT-IS	SOT-VII
58	6.5.7	The Team invited Japan to provide information on their AWS to the Chair of the Task Team	Japan	end 2011
59	6.6.8(1)	TT-Masking to liaise with the JCOMM DMPA Task Team on Table Driven Codes (TT-TDC), consult with operational users of the data and GTS routing centres (e.g. AOML/SEAS, NOAA Gateway, ECMWF), Japan, and update the proposal to reflect the SOT preference for option 'b' and to elaborate in more detail the governance regarding the management of the keys.	TT-Masking	Aug. 2011
60	6.6.8(1)	TT was also invited to consider whether it would be realistic to propose that all automated systems eventually use MASK	VOS Operators	Ongoing
61	6.6.8(2)	The new BUFR descriptors, templates, and BUFR table entries constituting the proposal shall then be submitted to the CBS Inter Programme Expert Team on Data Representation and Codes (IPET-DRC) for its meeting in Geneva, Switzerland, September 2010 in the view to have the proposal endorsed by the CBS-XV in 2012 for inclusion of appropriate elements in the WMO Manual on Codes	SOT Chair	Sept 2011
62	6.6.8(3)	The Team also requested TT-Masking to find, or possibly develop, and propose standard software for the encoding and decoding of encrypted callsigns	TT Masking	Sep 2011
63	6.7.3 7.1.1.4 7.2.1.3	The Team recommended to follow example of the UK efforts to upgrade ships to the VOSclim standard to other Member/Member states in order to raise the climate quality of data from the wider VOS, and thereby contribute to the Global Climate Observing System (GCOS). The Team therefore invited VOS operators to consider adapting the UK plan as detailed in Annex 4 of Annex VII to their needs as appropriate	VOS members & PMOs	ongoing

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No	Ref	Action item	By	Deadline
64	6.7.7(1)	Logo and certificate: a new logo should be proposed by the new VOSClim Focal Point (VFP). The certificate is useful and should be preserved. The VFP was invited to redesign the logo and certificate	VFP	end 2011
65	6.7.7(3)	Ship list: the list is still needed. E-SURFMAR was invited to provide sub-lists of VOSClim ships to the DAC	new focal point to liaise with Pierre Blouch	
66	7.1.1.5	New tools such as the Network of European Meteorological Services (EUMETNET) generated 'Observations Monitoring Report' for individual ships, and the UK VOS ranking lists, were demonstrated and VOS operators were urged to become familiar with the tools and use them as appropriate. VOS Operators to check the metadata of their VOS ships within the E-SURFMAR database and make changes directly if necessary.	VOS operators	ongoing
67	7.1.2.3	the Secretariat to promote the VOS-DP with WMO Members by mean of a letter to the Permanent Representatives of the WMO	WMO Secretariat	SOT-VII
68	7.1.2.4	Secretariat to liaise with Chile regarding PMO-V	Secretariat and Chile	2014
69	7.1.2.4	Members to consider providing financial resources through the VCP in support of PMO workshops	SOT members	2014
70	7.2.1.6	that national VOS Programme Managers ensure that the monthly VOSClim suspect list is provided to PMOs for immediate action as necessary	VOS operators & PMOs	ongoing
71	7.2.1.7	JCOMMOPS to develop and make routinely available dedicated monitoring tools for the VOSClim status	TC	SOT-VII
72	7.2.4.1(1)	That the Panel works to upgrade as many ships as practicable to VOSClim class with the aim that 25% of global active VOS ¹ will be VOSClim class by SOT-7. (Quantity)	VOS operators	2013
73	7.2.4.1(2)	That all VOS ships aim to meet the reporting criteria of an 'Active ship' by providing an average of 20 Observations per month. (Quantity)	VOS operators	SOT-VII
74	7.2.4.1(3)	That the Panel aims for less than 3% of VOSClim class ships per month being flagged on the Suspect List for Air Pressure. (Quality – this is something PMOs can directly influence)	VOS operators & PMOs & RTMC	SOT-VII
75	7.2.4.1(4)	That the Panel aims for 95% of VOSClim class observations to be received within 120 minutes. (Timeliness)	VOS operators & RTMC	SOT-VII
76	7.3.2.3	Sarah North to pursue and lead the ship design issue and relationship with ICS and IMO with the support of the WMO Secretariat and report on progress at the next SOT Session	Secretariat / S. North	SOT-VII
77	7.3.3.4	Noting that E-SURFMAR was planning to use and evaluate the AIS binary format for the collection of VOS data from ship to shore, the Panel requested E-SURFMAR to report back to the Panel via its Chair on its experience and recommendations	P. Blouch	SOT-VII
78	8.1.2.2	The Panel agreed to collect data on the common pool of old probes (AOML, CSIRO, NZ?) that could be used in further collaborative FRE experiments	SOOPIP chair and secretariat	end 2011
79	8.1.3.6 (3)	the workshop and the Panel consider developing web pages of major circulation metrics, using the XBTs to show short timescale changes in heat and mass fluxes through basins	All SOOPIP members	SOT-VII

1: The global active VOS is defined as the number of VOS registered in the Pub47 and reporting at least once per month – Today there are about 2000 such ships.

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No	Ref	Action item	By	Deadline
80	8.2.3.6	The Panel reviewed and agreed the provisional table provided in Annex XVI with information on the institutions taking the lead in one or more aspects of the implementation of the XBT transects. The Panel asked the Chairperson to update the table of transect responsibilities periodically	Chairperson	once yearly
80	8.2.5.3(2)	promoting the use of external temperature sensor data for GHRSSST by exploring how to start collaboration with GHRSSST group by providing observations of underway SSTs with SBE 38 and SBE 48 external temperature sensors a) within the NOAA fleet, and b) within the current SOOP fleet, which may be enhanced if the data is acknowledge to have an impact in GHRSSST work	SOOPIP chair and members	SOT-VII
82	8.2.5.3(4)	standardizing data management practices for insertion into the GTS, quality control, and archiving at GTSP [note need equiv action for TSG/GOSUD]	GTSP members (June 2011)	report by SOT-VII
83	8.2.5.3(5)	creating and maintaining a bibliography of publications using TSG data	Chair to negotiate with IRD and/or Coriolis to host	SOT-VII
84	8.2.5.3(6)	Initiate interaction with IOCCP to provide collaboration for the installation of pCO ₂ systems in cargo ships (see also Item 10.1	Action for SOOPIP chair and IOCCP	by SOT-VII
85	8.3.1.4	The Panel decided the following actions towards implementation of more regular real-time (monthly) monitoring of all XBT lines: to investigate possibilities of funding such a comprehensive monitoring of implementation and feedback to operators effort	for SOOPIP chair and SOT TC	by SOT-VII
86	8.3.3.5	The Panel expressed willingness to find ship time with a CTD to work cooperatively with Sippican on their tests. [separate action below] Sippican also requested feedback on technical requirements and potential market for improved probes.	for SOOP to explore cooperation and provide feedback to Sippican through SOOPIP chair	continuous with report by SOT-VII
87	8.3.4.5(1)	AOML to transmit identified problems with XBT deployment to the responsible center [link to 89]	AOML	continuous
88	8.3.4.5(2)	Encourage all agencies to transmit their data into the GTS. AOML will collaborate in the training and/or insertion of data	SOOPIP chair	report by SOT-VII
89	8.3.4.5(3)	Continue collaboration with GTSP and WOA projects to provide quality controlled data	all SOOP members	report by SOT-VII
90	8.3.5.2(1-1)	AOML will provide assistance and training to implement BUFR tables	AOML	continuous
91	8.3.5.2(1-2)	Establish a list of parameters that each agency making XBT deployments (BOM, CSIRO, SIO, NOAA, ...) needs to submit (may be as deployment logs), containing for each deployment: date, time, call sign, transect No., mode, probe type, launch height, operator name, sea state, etc.	SOOPIP members	End 2011
92	8.3.5.2(1-3)	Identify main players to accomplish a successful transition to BUFR (AT, JT, Japanese, French, etc)	SOOPIP chair and members	asap
93	8.3.5.2(1-4)	Investigate modifying SEAS and other software to transmit in all the information necessary needed for inclusion in the BUFR format	AOML and other SOOPIP members	2012
94	8.3.5.2(1-5)	Study and evaluate the need for the enhancement of the current BUFR tables to accommodate for new data sets (underway data, TSG, pCO ₂ , color, etc)	TT-TDC	SOT-VII

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No	Ref	Action item	By	Deadline
95	9.1.1.7	VOS operators were invited to consider the value of the proposed performance ranking system and to advise the Met Office if they considered that the parameters used were appropriate	VOS operators	end 2011
96	9.1.1.7	VOS operators were also invited to consider performance rankings when issuing awards to their individual VOS fleets	VOS operators	ongoing
97	9.1.1.9	The Team stressed that the JCOMMOPS REAL vs. MASK Database needs to be kept up to date. VOS operators using REAL masking scheme to provide quarterly up to date information on REAL vs MASK to JCOMMOPS	VOS operators	ongoing
98	9.1.1.10	The Team also requested the WMO Secretariat to share the list of contact points authorized to access the JCOMMOPS database of REAL vs. MASK callsigns with JCOMMOPS	WMO Secretariat	ongoing
99	9.1.1.11	Instead of sending links to those lists, the RSMC, Exeter to provide the monitoring statistics to the VOS Focal Points	RSMC Exeter	ongoing
100	9.1.1.12	The Team also requested the VOS Focal Points to make sure that these lists are forwarded to the PMOs for immediate action	VOS Focal Points	ongoing
101	9.1.1.13	The Team agreed that it would be useful to introduce separate graphs/tables on the UK Metoffice website to show the relative performance of national VOS fleets, and requested the RSMC to investigate this possibility	RSMC	SOT-VII
102	9.1.1.14	The Team invited the RTMC to review the possibility of tightening the criteria for the VOSclim and AWS, and to propose new criteria if needed Taking into account Australian criterias	RTMC	SOT-VII
103	9.1.1.14	The Team noted that Australia is also using tighter criteria for its VOS, and requested G. Ball to provide these criteria to the RTMC	G. Ball	asap
104	9.1.1.15	the VOSclim Focal Point to consider whether the VOSclim website should be closed, related information included in the VOS web site, including monitoring information, and list of ships	VOSclim FP	SOT-VII
105	9.1.3.4(1)	All CMs are recommended to begin recording observations in IMMT-4 format quality checked to MQCS-6 making use of its increased coding capabilities	CMs	asap
106	9.1.3.5 (1)	Electronic logbook programmers to upgrade logbook software to allow coding in IMMT-4 format	e-logbook developers	asap
107	9.1.3.5 (2)	All CMs that did not submit data during 2010 should do so in 2011 or alternatively contact the GCC for advice	CMs	July 2012
108	9.1.3.6	the SOT and VOSP Chairs to play an active role in TT-DMVOS discussions and provide SOT input as appropriate regarding the modernization of the MCSS	G. Ball & J. Fletcher	asap
109	9.1.6.6 (1) (3).	continue its operations, and in particular to acquire profiles and make real- time & delayed mode profile data available. convene a three-day workshop for design and requirements of the GTSPP NetCDF format revision	GTSPP Steering Group	June 2011
110	9.1.6.6 (2).	continue the production of metrics in support of the JCOMM Observations Programme Area (OPA) and the SOT	GTSPP Steering Group	ongoing
111	9.1.6.6 (4).	complete the evaluation of the use of a CRC in real-time and delayed mode duplicates identification	US NODC	September2011
112	9.1.6.6 (5).	design the GTSPP DVD for using in the IODE training/outreach programs.	US NODC	March 2012
113	9.1.6.6 (6).	complete the bi-annual GTSPP report for 2009-2010.	US NODC	April 2011

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No	Ref	Action item	By	Deadline
114	9.1.6.7	The SOT encouraged national funding bodies to consider on-going funding of this WOCE type QC a high priority because of the importance of this data globally	AOML & SIO & CSIRO	SOT-VII
115	9.1.7.6(1)	The SOT recommends that its members support the project by distributing the GOSUD report presented at this SOT Session in their country and to identify potential contributors either by providing data to the project or by providing scientific or data management expertise that could enhance the quality of the GOSUD dataset and /or enlarge the network. First priority must be put on research vessels or on merchant ships that operate on regular lines	SOT members	SOT-VII
116	9.1.7.7 (1)	Loic Petit de la Villéon and Francis Bringas to set back the connection in order to deliver again data from NOAA ships to GOSUD	L. Petit de la Villeon / F. Bringas	Dec 2011
117	9.1.7.7(2)	Loic Petit de la Villéon to investigate the link between IMOS ² (Australia) and GOSUD	L. Petit de la Villeon	Dec 2011
118	9.2.1.2	the TT-IS to look at those ship-based related practices elements from WMO No. 306, identify appropriate publication(s) to which the identified observation practices should be relocated, and make recommendations to the CBS as appropriate	TT-IS	Sep 2011
119	9.2.1.3(1)	January – June 2011: Validation of BUFR template for VOS data	candidate operational centres	end 2012
120 1	9.2.1.3(2)	July – December 2011: Software developments by SOT members for the adaptation of national data processing systems to permit the encoding of BUFR reports for VOS data, and beginning of operational distribution of VOS reports in BUFR format	members	end 2011
121	9.2.1.3(3)	2012: Transition period where the VOS data will be distributed in both FM-13 SHIP and FM-94 BUFR format	members	end 2012
122	9.2.1.3(4)	End of 2012: Migration to BUFR completed, and stopping of GTS distribution of VOS data in FM13 SHIP format	members	end 2012
123	9.2.1.4	Following the recommendations from PMO-IV in this regard, its members to alert their PMOs about (i) Understanding the basics of BUFR and the requirements for the reporting of new variables, and (ii) Providing feedback as appropriate on possible problems and issues to the JCOMM Task Team on Table Driven codes through their SOT National Focal Points.	PMOs	end 2012
124	9.2.1.6	Pierre Blouch (France), Etienne Charpentier (WMO Secretariat), Julie Fletcher (New Zealand), and Graeme Ball (Australia) to consider the essential additional metadata elements to be sent by TurboWin in real-time	P. Blouch, J. Fletcher, G. Ball, E. Charpentier	end June 2011
125	9.2.5.7	The Team invited E-SURFMAR to make its database of VOS metadata available in real-time to all VOS operators for the benefit of the WMO and IOC Applications, and requested the WMO Secretariat to write to E-SURFMAR in this regard	WMO Secretariat	asap
126	9.2.5.8	The Team encouraged the VOS operators / NMHSs to download VOS metadata from the E-SURFMAR database via FTP for inserting appropriate metadata into the new BUFR template for VOS	VOS operators / NMHSs	2012
127	9.2.4.2	The Team invited SOT members to access and decode those distributed reports encoded according to the BUFR templates in validation, and to report any issue and/or discrepancy to the	SOT members	ongoing

2 : IMOS: Australian Integrated Marine Observing System - <http://www.imos.org.au/>

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No	Ref	Action item	By	Deadline
		JCOMM Task Team on Table Driven Codes (TT-TDC) Chair, Mr Bill Burnett (USA, Bill.Burnett@noaa.gov)		
128	9.2.4.4(3)	The Team emphasized the importance for marine climatology of safeguarding old (expired) e-logbook documentation, formats, and software, including through the efforts of the Task Team on Instrument Standards	TT-IS & ETMC	SOT-VII
129	9.2.4.5(1)	The Team agreed to liaise with the E-SURFMAR's VOS Technical Advisory Group (VOS-TAG) and try to reconcile the different views and methods of ship to shore real-time transmission	TT-IS & TT-Satcom	SOT-VII
130	9.2.4.5(3)	the TT-IS to liaise with the ETMC ad hoc group in the view to make further recommendations to the Team at its Seventh Session	TT-IS	SOT-VII
131	9.2.4.6(1)	The Team strongly recommend the adoption of features of the new VOS BUFR template that support recommendations from the JCOMM Data Management Strategy including for BUFR to "more fully incorporate JCOMM considerations, including software reliability, human readability, and the archival and exchange of historical and delayed-mode data in its originally reported form." the DMPA Task Team on Table Driven Codes to address these issues	DMPA TT-TDC	SOT-VII
132	9.3.4	The meeting invited its members to provide feedback to the WMO Secretariat, E-SURFMAR, and JCOMMOPS regarding any remaining timeliness or residual WMO resource issues to ensure continuing satisfactory metadata availability for marine climatology in the future	SOT members	ongoing
133	9.3.5	the TT- Pub47 metadata to liaise with the DBCP, the ETMC, and the DMCG as appropriate in the view to make progress on the metadata requirements for Marine Climatology	TT-Pub47	SOT-VII
134	9.3.6	The Team invited the NMDIS to provide the ICOADS with a suitable sample of representative sample metadata (e.g. two years of <u>all</u> archived metadata for each of those years, with the years possibly bracketing the full available period of record of the stored metadata; i.e. separately from the ODASMS web-based interface, such as via ftp)	NMDIS	end 2011
135	9.3.7	In line with the recommendation from the third JCOMM Session, the National Marine Data and Information Service (NMDIS, China) to ensure that the ODASMS has taken over metadata formerly managed in the On-line Information Service Bulletin on Non-drifting ODAS and operated by the Integrated Science Data Management (ISDM, Canada)	NMDIS	asap
136	9.3.8	The Team emphasized again the importance of the rescue of historical buoy and ODAS metadata, which may be at risk of permanent loss due to media degradation, organizational changes, etc. The Team invited its members, and DBCP members to make sure that those metadata are properly rescued	SOT & DBCP members	ongoing
137	9.3.9 (2)	DMCG should be invited to establish a JCOMM DMPA Task Team focused on exploring web based technologies and that could leverage TT-TDC efforts and extend them with web-services that provide deeper functionality than the GTS can currently deliver	DMCG	SOT-VII
138	9.3.11	The Team invited JCOMMOPS to discuss the details of the ASAP metadata proposal with the ASAP Task Team, and the WMO Secretariat in the view to submit it at the next SOT Session and later to the CBS	JCOMMOPS	SOT-VII
139	9.3.12	the Secretariat to consult with operational users of the ASAP data (e.g. NWP, seasonal to inter-annual climate forecasting) and research users of the historical data (e.g. climate change), as well	Secretariat	end 2011

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No	Ref	Action item	By	Deadline
		as the Commission for Basic Systems (CBS) Expert Team on the Evolution of the Global Observing System (ET-EGOS) in the view to receive information about their requirements for ASAP metadata and permit the integration of ASAP metadata in the WMO No. 9 and the WMO Catalogue		
140	9.3.17	the Task Team on Pub47 metadata to liaise with the Center for Ocean-Atmospheric Prediction Studies (COAPS) and continue to work towards a more suitable integrated and interoperable scheme for the management of Research Vessel metadata as related to SOT and WMO Pub. 47 and to report on progress at the next SOT Session	TT-Pub47	SOT-VII
141	9.3.18	Gustavo Goni (USA) to address the issue of collecting and exchanging SOOP ship metadata, liaise with TT-Pub47 and JCOMMOPS, and report at the next SOT Session on recommended actions	G. Goni	SOT-VII
142	9.4.5 (1)	That SOT continues to take an active role in TT-DMVOS activities, and engage with TT-MOCS in the future as appropriate	SOT	ongoing
143	9.4.5 (2)	That the ETMC continues to investigate appropriate archiving format(s) at the GCCs taking into account the IMMT format and the modernized IMMA format	TT-DMVOS	GCCs, ongoing
144	9.4.5 (3)	That the SOT in collaboration with the ETMC provides views on the emerging new HQC standard, and also continues to suggest how data and products will most effectively be served to a broad spectrum of users, e.g., through possibly complementary roles of the GCCs, RMs, and ICOADS	SOT, TT-DMVOS, TT-MOCS	ongoing
145	10.1.2 (1)	Develop simple information to bring to industry at a high level on what is being done by which companies, what the potential is, where the scientific need is	SOT, VOSP, and SOOPIP chairs in collaboration with IOCCP, OceanScope, and World Ocean Council	by fall 2011
146	10.2.2(2)	Try to positively use the energy of all the initiatives to approach the shipping industry, the IMO and ICS in a coordinated way	SOT, VOSP, and SOOPIP chairs in collaboration with IOCCP, OceanScope, and World Ocean Council	SOT-VII
147	10.2.1(1)	to legacy recommendation 2, the Team agreed to contribute to the review of WMO and IOC Publications through its Task Team on Instrument Standards, and other Task Teams as appropriate	TT-IS	SOT-VII
148	10.2.1(2)	Referring to legacy recommendation 3, to make sure that instrument/platform metadata related to ship-based observations are properly collected and made available through the appropriate channels, taking particular attention to SST and SSS data	SOT members	ongoing

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No	Ref	Action item	By	Deadline
149	10.2.1(3)	Referring to legacy recommendation 4, the Team agreed to contribute to the development of JCOMM guidelines for marine instrument intercomparisons through its Task Team on Instrument Standards, and liaise with the JCOMM Observations Coordination Group (OCG) as appropriate	TT-IS	SOT-VII
150	10.2.1(4)	Referring to legacy recommendation 5, to use the facilities offered at the WMO-IOC Regional Marine Instrument Centres (RMIC) in the view to ensure better traceability of ship observations to international standards	SOT members	ongoing
151	10.2.1(5)	Referring to legacy recommendation 6, the Team invited the manufacturers of ship-based observation instrumentation to participate in the HMEI	manufacturers	asap
152	10.2.1(6)	Referring to legacy recommendation 9, to make sure that discovery metadata about ship-based observational data-sets, including in particular those collected through the associated programmes (IOCCP, GO-SHIP, FerryBox, OceanScope, etc.), are properly compiled and made available through the ODP and the WIS using the required ISO-19115 profiles	SOT members	ongoing
153	10.2.1(7)	Referring to legacy recommendation 11, to comply with the WMO Quality Management Framework (QMF) and quality management principles	SOT members	ongoing
154	10.2.1(8)	Referring to legacy recommendation 12, the Team invited the satellite data telecommunication system operators used for the collection of ship-based observations to participate in the international forum of users of satellite data telecommunication systems for environmental use once established	satcom operators	SOT-VII
155	10.2.3	The Team encouraged SOT members from these respective regions to participate at the RMIC workshops once organized	SOT members	ongoing
156	10.2.3	The Team invited all RMICs to take into account standard instrument practices for ship-based observations when developing their activities	RMICs	SOT-VII
157	10.2.5	The Team encouraged its members to install infrared radiometers on-board ships and sustain such observations in the view to support Satellite calibration and validation strategies and provide observations which are independent of individual satellite instrument programmes to ensure the ability to link climate records across potential satellite data gaps	SOT members	ongoing
158		Chair to investigate establishment of an SOT TT or working group on emerging technology developments and to report at SOT-VII	Chair	SOT-VII
159	10.2.7	The SOT requested the TT-IS, in liaison with other Task Teams as appropriate, and in a way consistent with the strategy proposed by the JCOMM Pilot Project for WIGOS, to participate in the efforts to further update the above publications as well as IOC M&G No. 4 & 26, WMO No. 544 & 488	TT-IS	SOT-VII
160	10.2.10	the SOT Technical Coordinator to investigate whether Morocco could be interested to participate in the VOS-DP before the RMIC workshop in Morocco in 2012	SOT TC	Jan 2012
161	11.1.1.4	The Team recalled that the LRIT system could potentially be used by the PMOs to know where the VOS ships are provided they has access to the system. the WMO Secretariat to contact IMSO and investigate under what condition the PMOs could access ship's location carrying LRIT	WMO Secretariat	Oct 2011
162	11.1.5.2	Pending receipt of information, Candyce Clark (USA) to follow up the situation regarding whether artificial delays of 48h delay is introduced for making the GTS VOS data available via the Sailwx	C. Clark	asap

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No	Ref	Action item	By	Deadline
		and others, and provide feedback if needed		
163	11.2.6 (1).	Ad hoc committee (G. Ball, J. Fletcher, G. Goni, C. Clark, M. Belbeoch, S. North, Secretariat) to review the proposal for the establishment of a Cruise Technical Coordinator position within JCOMMOPS, propose ToR, and provide feedback to the OCG, and consider funding part of it as of 2012, and generic yearly budget.	Ad hoc committee	end 2011
164	2.2(3-3) 11.2.6 (2).	The SOT Chair to encourage SOT participating countries to augment their contributions to JCOMMOPS for eventually achieving appropriate support to the ship-based observation programmes	SOT chair	on-going
165	3.4.9(1) 11.2.6 (3).	The SOT Chair to consult with the VOSP Chair, the SOOPIP Chair, and the ASAP Task Team Chair, and provide a list of reasonable priorities to the SOT TC & JCOMMOPS for the next intersessional period, with regard to SOT support.	SOT chair	end 2011
166	11.2.9	Graeme Ball to contact the GDC in the view to possibly install a drifter onboard the Lady Amber and use it as a simple AWS	G. Ball	asap
167	12.1.3	the VOSP, SOOPIP, and ASAP TT Chairpersons to comment and provide feedback to the SOT Chairperson regarding changes to the format of the National Report	VOSP, SOOPIP, ASAP TT chairs	Sept 2011
168	12.1.4	JCOMMOPS to provide the WMO Secretariat with a link where the SOOP survey for 2010 will be available, and for inclusion in the SOT annual report for 2010	SOT TC	asap
169		AOML to provide SOOP status report to the Secretariat for inclusion in the SOT annual report for 2010	G. Goni	asap
170	(to SOOP section)	TC to discuss with SOOPIP Chair the content of the SOOP semestrial vor yearly survey, and how the work for its production can be shared	SOT TC & G. Goni	asap
171	12.1.4	The Team urged the SOOP operators to provide the SOT TC as soon as possible with the required SOOP metadata permitting the compilation of the SOOP survey	SOOP operators	asap
172	12.2.4	JCOMMOPS to replace its list of SOOPIP contacts on the JCOMMOPS web site by a link to the same list maintained on the JCOMM web site	JCOMMOPS	asap
173	12.2.5	the VOS National Focal Points to provide Graeme Ball with links of national VOS or PMO web sites for their inclusion in the VOS website	VOS NFP	ongoing
174	12.3.2	The Team noted that the JCOMMOPS mailing lists were not consistent with the lists of contact maintained on the JCOMM web site. It requested the Secretariat and JCOMMOPS to find a solution to this problem	Secretariat & JCOMMOPS	end 2011
175	12.3.3	The Team agreed that the TT-VOSclim and VOSclim National Contact Point e-mailing lists was no longer needed and requested JCOMMOPS to delete it	JCOMMOPS	asap
176	12.4.1	The Team recalled the recommendations from the TT-VRPP, reviewed all current publications, and requested Sarah North to look at the suitability of using the UK Metoffice posters as a basis for VOS promotion	S. North	SOT-VII
177	13.1.2	In light of the discussions and recommendations arising during the week, the Team reviewed its Terms of Reference, and agreed with the changes proposed in <u>Annex XV</u> . The Team recommended that the proposed changes be submitted to JCOMM-IV for endorsement	Secretariat	JCOMM-IV
178	3.1.4.4(f)	the Secretariat to seek new contributions from Members/Member Sates in support of the SOT,	Secretariat	SOT-VII

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No	Ref	Action item	By	Deadline
	13.3.4	including through the WMO and IOC Executive bodies.		
179	13.3.4	the DBCP to credit any new SOT contribution, or increments to existing contributions, to the SOT budget line	DBCP	ongoing
180	13.3.5.2	The Team noted that no contribution had been made to the Ship Consumables Trust Fund at this point. The Team invited its member to investigate at the national level whether it would be appropriate for them to contribute to the Trust Fund	SOT members	ongoing
181	14.4	The Team agreed that the national reports provided by the Members to the WMO Secretariat as well as the PowerPoint presentations made at this meeting should eventually be published on CD-Rom within the SOT annual report for 2010	Secretariat	asap

ANNEX V

TERMS OF REFERENCE OF THE SOT TASK TEAMS

Task Team on Metadata for WMO Publication No. 47 (TT-Pub47)

The Task Team shall:

1. regularly review the WMO Publication No. 47 (Pub47) metadata requirements and make recommendations as appropriate.
2. monitor the receipt of regular Pub47 updates at WMO from participating VOS members.
3. review all relevant JCOMM Publications to ensure they are up to date and comply with Quality Management terminology.

Members:

- Mr Graeme BALL (Chairperson, Australia)
- Mr Pierre BLOUCH (France)
- Mrs Yvonne COOK (Canada)
- Ms Julie FLETCHER (New Zealand)
- Dr Elizabeth C. KENT (United Kingdom)
- Ms Sarah C. NORTH (United Kingdom)

Task Team on Satellite Communications System (TT-Satcom)

The Task Team shall:

1. evaluate the operational and cost-effective use of satellite data telecommunication systems for the real-time collection of VOS and SOOP data in support of the World Weather Watch, GOOS, and GCOS,
2. work closely with the DBCP Iridium Pilot Project,
3. continue to evaluate the operational use of Iridium Satellite data telecommunication technology for the real-time collection of VOS and SOOP data in support of the OBS, GOOS, GCOS, and Natural Disaster Prevention and Mitigation applications
4. continue to monitor the cost implications of Inmarsat satellite communications sent by Code 41,
5. review all relevant JCOMM Publications to ensure that they are kept up-to-date and comply with the Quality Management terminology,
6. report to the next SOT Session on any relevant issues/proposals.

Members: Members below, plus the following:

- Any representatives of countries where LES accepting Code 41 are located
- A representative of RA III.
- Mr Pierre BLOUCH (Chairperson, E-SURFMAR, France)
- Mr Graeme BALL (Australia)
- Ms Julie FLETCHER (New Zealand)
- Mr Frits B. KOEK (Netherlands)

- Mr Michael MYRSILIDIS (Greece)
- Ms Sarah C. NORTH (United Kingdom)
- Mr Satoshi OGAWA (Japan)
- Ms Paula RYCHTAR (USA)
- Mr Derrick SNOWDEN (United States)
- Mr Johan STANDER (South Africa)
- Mr. John WASSERMAN (USA)

Task Team on VOS Recruitment and Programme Promotion (TT-VRPP)

The Task Team shall:

1. Promote and monitor the upgrading of existing ships to VOSClim class standard (Action by DAC and VOSClim Focal Point)
2. Liaise with Scientific Advisors to monitor and report on compliance with VOSClim class requirements (Action by DAC and VOSClim Focal Point)
3. Complete the generic pre-installation design standards that will eventually be available to ship builders and classification societies.
4. Review existing promotional aids (flyer, certificate) and recommend new promotional aids.
5. Promote the use of, and keep under review, the promotional 'SOT Recruitment Presentation'.
6. Establish a store of newsworthy articles for use in a SOT or VOS publications or in national newsletters.
7. Review the questionnaire used for the 2009 Marine Meteorological Services Monitoring Programme, and propose any amendments.
8. Review all relevant JCOMM Publications to ensure they are up to date (in particular with respect to the new VOS classes) and comply with Quality Management terminology.

Members:

- Ms Julie FLETCHER (Chairperson, New Zealand)
- Mr Graeme BALL (Australia)
- Mr Pierre BLOUCH (E-SURFMAR & France)
- Ms Gerie Lynn LAVIGNE (Canada)
- Ms Sarah C. NORTH (United Kingdom)
- Dr Thomas ROSSBY (United States)
- Mr Johan STANDER (South Africa)
- Mr Volker WEIDNER (Germany)
- John Wasserman (USA) - VOSClim Focal Point
- VOSClim DAC
- VOSClim Scientific Advisors

Task Team on Instrument Standards (TT-IS)

The Task Team shall:

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, and 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 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.
7. perform intercomparisons as required by SOT Sessions.
8. review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology.
9. work with the WMO Commission on Instruments and Methods of Observations for updating the WMO Guide No. 8 section dealing with ship-based observations.

Members:

- Mr Henry KLETA (Chairperson, Germany)
- Mr Graeme BALL (Australia)
- Mr Pierre BLOUCH (E-SURFMAR & France)
- Mr Jean-Baptiste COHUET (France)
- Ms Julie FLETCHER (New Zealand)
- Dr Gustavo J. GONI (United States)
- Dr Elizabeth C. KENT (United Kingdom)
- Mr Rudolf KROCKAUER (Germany)
- Ms Sarah C. NORTH (United Kingdom)
- Mr Shawn SMITH (United States)
- Mr Derrick SNOWDEN (United States)
- Mr Johan STANDER (South Africa)
- Mr Bruce SUMNER (Associated Member, HMEI)
- Mr Scott WOODRUFF (United States)

Task Team on the VOS Climate implementation (TT-VOSClim)

The Task Team has been disbanded by SOT-VI and no longer exists.

Task Team on Callsign Masking and Encoding (TT-Masking)

The Task Team shall:

1. oversee the implementation of **MASK**, **SHIP** and **ENCODE** and develop guidelines as necessary.
2. review and approve national **MASK** schemes to ensure they remain unique and do not impinge on (1) the ITU callsign series allocated to a country, or (2) any other marine or oceanographic identification scheme used by WMO, e.g. buoy identification numbers;
3. ensure the **MASK** v **REAL** database is kept up-to-date by NMSs implementing **MASK**.
4. develop the **ENCODE** encryption strategy, as well as develop the encoding and decoding keys.

Members:

- Mr Graeme BALL (Chairperson, Australia)
- Mr Mathieu BELBEOCH (JCOMMOPS)
- Mr Etienne CHARPENTIER (WMO Secretariat)
- Ms Julie FLETCHER (New Zealand)
- Ms Sarah C. NORTH (United Kingdom)
- Mr Colin PARRETT (United Kingdom)
- Mr Scott WOODRUFF (United States)
- DBCP/SOT Technical Coordinator

Task Team on the Automated Shipboard Aerological Programme (TT-ASAP)

The Task Team shall:

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. review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;
5. prepare annually a report on the status of ASAP operations, data availability and data quality

Members:

- Mr Rudolf KROCKAUER (Chairperson, E-ASAP & Germany)
- Mr Graeme BALL (Australia)
- Ms Sarah C. NORTH (United Kingdom)
- Mr Satoshi OGAWA (Japan)
- Mr Johan STANDER (South Africa)
- Mr Bruce SUMNER (Associated Member, HMEI)

- Plus any other country making ASAP soundings
- Possible participation by POGO

XBT Science Team (SOOPST)

The XBT Science Team shall:

1. Provide scientific guidance to the SOOPIP on the implementation of the global XBT network;
2. Receive advice from CLIVAR panels and from international scientific teams on scientific issues associated with the monitoring of the upper ocean thermal structure;
3. Collaborate with the Argo Steering team, on the implementation of the upper ocean thermal network;
4. Collaborate with other teams involved in sustained ocean observations (such as the Ocean Topography Science Team, the Global Ocean Surface Underway Data Pilot Project , the Tropical Atlantic Circulation Experiment, the Tropical Moored Buoy Implementation Panel, OceanSites, etc.);
5. Periodically meet to discuss and communicate scientific and operational results obtained using the XBT global network;
6. Collaborate in the development of ocean systems experiments to evaluate and improve the design of the XBT network;
7. Provide regular reports to the SOT on its work.

Membership: the SOOPIP Chairperson will propose the membership during the intersessional period with preferred participation from the following individuals:

- Isabelle Ansorge (South Africa)
- Moly Baringer (USA)
- Tim Boyer (USA)
- Silvia Garzoli (USA)
- Gustavo Goni (USA)
- Victor Gouretski (Germany)
- Sydney Levitus (USA)
- Christophe Maes (New Caledonia)
- Gary Meyers (Australia)
- Robert Molinari (USA)
- Franco Reseghetti (Italy)
- Giles Reverdin (France)
- Dean Roemmich (USA)
- Derrick Snowden (USA)
- Charles Sun (USA)
- Sebastiaan Swart (Africa)
- Alexander Sy (Germany)
- Ann Thresher (Australia)
- Susan Wijfels (Australia)

ANNEX VI**RSMC EXETER MONITORING REPORT****Introduction**

The Regional Specialized Meteorological Centre (RSMC) Exeter, is acting as CBS Lead Centre for monitoring the quality of surface marine observations (observations from ships, buoys and other in situ marine platforms). It routinely produces monthly and biannual quality reports as well as providing essential feedback to VOS operators regarding the quality of the data delivered by VOS ships.

Monitoring the quality and timeliness of VOS observations*Ships reporting suspect observations*

The Met Office (RSMC Exeter) continues to compile lists of ships that have produced suspect observations each month, which are sent to the WMO Secretariat. They are also available via the Met Office web site¹. The monitoring criteria used are shown in [Annex 2](#).

The RSMC compares observations from individual platforms with the Met Office's global model background 6-hour forecast fields for each variable. Platforms for which the observed values differ from the background by a significant amount are flagged as suspect.

Monthly lists of suspect platforms are sent to the WMO Secretariat and 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 the background fields. The Met Office monthly suspect lists are available via the Met Office web site¹. A recent example of our on-line VOS suspect list for January 2011 is shown in [Annex 1](#). Monthly QC plots are also available from the website for each ship that is listed as suspect.

Monthly monitoring products

The Met Office produces monthly lists of monitoring statistics for all VOS. To maintain up to date lists of ships, the Met Office is using the latest data downloaded from the online E-SURFMAR metadata database, as well as the latest WMO Pub47 data. In addition it uses the masked call sign data available from the JCOMMOPS FTP site².

Originally only mean sea level pressure was monitored, but wind speed, wind direction, sea surface temperature, air temperature and relative humidity have been added to the information being exchanged on a monthly basis. The current monthly monitoring criteria for the 6 variables are shown in [Annex 2](#). The meeting is invited to confirm that the monitoring criteria continue to be set at the correct levels.

The Met Office also produces monthly lists of monitoring statistics for the VOS fleets recruited by certain countries. To maintain up to date lists of the VOS fleets for each country concerned, the Met Office uses WMO Pub 47 and the meta-data available from the E-SURFMAR web-site. However, to ensure that recently recruited VOS vessels are included, the Met Office also receives monthly fleet updates from a number of countries.

National focal points are notified when the latest VOS monthly monitoring reports and suspect lists become available on the Met Office website by means of an email sent by the Met Office to the SOT, VOS and PMO mailing lists, which are maintained by JCOMMOPS. It is important therefore that focal points wishing to receive this monitoring information check that their JCOMMOPS mailing list

1 : <http://research.metoffice.gov.uk/research/nwp/observations/monitoring/index.html>

2 : <ftp://mask2real.vosmask@ftp.jcommops.org/mask2real.csv>

information is kept up to date. However, the monthly monitoring statistics continue to be emailed directly to major VOS operating countries, and as mentioned in reports to previous SOT meetings, any other national focal points who may wish to receive directly emailed copies of the monthly monitoring lists or 'suspect' ship lists should advise the Met Office of their email address.

Semestrial monitoring products

Every 6 months more detailed monitoring reports, for all platforms, are produced and made available to the WMO Secretariat via the Met Office web site. The statistics relating to suspect VOS operated by specific members are extracted from the report and distributed by the Secretariat to national focal points for the members concerned, under a covering letter requesting that remedial action be taken to correct the problems. The Team is invited to note that the Met Office intends to discontinue producing the individual time-series plots for each suspect platform, due to the time-consuming nature of this work and doubts as to the usefulness of these time-series for correcting problems, especially considering the monthly information available (mentioned above). The general overview and statistics are deemed to be more useful on this time-scale, and these will continue to be produced and be available from the Met Office web site.

Ship Masking issue

The SHIP masking scheme implemented by JMA in 2007 is still preventing the Met Office from monitoring data from individual Japanese and some US ships. Although the Met Office continues to collect data with real call-signs from JMA's FTP server, it is unable to route the data to its meteorological database due to problems with guaranteeing data security.

The lists of VOS monitoring statistics available on the Met Office monitoring web-site has been modified during 2009 to replace masked call-signs with real call-signs for those ships with unique masked call-signs, and the ship names and country identifiers were also included (this was an action from SOT-5).

Masked call sign data available from the JCOMMOPS Mask vs Real database is also taken into account when preparing the lists of VOS monitoring statistics. The statistics available on the Met Office web site were modified during 2009 to replace masked call-signs with real call-signs for those ships with unique masked call-signs (the ship names and country identifiers were also included). This was an action from SOT-5.

As mentioned at SOT-5, the Met Office's role as CBS Lead Centre for monitoring marine data is incomplete, with Japanese ships not being monitored individually, due to JMA's adoption of the 'SHIP' masking scheme. The Met Office continues to collect the original data from JMA's FTP server, but this data is not routed into our meteorological database due to issues concerning its security. Consequently, to ensure that the VOS can continue to be monitored efficiently, the Met Office (RSMC Exeter) would prefer that all countries adopt a masking method with a unique masked identifier for each ship, until the new ENCODE masking scheme is rolled out.

Timeliness statistics

Timeliness statistics for VOS reports received at the Met Office are available from our web site³ where monthly timeliness data for individual VOS is available as well as tables and graphs showing the relative timeliness of national VOS fleets. A graphical example for January 2011 data is shown in [Annex 3](#), where it can be seen from the upper graph that the majority of ship reports were received promptly, with more than 50% received within 15 minutes and about 90% received within 60 minutes of the observation time. The timeliness has improved markedly in the past two years, probably due to increased automation. The cut-off time for operational NWP global data assimilation is typically 90-

3: <http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/index.html> . This link will be replaced during 2011 and the new URL will be circulated to users via the JCOMMOPS mailing lists - it will probably be under <http://www.metoffice.gov.uk/research/weather>

150 minutes after the analysis times of 00, 06, 12 and 18 UTC, so more than 90% of global VOS data should be received in time to be assimilated. An example of timeliness information for individual call-signs during January 2011 is shown in [Annex 4](#).

VOS Ranking

Since SOT-5, the Met Office has started producing annual lists of all VOS ships, ranked in order of importance to the numerical weather prediction (NWP) system, and made them available from the Met Office web-site⁴. The ships are ranked in terms of their quantity, quality and timeliness of reports, largely to assist in presenting awards to the best performing ships (initially in the UK VOS fleet). The method and latest results for the UK fleet are shown in [Annex 5](#).

VOS operators are invited to consider the value of the proposed performance ranking system and to advise the Met Office if they considered that the parameters used were appropriate. VOS operators are also invited to consider performance rankings when issuing awards to their individual VOS fleets.


4 : <http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/VOSranking/index.html>

MET OFFICE ON-LINE MONTHLY VOS SUSPECT LIST FOR JAN 2011

SEARCH Met Office

[Home](#) | [Research](#) | [NWP](#) | [Observations](#) | [Observation Monitoring](#) | [Surface Marine Monitoring](#) | [VOS MMR](#) | [Pub47 Suspects](#)

[NWP](#) | [Climate](#) | [Seasonal forecasting](#) | [Atmospheric processes](#) | [Oceanography](#) | [Projects](#) | [The stratosphere](#)



Pub47 VOS Suspects for Jan 2011

To view the suspect threshold for each variable and statistic, hover your cursor over the relevant column. Please note that the bias and standard deviation statistics listed below exclude observations having gross errors.

- Links**
- [Observation Processing](#)
 - [Observation Types](#)
 - [Quality Control](#)
 - [Observation Monitoring](#)
 - [News](#)**
 - [News releases](#)
 - [Contact](#)**
 - [Contact us](#)

PRESSURE (hPa)							
CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
CA	GRIFFON	CGDS	541	42	-12.3	0.7	QC plot
DE	JPO TUCANA	A8RW4	23	0	-4.6	2.9	QC plot
DE	SANTA CLARA	DAJT	74	0	-4.8	0.8	QC plot
EU	CELTIC VOYAGER (AWS)	BATEU03	46	43	11.5	2.1	QC plot
GB	CSCL Long Beach	VRCZ7	32	0	5.9	1.2	QC plot
GB	Eridge	ZCBH7	35	0	9.1	1.5	QC plot
RU	BORIS SYROMYATNIKOV	UCUF	51	35	2.4	7.0	QC plot
RU	ELENA SHATROVA	UITR	28	0	-6.0	2.3	QC plot
RU	OLEG NAIDENOV	UCUC	34	0	-5.1	1.9	QC plot
US	CARNIVAL SENSATION	C6FM8	25	0	-5.4	2.3	QC plot
US	HOOD ISLAND	C6LU4	63	0	-4.9	1.6	QC plot
US	INDIANA HARBOR	WXN3191	28	36	-8.8	4.9	QC plot

TEMPERATURE (deg C)							
CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
AU	NORTHWEST SANDERLING	VNVZ	24	42	0.0	0.9	QC plot
CA	ARCTIC	VCLM	70	0	4.6	1.4	QC plot
NO	FF JAN MAYEN	LAHV	70	0	4.5	4.2	QC plot
RU	BORIS SYROMYATNIKOV	UCUF	51	0	-5.9	4.4	QC plot
US	AURORA	WYM9567	154	0	5.4	2.6	QC plot
US	INDIANA HARBOR	WXN3191	28	11	-9.7	5.0	QC plot
US	KOTA JAYA	VRWM2	22	0	4.7	5.5	QC plot
US	VALDEZ STAR	WCO7674	71	7	7.7	2.9	QC plot

WIND SPEED (m s-1)							
CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
GB	Chiquita Deutschland	C6KD8	34	0	6.8	2.3	QC plot
NL	APOLLOGRACHT	PCSV	44	34	0.4	2.3	QC plot
US	BERLIAN EKUATOR	HPYK	28	71	5.1	5.4	QC plot
US	INDIANA HARBOR	WXN3191	28	0	-7.0	4.4	QC plot
US	KNORR (AWS)	NWS0029	120	0	-7.9	2.1	QC plot
US	OCEANUS (AWS)	NWS0028	67	0	-6.0	1.6	QC plot

WIND DIRECTION (deg)							
CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
AU	FLORENCE	V2BF1	21	5	-49.3	78.1	QC plot
GB	British Ruby	2AKI2	21	0	31.8	59.0	QC plot
GB	Chiquita Deutschland	C6KD8	31	0	-38.0	97.7	QC plot
GB	Ruby Princess	ZCDY2	215	2	24.6	105.0	QC plot
GB	Wren Arrow	C6JD7	33	0	13.9	86.3	QC plot
NL	APOLLOGRACHT	PCSV	35	43	50.1	118.5	QC plot
NL	POLAR STREAM	DDBR2	37	0	-32.4	52.7	QC plot
NZ	TASMAN CHALLENGER (ANTIGUA AND BARB)	V2BE4	23	0	-14.7	93.4	QC plot

CRITERIA FOR MONTHLY MONITORING OF MARINE SURFACE OBSERVATIONS

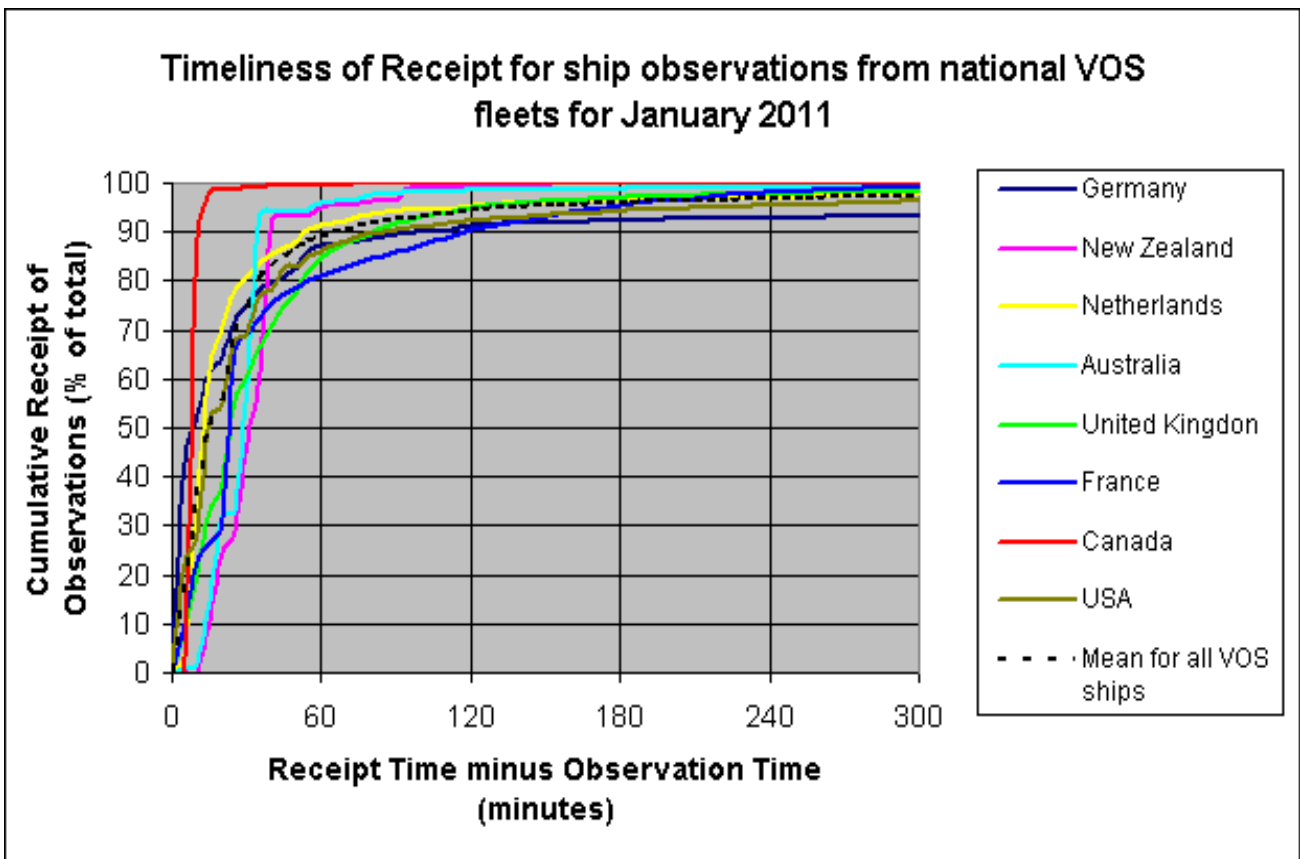
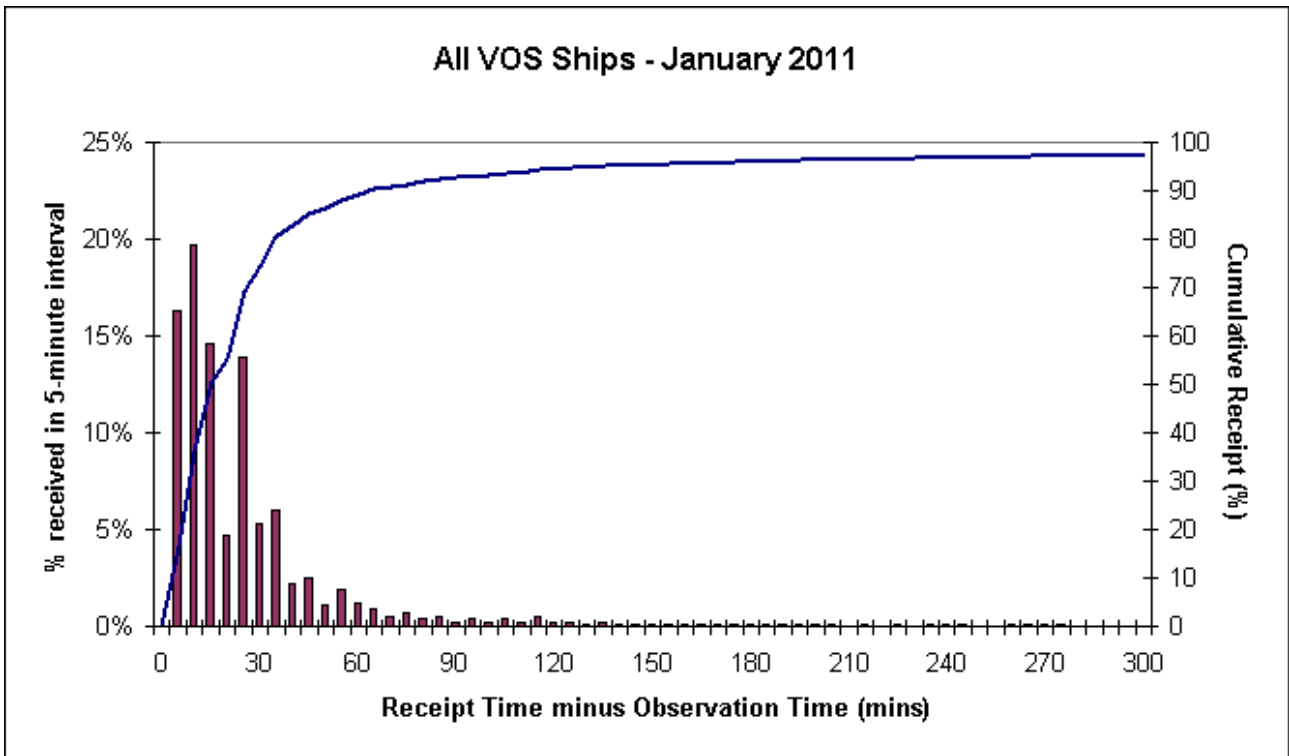
Monitoring procedures

Period	:One calendar month.
Data monitored	:Reports from each unique identifier for ships, fixed buoys and platforms.
Standard of comparison	:Background field from Exeter global model.
Observation times	:All hours
Elements monitored	:Mean sea level pressure (hPa). :Wind speed (ms^{-1}). :Wind direction (degrees). :Air temperature ($^{\circ}\text{C}$). :Relative Humidity (%). :Sea surface temperature ($^{\circ}\text{C}$).
Parameters monitored	
NOBS	:Number of observations received, excluding duplicates.
%GE	:Percentage of observations with gross errors.
%REJ	:Percentage of observations flagged, excluding those with gross errors.
SD	:Standard deviation of difference of observations from background values, excluding those with gross errors.
BIAS	:Mean difference of observations from background values, excluding those with gross errors (N.B. a positive bias indicates the wind observation is veered to the background).
RMS	:Root Mean Square difference of observations from background values, excluding those with gross errors.
GROSS ERROR LIMIT	:15 hPa (pressure) :25 ms^{-1} (vector wind) :15 $^{\circ}\text{C}$ (air temperature) :50% (relative humidity) :10 $^{\circ}\text{C}$ (sea surface temperature)
SELECTION CRITERIA	:NOBS \geq 20 , and one or more of the following:

1.Bias	\geq	4 hPa	(pressure)
	\geq	5 ms^{-1}	(wind speed)
	\geq	30 degrees	(direction)
	\geq	4 $^{\circ}\text{C}$	(air temperature)
	\geq	15%	(relative humidity)
	\geq	3 $^{\circ}\text{C}$	(SST)
2.SD	\geq	6 hPa	(pressure)
	\geq	80 degrees	(direction)
	\geq	6 $^{\circ}\text{C}$	(air temperature)
	\geq	25%	(relative humidity)
	\geq	5 $^{\circ}\text{C}$	(SST)
3.PGE	\geq	25	

N.B. Observations of wind direction are only included in the wind direction statistics if the observed or background wind speed is greater than 5 ms^{-1}

TIMELINESS OF VOS OBSERVATIONS RECEIVED AT THE MET OFFICE, JAN 2011



MET OFFICE ON-LINE TIME OF RECEIPT STATISTICS FOR INDIVIDUAL SHIPS, JAN 2011

SEARCH Met Office

[Home](#) ▶ [Research](#) ▶ [NWP](#) ▶ [Observations](#) ▶ [Observation Monitoring](#) ▶ [Surface Marine](#) ▶ [VOS ToR Stats](#) ▶ [SHIP](#)

[NWP](#) | [Climate](#) | [Seasonal forecasting](#) | [Atmospheric processes](#) | [Oceanography](#) | [Projects](#) | [The stratosphere](#)

Pub47 Time of Receipt Statistics by SHIP for January

CTRY	CALLSIGN	NAME	Observations	N<30	N<60	N<120	N>360	Average (R-O) (mins)
	TBWAA05		45	39	41	42	1	34.3
	TBWAA07		33	32	32	33	0	13.0
	TBWAA09		2	2	2	2	0	19.5
	TBWAA18		21	16	21	21	0	19.2
	TBWAA19		48	39	41	43	1	43.2
NL	PCAM	AALSMEERGRACHT	7	6	6	7	0	18.1
NL	PCCL	ACHTERGRACHT	36	36	36	36	0	18.2
NL	PCDE	ADMIRALENGRACHT	26	24	25	26	0	15.2
NL	PHMH	AFRICABORG	19	17	17	17	0	29.4
NL	PJKV	AGULHAS STREAM	1	0	0	0	1	1142.0
NL	PCKU	ALEXANDERGRACHT	40	36	38	39	0	18.5
NL	PHIN	AMAZONEBORG	65	63	65	65	0	12.6
NL	PHKT	AMERICABORG	20	15	19	20	0	19.2
NL	PCPR	AMSTELGRACHT	51	48	51	51	0	13.0
NL	PCGQ	ANJELIERSGRACHT	39	28	36	37	0	29.5
NL	PCQL	ANKERGRACHT	50	38	47	49	1	40.8
NL	PJJI	ANTILLA	4	4	4	4	0	1.8
NL	PCSV	APOLLOGRACHT	47	47	47	47	0	10.8
NL	PCTG	ARCHANGELGRACHT	35	31	35	35	0	14.8
NL	PHHD	ARNEBORG	9	8	8	8	1	66.2
NL	PCUI	ARTISGRACHT	53	44	49	49	0	30.1
NL	PHIW	ASIABORG	37	25	37	37	0	19.7
NL	C6KE3	ASIATIC	17	15	17	17	0	15.7
NL	PHNG	ATLANTICBORG	33	18	30	31	0	39.7
NL	PCVX	ATLASGRACHT	45	42	42	43	2	43.5
NL	PFPT	AVATAQ	37	28	31	32	3	79.0
NL	PENR	BENGUELA STREAM	117	114	117	117	0	13.4
NL	LAIK5	Berge Pacific	17	7	13	15	0	52.1
NL	LATO2	BERGE STAHL	33	28	32	32	1	41.4
NL	A8JH8	BUZZARD BAY	51	46	50	50	0	20.4
NL	PJRH	COLD STREAM	60	59	59	59	0	13.3
NL	A8IP4	COMOROS STREAM	41	32	39	40	0	24.5
NL	PHKM	CORAL FAVIA	33	31	33	33	0	16.5
NL	PDIB	CORAL MEANDRA	40	28	35	38	1	87.5
NL	ELWC5	CORAL PALMATA	52	37	50	52	0	26.1
NL	ELXG9	CORAL PAVONA	32	32	32	32	0	12.0
NL	PCFT	CORAL RIGIDA	46	41	45	45	0	22.1
NL	PBOF	Damgracht	27	23	23	24	1	42.1
NL	PDNN	DANIELLA	7	7	7	7	0	12.0
NL	PBLQ	Diamantgracht	35	12	29	34	0	50.6
NL	PBSZ	Dolfijngracht	11	8	9	9	2	140.9

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SCHEME FOR RANKING VOS SHIPS BY QUANTITY AND QUALITY OF REPORTS

Ranking Method

Statistics for each ship are accumulated for the year and these are used to rank the ships in terms of number of reports received, quality of the data and timeliness of the reports throughout the year.

The variables considered are:

- Pressure (P)
- Wind speed (Spd)
- Wind direction (Dir)
- Temperature (T)
- Relative humidity (RH)
- Visibility (Vis)
- Sea Surface Temperature (SST)

- these are the variables reported by SHIPs that are assimilated operationally at the Met Office.

Number of reports score

The set of numbers of reports received (Nobs) is 'capped' to limit the influence of any very high numbers from automatic stations, then a score is calculated for the number of observations (obs) received:

Firstly the values in Nobs are inversed to give low (good) scores to ships with high numbers of obs and vice-versa, **Nobs = MAX(Nobs) - Nobs**

Secondly, so that ships with below average numbers have scores greater than 1.0, and vice-versa, we set **NumObsScore = Nobs / MEAN(Nobs)**

Quality score

Quality scores for each variable are calculated, based on the following observation-minus-background (O-B) statistics:

MeanScore = (Absolute value of mean O-B) / VariableLimit

SDScore = (Standard Deviation of O-B) / VariableLimit

[where the following **VariableLimit** values are used, based on the Met Office reject list thresholds:

P = 2.0 hPa, Spd = 3.0 m/s, Dir = 40 degrees, T = 3.0 C, RH = 15.0 %, Log(Vis) = 1.0, SST = 3.0 C] and **GEScore = (Number of Gross Errors) / (Mean number of Gross Errors)**

(N.B. For ships with 100% gross errors, the Mean and SD scores are set to the worst in the set.)

All scores are capped at 2.0, then a "quality-score" is created for each variable:

QualityScore = (MeanScore + SDScore + GEScore) / 3

Time of receipt score

Time of receipt (ToR) scores are produced from yearly totals for the following ToR categories: reports received within 30 minutes of the report time, 30-60 minutes, 60-120 minutes, 120-360 minutes and after 360 minutes.

Each ship is given a score that is the sum of the following numbers of points for each category multiplied by the number of observations in that category:

points_30 = 0.0, points_60 = 30.0, points_120 = 75.0, points_360 = 225.0, points_after = 345.0

(These scores are just the values of the mid points of the ranges minus the mid-point of the first range (15 minutes) to make the best score zero; and 'points_after' has just been set to 360 minus 15 as the range is unbounded.)

The ToR scores are then divided by the scores the ships would have received had all of their observations been received between 60 and 120 minutes, i.e. we are suggesting that observations should really have been received within two hours and that reports received later than that are less useful to NWP. The ToR scores are also capped at 2.0.

Combined score

The **NumObs, Quality and ToR** scores are combined with weights of **0.4, 0.4 and 0.2**, respectively, for each variable.

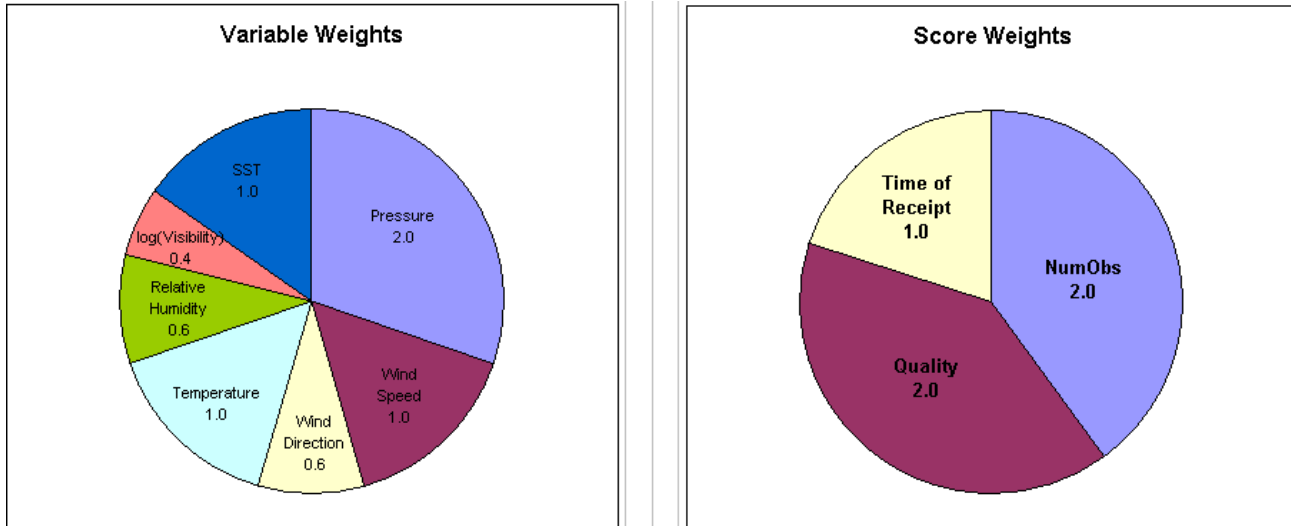
For ships that do not report certain variables the scores are set to the worst score for that variable (usually 2.0).

Then the scores for each variable are combined using the following weightings:

P = 2.0, Spd = 1.0, Dir = 0.6, T = 1.0, RH = 0.6, Vis = 0.4, SST = 1.0 .

These weightings are estimates of the relative importance of each variable to the NWP models (their values may need some further tuning).

Weights



N.B. The above ranking scheme is only intended to give an indication of the relative performance of individual observing ships and marine platforms. It is primarily aimed at usefulness for NWP and therefore only takes into account observations that have been received in near real time. It takes no account of delayed mode observations collected for climate studies (for which timeliness is largely irrelevant).

Annual VOS ranking scheme – results for UK ships for 2010

		Combined All vrbs		Pressure		Wind Speed		Wind Direction		Temperature		Relative Humidity		Visibility		SST		Time-of-receipt	
		Score	NumOb	P_Score	NumOb	SP_Score	NumOb	DR_Score	NumOb	I_Score	NumOb	RH_Score	NumOb	VI_Score	NumOb	TS_Score	NumOb	ToR_Score	NumOb
1	230 GB	0.066	28111	0.340	5434	0.397	4833	0.305	3153	0.289	6157	0.537	3842	0.709	170	0.379	4522	0.457	
2	241 GB	1.337	216380	0.477	4313	0.514	4330	0.478	1411	0.493	4335	0.351	4335	0.159	4262	0.351	4288	0.173	
3	320 GB	0.458	19907	0.477	3016	0.591	3016	0.475	1624	0.438	3016	0.468	2990	0.447	2994	0.447	3251	0.396	
4	325 GB	0.468	19880	0.365	3964	0.416	3854	0.370	2210	0.386	3974	0.418	3691	0.601	109	0.845	2078	0.154	
5	389 GB	0.505	10210	0.464	1563	0.780	1564	0.621	1022	0.455	1561	0.480	1560	0.083	1536	0.487	1404	0.079	
6	393 GB	0.507	6157	0.284	4831	0.664	276	0.670	178	0.664	515	0.579	515	0.285	493	0.488	472	0.050	
7	400 GB	0.510	3333	0.526	517	0.546	517	0.531	304	0.499	515	0.579	515	0.285	493	0.488	472	0.050	
8	426 GB	0.524	9100	0.522	1413	0.680	1413	0.574	629	0.554	1412	0.503	1410	0.095	1411	0.496	1412	0.102	
9	433 GB	0.526	11140	0.582	1641	0.637	1644	0.534	1076	0.509	1645	0.492	1645	0.079	1644	0.513	1845	0.372	
10	442 GB	0.528	1719	0.521	285	0.620	286	0.551	171	0.512	285	0.510	285	0.434	281	0.499	126	0.032	
11	453 GB	0.533	3108	0.545	470	0.633	470	0.566	288	0.499	470	0.527	469	0.307	467	0.520	474	0.052	
12	461 GB	0.536	924	0.528	143	0.563	143	0.595	98	0.522	142	0.528	142	0.470	143	0.533	113	0.080	
13	462 GB	0.536	2155	0.575	341	0.557	340	0.533	198	0.494	340	0.505	340	0.354	341	0.572	265	0.034	
14	510 GB	0.548	1826	0.552	280	0.622	279	0.550	153	0.536	280	0.548	277	0.426	280	0.530	277	0.193	
15	519 GB	0.550	3213	0.619	499	0.609	498	0.559	290	0.502	499	0.523	499	0.296	499	0.515	429	0.094	
16	520 GB	0.550	3030	0.524	464	0.631	464	0.539	310	0.542	464	0.569	455	0.340	464	0.607	409	0.160	
17	527 GB	0.552	2076	0.576	329	0.582	327	0.601	173	0.529	326	0.531	326	0.402	328	0.538	256	0.093	
18	528 GB	0.552	1940	0.553	288	0.614	288	0.559	193	0.552	288	0.558	279	0.434	288	0.529	316	0.271	
19	543 GB	0.554	6057	0.590	927	0.709	927	0.530	651	0.529	927	0.524	926	0.151	925	0.550	774	0.236	
20	546 GB	0.556	1138	0.580	184	0.581	184	0.555	106	0.544	184	0.551	177	0.470	184	0.534	119	0.164	
21	560 GB	0.557	2801	0.611	417	0.611	417	0.557	303	0.520	416	0.536	415	0.362	414	0.522	419	0.171	
22	561 GB	0.557	5956	0.591	904	0.679	904	0.557	534	0.554	902	0.539	902	0.148	899	0.545	911	0.195	
23	570 GB	0.558	1484	0.531	230	0.644	229	0.545	155	0.527	227	0.531	227	0.431	230	0.630	186	0.074	
24	582 GB	0.560	2838	0.578	448	0.625	448	0.581	288	0.540	448	0.551	445	0.352	447	0.557	314	0.235	
25	583 GB	0.560	2956	0.569	437	0.639	437	0.556	325	0.551	437	0.561	404	0.373	437	0.548	479	0.328	
26	602 GB	0.562	974	0.658	152	0.564	152	0.515	75	0.518	152	0.546	152	0.452	152	0.494	139	0.043	
27	621 GB	0.564	2080	0.558	312	0.645	312	0.645	214	0.545	312	0.559	312	0.419	306	0.523	312	0.216	
28	633 GB	0.565	3148	0.552	485	0.650	485	0.613	305	0.558	484	0.571	482	0.356	461	0.567	446	0.270	
29	643 GB	0.566	1599	0.569	272	0.573	271	0.577	120	0.566	272	0.549	272	0.447	272	0.607	120	0.158	
30	644 GB	0.566	4561	0.571	701	0.726	701	0.534	391	0.565	700	0.542	700	0.265	693	0.552	675	0.176	
31	654 GB	0.567	4638	0.581	708	0.679	713	0.618	481	0.535	708	0.542	707	0.309	704	0.543	616	0.255	
32	655 GB	0.567	1357	0.577	212	0.658	209	0.586	136	0.534	211	0.561	207	0.465	209	0.533	173	0.177	
33	656 GB	0.567	2585	0.569	386	0.634	387	0.623	286	0.570	385	0.577	385	0.381	375	0.526	381	0.166	
34	660 GB	0.568	1109	0.582	175	0.608	175	0.582	97	0.549	175	0.536	175	0.482	175	0.566	137	0.161	
35	661 GB	0.568	777	0.585	118	0.617	117	0.565	72	0.524	118	0.556	118	0.551	118	0.546	116	0.092	
36	667 GB	0.569	1328	0.575	203	0.643	203	0.585	105	0.552	203	0.554	201	0.452	202	0.551	211	0.167	
37	691 GB	0.572	1881	0.561	279	0.662	286	0.568	178	0.548	286	0.585	286	0.435	285	0.582	281	0.190	
38	704 GB	0.574	6987	0.674	1049	0.711	1080	0.571	630	0.525	1033	0.535	1032	0.070	1050	0.516	1113	0.133	
39	711 GB	0.575	3304	0.618	493	0.667	493	0.548	352	0.549	493	0.555	493	0.342	491	0.547	489	0.195	
40	712 GB	0.575	1281	0.549	198	0.626	198	0.616	111	0.523	198	0.556	193	0.494	198	0.566	185	0.136	
41	713 GB	0.575	1773	0.592	266	0.638	266	0.662	188	0.539	266	0.530	266	0.429	262	0.546	259	0.149	
42	722 GB	0.576	2919	0.567	446	0.666	446	0.621	269	0.570	448	0.571	444	0.373	447	0.570	417	0.332	
43	732 GB	0.577	1146	0.569	177	0.631	177	0.548	118	0.609	177	0.592	176	0.475	177	0.554	144	0.189	
44	733 GB	0.577	289	0.598	47	0.604	47	0.578	8	0.552	47	0.531	47	0.623	47	0.540	46	0.008	

ANNEX VII

REPORT BY THE TASK TEAM ON THE VOS CLIMATE PROJECT (VOSCLIM)

(report submitted by Alan D. Hall, Chairperson of the VOSCLim Task Team)

Introduction

1. The VOSCLim project is now and has been operationally mature for many years. Levels of ship participation set by the SOT have been met and the data flow processes are now operating as required with the relevant datasets readily available to users via the project website.
2. At the Third Session of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM-III), VOSCLim was discussed and several exciting recommendations and adaptation of VOSCLim as a new Class of reporting ship within the VOS Scheme was accepted.
3. Promotion of the VOSCLim within the intercessional has been on-going. Papers and posters were presented at two conferences demonstrating the need for better ocean observations; The U.S VOS program has implemented VOSCLim elements and IMMT III into their ship board software (SEAS); and the UK VOS program has adopted a multi-year plan to enhance all of their VOS fleet to VOSCLim where appropriate.
4. It is noted, however, that although in the initial phases of the project the value of VOSCLim observations is better than other VOS reporting ships; little more has been accomplished to further this assertion.
5. The report invites the SOT to consider broadening efforts of the UK VOS program to other Member/Member states. This action will raise the climate quality of data from the wider VOS, and thereby contribute to the Global Climate Observing System (GCOS).
6. The following supporting documents are appended to this report:

- | | |
|-------------------------|---|
| Annex 1 | Task Team current Terms of Reference |
| Annex 2 | VOSCLim Project Status Report |
| Annex 3 | Recommendations and Actions from the Third Session of WMO/IOC JCOMM (JCOMM-III) |
| Annex 4 | UK VOSCLim Proposal |
| Annex 5 | The future of the VOSCLim project |
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Terms of Reference of the SOT Task Team on VOS Climate Project

1. Coordinate the provision of VOS Climate data and promote its availability to data users;
2. Encourage VOS operators, wherever possible, to upgrade existing VOS to VOS Climate Standards;
3. Revise VOS Climate ship information and documentation to reflect the integration of the VOS Climate Project into the wider VOS Scheme e.g. update the VOSClim document and promotional brochure, logo, website, and electronic logbook software;
4. Review all relevant WMO Technical Regulation, and JCOMM Publications, and make recommendations to JCOMM and CBS as appropriate to ensure that they are kept up to date and reflect the SOT proposal to include VOSClim as a new class of VOS reporting ship as part of the VOS Scheme;
5. In liaison with the scientific advisers, monitor and report on the quality and added value of the observations, model parameters and metadata in the VOSClim datasets.

Members:

Alan D. Hall (TT chairperson, United States)

Julie Fletcher (VOSP chairperson, New Zealand)

Representatives of participating countries (VOSClim focal points)

Representative of the Real Time Monitoring Centre (RTMC) —hosted by the UK Met Office

Representative of the Data Assembly Center (DAC) — NOAA's National Climatic Data Center (NCDC)

Representatives of the Global Collecting Centres (GCCs)

Scientific advisers

VOSClim Project Status Report

1. VOSClim Ship Participation & Recruitment

1.1 The Task Team is pleased to report the number of recruited ships was up to 368 and participation in VOSClim continues to increase. Ninety-five ships were recruited since SOT-V (May 2009) while only 13 vessels were withdrawn during the same period. It is notable however, at the lack of participation by the U.S. and that their recruitments have decreased since SOT-V. The team believes this is due in part to the SEAS software deficiencies (noted in section 2. Electronic Logbooks). It is the hope that the U.S. will become a major contributor to the VOSClim fleet. Table 1 shows specifics of participation by each country.

Country	Number of VOSClim ships at SOT III	Number of VOSClim ships at SOT IV	Number of VOSClim ships at SOT V	Number of VOSClim ships at SOT VI (at March 2011- to be updated at meeting)
Australia	10	12	10	9
Canada	14	40	47	55
France	6	23	25	45
Germany	11	22	32	53
India	21	22	22	22
Japan	5	5	5	5
Netherlands	1	19	37	48
New Zealand	0	1	1	1
UK	33	62	59	113
USA	12	12	17	17
TOTALS	113	218	255	368

1.2 An essential component of the VOSClim data is the monitoring provided by the RTMC. A separate report of the RTMC will be presented (SOT-VI/9.1.2), but it is important to note here that the monitoring provides the mechanism to gain the higher quality of data. Therefore, recruitment, withdrawals, and call sign/name changes must be submitted to the DAC promptly. Full details of participating ships are maintained on the project website at <http://www1.ncdc.noaa.gov/pub/data/vosclim/vosclimshiplist.xls>.

2. Electronic Logbooks

2.1 The majority of the manually reporting VOSClim observations collected use TurboWin. Other notable electronic logbooks are OBSJMA (Japan) and SEAS (U.S). The SEAS electronic logbook has fallen behind some significant updates in recent years. For example, the delayed mode reporting format (IMMT) was lacking the 6 VOSClim elements that are essential to the project. Without these elements, there is little for a ship to contribute to VOSClim. The team is pleased to announce that a new version of the SEAS software, due out very soon if not already released by SOT VI, will correct these deficiencies.

2.2 AWS software continues to be deployed at a higher rate. At SOT-V it was recommended that the proprietary software used (AVOS, BATOS, MILOS, etc) be evaluated to ensure consistency of data. The proprietary nature of this software may not allow an in-depth study and it is unclear if any action has been taken.

3.0 Real Time Data

3.1 Observations from manually reporting VOSclim ships are transmitted in WMO Ship GTS Code (FM 13) and received by the RTMC. The ships the RTMC use are based on the current VOSclim ship list maintained on the project web site.

3.2 The RTMC then appends the six model parameters from the forecast model (pressure, relative humidity, air temperature, sea temperature, wind speed and direction) and transmits the data in BUFR format to the DAC.

4. Delayed Mode Data

4.1 Delayed mode collection of data is very important to the VOSclim project. This is the only method in which the additional parameters (relative wind speed and direction and information on ship speed, course and loading) are collected.

4.2 Delayed mode reporting continues to be a problem for the DAC. A more detailed report from the Global Collecting Centers will be presented, however the project must note here that at least two members are either not reporting at all or are not reporting the additional VOSclim parameters. The project believes that the only true solution to this problem is to transmit the additional VOSclim parameters in near-real time. Since the FM 13 code used in near-real time transmission cannot be changed, the team has worked extensively with the TT on Coding to ensure the inclusion of the necessary elements in the BUFR Master Table.

5.0 Metadata Collection & Recruitment/Update Forms

5.1 As reported at SOT-V, WMO Publication No. 47 updates on the WMO website is not at the desired level. The last update, as of this writing, was September of 2010. As has been previously reported, the majority of participants are collecting metadata in accordance with the latest WMO Publication No. 47, however access is not adequate for the community. In the case of E-SURFMAR recruited ships, the metadata is maintained in the E-SURFMAR metadata database. Monthly updates are provided by contributing members. (Metadata from other project countries are also made available on this database).

5.2 Along with the Pub. 47 metadata collected for each VOSclim ship, the project requested that digital images be made to show exposure and location of instruments and schematic drawings of the arrangements of the instruments. The DAC is receiving these and provides them on the project website on a case by case basis. Most if any of these images or drawings have been held by the VOS member. The project needs a better way to manage these very important data and there is still no word from the WMO Secretariat about the disposition of these very important images and documents.

6. Monitoring Statistics

6.1 Monitoring statistics for the real time observed data continue to be produced by the RTMC on a monthly basis together with monthly listings of ships whose observations have been flagged as 'suspect'. These statistics are made available to the DAC via the Met Office external FTP server.

6.2 A separate report by the RTMC has been provided under SOT-VI/9.1.2.

7. Project Website

7.1 The project website [<http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>] is maintained by the DAC, and acts as the main focal point for the project, providing users with easy access to the necessary data.

8. Project promotion – Project Brochure & Project Newsletter

8.1 Project promotion continues to be mostly via the project web site, where electronic versions of the brochures and all related information is readily accessible.

8.2 Other promotional activities were taken directly to potential users of the project data and to the PMO's themselves. Two posters were authored by the team chair with co-authors from the science advisors and other leading ocean observation experts. The poster was presented at OceanObs'09 held in Venice, Italy September 21-25, 2009 and at the American Geophysical Union Ocean (AGU) Sciences Meeting held in Portland, Oregon USA February 22-26, 2010.

8.3 OceanObs'09: The OceanObs'09 Conference brought together more than 600 scientists from 36 nations, supported by 99 Community White Papers and 47 Plenary Papers, to build a common vision for the provision of routine and sustained global information on the marine environment sufficient to meet society's needs for describing, understanding and forecasting marine variability (including physical, biogeochemical, ecosystems and living marine resources), weather, seasonal to decadal climate variability, climate change, sustainable management of living marine resources, and assessment of longer term trends.

8.4 AGU Ocean Sciences Meeting: From Observation to Prediction in the 21st Century: Stewardship of marine resources in the 21st Century demands the development of predictive tools based on models and field observations. The challenge of developing these tools forms the theme of the 2010 Ocean Sciences meeting. This overarching theme emphasizes efforts to link observations and models to form superior predictions across multiple space and time scales. It encompasses research focusing on some aspect of observations, models, and also field or laboratory experiments that ultimately seek to enhance our predictive ability, as well as efforts focusing on education, outreach, and marine policy.

8.5 Both posters were received well, however the poster for OceanObs'09 was unfortunately lost in transit. But the handouts were posted in its place and all were distributed. At AGU, the poster generated very exciting discussions during the poster sessions and during other sessions as the author was invited to informal discussions.

8.6 A VOSCLim presentation was made at the U.S National PMO Meeting in Orlando, FL USA December 6-10, 2010. This presentation generated much discussion from the U.S PMOs on the lack of recruitment from the U.S. Several deficiencies within the U.S. program were identified and actions were taken to correct. It was a positive outcome with much excitement, anticipation, and determination by the U.S. PMO program.

8.7 As a follow-on meeting from the U.S. National PMO Meeting, an International PMO workshop was held. VOSCLim was also a topic of discussion with exposure to many PMO programs worldwide.

8.8 The UK VOS Program (Sarah North, Lead) has adopted a transition plan to move all appropriate ships within their fleet to VOSCLim. See [Annex 4](#) for more details.

Recommendations and Actions from the Third Session of WMO/IOC JCOMM (JCOMM-III)

1. SOT-V VOSClim Class

1.1 SOT-V proposed and endorsed the revision of the VOS classes to include VOSClim. The *GUIDE TO MARINE METEOROLOGICAL SERVICES* (WMO-No. 471) would have to be updated to reflect the new class, documentation associated with minimal instrumentation, and recruitment/selection guidelines. Changes to WMO-No. 471 must be approved by JCOMM-III and, assuming approval, subsequent approval by the WMO Executive Council.

1.2 JCOMM-III was held in Marrakech on November 4-11, 2009 and the resulting document, Recommendations 12/4 (JCOMM-III), included the recommendations from SOT-V. These were then approved the Sixty-second Session of the WMO Executive Council held in Geneva, Switzerland June 8-18, 2010.

2. VOSClim updates to WMO-No. 471

2.1 The changes were most notably to chapter 6 of WMO-No. 471. Some of the highlights:
Chapter 6:

Section 6.2.1:

Since this *Guide* emphasizes the mutual collaboration between marine users and meteorologists, only the activities of Meteorological Services with regard to mobile ship stations are described in the following paragraphs. There are eight types of mobile ship stations engaged in the WMO Voluntary Observing Ship Scheme, namely:

- (a) Selected ships;
- (b) Selected AWS ships;
- (c) VOSClim (VOS Climate) ships;
- (d) VOSClim (VOS Climate) AWS ships;
- (e) Supplementary ships;
- (f) Supplementary AWS ships;
- (g) Auxiliary ships; and
- (h) Auxiliary AWS ships.

Section 6.2.4 VOSClim (VOS Climate) ships

A mobile ship station equipped with sufficient certified meteorological instruments for making observations, transmits regular and timely weather reports, enters the observations in an International Maritime Meteorological Tape (IMMT) compliant electronic logbook and has a proven record of providing high quality observations. A VOSClim ship should have at least a barometer, a thermometer to measure SST, a psychrometer (for air temperature and humidity), a barograph and possibly an anemometer. The full range of metadata must be maintained in WMO No. 47, ideally including the full suite of digital images, sketches and drawings, and the delayed-mode IMMT data must be submitted to the Global Collecting Centres (GCCs) according to the procedures described in Chapter 3 of this guide. It is highly desirable for a VOSClim ship to be inspected at less than six monthly intervals.

Section 6.2.5 VOSClim (VOS Climate) AWS ships

A mobile ship station equipped with an AWS system comprising certified meteorological instruments to measure at least air pressure, pressure change, temperature and humidity. Optional sensors would include wind speed and direction and sea temperature measurement. The AWS

should have a facility for manual input of the visual elements, and transmit reports at least three hourly or more frequently. The AWS must have the facility to log the data including the additional IMMT delayed-mode VOSCLim groups. The full range of metadata must be maintained in WMO No. 47, ideally including the full suite of digital images, sketches and drawings, and the delayed-mode IMMT data must be submitted to the GCCs according to the procedures described in Chapter 3 of this guide. It is highly desirable for a VOSCLim ship to be inspected at less than six monthly intervals.

Section 6.2.10 International list of selected, VOSCLim, supplementary and auxiliary ships

Selected, Selected AWS, VOSCLim, VOSCLim AWS, Supplementary, Supplementary AWS, Auxiliary and Auxiliary AWS ships constitute an important source of marine data. In analysing these data, Meteorological Services should be aware of the type of instrumentation onboard a given ship, or the particular method of observation when several methods are generally in use. To this end WMO compiled the *International List of Selected, VOSCLim, Supplementary and Auxiliary Ships* (WMO-No. 47) which is kept up to date through information supplied by Members, and for each ship. The information contained covers such particulars as:

- (a) Name of ship;
- (b) Call sign;
- (c) Vessel type;
- (d) Vessel dimensions;
- (e) Area or routes the ship normally plies;
- (f) Type of barometer;
- (g) Type of thermometer;
- (h) Exposure of thermometer;
- (i) Type of hygrometer or psychrometer;
- (j) Exposure of hygrometer or psychrometer;
- (k) Method of obtaining sea surface temperature;
- (l) Type of barograph;
- (m) Various other meteorological instruments used aboard the ship;
- (n) Types of radio equipment, including INMARSAT;
- (o) Height of barometer, in metres, measured from maximum load line;
- (p) Height of anemometer, in metres, measured from maximum load line;
- (q) Depth of sea temperature measurement;
- (h) Ships routes;
- (i) Satellite transmission system;
- (j) Make and model of AWS system;
- (k) Name and version of electronic logbook software.

The *International List of Selected, VOSCLim, Supplementary and Auxiliary Ships* needs to be regularly updated (see the *Manual on the Global Observing System*, Volume I, Part III, paragraph 2.3.3.3) because of frequent changes in the international merchant fleet and changes in the recruitment of observing ships. Members are asked to provide to the WMO Secretariat at least every quarter, but preferably every month, updates of their list of Selected, VOSCLim, Supplementary and Auxiliary ships, as an email attachment in approved format. This is the most efficient means of keeping the master list updated, as no retyping is required. The Secretariat makes available the master list through its web page (<http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm>).

Section 6.3.1:

According to the *Manual on the Global Observing System*, Volume I, Part III, paragraph 2.3.3.2, each Member shall recruit as mobile ship stations as many ships as possible that traverse data-sparse areas and regularly follow routes through areas of particular interest. If possible, some of these ships should be non-AWS, or VOSCLim AWS ships equipped with a facility for manual input of visual elements (para 6.2.5) so that at least some ships in these data-sparse areas take the full

range of Selected or VOSClm Observations, including visual observations of cloud, present weather and phenomena. In fulfilling this obligation, each Member contributes to the common objective of obtaining sufficient coverage of meteorological observations over the sea. While a uniform coverage of the oceans is desirable, this is difficult to achieve in view of the large differences in the density of shipping traffic. This traffic is comparatively dense in the northern hemisphere, but this is not the case in the tropics or in the southern hemisphere. Consequently, greater attention should be given to the recruitment of voluntary observing ships in these areas. Monthly maps showing the density of observations received from ships are available from JCOMMOPS (http://wo.jcommops.org/cgi-bin/WebObjects/JCOMMOPS.woa/wa/map?type=GTSM_VOS).

Meteorological Services in many countries are required to provide more detailed information of the weather and sea conditions in coastal areas. Some services recruit ships of local shipping companies to make and transmit observations during their voyage from harbour to harbour along the coast.. Their observations have been widely recognized as being of great value

Section 6.3.2:

Several criteria can be used in deciding whether a particular ship should be recruited as a Selected, VOSClm, Supplementary or Auxiliary ship, to satisfy national and international needs. Questions which should be examined are whether all the necessary instruments can be installed with adequate exposure, whether the ship's officers will have the time available for recording and transmitting the observations and whether the necessary regular contact can be established for training the observers and for the receipt of electronic or hardcopy logbook data. Shipowners and masters are generally very cooperative in these matters; however, it is advisable that these questions be thoroughly discussed at the recruiting stage. In all cases observations should never be undertaken if they will impair the safe navigation of the recruited ship.

Contrary to the early days of the VOS Scheme ships are now registered in a variety of different countries. Ships registered in ports outside those of the recruiting country are therefore commonly recruited, although it is advisable to contact the Meteorological Service of the flag state beforehand and to check that the ships has not already been recruited by reference to WMO Publication 47. Care should be taken to ensure that duplicate recruitment is avoided. Members should establish a suitable organizational structure for the maintenance of their marine networks and for the recruitment of voluntary observing ships. It will often be necessary to contact shipping companies, managers and shipping agencies to enlist their cooperation by arranging visits to ships and the provision of instruments. Port Meteorological Officers play a large role in the recruitment of ships.

United Kingdom VOSclim Proposal

The United Kingdom (UK) VOS Program (Sarah North, Lead) has adopted a transition plan to move all appropriate ships within their fleet to VOSclim. This proposal is presented here as a model for other countries.

VOS CLIMATE SHIPS - 3 YEAR PLAN

S.C. North, Marine Networks Manager, 28 June 2010

Background

Observations from Voluntary Observing Ships (VOS) not only provide vital input to Numerical Weather Prediction models, but are also increasingly important for improving the quality of climate models.

Recognising the need to establish a high quality marine meteorological data set to assist with climate studies, the WMO initiated the international VOS Climate (VOSclim) Project¹. The Met Office, together with the climate scientists at the National Oceanographic Centre, played a key role in ensuring the success of this project by providing its leadership, by acting as the real time monitoring centre, and by recruiting suitable observing ships to participate. In addition to being used by climate researchers, the incoming data are input directly into air-sea flux computations, as part of coupled atmosphere-ocean climate models. They also act as a high-quality reference data set for international VOS fleets, and can be used to provide ground truth for calibrating satellite observations.

In view of the success of this project the decision was recently taken by the Joint WMO-IOC Technical Commission on Oceanography and Marine Meteorology (JCOMM) to integrate VOS Climate ships as a new class of observing ship within the wider International VOS Scheme².

Implementation Plan

Recognising the value of global climate quality VOS data, the Met Office intends to take a proactive role in enhancing the volume of available VOS climate data and associated metadata, provided by UK observing ships. To achieve this objective a three year implementation plan has been proposed to re-balance the UK manual observing fleet to focus on the higher VOS climate standards.

To realise this ambition an initial target has already been set for a mean of 50 UK observing ships to be actively participating as VOS Climate class ships during FY 2010-11 (a ship being considered as active if it produces an average of 20 observations per month). For the following year 2011-12 it is planned to further increase this figure to 75 actively reporting VOS Climate ships.

In the longer term the objective is to move to a core climate observing fleet of 200 actively reporting VOS Climate ships within a three year time frame. These ships will effectively supersede the existing standard 'Selected' class observing ships that participate in the UK arm of the VOS Scheme. Port Meteorological Officers will therefore progressively upgrade existing ships that can demonstrate that they will produce observations of sufficient number and quality, and will recruit suitable new observing ships where necessary. At the same time existing UK observing ships that fail to meet the required criteria for climate observing, or which fail to submit the required number of observations, will be progressively de-selected from the fleet.

Essentially the size of the manually reporting UK fleet will reduce from the current figure of approximately 300 observing ships to the stated 200 ships producing an increased number of observations to the higher quality climate standards. This renewed fleet will in due course compliment, and add value to, the shipborne Automatic Weather Stations (AWS) that are now beginning to be rolled out to suitable ships. In three years time it is planned to have deployed approximately 50 shipborne AWS systems providing hourly observations - but reporting a limited number of parameters when compared to the planned 200 VOS Climate ships.

VOS Climate Class ships will provide the full range of ship coded weather reports, including the visual observations of sea state, ice conditions, cloud and past/present weather that are not available from the majority of shipborne Automatic Weather Station (AWS) sensors. Each manually reporting ship will be equipped with the latest version of the TurboWin electronic logbook software which will log the additional delayed mode climate parameters. Ships fitted with shipborne AWS sensors will only be considered for recruitment to the VOS Climate class if they have a software facility for manually adding the visually observed elements. Metadata for each VOS Climate ship will be collected in accordance with the requirements of WMO Publication No47 and will be stored on the E-SURFMAR metadata database.

The Met Office will continue to undertake its responsibilities as the real time monitoring centre for VOS Climate data by co-locating the real time observations with the associated model values, and by routinely monitoring the quality of the real time data to higher standards than are applied to existing VOS. Furthermore the additional observational parameters collected in delayed mode from VOS Climate ships will continue to be made available to the Global Collecting Centre (in Edinburgh) and thence to the National Climatic Data Centre in the US, which acts as international Data Assembly Centre for VOS Climate data.

- 1 <http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>
- 2 www.bom.gov.au/jcomm/vos/

The Future of the VOS Climate Project

1. Discussion

1.1 As has been previously mentioned, VOSClim has been operationally mature for many years. VOSClim has now been approved as a class of mobile ship stations engaged in the WMO Voluntary Observing Ship Scheme. It is believed now that the VOSClim project has finished and that the TT-VOSClim should come to an end.

1.2 In order to support climate quality data, it was agreed that it was important to keep the profile of VOSClim at a high level, and whilst the TT-VOSClim could be dispensed with, someone was required with a role to champion and promote the cause of VOSClim. This person is hereafter referred to as the VOSClim Focal Point (VOSClim FP). The Team agreed that including a VOSClim FP under the TT-VRPP would make good sense, as this TT is focused on recruitment and promotion.

1.3 The team liaised with the TT-VRPP regarding some changes to the TT's TOR and suggested that the VOSClim FP, the DAC and the scientific advisors become members of the TT-VRPP (these changes will be proposed under the Recommendations of the TT-VRPP).

2. Data Assembly Center

2.1 During the project phase of VOSClim it was important to keep the collected data readily available for the science team and others. However, now that the project phase has come to an end, perhaps it is time to re-evaluate the need for a separate collection of the data.

2.2 The team would invite the SOT to consider keeping all relevant information and activities related to VOSClim with the DAC (currently NOAA's National Climatic Data Center in Asheville, NC USA).

2.3 The team further recommends that any observational data be made available via normal distribution methods (e.g. International Comprehensive Ocean Atmosphere Data Set – ICOADS) and discontinue the separate collection at the DAC. Distinctions within ICOADS and IMMT have already been employed to identify an observation is of the VOSClim class. The team feels there is no longer any need keep a separate collection.

ANNEX VIII

REPORT BY THE REAL TIME MONITORING CENTRE (RTMC) OF THE VOSCLIM

1 The United Kingdom Met Office, as the Real Time Monitoring Centre (RTMC) for the VOS Climate Project (VOSClm), continues to produce monthly suspect lists and monitoring statistics for all VOSClm ships and an example of the suspect list for January 2011 can be seen in [Annex 1](#). The monitoring criteria are given in [Annex 2](#) and the Team is invited to confirm that these values are set correctly. Since SOT-IV the RTMC has continued to update its list of ships from that maintained on the VOSClm website.

2 The VOSClm suspect lists are currently sent to the VOSClm Data Assembly Centre¹ (DAC) and to all VOSClm focal points, but the Team is asked to consider whether they should also be sent to the JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS) mailing lists (PMO and VOS).

3 The Met Office RTMC continues to transfer VOSClm ships' observations and the associated co-located model data to the DAC, including putting a backup copy of the daily VOSClm BUFR data onto the Met Office's FTP server so that it is available for the DAC to access in case of problems with the GTS data.

4 Agreement has recently been obtained at the Met Office to extend the BUFR data sent to the DAC to encompass all ship and buoy reports and their co-located model field values. The work at the RTMC to include this extra data is scheduled for 2011.

1: The VOSClm DAC is operated by the NOAA National Climate Data Center (NCDC), USA - <http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html>

VOSCLIM SUSPECT LIST – JANUARY 2011

Monitoring centre: Met Office, UK.

All VOS-Clim ship data are monitored: against background 6-hour forecast fields for all variables except SST, for which analysed fields from the previous day are used.

Key to table below

 NumObs : number of observations 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.	Wind Speed	Direct.	Air Temp.	Rel.Hum.	SST
-----	(hPa)	(m/s)	(deg)	(deg C)	(%)	(deg C)
Bias limit	2.5	5	30	2.0	12	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

GBQM	P	72	0	2.4	-3.6	4.3
MQEC7	P	22	0	1.3	-2.9	3.1
VRGM8	P	32	0	1.7	3.0	3.4
WCX7445	P	416	0	5.9	3.3	6.8
ZQDI9	T	25	0	1.5	2.1	2.6
CGBN	RH	45	0	4.2	16.7	17.2
MYSU5	RH	50	0	12.0	14.7	19.0
VCSZ	RH	339	0	7.7	15.5	17.3
ZCDA9	RH	114	0	8.5	12.9	15.4
ZCDN9	RH	43	0	11.2	-20.0	22.9
C6KD8	SPEED	34	0	2.3	6.8	7.2
2AKI2	DIRN.	21	0	59.0	31.8	67.0
C6JD7	DIRN.	31	0	89.0	13.3	89.9
C6KD8	DIRN.	31	0	97.7	-38.0	104.8
PCUI	DIRN.	39	0	80.2	-14.1	81.5
WBP3210	DIRN.	189	0	71.7	3.8	71.8
C6YT4	SST	64	0	1.8	2.8	3.3
CGDR	SST	76	0	1.4	4.0	4.2
DGTX	SST	20	0	1.3	3.4	3.6
MGSG6	SST	24	29	3.2	5.1	6.1
MGSM5	SST	33	36	3.2	4.2	5.3
PCAW	SST	68	0	2.2	-2.4	3.2
WFLG	SST	83	0	1.1	-2.6	2.8

MONITORING CRITERIA FOR VOSCLIM SUSPECT SHIPS

1. For each ship and each variable there should be at least 20 reports during the period (if there are fewer reports the statistics may be unreliable and no action is needed).
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 ($^{\circ}$ C)	2.0	4.0	10.0
Relative humidity (%)	12.0	20.0	50.0
Sea surface temp. ($^{\circ}$ 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 considered to be a 'gross error'.

ANNEX IX

REPORT BY THE TASK TEAM ON ASAP

(Submitted by Mr Rudolf Krockauer, Chairperson of the JCOMM ASAP Task Team)

Note: The report is focused on EUMETNET ASAP (E-ASAP) since the European programme is the only programme which is predominantly based on a fleet of merchant ships.

1. Introduction

The number of ships which routinely provide upper air soundings on the GTS throughout the year is about 20 worldwide. Occasionally there are some research vessels which perform soundings during certain research campaigns. But these activities are usually limited to some weeks.

The Norwegian weather ship POLARFRONT used to perform 4 snd./day (around 110 snd./month), but terminated all sounding operations in Nov 2009 due to financial reasons.

So far, there were two significant ASAP programmes: The European programme E-ASAP with 12-18 ships in 2009-2010 and the Japanese programme with 5 ASAP stations on research ships. But in 2010 the Japanese ASAP fleet was reduced from 5 to 2 stations. Due to financial constraints no launches were performed on board the South African ASAP ship SA Agulhas in 2009-2010.

E-ASAP is the only programme worldwide which is based on a fleet of commercial vessels (except two research ships and one hospital ship). Therefore the report of the ASAP Task Team is focused on E-ASAP.

2. Basics

Following key differences to land based radiosonde stations shall be pointed out:

- Almost all ASAP systems in the E-ASAP fleet are installed on commercial container vessels. The ships sail with 15-20 knots (producing strong turbulences at the launcher) and undergo heavy vibrations from the machinery (thus shortening the lifetime of the technical equipment). Routine maintenance is limited to short berthing times in the port.
- Transmission of sounding data to the NMS is only possible through satellite communication. Satellite communication is generally less reliable than land based cable communications.
- On merchant ships ASAP systems are operated by members of the ships crews, not by professional observers. Skill and experience depend on the respective operator/crew member.
- Japanese ASAP ships are research vessels of the JMA (Japan Meteorological Agency) and Japan Agency for Marine-Earth Science and Technology (JAMSTEC). Since the stations are operated by skilled staff there are less problems than in the E-ASAP fleet.

3. E-ASAP fleet

Table 1 lists 18 active E-ASAP ships (status Feb 2011). 10 out of 18 stations (ASEU-, ASDE-, and ASGB01) are operationally managed by E-ASAP. The other stations belong to the E-ASAP fleet but are managed by the NMS's of France (ASFR-), Denmark (ASDK-), and Spain (ASES01). The naming convention of the stations in the E-ASAP fleet is as follows:

Char	Content
1, 2	AS (fixed data type, i.e., 'Aerology' and 'Ship')
3, 4	ISO alpha-2 country code ('EU' for EUMETNET)
5, 6	Sequential number

This unambiguous naming convention is an efficient ship masking scheme which could also be applied to other ASAP stations outside the E-ASAP fleet.

Table 1: Ships in the E-ASAP fleet in Feb 2011

Station	Line service	Sounding equipment
ASEU01	No line service, Research ship	The 10' container launcher is equipped with a DigiCORA III (MW21). Launches are usually carried out by the electronic engineer (system administrator).
ASEU02	Northern Europe – Chile	The 10' container launcher is equipped with a DigiCORA III (MW21). Launches are usually carried out by the officers and cadets.
ASEU03	Western Mediterranean – Montreal	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Launches are usually carried out by two cadets on board.
ASEU04	Western Mediterranean – Montreal	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Launches are usually carried out by two cadets on board.
ASEU05	Northern Europe – East coast US	The 10' container launcher is equipped with a DigiCORA III (MW21). Most crew members are involved in launching operations.
ASDE01	Northern Europe – East coast US	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). Most crew members are involved in launching operations.
ASDE02	No line service, Research ship	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). Launches are carried out by a professional observer of Deutscher Wetterdienst DWD.
ASDE03	Northern Europe – East coast US	The ship is equipped with a deck launcher and DigiCORA III (MW21) sounding system on the bridge. Most crew members are involved in launching operations.
ASDE04	Northern Europe – Chile	The ship is equipped with an E-ASAP Shed launcher and DigiCORA III (MW21) on the bridge. Launches are usually carried out by the officers and cadets.
ASGB01	Montreal – Northern Europe	The ship has a 10' container launcher portside and a open deck launcher starboard. The Vaisala DigiCORA III (MW21) system is installed on the bridge. Launches are usually carried out by two cadets on board.
ASDK01	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASDK02	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASDK3	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).

Station	Line service	Sounding equipment
ASFR1	North West Europe – French West Indies	The ship is equipped with a open deck launcher and MODEM SR2K sounding system in the wheelhouse. Launches are usually carried out by the electricians.
ASFR2	North West Europe – French West Indies	The ship is equipped with a open deck launcher and MODEM SR2K sounding system in the wheelhouse. Launches are usually carried out by the electricians.
ASFR3	North West Europe – French West Indies	The ship is equipped with a open deck launcher and MODEM SR2K sounding system in the wheelhouse. Launches are usually carried out by the electricians.
ASFR4	North West Europe – French West Indies	The ship is equipped with a open deck launcher and MODEM SR2K sounding system in the wheelhouse. Launches are usually carried out by the electricians.
ASES01	No line service, Hospital ship	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Launches are usually carried out by the 1st officer.

The number of stations was increased from 12 in January 2009 to 18 in December 2010 by re-installation of 'laid up' stations and acquisition of replacement ships. Additionally, the Icelandic ASAP station ASIS01 was re-installed as temporary land station Egilsstadir in NE-Iceland.

Table 2 shows the development of the E-ASAP fleet since 2003.

Table 2: Development of the fleet from 2003 to 2010.

Year	Lost ships ¹⁾	New ships	Number of active stations at the end of the year
2003	- 1	+ 1	13
2004	- 0	+ 1	14
2005	- 1	+ 4	17
2006	- 1	+ 0	16
2007	- 1	+ 0	15
2008	- 4	+ 1	12
2009	- 1	+ 4	15
2010	-0	+ 4	18 + 1 temporary land station

¹⁾ Usually due to changes in the trade pattern of the ships (i.e. routes away from the EUCOS area).

The following figures 1 to 3 demonstrate the different types of launchers on board the ships.



Figure 1: 10ft container launchers on board the ATLANTIC COMPANION and MELFI ITALIA II.



Figure 2: Installation of open deck launcher on board a French ASAP ship.



Figure 3: Prototype of shed launcher on board the DUBLIN EXPRESS.

The Shed Launcher prototype (see figure 3) was designed by E-ASAP and constructed in a shipyard. It provides shelter against wind and rain when rotated in leeward position. The launcher requires no regular maintenance and is in routine operation since Jan 2010. The electronic equipment (receiver, computer, satcom transceiver etc.) has to be installed inside the ship (e.g. bridge). A further Shed Launcher was produced in 2010 as replacement of one of the old 20ft container launchers.

4. Performance of the E-ASAP fleet

Basically, the performance of the ASAP stations is included in the national and E-ASAP SOT ASAP reports. Figure 4 shows the distribution of bulletins in 2010 on a 2x2° grid without interpolation.

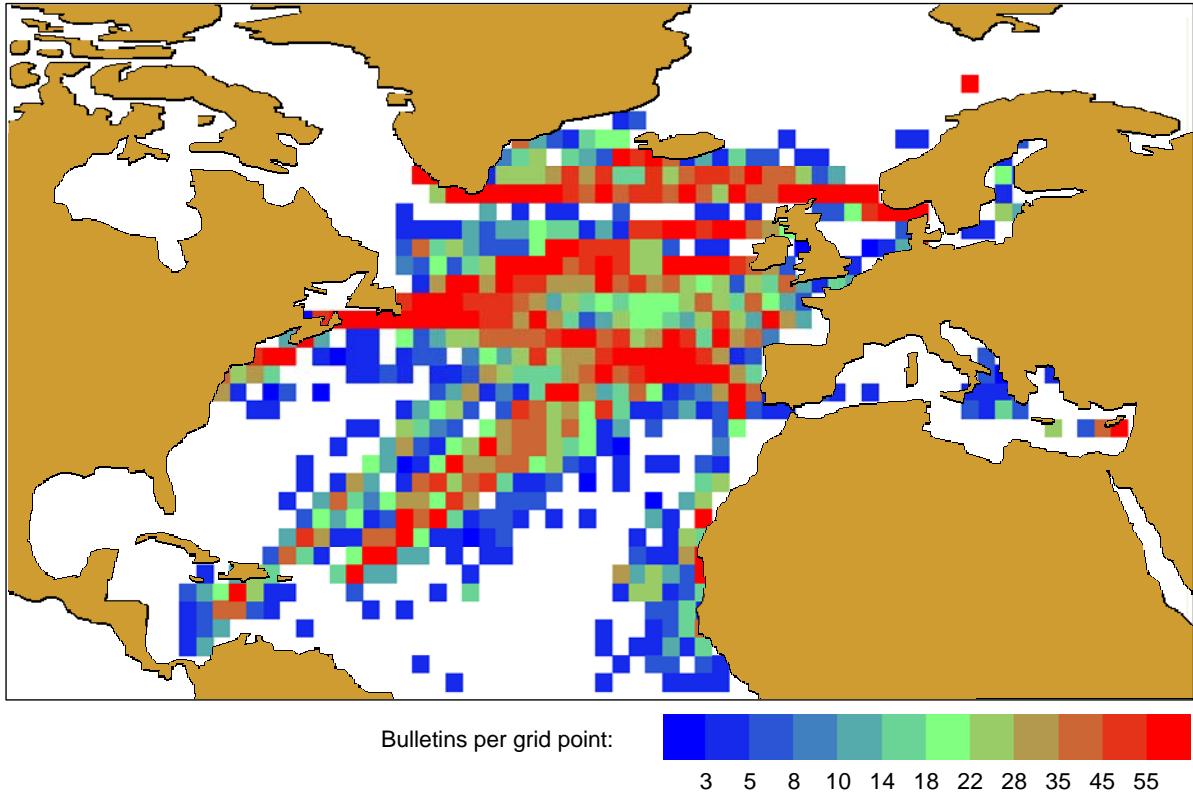


Figure 4: Distribution of TEMP bulletins in 2010 on a 2x2° grid without interpolation.

The distribution demonstrates the main trading lines between Europe and North America of the participating container vessels. The individual performances differ widely from month to month and from ship to ship. The red spots in the Eastern Mediterranean and north of Norway are soundings performed on board the Research Vessel MARIA S. MERIAN during stationary research campaigns. The red spots off the West African coast are soundings from the Spanish hospital ship ESPERANZA DEL MAR.

The total number of soundings on the GTS was around 4950 in 2010. Taking into account the total number of launches on board versus the received soundings on the GTS, the average output (GTS/Launches ratio) was 87%. Main reasons for failed launches are:

- technical problems of the equipment due to the permanent vibrations on board,
- unfavourable wind conditions at 15-20 knots sailing speed,
- unexperienced operators, and
- poor satellite communication.

5. Japanese ASAP fleet

Table 3 shows the list of the Japanese ASAP ships. The Japanese Met Service JMA operated ASAP stations on four research vessels in the western north Pacific and seas adjacent to Japan.

JAMSTEC (JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY) operates a station on the oceanographic research vessel MIRAI in variable areas based on its research voyages. Unfortunately, 3 stations were decommissioned in 2010. In total, around 650 soundings were performed by the Japanese ASAP ships in 2010.

Table 3: Japanese ASAP ships.

Ship name	Area	Sounding equipment	Received soundings in 2010
Mirai (JAMSTEC)	Variable areas	Semi-automatic Container, Vaisala sounding system, Vaisala RS92 GPS radiosondes.	572
Ryofu Maru (JMA)	North Pacific	Semi-automatic Container, Vaisala sounding system, Vaisala RS92 GPS radiosondes.	67
Kofu Maru (JMA)	Decommissioned in 2010		
Seifu Maru (JMA)	Decommissioned in 2010		
Chofu Maru (JMA)	Decommissioned in 2010		

6. Satellite communication and data format

By end of 2010, all 18 ships in the E-ASAP fleet were equipped with Iridium satcom systems to enable binary HiRes Bufr reporting from the ships. So far (Feb 2011), 11 ships already report HiRes Bufr and TEMP.

The vertical resolution of the HiRes Bufr is 20 sec (ca. 100 m) plus mandatory and significant levels. Purpose is to limit the file size to 10 Kbyte to reduce transmission time. A vertical resolution of 100 m is fully compliant to the minimum WMO requirements (Goal = 100 m, Breakthrough = 200 m, Updated on 28 May 2010).

7. Data Targeting System

The UK Met Office and the ECMWF set up the so-called Data Targeting System (DTS) Trial in 2008. Aim of the DTS is to deliver additional meteorological observations over key sensitive regions which are defined case by case. If a sensitive region is identified, a request for additional observations is sent out to the operators. The period of the trial was February to December 2008. First results were presented in 2009.

E-ASAP participated in the DTS Trial by providing additional radiosoundings in the North Atlantic on request. 123 out of 226 sounding requests were deployed. This is a success rate of 55% (cf. European land radiostations: 83%). Reasons for the low rate were following:

- extra launches depend on the work load of the operators on board and are not always possible,
- the lead time between request and targeted launch time was 12-24 hours. According to the sailing speed of 15-20 kn, the ships were 300-900 km away from the proposed position at the targeted launch time. In many cases the ships had reached the next port and were not able to launch.

Nonetheless, the DTS Trial confirmed the capabilities of targeted observations. Special procedures would have to be implemented in an operational DTS to take into account the movement of the ASAP stations. One option is to extrapolate the presumable position of the stations according to the soundings of the last 48 hours.

8. Summary and recommendations

In total, 6011 soundings were received in 2010 from all ASAP stations worldwide. The distribution is as follows:

- 82% E-ASAP,
- 7% Research vessel POLARSTERN,
- 11% All other ships (only 2 Japanese ASAP ships in 2010).

The spatial distribution is shown in figure 5. Occasional position errors (sign error in longitude) can be seen as soundings over East Europe. These errors were only observed at stations in the E-ASAP fleet and are due to operator errors. The German Research Vessel POLARSTERN is independent of any ASAP programme but transmits her soundings to the GTS.

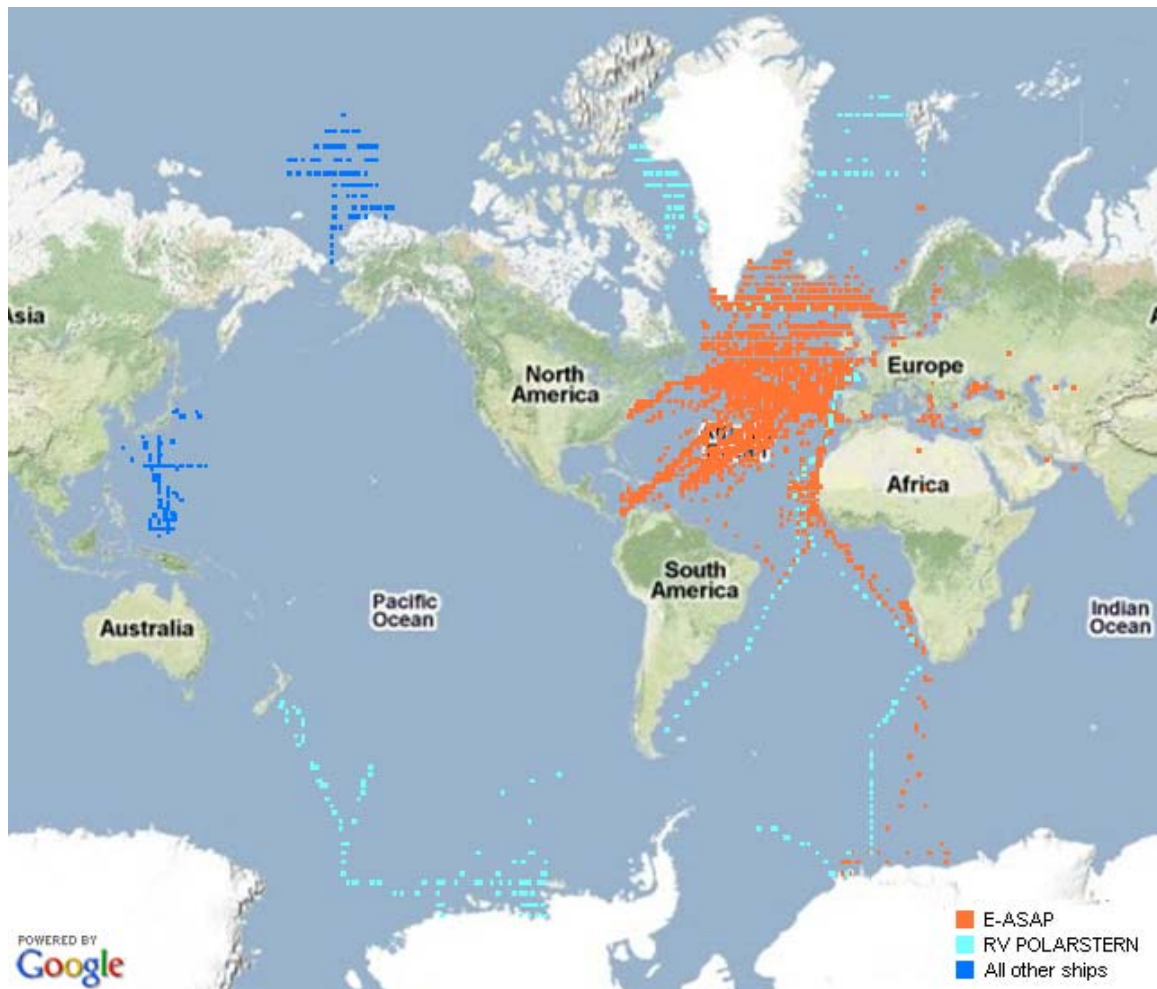


Figure 5: Distribution of global ASAP soundings from sailing ships in 2010.

The spatial distribution of global ASAP soundings show clearly the predominant and unique coverage of the North Atlantic by the European E-ASAP fleet. Several impact studies confirm the positive impact of ASAP soundings on the Numerical Weather Prediction.

In the 1997 World Weather Watch Technical Report No. 18 (reference: Impact of various observing systems on numerical weather prediction, Proceeding of CGC/WMO Workshop, Geneva, 7-9 April 1997, Edited by Jean Pailleux, WMO/TD No. 868) following analysis is given by the Editor in the 'Summary of recent results and perspectives', section '2. Evolution of the radiosonde impact':

'... It appears that during the last 15 years, a clear positive impact of North Atlantic RS is detected whenever the RS sample submitted to the study is equivalent to about 10 RS stations or more (operating twice a day), whereas it is not detected when the sample is significantly smaller, except

on some extreme cases like the storm of 25 January 1990 (when the impact of one single observation could be detected)....'

The message of this analysis is clear: Even if the minimum of 20 RS/day (10 stations x 2 RS/day) in an ocean region comparable to the North Atlantic is not achieved, it is worth to operate smaller ASAP fleets to mitigate the impact of extreme weather. Thus, National Met Services are encouraged to investigate potential co-operations with other Met Services to set up and operate ASAP stations on board merchant vessels in line service.

ANNEX X

ASAP TRUST FUND STATEMENTS OF ACCOUNT FOR 2009 AND 2010

1) ASAP TRUST FUND STATEMENT OF ACCOUNT FOR 2009



World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 bis, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse
Tél. : +41 (0) 22 730 81 11 – Fax: +41 (0) 22 730 81 81
wmo@wmo.int – www.wmo.int

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ASAP Trust Fund
Statement of income and expenditure
For the period 1 January to 31 December 2009
Amounts in Swiss Francs

1. Balance of fund at 1 January 2009	47,875
2. Expenditure	-
3. Balance of fund at 31 December 2009	<u>47,875</u>

Certified correct:

A handwritten signature in blue ink, appearing to read 'Luckson Ngwira'.

Luckson Ngwira
Chief, Finance Division

23 February 2011

2) ASAP TRUST FUND STATEMENT OF ACCOUNT FOR 2010



World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 bis, avenue de la Paix - Case postale 2300 - CH 1211 Genève 2 - Suisse
Tél.: +41 (0) 22 730 81 11 - Fax: +41 (0) 22 730 81 61
wmo@wmo.int - www.wmo.int

TEMPS • CLIMAT • EAU
WEATHER • CLIMATE • WATER

ASAP Trust Fund
Statement of income and expenditure
For the period 1 January to 31 December 2010
Amounts in Swiss Francs

1. Balance of fund at 1 January 2010		47,875
2. Income		
2.1 Unrealized gain on exchange difference	39	
2.2 Total income		39
3. Funds available for the period		47,914
4. Expenditure		
4.1 Direct costs		
4.1.1 Travel	8,479	
4.1.2 Total direct costs		8,479
4.2 Indirect costs		
4.2.1 Support costs (7%)	584	
4.2.2 Bank charges	40	
4.2.3 Total indirect costs		634
4.3 Total expenditure		9,113
5. Balance of fund at 31 December 2010		38,801

Certified correct:


Luckson Ngaira
Chief, Finance Division

23 February 2011

ANNEX XI

TABLE OF NATIONAL CONTRIBUTIONS TO THE DBCP TRUST FUND FOR 2011

Budget Country	JCOMMOPS	DBCP	OceanSITES	SOT	JTA	COMMENT
Australia	EUR 11,700		USD 5,000			JCOMMOPS: including DBCP and SOT
Canada	CAD 25,000					JCOMMOPS, including DBCP and SOT
CLS					USD 65,000	USD 15,00 for JTA Chairperson USD 30,000 for the JTA-Executive Committee ¹ USD 10,000 for the IOC Secretariat (paid directly to IOC) USD 10,000 for the WMO Secretariat
E-SURFMAR		EUR 40,000				Belgium, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom
Germany				EUR 3,600		Support to SOOP
India		EUR 2,200				
New Zealand	Eur 1,800					JCOMMOPS, including DBCP and SOT
South Africa		EUR 3,600				
USA		USD 80,000		USD 25,000		Contribution made to IOC

1: Unspent JTA EC contribution from the previous year are deduced from this amount.

ANNEX XII

STATUS OF GLOBAL VOS AUTOMATION AS AT DECEMBER 2010

Background

The VOSP-III meeting in London in 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 Chair was tasked with collating information on global VOS automation for presentation at subsequent VOS Panel sessions.

The first VOS Automation report was compiled in 2003 based on data as at 31 December 2002. The report has been updated annually since 2004, with details of national VOS automation being extracted from national SOT Annual Reports. This report is based on input from national SOT Annual Reports for 2010.

Present Status

Information on the status of automation by country is presented in two categories:

- Status of VOS Automated Observing Systems (AWS) - Table 1
- Status of VOS using (non-AWS) Electronic Logbook Software - Table 2

AWS

The number and type of fully automated shipboard weather observing systems is slowly increasing, as countries install AWS systems on suitable ships. However, numbers dipped in 2009 when 38 Russian ships were removed from the table following confirmation that these systems were no longer operational. At the end of 2010, there were some 241 operational AWS systems, an increase of 12 systems since 2009. Four countries indicated plans to expand their ship AWS networks in 2011, by proposing to add 22 new AWS.

E-Logbook Software

There are three main types of Electronic Logbook Software – OBSJMA, developed by the JMA, SEAS developed by NOAA and TurboWin developed by KNMI. Between 2003 and 2008, most countries reported an increase in the use of Electronic Logbook Software, but numbers have remained mostly stable over the last couple of years, as countries have now issued the software to the maximum number of ships possible.

The total number of global VOS using electronic logbooks dipped in 2007 when Denmark withdrew from VOS, and the USA changed their reporting methodology to count only the ships which use SEAS or TurboWin for VOS. Prior to 2007, the USA numbers had included the ships which used SEAS strictly for XBT transmissions only.

A total of 2073 ships were listed as using Electronic Logbook Software at the end of 2010. The increase in the 2010 numbers was mostly due to the inclusion of 61 ships from Poland, the first time this country had indicated the use of TurboWin software.

Challenges

Challenges with respect to installing Automated systems on board VOS ships continue to include:

- (i) Funding restraints
- (ii) Problems in finding 'long term' ships – the length of charter is often insufficient to justify AWS installation
- (iii) Difficulties siting equipment for best exposure
- (iv) Volatility of ship routes
- (v) Lack of warning of withdrawal of ships and potential loss of AWS equipment

Input of Non-Synoptic AWS and Manual Observations to GTS

There are now many types of VOS AWS installations in operation. These vary from basic AWS eg a SVPB buoy transmitting from the deck of a ship; to complex systems with many sensors, which log data and transmit it in real time. Some AWS transmit at intervals of one minute, some hourly and some three hourly, and the communications method varies from coastal cellular communications to satellite communications. Many AWS are proprietary systems which report raw data back to the NMS for processing and insertion on to the GTS for global consumption.

In the past, NMS set up routines to generate GTS bulletins containing ship observations at three hourly intervals, because these captured reports made at the main and intermediate synoptic times. Today, many AWS make hourly reports and as the global models can ingest hourly data, it is important to ensure that arrangements are in place to insert the hourly AWS data onto GTS in 'non-synoptic' hour bulletins. Eg NZKL SNVE01

In addition to the hourly reporting by AWS systems, some manual reporting ships are choosing to make their observations at non-standard reporting times eg 0100, 0700 UTC because these times fit their work schedules better. These manual non-synoptic observations must also be disseminated in 'non-synoptic' hour bulletins.

Recommendations

1. That NMS operating VOS AWS ensure that all observations, including hourly observations are inserted onto the GTS for global dissemination, using the correct Bulletin Header Data Designator T₁T₂A₁A₂ii starting with SNV...
2. That NMS receiving non-synoptic observations from manual reporting ships ensure that these observations are inserted onto the GTS for global dissemination, using the correct Bulletin Header Data Designator T₁T₂A₁A₂ii starting with SNV...

Point for discussion

- With some AWS now reporting minute data, investigations need to be undertaken to determine whether NMS and modelling centres can ingest minute data, and if so how this data should be disseminated. One suggestion is that minute data be identified by encoding the exact UTC hour and minute in group 9GGgg of the FM13-XII SHIP code or the relevant BUFR descriptor.

Julie Fletcher
Chair, JCOMM VOS Panel
28 March 2011

Table 1 : Status of VOS Automated Observing Systems (AWS)

Country	Type of AWS (as at 31/12/2010)	Method of Comms	Manual Entry Facility	Number of Ships with AWS at 31/12/2002	Number of Ships with AWS at 31/12/2004	Number of Ships with AWS at 31/12/2005	Number of Ships with AWS at 31/12/2006	Number of Ships with AWS at 31/12/2007	Number of Ships with AWS at 31/12/2008	Number of Ships with AWS at 31/12/2009	Number of Ships with AWS at 31/12/2010	Plans for 2011	
Australia	Vaisala Milos 500 AWS	Inmarsat C (Data Mode)	Yes	9	11	10	8	9	9	8	8		
	Other	-									1		
Canada	AVOS – AXYS Technologies	Inmarsat C Iridium	Yes Yes	13	14	14	39	41 1	45 1	35 17	18 35	5 -7 new AVOS	
Denmark	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	2	See EUMETNET					
EUMETNET	BATOS	Inmarsat C (Data Mode)	Yes					5	5	6	8	3 BATOS	
	BAROS	Iridium SBD	No					0	4	9	13	7 BAROS	
France	BATOS	Inmarsat C (Data Mode)	Yes	19	30	39	45	48	54	56	58		
	Mini BATOS	Inmarsat C (Data Mode)	No		1	2	3	3	1	-	-		
	MINOS	Argos	No		6	7	8	8	7	8	7		
	BAROS	Iridium	No					1	-	-	-		
Germany	Vaisala Milos 500 AWS Ships' own data logger	Meteosat Inmarsat Iridium	Yes Yes	23	21	21	17	18	17	16 2	17 2		
Ireland	Vaisala Milos AWS BATOS	Meteosat Iridium	No No	1	1	1	(1)	(1)	1	- 1	- 2		
Japan	Integrated System for Marine Met Observation (Koshin Denki Kogyo Co) Weather Observation System (Nippon) Shipboard Oceanographic & Atmospheric Radiation (Brookhaven) Ogasawara Keiki Seisakusho Co (Japan) JRCS MFG. Co. Ltd (Japan)	Inmarsat (4) MTSAT(2) Inmarsat C Inmarsat C Inmarsat Inmarsat F	Some	13	12	13	9	9	9	9	6		
			Some				4	5	5	6	6		
			Yes				1	1	1	1	1	1	
			No				3	1	1	-	-	-	
No							-	1	1	-	-		
New Zealand	Sutron 9000RTU mSTAR-SHIP	MTSAT GPRS Cell	Yes No	1	1	1	1	1 1	1 1	1 1	1 1		

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Norway	AWS	VSAT	some	-	-	17	17	18	16	15	(15)	
Russia	GM6	Inmarsat C	Yes	-	38	(38)	(38)	(38)	(38)	0	(0)	
South Africa	Vaisala Milos 520	Inmarsat C	Yes	-	-	1	(1)	1	1	1	1	3
Spain	Vaisala MAWS 410	Inmarsat C	Yes	1	1	(1)	1	1	1	1	1	
United Kingdom	Automet	Inmarsat	No	1	1	1	1	1	0	-	-	
	MINOS –GP	Argos	No	-	-	1	2	6	5	5	5	
	MINOS-GPW	Argos	No	-	-	1	2		1	1	1	
	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	1	3	3	2	5	
	AVOS	Inmarsat	Yes					1	1	0	0	
	MILOS/MAWS	Iridium	Yes						-	0	0	
	Metpod	Iridium	No						1	1	0	
Metocean Deck Buoy	Iridium	No						2	2	-		
United States	SEAS-AutoImet NOAA SCS (Science Computing System) Type 1	Inmarsat Email	Yes	-	3	(3)	0	3	16*	2	9	Plan to upgrade Type 2 to AutoImet
	NOAA SCS Type 2	Email ?	No	-	-	-	-	-	-	23	8	
	Other ship owned AWS systems Type 3		Yes								12	
TOTAL				81	140	171	204	226	245	229	241	22 new AWS planned for 2011

Numbers in brackets not confirmed.

* 2008 number corrected in 2009 – different from 2008 Annual Report

Table 2 : Status of VOS using (non-AWS) Electronic Logbook Software

Country	Electronic Logbook type	Number of Ships at 31/12/2002	Number of Ships at 31/12/2004	Number of Ships at 31/12/2005	Number of Ships at 31/12/2006	Number of Ships at 31/12/2007	Number of Ships at 31/12/2008	Number of Ships at 31/12/2009	Number of Ships at 31/12/2010
Australia	TurboWin	33	41	50	51	64	61	58	57
Canada	TurboWin								2
Croatia	TurboWin	3	4	3	7	(7)	(7)	(7)	(7)
Denmark	TurboWin	-	-	-	32	0	Finished		
France	TurboWin	-	7	6	7	10	4	4	2
Germany	TurboWin	315	412	556	600	709	730	780	800
Greece	TurboWin	2	0	0	0	1	3	1	4
Hong Kong	TurboWin	-	-	1	2	2	2	2	3
India	TurboWin	-	21	28	33	(33)	(33)	(33)	(33)
Ireland	TurboWin	-	-	-	-	-	-	-	2
Japan	OBSJMA	-	49	61	70	74	95	102	100
Netherlands	TurboWin	200	259	198	195	193	195	185	172
New Zealand	TurboWin	0	12	15	22	20	19	22	24
Poland	TurboWin								61
Singapore	TurboWin	-	-	2	3	1	1	1	(1)
South Africa	TurboWin	5	5	8	(8)	8	14	14	19
Sweden	TurboWin	-	-	-	-	-	1	1	3
United Kingdom	TurboWin	82	104	147	241	261	286	272	276
United States	SEAS TurboWin	353	439	447	622	129	344	524 3	507 -
TOTAL		993	1353	1522	1893	1512	1795	2009	2073

Numbers in brackets not confirmed.

ANNEX XIII**KEY PERFORMANCE INDICATORS (KPIs) FOR VOS AND VOSCLIM**

<i>KPI</i>	<i>Definition</i>	<i>Type</i>	<i>Target</i>
1	Percentage of VOSclim ships in the global active VOS ¹	Quantity	> 25%
2	Percentage of VOS ships to meet the reporting criteria of an 'Active ship' by providing an average of 20 Observations per month	Quantity	100%
3	Percentage of VOSclim class ships per month being flagged on the Suspect List for Air Pressure	Quality	< 3%
4	Percentage of VOSclim class observations to be received within 120 minutes	Timeliness	> 95%

1: The global active VOS is defined as the number of VOS registered in the Pub47 and reporting at least once per month – Today there are about 2000 such ships.

ANNEX XIV

**RECOMMENDATIONS FROM THE FOURTH INTERNATIONAL
PORT METEOROLOGICAL OFFICER CONFERENCE (PMO-IV),
AND SUPPORT TO GLOBAL OCEAN OBSERVATIONS USING SHIP LOGISTICS**

8-10 December 2010, Orlando, Florida, USA

Following the presentations made at the workshop, and taking into account the resulting discussions, the meeting agreed with the following.

1) Recommendations by the PMO workshop

1. Develop a web site where the names of ships wanting to join VOS (including de-recruited ships) can be advertised so the nearest PMO can recruit the ship;
2. Review the classification of all ships in national VOS fleets to ensure that all ships are assigned to the correct VOS Class;
3. Work towards upgrading as many ships as possible to VOSClm Class standard;
4. US to upgrade SEAS software so that it is VOSClm compliant (or use TurboWin);
5. Target existing ships which are doing only one observation per day to increase their daily reporting frequency;
6. Get existing VOS to report along their total route, including coastal voyages and coastal transits;
7. Encourage countries with no database to use the WMO pub 47 metadata tools;
8. Submit national VOS Pub47 metadata to WMO monthly or at least quarterly;
9. Use the Foreign VOS Inspection Form;
10. Post inspection details on existing international VOS databases;
11. All countries to monitor the quality and quantity of their Observations using the QC monitoring tools;
12. Make use of the tools and resources on the VOS web site;
13. WMO to write to all NMS which receive and disseminate Obs from LES to request that these NMS produce intermediate and non-standard ship bulletins for all geographical areas, so that non-synoptic (asynoptic) Obs are captured and sent on GTS;
14. Promote PMO international exchange programmes ;
15. Install a Drifting Buoy as an autonomous AWS on ships to provide a low cost, quality observation solution;
16. Avoid over tasking the same ships repeatedly for ocean deployments;
17. Use PMOs to recruit ships so as to avoid multiple people communicating with the shipping staff and company;
18. Encourage SOOP ships to do VOS observations as well;

19. Explore virtual PMO workshops;
20. Approach insurance companies and advertise programme; liability issues; benefits in terms of maritime safety;
21. Approach maritime routing companies who also collect ocean observations.

2) Advisory to PMOS

1. Beware that migration to BUFR is to be completed by 2012 and that some metadata will need to be collected and assembled for distribution.

3) Recommendations by the workshop in terms of ship support to global ocean observations:

1. Create a unique database, or a web page, with all available links to research and cargo ship schedules
2. Have an updated list of PMOs from around the globe, with their pictures, email, phone numbers, addresses, etc, all their contact information
3. Have and maintain an updated list of ships that are being served by each PMO
4. Continue having the SOOP community involved in collaboration with the international VOS and PMO communities
5. Encourage international PMOs to brief their IOC representatives on work being done on ocean observations and equipment deployment
6. Create awareness of international law, restrictions for deployment of instruments, observations, and data distribution
7. Support the design of smaller Argo floats that can be easily deployed by the crew of a ship
8. Enhance the international participation in SOOP.
9. Include drifter and float deployments in VOS log sheets
10. Continue strong collaboration among different programs, VOS, XBTs, drifter, floats, etc.
11. Continue having other programs involved in PMO meetings.
12. Encourage PMOs to participate at SEAS annual workshop in Miami
13. AOML will receive a list of recommendations from VOS on needs to enhance SEAS.

ANNEX XV

**CHANGES PROPOSED BY SOT-VI TO THE
TERMS OF REFERENCE OF THE SHIP OBSERVATIONS TEAM (SOT)¹**

2. SHIP OBSERVATIONS TEAM TERMS OF REFERENCE

The Ship Observations Team shall:

- (a) Respond to requirements for ship-based observational data expressed by relevant existing international programmes and/or systems in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;
- (b) Provide continuing assessment of the extent to which those requirements are being met;
- (c) Develop methodology for constantly controlling and improving the quality of data;
- (d) 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;
- (e) Coordinate Port Meteorological Officer (PMO)/ship greeting operations globally, propose actions to enhance PMO standards and operations, and contribute as required to PMO and observers training;
- (f) Review, maintain and update as necessary technical guidance material relating to ship observations and Port Meteorological Officers;
- (g) Liaise and coordinate as necessary with other JCOMM programme areas and expert teams, as well as with other interested parties;
- (h) Participate in the planning activities of the 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, ships from the Automated Shipboard Aerological Programme, and research ships;
- (i) Seek new opportunities for deploying various kinds of measuring devices as recommended by the relevant panels and widely publicize those opportunities;
- (j) Develop as necessary new pilot projects and/or operational activities and establish new specialized panels as required;
- (k) Carry out other activities as agreed by participating Members/Member States to implement and operate the SOT programme and to promote and expand it internationally.

TERMS OF REFERENCE OF COMPONENT PANELS

SHIP-OF-OPPORTUNITY PROGRAMME IMPLEMENTATION PANEL

The Ship-of-Opportunity Programme Implementation Panel (SOOPIP) coordinates the installation and deployment of instrumentation from Ships of Opportunity that travel in fixed transects, and in particular coordinates the implementation of regional and basin-wide instrumentation that measure physical, chemical and biological parameters, such as XBTs, TSGs and CPR. Its terms of reference are to:

¹: The current Terms of Reference of the SOT are detailed in the Annex to Resolution 2 (JCOMM-III) – Terms of Reference and General Membership of the Coordination Group and Teams of the Observations Programme Area

- (a) Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices dedicated, but not limited, to temperature and salinity measurements;
- (b) 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;
- (c) Ensure the distribution of available programme resources to ships to meet the recommended sampling network in the most efficient way;
- (d) Ensure the transmission of data in real time from participating ships; ensure that delayed mode data are distributed in a timely manner (within 24 hours of the observations) to data processing centres;
- (e) Maintain, through the SOT chairperson, appropriate inventories, monitoring reports and analyses, performance indicators and information exchange facilities;
- (f) Provide guidance to the coordinator in supporting the Ship-of-Opportunity Programme (SOOP);
- (g) Prepare annually a report on the status of SOOP operations, data availability and data quality;
- (h) Where relevant, serve as a platform for other observational programmes;
- (i) Maintain close communications with the scientific community;
- (j) Support the formation of an XBT Science Team dedicated to meet and discuss on a periodic basis results and ongoing research performed with XBT observations.

VOLUNTARY OBSERVING SHIP PANEL

The Voluntary Observing Ship (VOS) Panel shall:

- (a) Review, recommend and coordinate the implementation of new and improved specialized shipboard meteorological instrumentation, siting and observing practices, as well as of associated software;
- (b) Support the development and maintenance of new pilot projects;
- (c) Oversee the upgrade of ships to VOSCLIM class standard, and encourage new ships to be recruited to the VOSCLIM class;
- (d) Develop and implement activities to enhance ship recruitment, including promotional brochures and training videos;
- (e) Prepare annually a report on the status of VOS operations, data availability and data quality.

GENERAL MEMBERSHIP

Chairperson of the Ship Observations Team, selected by the Commission

Chairpersons of the SOOPIP and Voluntary Observing Ship Panel, selected by the Commission

Open membership, comprising operators of VOS and SOOP, representatives of monitoring centres, data management centres and bodies, representatives of the International Mobile Satellite

Organization and other communications satellite systems, representatives of manufacturers, representatives of science advisory bodies and users as appropriate.

The JCOMM In Situ Observing Platform Support Centre will participate in the work and the meetings of the Ship Observations Team.

ANNEX XVI

XBT TRANSECT IMPLEMENTATION RESPONSIBILITIES

The table below provides information on the institutions taking the lead in one or more aspects of the implementation of the XBT transects as agreed at SOT-VI.

Transect	Agency	Status	Year	
AX01	5, 1, 23	Active		Agency key 1 USA-AOML 2 USA-SIO 3 USA-NMFS 4 AUS-CSIRO 5 FRA-IRD/BREST 6 ZAF-UCT 7 FRA-IRD/NOUMEA 8 JPN-TOHOKU-U 9 AUS-BOM 10 GER-BSH 11 ARG-SHN 12 IND-NIO 13 BRA-FURG 14 UK-UKMO 15 IND 16 JPN-JMA 17 JPN-JAMSTEC 18 NZL-MSNZ 19 JPN 20 UK-BAS 21 IT-ENEA 22 IT-INOGS 23 FRA-UParis 24 CY-U.Cyprus 25 CAN-DFO
AX02	1, 23	Active		
AX03	10	Active		
AX04		Active		
AX07	1	Active	1995	
AX08	1, 6	Active	2000	
AX10	1	Active	1997	
AX11	10	Active		
AX15	5	Active		
AX18	1, 11, 6	Active	2002	
AX19	1	Active		
AX20	5, 1, 23	Active		
AX22	2, 1, 11	Active	1996	
AX25	1, 6, 20	Active	2004	
AX29	1			
AX32	1, 3	Active	1981	
AX34				
AX97	1, 13	Active	2004	
PX02	9	Active		
PX04	7			
PX05	2, 16, 17, 7	Active	2009	
PX06	2, 7, 1	Active	1986	
PX08	2, 1	Active	2004	
PX09	2, 1	Active	1987	
PX10	2, 1	Active	1991	
PX11	9	Active		
PX12	7	Active		
PX13	2, 7, 1	Active	1986	
PX18	1			
PX21				
PX26	1			
PX30	4, 2, 7	Active	1991	
PX31	2, 7, 1	Active	1986	
PX32	4	Active		
PX33	4	Active		
PX34	4, 2	Active	1991	
PX36				
PX37	2, 1	Active	1991	
PX38	2	Active	1993	
PX39	25	Active		
PX40	8, 17	Active	1998	
PX44	2, 1	Active	1991	
PX45	8, 16	Active		
PX46	16			
PX50	18, 2		1993	
PX53	9	Active		
PX81	2		1997	
IX01	9, 1	Active		

IX02		Active		
IX06	6			
IX08	12		1992	
IX09	14, 17			
IX10	14, 16, 17			
IX12	9	Active		
IX14	12	Active	1990	
IX15	2, 4, 6	Active	1994	
IX21	2, 4, 6	Active	1994	
IX22	9	Active		
IX28	4, 2	Active	1993	
IX29		Active		
IX31	2			
MX01	21, 9	Active		
MX02	21, 9	Active		
MX04	21, 9	Active		
MX05	21, 22	Active		
MX07	21, 24	Active		

ANNEX XVII

JCOMMOPS OPERATIONS BUDGET FOR THE SOT

Here are how contributing the different panels to JCOMMOPS, beyond the two technical coordinators salary and mission budget, handled by IOC and WMO.

To be noted that we have a major one-off increase for 2011 for the GIS.

The evolution of ESRI based GIS technologies implies we need to invest in a new type of licenses that are more expensive at the base and then for the yearly maintenance (+30 and +5 k\$). However, thanks to a partnership with ESRI, JCOMMOPS negotiated a 50% cut on the licenses price. JCOMMOPS needs to find an extra 30k\$ for 2011 and increase the yearly contribution to the software/hardware budget in 2012.

The DBCP has agreed to pay 15k\$ in 2011 and to increase the yearly contribution to the software/hardware in 2012. It is suggested the SOT cover the other 15k\$ in 2011 and then use then contribute to the position of the Cruise Coordinator.

In k\$ (needs/ panels contribution)	2010	DBCP	ARGO	SOT	OCEANSITES**
Logistic *	-30	15	15		
I.T. software/hardware *	-10	5	5		
I.T. full time resource *	-30				30
TOTAL	-70	20	20	0	30
BALANCE	0				

In k\$	2011	DBCP	ARGO	SOT	OCEANSITES	JCOMMOPS***
Logistic *	-30	15	15			
I.T. software/hardware *	-10	5	5			
One-off increment for GIS	-30	15		15		
I.T. full time resource *	-30				30	
Misc expenses	-3					30
TOTAL	-103	35	20	15	30	30
BALANCE	27					

In k\$	2012	DBCP	ARGO	SOT	OCEANSITES	JCOMMOPS	EXTRA****
Logistic *	-30	15	15				
I.T. software/hardware	-15	7.5	7.5				
I.T. full time resource *	-30				30		
Cruise Coordinator	-70			15		30	25
Misc expenses	-3						
TOTAL	-145	22.5	22.5	15	30	30	25
BALANCE	24						

(*) as contracted with host on a yearly basis:
 20 000 euros for logistic (or 30 000\$)
 7500 euros for software/hardware (or 10 000\$)
 20 000 euros for IT resource (or 30 000\$)

(**) NOAA extra contribution for OceanSITES coordination.

(***) Incomes from JCOMMOPS Services, including "Ship Time", official Argo sticker selling to manufacture:

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In k\$	2011
Stickers to Webb	2
Lady Amber Cruise #1	3.5
Lady Amber Cruise #2	11.5
<i>Lady Amber Cruise #3</i>	12.5
...	
<i>Total</i>	29.5

(****) *Potential extra contribution from NOAA/JCOMM*

ANNEX XVIII

NEW VOS CLASSES FOR WMO PUBLICATION NO. 47, TABLE 2202

Pub47 Table
2202

vssIM Type of meteorological reporting ship.

Code	Description
10	Selected Definition: A mobile ship station equipped with sufficient certified meteorological instruments for making observations, transmits regular weather reports and enters the observations in a meteorological logbook. A Selected ship should have at least a barometer, a thermometer to measure SST, a psychrometer (for AT and humidity), a barograph and possibly an anemometer.
15	Selected (AWS) Definition: an AWS system equipped with certified meteorological instruments to measure at least air pressure, pressure change, temperature and humidity. Optional sensors would include wind speed and direction and sea temperature measurement. The AWS may or may not have the facility for manual input of the visual elements, and transmit reports at least three hourly or more frequently. The AWS should have the facility to log the data.
30	VOSClim – VOS Climate Definition: A mobile ship station equipped with sufficient certified meteorological instruments for making observations, transmits regular and timely weather reports, enters the observations in an IMMT compliant electronic logbook including the extra VOSClim delayed-mode groups, and has a proven record of providing high quality observations. The ship should have at least a barometer, a thermometer to measure SST, a psychrometer (for AT and humidity), a barograph and possibly an anemometer. The ship should be inspected at less than six month intervals.
35	VOSClim (AWS) – VOS Climate (AWS) Definition: An AWS system equipped with certified meteorological instruments to measure at least air pressure, pressure change, temperature and humidity. Optional sensors would include wind speed and direction and sea temperature measurement. The AWS may have a facility for manual input of the visual elements, and transmit reports at least three hourly or more frequently. The AWS must have the facility to log the data including the additional IMMT delayed-mode VOSClim groups. The ship should be inspected at less than six month intervals.
40	Supplementary Definition: A mobile ship station equipped with a limited number of certified meteorological instruments for making observations. It transmits regular weather reports and enters the observations in a meteorological logbook.
45	Supplementary (AWS) Definition: an AWS system equipped with a limited number of certified meteorological instruments that reports regularly. The AWS should at least measure air pressure.
70	Auxiliary Definition: A mobile ship station normally without certified meteorological instruments, which transmits in a reduced code form or in plain language, either on a routine basis or on request, in certain areas and under certain

	<i>conditions.</i>
75	Auxiliary (AWS) Definition: <i>an AWS system using non-certified meteorological instruments and reporting regularly. The AWS should at least measure air pressure.</i>
OT	Other (specify in footnote).

additions

- 15 Selected (AWS)
- 30 VOSClim – VOS Climate
- 35 VOSClim (AWS) – VOS Climate (AWS)
- 45 Supplementary (AWS)
- 75 Auxiliary (AWS)

notes

- 10 Replaces former codes 20, 21 and 22 which were vessel type specific.
- 40 Replaces former codes 60 and 61 which were vessel type specific.
- 70 Replaces former codes 80 and 81 which were vessel type specific.
- OT Replaces former code 99

Codes **88-90**, formerly used by the USA, are deleted in favour of **10, 40** and **70**.

ACRONYM LIST

ABE-LOS	IOC Advisory Body on the Law of the Sea
ACCESS	African Centre for Climate and Earth System Science
ADB	AOML Data Buoy
ADOS	Autonomous Drifting Ocean Station
AG	DBCP Action Groups
AIC	Argo Information Center
ALD	UNESCO Appointment of Limited Duration
AOML	NOAA Atlantic Oceanographic and Meteorological Laboratory (USA)
AP	Air Pressure
Argo	Argo Profiling Float Pilot Project
ASCLME	Agulhas and Somali Current Large Marine Ecosystems
AST	Argo Steering Team
ATLAS	Autonomous Temperature Line Acquisition System
BAS	British Antarctic Survey
BOM	Bureau of Meteorology (Australia)
BUFR	FM 94 BUFR GTS format: Binary Universal Form for Representation of meteorological data
BUOY	FM 18 BUOY GTS format: Report of a buoy observation
CB	Capacity-Building
CBS	Commission for Basic Systems (WMO)
CCHDO	CLIVAR and Carbon Hydrographic Data Office
CCI	Commission for Climatology (CCI)
CDIP	Coastal Data Information Program
CDMP	Climate Database Modernization Programme (USA)
Cg	Congress (WMO)
CIMO	Commission on Instruments and Methods of Observation (WMO)
CLIVAR	Climate Variability and Predictability (WCRP)
CLS	Collecte Localisation Satellites (France)
CMR	Christian Michelsen Research (Norway)
CONOPS	WIGOS Concept of Operations
CRREL	Cold Regions Research and Engineering Laboratory (USA)
CSV	Comma Separated Values format
DAR	Data Discovery, Access and Retrieval service (WMO WIS)
DART	Deep-ocean Assessment and Reporting of Tsunami (buoy)
DB	Data Buoy
DBCP	Data Buoy Co-operation Panel (WMO-IOC)
DB-TAG	E-SURFMAR Data Buoy Technical Advisory Group
DCP	Data Collection Platform
DCPC	Data Collection and Production Centres (WMO WIS)
DCS	Data Collection System
DMCG	Data Management Coordination Group (JCOMM)
DMPA	Data Management Programme Area (DMPA)
EB	DBCP Executive Board
EBD	Equivalent Buoy Density
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecasts
EEZ	Exclusive Economic Zone
EOV	Essential Ocean Variable
ER	Expected Result
E-SURFMAR	Surface Marine programme of the Network of European Meteorological Services, EUMETNET
ET/AWS	CBS / IOS Expert Team on Requirements for Data from Automatic Weather Stations (WMO)
ETCCDI	joint CLIVAR / CCI / JCOMM Expert Team on Climate Detection and Indices

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ET/DRC	CBS Expert Team on Data Representation and Codes (WMO)
ET/EGOS	CBS / IOS Expert Team on the Evolution of the Global Observing System (WMO)
ETDMP	Expert Team on Data Management Practices (JCOMM)
ETMC	Expert Team on Marine Climatology (JCOMM)
ETSI	Expert Team on Sea Ice (JCOMM)
ETWS	Expert Team on Wind Waves and Storm Surge (JCOMM)
EUCOS	EUMETNET Composite Observing System
EUMETNET	Network of European Meteorological Services
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroSITES	European integrated network of open ocean multidisciplinary observatories
FAD	Fish Aggregation Device
FAO	Food and Agriculture Organization
FG	First Guess Field
FOAM	Forecasting Ocean Assimilation Model (United Kingdom)
GCC	Global Collecting Centre (of MCSS)
GCOS	Global Climate Observing System
GDAC	Global Data Assembly / Acquisition Centre
GDP	Global Drifter Programme
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GFCS	Global Framework for Climate Services
GHRSSST	GODAE High-Resolution SST Pilot Project
GIS	Geographical Information System
GISC	Global Information System Centres (WMO WIS)
GLOSS	Global Sea-level Observing System (JCOMM)
GODAE	Global Ocean Data Assimilation Experiment (GOOS)
GOOS	Global Ocean Observing System (IOC, WMO, UNEP, ICSU)
GOS	Global Observing System (WMO)
GPS	Global Positioning System
GPSRO	GPS Radio Occultation
GSOP	CLIVAR Global Synthesis and Observations Panel
GSM	Global System for Mobile Communications
GSSC	GOOS Scientific Steering Committee
GTS	Global Telecommunication System (WWW)
HMEI	Association of Hydro-Meteorological Equipment Industry
HRPT	High Resolution Picture Transmissions
HRSST	DBCP/GHRSSST High Resolution SST Pilot Project
IABP	International Arctic Buoy Programme
IBPIO	International Buoy Programme for the Indian Ocean
ICG	Intergovernmental Coordination Group
ICG/IOTWS	ICG for the Indian Ocean Tsunami Warning and Mitigation System (IOC)
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICSU	International Council for Science
ICT-IO	CBS Implementation / Coordination Team on the Integrated Observing System
ICTT-QMF	Inter Commission Task Team on Quality Management Framework
ID	Identification Number
IGDDS	Integrated Global Data Dissemination Service (satellite)
I-GOOS	Intergovernmental IOC-WMO-UNEP Committee for GOOS
IHO	International Hydrographic Organization
IMB	Ice Mass Balance
IMEI	International Mobile Equipment Identity
IMO	International Maritime Organization
InaGOOS	Indonesian Global Ocean Observing System
IndOOS	Indian Ocean Observing System
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCCP	International Ocean Carbon Coordination Project

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IODE	International Oceanographic Data and Information Exchange (IOC)
IPAB	WCRP-SCAR International Programme for Antarctic Buoys
IPP	Iridium Pilot Project
IPY	International Polar Year (2007-2008)
ISABP	International South Atlantic Buoy Programme
ISDM	Integrated Science Data Management (formerly MEDS, Canada)
ISO	International Organization for Standardization
IT	Information Technology
ITP	International Tsunami Partnership
ITT	Invitation To Tender
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMM-III	Third Session of JCOMM (Marrakech, Morocco, 4-11 November 2009)
JCOMMOPS	JCOMM <i>in situ</i> Observations Programme Support Centre
JTA	Joint Tariff Agreement (Argos)
KML	Keyhole Markup Language
LOI	Letters of Intent
LUT	Local User Terminal (Argos)
MAN	JCOMM Management Committee
MCSS	Marine Climatological Summaries Scheme
MDT	Modelling Development Team
MEDS	Marine Environmental Data Service (Canada, now ISDM)
META-T	Water Temperature instrument/platform Metadata Pilot Project (JCOMM)
METOP	Meteorological Operational satellites of the EUMETSAT Polar System (EPS)
MOFS	Met-Ocean Forecasts and Services
MOI	Mauritius Oceanography Institute
MOU	Memorandum of Understanding
MSC	Meteorological Services of Canada
NAVOCEANO	Naval Oceanographic Office (USA)
NC	National Centres (WMO WIS)
NCDC	NOAA National Climatic Data Center (USA)
NCEP	NOAA National Center for Environmental Prediction (USA)
NCOSM	National Centre of Ocean Standards and Metrology (China)
NDBC	NOAA National Data Buoy Center (USA)
NESDIS	NOAA National Environmental Satellite Data and Information Service (USA)
NFP	National Focal Point
NIOT	National Institute of Ocean Technology (India)
NMDIS	National Marine Data and Information Service (China)
NMHS	National Meteorological and Hydrological Service
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	National Oceanographic Data Centre
NPDBAP	DBCP-PICES North Pacific Data Buoy Advisory Panel
NPOESS	National Polar-orbiting Operational Environmental Satellite System (USA)
NSF	National Science Foundation (USA)
NWP	Numerical Weather Prediction
NWS	NOAA National Weather Service (USA)
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	Observations Coordination Group (JCOMM)
OCO	NOAA Office of Climate Observation (USA)
ODAS	Ocean Data Acquisition Systems
ODASMS	ODAS Metadata Service (operated by China on behalf of JCOMM)
ODINAFRICA	Ocean Data and Information Network for Africa (IODE)
ODP	Ocean Data Portal (IODE)
ODT	Observation Development Team
OGP	Oil and Gas Producers

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OOPC	Ocean Observations Panel for Climate (GCOS-GOOS-WCRP)
OPA	Observations Programme Area (JCOMM)
OPAG	Open Programme Area Group
OPAG-IOS	CBS OPAG on the Integrated Global Observing System
OPSC	Observing Programme Support Centre
OPSCOM	Argos Operations Committee
OSE	Observing System Experiment
OSMC	NOAA Observing System Monitoring Center (USA)
PA	Programme Area (JCOMM)
PANGEA	Partnerships for New GEOSS Applications
PGC	Principal GTS Co-ordinator (DBCP)
PICES	North Pacific Marine Science Organization
PICO	Panel for Integrated Coastal Observations
PIRATA	Pilot Research Moored Array in the Tropical Atlantic
PMEL	NOAA Pacific Marine Environmental Laboratory (USA)
PMO	Port Meteorological Officer
PMOC	Principal Meteorological or Oceanographic Centres responsible for quality control of buoy data (DBCP)
PMT	Platform Messaging Transceivers
POGO	Partnership for Observation of the Global Oceans
PP-WMD	Pilot Project on Wave Measurement from Drifters
PP-WET	JCOMM Pilot Project on Wave measurement Evaluation and Test from moored buoys
PTT	Platform Transmitter Terminal (Argos)
QA	Quality Assurance
QC	Quality Control
QMF	WMO Quality Management Framework
QMS	Quality Management Systems
RAMA	Indian Ocean Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
RMIC	WMO-IOC Regional Marine Instrument Centre
RMS	Root Mean Square
RNODC	Responsible Oceanographic Data Centre (IODE)
RNODC/DB	RNODC for Drifting Buoys
RRR	Rolling Review of Requirements
RTMC	VOSCLim Real-Time Monitoring Centre
RUDICS	Iridium Router-Based Unrestricted Digital Interworking Connectivity Solution
RV	Research Vessel
SADC	South African Development Community
SAMS	Scottish Association for Marine Science
SAT	Site Acceptance Test
SAWS	South African Weather Service
SBD	Short Burst Data (Iridium)
SC	Steering Committee
SCAR	Scientific Committee on Antarctic Research
SCG	Services Coordination Group (JCOMM)
SeaDataNET	Pan-European infrastructure for Ocean & Marine Data Management
SFSPA	JCOMM Services and Forecasting Systems Programme Area
SIA	Seasonal to Inter-annual Forecast
SIO	Scripps Institution of Oceanography (University of California, USA)
SLP	Sea Level Pressure
SMOS	Soil Moisture and Ocean Salinity mission
SOBP	Southern Ocean Buoy Programme
SOC	Specialized Oceanographic Centre (JCOMM)
SoG	Statements of Guidance
SOOP	Ship-Of-Opportunity Programme
SOOPIP	SOOP Implementation Panel (JCOMM)

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SOT	Ship Observations Team (JCOMM)
SPA	JCOMM Services Programme Area (now SFSPA)
SSA	WMO Special Service Agreement
SSG	Scientific Steering Group
SST	Sea-Surface Temperature
STIP	Stored Tiros Information Processing
SVP	Surface Velocity Programme (of TOGA and WOCE, replaced by GDP) drifter
SVP-B	SVP barometer drifter
SVP-BS	SVP drifter with salinity
SVP-BTC	SVP drifter with temperatures in depth
SVP-BW	SVP Abarometer and wind at a drifter
TAO	Tropical Atmosphere Ocean Array
TC	Technical Co-ordinator
TD	Technical Document
TIP	Tiros Information Processing
TIP	Tropical Moored Buoys Implementation Panel
TOGA	Tropical Atmosphere and Global Ocean programme
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems
TRITON	Triangle Trans-Ocean buoy network
TT	Task Team
TT-CB	DBCP Task Team on Capacity-Building
TT-DM	DBCP Task Team on Data Management
TT-MB	DBCP Task Team on Moored Buoys
TT-IBP	DBCP Task Team on Instrument Best Practices & Drifter Technology Developments (merged the TT-QM & TT-TD)
TT-QM	DBCP Task Team on Quality Management (now merged into TT-IBPD)
TT-TD	DBCP Task Team on Technological Development (now merged into TT-IBPD)
TT-TDC	DMPA Task Team on Table Driven Codes
UN	United Nations
UNESCO	UN Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
URL	Uniform Resource Locator
USA	United States of America
USD	United States Dollar
VAR	Value Added Reseller
VOS	Voluntary Observing Ship (JCOMM)
VOSclim	VOS Climate Project
WCRP	World Climate Research Programme
WCC-3	World Climate Conference 3
WDIP	WIGOS Test of Concept Development and Implementation Plan
WDIS	WIGOS Development and Implementation Strategy
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WOCE	World Ocean Circulation Experiment
WWW	World Weather Watch (WMO)
XBT	Expendable BathyThermograph
WML	Extensible Markup Language