JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)

SHIP OBSERVATIONS TEAM

EIGHT SESSION

Cape Town, South Africa

20 to 24 April 2015

FINAL REPORT

2015

JCOMM Meeting Report No. 120

World Meteorological Organization
Weather • Climate • Water

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

NOTES

WMO Regulation 42

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

WMO Regulation 43

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

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[Group Picture]

C O N T E N T S

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EXECUTIVE SUMMARY

The Eighth Session of the JCOMM Ship Observations Team (SOT) was held from 20 to 24 April 2015 in the conference room of the Pepper Club Hotel & Spa, Cape Town, South Africa, and at the kind invitation of the Government of South Africa, and the South African Weather Service (SAWS). The Session was chaired by the JCOMM Co-President, Mr Johan Stander (South Africa).

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. Ten 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 made six recommendations according to the workshop's discussion.

The Secretariat reported on issues of interest from the WMO and IOC Executive Bodies and their concerns with regard to the limited progress towards JCOMM Observations Programme Area (OPA) Implementation Goals. The Team noted with appreciation the recent update of the CIMO Guide[1] according to the changes proposed by the SOT.

The Team noted recent developments regarding the WMO Integrated Global Observing System (WIGOS), and agreed on the SOT contribution to the Key Activity Areas of the WIGOS Framework Implementation Plan (WIP) to be included in the SOT Implementation Strategy. Regarding WIGOS metadata, the Team agreed that ship metadata from the WMO Publication 47 should be integrated in the Observing Systems Capability Analysis and Review tool (OSCAR) as soon as possible.

The Team decided to establish an *ad hoc* Task Team on WIGOS Identifiers. The *ad hoc* Task Team shall be responsible for proposing an SOT scheme for ship identifiers that will be compatible with WIGOS Identifiers.

The Team noted the reports from the JCOMM Observations Programme Area Coordinator, the SOT Chair, and the SOT Technical Coordinator, and reviewed action items from the previous SOT Session. Most of the actions have been successfully completed, or addressed. The Team noted the good progress and developments of the SOT Technical Coordination and thanked Mr Kramp for his continuous support. Per the JCOMM Observations Coordination Group (OCG) request, the SOT agreed to explore and identify practical solutions in planning for WIGOS to address the need for 1) the JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS) to track ship-based observations and associate correct metadata to reported observations; and 2) the climate community to trace ship observations reports to unique hulls. Efforts will also have to be made to review JCOMM-4 priority actions relating to the SOT and to report on the achievements by JCOMM-5 (Indonesia, November 2017).

The Team noted that there are multiple requirement-documenting processes underway under WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS), the IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS), and WIGOS/WMO Rolling Review of Requirements (RRR). The Ocean Observations for Physics and Climate (OOPC) and OCG are undertaking an effort to document requirements and capabilities by network (e.g. the Voluntary Observing Ship (VOS) scheme of the SOT) and by variable. The Team agreed to cooperate with the OCG and to participate in these processes in order to fully describe and map requirements and capabilities in order to identify gaps and synergies.

The meeting reviewed the collaboration with associated programmes. 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 for example:

1 WMO No. 8, WMO Guide to Meteorological Instruments and Methods of Observation. The Guide is maintained by the WMO Commission for Instruments and Methods of Observation (CIMO)

(i.) The Task Team on Satellite Communication Systems (TT-Satcom) recommended that NMSs establish separate contracts with their national Inmarsat providers in order to pay the communication costs for their recruited ships whatever the service used: Inmarsat-C now, FleetBroadband in the future.

(ii.) The Task Team on Automated Shipboard Aerological Programme (ASAP) (TT-ASAP) report indicated that a total of 5466 soundings were received in 2014, mainly from the North Atlantic. The European E-ASAP fleet covers 77% of all global ASAP activities. E-ASAP shall complete the migration to BUFR in June 2015 (only BUFR will be available as of July 2015 from E-ASAP ships).

(iii.) The Task Team on VOS Recruitment and Programme Promotion (TT-VRPP) agreed on a number of actions, and recommended (i) that a summary paper and supporting documentation should be prepared immediately after SOT-8 for submission to the ICS Marine Committee; (ii) that the VOS Scheme Questionnaire 2015 should be approved and issued to as many participating VOS as possible in order to assess the performance of the Scheme and to identify any areas where improvements may be needed; (iii) that the VOS Brochure and VOS Poster should be approved for use (subject to final minor editorial by the SOT Technical Coordinator); (iv) that consideration should be given to establishing a social network group as an alternative to the Wikilog, which should then be archived; and (v) that the potential for using video for promoting both the VOS and for training VOS Observers should be addressed jointly addressed by the VRPP and Training Task Teams after the next session, and that their ToR should be amended as necessary.

(iv.) The Task Team on Metadata for WMO Publication No. 47 (TT-Pub47) requested the Secretariat to again remind VOS Focal Points and VOS program Managers that the use of the E-SURFMAR[2] VOS Metadata Database does not absolve them to submit their national Pub47 metadata to WMO at least quarterly (by January 15, April 15, July 15 and October 15) or preferably each month.

(v.) The Task Team on Instrument Standards (TT-IS) concurred with the first edition of JCOMM TR 63 “Recommended Algorithms for the computation of marine meteorological variables”, and encouraged Team members to contribute to a revision of the Publication. The Task Team also agreed to use online questionnaires to collect information on Instrument Standard Guidelines and Instrument Standard Equipment and make them available to all potential users.

(vi.) The Task Team on Callsign Masking and encoding (TT-Masking) proposed to establish a JCOMM Focal Point on Ship Masking, and drafter its Terms of Reference to be submitted to the JCOMM Co-Presidents.

(vii.) The Task Team on Training (Tt-Training) agreed to develop global standards, practices and functions for Port Meteorological Officers.

The Team also discussed the development of the VOS Ancillary Pilot Project (PP). Detailed criteria for the recruitment of ships to the VOS Ancillary Pilot Project were developed and published on the VOS website[3] and are also provided in this report (***Annex XIII***). The VOS Chair reported that recruitment of new ships to the Ancillary PP had been very slow since the last session and that (by March 2015) there were only 20 ships recorded as having been recruited and, furthermore, that only ten of these ships had actively reported during 2014. In view of the a number of factors detailed in this report, the limited number of ships recruited to the Ancillary PP over the last 3 years, and the low number of observations that they had generated, the Team agreed that the Ancillary PP should be discontinued and instead a third party ‘Support Fleet’ Class be established. Where possible suitable existing Ancillary ships should be transferred to national VOS fleets.

2 EIG EUMETNET operational service for Surface Marine Observations
3 http://www.bom.gov.au/jcomm/vos/projects.html#supp6

The Ninth Session of the Voluntary Observing Ship (VOS) Panel reviewed the status of the VOS fleet, including status of VOS automation, and trends in recent years, and considered proposals for the evolution of the fleet, in particular taking into account the upgrading of VOS to VOSClim standards, and the increasing demand for high quality observations to serve the needs of the developing Global Framework for Climate Service (GFCS). The Panel noted that, using figures extracted from the E-SURFMAR database[32] there were 29 countries listed as having a total of 3,045 active VOS (on 24 March 2015). This compared to a figure of 3336 ships reported at the last session. In terms of numbers of ships reported there had been approximately a 9% reduction in the size of the international VOS fleet over the last two years since the last session. Moreover, the fleet was less than half the size it was a decade ago. However, the Panel was pleased to note that there had been a further growth, albeit much smaller than had been hoped for, in the numbers of reported VOSClim ships. The number of active VOSClim and VOSClim (Automatic Weather Station - AWS) ships currently reported on the E-SURFMAR metadata database now stands at 498 ships. This represented a slight increase from 12% of the total number of reported global VOS to just over 16%.

Recalling the Key Performance Indicator (KPI) for the VOSClim agreed at the previous SOT Session, whereby 25% of the global VOS fleet should be upgraded to VOSClim, the VOS Panel noted that based on a Real Time Monitoring Centre (RTMC) analysis of ships that had submitted more than 5 pressure observations per month a figure of 22% was achieved in 2014. This was therefore unchanged since the figure reported at the last session (in 2012). The KPI for less than 3% of VOSClim class ships being flagged on the suspect list for air pressure has just been met. The KPI for 95% of VOSClim class observations to be received within 120 minutes has also been met. Regarding the KPI for all VOS ships' aim to meet the reporting criteria of an 'Active ship' by providing an average of 20 Observations per month the Panel noted a slight drop since SOT-7 (i.e. from 43.2% to 41.97%). Regarding the KPI that at least 25% of the active international VOS Fleet registered on the E-SURFMAR metadata database being recorded as VOSClim Class by SOT-8, the Panel noted that this KPI had not been met and was at a level of 19.4%.

The Panel recommended introducing a new KPI to measure the percentage of observations received from VOSClim Class ships (i.e. manual and automated VOSClim ships) with a target of 50% by SOT-9.

The Panel received a report on VOS activities by E-SURFMAR. This included a report on the use of the E-SURFMAR metadata database, which is open to any Port Meteorological Officer (PMO) or VOS operator in the world who would use it (even in read-only mode).

Regarding the DBCP/VOS donation programme, from nine countries that had shown interest, only Tanzania successfully accomplished the first few steps of the procedure, including ship recruitment, national contact point (NCP), and PMO with "buddy". The Panel agreed to continue with the VOS-DP to gain more experience with further countries, and review the VOS-DP at SOT-9.

The Panel reviewed VOS developments, including electronic logbooks software status, and developments. Recognising the advantages of moving over to web-based observing systems, the Panel encouraged VOS Operators to liaise with ship owners and managers with a view to increasing the use of TurboWeb on suitable observing ships. The Panel also reviewed status of VOS automation. It once again 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. There are now 19 countries with Automatic Weather Station (AWS) systems installed on their national VOS, and 392 systems installed on ships. Some existing AWS systems such as E-SURMAR European Automatic Weather Station (EUCAWS) and the Autonomous Marine Observing System (AMOS) were presented.

The Panel recalled that the Port Meteorological Officers (PMOs) play an important role in all of the observing programs of the SOT. It reviewed the status of PMO Global network and noted that there are currently 116 PMO contacts listed on the JCOMM website. The Fifth International Workshop of

Port Meteorological Officers (PMO-5) to be held in Chile from 20 to 24 July 2015 will offer an opportunity to strengthen the PMO network.

The VOS Panel discussed a number of issues of interest, including VOS Classes, upgrading to VOSClim standards, third party data and non-VOS support ships, the collection of delayed mode data. The Paned requested the TT-VRPP, in liaison with the VOS Panel (VOSP) Chair, to undertake a review of the current VOS Classes with a view to making recommendations to the Panel for consideration and approval at SOT-9. The Panel also requested the Operational Service Manager of E-SURFMAR and the Japan Meteorological Agency (JMA) to consider the feasibility of restricting future versions of their future electronic logbook versions to VOSClim class reporting

The 11th Session of the Ship Of Opportunity Program (SOOP) Implementation Panel (SOOPIP) focused on the implementation status of recommended Expendable Bathy Thermograph (XBT) network. SOOP Science Presentations reinforced the value of decadal time series of high resolution transects by demonstrating the application of XBT transect data to oceanographic research, including studies of the temporal and spatial variability of key surface, subsurface, and boundary currents, meridional heat transport (MHT) and upper ocean heat content monitoring. The SOOP continues to develop appropriate status metrics for the XBT Network in collaboration with JCOMM. The SOOP supports technology development through XBT Fall Rate Equation studies and climate quality XBT probe development and tests. The XBT Science team has recommended implementation of XBT Bias and Fall Rate corrections based on the team's recent peer reviewed publications. The Panel noted the value of collaboration between SOOP and different programs that share the same deployment platforms, highlighting support of pCO_2 programs in addition to XCTDs, TSGs, CPRs and Argo. The Panel made recommendations to maintain and increase international collaboration and interaction with other programmes to improve real time data transmission through improved metadata and QC procedures. One of the priorities of SOOP will be to work with the SOT Technical Coordinator (who is also the JCOMMOPS Ship Coordinator) to improve semestrial reports on the status of the network. A task team on SOOP metadata was established to investigate improvements in the SOOP platform metadata collection mechanism to improve proper status monitoring of the network and global statistics. The Panel reviewed the status of Real Time transmission of SOOP XBT data to the Global Telecommunication System (GTS), noting the need to further develop metadata standards and update the BUFR template. The Panel also noted advances in QC procedures supporting the International Quality controlled Ocean Database (IQuOD) database of upper ocean temperature data.

The Team reviewed the monitoring reports from (i) the Regional Specialized Meteorological Centre (RSMC) Exeter, acting as CBS Lead Centre for monitoring the quality of surface marine observations, (ii) the Real-Time Monitoring Centre RTMC) for the VOS Climate (VOSClim) data (also operated by the United Kingdom), (iii) the Global Collecting Centres of the United Kingdom and Germany, (iv) the Data Assembly Centre (DAC) for the VOSClim fleet (operated by the USA), and (v) the ASAP quality control monitoring reports from the European Centre for Medium Range Weather Forecast (ECMWF) and Météo France. Activities of the Global Temperature and Salinity Profile Programme (GTSPP), and the Global Ocean Surface Underway Data Pilot Project (GOSUD) were also discussed. The Team noted with appreciation that according to ECMWF, the quality of the data has continued to be good and highly valuable.

The Team discussed the modernization of the Marine Climatological Summaries Scheme (MCSS), and related development of the Marine Climate Data System (MCDS). It noted that efforts are underway through the ETMC to revise the marine climatology sections of WMO Publication No. 471 and 558. The Team made a number of recommendations to the MCSS Contributing Members.

The Team discussed migration to Table Driven Codes (TDCs), including validation of the revised VOS BUFR Template, and their submission with validation results to the third meeting of the Commission for Basic Systems (CBS) Inter Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM).

The Team reviewed the requirements for the collection of SOOP, Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP), and ASAP metadata, and made some recommendations in this regard. An *ad hoc* Task Team on SOOP metadata was established.

The Team reviewed its Implementation Strategy (JCOMM Technical Report No. 61), and proposed some adjustments to the document taking the SOT-8 outcome into account. The new version particularly includes a description of the SOT contribution to the WIGOS Implementation Plan (WIP).

In light of the discussions and recommendations arising during the week, the Team reviewed its Terms of Reference, and agreed to propose some changes (see ***Annex V***) to be considered by the Observations Coordination Group and the Management Committee.

The Team reviewed the composition of the SOT Management Team, as well as the role of the JCOMMOPS ship Coordinator who is also acting as SOT Technical Coordinator (SOT TC) on a part-time basis. The Team agreed that the SOT TC provides a valuable coordination and support service to the component programs of the SOT, and agreed with the SOT TC working priorities as listed in ***Annex XII***.

The Team reviewed funding issues and status of the ASAP Trust Fund, and made recommendations accordingly.

National reports from 11 Members/Member States were presented during the Session (23 written reports were submitted from 22 countries and from E-SURFMAR).

The next Session of the SOT is tentatively planned to be held in April or May 2017 at a venue yet to be decided.

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GENERAL SUMMARY OF THE WORK OF THE SOT-8 SESSION

1. ORGANIZATION OF THE SESSION

1.1. Opening of the Session

1.1.1. Before formally opening the SOT Session, the Secretariat informed the meeting participants that the SOT Chairs, Mr Graeme Ball (Australia), and vice-Chair, Mr Chris Marshall (Canada) could not, unfortunately, attend the meeting. Mr Ball has therefore requested Mr Johan Stander (South Africa) to Chair this SOT Session on his behalf.

1.1.2. The eighth session of the JCOMM Ship Observations Team (SOT-8) was opened by the JCOMM co-President, Mr Johan Stander (South Africa) on behalf of Team's Chairperson, Mr Graeme Ball (Australia), at 0900 hours on Monday, 20 April 2015, in the conference room of the Pepper Club Hotel & Spa, Cape Town, South Africa, and at the kind invitation of the Government of South Africa, and the South Africa Weather Service (SAWS).

1.1.3. Mr Stander also welcomed the participants to the Session and to Cape Town on behalf of the Government of South Africa, and the South Africa Weather Service (SAWS).

1.1.4. On behalf of the Secretary-General of the World Meteorological Organization (WMO), Mr Michel Jarraud, and the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), Dr Vladimir Ryabinin, the WMO Secretariat Representative, Mr Etienne Charpentier also welcomed the participants to the session, and to Cape Town. He thanked the South African government and SAWS for organizing the SOT Session, and for the nice facilities offered for this event.

1.1.5. During the opening remarks, it was recalled that:

- WMO and IOC of UNESCO applications include in particular (i) weather forecasting and operational meteorology, (ii) the monitoring, understanding and prediction of seasonal-to-interannual climate variability and climate change, (iii) marine services activities such as marine forecasting, (iv) the protection and sustainable development of the ocean and marine environment, and (v) the efficient management of marine resources;
- These applications rely heavily on *in situ* and satellite meteorological and oceanographic observations, and on observations made from ships in particular;
- The Global Framework for Climate Services (GFCS) and the WMO Integrated Global Observing System (WIGOS) are increasing the demand for high quality, documented, and traceable observations of known uncertainty, not only for current observations of newly deployed instruments but also for historical data. This includes of course in particular marine meteorological and oceanographic observations;
- The SOT plays a crucial role within JCOMM for providing the ship observation component of the WIGOS framework implementation effort, including for marine meteorological observations provided by the Voluntary Observing Ship (VOS) scheme, oceanographic measurements and sub-surface profiles provided by the Ship of Opportunity Programme (SOOP), and upper air observations provided by the Automated Shipboard Aerological Programme (ASAP);
- The SOT associated programmes also play a crucial role for providing other types and complementary ocean observations;

- Achievements of the Team will be reported to the fifth Session of JCOMM, which is planned in Indonesia in November 2017.

1.1.6. The participants thanked the South African government and the SAWS for their support to the meeting. Mr Stander recalled the objectives of the SOT and proposed by the SOT Chair, Mr Graeme Ball, and provided an overview of the SOT and of the goals for the meeting. Mr Stander indicated that key objectives for the meeting included the following:

(1) Approve the changes to the SOT Implementation Strategy, including the SOT contribution to WIGOS;

(2) Review the performance of the major ship-based networks against key metrics;

(3) Review the work and recommendations of the VOS Panel (VOSP) and the SOOP Implementation Panel (SOOPIP);

(4) Review the work and recommendations of the Task Teams;

(5) Consider the need for additional Task Teams and Working Groups;

(6) Review and assess enhancements to technology and data management;

(7) Further enhance international collaboration and coordination;

(8) Explore opportunities to collaborate with other international groups, and with the International Maritime Organization (IMO);

(9) Review the composition of the SOT Management Team;

(10) Improve collaboration with regard to cross cutting activities (e.g. instrument standards, methods of observation, data management, and quality control) with bodies such as the Data Buoy Cooperation Panel (DBCP) and other Technical Commissions such as the WMO Commission for Basic Systems (CBS), the WMO Commission for Instruments and Methods of Observation (CIMO) and the WMO Commission for Climatology (CCl);

(11) Address the need to enhance ship and oceanographic observations by establishing closer working relationship with oceanographic communities in an international climate where funds are not easily available;

(12) Investigate the potential for harnessing third party marine data;

(13) Discuss how the SOT could play an active role, and contribute to the Second International Indian Ocean Expedition (IIOE-2).

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 Paula Rychtar (USA), 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) *"OceanoScientific Campaign 2015-2025"* by Cindy Guillemet (France);

(2) *"All Ships Log"* by Miranda Kichenside-Quinn (Australia);

(3) "*The Weather Observations Website (WOW[4])"* by Sarah North (United Kingdom);

(4) "*Installation of Radiometers on Ships of Opportunity/VOS"* by Peter Minnett (USA);

(5) "*NOSIA report"* by Steven Pritchett (USA);

(6) "*The FerryBox Systems"* by Wilhelm Petersen (Germany);

(7) *"Contributions of the Expendable Bathythermograph (XBT) network to our understanding of the S. Atlantic Meridional Overturning Circulation"* by Shenfu Dong;

(8) *Observing New Time and Space Scales-Overview of our Seasonal Cycle Experiments"* by Sebastiaan Swart (South Africa);

(9) *"Value of High Sampling Rate Marine Observations"* by Shawn Smith (USA);

(10) *"XBT Timing Tests"* by Francis Bringas (USA);

2.3. Based on these presentation and resulting discussions, the Team agreed on the following:

- To support the observation of marine debris using TurboWin or other electronic logbook (e-logbook) liaison between WMO and IMO Secretariat required to investigate commonality and potential complementarity of the TurboWin and the MARPOL systems;
- The Team to investigate using WOW[4] to report weather observations from ship. Metadata are needed, and submitters must be given the opportunity to receive feedback on the quality and impact of their observations, and information on how the data are being used. Some recommendations or guidelines to be developed on what instrumentation should be used;
- Better coordination is needed for having Team members informed about the ships operated by the associated programmes;
- The Team to investigate the opportunity to use gliders as a possible cost-effective technology to replace XBTs in the future;
- The Team to explore options on how to collect 1-minute high resolution data from ships (e.g. user requirements document to be produced as a first step);
- The Team to seek feedback and recommendations from the scientific community on parameters, quality, temporal/spatial sampling strategies for climate, weather, and oceanographic studies.

2.4. Regarding the presentation of Shenfu Dong on the Contributions of the XBT network to our understanding of the S. Atlantic Meridional Overturning Circulation, the Team noted with appreciation the kind offer of the SAWS to assist in this regard.

4 http://wow.metoffice.gov.uk/

2.5. The meeting thanked the workshop's Chair, Ms. Rychtar, and all presenters for their contributions.

3. REPORTS BY THE SECRETARIAT, OPA COORDINATOR, SOT CHAIRPERSON, AND JCOMMOPS

3.1. Report from the Secretariat (incl. relationship with IMO)

Forty-seventh Session of the IOC Executive Council

3.1.1. The IOC Secretariat representative reported on the proceedings of the forty-seventh IOC Executive Council (EC-XLVII, Paris, France, 1-4 July 2014). The Team noted with appreciation the EC-XLVII, Decision 3.1 which recognized the Australian Integrated Marine Observing System (IMOS) as a GOOS Regional Alliance. The Team also noted the significance of the Decision EC-XLVII 3.2.2 regarding the Renewal of the JCOMMOPS Hosting Agreement. The Executive Council expressed their gratitude to CLS and the government of France for their contributions to the institutional arrangement for JCOMMOPS through the years and noted the value of the IOC-WMO partnership arrangement of support for the JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS). To encourage sustainable Member State support of JCOMMOPS the Executive Council requested:

- *IOC in cooperation with the WMO Secretariat, to clarify IOC/UNESCO and WMO's responsibilities for JCOMMOPS with a view to improving its sustainability, and report on the outcome to the IOC Assembly at its 28th session in 2015.*

Sixty-sixth Session of the WMO Executive Council

3.1.2. The WMO Secretariat representative reported on the outcome of the sixty-sixth Session of the WMO Executive Council (WMO EC-66, Geneva, Switzerland, 18-27 June 2014). In particular, the Team noted the following decision of EC-66 and urged its members to take it into account when developing their activities in support of the Team (***action; Team members; ongoing***):

- *The Council recognized the difficulties that JCOMM is facing with regard to the implementation of marine meteorological and oceanographic observing systems. In particular, noting the on-going development of the Tropical Pacific Observing System (TPOS) and related observing system network design activities, the Council urged Members to enhance their contributions in support of the implementation and operations of the tropical moored buoy arrays, in particular in the Tropical Pacific Ocean, where data availability has dropped substantially in the last two years. Of particular interest is the provision of ship time to assist in the deployment and servicing of tropical moored buoys.*

3.1.3. The Team noted with interest that South Africa has acted with some positive results to prevent vandalism on the moored buoys it is operating with measures such as raising the public's awareness about the use of buoy data.

CBS Ext.(2014)

3.1.4. The Team noted the outcome of the 2014 Extraordinary Session of the WMO Commission for Basic Systems (CBS Ext. (2014), Asuncion, Paraguay, 8 - 12 September 2014). The Team noted in particular that the Commission had noted with concern that the completion of the initial composite ocean observing system has not progressed substantially in the last few years, and remained at a level of about 62%. The CBS requested its Members to contribute to the JCOMM Observations Programme Area Implementation Goals and to sustain

the marine meteorological and oceanographic observing system as a top priority. Accordingly the Commission adopted Recommendation 18 (CBS-Ext.(2014)) – Support of Members to the implementation of the marine meteorological and oceanographic observing system in support of NWP.

WMO Integrated Global Observing System (WIGOS)

WIGOS Framework Implementation

3.1.5. The Secretariat reported on the recent development with regard to the implementation of the WMO Integrated Global Observing System (WIGOS). The Team noted that the WIGOS framework Implementation Plan (WIP) has been updated (see website[5]) by the Inter Commission Coordination Group on WIGOS (ICG-WIGOS) at its third meeting (Geneva, Switzerland, February 2014), and noted by the Sixty-Sixth Session of the WMO Executive Council (Geneva, Switzerland, 18-27 June 2014). Then further updated by the ICG-WIGOS at its fourth Session (Geneva, 17-20 February 2015). The Team agreed on its contribution to the ten WIGOS framework implementation Key Activity Areas (KAAs). The Team also agreed to record such contribution in the SOT Implementation Strategy.

JCOMM Pilot Project for WIGOS legacy recommendations

3.1.6. The Team also recalled its response made at SOT-6 to the legacy recommendations of the JCOMM Pilot Project for WIGOS, which provided an excellent contribution of the Team to WIGOS implementation (see JCOMM MR No. 84[6], SOT-6 final report, paragraph 10.2). These are also reflected in section 2.3 of the SOT Implementation Strategy (JCOMM TR No. 61).

OSCAR Platform developments

3.1.7. The Team agreed that ship metadata from the WMO Publication 47 should be integrated in the Observing Systems Capability Analysis and Review tool (OSCAR[7]) as soon as possible. It requested the WMO Secretariat to discuss the issue with JCOMMOPS, E-SURFMAR, and MeteoSwiss in the view to undertake the necessary developments in this regard (***action; WMO Secretariat; ongoing***).

International Forum of Users of Satellite Data Telecommunication Systems

3.1.8. The Team noted that the *ad hoc* International Forum of users of satellite data telecommunication systems (Satcom Forum[8]) was held in Paris, from 3 to 4 October 2013 and has made a number of recommendations, which the Team also supported. The Team noted that EC-66 requested CBS to review the reports of the initial *ad hoc* Satcom meetings, for consideration by Cg-17, including assessment of budget implications associated with the organizational and operating practices should a Forum be established. Per EC-66 guidance, CBS Ext. (2014) (Asuncion, Paraguay, 8 - 12 September 2014) adopted Resolution 9 - Establishment of a Satcom Users Forum.

Observing station Identifiers

3.1.9. The Commission had noted that all stations, platforms and instruments contributing to WIGOS will need identifiers in order for them to be properly referenced in the observational data records, in the associated WIGOS metadata, and for the purpose of managing and planning the networks. CBS stressed that providing identifiers for any observing station or

5 http://www.wmo.int/pages/prog/www/wigos/documents.html
6 http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=8228
7 http://www.wmo-sat.info/oscar/
8 http://www.jcomm.info/SatCom1

platform known to Members, regardless of the commitment of the operator regarding data quality or sustained operation, is essential for WIGOS. Potential issues regarding data quality and sustainability will be documented in the associated WIGOS metadata records. The Commission had noted the structure for WIGOS identifiers and recommended that this structure be included in the Manual on WIGOS.

3.1.10. The Team noted that according to the proposal for WIGOS station identifiers, the current structure of ship identifiers would be reflected in the so called “Local Identifier” part of the WIGOS station identifiers, while a specific value (yet to be decided) would be provided to the “Issuer Identifier” part of the WIGOS station identifiers, in order to indicate that the “Local Identifier” is dealing with the ship identifiers used under the SOT.

WMO Commission for Instruments and Methods of Observation (CIMO)

CIMO Guide update

3.1.11. The Team recalled that the SOT, through its Task Team on Instrument Standards (TT-IS), had provided input for updating the WMO Publication No. 8, WMO Guide to Meteorological Instruments and Methods of Observation (CIMO Guide). In particular, the Team noted with appreciation that the SOT proposed changes were submitted to, and approved by the 16th Session of the WMO Commission for Instruments and Methods of Observation (St.-Petersburg, Russian Federation, 10 - 16 July 2014) (see paragraph 6.20 and 6.21 of the CIMO-16 Session report, WMO No. 1138[9] for details). These changes refer essentially to Chapter 4, Marine Observations, of Part II, Observing Systems of the Guide (see the WMO Website for the provisional 2014 edition[10] approved by CIMO-16). The 2008 Version of the CIMO Guide (updated in 2010), is now available on the WMO website[11] also in French, Spanish and Russian.

3.1.12. The meeting noted the need to record and document instrument practices for oceanographic instruments in order to complement what appears in the CIMO Guide for marine meteorological observations, and invited the Observations Coordination Group to propose the way forward in this regard (***action; OCG; OCG-6***).

Minamata Convention on Mercury

3.1.13. The Team recalled that the UNEP Minamata Convention on Mercury, which introduces a ban on the manufacture, import and export of products containing mercury, will enter into force in 2020 and could have significant consequences for Members still using these types of instruments on VOS. Additionally, a new European Union regulation totally bans sales of these products in Europe as of April 2014. CIMO-16 requested the WMO Secretariat to inform Members of the possible impact of this Convention and requested the CIMO Management Group to ensure that appropriate outreach material was developed and shared with all WMO Members to enable them to adapt to the new situation, while minimizing the possible impact on data quality and data compatibility.

3.2. Report from the Observations Programme Area Coordinator

3.2.1. The Co-chair of the JCOMM Observations Coordination Group (OCG), Prof. David Meldrum (UK) reported on JCOMM Observations Programme Area (OPA) issues of interest to the SOT on behalf of the two OCG co-Chairs, Dr David Legler (USA), and himself. They recalled that the Implementation Goals for the OPA are based on the WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS) Implementation Plan for Climate (GCOS-IP).

9 http://library.wmo.int/opac/index.php?lvl=notice_display&id=16780#.VPXRp2NRopo
10 http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/Provisional2014Edition.html
11 http://www.wmo.int/pages/prog/www/IMOP/IMOP-home.html

Although this plan is designed for climate, it also adequately serves the needs of global and coastal ocean prediction, marine transportation, marine hazards warning, marine environmental monitoring, naval applications, and many other non-climate users.

3.2.2. The Co-chairs reported that the global system had remained about 64% complete for several years, as measured against the implementation targets identified in the GCOS-IP, and that new resources would be necessary to advance system-wide implementation in deployment of data buoys, profiling floats, tide gauge stations, and ship-based systems. It was recognized nonetheless that these targets were somewhat subjective and out date, and OOPC and OCG were in consequence undertaking a considerable effort to document requirements and capabilities by network (e.g. SOT/VOS) and by variable. The OCG requested the continued cooperation of SOT in order to fully describe and map requirements and capabilities so as to identify gaps and synergies. Specifically, the SOT was urged to participate in this process through the timely completion of Network Specification questionnaires. (***action; SOT chairs & task team leaders; 31 May 2015***).

3.2.3. In general, management of the global observing network was severely hampered by the inconsistency of monitoring metrics and statistics, both between monitoring agencies and by platform and ECV, making it difficult to accurately determine the state of the network and its evolution over time. In this context, the OPA applauded the efforts of JCOMMOPS and the NOAA OSMC, and urged them to continue to work closely in defining and implementing a consistent and accurate set of monitoring tools. (***action; JCOMMOPS and NOAA OSMC; SOT-9***).

3.2.4. The Co-chairs recalled the priority activities decided by JCOMM-4 (Yeosu, Republic of Korea, May 2012) for the OPA until JCOMM-5 (November 2017) and urged SOT to begin preparations for JCOMM-5 by undertaking/completing tasks that would lead to new capabilities that could be highlighted at JCOMM-5, and by paying careful attention to succession planning. This would be the subject of some discussion at OCG-6. (***action; SOT chairs and team leaders; Apr. 2017***).

3.2.5. Consistent use of unique ship identifiers would greatly aid tracking and reporting of ship-based measurements for many purposes. The OPA Co-chairs requested SOT to explore and identify practical solutions to address the need for 1) JCOMMOPS to track ship-based observations and associate correct metadata to reported observations; and 2) the climate community to trace ship observations reports to unique hulls. (***action; JCOMMOPS, TT on call sign masking; SOT-9***).

3.2.6. Issues continued to arise regarding access to the GTS both for data submission and for subsequent verification by the originator and by research users. This was particularly true for the non-NMHS '3rd party' operators and agencies who generated the majority of ocean data, and JCOMMOPS was urged to continue its valuable efforts in this regard. (***action; JCOMMOPS; SOT-9***).

3.2.7. With regard to feedback to ships' officers on the outcome of their data submissions to the GTS, it was noted that the SOT was unwilling to publicize sites such as sailwx.info that displayed ship GTS traffic despite their widespread use in the shipping industry. Nonetheless, it was recognized that near-real-time feedback was appreciated by ships' officers, and the SOT and JCOMMOPS were urged to develop a solution, possibly in collaboration with existing activities such as NOAA MADIS. (***action; SOT and JCOMMOPS; asap***).

3.2.8. With the commissioning of the new JCOMMOPS Centre in Brest on March 18, 2015, planning is continuing to fully exploit the synergies and resources of this Centre in support of ocean observing activities and monitoring ocean observing system performance. During OCG6, JCOMMOPS work plans and priorities will be reviewed and approved to guide

JCOMMOPS efforts over the next two years. OCG requested continued engagement by SOT leadership in this process, and their continued proactive effort in seeking additional financial support for JCOMMOPS. (***action; SOT chairs and team leaders; ongoing***).

3.2.9. The meeting's attention was directed to the Keeley Report[12] which contains a number of data management recommendations to improve real-time data accessibility and interoperability across the OPA. The OCG requested its networks review these recommendations and encourage actions in response. Progress will be reviewed during OCG-6. (***action; SOT chairs and TT leaders; asap***).

3.2.10. Finally, the meeting was asked to note the OPA forward-looking action plan, and consider how it might help the OPA to achieve these objectives (see ***Annex XVIII***).

3.3. Report from the SOT Chairperson

3.3.1. The JCOMM Co-President, Mr Johan Stander (South Africa) reported on behalf of the SOT Chair, Mr Graeme Ball (BOM, Australia) on the Chair's activities in support of the Team during the last inter-sessional period, including a review of the action items assigned to him at SOT-7.

3.3.2. Mr Ball provided an extensive list of publications that he was involved in either preparing or reviewing on behalf of the Team, including the SOT Implementation Strategy, the VOS Framework Document, numerous WMO publications and reports commissioned by the OCG.

3.3.3. Mr Ball attended the OCG Meeting (Washington, USA, September 2013) as the SOT Chair. He is a member of the DBCP and attended DBCP-29 (Paris, France, September 2013) and DBCP-30 (Wendeng, China, October 2014) where he represented the SOT as required.

3.3.4. Mr Ball was unable to participate in the two JCOMMOPS teleconferences due to the scheduling difficulties and appointed Ms Sarah North (VOSP Chair) and Mr Chris Marshall (SOT Vice Chair) as his proxies.

3.3.5. Mr Ball worked closely with Mr Johan Stander (SAWS, South Africa) to specify the requirements for SOT-8. He also worked closely with Mr Etienne Charpentier (WMO Secretariat), Mr Chris Marshall (SOT Vice-Chair, Canada), Ms Sarah North (VOSP Chair, United Kingdom) and Mr Gustavo Goni (SOOPIP Chair, USA) to prepare the timetable and agenda for SOT-8.

3.3.6. Mr Ball noted his continued involvement in numerous Task Teams and also continued as the VOS Webmaster during the inter-sessional period. On the latter matter, he initiated discussion with JCOMMOPS about a relocation of the VOS Website from the Australian Bureau of Meteorology (BOM) to JCOMMOPS. This is discussed further under item 8.5.3.

3.3.7. After closing his report on behalf of Mr Ball, Mr Stander invited Mr Jan Rozema (the Netherlands) to say a few words about the passing of Team member Frits Koek (the Netherlands). The Team recalled the excellent contribution of Mr Koek to its work. Frits was heavily involved in maritime meteorology, data rescue and severe weather events, and he loved sailing: He was very successful as navigator on board of the BrunelSunergy during the Whitbread / Volvo Ocean race of 1998. Frits very actively supported the VOS program, as a (KNMI) specialist on the VOSClim project, but in the background also as a specialist on TurboWin. The Team was very thankful to him for that, and wished to express its sympathy to

12 http://jcomm.info/index.php?option=com_content&view=article&id=331

his colleagues, family, and friends.

3.4. Report from JCOMMOPS (incl. from the SOT Technical Coordinator)

3.4.1. The JCOMMOPS Ship Coordinator, Mr Martin Kramp reported on his activities for SOT the last intersessional period, and used the opportunity to thank the Team for its good cooperation and feedback since SOT-7.

3.4.2. While not being a formal member of most of the SOT Task Teams, Mr Kramp worked closely with the different groups (ex officio). Merged with international missions of the Ship Coordinator, *ad-hoc* meetings with chairs, vice-chairs or national managers of the different SOT panels took place as appropriate during the intersessional period.

3.4.3. Because of the integrated character of the Ship Coordinator position, Mr Kramp attended a number of international meetings from other groups, and in particular of the Data Buoy Cooperation Panel (DBCP), the Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP), the International Ocean Carbon Coordination Project (IOCCP), the Argo profiling float programme, the International Research Ship Operators (IRSO) forum, the JCOMM Data Management Coordination Group (DMCG), and the Surface Marine Operational Service (E-SURFMAR) of the Economic Interest Group (EIG) grouping of European National Meteorological Services (EUMETNET). He represented the SOT as required both within and outside of the observing community, and contributed to SOT related publications.

3.4.4. Mr Kramp resumed the production of Global Telecommunication System (GTS) - based monitoring reports for the SOT, which are available via JCOMMOPS viewer, FTP or Google+. Low-resolution images are accompanied by links to high-resolution & multi-layer versions in PDF format. In addition to the visualization of spatial data distribution in maps, he introduced a “Scorecard” with more numeric information and Key Performance Indicators (KPIs).

3.4.5. The SOT TC explained that the WMO migration to Table Driven Codes (TDCs) has created problems[13] with regard to the data distributed on the GTS (not only for SOT data). This is leading to missing observations in some cases, and to duplication of data in other cases using multiple formats (e.g. TDCs, and Traditional Alphanumeric Codes). Analysing the problem in order to solve it is difficult. All JCOMMOPS Coordinators will work on this issue in a joint and cross-cutting effort after the OCG-6 meeting.

3.4.6. Mr Kramp reported that the new JCOMMOPS website and information system comprises panel-related views/subsites (see also agenda items 7.3 and 8.5.2). The structures for the different panels are identical, and users can easily switch from e.g. DBCP to SOT, or combine queries. He invited the team to discuss whether or not individual websites for SOT, SOOP, VOS, etc. should be maintained, or merged here. The Team noted that the move of the VOS pages from BOM to JCOMMOPS is underway.

3.4.7. The TC explained that the JCOMMOPS Quality Control Relay (QCR) tool is still operational, but has not been updated anymore, because it will shortly be fully re-implemented as a cross-programme tool in the new system.

3.4.8. Mr Kramp introduced the ASAP platform metadata mechanism established in close

13 Some data are injected only in Traditional Alphanumeric Codes (TACs), some already only in TDCs, and some in both, with some data centres using old or *ad hoc* BUFR templates, and some centres partly converting data injected by other centres only in TAC into TDC, and reinjecting those data. Additionally, data from centres using the SHIP to mask true identities on the GTS are transferred unmasked to other centres in bilateral agreements, where they are merged with all other data, processed and thereby also partly reinjected on the GTS, in TAC and TDC, unmasked and referencing to a different GTS centre. For the same platform, up to 4 bulletins could be found, but the duplications are not systematic, and in different observing periods there are sometimes more bulletins in TAC than TDC for the same platform, but sometimes also more in TDC than in TAC.

cooperation with the ASAP Task Team Chair. Metadata are available through the URL proposed at SOT-6[14] and will be incorporated in the new JCOMMOPS system. (see also agenda item 10.4).

3.4.9. Mr Kramp reported on the status of the VOS Real/Mask list. Updates are either (i) sent to the TC by national platform operators in appropriate timely intervals, or (ii) most often extracted from E-SURFMAR on a day-to-day basis. Given that E-ASAP uses unique identifiers similar to VOS masks, an additional Real/Mask list for ASAP is now maintained at the same location.

3.4.10. The TC stressed that using Pub47 as ship reference list for other panels (such as ASAP) or programs raises serious issues if (i) no IMO number is provided, complicating the tracking of a ship hull when the call sign changes, or (ii) a ship hull has no or multiple entries in Pub47, e.g. two NMS are using the same hull for different VOS stations with two different IDs. Given that all in-situ observing systems are using ships, Mr Kramp suggested that they should ideally all refer to the same, unique JCOMM ship list.

3.4.11. Beyond the problem with a unique ship hull reference list, Mr Kramp also raised the issue of unique identifiers for non-masked VOS and SOOP platforms hosted by these ship hulls. Mr Kramp reported on JCOMMOPS involvement in WMO-OSCAR (see also agenda item 3.1), and alerted the team that the present practice could provoke problems when migrating to WIGOS-IDs. The Team decided to establish an *ad hoc* Task Team on WIGOS Identifiers. The Task Team shall be responsible for proposing a SOT scheme for ship identifiers that will be compatible with WIGOS Identifiers. It requested the *ad hoc* Task Team to deliver its recommendations within six months, and to liaise with the TT-Pub47 and the TT-Masking as needed to address this issue. The Team nominated Dr David Berry (United Kingdom) to lead the *ad hoc* Task Team, and the following people as members: Sarah North (United Kingdom), Paula Rychtar (USA), and Pierre Blouch (E-SURFMAR). The Technical Coordinator of the SOT was also nominated as *ex officio* member of the *ad hoc* Task Team.

3.4.12. The Team reviewed the status of the different SOT mailing lists (SOT, VOS, SOOPIP, PMO, all Task Teams), which have always been updated as soon as changes occurred, in close cooperation with the JCOMM secretariat. Mr Kramp recommended a more systematic use of the lists, given that messages are archived and thus allow new members an easier integration.

3.4.13. Mr Kramp reported on cross-programme recruiting activities, with ship operators, owners, builders and the sailing community. A number of formal partnerships have been established (essentially through the IOC at this point) or are underway. They target undersampled ocean regions, and comprise also innovate solutions with rather unconventional vessel types, without necessarily involving a NMS, and can go beyond in-kind support.

3.4.14. Mr Kramp reported that a proposed final version of the VOS brochure had been submitted to the VOSRPP Task Team (see also agenda item 7.3). In the need of appropriate pictures, and supported by a German PMO, he visited several ships and took high quality pictures, and also video footage, which are now available to the Team. A shorter, and between the different panels more balanced brochure and video, was considered being a reasonable project for the future.

3.4.15. The Team noted the good progress and developments of the SOT Technical Coordination and thanked Mr Kramp for his continuous support.

3.4.16. The Team made the following recommendations:

14 http://www.jcommops.org/asap-metadata.html

(i.) Include the SOT TC ex officio in all SOT Task Teams;

(ii.) Schedule intersessional Task Team web conferences through the SOT TC, with review of Task Team related action items (***action; M. Kramp; ongoing***);

(iii.) Continue with the concept of a scorecard; and the SOT Technical Coordinator to routinely update the SOT scorecard (***action; M. Kramp; ongoing***);

(iv.) Continue with innovative and cross-cutting recruiting concepts (e.g. sailing community); and

(v.) Develop a standardized cross-programme cooperation agreement or logo for volunteer ships, under an appropriate umbrella (such as OCG, JCOMM, GOOS, WMO, IOC-UNESCO, and JCOMMOPS).

3.4.17. The Team decided on the following action items:

(i) The SOT Technical Coordinator to coordinate with the relevant SOT Task Teams, and investigate how unique ship hull and station identifiers could or must be achieved to match future requirements of an integrated observing system (***action; M. Kramp; asap***);

(ii) The SOT Technical Coordinator, to work with the TT-VOSRPP and corresponding members from other programmes and panels in the need of volunteer ships (in particular DBCP and Argo) to draft and edit a JCOMM OPA brochure (***action; M. Kramp; SOT-9***); and

(iii) The SOT Technical Coordinator to work with the TT-VOSRPP and KNMI to create a TurboWin Videoclips (***action; M. Kramp & KNMI; April 2016***).

(iv) The SOT Technical Coordinator to merge the individual SOT, VOS, ASAP and SOOP pages into simplified SOT starting pages with basic information, brochures and videos for a broader public, and linked to the new JCOMMOPS website with all operational information and resources for the SOT community. (***action; M. Kramp; April 2016***).

3.4.18. The Team congratulated the SOT TC, M. Kramp, for the excellent work done so far for the Team and within JCOMMOPS.

3.4.19. Mr Belbéoch (JCOMMOPS) reported on the overarching and cross-cutting JCOMMOPS issues. He mentioned that the financial commitments from USA (NOAA/JCOMM) or Europe (AtlantOS/GOSHIP) will allow to ensure maintaining the SOT TC position in the next three years. He however encouraged the SOT and associated partners (such as GO-SHIP) to consider diversifying and strengthening the financial support to the TC activities. The Team commended JCOMMOPS for assisting securing the ship Coordinator's and SOT TC position, and the contributors for their commitments. The Team recognized securing the position was an important step forward for the future of the SOT.

3.4.20. Mr Belbéoch reported that JCOMMOPS welcomed the new Coordinator for DBCP/OceanSITES, Champika Gallage (Canada), who was recruited in replacement of Kelly Stroker in November 2014.

3.4.21. The Team noted that the I.T. expert, Damien Bourarach left JCOMMOPS in March 2014 and was replaced in August by Anthonin Lizé (France, 22, INSA engineering school) after a 4 months gap. A. Lizé, under unlimited duration contract by CLS, was based in Brest after a 5 weeks training period in Toulouse. He showed quickly a strong technical background and special interest for the JCOMM community which will definitely support the Centre and Coordinators services.

3.4.22. The Panel also noted that two students undertook an internship within

JCOMMOPS between April and September 2014. One of them, Thomas Latter (UK), was recruited (via subcontracting) to finalize the website development for another year.

3.4.23. Mr Belbéoch announced that the Centre moved effectively from Toulouse to Brest in March 2015, within Ifremer. The Team thanked the two French hosts of JCOMMOPS for their continuous support to the center activities. CLS will continue to host a part of the infrastructure (global information system and office computing needs) and support some administrative functions. The infrastructure functioning costs (beyond TCs salary and missions), is now proposed through a single contract with CLS at the level of 80 k€/year. He suggested the Team to consider covering a third of these costs using Members/Member States voluntary commitments to the SOT made to the DBCP and JCOMM Trust Funds at the WMO. This SOT contribution would therefore be shared equally with the DBCP/OceanSITES, and Argo. All contractual elements might eventually be regrouped in one or more MoU(s) between WMO, IOC, and the hosts.

3.4.24. The Team noted that a formal inauguration of the Centre was made in Océanopolis aquarium (a JCOMMOPS partner in Brest) on 18 March 2015, aside from the international Argo Steering Team meeting and in presence of high level representatives from IOC, WMO and JCOMM, and many local supporters of the JCOMM networks. The practicalities of the move and installation as well as the event preparation required substantial efforts from the staff. A poster was prepared to promote and explain its activities in support of in-situ networks; logos and signage were reviewed and produced. Mr Belbéoch thanked the JCOMMOPS staff and in particular Mr Kramp for his critical involvement in these tasks.

3.4.25. M. Belbéoch recalled that the financial support from the local authorities from French Britanny (local authorities: city, department, and region) was confirmed for the next 3 years and signed late 2014. The funding (100 k€/ year) provided was based on a proposal for 2014-2016 to support:

- administrative needs (full time staff)
- technical development (IT development subcontracting)
- operational activity (ship time)
- promotion and communication (to create leverage for continued support) Such funding will support all existing activities of the Centre and may encourage some networks specific initiatives.

3.4.26. The Team also noted the commitment from the European Union to fund JCOMMOPS for specific developments in support of the Atlantic Ocean (AtlantOS). Priorities will be discussed at the sixth Session of the OCG (Cape Town, 27-30 April 2015).

3.4.27. The Panel commended Mr Belbéoch for his efforts to strategically promote the centre and seek new contributions.

3.4.28. The Team noted that progress has been made with regard to the new integrated webservices and websites development. The developments have been extremely ambitious for a relatively small developer team. Nevertheless, most of the work has now been achieved, including through external developments (ArxIT company for the GIS engine). An official launch is anticipated in late 2015. A version is now available for testing and Mr Belbéoch invited Team volunteers to participate in its' evaluation. A mobile application (Android) has been realized as well, to facilitate networks status consultation, deployment, retrieval or recruitments activities, and to submit photos and observations. It uses GPS features for mobile phones, and webservices (GIS API) set up for the website. This application should be connected to existing JCOMM initiatives and data distribution centres such as UKMO WOW. He invited the Team to provide feedback on such developments.

3.4.29. The Team noted that a substantial involvement of the JCOMMOPS staff will be required in the next weeks and months to i) finalize the loading of metadata in the new system, ii) review and populate the website content, iii) finalize the indicators and statistics developed, and iv) suggest network specific tools. The Team recognized the potential additional workload for the SOT TC and requested JCOMMOPS to work as much a possible on synergies between JCOMMOPS staff, and to make the best use of the JCOMMOPS engineer, in order to minimize the time spent by the SOT TC on IT matters, so that he can concentrate on his core mission in support of the Team.

3.4.30. The Team recalled that a crucial work was initiated within the JCOMM OPA to define and harmonize some network performance indicators. The existing set of Key Performance Indicators (KPIs) defined by the SOT will definitely help. However Mr Belbéoch encouraged the SOT to define as far as possible some spatial distribution target(s). Some Team members suggested monitoring closely and developing further the cross programme contributions such as SOOP ships used for floats and drifters deployments, and VOS observations. He recalled then that for this JCOMM integrated initiatives to be developed, information on recruited ships and planned cruises (in particular for SOOP or DBCP) had to circulate in advance in the community via JCOMMOPS.

3.4.31. The Team also noted the involvement of JCOMMOPS in WIGOS and OSCAR initiatives via WMO.

3.4.32. The Team noted the multiple partnerships with civil society set up by JCOMMOPS (together with IOC and WMO) and encouraged the Centre to continue such efforts where fruitful with regard to operations, promotion and education. The Coordinator mentioned that these partnerships might also foster some sponsorship and thus direct contributions to the observing networks.

3.4.33. Mr. Belbéoch concluded that the Centre is now opening a new chapter with the kind of services provided to GOOS and JCOMM in support of the implementation of the ocean observing networks. With new staff; location and office space, upcoming new products and services, increased financial means, clarified governance and roadmap, JCOMMOPS has now solid foundations to address its mandate.

3.4.34. The Team made the following recommendations:

(i) Agreed to cover the JCOMMOPS infrastructure budget requirements at a level of USD 30,000 per year, and using voluntary contributions of Members/Member States to the DBCP and JCOMM Trust funds at the WMO;

(ii) Team members to volunteer to participate in the evaluation of the new generation of webservices, websites and mobile application developed by JCOMMOPS (***action; SOT members; asap***). The SOT TC to work on the content of the new website from SOT, SOOP, and GO-SHIP perspectives and to prepare the Cruise Information Centre toolbox (***action; SOT TC; Sep. 2015***).

(iii) SOOP operators to notify JCOMMOPS when a cruise is organized (i.e. cc the Coordinator) (***action; SOOP members; ongoing***). JCOMMOPS to facilitate such information exchange by developing appropriate tools (***action; JCOMMOPS; Dec. 2015***).

(iv) JCOMMOPS to continue investigating the development of partnerships with the civil society as long as this benefits the JCOMM OPA interests.

4. REVIEW OF PENDING ACTION ITEMS FROM SOT-7

4.1. The SOT Technical Coordinator, Mr Martin Kramp (JCOMMOPS) provided an overview of the list of action items from the seventh Session of the SOT, Victoria, Canada, 22-26 April 2013 (annotated with completion status. All action item leaders had been provided with a personalized list on 5 February 2015 with a request to provide feedback before SOT-8. The meeting noted that most 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).

4.2. When reviewing action items, the Team agreed that a short document should be produced to describe how practical it would be to make precipitation measurements from ships, with some recommendations (***action; VOSP; SOT-9***).

4.3. The meeting requested the SOT Technical Coordinator to coordinate the review of the action items during the next intersessional period, and organize regular calls for that purpose (***action; M. Kramp; SOT-9***).

5. REQUIREMENTS FOR SHIP-BASED OBSERVATIONS

5.1. GCOS / GOOS / WCRP Ocean Observations for Physics and Climate (OOPC)

5.1.1. The requirements for observations requested of the SOT remain the GCOS Implementation Plan goals reflected in the 2010 updated of the GCOS Implementation Plan (GCOS-138). 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 GCOS-138 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 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.
- [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.

5.1.2. The GCOS Status Report is currently being drafted, and the progress against these actions reported against. The Team invited its members to respond to requests for information with respect to progress of GCOS-IP actions for the GCOS Status Report (***action; SOT members; May 2015***).

5.1.3. The Team noted that the 2016 Implementation Plan will be developed during 2015-2016, and this will provide an opportunity to update the implementation target in consultation with OOPC/JCOMM OCG.

5.1.4. The Seventeenth Session of the GCOS/GOOS/WCRP Ocean Observations for Physics and Climate (OOPC), met 21 - 23 July 2014, in Barcelona, Spain, just prior to the Third Meeting of the GOOS Steering Committee, 24-26 July 2014. The OOPC embraces the GOOS and GCOS framework for an Essential Ocean Variables approach to defining requirements and of ongoing evaluation and assessment of observing systems. The Team reviewed evaluations of new initiatives, including Upper Ocean Thermal Review, TPOS, Boundary Current and Inter-basin flows, and the Deep Ocean Observing Strategy. The Team noted the following:

- Responding to the erosion of readiness of the Tropical Pacific Observation System, the TPOS 2020 Workshop (27-30 Jan. 2014, La Jolla, United States) an OOPC expert group, has emphasized the need to improve resilience and integration of observing systems and articulated the strengths of a multiplatform approach. The OOPC has suggested that a framework for risk assessment is needed which will include the evaluation of system "readiness". This is a cross cutting activity which should be embraced by the JCOMM panels, such as GO-SHIP and the SOT.
- The OOPC recommends that SOT participate in the 'Strategic Mapping of GOOS, and the development of Network Specification Sheets which articulate the role of SOT activities in the observing system, to meet requirements articulated in 'Variable Specifications' (see website[15]).
- The OOPC recommends that evaluation of initiatives should be accompanied by a small set of performance indicators (metrics) that capture the technical performance and uptake/impact of the system data and information, particularly in terms of the ultimate socio-economic impact.

5.1.5. The SOT agreed with the following:

- The Team requested the SOT Technical Coordinator to coordinate with the SOT, VOSP, SOOPIP, and the OCG Chairs and develop the 'Network Specification(s) for SOT activities (***action; M. Kramp; asap***). This will also form the basis of input to the GCOS Implementation Plan, 2016.
- To participate in OOPC studies of the feasibility of metrics for systems evaluation. The Team tasked Gustavo Goni (USA) to represent the Team in such activity, and to contribute and liaise with the JCOMM OCG (***action; G. Goni; D. Berry, OCG-6, OOPC-18, SOT-9***).

5.1.6. The GOOS Steering Committee at its Third Session (GOOS-SC-3, Barcelona, Spain, 24 – 26 July, 2014) continued to define the structure of GOOS, which now comprises the three ocean subject Panels: Physics (OOPC); Biogeochemistry (IOCCP) and; Biology and Ecosystems. The Committee recognized that evaluating Essential Ocean Variables for "readiness" also includes an evaluation of the potential risks to continuity of extant observing systems, including funding aspects. The GOOS SC, therefore, requests that JCOMM panels develop risk and vulnerabilities information for their systems and communicate to the appropriate GOOS panel. In addition, the GOOS SC elaborated a communication and outreach plan, which includes communication to the JCOMM panels of the GOOS Framework for Ocean Observing, and the new focus of GOOS on Essential Ocean Variables. The Team agreed with the following:

- Gustavo Goni (USA) to develop risk and vulnerabilities information for the ship-based observing systems on behalf of the Team, and communicate to JCOMM OCG as needed (***action; G. Goni, D. Berry, GOOS-SC 4; SOT-9***).

15 http://lists-ioc-goos.org/goos-strategic-mapping-graphic/

5.2. Rolling Review of Requirements update

5.2.1. The Team noted that the impact of sea level pressure data on NWP and other WMO Application Areas has been discussed at the first meeting of the CBS Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE-1, Geneva, Switzerland, 31 March – 3 April 2014), and at the eighth Session of the CBS Implementation Coordination Team on the Integrated Observing System (ICT-IOS-8, Geneva, Switzerland, 7-10 April 2014). In particular, the Team noted the following with appreciation:

- ICT-IOS-8 agreed that the impact of marine meteorological and oceanographic data on NWP should be taken into account in the list of science questions to be addressed by the CBS, and the International Workshop in the Impact of Various Observational Systems on NWP.
- ICT-IOS-8 stressed that support of NMHSs to marine meteorological and oceanographic observations should be enhanced, noting that NMHSs do not necessarily have to contribute infrastructure, but can contribute resources to such programmes. This should be highlighted in the reporting to WMO Executive Council and Congress.
- ICT-IOS-8 noted that (a) the influence of buoy surface pressure observations is particularly large on a per-observation basis and their Observing System Experiment (OSE) impact extends from the surface throughout the troposphere in mid-latitudes (see final report of the 5th NWP Obs. Impact workshop[16]), and (b) the higher impact per cost of such data compared with other observing systems, including space- and surface-based observing systems, per the UK study presented by the Chair of IPET-OSDE at the IPET-OSDE-1 meeting (see website[17]).
- ICT-IOS-8 agreed that it was important to raise awareness of Members with regard to the profile of ocean observations to address WMO applications observational user requirements, and to the issues outlined by JCOMM. It also agreed that the impact of drifters on NWP, and its cost-effectiveness should be brought to the attention of CBS, and decided to submit a formal Recommendation to CBS Ext.(2014) on Support of Members to the implementation of marine meteorological and oceanographic observing systems in support of NWP. CBS Ext.(2014) adopted that Recommendation.

6. REPORTS BY THE ASSOCIATED PROGRAMMES

6.1. International Ocean Carbon Coordination Project (IOCCP)

6.1.1. Mr Tom Gross (IOC Secretariat) reported on behalf of the International Ocean Carbon Coordination Project (IOCCP).

6.1.2. The IOCCP promotes the development of a global network of ocean carbon observations for research through technical coordination and communication services, international agreements on standards and methods, and advocacy and links to the global observing systems. Recent initiatives include: Approach to the IMO to negotiate legislation requiring ocean users to support the global ocean observing system though provision of routing information and basic shipboard instrument monitoring; Publication of a “Cookbook” for pCO2 installations on ships of opportunity; A formalized assessment of requirements for optimum and minimum observation networks; the Surface Ocean CO2 Atlas, with over 14 million pCO2 data; and the 3rd decadal survey of interior ocean observations with GO-SHIP. More information on IOCCP programs is available on the newly rebuilt web site: www.ioccp.org

16 http://www.wmo.int/pages/prog/www/OSY/Meetings/NWP5_Sedona2012/Final_Report.pdf
17 http://www.wmo.int/pages/prog/www/OSY/Meetings/IPET-OSDE1/documents/IPET-OSDE1-Doc-8.4-Cost-benefit-studies.pdf

6.2. Shipboard Automated Meteorological and Oceanographic System (SAMOS) Project

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

6.2.2. The SAMOS initiative focuses on high-temporal sampling (1-min. interval) meteorological and near-surface oceanographic data collected by the scientific instrument system (a SAMOS) permanently installed on individual R/Vs. The SAMOS data centre at the Florida State University (FSU) receives data from 29 U.S.-operated and 2 international R/Vs. SAMOS data are collected from R/Vs via satellite email communications, undergo both automated and visual data quality control, and are distributed via the web[18].

6.2.3. Personnel at the SAMOS data centre collaborate with the U.S. VOS Coordinator to ensure that all vessels transmitting 1-min data samples to SAMOS are also submitting standard VOS reports via the GTS. NOAA vessels in the U.S. use SEAS v9.1 AutoIMET, while other R/Vs use custom software for their VOS reports, and these reports are independent of data sent to SAMOS via daily emails. SAMOS monitors many of the AWS used by VOS on R/Vs, providing notification to operators when problems occur and aiding VOS by resolving sensor malfunctions. U.S. VOS aids SAMOS by collecting updated metadata when VOS personnel visit U.S. RVs.

6.2.4. Many SAMOS activities support the JCOMM ETMC. In May 2015, the data centre will provide an hourly subset of SAMOS observations collected since 2005 for inclusion in release 3.0 of the International Comprehensive Ocean-Atmosphere Data Set (planned release early 2016). In addition to supporting ETMC, the SAMOS chair is an acting member of the SOT Task Team on Instrument Standards (TT-IS) and the JCOMM Cross-cutting Task Team on the Marine Climate Data System (MCDS).

6.2.5. In partnership with NOAA's Earth System Research Laboratory, the SAMOS data centre presents a professional development short-course for in-service marine technicians on a yearly basis. The course focuses on best practices and techniques for collection of marine meteorological observations on R/Vs to support ocean, atmosphere, and climate research. The most recent course occurred at the 2014 International Marine Technician Workshop (INMARTECH2014) and course materials for each session are available on the web[19].

6.2.6. An *ad hoc* meeting was arranged by Mr. Smith on Wednesday 22 April 2015 to discuss future high-sampling-rate data collection from VOS-AWS. Participants considered the concept, with a particular focus on marine meteorological data (including SST) collected at intervals less than or equal to 1-minute. Topics included the need to establish clear user requirements, standards for data format, time averaging, metadata, etc., and processes to transfer these data from individual ships to responsible data assembly centres. The primary outcome was a recommendation by the participants to form a new task team for high-resolution marine meteorology (TT-HRMM). The draft terms of reference and preliminary membership (see ***Annex IV***) were presented to the SOT and adopted. The participants also recommended that the ETMC contribute to developing user requirements for HRMM from VOS-AWS (***action; ETMC; SOT-9***). The outcome of the ad hoc working group meeting is summarized in ***Annex XV***.

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

6.3.1. Dr Bernadette Sloyan (Australia) reported on the Global Ocean Ship-Based

18 http://samos.coaps.fsu.edu
19 http://samos.coaps.fsu.edu/html/mtshortcourse.php

Hydrographic Investigations Programme (GO-SHIP). GO-SHIP provides a globally coordinated network of sustained hydrographic sections as part of the global ocean/climate observing system including physical oceanography, the carbon cycle, marine biogeochemistry and ecosystems. GO-SHIP provides approximately decadal resolution of the changes in inventories of heat, freshwater, carbon, oxygen, nutrients and transient tracers, covering the ocean basins from coast to coast and full depth (top to bottom), with global measurements of the highest required accuracy to detect these changes.

6.3.2. The GO-SHIP principal scientific objectives are: (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 warmer, more acidic and more stratified, and experience changes in circulation and ventilation processes due to global warming, atmospheric CO_2 increases, altered water cycle and sea-ice will interact with natural ocean variability.

6.3.3. The 2012-2023 decadal survey is well underway and to date is meeting most targets (Figure 1.) A summary of the status of the program to 2014:

- Percentage of the 2012-2023 survey completed: 47%
- Percentage of the 2012-2023 survey completed and funded: 71%
- Percentage of the 2012-2023 survey completed, funded and planned: 87%
- Percentage of the 2012-2023 survey unplanned: 13%
- We note that 2014 is 30% of the way through the 2012-2023 decadal period.

6.3.4. Data has been sent to the appropriate data centres. In particular, bottle and CTD data submitted to the designated GO-SHIP repository at the CLIVAR and Carbon Hydrographic Office (CCHDO, http://cchdo.ucsd.edu/) and Carbon Dioxide Information Analysis Center (CDIAC, http://cdiac.ornl.gov/oceans/).

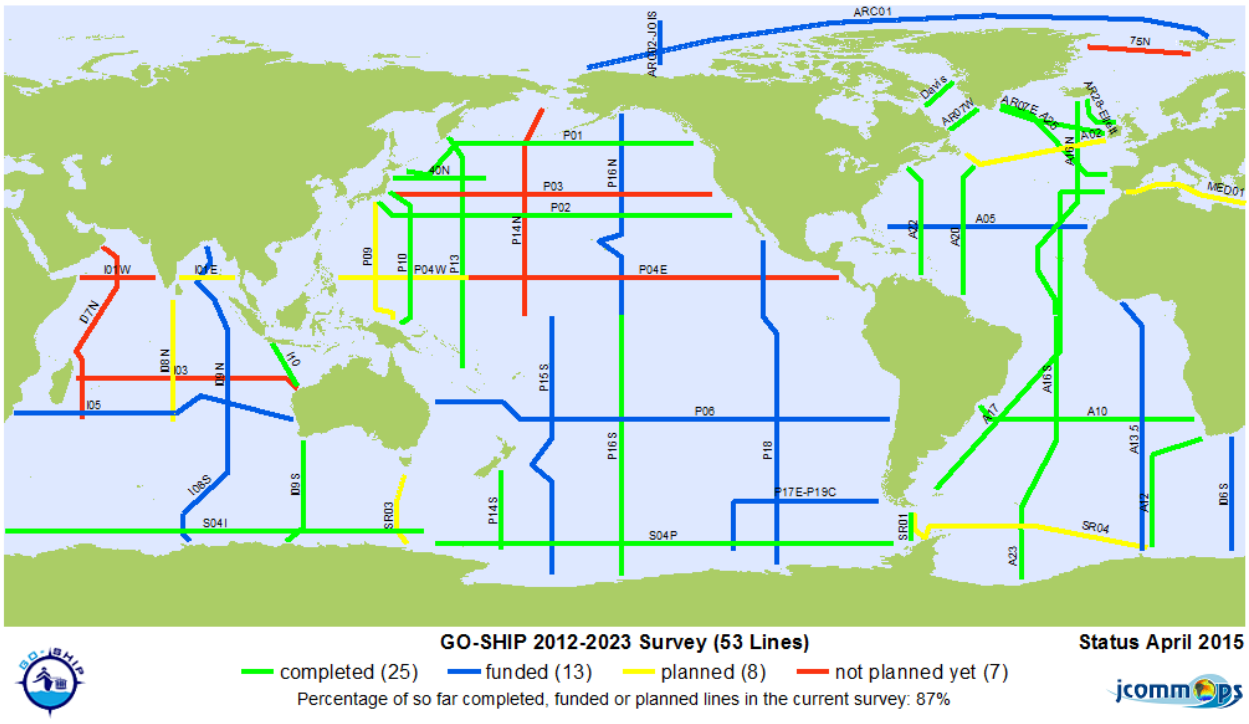

Figure 1. Status of the GO-SHIP current decade global survey
http://www.go-ship.org/RefSecs/goship_ref_secs.html

Risk assessment

6.3.5. GO-SHIP is providing its value as a coordinating mechanism and providing clear guidelines on execution of cruises. The implementation of the core measurement requirements (see www.go-ship.org) is highlighting measurement gaps that are addressed through GO-SHIP. The data flow and submission protocols are now clearly presented at the GO-SHIP website with links to data centres receive GO-SHIP data and data submission protocols. An ongoing risk is securing national funding for currently unplanned sections and ensuring that all sections complete the level observations once every 10 years.

6.4. Group for High-Resolution SST (GHRSST)

6.4.1. Dr Peter Minnett (USA) reported on the activities of the Group for High Resolution Sea Surface Temperature (GHRSST) in relation to the SOT activities. GHRSST is the international expert group for the provision and application of the highest quality Sea Surface Temperature (SST) data to the global user and research communities. GHRSST is also the scientific expert group of the CEOS SST-Virtual Constellation. GHRSST provides a suite of global, high-resolution SST products, operationally, in near-real-time, on a daily basis. To maintain the high quality of the various SST products it is essential that the Group has access to *in situ* ocean surface data provided by a range of accurate instruments located on diverse platforms, over a wide range of climate conditions. Drifting and moored buoys provide a wealth of surface data, but lack repeated calibration (at least for drifters) and provision of the important metadata required for accurate validation of the GHRSST satellite-based products. These latter requirements can only be provided by instruments on research vessels and ships of opportunity. This report to the JCOMM Ship Observations Team 8th Session summarises activities relating to ship measurements of SST that GHRSST has been involved with since the SOT 7 session. Material in the Report to the SOT 7 session is not repeated here.

Use of ship data in GHRSST

6.4.2. The Team noted that the current use of ship-borne SST data within GHRSST falls mainly into two categories. First, radiometric temperature measurements from SI-traceable infrared radiometers mounted on ships of opportunity, commercial and research vessels, are used as a primary reference data set for satellite infrared sensors that provide a retrieval of the skin SST, such as the MODerate-resolution Imaging Spectroradiometers (MODIS) and the Visible Infrared Imager Radiometer Suite (VIIRS), and are anticipated to be used with the Sea and Land Surface Radiometers (SLSTR's), the first of which is scheduled for launch in late 2015. Second, conventional ship-based temperature measurements taken from the Global Telecommunications System (GTS) are used in many of the Level 4 analysis products and for validation of SST at depth products.

Requirements for non-radiometric SST measurements

6.4.3. The Team acknowledged the GHRSST requirements for data accuracy and transmission resolution as summarized in the table below:

Element	***Ship observations***		***Ship-AWS***	
	Resolution	***Accuracy***	***Resolution***	***Accuracy***
Time	1 minute	5 minutes	1 second	2 minutes
Latitude, Longitude	0.01°	0.1°	0.001°	0.01°
Wind Speed	0.5 m/s	1.0 m/s	0.1 m/s	0.5 m/s
SST	0.01°	0.05°	0.01°	0.05°

Standardisation of ship-borne radiometric SST measurements

6.4.4. Dr Minnett also reported that following a series of workshops hosted by the

International Space Science Institute in Bern, Switzerland, a Ship infrared Radiometer Network (SRN) was formed. An SRN document describing a standardized format for ship-radiometer data has been developed using the CF (Climate and Forecast) metadata compliant NetCDF data format; the document is currently under review by the GHRSST Science Team. It is anticipated the format will be approved at the next GHRSST Science Team Meeting in July 2015.

6.4.5. He also indicated that several members of the SRN have contributed to a book published in late 2014: "Optical Radiometry for Ocean Climate Measurements" *Experimental Methods in the Physical Sciences, Vol 47*, G. Zibordi, C. J. Donlon, and A. C. Parr, Eds., Academic Press, 697pp.

6.4.6. At SOT-7 it was decided that a JCOMM SOT *ad hoc* working group be established to collaborate with GHRSST to better define requirements of measurements of SST and ancillary variables from ships, and to identify new opportunities that may assist with a more uniform coverage of the global oceans. Current members of the *ad hoc* working group are Helen Beggs (Bureau of Meteorology) - Chair, Graeme Ball (Bureau of Meteorology), Werenfrid Wimmer (University of Southampton) and Viva Banzon (NOAA NCDC). The Team concurred with the SOT/GHRSST *ad hoc* working group recommendation that the Ship infrared Radiometer Network become a complementary programme of SOOP as data providers, and its' suggestion that Gustavo Goni (USA) should participate in the *ad hoc* working group in his capacity as SOOPIP Chair.

6.5. World Ocean Council

6.5.1. The meeting received a written report on the World Ocean Council (WOC) from Mr Paul Holthus (WOC).

6.5.2. The report focussed on the Smart Ocean/Smart Industries (SO-SI) program, as WOC Members have identified the need and opportunity for WOC to develop and coordinate a program or "platform" to expand, improve and better coordinate the role of industry in collecting and sharing ocean and atmospheric data. The SO-SI program will learn from/build on existing ships of opportunity efforts and create a program to expand and improve industry involvement in observations, i.e. scaling up the number and range of merchant vessels, fishing boats, oil platforms, etc. participating in long term, integrated data collection. A WOC SO-SI working group (WG) has been formed and is co-chaired by Maersk and Planet OS.

6.5.3. Since the SOT-7, the WOC has:

- Focused on expanding ocean industry data collection and sharing though monthly SO-SI WG meetings.
- Organized a workshop on "Smart Fishing Vessels" in late 2013 at the World Seafood Congress (St Johns, Canada, 28 September-4 October 2013).
- Promoted voluntary ocean observations by industry and the SO-SI at the Oceanology conference (London, 11-13 March 2014).
- Organized an industry workshop on Arctic data collection, as part of the Arctic Shipping Forum (Helsinki, 8-10 April 2014).
- Co-organized WOC-Canada Smart Ocean/Smart Industries Workshop (Montreal, 27-29 May 2014).
- Been invited to develop a SO-SI workshop at the Arctic Observing Summit in 2016.
- Identified several priority pilot project areas to advance industry involvement in data collection, e.g. Eastern Canada, Arctic, Indian Ocean.

- Initiated a pilot project between Maersk and the University of Hawaii for data collection in the North Pacific.
- Received draft descriptions of possible pilot projects from NOAA that are being evaluated by shipping companies.
- Initiated an inventory of voluntary industry data collection efforts, especially to identify the companies that have been involved in voluntary data collection.
- Met with IOC GOOS in February 2014 at Ocean Sciences conference to explore how to accelerate the WOC SO-SI program and interaction with IOC, resulting in an offer from IOC to (i) develop the information WOC could use to reach out to companies with immediate, practical opportunities to deploy drifters or Argo floats; and (ii) explore further if it is possible to use the call signs in the data base to get to the info on ship owners involved in observation efforts.

6.5.4. The Team noted that the WOC could make use of a document describing how the WOC could contribute to the SOT activities, and requested the SOT Technical Coordinator to coordinate production of such a document (***action; M. Kramp; Dec. 2015***). The Team agreed that while WOC can be seen as a facilitator, recruiting ships directly with the shipping companies and/or the ship's captains was the most effective route.

6.6. OceanScope

6.6.1. The Team received written input from Tom Rossby (USA), the former co-chair of SCOR/IAPSO working group no. 133, OceanScope. The Team noted that the final OceanScope report had been released in early 2012. For a while, there was some hope of funding for initiating a pilot program, but those plans did not materialize. Therefore, in formal terms nothing is happening with respect to the OceanScope initiative. However, the following elements of OceanScope continue to shape thinking and activities.

6.6.2. The Team noted that four merchant marine ships are presently operating ADCPs in the North Atlantic: 1) the Oleander between Bermuda and New Jersey (now in its 23rd year of operation), 2) the Nuka Arctica between Denmark and Greenland, 1999-2002 and restarted in fall 2012, 3) the Norröna collecting data since 2008, and 4) shortly the cruise liner the Allure of the Seas will replace and operate on about the same routes as the Explorer of the Seas. The first three vessels also take XBT sections. The Explorer of the Seas has moved to the Pacific under new ownership and it is possible that the 38 kHz ADCP will be reactivated. A proposal has been submitted to NSF to substantially enhance and continue the Oleander program. Serious thought is being given to instrumenting additional freighters that operate across the Subpolar waters between Iceland and North America. Numerous publications on currents and transports including interannual variability have resulted from the above operations (see references below). The O(0.01) m s^{-1} accuracy of ADCP data (even from vessels operating at 20 Kt speeds) combined with repeat sampling to reduce variance from eddy activity enables us to determine transports in the Gulf Stream, currents in the Irminger Sea and Iceland Basin, and fluxes into the Nordic Seas with unprecedented accuracy. These partnerships with the merchant marine are proving to be an excellent opportunity to accurately monitor ocean transports and their space-time variability. Even though OceanScope as a program has yet to take shape as envisioned, the above activities show what is possible.

6.6.3. Dr Rossby also reported in writing that another exciting activity is that two ships, the Oleander and the Norröna, have been equipped with automated XBT launchers (AXIS). Allowing, XBTs to be taken without the need for an observer. A trained crewmember reloads the 12-XBT carousel as needed. This permits us to take monthly (or however often desired) XBT sections. Thus, we will soon reach two years of monthly sampling on the Norröna. These data together with the ADCP velocity data will permit us to determine not only annually-averaged, but also the seasonal cycle of heat transport into the Nordic Seas. According to Dr

Rossby, there is an urgent need to install the AXIS on several other vessels in the North Atlantic, minimally the Nuka Artica and one of the Eimskip vessels in North America service. Noting that AXIS may prove to be a good investment scientifically and operationally, the Team invited its members to consider the AXIS XBT auto-launcher system as a way to enhance XBT sampling without the need to send an observer along (***action; SOT members; SOT-9***).

6.6.4. The Team also noted that there is growing interest in developing expendable probes that can profile as a function of pressure oxygen, perhaps pH, and conductivity with telemetry either through the standard wire or perhaps acoustically.

6.6.5. The Team noted that SOOPIP maintains an active collaboration with OceanScope. As part of this collaboration, SOPPIP members provide instruments, probes, and data management services at no cost to OceanScope in support of their efforts. This include Thermosalinograph instruments for several ships, including Oleander and Allure of the Seas, XBT probes for deployments along the AX01 and AX02 transects (Skogafoss and Nuka Arctica), as well as data dissemination through the GTS and data centres for XBT deployments along AX01 (Nuka Arctica), AX02 (Skogafoss), AX32 (Oleander) and AX90 (Norrona). Gustavo Goni also participated in an Oleander transect in 2014 to assess the new AXIS autolauncher.

6.7. FerryBox

6.7.1. Dr Whilhelm Petersen (Germany) reported on the FerryBox project. He explained that 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. However, most of them are temporary activities and are on a voluntary basis. There is still a lack of sustained funding in order to get reliable and comparable data over longer time periods.

6.7.2. The Team noted that FerryBox systems are ideal platforms for biogeochemical sensors/instruments (easier maintenance, no energy restrictions etc.) in order to overcome the still existing lack of sufficient spatial coverage and a particular lack of robust biogeochemical measurements.

6.7.3. The monitoring of algal bloom by agencies has very low spatial and temporal coverage and in northern Europe optical remote sensing is often restricted by clouds. Data are needed for management (prognosis) of fisheries and tourism: Amount of plankton controls the fish yield, occurrence of harmful algae blooms influences fish, oyster and mussel yield and occurrence of algal degradation products influences tourism (e.g. foam on beaches). The FerryBox system can close this gap due to the high spatial and temporal resolution of the data along the transect.

6.7.4. In addition, the development of more reliable autonomous sensors for chemical and biological parameters for ecological monitoring including greenhouse gases has to be intensified. Some new developments are under development in ongoing European projects such as NEXOS, EnviGuard, SensOcean etc. The budget of climate-relevant gases in shelf seas and estuaries and its contribution to global climate development is still not quite clear. There exist only isolated field campaigns with measurements of pCO2/carbonate, CH4, N2O and halogenated hydrocarbons. FerryBoxes allow the opportunity to obtain continuous measurements in these areas.

6.7.5. The FerryBox systems will contribute to the operational European Copernicus Marine Services starting in 2015. This will push forward the marine observations not only in obtaining more data but also in producing much more reliable data with a new dimension of chemical/biological information. In addition, there will be a high potential for evolution: The

implementation of new sensors that are already working in the lab., e.g., new optical and genetic sensors for automated algae identification. Within the EU project JERICO (www.jerico-fp7.eu) a Handbook of Best Practice for FerryBoxes came out supporting new installations as well as giving recommendations for operation, suitable sensors etc.

6.7.6. Support for all these ongoing activities is at risk due to a lack of a source of long-term funding. A mechanism has to be found for a sustainable funding of such "routine measurements" in order to guarantee the operation over a longer time period.

6.7.7. The Team noted the following Potential contribution to/cooperation with JCOMM-SOT:

- encouraging shipping and other companies to support FerryBox activities as an active contribution to protect the marine environmental;
- promote concepts preparing new build merchant vessels to be factory ready for installation of FB systems (e.g. SCOR and WOC initiative);
- foster the collaboration between XBT/XCTD and FerryBox activities on the same vessels which enables the combination of high resolution surface measurement with depth profiles;
- encourage the collaboration between carbon ocean research groups (IOCCP) and FerryBox activities;
- work towards a common platform for meteorological and oceanographic data within JCOMM-SOT;
- Strengthen the co-operation with GOSUD initiative; and
- promote sustainable funding for long-term observations.

6.8. Other associated programmes

6.8.1. The meeting did not discuss any other associated programme.

7. RECOMMENDATIONS BY THE TASK TEAMS AND PILOT PROJECTS

7.1. Task Team on Satellite Communication Systems

7.1.1. The Chairperson of the SOT Task Team on Satellite Communication Systems (TT-SatCom), Mr Pierre Blouch (France), reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-7.

7.1.2. The team noted that a comprehensive statistics scheme was established to monitor the various satellite communication systems used by the VOS to report their observations ashore (SOT-7 Action II.20), thanks to the prST communication types entered into Pub 47 by VOS operators. Results for 2014 showed significant increases in the use of emails for conventional VOS – corresponding with a reduction of the use of Inmarsat-C Code 41 -, and Iridium SBD for S-AWS stations. About 60% of the observations carried out by such stations are now sent ashore through Iridium SBD.

7.1.3. Mr Blouch also reported on the use of communication systems by SOOP ships. As for VOS ships, Iridium SBD and emails are increasingly used for thermosalinographs and XBTs.

7.1.4. The team noted that no progress had been made on the design of a new method

for conventional VOS to report their observations ashore using FleetBroadband (FB) terminals (SOT-7 Action II.18). TT-SatCom was informed that FB is not Global Maritime Distress and Safety System (GMDSS) approved yet and that Inmarsat intends to keep Inmarsat-C up and running for at least another 7-8 years.

7.1.5. In order to build a fairer funding system than the one used for Code 41, TT-SatCom recommends that NMSs establish separate contracts with their national Inmarsat providers in order to pay the communication costs for their recruited ships whatever the service used: Inmarsat-C now, FleetBroadband in the future (***recommendation***).

7.1.6. The team was informed that ship-to-shore E-SURFMAR dataformat #101 was defined in coordination with the Expert Team on Marine Climatology (ETMC of the JCOMM Data Management Programme Area (DMPA) and may be now used by conventional VOS (SOT-7 Action II.19). Its implementation in the most recent version of TurboWin is ongoing. Mr Blouch reminded the team that another format (#100) was defined for the S-AWS and is now operational. The description of E-SURFMAR data format is available on the E-SURFMAR website[20].

7.1.7. The team noted that no progress had been made on the adaptation of observation stations to AIS equipment (SOT-7 Action I.3). Works could start with the availability of new AWS.

7.1.8. The Team noted that for ships participating in the SOOP / US TSG operation, data transmission are currently performed using the ship email system or Iridium. TSG data is currently disseminated trough the National Oceanographic Data Centre (NODC) of the National Oceanic and Atmospheric Administration (NOAA) and the Global Ocean Surface Underway Data (GOSUD) at the French Institute for Sea Research (Ifremer).

7.1.9. The Team further noted that for ships participating in the SOOP / US XBT operations, data transmission is being transitioned from Inmarsat to Iridium. This transition has been already completed for approximately 50% of all transects and deployments in the Atlantic Ocean and will be extended during 2015 to other transects in the Atlantic and Pacific Ocean operated by NOAA and Scripps Institution of Oceanography (SIO). The implementation of Iridium transmission represents a large reduction in transmission costs, by as much as 80% when the transition is completed.

7.1.10. Finally, Mr Blouch reported on the status of the migration to BUFR for ship stations. Despite Traditional Alphanumeric Codes (TAC) should have disappeared in November 2014, a few GTS centres are not reporting BUFR messages onto the GTS yet. However, it must be noted that NWP centres are not ready to assimilate BUFR ship data in their models yet. The transmission of data with both codes simultaneously can lead to problems.

7.1.11. The meeting made the following recommendations:

(i) The Team approved the following change to the membership of TT-SatCom:
   a. Remove: Graeme Ball (Australia) and Frits Koek (Netherlands)
   b. Add: Joel Cabrié (Australia) and René Rozeboom (Netherlands)

(ii) The Team appointed Jan Rozema (the Netherlands) to serve as a new Chair for the Task Team.

(iii) VOS operators to consider adopting the EIG EUMETNET operational service for Surface Marine Observations (E-SURFMAR) data formats for their VOS fleets or to

20 http://esurfmar.meteo.fr/doc/o/vos/E-SURFMAR_VOS_formats.pdf

propose alternative formats if necessary (recommendation already done at SOT-7 for Ship-based Automatic Weather Stations – S-AWS).

(iv) The Task Team on WMO Publication No. 48 (TT-Pub47) to consider the adding of new metadata to indicate what kind of data format is used for the ship-to-shore communication.

(v) The team urged Global Telecommunication System (GTS) centres to complete the migration to BUFR[21] and data users to ingest BUFR data.

(vi) To insert a new term of reference regarding the monitoring of the migration to BUFR.

7.1.12. The meeting decided to continue the actions which were not completed:

(i) TT-SatCom to closely work with Inmarsat Safety Services team and the International Maritime Satellite Organization (IMSO) to propose a new method for conventional VOS to report their observations ashore using the GMDSS FleetBroadband terminals (***action; TT-SatCom; SOT-9***).

(ii) TT-SatCom to consider the technical implications related to the compatibility between AIS equipment and observation stations (***action; TT-Satcom; SOT-9***).

7.1.13. The full report by the Task Team on Satellite Communication Systems is provided in Appendix A of SOT-8 preparatory document No. 7.

7.2. Task Team on ASAP

7.2.1. The Chairperson of the SOT Task Team on the Automated Shipboard Aerological Programme (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-7. 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).

7.2.2. The Team noted that a total of 5466 soundings were received in 2014, mainly from the North Atlantic. The European E-ASAP fleet covers 77% of all global ASAP activities. E-ASAP shall complete the migration to BUFR[21] in June 2015 (only BUFR will be available as of July 2015 from E-ASAP ships).

7.2.3. The Team noted the interest of some research users for the raw ASAP data, requested the Task Team to investigate preservation of the ASAP data and better collaboration with the research community for accessing such data (***action; R. Krockauer; SOT-9***).

7.2.4. The detailed report by the Task Team is provided in ***Annex VII***.

7.2.5. ASAP monitoring issues are discussed under agenda item 10.1.3, and ASAP Trust Fund issues are discussed under agenda item 12.3.

7.3. Task Team on VOS Recruitment and Programme Promotion

7.3.1. The Chair of the Task Team on VOS Recruitment and Programme Promotion (TT-VRPP), Ms Sarah North (United Kingdom) reported on the activities of the Task Team during the last inter-sessional period.

7.3.2. The meeting made the following recommendations:

21 FM-94 BUFR: Binary Universal Form for the Representation of Meteorological data

(i) That a summary paper and supporting documentation should be prepared immediately after SOT-8 for submission to the International Chamber of Shipping (ICS) Marine Committee (***action; S.North; asap***);

(ii) That the VOS Scheme Questionnaire 2015 should be approved and issued to as many participating VOS as possible in order to assess the performance of the Scheme and to identify any areas where improvements may be needed;

(iii) That the VOS Brochure and VOS Poster should be approved for use (subject to final minor editorial by the SOT Technical Coordinator);

(iv) That consideration should be given to establishing a social network group as an alternative to the Wikilog, which should then be archived;

(v) That the potential for using video for promoting both the VOS and for training VOS Observers should be addressed jointly addressed by the VRPP and Training Task Teams after the next session, and that their Terms of Reference (ToR) should be amended as necessary; and

(vi) That the following changes be made to the membership of the Task Team:

Remove: Graeme Ball (Australia)

Remove: Santjie du Toit (South Africa)

Add: Joel Cabrié (Australia),

Add: Steven Pritchett (USA)

and

Amend membership to show Paula Rychtar (United States) as the VOSClim Focal Point.

7.3.3. The meeting decided on the following action items:

(i) Port Meteorological Officers (PMOs) and VOS Focal Points to keep their E-SURFMAR metadata entries for VOSClim ships up to date so that the most accurate and current ship information can be used for VOSClim Data Assembly Centre (DAC) data processing (***action; PMOs/VOS Focal Points; ongoing***);

(ii) The TT-VRPP Chair, the SOT TC and KNMI to develop a simple flyer to promote the availability and use of the TurboWin software to ships that are not presently recruited to the VOS (***action; S. North, M. Kramp & KNMI; SOT-9***);

(iii) VOS and SOT National Focal Points to invite the national maritime administrations to consider the need for new build ships to be equipped with certified meteorological instruments (e.g. anemometers and barometers) that comply with WMO guidelines, and to consider whether this issue should be raised within IMO (***action; VOS&SOT NFPs; SOT-9***);

(iv) The SOT Technical Coordinator to produce a final copy of the VOS Brochure (***action; M. Kramp; June 2015***);

(v) The SOT Technical Coordinator to make any necessary final minor design adjustments to the VOS Poster (***action; M. Kramp; June 2015***);

(vi) The SOT Technical Coordinator to make soft copies of the final VOS Brochure and VOS Poster available on the VOS website (***action; M. Kramp; June 2015***);

(vii) The VPPP Chair to advise the Team via the VOS, SOT and PMO mailing lists when the poster and VOS brochures are finalized and available for use (***action; S. North; SOT-9***);

(viii) The WMO Secretariat to advise whether funding could be made available for printing hardcopies of the VOS Brochure (***action; WMO Secretariat; end 2015***);

(ix) The SOT Technical Coordinator to review the content and need for the SOT Flyer with a view to making recommendations to the TT (***action; M. Kramp; SOT-9***);

(x) The SOT Technical Coordinator to consider how the JCOMMOPS twitter and Facebook sites could be used to promote VOS programmatic issues to a wider audience (***action; M. Kramp & TT-VRPP; SOT-9***);

(xi) SOT Technical Coordinator to circulate details of JCOMMOPS Twitter and Facebook sites to the SOT, VOS and PMO mailing lists inviting members to join/follow (***action; M. Kramp; asap***);

(xii) NOAA to keep the TT-VRPP and TT-Training advised of any future developments concerning their video and sea state clips (***action; S. Pritchett & P. Rychtar; SOT-9***);

(xiii) The SOT Technical Coordinator to liaise with, and keep the TT-VRPP informed, regarding any further VOS video developments (***action; M. Kramp; SOT-9***);

(xiv) KNMI and the TT-VRPP to consider the feasibility of bundling training videos within TurboWin (***action; S. North & KNMI; SOT-9***);

(xv) The TT-Training to consider the potential of international PMO exchanges or secondments as a means of promoting best practice and information exchange between VOS operators (***action; P. Rychtar; SOT-9***);

(xvi) Paula Rychtar (USA) to investigate the potential of the forthcoming voyage of the Hermione to promote and possibly film our VOS activities onboard (***action; P. Rychtar; SOT-9***);

(xvii) VOS Operators to record whether SOT certificates have been issued to ships participating in the VOS Scheme on the E-SURFMAR database (***action; VOS focal Points & PMOs; ongoing***);

(xviii) The TT-VRPP Chair and the Task Team to keep the content of the Quick Reference Guides on the VOS website under review (***action; S. North & TT-VRPP; ongoing***);

(xix) SOT Technical Coordinator to review the content of the SOT Promotional presentation and to include, inter-alia, updated JCOMMOPS network maps where appropriate (***action; M. Kramp; end 2015***);

(xx) National VOS Operators are encouraged to provide the SOT Technical Coordinator with suitable news and articles or scientific papers related to VOS activities that can be included (or linked to) on the JCOMMOPS/VOS website (***action; VOS & SOT NFPs; ongoing***);

(xxi) SOT members, VOS operators and PMOs are encouraged to submit articles for inclusion in the Mariners Weather Log (***action; VOS&SOT NFPs, PMOs; ongoing***);

(xxii) WMO Secretariat and the SOT Technical Coordinator to provide the updated VOS fleet numbers for inclusion in the VOS Framework document and to upload the revised version of the document on the VOS Website (***action; WMO Secretariat & M. Kramp; asap***);

(xxiii) While the VOS Scheme questionnaire should run for six months, to issue the questionnaire by the end of May in order that some preliminary results could be available for the PMO-V International Workshop (***action; VOS Operators, WMO Secretariat, PMOs, VOS Chair; End May 2015***);

(xxiv) WMO Secretariat to investigate the potential for additionally issuing the VOS Questionnaire as an online survey via the JCOMM website (***action; WMO***

Secretariat; asap);

(xxv) The SOT Technical Coordinator to send to all PMOs and VOS Focal Point a final pdf version of the VOS Questionnaire for distribution to their participating ships (taking into account any necessary editorial amendments raised at SOT-8) (***action; M. Kramp & WMO Secretariat; asap***); and

(xxvi) The SOT Technical Coordinator to include on the VOS website the links to WMO Publications which are of relevance to VOS related activities (***action; M. Kramp; asap***).

7.3.4. The full Task Team report is provided in Appendix C of SOT-8 preparatory document No. 7.

7.3.5. The Team requested the SOT Technical Coordinator to discuss with the SAWS availability of marine meteorological, oceanographic, and aerological data from South African ships to the community (***action; M. Kramp; Dec. 2015***).

7.4. Task Team on Metadata for WMO-No. 47

7.4.1. Ms North reported on behalf of the Chair of the Task Team on Metadata for WMO Publication No. 47 (TT-Pub47), Mr Graeme Ball (BOM, Australia), on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-7.

7.4.2. The meeting agreed on the following:

(i) The Team endorsed adding codes 80 and 85 (AWS) to Code Table 2202 (Type of meteorological reporting ship) for support ships.

(ii) The Team endorsed adding code HH (hand-held digital temperature/humidity sensor) to Code Table 0801.

(iii) The Team endorsed adding code ZZ (third party recruited support ships) to Code Table 1801.

(iv) The Team endorsed an addition of a new entry to code table 0801 (exposure of hygrometer / thermometer) as follow:

Code	Description
RS	Radiation Shield

(v) The Team endorsed a change in the location of the Pub47 XML Schema namespace variable as a result of the transfer of the VOS Website from the Australian BOM to JCOMMOPS.

(vi) The Task Team on Metadata for WMO Publication No. 47 (TT-Pub47) requested the Secretariat to again remind VOS Focal Points and VOS program Managers that the use of the E-SURFMAR VOS Metadata Database does not absolve them to submit their national Pub47 metadata to WMO at least quarterly (by January 15, April 15, July 15 and October 15) or preferably each month

(vii) The Team approved a change to the membership of the Task Team to:

a. Remove: Graeme Ball (Australia)

b. Add: Joel Cabrié (Australia).

c. Add: Rob Neimeyer (USA)

(viii) The Team appointed Dr David Berry (United Kingdom) as new Chair of the Task Team.

7.4.3. The Team concurred with the proposed revised version of the Metadata Format Version 4.2 (metadata fields & descriptions, exchange formats and code tables) of WMO-No. 47 (International list of Voluntary Observing Ships), which incorporates the changes outlined above and which is provided in the annex to Appendix D of SOT-8 preparatory document No. 7.

7.4.4. The meeting decided on the following action items:

(i) Pending endorsement from the Team to transfer the VOS Website from the Bureau of Meteorology to JCOMMOPS, Members to note a change in the location of the XML Schema referenced in the XML namespace variable and update national Pub47 XML generators accordingly. (***action; Members; 1 August 2015***)

(ii) To comply with the recommendations in the 2013 report by J R Keeley, "Data Systems relevant to JCOMM Activities", the Task Team to further examine the requirements to collect metadata about instrument sampling rates and instrument accuracies and precision and report at SOT-9 (***action; TT-Pub47; SOT-9***);

(iii) The Task Team to further examine the need to record the data format used to send data from ship-to-shore (***action; TT-Pub47; SOT-9***); and

(iv) The Task Team to submit a proposal to JCOMM-5 to change the structure of Pub47 to include the new fields endorsed by the Team at SOT-7 and SOT-8 (***action; TT-Pub47; 2016***).

7.4.5. The full Task Team report is provided in Appendix D of SOT-8 preparatory document No. 7.

7.5. Task Team on Instrument Standards

7.5.1. 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-7. He 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-7.

7.5.2. The Team considered carefully how the project should develop in the future, so that it can help to raise the quality of data to climate standard within the VOS, and thereby contribute to the Global Climate Observing System (GCOS). With this perspective in mind, the meeting agreed on the following:

(i) To revise the Task Teams Terms of Reference, as necessary, to reflect the proposed changes to the project;

(ii) The Team concurred with the first edition of JCOMM TR 63 "Recommended Algorithms for the computation of marine meteorological variables" as drafted by the TT-IS and then published during the intersessional period;

(iii) To encourage members to contribute to a revision of JCOMM TR 63 and to follow the recommendations made in that TR (***action; SOT member; SOT-9***);

(iv) To propose the following additional variables to be added to the JCOMM TR 63 during the next intersessional period: True wind (***action; TT-IS; SOT-9***);

(v) To use online questionnaires to collect information on Instrument Standard Guidelines and Instrument Standard Equipment and make them available to all potential users. It requested the Secretariat to liaise with the chair of the TT-IS and organize the activity as required (***action; Secretariat; SOT-9***);

(vi) To terminate the working groups of the TT-IS (Working Group on Publications, Working Group on Automatic Weather Stations, Working Group on New Technology) as they have proven to be not practical. The TT-IS shall setup *ad hoc* Working Groups instead when needed.

7.5.3. The full Task Team on Instrument Standards report is provided in Appendix E of SOT-8 preparatory document No. 7.

7.6. Task Team on Call Sign Masking and Encoding

7.6.1. The Secretariat reported on behalf of the Chair of the Task Team on Call Sign Masking and Encoding, Mr Graeme Ball (BOM, Australia) on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-7.

7.6.2. The meeting made the following recommendations:

(i) The Team approved the following change to its membership:

a. Remove: Graeme Ball (Australia) as Member and TT Chair.

b. Add: Hiroshi Ohno (Japan) as Member

(ii) The Team requested Mr Ball to nominate someone as new Chair of the Task Team (***action; G. Ball; asap***);

(iii) The new Chair of the Task Team is requested to nominate a Task Team member on security requirements (***action; TT-Masking Chair; asap***);

(iv) Members using the E-SURFMAR VOS Metadata Database operationally, to continue to maintain their **MASK** details as an alternative to submitting a quarterly advice to JCOMMOPS;

(v) E-SURFMAR to continue to provide JCOMMOPS with a list of current **MASK** details on a daily basis;

(vi) To establish a JCOMM Focal Point on Ship Masking, which draft Terms of Reference are provided in ***Annex XIV***. In particular, the Focal Point shall be responsible for managing encryption / decryption keys;

(vii) The SOT Chair to submit the draft Terms of Reference of the JCOMM Focal Point on Ship Masking to the JCOMM Co-Presidents for their approval (***action; SOT Chair: 30/4/2015***);

(viii) Once approved, the Chair of the Task Team to nominate through the SOT Chair someone to become the new Focal Point on Ship Masking and submit the proposal to the JCOMM Co-Presidents for their approval (***action: SOT Chair; 15/5/2015***);

7.6.3. The full Task Team on Callsign Masking and Encoding report is provided in Appendix F of SOT-8 preparatory document No. 7. The full report particularly includes (i) a list of alternative callsign sequences (i.e. **MASK**) approved by TT-Masking is provided in its Annex 1, (ii) the decision of the Co-Presidents of JCOMM concerning ***Security requirements for the encryption/decryption of ship's call signs within BUFR***[21] ***reports distributed on GTS*** in its Annex 2, and (iii) the Security requirements for the encryption/decryption of ship's call sign in its Annex 3.

7.6.4. Following the discussion on progress with ship callsign masking and encoding schemes, Prof David Meldrum (OPA Co-chair) reminded the meeting that much ship data was in fact freely available in the public domain, and that open access to these data would not be restricted by the proposed schemes. In particular, Prof Meldrum noted the following Internet resources, all of which had come on line since the initial request by CBS to implement call-sign

security:

(i.) Open access to raw observational data circulating on the GTS. A number of NMHSs allowed these data to be downloaded in real time from their telecommunications gateways. While this was in line with WMO Resolution 40 on free and open exchange of data, it was a relatively new departure and allowed ship tracks to be plotted without difficulty;

(ii.) Public websites displaying data originating from the GTS. Open access to raw GTS data had encouraged the emergence of sites (e.g. www.sailwx.info) that plotted and listed these data, alongside the ship's call-sign;

(iii.) The increasing rollout of the ship Automatic Identification System (AIS). This system, initially designed for coastal traffic management and navigational safety, obligated ships above 300 GRT to carry an AIS transponder. Numerous websites (e.g. www.marinetraffic.com) plotted global AIS data, allowing vessels to be tracked, their call-signs displayed, and voyage data inspected and downloaded;

(iv.) The emergence of Satellite AIS (S-AIS). Although never envisaged initially for AIS, a number of satellite systems were now in place or being developed to interrogate vessels' AIS transponders in the open ocean. Subscription services were now available that allowed near-real-time access to these data.

7.6.5. In consequence, the view might be taken that, realistically, the call-sign masking and encoding schemes were now more or less superfluous, at least from the point of view of ship security.

7.6.6. The meeting agreed that, while it was bound by previous decisions of the WMO Executive council to proceed with the schemes for the time being, it should take stock of the current situation with regard to the increasing amount of ship data now available publicly, investigate with concerned Members whether their views can evolve in light of this information, and, if felt realistic to achieve better solutions, report this situation back to the WMO Executive Council through JCOMM for a review of its decisions in this regard. In particular, recognizing the difficulties that call sign masking introduced for research users, it asked the WMO to be careful not to promote call sign masking in areas where it might not be needed, and to review its guidance material in this light ***(action; WMO Secretariat; asap)***.

7.6.7. The meeting also asked the Members with ship security concerns to raise AIS security concerns with the IMO and to report back to the next session. ***(action; members with ship security concerns; by SOT-9***).

7.7. Task Team on Training

7.7.1. The Chair of the Task Team on Training, Ms Paula Rychtar (USA) reported on the activities of the Task Team during the last intersessional period and follow-up actions from SOT-7.

7.7.2. The meeting agreed on the following:

(i) To develop global standards, practices and functions for Port Meteorological Officers

PMO exchange program: The primary deliverable from PMO-5 is the initiation of PMO exchange program between countries. This would provide an extraordinary opportunity to broaden the experience, techniques and appreciate as well as provide a different perspective in VOS support strategies.

(ii) To make the following changes to the membership of the Task Team:

Remove: Graeme Ball (Australia)

Add: Joel Cabrié (Australia)

Add: Ron Williams (USA), Jim Luciani (USA), and Matt Thompson (USA)

(iii) Regarding action item(s) referring to the Task Team Term of Reference no. 7:

a. To ensure that the International Maritime Organization (IMO) International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW[22]) is current and to investigate what is specifically mentioned and required about training meteorology; and to ensure that training syllabuses are based on the IMO STCW Convention (***action; SOT members; ongoing***). It would be beneficial to obtain the various academies/colleges syllabuses used in training their cadets in preparation for developing power point presentations. These power points should cover a) detailing PMO activities and the service they provide to the observing ships and b)an overview of SOT VOS and other observing practices (XBT, SOOP, ASAP).

b. Now that TurboWin is the primary tool for compiling weather reports, to distribute copies of TurboWin e-logbook software and user manual/handbooks to the various maritime colleges/academies, and in the best case given instruction on its use (***action; SOT members; asap***).

(iv) Regarding action item(s) referring to the Task Team Term of Reference no. 9:

a. To revise the Marine Observers Handbook and the NWS Handbook No. 1, and edit it to include updates (***action; P. Rychtar; asap***).

b. To establish a sub-committee to accomplish this revision (***action; TT-Training; asap***).

7.7.3. The Team agreed that the IODE Repository[23] of Best Practices in Ocean Data and Information Management could be used as a mechanism to reference existing SOT training documents. It invited the Task Team to investigate this option (***action; P. Rychtar; SOT-9***).

7.7.4. The Team requested the Task Team to keep the JCOMM Activity Leader on Capacity Development, Mr John Mungai (Kenya) informed of the activities of the Task Team (***action; P. Rychtar; ongoing***);

7.7.5. The full Task Team on Training report is provided in Appendix G of SOT-8 preparatory document No. 7.

7.7.6. The Team recommended Team members to consider providing training on AMVER messages and on the possibility to provide more data from the data sparse areas (***action; SOT members; ongoing***).

7.8. VOS Ancillary Pilot Project

7.8.1. Ms Sarah North (United Kingdom) reported on the activities of the VOS Ancillary Pilot Project during the last intersessional period and follow-up actions from SOT-7.

7.8.2. She reminded the meeting that the project had been initiated in response to increasing pressures on VOS operators to recruit new VOS in the face of limited PMO resources; financial constraints that prevented the supply of calibrated instruments; and increasing moves by VOS operators to automate their observing ships. Furthermore, ships operating on international voyages were increasingly seeking recruitment to the VOS, but could not be inspected by PMOs at an established home port.

22 http://www.imo.org/OurWork/HumanElement/TrainingCertification/Pages/STCW-Convention.aspx
23 http://www.oceandatapractices.net/

7.8.3. It had therefore been proposed by the SOT Task Team on VOS Recruitment and Programme Promotion (TT-VRPP) that a new VOS Ancillary class should be established as a Pilot Project to enable VOS operators to respond promptly to requests to recruit ships that might otherwise have to be turned down.

7.8.4. Detailed criteria for the recruitment of ships to the VOS Ancillary Pilot Project were developed and published on the VOS website[24] and are also provided in ***Annex XIII*** together with the Terms of Reference for the Pilot Project.

7.8.5. Under the VOS Ancillary PP, ships are to be supplied with the latest TurboWin software and are required to report in real time. Moreover, the parent shipping company is assigned responsibility for collecting the necessary metadata for WMO Pub 47, for supplying certified meteorological instruments and for monitoring the data quality of their ships.

7.8.6. Invitations to VOS operators to consider recruiting ships to the Ancillary class were issued in December 2011. It was additionally recommended, at the last session, that when it was not possible to recruit a potentially suitable manually reporting ship to participate in the VOS Scheme, or to maintain an existing manually reporting ship within the VOS Scheme that has a suitable observing record, then such ships and their parent shipowners/managers should be offered the opportunity to participate in the Ancillary Pilot Project.

7.8.7. In view of the slow take-up of ships, the Team recalled that it was agreed at the last session that the VOS Ancillary Pilot Project should be continued until SOT-8 when a final decision would be taken on the need for a new Ancillary VOS class. The SOT Technical Coordinator was tasked with assisting with the development of the Pilot Project as needed. In particular it was decided that the SOT Technical Coordinator should:

(i) Oversee the performance of the Ancillary VOS (e.g. checking that metadata is being collected and that the companies concerned are providing feedback on data quality);

(ii) Liaise with Ancillary ship Masters and parent companies (and with VOS Focal Points where appropriate) to gather and check the accuracy of Ancillary metadata prior to entering such information into the E-SURFMAR database;

(iii) Ensure that any masked call signs that may be assigned to Ancillary ships are referred to the Task Team on Call sign Masking for approval;

(iv) Ensure that monitoring information and qc tools are made available and are applied by shipping companies that have volunteered Ancillary class ships to participate in the Pilot Project; and

(v) Provide input to the TT-VRPP on the operation of the Ancillary PP to assist decisions being made on the need to formally introduce the new VOS Ancillary class at SOT-8.

7.8.8. The Team recalled that at its last Session only 8 Ancillary ships had been recorded on the E-SURFMAR metadata database (by March 2013) and that these ships had only submitted a total of 1963 observations during 2012 (including observations submitted under masked call signs).

7.8.9. The VOS Chair reported that recruitment of new ships to the Ancillary PP had been very slow since the last session and that (by March 2015) there were only 20 ships recorded as having been recruited and, furthermore, that only ten of these ships had actively reported during 2014. She also pointed out that the number of observations from Ancillary ships had actually decreased in 2013 (to 1390 observations) but had risen slightly to 2301 observations in 2014.

24 http://www.bom.gov.au/jcomm/vos/projects.html#supp6

7.8.10. The Team also noted that in considering the low level participation the SOT Technical Coordinator advised the TT that he had been trialling the ancillary class with several ships and that Clipper [25] had recently volunteered yachts sailing around the world to participate.

7.8.11. The TT Chair reported that the UK intended to upgrade two of the current Ancillary ships as UK VOS Climate ships and were in discussion with a shipowner about upgrading a further two ships, depending on their performance.

7.8.12. It was further noted that the USA had appointed a further 29 ships to the Ancillary class but due to problems with their national iVOS database it was not presently possible to transfer information on these ancillary ships to the E-SURFMAR metadata database. Although these problems were being addressed, the USA considered that these ships did not belong in the Ancillary class. In this respect, it was noted that of these ships well over half were being flagged routinely on the quality monitoring black lists. It was further noted that in addition to these 29 proposed USA ancillary class ships there were currently a further 127 ships assigned to what they refer to as the USA Support Fleet, many of which had been recruited remotely.

7.8.13. The USA stated that whilst these ships could not be expected to comply with the criteria prescribed by the pilot project for ancillary ships, their contribution should nevertheless still be recognized. There was serious concern however that the poor quality data from these ships would continue to pass unfettered through the USA gateway and onto the GTS. At present, they do not actually fall into any proper VOS class and moreover they cannot be visited nor inspected, and their observers cannot be properly trained. The Team suggested that observations from these US ancillary/support vessels should not be passed to the gateway but rather sent to some form of 'observation purgatory' until they are shown to be of suitable quality to pass to the GTS.

7.8.14. Ms North also explained that the SOT Technical Coordinator had reported that some yachts, which had been experimenting with ancillary class reporting, felt that the TurboWin software included more options than they really needed. The Team requested the SOT Technical Coordinator to coordinate and work with KNMI and E-SURFMAR to investigate the case for developing a 'TurboWin Lite' version with more limited functionality ***(action; M. Kramp; SOT-9)***.

7.8.15. The Team noted the recommendation from the SOT Technical Coordinator that consideration should be given to developing an App for Smartphones and tablets that could be used for sending observations either through an onboard satellite system or through GSM, if within coverage. The TT recognised that this would be a good way of crowd-sourcing third party data to support the established VOS quality data. The Team requested the SOT Technical Coordinator to discuss with the SOT Chair and to investigate the potential and funding implications involved (including whether any financial support could be realized) in developing an App for sending weather observations via Smartphone's or tablets ***(action; SOT Chair; SOT-9)***.

7.8.16. Notwithstanding the low take up to the Ancillary PP, the Team noted that the quality of observations from participating ships was generally high as evidenced by the scores achieved in the UK Met Office VOS Annual rankings[26].

7.8.17. Although difficult to fully determine, the Team felt that only a few shipowners operating Ancillary ships were actively providing routine feedback on the quality of their ships. Moreover, it was noted that only limited metadata had been collected for many of the Ancillary ships.

25 https://www.clipperroundtheworld.com/race/route-map
26 http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/VOSranking/index.html

7.8.18. In view of the above factors, the limited number of ships recruited to the Ancillary PP over the last 3 years, and the low number of observations that they had generated, the Team agreed with the Task Team's recommendation that the Ancillary PP should be discontinued and that, where possible, suitable existing Ancillary ships should be transferred to national VOS fleets.

7.8.19. As a consequence of this decision it was agreed that details about participation in the Ancillary Pilot Project should be removed from the Supplementary Programs section of the VOS website **(*action; M. Kramp; asap*).**

7.8.20. Although ships recruited to the PP had not achieved the standards or numbers expected, the Team agreed with the Task Team's recommendation that there remained a need for a separate category for ships that wish to submit marine observations to support the VOS effort, but which would be unable to comply with the provisions or requirements normally imposed on participating VOS Class ships.

7.8.21. The Team agreed that such a third party 'support' fleet should not be considered as ships belonging to a particular recruiting country but would, in effect, be third party VOS. They should be referred to as 'Support Fleet' and not be bound by the same criteria that had been established for Ancillary PP class ships.

7.8.22. The Team recognised that the data from such a third party fleet might be of lesser quality than for fully recruited VOS class ships, especially if amateur observers using uncertified instruments are involved. As a consequence, the Team agreed that it would be preferable to have means to identify data from such ships on the GTS, which was confirmed to be possible through the optional fields in Table Driven Codes. The USA VOS program manager proposed to investigate if the US "MADIS[27]" system could be used to quality control and process data from such a fleet. The Team invited the VOS operators to develop mechanisms to 'block' poor quality data from non VOS observing ships from being inserted on the GTS ***(action; VOS Operators; ongoing)***.

7.8.23. In considering this issue, the Team recognised that the 'ZZ' country notation currently used to identify Ancillary class ships in the E-SURFMAR metadata database had worked well as a way of quickly identifying participating ships, and for segregating them from the established national VOS fleets. The Team therefore agreed that the ZZ notation should be continued for the proposed new third party support ships that are not recruited to the established VOS by a National Meteorological Service.

7.8.24. In considering the concept of such a third party support fleet, the Team recalled that the UK Met Office, supported by the Royal Meteorological Society, had developed a Weather Observations Website (WOW[28]) for land based amateur observers. The Team noted with appreciation that the WOW website was now being extended to other countries (Australia, New Zealand and the Netherlands) which are also active within the VOS Scheme.

7.8.25. Furthermore, agreement had recently been reached to extend the capability of the WOW site to include ship observing sites. It was therefore possible that this could potentially be used by third party or amateur observing ships that cannot, for whatever reason, be recruited to the traditional manned VOS. The ships could then submit, and visualise, their weather reports by, for example, using adapted versions of electronic log book software such as TurboWin. The Team considered that the future potential for linking TurboWin to WOW should be investigated **(*action; E-SURFMAR/KNMI; SOT-9*)**.

7.8.26. The Team requested the Chair of the TT-VRPP to keep the SOT advised of any

27 https://madis.noaa.gov/
28 http://wow.metoffice.gov.uk/

relevant WOW developments (e.g. for including new ship observations) and to circulate details to the JCOMMOPS PMO, VOS and SOT mailing lists when available **(*action; S. North; SOT-9*)**.

7.8.27. The meeting also requested the SOT Chair to remove details of the Ancillary Pilot Project from Supplementary Programs section of the VOS website ***(action; SOT Chair; asap)***.

7.8.28. The meeting made the following recommendations:

(i) That the Ancillary PP should be discontinued and instead a third party 'Support Fleet' Class be established;

(ii) That the corresponding class codes (vsslm) be '80' for manual and '85' for automated stations;

(iii) That the chairpersons of all SOT Task Teams, led by the VOSP chair and Dr David Berry, and supported by the SOT Technical Coordinator, should evaluate the support fleet by SOT-9, in particular if the class needs to be divided in subclasses distinguishing the quality of instruments/observations;

(iv) That the ZZ notation should be continued for vessels of the support fleet;

(v) That in addition to all mandatory fields in Pub47, contact and submission email must be gathered systematically to whitelist stations and to automatically submit QC reports through the E-SURFMAR system;

(vi) That the use of Turbowin should be recommended, in particular for TDC compatibility through E-Surfmar format 101;

(vii) That NMSs should inform the SOT TC when they add new stations to the support fleet;

(viii) That the SOT TC enters and maintains metadata whenever no NMS is involved;

(ix) That the E-SURFMAR Programme Manager as of now regularly submits metadata of the support fleet to WMO together with data of the Eumetnet fleet;

(x) That the RSMC should investigate if a separate suspect list for the support fleet could be issued;

(xi) That the Terms of Reference of the TT-VRPP should be revised according to these changes; and

(xii) That a Webinar on MADIS should be set up (***action; S. Pritchett; May 2015***).

7.8.29. The Team also asked the metadata Task Team (TT Pub47) to investigate carefully if distinguishing manual and automated classes in general should be discontinued, given that the information on automatization is also available through the mandatory field for general observing practice (atm) (***action; TT-Pub47; SOT-9***)

7.8.30. The detailed report by the Pilot Project is provided in SOT-8 preparatory document No. 7.8.

7.9. The Team encouraged all Task Team Chairs to invite and include PMOs in the membership of their Task Teams (***action; TT Chairs; SOT-9***).

7.10. The Team reviewed the Terms of Reference and membership of the SOT Task Teams. These are provided in ***Annex IV***.

8. NINETH SESSION OF THE VOS PANEL (VOSP-9)

8.1. VOS Programme activity reports

8.1.1. Report by the VOSP Chairperson

8.1.1.1. The Voluntary Observing Ship (VOS) Panel (VOSP) Chairperson, Ms Sarah North (United Kingdom), opened the eighth Session of the VOS Panel. She reported on activities undertaken during the intersessional period April 2013 to April 2015.

8.1.1.2. Ms North attended the fifth Session of the JCOMM Observations Coordination Group (OCG, Washington, USA, September 2013). She reported that the OCG had decided to facilitate the formation of a Task Team (TT) to focus on the scientific and strategic aspects of engaging the shipping industry on marine observing. The Task Team, would also include representatives from several programs including from SOT/VOS. The final report of the OCG-5 meeting is available on the JCOMM website[29].

8.1.1.3. Ms North also attended the USA Port Meteorological Officers (PMO) Conference (Stennis Space Center, 26-28 August 2014). She reported that one of the most significant developments arising from this meeting was the decision by NOAA's National Weather Service to migrate their VOS to the future use of TurboWin electronic logbook software, thereby replacing the Amver/SEAS software. This move will greatly help with upgrading ships to VOSClim standards and will help establish closer ties between USA and International/European VOS operators, the majority whom already use the TurboWin software. Details of this USA PMO meeting are available at the NOAA VOS website[30].

8.1.1.4. The Team noted that throughout the intersessional period the VOSP Chair actively participated as a member of all seven of the current SOT Task Teams. She had in particular been heavily involved in the work of the Task Team on VOS Recruitment and Programme Promotion (TT-VRPP), which she currently chairs. In this regard, she had drafted a new VOS Poster, which could be used to promote VOS activities at international meetings, and had prepared a draft VOS Questionnaire to assess how the VOS Scheme is performing, and to gain feedback on the service provided by PMOs. She also provided input to the revision of the VOS Brochure and further progressed the proposals for generic ship designs standards at a meeting with the International Chamber of Shipping held on 6 March 2015.

8.1.1.5. As chair of the TT- VRPP Ms North was also heavily involved in the review of the performance of the Ancillary Pilot Project and, following close liaison with other members of the Task Team, made recommendations on its future (agenda item 7.8 refers). She thanked the Team for their active participation and input.

8.1.1.6. As Chair of the Drifter Donation Programme Evaluation Committee (PEC) Ms North was kept informed of all proposed drifter donations. However, she noted that, unfortunately, none of the proposals for drifter donations had been realised yet.

8.1.1.7. Ms North also represented WMO at the first session of the International Maritime Organization's Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) held from 30 June to 4 July 2014 at the IMO Headquarters in London. At this meeting, a paper was submitted jointly by Canada, Iceland, Norway, Sweden and the

29 http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=14660
30 http://www.vos.noaa.gov/met_officers_workshop.shtml

United States encouraging enhanced participation in the VOS Scheme in the Arctic. She made and intervention at the meeting supporting the submission of this paper (Agenda item 8.2.1.4 also refers).

8.1.1.8. Deputizing for the SOT Chair, Ms North also participated in two JCOMMOPS teleconferences aimed at navigating the future of JCOMMOPS, and to help ensure that the VOS Panel (along with other constituent JCOMM programs), can continue see value in engaging with JCOMMOPS and its infrastructure.

8.1.1.9. The Team noted that, pending retirement, Ms North had recently stood down as chair of the E-SURFMAR VOS Expert Team and had been succeeded by Henry Kleta (Germany). She advised the meeting that she was however willing to continue as Chair of the VOS Panel and to participate in PMO-5.

8.1.1.10. Ms North also advised that she had extracted information from the VOS National Reports submitted by members in order to provide input to the 2013 and 2014 SOT reports concerning the use of electronic logbooks and automated observing systems. These reports, together with information extracted from the E- SURFMAR metadata database, were also essential to assess the status of participation in the VOS Scheme (Agenda item 8.2.1 refers). In this regard, Ms North stressed on the following:

- Although VOS national reports had so far been received from 19 VOS operating countries, there were several countries that had failed to submit reports by the deadline. Unfortunately, some of the reports contained limited information, either suggesting that completing the reports was too onerous a task, or perhaps indicating limited awareness of how the VOS Scheme works.

- There was considerable duplication of information being requested from VOS operators. For instance, information on instruments was not only being collected in the VOS national reports but also for the Task Team on Instrument Standards. Moreover, this information should, in theory, already be accessible from the E-SURFMAR database, provided members keep it up to date.

8.1.1.11. With these factors in mind, the VOSP Chair suggested that consideration should be given to developing an alternative on-line version of the VOS report. The Panel agreed with this suggestion and requested the SOT Technical Coordinator, in liaison with the SOT Chair, the VOSP Chair and the SOT Task Team Chairs to consider the potential for developing an on-line reporting system for the VOS **(*action; M. Kramp; Nov. 2015*)**.

8.1.1.12. She also drew attention to a recommendation made in the report prepared by Bob Keeley (Canada) on the Data Systems Relevant to JCOMM Activities[31] that VOS annual reporting needs to provide graphics to show how well the VOS is meeting its objectives. She suggested that the proposed new reporting system should be designed to tentatively help achieving this objective.

8.1.2. SOT Technical Coordinator report on VOS support activities

8.1.2.1. The SOT Technical Coordinator, Mr Martin Kramp reported on his activities in support of the VOS Panel during the last intersessional period. He used the opportunity to thank the Panel members for their good cooperation and feedback since SOT-7.

8.1.2.2. The production of regular maps has been resumed in early 2013, and ever since evolved with a growing number of maps focusing on special VOS aspects (such as

31 http://www.jcomm.info/index.php?option=com_content&view=article&id=331

parameters, masking, automatization, regional). Mr Kramp presented the current set of VOS maps and demonstrated the structure of multi-layer pdf versions. He requested feedback from the Panel on further requirements.

8.1.2.3. Mr Kramp reported on the platform metadata control performed on a monthly basis by the TC, and demonstrated how day-to-day information available at E-SURFMAR are extracted, analysed and archived. He thanked the Panel for the ongoing cooperation in platform metadata matters, and stressed that providing complete and coherent platform metadata (including mask information and mandatory footnotes) is crucial for monitoring, and performance measurement.

8.1.2.4. Mr Kramp explained that in contrast to monitoring reports from other sources, JCOMMOPS VOS reports are manually revised to exclude numerous and partly difficult to identify non-VOS platforms. He recommended a more appropriate use of table 2201 (vessel type) to facilitate this analysis.

8.1.2.5. The Panel noted that numerous duplicates had been identified on the GTS, with a large number having bilateral agreements as identified (and in the meantime mostly eliminated) origin. Bilateral agreements also allowed identifying missing data from the GTS. JCOMMOPS VOS reports take into account these circumstances.

8.1.2.6. Mr Kramp reported on ongoing recruiting activities with third-party contributors (see also agenda item 7.8), that frequently operate in undersampled sea areas (e.g. yachts in the Southern Ocean). Recurrent issues with such contributors are i) complexity of TurboWin without appropriate training, and ii) missing instrument recommendations. He stated that ship operators had shown willingness to self-fund more appropriate equipment, and to use existing email facilities for the transmission of the observations. Data from ship-owned instruments are mostly available from the navigation system (standardized NMEA data stream), and automated test submissions successfully took place in 2014.

8.1.2.7. Mr Kramp attended in 2014 the yearly International Research Ship Operators Meeting (IRSO) and presented details of the VOS Scheme with the goal to facilitate the collection and GTS-transmission of meteorological data from more research ships. Progress is expected by the next session of IRSO in October 2015.

8.1.2.8. The Panel thanked Mr Kramp for the good progress in VOS support and monitoring, and made the following recommendations:

(i.) The Panel members, with assistance of the SOT Technical Coordinator to identify resources and initiate the development of “Turbowin Lite” (possibly as option in TurboWin), or similar software for basic parameters, and/or smartphone application (***action; Panel members and M. Kramp; SOT-9***); and

(ii.) The Panel members, with assistance of the SOT Technical Coordinator to identify resources and initiate the development of a sensor-free mini-AWS or application, using data from ship-owned instruments (NMEA data stream) and satellite facilities to code and submit 3rd party observations (***action; Panel members and M. Kramp; SOT-9***);

8.1.2.9. The Panel decided on the following action items:

(i.) The SOT Technical Coordinator to continue with 3rd party recruiting activities, with a focus on undersampled sea areas (***action; M. Kramp; ongoing***);

(ii.) The SOT Technical Coordinator to expand a cooperation with IRSO, with the aim to receive more data from research vessels (possibly without involvement of a NMS) (***action; M. Kramp; SOT-9***);

(iii.) The SOT Technical Coordinator to discuss with the VOSP Chair on the possible need to routinely produce new maps and statistics (***action; M. Kramp; SOT-9***).

(iv.) Registration of all non-VOS platforms as "other" (OT, table 2201) vessel type (vssl) with appropriate footnote (Pub47 and E-SURFMAR), until an appropriate metadata collection mechanism for such platforms has been set up by the DBCP Coordinator (***action; Panel members; ongoing***); and

(v.) The SOT TC with assistance from the chair of the Task Team on Instrument Standards Coordinator to create a list of existing third-party equipment (***action; M. Kramp; Apr. 2016***).

8.2. VOS Programme status reports

8.2.1. VOS status report

8.2.1.1. The VOSP Chair reported on 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 upgrading of VOS to VOSClim standards, and the increasing demand for high quality observations to serve the needs of the developing Global Framework for Climate Service (GFCS).

8.2.1.2. In order to determine the status of participation figures had been drawn from the E-SURFMAR metadata database[32] and from the national VOS reports submitted by participating VOS operators. In this latter regard, the VOSP Chair reported that only 19 national reports had been submitted for 2014 (i.e. by the March 2015 deadline). This compared with 22 reports in 2013 and 28 reports in 2012.

8.2.1.3. VOS participation

Number of recruited ships

8.2.1.3.1. The Panel noted that, using figures extracted from the E-SURFMAR database[32] there were 29 countries listed as having a total of 3,045 active VOS (on 24 March 2015). This compared to a figure of 3336 ships reported at the last session. A comparison between the numbers of ships recruited to each of the current eight approved VOS classes at the current session to those reported at the last session was presented.

8.2.1.3.2. In terms of numbers of ships reported there had been approximately a 9% reduction in the size of the international VOS fleet over the last two years since the last session. Moreover, the fleet was less than half the size it was a decade ago.

8.2.1.3.3. However, the Panel was pleased to note that there had been a further growth, albeit much smaller than had been hoped for, in the numbers of reported VOSClim ships. A table and graph showing the growth in the size of the VOSClim fleet over the last decade since the initiation of the then VOS Climate Project was presented. The number of active VOSClim and VOSClim (AWS) ships currently reported on the E-SURFMAR metadata database now stands at 498 ships. This represented a slight increase from 12% of the total number of reported global VOS to just over 16%.

Number of observations

8.2.1.3.4. The VOSP Chair advised that it had been extremely difficult to

32 http://surfmar.meteo.fr/doc/vosmetadata_v6/

prepare accurate observation numbers for the current session. She drew attention to the figures derived from the E-SURFMAR counters[33] for each VOS operating country. Whilst these figures were generally correct it was believed that the figures for Canada were likely to be in error. This was due to interruptions in the transmission of unmasked data, and to known counting errors in the E-SURFMAR observation counters. A revised table was kindly generated by the E-SURFMAR team using estimates for the Canadian contribution agreed with the SOT Technical Coordinator.

8.2.1.3.5. Based on these revised figures the Panel noted that a total of 1.88 million observations had been submitted by participating VOS Operators in 2014 and that VOSClim Class ships (i.e. manual and automated VOSClim ships) now accounted for more than 35% of the total. The Panel therefore recommended introducing a new Key Performance Indicator (KPI) to measure the percentage of observations received from VOSClim Class ships (i.e. manual and automated VOSClim ships) with a target of 50% by SOT-9. The new KPI shall be included in the SOT Implementation Strategy (***action; Secretariat; asap***). The Panel also requested the VOSP Chair to monitor this KPI, and to report at the next Panel Session (***action; S. North; SOT-9***).

8.2.1.3.6. It was further noted that almost 90 % of the VOS observations came from just 7 participating members. Consequently, there remained a need to increase the capacity of other countries that are seeking to implement VOS networks, and to involve other countries that have large national merchant fleets but which currently have no established VOS fleet.

8.2.1.3.7. According to the E-SURFMAR Observation counters[33] there appeared to have been a decrease in overall observation numbers over the last year, and since the last session. However, it was recognized that, for the reasons stated above, revisions to the scripts that generate these figures will be needed in order to verify this trend.

8.2.1.3.8. In addition to the above figures, a further ~344k observations had been received under the anonymous call sign ‘SHIP’ and a further ~20k observations were received from ships not recognized as having been recruited by a particular national VOS operator. Consequently, approximately 19% of observations were from unidentified ships (a slightly higher figure to that reported at the last session) that could not, therefore, be properly monitored for quality.

8.2.1.3.9. The Panel further noted that 521280 observations were received and processed from VOSClim registered ships by the Global Collecting Centres during 2014, representing 68% of the VOS data received.

8.2.1.4. Metadata – status & completion

8.2.1.4.1. The VOSP Chair drew the meetings attention to figures that she had extracted from the E-SURFMAR metadata database and from the national VOS reports. She pointed out that, in certain cases, there were clear inconsistencies between the numbers of ships being reported and those recorded in the database. There were, for instance, some countries that reported substantial VOS fleets in their 2014 national VOS reports and yet had no ships recorded in the database. Conversely, there were some countries that had more ships reported in the database than in the national reports, suggesting a failure to keep the database up to date.

8.2.1.4.2. The numbers of active VOS reported in the E-SURFMAR database

33 http://www.meteo2.shom.fr/vos-monitoring/counters.htm

were further compared with the number of VOS recorded in the E-SURFMAR Observation Counters[33] that had submitted real time observations in 2014. This revealed there were several countries that had reported large numbers of VOS and yet very few of these ships were actively submitting observations. It was recognised that whilst there may be good reasons for such discrepancies e.g. use of masked call signs, ships only recruited to submit delayed mode data etc., there were clearly several ships that needed to be made inactive on the database.

8.2.1.4.3. Furthermore, the number of real time FM-13 SHIP (BBXX) observations reported as having been sent on the GTS in the national VOS reports was compared with the number of observations derived from the E-SURFMAR observations counters. This revealed further inconsistencies with a few countries reporting far more observations having been submitted in 2014 than were actually received on the GTS. Indeed, it was noted that there were some countries with ships listed in the E-SURFMAR metadata database from which no observations had been received in 2014. The reasons for such inconsistencies are unclear but it is considered that, in some cases, these observations were collected in delayed mode rather than being transmitted in real time.

8.2.1.4.4. In view of these apparent inconsistencies, VOS Operators were requested to examine the figured contained in Appendices D and E of SOT-8 preparatory document No. 8.2.1 and to verify the accuracy of the figures they had recorded in their recorded national reports. The Panel requested the SOT Technical Coordinator to contact the national VOS Focal Point of the counties where marked differences were noted with a view to ensuring that E-SURFMAR records are corrected as necessary **(*action; M. Kramp & VOS Operators; asap*)**.

8.2.1.4.5. As there are currently no tools for analysing completeness of VOS metadata entries it was difficult to ascertain whether individual VOS operators were collecting the full suite of metadata for each ship or to determine the frequency at which of the data being updated. However, brief examination of the WMO Pub 47 data when extracted from the E-SURFMAR database[34] showed that, whilst the overall level of completeness was good, there were at least four countries that appeared to have supplied very limited national data for their VOS. In order to overcome this lack of data it was suggested that a more pro-active approach was needed.

8.2.1.4.6. The VOS Panel Chair therefore requested the SOT Technical Coordinator to send reminders, at least quarterly, to national VOS Focal points to request them to check that their metadata records are maintained up to date. (***action; M. Kramp; Oct. 2015 onwards***). In addition it invited the E-SURFMAR Programme Manager to take steps so that the E-SURFMAR metadata database would include a facility to generate a query based on the 'chgd' metadata field in order to determine the last dates of changes made to metadata fields by each nation (***action; P. Blouch PM; 2016***).

8.2.1.4.7. The Panel reiterated the request made at the last session that VOS Focal Points should ensure the accuracy of the metadata of their VOS fleets is maintained up to date in the E-SURFMAR database (or is regularly submitted to WMO in Pub47 format) and to upload digital imagery into the database, especially in the case of VOS Climate class ships.

8.2.1.4.8. The Team requested Members implementing the SHIP masking scheme to consider providing the list of masked ships to the SOT Technical

34 ftp://esurfmar.meteo.fr/pub/Pub47/

Coordinator (***action; Members implementing SHIP; asap***).

8.2.1.5. KPI compliances

8.2.1.5.1. The VOSP Chair reminded the meeting of the KPI targets that were established for VOS and VOSClim class ships at the previous sessions, and to the targets that were proposed in the SOT Implementation Strategy.

8.2.1.5.2. The Panel noted that many of the KPIs agreed at the last session were assigned to the RTMC to determine, and were addressed in greater detail in under agenda item 10.1.2. However the VOSP chair summarised the level of compliance as follows:

- ***25% of the global active VOS1 to be VOSClim class***

  It was recalled that at the last session it had been decided to continue to monitor this KPI (which was originally set at SOT-6).

  Based on an RTMC analysis of ships that had submitted more than 5 pressure observations per month a figure of 22% was achieved in 2014. This was therefore unchanged since the figure reported at the last session (in 2012).

  At the present time the RTMC does not have an easy way to determine the percentage based upon the number of VOS, which report at a single observation per month. However, it was noted that figures derived by the SOT Technical Coordinator suggested approximately 28% was achieved (in December 2014 and January 2105).

  Based on these statistics and also taking into account that ships reporting only in delayed mode are not included in the figures the meeting considered that the KPI had been met.

- ***Less than 3% of VOSClim class ships being flagged on the suspect list for air pressure***

  Because of the decision made at the last session to tighten the VOSClim monitoring criteria it had been agreed that compliance with this KPI should continue to be monitored until the current session. The Panel were pleased to note that this KPI had just been met.

- ***95% of VOSClim class observations to be received within 120 minutes.***

  It was recalled that it was agreed at the last session that this KPI should continue to be measured and reported to SOT-8. The Panel was pleased to note that this KPI had again been met at the current session (further details are given in the RTMC report – agenda item 10.1.2).

  In considering this KPI the VOSP Chair also drew attention the Panel's to the timeliness figures produced by the RSMC each month for national observing fleets which are available on the Met Office website[35]. She encouraged VOS Operators to make good use of these statistics, in particular to determine the average receipt times of their fleets but also the average number of observation per ship.

- ***All VOS ships aim to meet the reporting criteria of an 'Active ship' by providing an average of 20 Observations per month.***

  It was recalled that this KPI had been set at SOT-6 and that at SOT-7 a figure of 43.2% had been achieved (based upon the annual ranking list produced by the UK Met Office).

35 http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/Pub47_ToR_by_CTRY.html

Using the 2014 annual ranking lists it was noted that 41.97% of VOS ships (i.e. 1072 out of 2554 ships reporting) had reported an average of at least 20 pressure reports per month. The Panel were therefore disappointed to note that there had been a slight drop in the activity level of the VOS since the last session.

- ***At least 25% of the active international VOS Fleet registered on the E-SURFMAR metadata database being recorded as VOSClim Class by SOT-8***

  This new KPI target was introduced at the last session. The Panel noted that based solely on the numbers of national VOS Class ships recorded in the database (i.e. 498 out of a total of 3045 active nationally recruited ships) the figure currently stood at 16.4%. Taking into account only the VOS that were actually actively producing observations in 2014 (i.e. 2554 ships) the figure achieved was 19.4%. The KPI had therefore not been met.

8.2.1.5.3. In considering this item, the Panel recalled that the SOT Technical Coordinator had been assigned a task to create tools to monitor the SOT KPIs as defined in the SOT Implementation Strategy. To this end, he had recently developed an SOT 'Scorecard' to keep track of compliance levels. However, it was noted that some of the levels being reported differed in some cases from those being generated by the RTMC (Met Office). The Panel therefore requested the SOT Technical Coordinator to liaise closely with the RTMC to verify the figures being derived for the KPIs (***action; M. Kramp; SOT-9***).

8.2.1.5.4. In order simplify measuring compliance with some of the KPIs, the Panel also invited the E-SURFMAR Programme Management to include in the E-SURFMAR Observations Counters[33] a criteria to search on the VOSClim and VOSClim AWS (and indeed the other VOS Classes as well) and derive figures for individual ships, as is currently done on a country basis (***action; P. Blouch; SOT-9***).

8.2.1.6. VOS Data coverage

8.2.1.6.1. The VOSP Chair drew attention to the latest JCOMMOPS VOS observation density map and stressed the need to recruit VOS to fill data voids, particularly in the polar regions. In this respect, she drew the Panels attention to the website[36] maintained by the Scientific Community on Antarctic Research (SCAR) at which includes an updated list of all the names and call signs of ships that are known to have made meteorological observations in Antarctica during the 2014/15 season.

8.2.1.6.2. The Panel noted that there were currently estimated to be 23 ships reporting in these waters and 60 not reporting in Antarctic waters. A graph showing the relative trend between ships reporting and not reporting in recent years was presented. The general picture was one of an overall increase in shipping in Antarctic waters, but with the number reporting observations not changing. The VOSP Chair reminded the meeting of the action placed on VOS Focal Points and PMO's at the last session to make determined efforts to recruit ships that operate in these waters to the VOS Scheme or preferably to consider installing AWS systems on suitable ships.

8.2.1.6.3. The VOSP Chair also reported on a paper that was submitted jointly to IMO by Canada, Iceland, Norway, Sweden and the United States encouraging enhanced participation in the VOS Scheme in the Arctic. The paper was submitted to the first session of the International Maritime Organization's Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) held from 30 June to 4

36 http://www.antarctica.ac.uk/met/jds/met/SCAR_oma.htm

July 2014 at the IMO Headquarters in London.

8.2.1.6.4. The VOSP Chair made an intervention at this NCSR Sub Committee meeting supporting the submission. An extract from the Sub-Committee's report was presented. She pointed out that the Arctic was only one of several areas in the world where data was not forthcoming, and suggested that WMO should submit a paper providing information on areas where it seeks IMO members' assistance with increasing participation in the WMO VOS Scheme. The Panel therefore requested the WMO Secretariat in liaison with the VOSP Chair and members to prepare a paper to the IMO concerning the need to increase VOS data coverage, and to consider how best to pursue this matter (***action; WMO Secretariat; Oct. 2015***).

8.2.1.6.5. The Panel noted with appreciation that the NCSR Sub-Committee invited Member States to consider increased participation in the VOS Scheme, in particular, those with vessels which sail in Arctic waters.

8.2.1.6.6. At the last session, it had been hoped that data coverage could be enhanced in data sparse areas by means of VOS Drifter donation programme. It was recalled that WMO Secretary General had written (on 8 February 2013) to all WMO Permanent Representatives formally inviting developing countries to consider whether they could initiate a local VOS programme by participating in the VOS-DP. Unfortunately, to date, no drifters had been donated. Similarly, it had been hoped that the Ancillary Pilot Project would have helped to increase data coverage, but very few ships were actively participating.

8.2.2. E-SURFMAR Expert Team VOS status report

8.2.2.1. Status report

8.2.2.1.1. Mr Pierre Blouch (France) reported on the VOS activities by E-SURFMAR - the EIG EUMETNET operational service for Surface Marine Observations. He reminded that nineteen European NMS are financially contributing to the service, which is still optional. In 2014, observations transmitted by European VOS and Shipborne Automated Weather Stations (S-AWS) represented 43% and 64% of all observations sent onto the GTS, respectively.

8.2.2.1.2. 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-7. In particular:

(i) The progress in the procurement of S-AWS having specifications commonly defined by E-SURFMAR participants (EUCAWS project). Three prototypes were ordered to Sterela in 2014. In April 2015, the Site Acceptance Test was almost ended. First series should be available for purchases by the end of 2015. Details are presented under agenda item 8.3.3.1.

(ii) E-SURFMAR ship-to-shore dataformats. These have been finalized in close cooperation with the JCOMM Expert Team on Marine Climatology (DMPA/ETMC). Dataformat #100 has been implemented in several S-AWS using Iridium SBD to report their observations ashore, including EUCAWS and the OceanoScientific systems. Dataformat #101, combined with the half compression technique, is devoted to conventional VOS. Its implementation in TurboWin is ongoing. Source codes of software necessary to convert raw data in BUFR[21] may be freely distributed by Météo-France.

(iii) The developments and the maintenance of TurboWin financially supported by

E-SURFMAR. NOAA adopted it for US recruited VOS. Details are given under agenda item 8.3.1.2).

(iv) An experience with a “deck drifter”. A recovered drifting buoy was put onboard a French Navy tug during her campaign in the Arctic in summer 2014. This makes a cost-effective way to re-use recovered buoys. The experience will be renewed in 2015 with two ships.

(v) Data monitoring. Mr Blouch reminded that E-SURFMAR makes monitoring tools[37] available to data buoy and VOS operators reporting their observations onto the GTS. The meeting recognized the value of these tools, which are widely used and appreciated by the community and asked E-SURFMAR and Météo-France to continue this service.

(vi) Impact studies. Several studies are ongoing at European NWP centres in order to measure the impact of surface marine observations (from buoys and ships) on Numerical Weather Predictions. Results are expected in 2015. The Team requested Pierre Blouch to inform SOT members when and where results of impact studies are available (***action; P. Blouch; asap***)

8.2.2.2. E-SURFMAR Metadata database

8.2.2.2.1. Mr Blouch gave a status of the E-SURFMAR metadata database. Whilst this database is regularly updated by E-SURFMAR participants, it is also fed by Pub47 metadata submitted to WMO by non-European NMS. During the intersessional period, the database became the main repository for VOSClim ship metadata. Several functionalities were also added: list of ships reporting on the GTS but absent in the database, ancillary VOS taken into account and record of SOT Certificates.

8.2.2.2.2. E-SURFMAR proposed to add three new non-Pub47 fields in the VOS metadata database to tell if the ship is participating or not in ASAP, SOOP and/or GOSUD programmes.

8.2.2.2.3. Mr Blouch reminded that the E-SURFMAR metadata database is open to any PMO or VOS operator in the world who would use it (even in read-only mode). Pub47 metadata may be exported on the form of XML files that may be sent to WMO to comply with recruited country obligations.

8.2.2.2.4. The Panel requested E-SURFMAR to add three non-Pub47 fields to in the VOS metadata database to tell if the ship is participating or not in ASAP, SOOP and/or GOSUD programmes (***action; E-SURFMAR; asap***).

8.2.3. VOS Donation Programme

8.2.3.1. The Panel recalled that the DBCP/VOS donation programme was proposed by the Fourth International Port Meteorological Officer Conference (PMO-4), and support to Global Ocean Observations using Ship Logistics (8-10 December 2010, Orlando, Florida, USA) to assist developing countries in setting 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. Some countries expressed interest in participating in this programme. The Programme was later established and confirmed by SOT-6 and SOT-7 respectively.

8.2.3.2. Mr Kramp reported that he has promoted the VOS DP to developing countries,

37 http://www.meteo.shom.fr/qctools/

which have no VOS programme whenever possible, in particular when attending community meetings such as DBCP jointly with representatives from such countries.

8.2.3.3. From nine countries that had shown interest, only Tanzania successfully accomplished the first few steps of the procedure, including ship recruitment, national contact point (NCP), and PMO with buddy.

8.2.3.4. Mr Kramp notified The Programme Evaluation Committee (PEC), and despite non-ideal ships (passenger catamarans) operating in rather coastal waters, the PEC decided to move forward, in order to gain experience with the VOS-DP.

8.2.3.5. Within the procedure, the NCP resigned, but was eventually replaced by a new NCP. The progress is slow, but the buddy PMO now works with Tanzania on the metadata collection for Pub47.

8.2.3.6. Mr Kramp reported that the shipping of two drifters, without drogue, had been planned, but the status is now pending due to very high shipping costs. The GDP deployment manager at NOAA requested if the shipping could be (co)-funded by another entity. Costs are approximately 1000 USD per buoy.

8.2.3.7. The TC explained that it is uncertain if this initiative could spark a real national programme with NMS owned and maintained instruments on larger vessels, which call in Tanzania and sail in areas of higher interest for the Team.

8.2.3.8. The Panel thanked Tanzania, NOAA, the PEC, the buddy PMO, and the Technical Coordinator for their efforts to promote the VOS-DP so far.

8.2.3.9. The Panel agreed on the following:

(i) To continue with the VOS-DP to gain more experience with further countries, and review the VOS-DP at SOT-9;
(ii) To consider using recovered and refurbished drifters to be used for the VOS-DB (***action; VOS-DP; ongoing***);
(iii) The Secretariat to invite Tanzania to attend the PMO-5 workshop (***action; Secretariat; asap***);
(iv) To continue with the Tanzania initiative, and the SOT Technical Coordinator to assist the PEC and investigate funding solutions for shipping of drifters (***action; M. Kramp; SOT-9***).

8.3. VOS Developments

8.3.1. Electronic logbooks

8.3.1.1. Electronic logbooks software status

8.3.1.1.1. The Panel recalled that the VOS Panel has been working to increase the number of e-logbooks. The use of electronic logbook software eliminates the need to digitise data in traditional hardcopy logbooks and helps to increase the quality of the data due to their built in quality checks. Moreover, the software avoids the need for observer to have a detailed knowledge of the WMO codes.

8.3.1.1.2. The Panel noted that, despite a gradual rise in the provision of e-logbook software on observing ships over the last decade, there had been a disappointing fall in numbers over the last year. Information on the reported status of e-logbooks, derived from annual VOS reports at the end of 2014 was presented to the Panel.

8.3.1.1.3. It was recognised that there were several possible reasons for this decline. Firstly, the figures are derived from information submitted in national VOS reports and unfortunately, several national VOS operators had again failed to submit their reports. Consequently, numbers had, in some cases, to be estimated based on previous years' submissions. Secondly, the plans by some NMS to migrate to automatic weather systems appear to be having gradual impact on the size of national VOS fleets. In addition, it was known that some VOS Operators were rationalising the composition of their national fleets by focusing mainly on the higher quality VOSClim ships.

8.3.1.1.4. There are three main types of electronic logbook software currently in use on VOS – OBSJMA developed by the JMA, Amver/SEAS developed by NOAA, and TurboWin developed by KNMI in cooperation with E-SURFMAR. However, the Panel noted that NOAA's National Weather Service had recently made a policy decision to transition their VOS to the use of TurboWin software, as a replacement for Amver/SEAS. The Panel welcomed this decision and noted from the United States VOS report that well over a hundred of their observing ships had already moved over to using TurboWin software.

8.3.1.2. Electronic logbook developments (TurboWin, TurboWeb & TurboWin+)

8.3.1.2.1. The Panel reviewed current initiatives for the enhancement of e-logbook software programs. In particular, it was noted that version 5.5 of the TurboWin software was presently being beta tested. A key feature of the new version will be the facility to send messages using the E-SURFMAR #101 dataformat (details available at the E-SURFMAR website[38]) which will allow the easy translation of incoming messages to the higher resolution BUFR[21] format prior to circulation on the GTS.

8.3.1.2.2. Another significant development was the TurboWin+ software, which is also being beta tested prior to formal release, and which is already available for download from the KNMI website[39]. The Turbowin+ software can be used in the same stand-alone version as the traditional TurboWin software, and is already being trialled on more than thirty observing ships. Whilst the TurboWin+ software doesn't include as many of the add-ons that are available in the traditional TurboWin software it incorporates several important new features , including the ability to

- be used in Web mode to send observation directly via the internet to the NMS server
- display pressure tendency graphs and data when connected a suitable barometer (i.e. currently a Vaisala PTB330 or PTB220 MintakaDuo barometer)
- interface with the new EUCAWS (European Automatic Weather Station) shipborne AWs system to display the measured sensor parameters, and allowing the observer to add visual observations to the measured values
- also run on Linux and Mac OS
- make and submit AMVER reports
- check the ship observation position on Google maps when the internet is available
- to be updated remotely via the internet when available

38 http://esurfmar.meteo.fr/doc/o/vos/E-SURFMAR_VOS_formats.pdf
39 http://www.knmi.nl/turbowin/

8.3.1.2.3. The Panel further noted that there had been a gradual growth in the number of ships using TurboWeb since it was first trialed back in 2010. This method of reporting is of course only available to ships that have internet access and suitable bandwidth, and where the parent ship owner has agreed to its use on board. In this respect VOSP Chair advised that one major UK based shipping company had recently agreed that the TurboWeb software could be rolled out to all their participating VOS (more than 20 ships).

8.3.1.2.4. A major advantage of the TurboWeb approach is that any updates to the software can be made remotely thereby avoiding the need for ships officers or visiting Port Meteorological Officers (PMO's) to install new versions on the ships computers. It therefore overcomes the onboard IT security issues that can present a problem for PMOs. The Panel noted that provided Java 7 is installed on the host computer the TurboWeb software would run from a specific link[40] on the KNMI website. It had been designed to work on a variety of computers (e.g. Windows, Linux, Mac, and Solaris). Whilst observations can immediately be prepared and submitted, the Panel further noted that new users would receive a return message requiring them to add their call signs to the white list currently maintained at KNMI.

8.3.1.2.5. Recognising the advantages of moving over to web-based observing systems the Panel encouraged VOS Operators to liaise with ship owners and managers with a view to increasing the use of TurboWeb on suitable observing ships (***action; VOS Operators; ongoing***).

8.3.1.2.6. The Panel noted that TurboWin software also allowed observation data to be transmitted in a half-compressed format. This necessitated the use of a dedicated three figure Inmarsat Special Access Code (SAC) which the national VOS operator will need to set up prior to use. The raw messages are sent via Inmarsat-C (usually via Burum LES) and are processed at Météo-France for insertion on the GTS. The Panel recognised that the use of this half-compressed system could help reducing the currently unfair cost burden borne by the small number of NMS that currently host SAC 41 Land Earth Stations. The Netherlands VOS are already using this method.

8.3.2. VOS meteorological instruments

8.3.2.1.1. The VOSP Chair drew the Panel's attention to number of issues that were requiring VOS operators to review the instruments supplied to their national manned VOS fleets. In particular the ban on the sale, manufacture, import and export of products containing mercury arising from EU regulations, and from the Minamata Convention, (para 3.1.11 of this report refers) will inevitably impact on many current VOS operators that currently still use mercury thermometers either in whirling psychrometers or in dedicated marine screens.

8.3.2.1.2. The Panel recognised that the supply and stocks of mercury thermometers were expected to diminish in a relatively short space of time, and that the cost of continuing to use of mercury in glass (MiG) thermometry was already starting to increase as a consequence. Many VOS operators were therefore having to source, and rollout, alternatives as a matter of some urgency.

8.3.2.1.3. The VOSP Chair reported that trials of alternative organic spirit thermometers in the UK against the standards currently used for MiG thermometers had been inconclusive. Given the cost and inevitable breakages of glass

40 http://www.knmi.nl/turbowin/webstart/turbowin_jws.jnlp

thermometers, it was expected that many VOS operators who currently use MiG thermometers would migrate to the use of digital hand held temperature/humidity sensors. Some meteorological services (e.g. DWD) had already trialled such systems and were rolling out such hand held devices to their manually reporting ships.

8.3.2.1.4. The Panel also agreed that the need to continue to equip manned VOS with traditional marine barographs was also in question now that programs such as TurboWin+, and the Australian Bureau of Meteorology's Marine Barograph software, have the facility to electronically display a barograph pressure trace.

8.3.2.1.5. Furthermore, higher quality barometers (e.g. the Vaisala PTB 330) which have the ability to display the pressure tendency on a built-in LCD display, were increasingly being rolled out to VOS, thereby avoiding the need to supply traditional barographs.

8.3.2.1.6. Whilst the Panel appreciated that most ship captains would like their ships to be equipped with a barograph, such equipment was quite often prone to failure in service. In addition, there was the ongoing cost to VOS Operators of supplying barograms charts and pens. The Panel also noted that most, but not all, VOS operators set their barographs to read Mean Sea Level pressures. This can occasionally result in pressure bias errors when an observer incorrectly enters the pressure read from the barograph into the electronic logbook software (i.e. when the barometer itself is set to station level).

8.3.2.1.7. The Panel also questioned the value to forecasters of reporting the traditional 3 hourly tendency value required by the WMO Ship code now that the vast majority of VOS data was being submitted hourly via AWS systems.

8.3.2.1.8. The Panel recognised that the changes being made to VOS equipment in the next few years would inevitably impact on the climate record. This therefore highlighted the need to maintain good records of the observing practices employed by national VOS operators. In this regard the Panel recalled that the Task Team on Instrument Standards (TT-IS) was already tasked with compiling of information on existing activities, procedures and practices within the JCOMM relating to instrument testing, standardization and intercalibration as well as the standardization of observation practices and procedures. A list of the national instrument standards guidelines is attached to the TT-IS report.

8.3.2.1.9. However many of the national documents relating to VOS observing practices are in need of review. For instance the Met Office's Marine Observers Handbook, which is included in softcopy format within the TurboWin program, had not been revised since 1995 and needed updating to include information on the new instruments, current observing practices and their associated operational procedures and practices. Accordingly the Panel requested its members to review, and update as necessary, the content of their national observing guidance and documentation (***action; VOSP Members; asap & ongoing***).

8.3.2.1.10. In considering this issue the Panel note that the Task Team on Instrument Standards was already considering where the lists of current national observing practices should be maintained and were considering listing them on a webpage, as this would be more helpful and effective for the users of such information. The Task Team therefore invited the SOT Technical Coordinator, in liaison with the Chair TT-Instruments and the WMO Secretariat, to consider the feasibility of creating appropriate online tools to collect and display information on national observing practices, and also on the standard equipment used, on the

JCOMMOPS website (***action; M. Kramp; SOT-9***).

8.3.3. VOS automation Status

8.3.3.1. VOS Automation status

8.3.3.1.1. The Panel once again 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. In this respect the VOS Panel recalled that it had previously recommended that Members should increasingly implement automated systems on their fleets, while at the same time recognising 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.

8.3.3.1.2. The VOSP Chair reported on the present status of VOS Automation. According to VOS national reports received in 2014 there were now 19 countries with AWS systems installed on their national VOS. This was a similar figure to that reported at the last session. However, the number of deployed shipborne AWS had risen to 392 systems (an increase of approximately 60 systems since the last session). Information on the reported status of shipborne AWS derived from annual VOS reports at the end of 2014 was presented to the Panel.

8.3.3.1.3. The VOSP Chair advised that the number of AWS systems reported in the VOS national reports was inconsistent with the number of automated systems reported in the E-SURFMAR metadata database (257 systems listed in March 2015). She therefore reiterated the ongoing action placed on VOS Focal Points to ensure that their WMO Pub47 metadata records are maintained up to date.

8.3.3.1.4. The Panel noted that almost half the number of AWS systems reported by Members in their VOS reports had the facility to manually add the traditional visual observations to the measured automated observations. However, the number of visual reports actually being added by observers to the automated reports was still disappointing. It was hoped that this trend would be reversed when EUCAWS links to the TurboWin+ software, which will be more familiar to observers.

8.3.3.1.5. The Panel noted with some concern that most of the established major VOS operators now had plans to automate their national fleets and in some cases were planning to substantially reduce the size of their manually reporting VOS fleets. Because many of these automated systems were likely to fall into the Supplementary AWS VOS Class (i.e. without the ability to manually add visual data), there were potentially serious implications for the future of the VOS Scheme and for continuity of the climate records.

8.3.3.1.6. The Panel reviewed initiatives for the enhancement of automation, including on the E-SURFMAR AWS developments, and other AWS rollout systems/plans such as AMOS, as detailed in paragraphs 8.3.3.1 to 8.3.3.3 below.

8.3.3.2. E-SURFMAR - EUCAWS developments

8.3.3.2.1. 8.3.3.1.1 Mr Henry Kleta (Germany) reported on the extensive work that had been undertaken by E-SURFMAR Members to develop the new E-SURFMAR Shipboard AWS system, now named EUCAWS (European Common AWS), but being marketed under the name Neptune by the manufacturer Sterela.

8.3.3.2.2. The EUCAWS system was developed after lengthy discussions with the E-SURFMAR Membership, which had resulted in detailed design specifications and recommendations. In its normal mode of operation, the system requires no intervention from the ships staff, although visually observed parameters can be added by the observer using the TurboWin+ program.

8.3.3.2.3. EUCAWS essentially consists of a processing unit, a satellite position system and a two-way Iridium satellite communication system providing global coverage. A service unit allows PMO's or technicians to check and configure the system, while a Land-Based Monitoring Facility enable shore based staff to configure the system remotely using Iridium two way communication. The system has been designed to work with a wide range of different sensor types.

8.3.3.2.4. Tendering documents for the EUCAWS system were issued in mid 2012 and following detailed evaluation of the tenders, it was decided to establish a Framework Agreement with the chosen manufacturer. Under this agreement, participating E-SURFMAR Members are able to purchase the S-AWS systems through national contracts.

8.3.3.2.5. Mr Kleta advised the panel that under the agreement Sterela had built three prototype systems and that following the successful Factory Acceptance Test (FAT) in December 2014, the first prototype system has been installed on the Brittany ferry 'Amorique' in January 2015 for the Site Acceptance Test (SAT), which has not yet been accepted due to still unsolved challenges (i.e. with the connectors). Once these challenges are solved, the three prototypes will undergo intensive tests during the six-month acceptance period in Germany, France and the Netherlands.

8.3.3.2.6. The Panel noted that expressions of interest to purchase as many as 300 E-SURFMAR EUCAWS systems had already been received from several European National Meteorological Services (notably Germany, France and the Netherlands).

8.3.3.3. AMOS developments

8.3.3.3.1. The VOSP Chair reported on the roll out status of Met Office's Autonomous Marine Observing System (AMOS). She explained that more than 40 systems had now been installed on UK VOS. Most of the systems had been installed on ferries and coastal vessels operating around the UK coast and in near continental European waters. However, systems had also been on several research and survey ship operating in the data sparse areas of the Southern Ocean.

8.3.3.3.2. In the coming year it was planned to install a further fifteen AMOS systems and that a target of 100 AMOS systems had been set by the Met Office. Up to now, the system has essentially been a trial system but now that it had been proven in service, it was planned to make it a fully operational system later this year and issue it with an internal production license. To do this the procedures and processes necessary for dealing with fault and asset management were being developed, and documented work instructions were being prepared.

8.3.3.3.3. It was noted that there were currently two variants of the AMOS system – a stand-alone solar powered version that required no links to the ships systems, and a 24-volt that only required connection to the ships power supply. Whilst both systems were now operating well the preference was to install 24 v version, and to increasing move over to using such systems in the future. However, several shipowners had expressed a preference for the solar variant.

8.3.3.3.4. Plans were also being made to develop an Mk2 version of the AMOS, which would be able to connect either wirelessly or via cable to a visual display on the ships bridge. Many captains had expressed a wish to have such display information available to them to assist with their shipboard and navigational operations.

8.3.3.3.5. At present, the raw CSV data from the AMOS systems was being processed by a third party and converted into FM-13 ship code. However, the Met Office was in the process of developing a new marine data gateway, which would soon permit the raw data to be processed within the Met Office and converted into BUFR[21] format for circulation to Members via the GTS.

8.3.3.4. Other AWS developments

8.3.3.4.1. The VOSP Chair pointed out that a number of other shipboard AWS systems had been reported by Members in their national VOS reports. Some of these related to well established systems such as the BATOS, AVOS, BAROS. MAWS and MILOS. However, there were several systems reported that were not so well known internationally. She therefore stressed the benefits of exchanging information on ship AWS systems and to provide documentation on their design and operation and the algorithms used in their software. The Panel therefore requested its members who operate ship AWS systems (e.g. Japan, India, China) on their VOS to keep the Panel and the TT on Instrumentation informed of any new AWS developments and to report on their system developments at the next session (***action; VOS Operators; SOT-9***).

8.3.3.4.2. The meeting encouraged the VOS Operators, in liaison with ship operators and managers, to start using web-based TurboWeb electronic logbooks on suitable observing ships (***action; VOS Operators; SOT-9***).

8.3.3.4.3. Balakrishnan Nair T. M. (India) reported that under the Indian Real-time Automatic Weather Station (I-RAWS) program, India established network of 20 AWS onboard ships operating in the Indian Ocean region to measure true wind speed, direction, AT, AP, Humidity, rain, long wave and shortwave radiation. Installation of additional 15 numbers of I-RAWS is underway for the year 2015. The systems are integrated with Indian geosynchronous communication satellite INSAT (3A and 3A) and data is received in Real-time at 30 minutes interval. An automated Real-time quality control procedures and parallel processing systems are established for data reception and dissemination. A web portal for health monitoring of the systems and for facilitating calibration and logistics management is also in place. Data from 11 ships are pushed to GTS. As a new initiative, water quality sensors such as SST, Chlorophyll and Turbidity are also integrated with two of the I-RAWS systems. In addition, India also established one ship based Real-time Wave height meter to measure the ocean waves along the shipping routes integrating with INSAT. The performance of the systems and the usage of data for ocean and monsoon forecasting, satellite and model data, among other things, are published in high impact factor scientific journals such as JAOT of American Meteorological society.

8.4. PMO Status and activities

8.4.1. Role of the PMO

8.4.1.1. The Panel recalled that the Port Meteorological Officers (PMOs) play an important role in all of the observing programs of the SOT. Their roles are described in Chapter 6 of WMO Publication No. 471. In terms of the VOS Scheme, they play a vital role in maintaining the strength of the VOS Scheme, as well as contributing to the volume and frequency of accurate observations.

8.4.1.2. The Panel reviewed the status of PMO Global network and noted that there are currently 116 PMO contacts listed on the JCOMM website[41]. However many of these contacts are part time PMOs and may only have limited contact with the VOS. In addition, some national PMO contacts limit their involvement to automated VOS. In order to gain a clearer understanding of the true level of PMO activity the Panel agreed that the SOT national report format should be amended to include field to report the percentage of PMO time actually spent on PMO related activities and VOS ship inspections, and requested the WMO Secretariat to update the template accordingly (***action; SOT Chair & WMO Secretariat; Nov. 2015***).

8.4.1.3. The Panel further noted that the PMO contact details currently include the address, telephone number and fax number. As very few people use fax nowadays, and because most ships now use email for their communications with ships, the Panel recommended that the PMO listing on the JCOMM website should be amended to also include email addresses, and requested the WMO Secretariat to request email addresses from the PMOs when the information is unknown, and to update the website accordingly (***action; WMO Secretariat; Nov. 2015***).

8.4.1.4. The Panel also noted that the SOT Chair had recently updated the Google Earth **Find-a-PMO** facility that is accessible via the VOS website[42]. The Panel generally liked this facility, which also includes images of the PMOs, and felt that it should be continued when the VOS website transfers to JCOMMOPS.

8.4.1.5. The VOSP Chair reminded the Panel that since 2013 the annual national VOS reports now required members to report on their PMO inspection activities and drew the meetings attention the details she had extracted from the 2013 and 2014 reports. In undertaking this exercise, she had noted that several members were still using the old VOS reports that did not include this PMO information. Some members appeared to have simply failed to fill in the necessary details. Furthermore, not all members had reported in both years, and fewer members reported in 2014.

8.4.1.6. For these reasons, it was difficult to draw any clear conclusions from the information provided, although close analysis of the data suggested that there had been a small increase in the overall number of PMO inspections of VOS since December 2013. The VOSP Chair suggested that a better method of reporting PMO inspections needed to be developed, possibly using an online VOS national form, which could auto-generate the PMO inspection statistics and provide the necessary instructions on how to enter the data. This would then allow metrics to be developed to more clearly monitor the level of international PMO activity. The Panel requested the SOT Technical Coordinator to investigate whether an on line National VOS form could be developed to allow metrics to more clearly monitor the level of international PMO activities (***action; M. Kramp; Jan. 2016***).

8.4.1.7. Analysis of the routine inspection numbers provided in the VOS national reports also appeared to reveal a reduction in the number of manned VOS inspections and an increase in the number of AWS inspections – although inconsistent reporting year on year again made it very difficult to draw any clear conclusions.

8.4.1.8. The VOSP Chair pointed out that the expected increase in the automatic component of the VOS fleet would inevitably have an impact on the future of the PMO role and the skills sets they will require. Although increased technical competencies would probably be needed, the level of technical knowledge needed would depend on the type of AWS system being used. In the case of the small 'autonomous ' systems the PMO would

41 http://www.jcomm.info/index.php?option=com_oe&task=viewGroupRecord&groupID=151
42 http://www.bom.gov.au/jcomm/vos/find_pmo.html

only need limited technical knowledge because the whole unit could be simply replaced in the event of a major failure, and the old unit returned to the technicians for repair ashore. In the case of complex 'integrated' AWS systems, which need to be interfaced with the ships own systems, substantially greater and more specialized and technical competence would be needed for routine maintenance and failure resolution.

8.4.1.9. Because the procedures involved with inspecting a manual observing ship are largely universal it is relatively easy for a PMO from one VOS operating country to inspect a ship from another, thereby helping to foster increased cooperation between PMOs and encouraging continued participation in the VOS Scheme. However in the case of automated systems it is likely be much harder to maintain the currently levels of cooperation because each AWS system is likely to require specialist technical knowledge and experience, and replacement sensors are unlikely to be readily available in other inspecting countries.

8.4.1.10. Nevertheless, the traditional PMO competencies would still be needed for complex AWS systems that employ a visual display on the bridge and require ships officers to manually add the visual observed elements (e.g. waves, swell, weather, cloud types/heights etc.) to the measured automated AWS observations. In addition, to verify the quality of the AWS data, the PMO will still need to use transfer standard instruments to check the accuracy of the AWS sensor output - but may now also need to be equipped with an internet-enabled notebook to connect to the AWS systems' configuration port.

8.4.1.11. Consequently, there is a growing need for future PMOs to be trained in the basic technical skills necessary to maintain an AWS in service. The Panel was therefore pleased to note that such issues were now being addressed by the Task Team on Training and that E-SURFMAR was planning to hold a Workshop next year to train PMOs on the functionality of the EUCAWS AWS system. In order to enhance technical cooperation and exchange, the Panel requested E-SURFMAR to consider also inviting interested PMOs and technicians from outside E-SURFMAR to attend their planned Workshop in 2016 (***action; P. Blouch; March 2016***).

8.4.1.12. The Panel noted that in accordance with the SOT Implementation Strategy[43], the Team was committed to capacity building through the development of partnerships between developed countries and developing countries. Moreover, it recognized that organizing regular PMO workshops was an efficient mean of realizing the Partnerships for New GEOSS Applications (PANGEA) concept established by JCOMM. The forthcoming Fifth International Workshop of Port Meteorological Officers (PMO-5) to be held in Chile from 20 to 24 July 2015 therefore fits well with the PANGEA concept.

8.4.1.13. In considering this item The VOSP Chair also reminded the Panel that SOT Terms of Reference called for coordination of Port Meteorological Officer (PMO)/ship greeting operations globally, and for actions to be proposed to enhance PMO standards and operations, and to contribute as required to PMO and observers training. She also drew the Panels attention to the SOT Implementation Strategy[43] document, which calls for the development of simple metrics to calculate the intensity of PMO effort in maintenance of the observing networks.

8.4.1.14. Similarly, the Panel recognised that the PMO "buddy" system being established under the VOS Drifter Donation programme provided a good opportunity for increasing the number of contributors to the global observing effort, and for enhancing the scope of the VOS Scheme.

43 JCOMM Technical Report No. 61 - http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=9936

8.4.1.15. The Panel also recognised that programme integration could also have an impact on the future role of the PMO as they are increasingly called upon to provide a ship-greeting service to ships engaged in other programme activities, and in particular for oceanographic observations. PMO support for regional buoy and float deployment programmes would for instance directly support the objectives of the Data Buoy Cooperation Panel (DBCP) and its Regional Action Groups, and also the Argo Science Team (AST). The PMOs therefore have an important role to ensure that volunteer ships are not being over-tasked by demands imposed by various programmes.

8.4.1.16. In view of the increasing scope of demands being placed on PMOs themselves the VOSP Chair suggested that, where possible, efforts should be made to harmonise and standardise PMO practices by developing uniform international work instructions and guidance. To some extent the quick reference guide on the VOS website[44] already provided an overview of the key activities undertaken by a PMO but did not go into detail. For instance, there was a need to properly address the health and safety issues associated with visiting recruited ships, and to ensure that PMOs are fully trained. The Panel noted that the USA was in the process of developing a document with details on its PMOs practices, duties, and tasks. The Team invited USA to share this PMO practice document with the VOS Panel once developed (***action; USA; asap***).

8.4.1.17. the Panel agreed that having a level of uniformity in the procedures carried out by PMOs would help to ensure that ships are inspected and maintained to a common, high standard, and would also help to ensure that the message given to ships observers is consistent. In addition, having comprehensive work instructions would help other countries to establish a PMO presence in their ports and to encourage their participation in the VOS Scheme. The Panel therefore recommended that work should commence on developing a new JCOMM guidance document to address, in so far as is practicable, the full scope of PMO work instructions, duties and responsibilities, and requested the Task Team on Training, and the Task Team on VOS Recruitment and Programme Promotion to jointly develop such a document (***action; S. North, P. Rychtar, PMOs; SOT-9***). The Team also agreed to amend the two Task Teams' Terms of Reference accordingly (***action; SOT; SOT-8***).

8.4.2. VOS & AWS inspection reports - implications of automation

8.4.2.1. The Panel noted that the whilst there were a variety of VOS inspection and recruitment forms in use by national VOS operators for manned VOS many of the details collected were common. A list of the details used had already been collated within E-SURFMAR with a view to establishing a common inspection form that could possibly be linked directly to the E-SURFMAR metadata database.

8.4.2.2. The Panel also noted that E-SURFMAR was establishing new 'Rules for collaboration on PMO activities' between its European member nations with a view to financially compensating members who undertake more than 15 courtesy inspections of VOS from other E-SURFMAR member countries. Whilst it was recognized that this arrangement would be limited to E-SURFMAR it was nevertheless considered that there was a need to keep closer track of courtesy inspections undertaken internationally.

8.4.2.3. In this respect, it was further noted that to qualify for compensation in the E-SURFMAR scheme the inspecting nation was required to upload a completed a copy of the VSOP001- Report of Inspection to Foreign VOS form[45] to the E-SURFMAR metadata database as a permanent record of the inspection. The Panel suggested that it would be good practice for all international PMOs to upload completed copies of their foreign VOS

44 http://www.bom.gov.au/jcomm/vos/quick_reference_pmo.html
45 http://www.bom.gov.au/jcomm/vos/documents/vosp001.doc

inspection forms to the E-SURFMAR database (***action; PMOs; asap & ongoing***).

8.4.2.4. The Panel recalled that at the last session it was agreed that consideration should be given to developing new 'Shipborne AWS – VOS' inspection, and site inspection forms. In this regard it was noted that E-SURFMAR were considering the development of a new inspection form for ships with AWS that could be uploaded to the E- SURFMAR metadata database and which would link, where appropriate, with the appropriate metadata fields. The Panel requested E-SURFMAR to keep the Panel advised on their development of a new AWS inspection form for ships with AWS. (***action; P. Blouch; SOT-9***).

8.5. VOS Issues

8.5.1. VOS Classes

8.5.1.1. Future composition of the international VOS fleets

Current status of VOS Classes

8.5.1.1.1. The VOSP Chair pointed out that 52% of ships in the international VOS fleet were currently recruited to the 'Selected' Class. This had reduced from 59% at the last session. The second largest component of the fleet was the 'Supplementary' class, which had remained constant since the last session at 18%, although the number of ships actually recruited to this class had fallen.

8.5.1.1.2. The Panel noted that, in terms of ship numbers, the automatic component of the VOS Fleet had only increased slightly, from 7% at the last session to 8.4% at the current session. Meanwhile the combined percentage of ships recruited to the VOSClim and VOSClim (AWS) Classes had only risen by 4%.

8.5.1.1.3. Although the overall composition of the VOS fleet classes had therefore not changed significantly since the last session, the overall size of the VOS fleet had fallen by almost 300 ships.

8.5.1.1.4. Bearing in mind the plans being made by several VOS operating countries to automate their vessels, and the proposals to upgrade TurboWin to permit only VOSClim class observations, the Panel considered that there would inevitably be a gradual shift away from the traditional manually reporting VOS Classes (i.e. Supplementary, Selected and Auxiliary) in the coming years.

Future composition of the international VOS fleets

8.5.1.1.5. At present, there are eight approved VOS Classes in use in the VOS Scheme i.e. four classes for manual reporting VOS, and four classes for automated VOS. The definitions for each of these types of meteorological reporting ship are specified under the vsslM code in code table 2202. Two further classes for Ancillary and Ancillary (AWS) will also be considered at the current session, making a potential total of ten VOS classes. The current VOS Classes are as follow:

- Selected
- Supplementary
- VOSClim
- Auxiliary
- Selected (AWS)
- Supplementary (AWS)
- Auxiliary (AWS)

- VOSClim (AWS)

8.5.1.1.6. The VOSP Chair pointed out that the original classes for manual reporting ships – Selected, Supplementary and Auxiliary were largely related to the number of elements in the WMO Ship Code that were to be reported. The Panels attention was drawn to the list of elements reported by each VOS Class and to an extract from the Met Office Ships' Code and Decode Book (1996 Edition) detailing the code groups to be reported by each of these classes

8.5.1.1.7. Although the Traditional alphanumeric Code (TAC) FM-13 SHIP had now been superseded by the binary Table Driven Code (TDC) FM-94 BUFR[21] for international data exchanges between national Meteorological Services, it was recognised that the use of the FM-13 SHIP code on board ships for transmitting data ashore would likely continue for a few more years. Notwithstanding, the Panel recognised that electronic logbook software was now being developed to allow data to be transmitted in binary compatible codes, such as the E-SURFMAR #101 format. This would therefore allow the higher resolution data to be gradually increased and shared internationally. In addition, the new TurboWin+ software would only permit reporting of VOSClim class data.

8.5.1.1.8. The Panel also recognised that the FM-94 BUFR[21] template undergoing validation would allow the additional VOSClim elements to be shared in real time, whereas for the last decade they have only been available in the delayed mode International Maritime Meteorological Tape (IMMT) format downloaded from the ships electronic logbooks i.e. because changes to the FM-13 SHIP code were restricted when the VOSClim elements were introduced.

8.5.1.1.9. With these significant changes in mind the VOSP Chair suggested that there was a growing need to revisit the current VOS classes for manually reporting VOS and proposed that, in her view, the Supplementary and Selected classes should be phased out and eventually withdrawn, ideally by SOT-10. She suggested however that the manned Auxiliary class should probably be continued, as these ships used their own instruments for reporting their observations, and had value for temporary recruitment in data sparse areas.

8.5.1.1.10. With respect to the automated VOS classes, the Panel noted that the number of small autonomous AWS systems, currently recorded under the Supplementary (AWS) class had increased since the last session. Meanwhile the number of Selected (AWS) class ships, which according to their definition may or may not have a facility to manually add visually observed elements, had decreased. The VOSP Chair pointed out that AWS systems were increasingly modular in design and ranged from complex 'integrated' AWS systems to very simple 'Autonomous' AWS systems. With these developments in mind, and taking into account the need for increased volumes of VOSClim quality data, she suggested that consideration could therefore be given to the phased withdrawal of the Selected AWS class.

8.5.1.1.11. The Panel discussed this matter and requested the TT-VRPP, in liaison with the VOSP Chair, to undertake a review of the current VOS Classes with a view to making recommendations to the Panel for consideration and approval at SOT-9 (***action; S. North & TT-VRPP; SOT-9***). Accordingly, the Team agreed to add the review of the current VOS classes to the Task Team's Terms of Reference (***action; TT-VRPP; SOT-8***).

8.5.1.2. Upgrading to VOSClim standards

8.5.1.2.1. Further to the consideration given to the issue under agenda item 8.2.1.1, the VOSP Chair suggested that proposals made at the last session to significantly increase the number of ships recruited to the VOSClim class had not been successful. She suggested however that restricting future versions of the TurboWin+ and TurboWeb software to only VOSClim would help encourage future levels of participation in the class.

8.5.1.2.2. In order to accelerate VOSClim participation by manually reporting ships, the VOSP Chair therefore proposed that consideration should be given to restricting all future electronic logbook versions to VOSClim class reporting. Because the NOAAs National Weather Service had now decided to discontinue using AmverSEAS software this proposal would essentially only apply to the OBSJMA and TurboWin software. Accordingly, the Panel requested the KNMI and JMA to consider the feasibility of restricting future versions of their future electronic logbook versions to VOSClim class reporting (***action; KNMI/E-SURFMAR, JMA; SOT-9***).

8.5.1.3. Third party data and non-VOS support ships

8.5.1.3.1. Further to the discussions that had already taken place on the Ancillary Pilot Project (Agenda item 7.8) and on increased data coverage (agenda item 8.2.1.4), the VOSP Chair suggested that the Panel should consider the potential for 'crowd-sourcing' third party data as a way of increasing coverage, recognising however that quality may be impacted and would require new monitoring procedures.

8.5.1.3.2. The VOSP Chair pointed out that the growing world of social networking online made it relatively easy for anyone to get involved and to share their weather observations. In this respect the planned extension of the WOW website[46] to include marine data was expected present a possible means of promoting the growth of the marine weather observing community, not only in the UK, but worldwide.

8.5.1.3.3. WOW[46] is open to both casual marine observers and keen weather enthusiasts. As with the current land based WOW[46] observers, weather reports could be made using all levels of equipment found on board ships. In addition, bearing in mind that relatively few marine users have access to the web at sea, the VOSP Chair pointed out that users could bulk upload files of delayed mode data as long as it was in the correct WOW[46] format.

8.5.1.3.4. In addition to the potential offered by interactive sites such as WOW[46] the VOSP Chair suggested that currently data sparse areas could also be filled through the targeted use of low cost autonomous ship AWS systems, and through the recruitment of ocean going yachts.

8.5.1.3.5. The VOSP Chair also pointed out that shipowners were increasingly fitting their new vessels with quality instruments, and in some cases with automatic weather stations, but that the data from such instruments was not available to national meteorological services. Recognising the limitations on NMS and PMO resources to recruit and maintain observing ships, she suggested that closer linkage was needed with the leadership shipping companies in order to gain access to this valuable third party data. In this regard, she pointed out that many operators of oil rigs and platforms around the UK continental shelf were already making their third party

46 http://wow.metoffice.gov.uk/

data available so that it could be used for safety purposes and for the common good.

8.5.1.4. Collection of delayed mode data

8.5.1.4.1. The VOSP Chair invited the Panel to consider the possibility of configuring the TurboWin electronic logbook program to allow the delayed mode IMMT log files to be emailed directly to the Global Collecting Centres (GCCs).

8.5.1.4.2. In accordance with WMO Pub 471, it was noted that the primary responsibility for applying the Minimum Quality Control Standard (MQCS) of IMMT data currently rests with the contributing national meteorological service (Contributing Member / CM) where the data originated. The CMs then send the data to the Global Collecting Centres (GCCs), who ensure that the MQCS have been applied, and thereafter supply data sets to the Responsible Members (RMs).

8.5.1.4.3. The VOSP chair suggested that provided the TurboWin program could quality control the data to the required levels and eliminate duplicates it would be more efficient for the data to be routine direct to the GCCs. This would be simple to achieve, would streamline the current procedures, and would potentially increase the volume of data provided to the GCCs. She reported that she had already informally raised this suggestion with a number of members, and the GCCs, and had received a mixed response.

8.5.1.4.4. The initial response from the GCC was generally not supportive as it was felt that it might generate extra work putting datasets together from the original ship files. They also considered that it was a good arrangement for the contributing members to do this work as it allowed them closer interaction with their own fleet's data. Apparently the contributed data can often contain many near-duplicates (date/time) and decisions have to be made about which observations can be stored, and which have to be deleted. Other problems in the data can include missing country codes, dates in the future, missing indicators or signs, displaced columns, wrong positions etc. Whilst it was recognised that TurboWin does take care of some of the quality issues, the GCCs nevertheless felt that some would remain.

8.5.1.4.5. However at least one member was of the view that the TurboWin checks were in some respects better than those applied in the MQCS procedure in that they take into account the extra confirmations made the observer him/herself who would be asked 'are you sure' before making a positive confirmation of an extreme reported value. It was also questioned why the GCCs did not have the necessary computing power to automatically eliminate duplicates to derive a complete data set. In this respect it was further suggested that consideration should be given to revising the current MQCS routines to take into account extra information like model analysis, advanced spatial checks algorithms etc.

8.5.1.4.6. The VOSP Chair reminded members that the volume of delayed mode data from manned VOS was likely to be in decline as VOS operators increasingly automate their fleets. She also pointed to the 2014 GCC report, which showed that more than half the IMMT data received was now derived from automated VOSClim (AWS) class ships. Furthermore, it was noted that the number of contributing members and volume of data processed had been in decline in recent years (currently 18 out of 27 members currently contributing).

8.5.1.4.7. With these considerations in mind the Panel invited the ETMC to investigate the potential for developing automated procedures to allow IMMT data to be sent direct to the GCCs, and to liaise with KNMI about any modifications that might

be necessary to the quality controls in TurboWin to allow this to happen (***action; L. Gates; SOT-9***).

8.5.2. VOS website

8.5.2.1. The VOSP Chair, acting on behalf of the VOS website webmaster (Mr Graeme Ball) advised the Panel about the arrangements for transitioning the VOS website from the Australian Bureau of Meteorology to JCOMMOPS. She thanked Mr Ball for all the hard work he had put into developing and maintaining the website, and for acting as the VOS Webmaster. The website was now the recognised international focus for all VOS Scheme and first stop for anyone interested in VOS activities.

8.5.2.2. The Panel noted that Mr Ball had prepared a report on the changes to the VOS Website during the last inter-sessional period and follow-up actions from SOT-7. Mr Ball also reported on the proposed relocation of the VOS Website from ABOM to JCOMMOPS during 2015.

8.5.2.3. In this latter regard, the SOT Technical Coordinator advised that he had recently activated a redirection from the VOS webpages[47] of JCOMMOPS to the existing VOS URL[48] at the Australian Bureau of Meteorology.

8.5.2.4. The Panel concurred with the following recommendations proposed by Mr Ball:

- The Panel endorsed the proposal to relocate the VOS Website from ABOM to JCOMMOPS (***action; G. Ball & M. Kramp; 1 Aug. 2015***);
- The VOSP and SOT TC to discuss **Find-a-PMO** and decide who will be responsible for future updates to the PMO contact details (***action; S. North & M. Kramp; 1 Aug. 2015***);
- Mr Ball to place a redirection link from the VOS Website at ABOM to the VOS Website at JCOMMOPS once the transfer is complete (***action; G. Ball; once the website relocation is complete***); and
- The VOSP Chair or SOT TC to inform the mailing lists of the relocation, including the new link to Find-a-PMO (***action; S. North or M. Kramp; once the relocation is complete***).

47 http://sot.jcommops.org/vos
48 http://www.bom.gov.au/jcomm/vos/

9. ELEVENTH SESSION OF THE SOOP IMPLEMENTATION PANEL (SOOPIP-11)

9.1. SOOP Programme activity reports

9.1.1. Report by the SOOPIP Chairperson

9.1.1.1. The SOOPIP Chairperson, Dr Gustavo Goni, reported to the panel on the status of the SOOPIP XBT network activities. XBT transects were first implemented in the early 1980s, and the current XBT network recommended by the scientific community includes repeated transects in frequently repeated and high-density mode. Until the introduction of Argo profiling floats, the XBT network constituted more than 50% of the global ocean thermal observations. With the Argo array now in place, XBT observations currently represent approximately 15% of temperature profile observations. The goal of the XBT network is to obtain temperature sections along fixed repeated transects to enhance our knowledge of the temporal and spatial variability of key surface, subsurface, and boundary currents, and of meridional heat transport (MHT), and to complement temperature observations obtained from other platforms to monitor the global ocean heat content. The current XBT network include 50 transects, of which 29 are currently active. Some transects, such as IX01, AX07, AX32, and PX06, have been sampled already for more than 20 years. Data from all XBT transects are distributed in real-time. A number of approximately 3,000 XBT profiles obtained from research vessels are usually received with a delay of two or more years. The US is currently distributing all real-time data using BUFR[21] format and the SOOPIP will be aiding Australia in its implementation. . Discussions will be held on the current use of XBT data for MHT and ocean current studies and for upper ocean heat content monitoring. In addition, discussions will be held on the role that SOOP currently plays given the advancement of science and the implementation of scientific panels in the oceanographic community, including the formation in 2011 of the XBT Science Team.

9.1.1.2. The Panel agreed on the following:

(i) To maintain and increase the current international collaboration and partnerships to enhance implementation of the XBT network (***action; SOOPIP members; ongoing***);

(ii) To promote close collaboration among panel members to identify issues on the implementation and data management (***action; SOOPIP members; ongoing***);

(iii) To strengthen the collaboration with oceanographic panels that are focused on obtaining profile data for scientific and operational applications (***action; SOOPIP members; SOT-9***);

(iv) To support the processes to carry out joint meetings with scientific panels dedicated to profile data in order to enhance the contribution to the scientific community of the XBT network and observations from ships of opportunity (***action; SOOPIP members; asap***).

9.1.2. SOT Technical Coordinator report on SOOP support activities

9.1.2.1. The Team recalled that JCOMM-4, through Recommendation 1 (JCOMM-4, see Appendix A) recommended in particular that (i) WMO Members and IOC Member States should record and provide through the appropriate mechanisms, on a routine basis, the required metadata about ocean instruments and observing platforms that they operate; and (ii) JCOMMOPS should routinely contact platform operators so that the metadata are

being submitted to the relevant Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs), including for operational platforms and for historical ones.

9.1.2.2. The Team also recalled that a metadata collection mechanism has been established by SOOP through the SOOP annual XBT survey coordinated by JCOMMOPS. A dedicated metadata format has been developed many years ago for SOOP operators to submit the metadata for every XBT and XCTD profile on a yearly basis. The TC presented the format and mechanism.

9.1.2.3. The Team noted with concern that while this mechanism had been implemented and maintained by the different SOOP agencies for more than a decade, and despite all efforts, including involvement of SOT and SOOPIP chairs, a satisfying collection of SOOP metadata from participating agencies could not be resumed by the TC in the last two years. Nevertheless, the Team thanked NOAA-AOML for support in this matter, and also all involved Australian agencies (BOM, CSIRO, RAN), which have submitted data continuously, in a timely manner and appropriate format to JCOMMOPS.

9.1.2.4. The Team discussed the matter and once again agreed that the JCOMMOPS SOOP survey is an important monitoring tool, and should as before be coordinated and produced by JCOMMOPS and the SOT Technical Coordinator, Mr Martin Kramp, who is seen an actor independent of national interests. Indeed, while the Team recognizes that the implementation of SOOP is driven by both national and global international interests, the monitoring of the SOOP must only reflect how the global international requirements are met (the monitoring of how the national requirements are met is the responsibility of Members and Member States).

9.1.2.5. The Team also agreed that as already successfully implemented for ASAP platform metadata, the establishment of a SOOP platform metadata collection is now of high importance, in addition to operational deployment metadata.

9.1.2.6. Mr Kramp, reported that in lack of sufficient delayed-time data provided by the agencies, the production of monthly and yearly maps have been resumed only based on data from the GTS, for XBT and XCTD deployments, and TSG data. These maps are not based on platform metadata and not checked for conformity with an XBT line.

9.1.2.7. The Team noted that NOAA-AOML gathers and processes data from a number of different sources and partners, and creates global statistics. These already processed data have gratefully been submitted to the SOT-TC, who submitted the NOAA-AOML SOOP operations report as estimation of the global implementation to JCOMM without any modification for 2012 and 2013.

9.1.2.8. The Team noted that the metadata collection issue had been discussed in a side meeting with the SOOPIP Chair, the deputy SOT Chair/JCOMM co-President, and the JCOMM secretariat. In agreement with the Team, it was now agreed that all non-AU XBT metadata should as of now be submitted to JCOMMOPS by AOML, at a due month yet to be decided. Nevertheless, metadata can as before also be submitted by all SOOP members to JCOMMOPS in the dedicated format.

9.1.2.9. Regarding vessel recruitment, Mr. Kramp reported on activities requested by NOAA-AOML, particularly for AX18. Ships operating for Hamburg Süd had been identified on the direct line, which had been the main driver for the TC to successfully establish a deeper, cross-programme and company-wide agreement with the long-time partner Hamburg Süd. Unfortunately, by the time this was set up, the direct AX18 line had been taken out of the Hamburg Süd portfolio. The Team appreciated the cross-cutting approach with Hamburg Süd and encouraged the TC to continue likewise with other big shipping

companies.

9.1.2.10. The SOOP noted that information on scheduled SOOP cruises would also be of interest for other panels (e.g. DBCP, Argo) and agreed to submit and update such information in the future to the Technical Coordinator, in the framework of the cross-cutting ship coordination (***action; SOOP members; ongoing***).

9.1.2.11. Mr Kramp reminded the Team that in absence of volunteer vessels on crucial lines, JCOMMOPS has developed capacities to set up cost-effective and cross-cutting charter solutions, given that density issues in such sea areas are mostly shared by several Panels, and combined SOOP-VOS-Argo-DBCP missions seem conceivable. E.g. Lady Amber, on stand-by in Cape Town, could establish such a mission on short notice.

9.1.2.12. The Team recommended the following:

(i) To establish an *ad hoc* Task Team on SOOP metadata Chaired by Joaquin Trinanes (USA) to start working immediately and to report to the Chair no later than mid-2016 (***action; ad hoc TT on SOOP metadata; end 2015***). The Terms of Reference of the ad hoc Task Team, and its membership are detailed in ***Annex IV***.

(ii) SOOPIP members (active XBT agencies) to provide the SOOP metadata on a semestrial basis to JCOMMOPS or AOML (***action; SOOPIP members; ongoing***).

(iii) To resume the routine production of the SOOP survey (***action; SOT TC; ongoing***);

(iv) To provide the SOT TC with information on community meetings, and other information as appropriate (***action; SOT members; ongoing***);

(v) To privilege mailing lists for communication inside the community. (***action; SOT members; ongoing***);

9.1.3. XBT Science Team

9.1.3.1. Dr Shenfu Dong (USA) reported to the panel on the activities of the SOOP XBT Science Team. The SOT-7 re-established a SOOP 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.

9.1.3.2. The XBT Science team has guided a series of XBT Science and Fall Rate Workshops which led to a consensus on recommending a unique XBT Bias correction to the global XBT data set (Cheng and Co-authors, 2015; Fourth XBT Science Workshop progress report : making consensus and establishing best practices to reduce XBT biases. Submitted to BAMS.) The team has set up a web page[49], which provides easy access to XBT data, products and related scientific and operational products. The team also

49 http://www.aoml.noaa.gov/phod/goos/xbtscience/

promoted MOC/MHT studies with an MOC webpage. The next meeting of XBT-ST will be aligned with the 2016 IQuOD meeting.

9.1.3.3. The Panel thanked Dr Dong for the report and noted that the individual panel members are invited to participate in SOOP XBT Science Team activities,

9.2. Programme status and implementation

9.2.1. Status of SOOP implementation

9.2.1.1. Several parameters are being considered to evaluate the performance of the XBT network. 1) Of the 50 proposed transects, 29 are currently being occupied. 2) Currently, between 18,000 and 20,000 XBTs are deployed per year, out of the approximately 30,000 probes that should be deployed if all transects were occupied. The difference between the actual and recommended number of realizations are due mostly to budgetary and not logistical (for example, ship recruitment) issues. 3) A metric also being evaluated is the scientific impact as given by the number of research publications that use XBT observations. Currently, some 70 white manuscripts are published every year that use XBT data, not including those that use climatological temperature fields that have used XBT observations in their publications. 4) The support to other key observational platforms, such as surface drifters, profiling floats, and pCO2 observations, are also important to evaluate the performance of the XBT network. The Chairman noticed that since 2000, 660 Argo floats and 880 surface drifters were deployed in the Atlantic Ocean by riders of XBT riders.. These ships are also used to deploy drifters and floats where deployment opportunities are scarce.

9.2.1.2. The Panel agreed on the following:

(i) To continue assessing the status of XBT Network using a suite of parameters (***action; SOOPIP members; ongoing***);

(ii) To continue collaboration with JCOMM to assess the status of the XBT network (***action; SOOPIP members; SOT-9***);

(iii) To continue partnering with other panels to help implement their deployments (and inform the SOT TC accordingly) (***action; SOOPIP members; ongoing***);

(iv) SOOP members to explore possibilities for assisting whenever possible, and if funding and support resources allow, to allow the undertaking of VOS observations from SOOP ships (***action; SOOP members; ongoing***).

9.2.2. XBT sampling transect occupation

9.2.2.1. The Panel reviewed the status of the current sampling programme. Due to the complementary nature of the XBT SOOP, Argo, Tropical Moorings, and OceanSITEs, and considering the outcome of the OceanOBS'09 Conference, and the development of the Tropical Pacific Observing System 2020 (TPOS-2020) and the recommendations from the XBT Science Team, the Panel discussed possible adjustments to the global sampling scheme. Future plans include: work in conjunction with JCOMMOPS in generation of reports monitoring XBT operations; maintain; increase international partnerships; recruitment of ships in selected problematic transects; enhance support to ships with multiple observational platforms, including weather observations; fully implement real time data transmissions in BUFR[21] into the GTS. Current international partnership work currently include the sharing of resources, such as probes, recruitment of ships and riders, transmission in real-time, data distribution, etc. These activities make the current XBT network operations extremely successful and cost-effective. The Panel agreed on the

following:

9.2.2.2. TSG observations are mostly conducted in support of pCO2 operations. Other applications of these observations include the determination of boundary regions in ocean currents, climate and ocean dynamic research, sea surface salinity satellite mission calibration and applications on NASA led ocean experiments (SPURS). There were approximately 70 ships sending TSG data to GOSUD during 2013-2014. TSG data is distributed in real-time trough the GTS as well as through data centres including NOAA/NODC and GOSUD/Ifremer. Future plans for the TSG operation include continuing the support to pCO2 operations, to implement real-time data transmission in BUFR[21] into the GTS, and to continue the collaboration with other projects including SAMOS, GHRSST, SPURS, and Aquarius.

9.2.3. Ship riders in High Density deployments

9.2.3.1. Christopher Jacobs (South Africa) presented details of the work of a Ship Rider on a typical high density transect, AX-08 between Cape Town and New York City. In addition to wiring the ship, setup of hardware and software and preparatory tests, the ship rider will also care for other deployments (Argo or Drifters). Between deployments, as the only scientist on board the rider also communicates the value of the work to the officers and crew.

9.2.4. XBT Ship Recruitment

9.2.4.1. This agenda item was presented by Mr Jacobs as part of his presentation under item 9.2.3 above, and using materials from Mr Sidney Marais (South Africa).

9.3. Interactions with other SOOP sampling programmes and activities

9.3.1. pCO2 systems

9.3.1.1. Warren Joubert (South Africa) reviewed the pCO2 systems on ships of opportunity. The CO2-SOOP objectives are to produce seasonal maps of CO2 and determine variability of surface water CO2 and its impact on ocean ecosystems in support of the global efforts to monitor CO2. Typical pCO2 instrumentation measures pCO2 in surface water pumped to the instrument, which is calibrated with global traceable standards (NOAA Central Calibration Laboratory). Surface CO2 measurements from international partners are coordinated through projects such as IOCCP. The data from efforts are currently standardised and quality controlled through the Surface Ocean CO2 Atlas. The SOCAT community is producing products such as monthly global maps, including those of the Southern Ocean flux, and are moving towards an annual data release. Impact from these products includes more than 68 peer reviewed citations from the SOCAT database. High quality ancillary measurements, (i.e. temperature, salinity) from XBT and other sensors add tremendous value in the usefulness of surface pCO2 measurements. Small inexpensive sensor pCO2 sensors being developed but not yet fully implemented on autonomous platforms.

9.3.2. Thermosalinograph Network

9.3.2.1. The SOOP contributes to the implementation of additional oceanographic observations from ships of opportunity, including thermosalinograph (TSG) operations, pCO2 systems, deployment opportunities for surface drifters and profiling floats. Most TSGs are mostly installed in ships in support of pCO2 operations, while some TSG provide data with very high resolution used for satellite-derived sea surface salinity and sea surface temperature data.

9.3.2.2. In real time, TSG data are mostly distributed as TRACKOB messages into the GTS. In delayed-time, TSG data are distributed mainly through GOSUD and NODC. The number of ships contributing data to GOSUD has remained stable during the last 12 years in about 80 ships.

9.3.2.3. During the last 10 years, ships of the SOOP dedicated to the deployment of XBTs have also contributed for the deployment of 850 surface drifters and 700 profiling floats in the Atlantic Ocean, indicating the importance of the XBT network in support of these observational networks.

9.3.2.4. The Panel agreed on the following:

(i) To continue supporting TSG operations in support of pCO2 observations (***action; SOOPIP members; ongoing***);

(ii) To continue collaboration with GOSUD on data management issues (***action; SOOPIP members; SOT-9***);

(iii) To continue transmitting data in real- and delayed-time modes as funding sources allow (***action; SOOPIP members; ongoing***).

9.4. Development and plans for the SOOP

9.4.1. XBT Fall Rate Equation (FRE) advancements

9.4.1.1. Francis Bringas (USA) reported on the outcome of the "4th XBT Workshop: XBT Science and the Way Forward", held in Beijing, China on 11-13 November 2014. With 34 participants from 18 institutions, the discussions were focused on XBT profile biases and their implications for different scientific applications and products. During the meeting, several meta-data requirements were specified for XBT observations in order to allow for the correction of XBT biases and offsets, including fall rate coefficients, probe type, probe manufacture date and serial number, launch height, and type of recording system and software version. In addition, it was determined that future correction schemes for the XBT data sets should be probe type dependent, cover all manufacturers and years, account for a time-variable temperature bias, contain a depth correction, and contain a water temperature correction in fall rate and temperature bias. The report of this meeting was submitted for publication in the Bulletin of the American Meteorological Society.

9.4.2. Fall Rate Equation Experiments for Depth Offsets

9.4.2.1. Francis Bringas (USA) reported on a series of experiments performed at AOML to study the first meters of the XBT fall in the water, and in particular, the effect of the deployment height in the XBT profile as well as possible methodologies to correct depth offset due to the deployment height. Results from these experiments show that a depth offset exist in the XBT profile as a function of the deployment height. This depth offset can be corrected by applying the model by Hallock and Teague, 1992, combined with the values of the initial velocities of the XBTs in the water as determined from these experiments. Since these experiments were performed using Deep Blue probes, it was noted that further experiments are needed in order to determine the initial velocity in the water of other types of XBT probes. The results presented were submitted for publication to the Journal of Atmospheric and Oceanic Technology.

9.4.3. Review of the XBT network

9.4.3.1. Dr Goni reviewed the present status of the XBT network. The XBT network continues to provide critical observations to investigate the spatial and temporal variability

of key ocean currents and of the meridional heat transport. In addition, XBT observations currently provide approximately 20,000 profile data, or 15% of the global temperature profile observations, making them a key component in the data set to assess global ocean heat content. Five of the current transects serve to monitor the variability of all boundary currents linked to subtropical gyres, and others have provided constant monitoring of the Meridional Overturning Circulation for more than 15 years. Challenges that are typical of the implementation of the XBT network are related to ship recruitment, data transmission costs, equipment maintenance. The main data management issue is related to including the appropriate metadata in the newly implemented BUFR[21] format. Scientific applications of the data will continue to be valuable as the community keeps working on improving the quality of the data, including the assessment of XBT biases.

9.4.3.2. The Panel agreed on the following:

(i) To continue assessing the scientific value of the XBT Network (***action; SOOPIP members; ongoing***);

(ii) To continue promoting close partnerships among members (***action; SOOPIP members; ongoing***);

(iii) To strengthen the participation in scientific and operational panels that relate to the scientific and operational use of XBT data, and to improve XBT observations and data (***action; SOOPIP members; SOT-9***);

(iv) To support the processes to carry out joint XBT Network meetings with scientific panels dedicated to profile data (particularly temperature profile data) (***action; SOOPIP members; asap***).

9.5. Data management

9.5.1. XBT Data Flow and Transmission

9.5.1.1. The Panel reviewed the report by Joaquin Trinanes of the consistency and integration of the SOOP data flow with the Global Telecommunication System (GTS). Most of the SOOP XBT measurements are transmitted in near-real-time to the GTS, after being quality controlled using automatic procedures that implement XBT real-time QC tests. An additional visual QC is applied on profiles failing some of the tests before submission onto the GTS. The NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) has been encoding XBT profiles both in FM 63-XI Ext. BATHY and BUFR[21] (using common sequence 3 15 004) formats. They are put in parallel onto the GTS and tracked to ensure transmission success and to assess latency. This dual delivery scheme will continue up until global XBT migration process to BUFR is finished and users have accommodated their decoding processes to the new format.

9.5.1.2. On a semestrial basis, reports providing information on the global XBT deployments are prepared by AOML. They comprise information from near-real-time and delayed mode sources. These reports contain detailed listing of active transects, number and mode of deployments, probe types, location and time, as well as the institutions involved in logistics, deployments, data management and transmission. These reports are posted online in the XBT Science Team web site[50]. They are also submitted to JCOMM's Ship Coordinator.

9.5.1.3. The Panel reviewed the real-time data transmission systems being used for the collection of SOOP data, including XBT measurements. AOML is currently transitioning from Inmarsat to Iridium for XBT data transmissions. The Panel noted that the move is

50 http://www.aoml.noaa.gov/phod/goos/xbtscience/reportsumm.php

expected to be completed by the end of FY2015 for the Atlantic HD transects.

9.5.1.4. The Panel recognized the need to further develop metadata standards in order to fulfil XBT community requirements. Within the current operational data distribution scheme through the GTS, this would require to create a new sequence that includes the new fields. A valid alternative would imply to use the optional Section 2 of the BUFR message to store those fields and distribute the local descriptor information to the prospective users. AOML has updated the SEAS binary format with new metadata fields, which could be used during the encoding of BUFR bulletins and to embed in the NDC files that are routinely transmitted to NODC.

9.5.1.5. The Panel agreed on the following:

(i.) To maintain and increase the current international collaboration to improve data tracking, and audit current operational quality control processes to detect inconsistencies and errors (***action; SOOPIP members; ongoing***);

(ii.) To encourage the completion and closing of the migration to BUFR. All SOOPIP partners should put the data on the GTS in BUFR format, and terminate the transmission of BATHY reports after ensuring the user community and service providers are prepared (***action; SOOPIP members; asap***);

(iii.) To strengthen the coordination of SOOPIP activities by updating (if needed) the links to online national data and metadata repositories, and hold regular online meetings on data management and transect statistics. Accomplishing this will allow for better integration of SOOP metadata fields within the semestrial reports. The Panel requested the SOOPIP Chair to organize this activity (***action; SOOPIP Chair; SOT-9***);

(iv.) To support the processes to identify new common metadata requirements. The meeting strongly advocates for the inclusion of agreed metadata in the BUFR bulletins. It requested Joaquin Trinanes to coordinate the collection of input to CBS through the JCOMM Task Team on Table Driven Codes (TT-TDC) (**action; J. Trinanes; asap**).

9.5.2. Southern Ocean Data

9.5.2.1. Katherine Hutchinson (South Africa) reported on the availability of SOOP data from the Southern Ocean. She recalled that the southeast Atlantic sector of the Southern Ocean connects the Atlantic with the Indian Ocean and the Antarctic Circumpolar Current, thereby acting as a major conduit within global ocean circulation. Thermohaline transports in this region are widely thought to have a critical influence on global climate. Yet magnitudes of the associated heat and salt content variations are poorly understood due restricted hydrographic observations and model limitations. The GoodHope (GH) repeat sampling track, which spans the ocean domain between Africa and Antarctica, was established in 2004 with the aim of addressing an identified deficiency in hydrographic data. The location of the GH line was carefully chosen to follow the Topex/Poseidon (T/P)-Jason1 altimeter flight path exactly in the northern domain, and then run directly along the Greenwich Meridian south of 51°S. The Atlantic Oceanographic and Meteorological Laboratory (AOML) of NOAA have established a high density XBT transect that overlays the GH line, named AX25. In addition, the layout of the GoodHope line is also designed so that it is a convenient route for the “logistic ferry services” that re-supply the South African Antarctic base to follow from Cape Town South Africa, to the Antarctic ice shelf. Since establishment of this ocean monitoring line, there have been 27 XBT transects undertaken along AX25, and 6 CTD occupations on or within very close proximity to the GH track. This data has proven invaluable in improving our understanding regarding the heat and salt changes taking place in the African choke point of the Southern Ocean, however, some

challenges still remain. The Panel focused on the following issues:

Summertime seasonal bias of data acquisition

9.5.2.2. The Panel noted that data for the Southern Ocean is largely seasonally biased, as most cruises are restricted to the austral spring-summer months due to the constraints of harsh sampling conditions during winter. Knowledge of the seasonal cycle therefore remains poorly understood. One occupation of the GH line during winter has been undertaken, and another is planned for July 2015.

XBT temperature bias

9.5.2.3. Results found in a study comparing XBT profiles with collocated CTD casts support the hypothesis of the regional dependence of the XBT fall rate on water temperature, and thus water viscosity. In addition, results obtained highlight the need to develop an XBT bias correction scheme specifically appropriate to the Southern Ocean. Furthermore, only type Deep Blue is used which has a maximum sampling depth of 800m – alternative model could be used to obtain a deeper cast i.e. T5.

Need for full depth profiles

9.5.2.4. While XBT data is extraordinarily valuable in obtaining a better understanding of upper ocean temperature and heat content, full depth profiles are needed in order to fully understand the thermohaline alterations taking place in all water masses.

Synthesis of all data and coordination of ocean sampling efforts

9.5.2.5. A variety of ocean projects exist which aim to collect and further monitor ocean parameters in the domain south of Africa. Monitoring of the Agulhas current, the Agulhas Return Current and the variability within the Cape Cauldron and South Atlantic is underway; however, there has been limited collaboration, communication and data sharing. Better coordination of these efforts would provide an improved “big picture” view of variability in an area that is hypothesized to play a major role in global ocean circulation and water mass alteration.

9.5.3. International Quality controlled Ocean Data Base (IQUOD)

9.5.3.1. Charles Sun (USA) presented an overview and reported on the status of the International Quality controlled Ocean Data Base (IQuOD).

9.5.3.2. The Panel noted the following goals and purpose of IQuOD:

(i) IQuOD aims to produce, freely distribute and curate the highest quality, most complete and consistent global subsurface ocean temperature (and later, salinity) profile database possible. The IQuOD database will include intelligent metadata and assign an estimated uncertainty to each individual observation. IQuOD is ultimately for use in understanding climate variability and change (the Earth’s energy balance, water cycle and sea level). With IQuOD, scientists will be better able to put modern changes in the context of past changes and separate anthropogenic drivers from natural climate modes of variability. IQuOD will also be used to evaluate, constrain, initialize, and assimilate into numerical models to investigate physical mechanisms and causes of past/current changes, and to predict/project future changes.

(ii) IQuOD version 1.0 is expected to be available in 2016. The database will contain:

- All available upper ocean temperature data (nominally what is currently available from the WOD).
- Provision of intelligent meta-data, particularly for XBT measurements. This information will be of great value for the research community in refining XBT-bias corrections.
- Provision of instrument measurement (random) error on each observation. This information is of particular interest to researchers involved in ocean reanalysis/operational oceanography and state estimation.
- An internationally agreed and optimal automated quality control system.

9.5.3.3. The Panel also noted the outcome of the second IQuOD workshop, which was held at NOAA, Silver spring, USA, from 4 to 6 June 2015:

(i) The project's structure and goals were refined and clarified. Meeting goals included a published meeting report, a scientific report on the project and the scientific implementation plan useful for seeking funding and in-kind support. One of the key items for the meeting was to review the automatic QC benchmarking test efforts from the previous year. The manual QC group was given several tasks for the coming year to begin comparison and clarification of manual QC methods. A new task group to investigate file formats, uncertainty estimation methods and flagging methods was formed. Major outcomes from the second IQuOD workshop include:

- Review of the IQuOD structure, task group memberships and tasks;
- Inclusion of the formats, uncertainties and data flagging task group led by Simon Good (Met Office, UK);
- Efforts to clarify the mission statement for IQuOD and focus on user requirements;
- Clarification of the data types and instrument types that will be tackled initially in the project; and
- Planned publication of the scientific implementation plan, a meeting summary, scientific report and report on the Auto QC comparisons.

9.5.3.4. Finally, under this item, the Panel noted the following progress with regard to the IQuOD project to date:

(i) Matt Palmer (UK Met Office) has taken over the co-chair role from Rebecca Cowley (CSIRO). Catia Domingues (ACE CRC) remains as the other co-chair;

(ii) The IQuOD website[51] is now available. The content requires some updating;

(iii) IQuOD has been recommended as an IODE Project;

(iv) The Automated QC task group is developing Python code via a Mozilla-sponsored project. The coding is open-sourced[52]; and

(v) The third IQuOD workshop is planned for late 2015 or early 2016. The location is dependent upon funding applications.

51 www.iquod.org
52 https://github.com/IQuOD

10. MONITORING, CODING AND DATA MANAGEMENT

10.1. Monitoring and data centre reports

10.1.1. VOS Monitoring Report from the Exeter (UK) Regional Specialized Meteorological Centre (RSMC)

10.1.1.1. Ms Sarah North (United Kingdom) 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 and provides feedback to VOS operators regarding the quality of the data delivered by VOS ships.

10.1.1.2. The Met Office (RSMC Exeter) continues to compile lists of ships that have produced 'suspect' observations each month (e.g. see Appendix A of ***Annex VI***) which are available via the Met Office web site[53] and are also sent to the WMO Secretariat. Following action item 105 from SOT-7, the Met Office contacted other monitoring centres regarding the new monitoring criteria for labelling ships as 'suspect' and obtained agreement on implementing them in monthly monitoring reports.

10.1.1.3. The new monitoring criteria (shown in Appendix B of ***Annex VI***) started to be used from January 2015 (action 106 from SOT-7) in monthly monitoring reports. These criteria are substantially tighter for ships that report with automatic observing systems, because these systems are seen to be more reliable and less prone to errors than manual observing systems. Some of the criteria for ships with manual observing systems were also tightened slightly. Consequently, there will be more ships on the suspect lists than in previous months and years; the increases for pressure and temperature for February 2015 can be seen by comparing the two lists in Appendix A of ***Annex VI***. Following guidance from WMO (Dr Steve Foreman, Chief, Data Representation, Metadata and Monitoring) it has been agreed that the old criteria will be used to produce 'parallel' suspect lists that will be compared with the new lists by the Met Office. The changes in criteria will be noted in the RSMC's Biannual Report and any changes in the time-series of suspects will be reported. The Team requested the WMO Secretariat to confirm with the CBS that the new monitoring criteria are fit for purpose (***action; WMO Secretariat; Sep. 2016***), and the RSMC to produce separate tables for suspect manual and automatic ships on the Met Office marine monitoring website (***action; RSMC; Sep. 2015***).

10.1.1.4. The Met Office also produces monthly lists of monitoring statistics for all VOS, which are sent to the VOS focal points and are also available from the Met Office web site. To maintain up to date lists of ships, the Met Office advised that it continues to use the latest data downloaded from the online E-SURFMAR metadata database, rather than from the WMO Pub47 database. In addition, the Met Office uses the masked call sign data available from the JCOMMOPS FTP site.

10.1.1.5. It was noted that the SHIP masking scheme implemented by JMA in 2007 continues to prevent the Met Office from monitoring data from individual Japanese and some US and Canadian ships. There has been a slight increase in the number of these reports over the last two years, with 27199 reports of pressure received in January 2015 from VOS with call-sign "SHIP", compared to 23457 reports in January 2013 (automatic reports account for 85% of these).

53 : http://research.metoffice.gov.uk/research/nwp/observations/monitoring/index.html

10.1.1.6. Timeliness information for VOS reports received at the Met Office is also made available from the observation monitoring web site[54] (see Appendices D and E of ***Annex VI***). This information shows that the majority of ship reports continue to be received promptly, with more than 90% received within 60 minutes of the observation time. The Met Office apologized for not completing action 107 to separate timeliness information for automatic and manual ships.

10.1.1.7. The Met Office continues to make monthly VOS ranking scheme results available on their website for all VOS and for the national VOS fleets. Separate monthly lists of scores are produced for automatic and manual ships. An example from the February 2015 monthly scores and national fleet rankings are shown in Appendix F of ***Annex VI***. VOS operators are asked to consider the value of these monthly and annual performance rankings and provide feedback.

10.1.1.8. The Team also decided on the following action items:

(i.) RSMC to produce a report on time-series of 'suspect' ships, to show impact of the change in selection criteria (***action; RSMC; Feb. 2016***);

(ii.) RSMC to separate timeliness information for manual and automatic ships (***action; RSMC; Apr. 2016***); and

(iii.) PMOs to contact ships on monthly suspect lists to rectify any problems (***action; PMOs; ongoing***).

10.1.2. Monitoring Report from the Real-Time Monitoring Centre (RTMC) for the VOS Climate (VOSClim) data

10.1.2.1. Ms Sarah North reported on the activities of the Real-Time Monitoring Centre (RTMC) for the VOS Climate (VOSClim) data, 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 active VOSClim ship list maintained on the E-SURFMAR ftp site (previously on the VOSClim website).

10.1.2.2. An example of the suspect list for February 2015 can be seen in Appendix A of ***Annex VII*** and the monitoring criteria are given in Appendix B of ***Annex VII***. The number of active VOSClim ships is steadily increasing, as seen in Appendix C of ***Annex VII***, which shows the numbers of ships reporting at least 5 reports for each of the 6 variables that are monitored in the month of December for the last 5 years.

10.1.2.3. Following action 108 from SOT-7, the suspect criteria for VOSClim ships were tightened in January 2015 to the new values for manual ships shown in Appendix B of ***Annex VII***. The tighter criteria agreed for automated ships have not yet been implemented, due to pressure of other work, for which the Met Office apologizes (Action: RTMC to start using the new monitoring criteria for automated ships).

10.1.2.4. The Team noted that the Met Office continues to send the VOSClim suspect lists and the lists of statistics to the JCOMMOPS mailing lists (PMO and VOS). There were 6 ships on the VOSClim suspect list in February 2015, which is 1.8% of the 335 VOSClim ships reporting pressure. The KPI for less than 3% of VOSClim class ships to be flagged on the suspect list for air pressure (action 77) has been met in each month over the last 3 years, as shown in Appendix D of ***Annex VII***.

10.1.2.5. Regarding action item 76, in February 2015 there were 335 VOSClim ships

54 : http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/index.html
3 :ftp://mask2real:vosmask@ftp.jcommops.org/mask2real.csv

out of a total of 1526 VOS ships reporting at least 5 pressure values during the month in real time (within about 6 hours of 00, 06, 12 or 18 UTC). Therefore, 22% of VOS ships are also VOSClim by this measure, close to the KPI for 25% of the global active VOS to be upgraded to VOSClim by SOT-8 and similar to the value 2 years ago, although delayed-mode reports are not included in this percentage. (The number of active VOSClim ships listed on E-SURFMAR in February was 491, compared to 3073 active VOS, i.e. just 16.0% of VOS ships are VOSClim by this measure.)

10.1.2.6. In February 2015, 97.5% of VOSClim reports were received within 120 minutes, which exceeded the KPI for at least 95% to be received within 120 minutes (action item 78).

10.1.2.7. The Team also noted that the Met Office continues to send all ship and buoy reports and their co-located model field values to the Data Assembly Center (DAC) and puts a backup copy of the daily BUFR[21] data onto their FTP server, so that it is available for the DAC to access in case of problems with the GTS data. The BUFR data was upgraded in May 2014 to include some extra variables (e.g. wave height) and the BUFR version was upgraded from 3 to version 4.

10.1.2.8. The Team decided on the following action items:

(i) RTMC to start using the new monitoring criteria for automated ships (***action; RTMC; Jul. 2015***); and

(ii) PMOs to contact ships on monthly suspect lists to rectify any problems (***action; PMOs; ongoing***).

10.1.3. ASAP QC Monitoring report

ECMWF ASAP Monitoring

10.1.3.1. Cristina Prates (ECMWF) reported via teleconference on the monitoring activities for ASAP conducted by the European Centre for Medium-Range Weather Forecasts (ECMWF). ECMWF is monitoring ASAP data on a daily and monthly basis.

10.1.3.2. The Team noted that in 2014, the number of ASAP reports received at ECMWF were comparable to 2013 levels with a slight increase. An increase in the number of reporting platform identifiers was noticeable. This increase can be attributed to the inclusion of BUFR[21] encoded reports from the same platform in the monitoring. ECMWF started assimilating BUFR encoded ASAPs from November 2014. In cases where the BUFR encoded reports are assimilated, the TAC counterparts are no longer assimilated and are also not considered in this report. The Team noted that the percentage of ascents reaching the 100 hPa level have improved compared to 2013.

10.1.3.3. The Team also noted that the problem of wrongly located reports has been reduced to only few cases in 2014 (ASFR4 platform). The Team noted with appreciation that according to ECMWF, the quality of the data has continued to be good and highly valuable. Some BUFR encoded ASAP identifiers are not in the assimilation whitelist. Their TAC counterparts are assimilated instead.

ASAP Monitoring Centre (Météo France)

10.1.3.4. Mr Rudolf Krockauer (Germany) reported on behalf of Mr Frédéric Marin (France) on the status of the ASAP monitoring centre of France, 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.

10.1.3.5. The Team reviewed the monitoring reports, noting in particular the operational performance and data quality of the ASAP. The quality of ASAP reports was generally of a high standard, with only a small percentage of erroneous data. The Team noted the following:

- During 2014, Météo-France Toulouse received 5167 upper air messages (TEMP with 4 parts) from ships. This number of messages is substantially the same than it was in 2013 (5252). The reports were received from 23 different call signs;
- 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; and
- There is no significant degradation on the delay for the other ASAP ships.

10.1.3.6. The Team made the following recommendations:

(i) ASAP ship operators should try to update their transmission systems in order to be able to transmit high resolution BUFR messages.

10.1.4. Global temperature and Salinity Profile Programme (GTSPP)

10.1.4.1. Dr Charles Sun (USA), Chairperson of the Global Temperature and Salinity Profile Programme (GTSPP) reported on the development and activities of the GTSPP, including GTSPP daily operations, the first IODE Ocean Teacher Academy Training Course on the Use of the GTSPP data, and the integration of the GTSPP and WOD (World Ocean Database).

10.1.4.2. The Activities implemented between April 2013 and March 2015 include:

(i) GTSPP daily operations to process and preserve both real-time and non-real-time temperature and salinity data and maintained the project web sites (i) Website #1[55] by the Center for Coasts, Oceans, and Geophysics (CCOG), formerly NOAA's National Oceanographic Data Center and National Geophysical Data Center, USA and (ii) Website #2[56] by Oceanography and Scientific Data (OSD), Department of Fisheries and Oceans, Canada;

(ii) Populated the outcomes of the comparison between observed versus model-simulated temperature data for the North Pacific Region (see website[57]) by Japan Meteorological Agency (JMA), Japan;

(iii) Held the second session of the Joint IODE-JCOMM Steering Group of the GTSPP (SG-GTSPP), 17-20 June 2014, Oostende, Belgium;

(iv) Held the first IODE Ocean Teacher Academy Training Course on the Use of the Global Temperature and Salinity Profile Programme Data, 23-27 June 2014, Oostende, Belgium; and

(v) Reported to the Twenty-third (23rd) Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXII), 17-20 March 2015, Bruges, Belgium.

55 http://www.nodc.noaa.gov/GTSPP/
56 http://isdm.gc.ca/isdm-gdsi/gtspp/index-eng.htm
57 http://ds.data.jma.go.jp/gmd/gtspp/data/index.html

10.1.4.3. The Team made the following recommendations:

(i) Continue GTSPP daily operations; and

(ii) Collaborate with the staff of the WOD (world ocean database) project to process and archive the delayed-mode data submitted by the GTSPP partners.

10.1.4.4. The Team concurred with the following:

(i) OSD to continue real-time data acquisition from the Global Telecommunication System (GTS) during the period April 2015 to March 2017 (***action; OSD; ongoing***);

(ii) GTS participants to continue submission of the real-time and delayed-mode data to CCOG during the period April 2015 to March 2017 (***action; GTSPP participants; ongoing***);

(iii) CCOG and OSD to provide data services during the period April 2015 to March 2017 (***action; CCOG and OSD; April 2017***);

(iv) CCOG to undertake CMD-WOD integration during the period April 2015 to March 2017 (***action; CCOG; March 2017***); and

(v) The GTSPP Chair to organize and identify host for the third meeting of the GTSPP steering team in June 2016 (***action; Chair, GTSPP; June 2016***).

10.1.5. Global Ocean Surface Underway data Pilot Project (GOSUD)

10.1.5.1. Dr J. Trinanes (USA) reported on the development and activities of GOSUD on behalf of the GOSUD chair. The Team noted the following achievements of GOSUD:

- The GOSUD routine operations to collect, process, archive and distribute real-time surface temperature and salinity surface data have been continued;
- A study on data quality of real time transmitted data from several ships has been carried;
- Delayed mode Salinity datasets adjusted on water samples have been delivered for merchant ships and for French research ships. Those datasets have been included in the GOSUD database;
- The GOSUD NetCdf format V3 has been defined as the new GOSUD standard and the TSGQC software that enables to perform quality control and data adjustment has been updated; and
- A new GOSUD Steering group is being formed.

10.1.5.2. The Team recommended to transmit intake temperature and flow rate with salinity to help qualify the data.

10.1.5.3. The Team concurred with the following:

(i) To complete Steering Group formation (***action; GOSUD co-chairs; May 2015***);

(ii) To produce a new project plan (***action; GOSUD co-chairs; Sept. 2015***);

(iii) To hold GOSUD workshop (***action; GOSUD ; late 2015 or early 2016***);

(iv) To coordinate with FerryBox projects (***action; GOSUD co-chairs; Mar. 2016***); and

(v) To localize delayed mode datasets (***action; GOSUD FP for Australia; March 2016***).

10.2. Marine Climate Data System (MCDS)

10.2.1. Global Collecting Centres (GCCs) report on the VOS

Marine Climate Data System (MCDS)

10.2.1.1. The Vice-Chair of the JCOMM Expert Team on Marine Climatology (ETMC), Dr Lydia Gates (Germany) reported on the status of the development of the new Marine Climate Data System (MCDS) per Recommendation 2 (JCOMM-4). The Team recalled that the MCDS is an outcome of the modernization of the Marine Climatological Summaries Scheme (MCSS) taking into account new sources of historical marine-meteorological and oceanographic climate data, as well as state of the art data management techniques. The goal is to develop a standardized international data management system across JCOMM, integrating collection, rescue, quality control, formatting, archiving, exchange, and access—for marine-meteorological and oceanographic real-time and delayed-mode data and associated metadata of known quality, and products that satisfy the needs of WMO and IOC applications. In particular, ocean data. Requirements for long term climate monitoring, and climate services are to be addressed.

10.2.1.2. The Team noted that establishment of the first Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) at the National Marine Data Information Service (NMDIS) of the State Oceanic Administration (SOA) of China is nearly completed. A draft Resolution establishing CMOC/China has indeed been submitted to the WMO 17th Congress for its adoption.

10.2.1.3. CMOC/China will for example focus on the integration of global drifting buoy observations and metadata, in cooperation with NOAA/AOML and MCDS Global Data Assembly Centres (GDACs). CMOC/China will also have a focus on historical metadata and data rescue in the Asian-Pacific region, as well as on capacity building in this region.

10.2.1.4. The Team also noted that efforts are underway through the ETMC to revise the marine climatology sections of WMO Publication No. 471 and 558.

Global Collecting Centres (GCCs) report on the VOS

10.2.1.5. The Team 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.

10.2.1.6. The Team reviewed a consolidated 2014 report from the two GCCs. The report included a status on the volume and frequency of delayed-mode data being forwarded to the VOSClim Data Assembly Centre.

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

10.2.1.8. The Team made the following recommendations:

(i) Contributing Members (CMs) should submit their observations only once. If there is a requirement to resubmit data (e.g. quality improvements) then the GCCs should be made aware of this;

(ii) All CMs should submit data files in one IMMT format only – preferably now IMMT-5

quality checked to MQCS-7 making use of its increased coding capabilities;

(iii) CMs not able to submit their data because of issues e.g. with digitizing or converting into the IMMT format, should contact GCCs for advice;

(iv) All VOSClim class ships should use the indicator for registered VOSClim ships in element 41 (observation Platform) of the newly adopted formats IMMT-4 and -5;

(v) All VOSClim class ship observations should include the additional VOSClim elements;

(vi) If possible CMs should ensure all masked call signs (i.e. 'SHIP') are converted back to the original ID prior to submission; and

(vii) SOT should stay up to date with TT-MCDS developments.

10.2.1.9. The Team decided on the following action items:

(i) All CMs that did not submit data during 2014 should do so in 2015 or alternatively contact GCC for advice (***action; CMs; end of 2015***); and

(ii) The GCC should proactively contact the CMs that have not submitted data for a number of years to offer assistance and encourage submission of data (***action; GCCs; end 2015***).

(iii) SOT members operating AWS systems on ships should make sure that the delayed mode data are submitted to the MCSS in IMMT format according the WMO Technical Regulations detailed in WMO No. 558 and 471 (***action; members operating AWS; asap***).

(iv) Should members decide to use the GTS and BUFR[21] format for the collecting of the required MCSS delayed mode data, revision of the VOS BUFR template may be needed, and the Team invited members preferring such a solution to liaise with the JCOMM Task Team on Table Driven Codes (TT-TDC) to make sure that the MCSS requirements are taken into account (***action; members operating AWS; asap***).

10.2.2. VOSClim Data Assembly Centre (DAC) report

10.2.2.1. The US NOAA National Centers for Environmental Information (NCEI), acting as the DAC for the VOSClim fleet, reported 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. In the coming years, the MCDS will replace the MCSS and at that time, it is expected that the VOSClim DAC will be upgraded to the MCDS Global Data Assembly Centre (GDAC) for the VOSClim.

Data Assembly

10.2.2.2. NCEI maintains several archives in support of the VOSClim Fleet and hosts a web presence[58] for access to fleet information and data. The archive consists of three data streams:

- GTS - near-real time collection of ship observations
- BUFR[21] – ship observations plus model fields
- GCC – Global Collection Centres delayed mode ship observations

58 http://www.ncdc.noaa.gov/data-access/marineocean-data/vosclim

10.2.2.3. VOSClim observations from all streams are captured based on the most current VOSClim ship list[59] available. GTS ship observations are transmitted over the GTS under a variety of WMO headers. BUFR ship observations are transmitted daily from the UK Met Office via the GTS under WMO abbreviated headers ISXX4* and IOXX4* (where * is equal to 0, 1, 2 or 3).

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

10.2.2.5. All observations are decoded into the International Maritime Meteorological Archive (IMMA) format[60] and placed on the project web site[61].

VOSClim Web Page and Data Access

10.2.2.6. NCEI reported that the VOSClim DAC web pages were significantly modified in 2013 due to NCEI web operations being moved to a web content manage system. The website was streamlined and provides a new look and feel. All data and Fleet information remain as before. Screen shots of the updated DAC VOSClim Fleet web pages were presented to the Team.

10.2.2.7. The URL for data access[61] provides links to ftp downloads and NCEI Climate Data Online (CDO[62]) for subsetting VOSClim Fleet observations. The Marine CDO access system is currently under construction and is being upgraded significantly to enhance marine data access and provide more user-friendly functions for data access. The CDO subsetting interface should be fully functional by June 2015 and at that time will provide map search functions and other subsetting options, such as call sign and temporal/spatial parameter subsetting capabilities.

10.2.2.8. For an automated download, the data is available on an anonymous FTP site ftp://ftp.ncdc.noaa.gov/pub/data/vosclim. Separate folders exist for each year beginning with 2001. Also available for download from the FTP site is award pictures, ship pictures, monthly statistics and suspect ship reports.

VOSClim Ship List

10.2.2.9. During 2014, preparations and testing were performed to transition VOSClim operational processing at the DAC from the old NCDC-maintained ship list to use of the more frequently updated ESURFMAR informal Pub 47 ship list. ESURFMAR produces two VOSClim ship lists, active-only and a full VOSClim historical list containing both active and inactive ships. NCEI is archiving a daily snapshot of both lists and is using the full historical list for operational processing.

10.2.2.10. On 1 January 2015, this operational change went into effect and the DAC ship list was then abandoned and removed from the DAC website. Benefits of this change include: access to the most current VOSClim metadata when processing; and one less requirement on PMOs to provide metadata to two different locations to ensure accurate VOSClim data processing.

10.3. Operational Coding requirements

10.3.1. BUFR[21] Template for VOS data

59 ftp://esurfmar.meteo.fr/pub/Pub47/
60 http://icoads.noaa.gov/e-doc/imma/R2.5-imma.pdf
61 http://www.ncdc.noaa.gov/data-access/marineocean-data/vosclim/data-management-and-access
62 https://www.ncdc.noaa.gov/cdo-web/

10.3.1.1. The Meeting reviewed the status of the migration to Table Driven Code (TDC) forms, and the status of the BUFR template for VOS data, and discussed the needs for its evolution.

10.3.1.2. The Meeting noted that a BUFR template suitable for the reporting of VOS data (TM308009) is currently operational and contains the same information as the previous TAC code (FM13). However, further changes are required to meet the needs of the forecasting and climate communities. Dr David Berry (United Kingdom), Chair of the JCOMM Task Team on Table Driven Codes (TT-TDC), presented an update on the latest VOS template presented to the Second Session (College Park, USA, 28 April-2 May 2014) of the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) of the WMO Commission for Basic Systems (CBS). A number of further proposed changes to the template and BUFR descriptors were presented, taking into account feedback from the IPET-DRMM II. These changes included a mapping of Pub47 metadata elements to BUFR descriptors and code table entries. An expected time scale for the validation of the template and its operational status was also presented.

10.3.1.3. Dr Berry reported on the status of the encryption of call signs with the VOS BUFR template. Before encrypted call signs can be used within BUFR a framework for the management of the encryption / decryption keys and their security requirements needs to be agreed (see SOT-8 / Doc. 7.6). However, Dr Berry reported that this does not prevent the new BUFR template for the VOS from being validated.

10.3.2. BUFR Template and implementation for XBT/XCTD/TSG data

10.3.2.1. The Meeting also reviewed the latest developments from the JCOMM Data Management Programme Area (DMPA) Task Team on Table Driven Codes (TT-TDC), and particularly the status of the BUFR templates for XBT, XCTD, and TSG data.

10.3.2.2. The meeting noted that the BUFR templates for XBT / XCTD (TM315004) data, TSG data (TM308010) and CTD (TM315007) data were now operational.

10.3.2.3. Dr Berry reported that, in addition to the ship based templates, the TT-TDC had proposed and subsequently validated BUFR templates for moored (TM315008) and drifting (TM315009) buoys. A proposed BUFR template for reporting observations from offshore platforms (TM308017) has been passed to the validation stage, although validation has yet to commence. The status of the BUFR templates for marine data was presented to the Team. At DBCP-29, it was recognized that DBCP should take the lead, with the JCOMM TT-TDC, on developing suitable BUFR templates for the exchange of Autonomous Surface Vehicle data on GTS, and it is expected to progress this during the coming year.

10.3.2.4. The Team endorsed the proposed mapping of the Pub47 metadata entries for humidity to BUFR elements.

10.3.2.5. Dr Berry announced that he would be stepping down from leadership of the TT-TDC and asked any members of the team willing to lead the task team to notify the chair of the DMPA (Sissy Iona) (***action; SOT members; asap***).

10.3.3. The Team decided on the following action items:

(i) To validate the revised VOS BUFR Template by the next IPET-DRMM meeting (***action; TT-TDC; July 2015***);

(ii) To submit the revised VOS BUFR Template and validation results to the IPET-DRMM-III (***action; TT-TDC;July 2015***);

(iii) TT-TDC in liaison with the ETMC to undertaker a comparison of the BUFR Template

for VOS data to the IMMT-5 data format and, if necessary, make proposal to modify the template to allow the representation of IMMT-5 on the GTS (***action; TT-TDC; July 2015***);

(iv) To comment on and endorse the proposed mapping of Pub47 to BUFR (SOT members to email comments on proposed mapping to TT-TDC Chair (D. Berry)) ***(action; SOT members; asap)***;

(v) The TT-TDC to work with the TT-IS and TT-Pub47 to provide guidance on the mapping of Pub47 to BUFR (***action; TT-TDC; asap***); and

(vi) Recommend the validation of the offshore rig / platform template by the next IPET-DRMM (***action; TT-TDC; July 2015***).

10.4. SOOP, GO-SHIP, and ASAP metadata requirements

SOOP Metadata

10.4.1. JCOMM-4 guidance regarding metadata as well as the SOOP metadata issue was discussed under item 9.1.2.

GO-SHIP Metadata

10.4.2. Mr Kramp reported that GO-SHIP has established a format and procedure to gather and publish cruise metadata[63] and that a mechanism is under construction to monitor the fulfilment of GO-SHIP data-requirements[64], in close cooperation with the CLIVAR and Carbon Hydrographic Data Office (CCHDO). Similar to the so-called hydrotable[65] a new JCOMMOPS tool will allow registering and monitoring of GO-SHIP cruises from the earliest planning phase to the final delivery of all emerging data to appropriate data centres.

Automated Shipboard Aerological Programme (ASAP) Metadata

10.4.3. The Team recalled its discussion and decisions at SOT-7 regarding the collection of ASAP metadata. The SOT Technical Coordinator reported on the work undertaken during the intersessional period in this regard.

10.4.4. Mr Kramp explained that based on the format endorsed at SOT-7, and in close cooperation with the ASAP Task Team Chair, metadata from almost all ASAP platforms have been gathered and published as decided at the last session. The missing data from the Japanese programme can hopefully be added shortly. The Team invited Japan to provide the SOT Technical Coordinator with the Japanese ASAP platform metadata (***action; Japan; June 2015***).

10.4.5. Mr Kramp reminded the team that this mechanism refers to Pub47 regarding ship-related metadata. Referring to agenda items 3.4, 7.4, and 8.1.2, issues arise from this practice: ASAP platforms on ships which are not part of VOS cannot (mandatory fields) and should not (statistics for inactive VOS) be registered in Pub47, and ASAP platforms are also installed on ships with multiple entries in Pub47, i.e. without clear reference.

10.4.6. The Team recalled that at some later stage, the ASAP metadata will have to become consistent with the requirements of the Observing System Capability Analysis and Review Tool (OSCAR[66]).

63 http://www.go-ship.org/Cruise-Notice.pdf
64 http://www.go-ship.org/GO-SHIP_CMST.pdf
65 http://ushydro.ucsd.edu/hydrotable/
66 http://www.wmo.int/oscar

11. SOT IMPLEMENTATION STRATEGY

11.1. The Team recalled that per SOT-7 discussion and decision a first version of the SOT Implementation Strategy was published on the JCOMM website[67] as JCOMM Technical Report No. 61. The document is meant to provide an overall framework for the Team's work, and at the same time enable it and its members to react appropriately to future developments. The strategy elaborates on the rationale and plans for implementation of the ship fleets under SOT's responsibility in the foreseeable future. It particularly it includes an overarching implementation plan and a detailed implementation plan with clear objectives, and some performance targets.

11.2. The Team reviewed a proposed revised version of the document, which included the following changes:

- SOT contribution to the WIGOS Implementation Plan (WIP), Section 2.3 and Annex XII added in this regard;
- Update of the SOT plan for migrating to Table Driven Codes (tables 4 and 5 in section 4.4);
- Update with regard to several contact points (Annexes II and VIII);
- Updated status maps (Annex VII);

11.3. The Team proposed some further adjustments reflected in ***Annex XVI***.

11.4. The Team invited its members to send comments on the revised version of the implementation strategy to the SOT Chair and the Secretariat by 31 May 2015 (***action; SOT members; 31 May 2015***).

11.5. RSMC was requested to investigate the feasibility of providing separate quality monitoring list for third party vessels (***action; RSMC; ongoing***).

11.6. The Team then requested the SOT Chair to finalize the new version of the Strategy on behalf of the Team in consultation with the VOSP and SOOPIP chairs, the OPA Coordinator, the Task Team Chair, and the Secretariat. The goal is to post the second version of the strategy on the SOT and JCOMM websites by mid-2015 (***action; C. Marshall; 31 July 2015***).

12. ORGANIZATIONAL MATTERS

12.1. Review the Terms of Reference of the SOT, VOSP and SOOPIP

12.1.1. In light of the discussions and recommendations arising during the week, and of the changes already proposed by SOT-7 (Annex VI of JCOMM MR No. 97[68]), the Team reviewed its Terms of Reference, and agreed to propose some further changes (see ***Annex V***) to be considered by the Observations Coordination Group and the Management Committee. The Team noted that the next SOT Session will in principle be another opportunity to review again these Terms of Reference again prior to JCOMM-5 (Indonesia, November 2017).

12.2. Review of the SOT Management Team (including the role of the SOT Technical Coordinator)

67 http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=9936
68 http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=12222

12.2.1. The Team reviewed the composition of the SOT Management Team. It recalled that the Chairs of SOT, VOSP and the SOOPIP are appointed by JCOMM for the JCOMM intersessional period. These will be reviewed at JCOMM-5. Following the proposal from SOT-7, Mr Chris Marshall (Canada), Mr Jan Rozema (the Netherlands), and Ms Rebecca Cowley (Australia) have been appointed by the JCOMM co-Presidents on behalf of the Commission to serve as vice-Chairs of the SOT, VOSP, and SOOPIP respectively.

12.2.2. The Team reviewed the role of the JCOMMOPS ship Coordinator who is also acting as SOT Technical Coordinator (SOT TC) on a part-time basis. It recalled that SOT-4 had 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 Chair of the SOT provides technical guidance and is prioritising the tasks of the SOT TC. The JCOMMOPS ship Coordinator is currently under Special Service Agreement (SSA) contract with the WMO.

12.2.3. The Team recalled the work requirements proposed by SOT-7 for the SOT TC. The SOT TC provides a valuable coordination and support service to the component programs of the SOT. The Team endorsed the additional requirements proposed by the Chair of SOT and the sub-panel Chairs. More specifically the Team agreed with the working priorities of the SOT TC as listed in ***Annex XII***.

12.2.4. The Team also recalled the draft JCOMMOPS Ship Coordinator's workplan with deliverables and deadlines as outlined under agenda item 3.4. The Team endorsed the workplan (living document to be provided on the JCOMMOPS website).

12.3. Funding issues (SOT Technical Coordinator, Trust Funds)

Funding of JCOMMOPS and the SOT Technical Coordinator's position

12.3.1. The Team recalled that during the last intersessional period the position of the SOT Technical Coordinator was occupied by Mr Martin Kramp (JCOMMOPS) on a part-time (30%) basis. The Team noted that the Ship Coordinator's position, including salary and missions are essentially supported by (i) the DBCP, (ii) GO-SHIP, and (iii) the SOT through voluntary contributions made to the DBCP and JCOMM trust funds at WMO. Contributions to the DBCP Trust fund in 2015 are provided in ***Annex XI***. The national contributions to the SOT and GO-SHIP are made through the DBCP and JCOMM Trust Funds at the WMO, and total of USD 110,000 from these Trust Funds was committed to the 2015 budget as detailed below:

- JCOMM Trust Fund: USD 100,000 allocated to the Ship Coordinator's position (US contribution for GO-SHIP, SOT, and cruise coordination)
- DBCP Trust Fund: USD 10,000 allocated to SOT activities
- Additional GO-SHIP salary support contributions are made through IOC and CLS.

12.3.2. The Team recommended that actual expenditures for the SOT Ship Coordinator's position should be balanced with the contributions from other Panels contributing to JCOMMOPS, and that the total of SOT expenditures should not exceed the national contributions to the SOT in any case.

12.3.3. The Team agreed that contributions for the SOT TC would continue to be made to the DBCP and JCOMM Trust Funds at WMO, and that expenditures related to the SOT budged line in the DBCP Trust Fund should be authorized by the SOT Chair, noting that in any case and according to the WMO financial regulation all DBCP TF expenditures have to be authorized by the DBCP Chair. The Team invited its members to contribute to either of the DBCP or JCOMM Trust Funds to support the Technical Coordinator post and thus ensure that

current services are maintained while also allowing (i) decreasing the contributions of those countries contributing heavily to the SOT, and (ii) for future development in support of the VOS, ASAP, SOOP, and GO-SHIP.

JCOMM Trust Fund for Ship Consumables

12.3.4. The Team recalled and confirmed its decision at SOT-7 that the Ship Consumables Trust Fund was no longer needed.

ASAP Trust Fund

12.3.5. The meeting reviewed the final statements of account for the ASAP Trust Fund for the period 1 January 2013 to 31 December 2013, and for the period 1 January 2014 to 31 December 2014. These statements are given in ***Annex IX***. The Team noted that some expenditures – approved by the SOT Chair – were made in support of (i) the Fifth Session of the JCOMM Observations Coordination Group (Silver Spring, USA, 5-7 September 2013), and the Seventh Session of the SOT (Victoria, Canada, 22-26 April 2013). A total of CHF 24,180 remained available in the ASAP Trust Fund as of 31 December 2014. The Team accepted both statements of accounts.

12.3.6. The Team agreed that no additional contributions to the ASAP Trust Fund were needed at this point.

12.3.7. The Team recalled that the ASAP Trust Fund consists of money owed to the Bureau of Meteorology (BOM) following the termination of the WRAP project. The Team also recalled the conditions proposed by SOT-5 regarding the use of the remaining funds within the ASAP Trust Fund (i.e. SOT-5 final report, paragraphs I-7.2.3.4 and I-7.2.3.5). Since being deposited in the ASAP Trust Fund, the money has mostly been used to fund the travel of the Chair to attend sessions of the SOT and PMO Workshops. With the imminent retirement of the Chair and current SOT Focal Point for the BOM and the appointment of a new SOT Focal Point for the BOM, the Team agreed to transfer the control of the spending of the ASAP Trust Fund to the new SOT Focal Point for the BOM.

12.4. SOT annual report format

12.4.1. The Team reviewed the content of the SOT Annual Report for 2012 and 2013, and received feedback from the WMO Secretariat on the status of preparation of the 2014 SOT Annual Report.

12.4.2. The Team discussed whether changes of the format and content of the 2015 and subsequent issues of the SOT Annual Report should be introduced, and tasked the SOT vice-Chair to coordinate with the VOSP and SOOPIP Chairs, and with the Secretariat in the view to propose an updated or new format (***action; SOT Chair; end 2015***).

13. NATIONAL REPORTS

13.1. Pierre Blouch (France, and E-SURFMAR) chaired the National Reports session. Written reports were presented by the following Members/Member States: Australia; Brazil; Canada; China; China, Ecuador; France; Germany; Greece; Hong Kong, China; India, Indonesia, Ireland; Italy; Japan; the Netherlands; New Zealand; the Democratic Republic of Congo; Singapore; South Africa; Sweden; the United Kingdom, and the USA.

13.2. Additionally, a written report was submitted by the Surface Marine Operational Service (E-

SURFMAR[69]) of the Economic Interest Group (EIG) grouping of European National Meteorological Services (EUMETNET).

13.3. These reports[70] 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, India, Japan, and USA) provided information regarding the status of sampling on each line.

13.4. In addition, the following national presentations were made during the meeting:

- *Australia; China; France; Germany; Greece; Hong Kong, China; India; Japan; the Netherlands; the United Kingdom; and the USA.*

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 within the SOT annual report for 2014 (***action; Secretariat; asap***).

14. NEXT SESSION OF THE SOT

14.1. The Team requested the SOT Chair to discuss with the Secretariat and potential hosts in the view to organize the next SOT Session preferably in Europe in April/May 2017 (***action; C. Marshall; end Dec. 2015***).

15. REVIEW OF THE SOT-8 SESSION REPORT, ACTION ITEMS AND RECOMMENDATIONS

15.1. 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 III***.

16. CLOSURE OF THE SESSION

16.1. The Team noted that Mr Graeme Ball was stepping down from the SOT Chair. The Team expressed their sincere gratitude to Mr Graeme Ball for the outstanding contribution he has made to SOT's work since its first session in Goa in February 2002 and for the leadership he has provided since he first chaired the Team in October 2002 at the second SOT Session. During this period, he has been actively involved in all the SOT programme activities and has provided expert guidance to the Panel and Task Team Chairs. In particular, he was instrumental in setting up the VOS website, which is now recognised as the focal point for all VOS, and PMO related activities.

16.2. For many years, Graeme has also chaired the SOT Task Teams on Metadata and a Call sign Masking, and has actively participated in the Task Teams on Instrument Standards, Satellite Communications and VOS Recruitment and Programme Promotion. His kind and open personality, combined with a professional and diligent approach, have undoubtedly helped to

69: E-SURFMAR (Surface Marine Operational Service) and E-ASAP are two operational services of the EUMETNET Observation Programme. Although participating in E-ASAP is mandatory, nineteen EUMETNET Members only are participating in E-SURFMAR which is optional. E-SURFMAR 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, Malta, the Netherlands, Norway, Poland, Portugal, Serbia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland, the Czech Republic, Montenegro, and the Former Yugoslav Republic of Macedonia. The following Members are participating in E-SURFMAR: Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, The Netherlands, Norway, Portugal, Serbia, Spain, Sweden, Switzerland, and the United Kingdom of Great Britain and Northern Ireland.

70: ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-83-SOT-ANN-2014/national_reports.html

ensure the success of the SOT and facilitated increased active participation in its programmes. His Team colleagues therefore wanted to formally note their thanks to Graeme for his long-standing contribution to marine observations, and to convey their very best wishes for his forthcoming retirement.

16.3. The Chairperson congratulated the Team for the meeting's achievements. He thanked the South African Weather Service for hosting the Session, the participants of the meeting for their contributions to the outcome of this meeting, his co-chairs, and the Secretariat for their support prior to and during the meeting. The Secretariat Representative thanked the SAWS, the SOT Chairperson, the VOSP, and SOOPIP Chairpersons, and the participants of the meeting for their contributions to this Session and the activities of the SOT. The Eighth Session of the Ship Observations Team closed at 12:00 pm on Friday 24 April 2015.

ANNEX I

AGENDA OF SOT-8

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 JCOMMOPS**
   - 3.1 **Report from the Secretariat (incl. relationship with IMO)**
   - 3.2 **Report from the Observations Programme Area Coordinator**
   - 3.3 **Report from the SOT Chairperson**
   - 3.4 **Report from JCOMMOPS (incl. from the SOT Technical Coordinator)**
4. **REVIEW OF PENDING ACTION ITEMS FROM SOT-7**
5 **REQUIREMENTS FOR SHIP-BASED OBSERVATIONS**
   - 5.1 **GCOS / GOOS / WCRP Ocean Observations for Physics and Climate (OOPC)**
   - 5.2 **Rolling Review of Requirements update**
6. **REPORTS BY THE ASSOCIATED PROGRAMMES**
   - 6.1 **International Ocean Carbon Coordination Project (IOCCP)**
   - 6.2 **Shipboard Automated Meteorological and Oceanographic System (SAMOS) Project**
   - 6.3 **Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP)**
   - 6.4 **Group for High-Resolution SST (GHRSST)**
   - 6.5 **World Ocean Council**
   - 6.6 **OceanScope**
   - 6.7 **Ferrybox**
   - 6.8 **Other associated programmes**
7. **RECOMMENDATIONS BY THE TASK TEAMS AND PILOT PROJECTS**

7.1 Task Team on Satellite Communication Systems

7.2 Task Team on ASAP

7.3 Task Team on VOS Recruitment and Programme Promotion

7.4 Task Team on Metadata for WMO-No. 47

7.5 Task Team on Instrument Standards

7.6 Task Team on Call Sign Masking and Encoding

7.7 Task Team on Training

7.8 VOS Ancillary Pilot Project

8. NINETH SESSION OF THE VOS PANEL (VOSP-9)

8.1 VOS Programme activity reports
- 8.1.1 Report by the VOSP Chairperson
- 8.1.2 SOT Technical Coordinator report on VOS support activities

8.2 VOS Programme status reports
- 8.2.1 VOS status report
  - 8.2.1.1 VOS participation
  - 8.2.1.2 Metadata – status & completion
  - 8.2.1.3 KPI compliances
  - 8.2.1.4 VOS Data coverage
- 8.2.2 E-SURFMAR Expert Team on VOS status report
  - 8.2.2.1 Status report
  - 8.2.2.2 E-SURFMAR Metadata database
- 8.2.3 VOS Donation Programme

8.3 VOS Developments
- 8.3.1 Electronic logbooks
  - 8.3.1.1 Electronic logbooks software status
  - 8.3.1.2 Electronic logbook developments (TurboWin, TurboWeb & TurboWin+)
- 8.3.2 VOS meteorological instruments
- 8.3.3 VOS automation Status
  - 8.3.3.1 E-SURFMAR - EUCAWS developments
  - 8.3.3.2 AMOS developments
  - 8.3.3.3 Other AWS developments

8.4 PMO Status and activities
- 8.4.1 Role of the PMO
- 8.4.2 VOS & AWS inspection reports - implications of automation

8.5 VOS Issues
- 8.5.1 VOS Classes
  - 8.5.1.1 Future composition of the international VOS fleets

8.5.1.2 Upgrading to VOSClim standards
8.5.1.3 Third party data and non-VOS support ships
8.5.1.4 Collection of delayed mode data
8.5.2 VOS website

9. ELEVENTH SESSION OF THE SOOP IMPLEMENTATION PANEL (SOOPIP-11)

9.1 SOOP Programme activity reports
9.1.1 Report by the SOOPIP Chairperson
9.1.2 SOT Technical Coordinator report on SOOP support activities
9.1.3 XBT Science Team

9.2 Programme status and implementation
9.2.1 Status of SOOP implementation
9.2.2 XBT sampling transect occupation
9.2.3 Ship riders in High Density deployments
9.2.4 XBT Ship Recruitment

9.3 Interactions with other SOOP sampling programmes and activities
9.3.1 pCO2 systems
9.3.2 Thermosalinograph Network

9.4 Development and plans for the SOOP
9.4.1 XBT Fall Rate Equation (FRE) advancements
9.4.2 Fall Rate Equation Experiments for Depth Offsets
9.4.3 Review of the XBT network

9.5 Data management
9.5.1 XBT Data Flow and Transmission
9.5.2 Southern Ocean Data
9.5.3 International Quality controlled Ocean Data Base (IQUOD)

10. MONITORING, CODING AND DATA MANAGEMENT

10.1 Monitoring and data centre reports
10.1.1 VOS Monitoring Report from the Exeter (UK) Regional Specialized Meteorological Centre (RSMC)
10.1.2 Monitoring Report from the Real-Time Monitoring Centre (RTMC) for the VOS Climate (VOSClim) data
10.1.3 ASAP QC Monitoring report
10.1.4 Global temperature and Salinity Profile Programme (GTSPP)
10.1.5 Global Ocean Surface Underway data Pilot Project (GOSUD)

10.2 Marine Climate Data System (MCDS)
10.2.1 Global Collecting Centres (GCCs) report on the VOS
10.2.2 VOSClim Data Assembly Centre (DAC) report

10.3 Operational Coding requirements
10.3.1 BUFR Template for VOS data
10.3.2 BUFR Template and implementation for XBT/XCTD/TSG data

10.4 SOOP, GO-SHIP, and ASAP metadata requirements

11 SOT IMPLEMENTATION STRATEGY

12. ORGANIZATIONAL MATTERS

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

12.2 Review of the SOT Management Team (including the role of the SOT Technical Coordinator)

12.3 Funding issues (SOT Technical Coordinator, Trust Funds)

12.4 SOT annual report format

13. NATIONAL REPORTS

14. NEXT SESSION OF THE SOT

15. REVIEW OF THE SOT-8 SESSION REPORT, ACTION ITEMS AND RECOMMENDATIONS

16. CLOSURE OF THE SESSION

ANNEX II

LIST OF PARTICIPANTS

Participants at the Eighth Session of the JCOMM Ship Observations Team (SOT)

(Cape Town, South Africa, 20-24 April 2015)

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ANNEX III

SHIP OBSERVATIONS TEAM (SOT) ACTION ITEMS ARISING FROM SOT-8 SESSION

Note 1: Ongoing actions arising from SOT-8 have been transferred to the revised version of the Implementation Strategy.
Note 2: Status of action items pending from previous SOT Sessions is maintained by the SOT Technical Coordinator.

No.	*Report ref.*	*Action item*	*By*	*Deadline*
1	3.1.12	to propose the way forward regarding the need to record and document instrument practices for oceanographic instruments in order to complement what appears in the CIMO Guide for marine meteorological observations	OCG	OCG-6
2	3.2.2	to participate in the OCG process through the timely completion of Network Specification questionnaires.	SOT chair, Task team chairs	31 May 2015
3	3.2.3	to continue to work closely in defining and implementing a consistent and accurate set of monitoring tools.	JCOMMOPS, NOAA OSMC	SOT-9
4	3.2.4	to begin preparations for JCOMM-5 by undertaking/completing tasks that would lead to new capabilities that could be highlighted at JCOMM-5, and by paying careful attention to succession planning	SOT chair, Task team chairs	Apr. 2017
5	3.2.5	to explore and identify practical solutions to address the need for 1) JCOMMOPS to track ship-based observations and associate correct metadata to reported observations; and 2) the climate community to trace ship observations reports to unique hulls.	JCOMMOPS, TT-masking	SOT-9
6	3.2.6	to continue its valuable efforts regarding access to third party data	JCOMMOPS	SOT-9
7	3.2.7	to develop a solution on providing feedback to ships' officers on the outcome of their data submissions to the GTS, possibly in collaboration with existing activities such as NOAA MADIS.	SOT, JCOMMOPS	asap
8	3.2.9	to review the Keeley report recommendations and encourage actions in response.	SOT chair, Task team chairs	asap
9	3.4.17 (i)	to coordinate with the relevant SOT Task Teams, and investigate how unique ship hull and station identifiers could or must be achieved to match future requirements of an integrated observing system	M. Kramp	asap
10	3.4.17 (ii)	to work with the TT-VOSRPP and corresponding members from other programmes and panels in the need of volunteer ships (in particular DBCP and Argo) to draft and edit a JCOMM OPA brochure	M. Kramp	SOT-9
11	3.4.17 (iii)	to work with the TT-VOSRPP and KNMI to create a TurboWin Videoclips	M. Kramp, KNMI	April 2016
12	3.4.17 (iv)	to merge the individual SOT, VOS, ASAP and SOOP pages into simplified SOT	M. Kramp	April 2016

No.	Report ref.	Action item	By	Deadline
		starting pages with basic information, brochures and videos for a broader public, and linked to the new JCOMMOPS website with all operational information and resources for the SOT community.		
13	3.4.24(ii)	to volunteer to participate in the evaluation of the new generation of webservices, websites and mobile application developed by JCOMMOPS	SOT members	asap
14	3.4.34(ii)	to work on the content of the new website from SOT, SOOP, and GO-SHIP perspectives and to prepare the Cruise Information Centre toolbox	SOT TC	Sep. 2015
15	3.4.34(iii)	to facilitate information exchange on cruises by developing appropriate tools	JCOMMOPS	Dec. 2015
16	4.2	VOSP to produce a short document to describe how practical it is to make precipitation measurements from ships, with some recommendation	S. North	SOT-9
17	4.3	to coordinate the review of the action items during the next intersessional period, and organize regular calls for that purpose	M. Kramp	SOT-9
18	5.1.2	to respond to requests for information with respect to progress of GCOS-IP actions for the GCOS Status Report	SOT members	May 2015
19	5.1.5(1)	to coordinate with the SOT, VOSP, SOOPIP, and the OCG Chairs and develop the 'Network Specification(s) for SOT activities	M. Kramp	asap
20	5.1.5(2)	to participate in OOPC studies of the feasibility of metrics for systems evaluation. The Team tasked Gustavo Goni (USA) to represent the Team in such activity, and to contribute and liaise with the JCOMM OCG	G. Goni, D. Berry	OCG-6, OOPC-18, SOT-9
21	5.1.6	to develop risk and vulnerabilities information for the ship-based observing systems on behalf of the Team, and communicate to JCOMM OCG as needed	G. Goni, D. Berry, GOOS-SC 4	SOT-9
22	6.2.6	to contribute to developing user requirements for high-resolution marine meteorology from VOS-AWS	ETMC	SOT-9
23	6.5.4	to coordinate the production of a document describing how the WOC could contribute to the SOT activities	M. Kramp	Dec. 2015
24	6.6.3	to consider the AXIS XBT auto-launcher system as a way to enhance XBT sampling without the need to send an observer along	SOT members	SOT-9
25	7.1.12 (i)	to closely work with Inmarsat Safety Services team and IMSO to propose a new method for conventional VOS to report their observations ashore using the GMDSS FleetBroadband terminals	TT-SatCom	SOT-9
26	7.1.12 (ii)	TT-SatCom to consider the technical implications related to the compatibility between AIS equipment and observation stations	TT-Satcom	SOT-9
27	7.2.3	to investigate preservation of the ASAP data, and better collaboration with the research community for accessing such data	R. Krockauer	SOT-9
28	7.3.2 (i)	to prepare a summary paper and supporting documentation immediately after SOT-	S.North	asap

No.	Report ref.	Action item	By	Deadline
		8 for submission to the ICS Marine Committee		
29	7.3.3 (ii)	to develop a simple flyer to promote the availability and use of the TurboWin software to ships that are not presently recruited to the VOS	S. North, M. Kramp, KNMI	SOT-9
30	7.3.3 (iii)	to invite the national maritime administrations to consider the need for new build ships to be equipped with certified meteorological instruments (e.g. anemometers and barometers) that comply with WMO guidelines, and to consider whether this issue should be raised within IMO	VOS&SOT NFPs	SOT-9
31	7.3.3 (iv)	to produce a final copy of the VOS Brochure	M. Kramp	June 2015
32	7.3.3 (v)	to make any necessary final minor design adjustments to the VOS Poster	M. Kramp	June 2015
33	7.3.3 (vi)	to make soft copies of the final VOS Brochure and VOS Poster available on the VOS website	M. Kramp	June 2015
34	7.3.3 (vii)	to advise the Team via the VOS, SOT and PMO mailing lists when the poster and VOS brochures are finalized and available for use	S. North	SOT-9
35	7.3.3 (viii)	to advise whether funding could be made available for printing hardcopies of the VOS Brochure	WMO Secretariat	end 2015)
36	7.3.3 (ix)	to review the content and need for the SOT Flyer with a view to making recommendations to the TT	M. Kramp	SOT-9
37	7.3.3 (x)	to consider how the JCOMMOPS twitter and Facebook sites could be used to promote VOS programmatic issues to a wider audience	M. Kramp, TT-VRPP	SOT-9
38	7.3.3 (xi)	to circulate details of JCOMMOPS Twitter and Facebook sites to the SOT, VOS and PMO mailing lists inviting members to join/follow	M. Kramp	asap
39	7.3.3 (xii)	to keep the TT-VRPP and TT-Training advised of any future developments concerning their video and sea state clips	S. Pritchett, P. Rychtar	SOT-9
40	7.3.3 (xiii)	to liaise with, and keep the TT-VRPP informed, regarding any further VOS video developments	M. Kramp	SOT-9
41	7.3.3 (xiv)	to consider the feasibility of bundling training videos within TurboWin	S. North, KNMI	SOT-9
42	7.3.3 (xv)	to consider the potential of international PMO exchanges or secondments as a means of promoting best practice and information exchange between VOS operators	P. Rychtar	SOT-9
43	7.3.3 (xvi)	to investigate the potential of the forthcoming voyage of the Hermione to promote and possibly film our VOS activities onboard	P. Rychtar	SOT-9
44	7.3.3 (xix)	to review the content of the SOT Promotional presentation and to include, inter-alia, updated JCOMMOPS network maps where appropriate	M. Kramp	end 2015
45	7.3.3 (xxii)	to provide the updated VOS fleet numbers for inclusion in the VOS Framework	WMO Secretariat,	asap

No.	Report ref.	Action item	By	Deadline
		document and to upload the revised version of the document on the VOS Website	M. Kramp	
46	7.3.3 (xxiii)	While the VOS Scheme questionnaire should run for six months, to issue the questionnaire by the end of May in order that some preliminary results could be available for the PMO-V International Workshop	VOS Operators, WMO Secretariat, PMOs, VOS Chair	End May 2015
47	7.3.3 (xxiv)	to investigate the potential for additionally issuing the VOS Questionnaire as an online survey via the JCOMM website	WMO Secretariat	asap
48	7.3.3 (xxv)	to send to all PMOs and VOS Focal Point a final pdf version of the VOS Questionnaire for distribution to their participating ships (taking into account any necessary editorial amendments raised at SOT-8)	M. Kramp, WMO Secretariat	asap
49	7.3.3 (xxvi)	to include on the VOS website the links to WMO Publications which are of relevance to VOS related activities	M. Kramp	asap
50	7.3.5	to discuss with the SAWS availability of marine meteorological, oceanographic, and aerological data from South African ships to the community	M. Kramp	Dec. 2015
51	7.4.4 (i)	Pending endorsement from the Team to transfer the VOS Website from the Bureau of Meteorology to JCOMMOPS, Members to note a change in the location of the XML Schema referenced in the XML namespace variable and update national Pub47 XML generators accordingly.	Members	1 August 2015
52	7.4.4 (ii)	to further examine the requirements to collect metadata about instruments sampling rates and instrument accuracies and precision and report at SOT-9	TT-Pub47	SOT-9
53	7.4.4 (iii)	to further examine the need to record the data format used to send data from ship-to-shore	TT-Pub47	SOT-9
54	7.4.4 (iv)	to submit a proposal to JCOMM-5 to change the structure of Pub47 to include the new fields endorsed by the Team at SOT-7 and SOT-8	TT-Pub47	2016
55	7.5.2 (iii)	to encourage members to contribute to a revision of JCOMM TR 63 and to follow the recommendations made in that TR	SOT member	SOT-9
56	7.5.2 (iv)	to propose the following additional variables to be added to the JCOMM TR 63 during the next intersessional period: True wind	TT-IS	SOT-9
57	7.5.2 (v)	to use online questionnaires to collect information on Instrument Standard Guidelines and Instrument Standard Equipment and make them available to all potential users. It requested the Secretariat to liaise with the chair of the TT-IS and organize the activity as required	Secretariat	SOT-9
58	7.6.2 (ii)	to nominate someone as new Chair of the Task Team	G. Ball	asap
59	7.6.2 (iii)	to nominate a Task Team member on security requirements	TT-Masking Chair	asap
60	7.6.2 (vii)	to submit the draft Terms of Reference of the JCOMM Focal Point on Ship Masking to the JCOMM Co-Presidents for their approval	SOT Chair	30/4/2015

No.	*Report ref.*	*Action item*	*By*	*Deadline*
61	7.6.2 (viii)	to nominate through the SOT Chair someone to become the new Focal Point on Ship Masking and submit the proposal to the JCOMM Co-Presidents for their approval	SOT Chair	15/5/2015
62	7.6.6	to be careful not to promote call sign masking in areas where it might not be needed, and to review its guidance material in this light	WMO Secretariat	asap
63	7.6.7	to raise AIS security concerns with the IMO and to report back to the next session.	Japan, Canada, USA	SOT-9
64	7.7.2 (iii)(b)	to distribute copies of TurboWin e-logbook software and user manual/handbooks to the various maritime colleges/academies, and in the best case given instruction on its use	SOT members	asap
65	7.7.2(iv)(a)	to revise the Marine Observers Handbook and the NWS Handbook No. 1, and edit it to include updates	P. Rychtar	asap
66	7.7.2(iv)(b)	to establish a sub-committee to accomplish this revision	TT-Training	asap
67	7.7.3	to investigate the option of using the IODE Repository of Best Practices in Ocean Data and Information Management as a mechanism to reference existing SOT training documents	P. Rychtar	SOT-9
68	7.8.14	to investigate the case for developing a 'TurboWin Lite' version with more limited functionality	M. Kramp	SOT-9
69	7.8.15	to discuss with the SOT Chair and to investigate the potential and funding implications involved (including whether any financial support could be realized) in developing an App for sending weather observations via Smartphone's or tablets	SOT Chair	SOT-9
70	7.8.19	To remove from the Supplementary Programs section of the VOS website the details about participation in the Ancillary Pilot Project	M. Kramp	asap
71	7.8.25	to investigate the future potential for linking TurboWin to WOW	E-SURFMAR, KNMI	SOT-9
72	7.8.26	to keep the SOT advised of any relevant WOW developments (e.g. for including new ship observations) and to circulate details to the JCOMMOPS PMO, VOS and SOT mailing lists when available	S. North	SOT-9
73	7.8.27	to remove details of the Ancillary Pilot Project from Supplementary Programs section of the VOS website	SOT Chair	asap
74	7.8.28 (xii)	to set up a Webinar on MADIS	S. Pritchett	May 2015
75	7.8.29	to investigate carefully if distinguishing manual and automated classes in general should be discontinued, given that the information on automatization is also available through the mandatory field for general observing practice (atm)	TT-Pub47	SOT-9
76	7.9	to invite and include PMOs in the membership of their Task Teams	TT Chairs	SOT-9

No.	Report ref.	Action item	By	Deadline
77	8.1.1.11	in liaison with the SOT Chair, the VOSP Chair and the SOT Task Team Chairs to consider the potential for developing an on-line reporting system for the VOS	M. Kramp	Nov. 2015
78	8.1.2.8 (i.)	The Panel members, with assistance of the SOT Technical Coordinator to identify resources and initiate the development of "Turbowin Light" (possibly as option in TurboWin), or similar software for basic parameters, and/or smartphone application	Panel members, M. Kramp	SOT-9
79	8.1.2.8 (ii.)	The Panel members, with assistance of the SOT Technical Coordinator to identify resources and initiate the development of a sensor-free mini-AWS or application, using data from ship-owned instruments (NMEA data stream) and satellite facilities to code and submit 3rd party observations	Panel members, M. Kramp	SOT-9
80	8.1.2.9 (ii.)	to expand a cooperation with IRSO, with the aim to receive more data from research vessels (possibly without involvement of a NMS)	M. Kramp	SOT-9
81	8.1.2.9 (iii.)	to discuss with the VOSP Chair on the possible need to routinely produce new maps and statistics	M. Kramp	SOT-9
82	8.1.2.9 (v.)	The SOT TC with assistance from the chair of the Task Team on Instrument Standards to create a list of existing 3rd party equipment	M. Kramp	Apr. 2016
83	8.2.1.3.5	To include in the SOT Implementation Strategy a new KPI to measure the percentage of observations received from VOSClim Class ships (i.e. manual and automated VOSClim ships) with a target of 50% by SOT-9	Secretariat	asap
84	8.2.1.3.5	to monitor the new KPI to measure the percentage of observations received from VOSClim Class ships, and to report at the next Panel Session	S. North	SOT-9
85	8.2.1.4.4	to contact the national VOS Focal Point of the counties where marked differences were noted with a view to ensuring that E-SURFMAR records are corrected as necessary	M. Kramp, VOSP members	asap
86	8.2.1.4.6	to send reminders, at least quarterly, to national VOS Focal points to request them to check that their metadata records are maintained up to date.	M. Kramp	Oct. 2015 onwards
87	8.2.1.4.6	to take steps so that the E-SURFMAR metadata database would include a facility to generate a query based on the 'chgd' metadata field in order to determine the last dates of changes made to metadata fields by each nation	P. Blouch	2016
88	8.2.1.4.8	Members implementing SHIP to consider providing the list of masked ships to the SOT Technical Coordinator	Japan USA Canada	asap
89	8.2.1.5.3	to liaise closely with the RTMC to verify the figures being derived for the KPIs	M. Kramp	SOT-9
90	8.2.1.5.4	to include in the E-SURFMAR Observations Counters2 a criteria to search on the VOSClim and VOSClim AWS (and indeed the other VOS Classes as well) and derive figures for individual ships, as is currently done on a country basis	P. Blouch	SOT-9

No.	*Report ref.*	*Action item*	*By*	*Deadline*
91	8.2.1.6.4	to prepare a paper to the IMO concerning the need to increase VOS data coverage, and to consider how best to pursue this matter	WMO Secretariat	Oct. 2015
92	8.2.2.1.2(vi)	to inform SOT members when and where results of impact studies are available	P. Blouch	asap
93	8.2.2.2.4	to add three non-Pub47 fields to in the VOS metadata database to tell if the ship is participating or not in ASAP, SOOP and/or GOSUD programmes	E SURFMAR	asap
94	8.2.3.9 (iii)	to invite Tanzania to attend the PMO-5 workshop	Secretariat	asap
95	8.2.3.9 (iv)	to continue with the Tanzania initiative, and the SOT Technical Coordinator to assist the PEC and investigate funding solutions for shipping of drifters	M. Kramp	SOT-9
96	8.3.2.1.9	to review, and update as necessary, the content of their national observing guidance and documentation	VOSP members	asap & ongoing
97	8.3.2.1.10	the SOT Technical Coordinator, in liaison with the Chair TT-Instruments and the WMO Secretariat, to consider the feasibility of creating appropriate online tools to collect and display information on national observing practices, and also on the standard equipment used, on the JCOMMOPS website	M. Kramp	SOT-9
98	8.3.3.4.1	members who operate ship AWS systems (e.g. Japan, India, China) on their VOS to keep the Panel and the TT on Instrumentation informed of any new AWS developments and to report on their system developments at the next session	VOSP members	SOT-9
99	8.3.3.4.2	the VOS Operators, in liaison with ship operators and managers, to start using web-based TurboWeb electronic logbooks on suitable observing ships	VOSP members	SOT-9
100	8.4.1.2	to update the template of SOT national reports to include field to report the percentage of PMO time actually spent on PMO related activities and VOS ship inspections	SOT Chair, WMO Secretariat	Nov. 2015
101	8.4.1.3	to request email addresses from the PMOs when the information is unknown, and to update the website accordingly	WMO Secretariat	Nov. 2015
102	8.4.1.6	to investigate whether an on line National VOS form could be developed to allow metrics to more clearly monitor the level of international PMO activities	M. Kramp	Jan. 2016
103	8.4.1.11	to consider also inviting interested PMOs and technicians from outside E-SURFMAR to attend their planned Workshop in 2016	P. Blouch	March 2016
104	8.4.1.16	to share its PMO practice document with the VOS Panel once developed	USA	asap
105	8.4.1.17	TT-VOSRPP to jointly develop a new JCOMM guidance document to address, in so far as is practicable, the full scope of PMO work instructions, duties and responsibilities	S. North, P. Rychtar, PMOs	SOT-9
106	8.4.2.3	to upload completed copies of their foreign VOS inspection forms to the E-SURFMAR database	PMOs	asap & ongoing
107	8.4.2.4	to keep the Panel advised on their development of a new AWS inspection form for ships with AWS.	P. Blouch	SOT-9

No.	Report ref.	Action item	By	Deadline
108	8.5.1.1.11	TT-VRPP, in liaison with the VOSP Chair, to undertake a review of the current VOS Classes with a view to making recommendations to the Panel for consideration and approval at SOT-9	S. North, TT-VRPP	SOT-9
109	8.5.1.2.2	to consider the feasibility of restricting future versions of their future electronic logbook versions to VOSClim class reporting	KNMI/E-SURFMAR, JMA	SOT-9
110	8.5.1.4.7	ETMC to investigate the potential for developing automated procedures to allow IMMT data to be sent direct to the GCCs, and to liaise with KNMI about any modifications that might be necessary to the quality controls in TurboWin to allow this to happen	L. Gates	SOT-9
111	8.5.2.4 (1)	to relocate the VOS Website from ABOM to JCOMMOPS	G. Ball, M. Kramp	1 Aug. 2015
112	8.5.2.4 (2)	to discuss Find-a-PMO and decide who will be responsible for future updates to the PMO contact details	S. North, M. Kramp	1 Aug. 2015
113	8.5.2.4 (3)	to place a redirection link from the VOS Website at ABOM to the VOS Website at JCOMMOPS once the transfer is complete	G. Ball	once the website relocation is complete
114	8.5.2.4 (4)	to inform the mailing lists of the relocation, including the new link to Find-a-PMO	S. North, M. Kramp	once the relocation is complete
115	9.1.1.2 (iii)	to strengthen the collaboration with oceanographic panels that are focused on obtaining profile data for scientific and operational applications	SOOPIP members	SOT-9
116	9.1.1.2 (iv)	to support the processes to carry out joint meetings with scientific panels dedicated to profile data in order to enhance the contribution to the scientific community of the XBT network and observations from ships of opportunity	SOOPIP members	asap
117	9.1.2.12 (i)	to establish an ad hoc Task Team on SOOP metadata Chaired by Joaquin Trinanes (USA) to start working immediately and to report to the Chair no later than mid-2016	*ad hoc* TT on SOOP metadata	end 2015
118	9.2.1.2 (ii)	to continue collaboration with JCOMM to assess the status of the XBT network	SOOPIP members	SOT-9
119	9.3.2.4. (ii)	to continue collaboration with GOSUD on data management issues	SOOPIP members	SOT-9
120	9.4.3.2 (iii)	to strengthen the participation in scientific and operational panels that relate to the scientific and operational use of XBT data, and to improve XBT observations and data	SOOPIP members	SOT-9
121	9.4.3.2 (iv)	to support the processes to carry out joint XBT Network meetings with scientific	SOOPIP	asap

No.	Report ref.	Action item	By	Deadline
		panels dedicated to profile data (particularly temperature profile data)	members	
122	9.5.1.5 (ii.)	to encourage the completion and closing of the migration to BUFR. All SOOPIP partners should put the data on the GTS in BUFR format, and terminate the transmission of BATHY reports after ensuring the user community and service providers are prepared	SOOPIP members	asap
123	9.5.1.5 (iii.)	to organize the activity of strengthening the coordination of SOOPIP activities by updating (if needed) the links to online national data and metadata repositories, and hold regular online meetings on data management and transect statistics	SOOPIP Chair	SOT-9
124	9.5.1.5 (iv.)	to coordinate the collection of input to CBS through the JCOMM Task Team on Table Driven Codes (TT-TDC)	J. Trinanes	asap
125	10.1.1.3	to confirm with the CBS that the new monitoring criteria are fit for purpose	WMO Secretariat	Sep. 2016
126	10.1.1.3	to produce separate tables for suspect manual and automatic ships on the Met Office marine monitoring website	RSMC	Sep. 2015
127	10.1.1.8 (i.)	to produce a report on time-series of 'suspect' ships, to show impact of the change in selection criteria	RSMC	Feb. 2016
128	10.1.1.8 (ii.)	to separate timeliness information for manual and automatic ships	RSMC	Apr. 2016
129	10.1.2.8 (i)	to start using the new monitoring criteria for automated ships	RTMC	Jul. 2015
130	10.1.4.4 (iii)	to provide data services during the period April 2015 to March 2017	CCOG, OSD	April 2017
131	10.1.4.4 (iv)	to undertake CMD-WOD integration during the period April 2015 to March 2017	CCOG	March 2017
132	10.1.4.4 (v)	to organize and identify host for the third meeting of the GTSPP steering team in June 2016	C. Sun	June 2016
133	10.1.5.3 (i)	to complete Steering Group formation	GOSUD co-chairs	May 2015
134	10.1.5.3 (ii)	to produce a new project plan	GOSUD co-chairs	Sept. 2015
135	10.1.5.3 (iii)	to hold GOSUD workshop	GOSUD	late 2015 or early 2016
136	10.1.5.3 (iv)	to coordinate with FerryBox projects	GOSUD co-chairs	Mar. 2016
137	10.1.5.3 (v)	To localize delayed mode datasets	GOSUD FP for Australia	march 2016
138	10.2.1.9 (i)	All CMs that did not submit data during 2014 to do so in 2015 or alternatively contact GCC for advice	CMs	end of 2015
139	10.2.1.9 (ii)	to proactively contact CM that have not submitted data for a number of years to offer	GCCs	end 2015

No.	Report ref.	Action item	By	Deadline
		assistance and encourage submission of data		
140	10.2.1.9 (iii)	SOT members operating AWS systems on ships to make sure that the delayed mode data are submitted to the MCSS in IMMT format according the WMO Technical Regulations detailed in WMO No. 558 and 471	members operating AWS	asap
141	10.2.1.9 (iv)	to liaise with the JCOMM Task Team on Table Driven Codes (TT-TDC) to make sure that the MCSS requirements are taken into account	members operating AWS	asap
142	10.3.2.5	SOT members willing to lead the task team on table driven codes (TT-TDC) to notify the chair of the DMPA (Sissy Iona)	SOT members	asap
143	10.3.3 (i)	to validate the revised VOS BUFR Template by the next IPET-DRMM meeting	TT-TDC	July 2015
144	10.3.3 (ii)	to submit the revised VOS BUFR Template and validation results to the IPET-DRMM-III	TT-TDC	July 2015
145	10.3.3 (iii)	TT-TDC in liaison with the ETMC to undertaker a comparison of the BUFR Template for VOS data to the IMMT-5 data format and, if necessary, make proposal to modify the template to allow the representation of IMMT-5 on the GTS	TT-TDC	July 2015
146	10.3.3 (iv)	to comment on and endorse the proposed mapping of Pub47 to BUFR (SOT members to email comments on proposed mapping to TT-TDC Chair (D. Berry))	SOT members	asap
147	10.3.3 (v)	to work with the TT-IS and TT-Pub47 to provide guidance on the mapping of Pub47 to BUFR	TT-TDC	asap
148	10.3.3 (vi)	to recommend the validation of the offshore rig / platform template by the next IPET-DRMM	TT-TDC	July 2015
149	10.4.9	to provide the SOT Technical Coordinator with the Japanese ASAP platform metadata	Japan	June 2015
150	11.4	to send comments on the revised version of the implementation strategy to the SOT Chair and the Secretariat by 31 May 2015	SOT members	31 May 2015
151	11.6	to finalize the new version of the Strategy on behalf of the Team in consultation with the VOSP and SOOPIP chairs, the OPA Coordinator, the Task Team Chair, and the Secretariat	C. Marshall	31 July 2015
152	12.4.2	to coordinate with the VOSP and SOOPIP Chairs, and with the Secretariat in the view to propose an updated or new format of SOT annual reports	SOT Chair	end 2014
153	13.5	to publish with the SOT annual report for 2014 the national reports provided by the Members to the WMO Secretariat as well as the PowerPoint presentations made at this meeting	Secretariat	asap
154	14.1	to discuss with the Secretariat and potential hosts in the view to organize the next SOT Session preferably in Europe in April/May 2017	C. Marshall	end Dec. 2015

ANNEX IV

TERMS OF REFERENCE AND MEMBERSHIP OF THE SOT TASK TEAMS

1. TASK TEAM ON SATELLITE COMMUNICATION SYSTEMS

The Task Team shall:

ToR no.	*Terms of Reference*
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	Design a new communication system for conventional VOS based on their future FleetBoardband GMDSS terminals to replace Inmarsat Code-41;
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	Monitor migration to Table Driven Codes;
6	Review all relevant JCOMM Publications to ensure that they are kept up-to-date and comply with the Quality Management terminology;
7	Report to the next SOT Session on any relevant issues/proposals.

Task Team members:

Mr Jan Rozema (Chair, the Netherlands)	Mr Steven PRITCHETT (USA)
Mr Pierre BLOUCH (E-SURFMAR, France)	Ms Paula RYCHTAR (USA)
Mr Joel CABRIE (Australia)	Mr René ROZEBOOM (the Netherlands)
Ms Annina KROLL (Germany)	Mr Derrick SNOWDEN (United States)
Mr Michael MYRSILIDIS (Greece)	Mr Johan STANDER (South Africa)
Ms Sarah C. NORTH (United Kingdom)	Any representatives of countries where LES accepting Code 41 are located
Mr Hiroshi OHNO (Japan)	A representative of RA III.
Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*	

2. TASK TEAM ON ASAP

The Task Team shall:

ToR no.	*Terms of Reference*
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.

Task Team members:

Mr Rudolf KROCKAUER (Chairperson, E-ASAP & Germany)	Mr Johan STANDER (South Africa)
Mr Alexander KARPOV (Associated Member, HMEI)	Plus any other country making ASAP soundings
Ms Sarah C. NORTH (United Kingdom)	Possible participation by POGO
Mr Hiroshi OHNO (Japan)	Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*

3. TASK TEAM ON VOS RECRUITMENT AND PROGRAMME PROMOTION

The Task Team shall:

ToR no.	*Terms of Reference*
1	Promote and monitor the upgrade of observing ships to VOSClim Class liaising with scientific advisers, the DAC and the VOSClim Focal Point as necessary
2	Review existing promotional aids (flyer, certificates etc) and recommend new promotional aids
3	Promote the use of, and keep under review, the promotional SOT 'Recruitment Presentation'
4	Establish a store of relevant news and articles for use in SOT or VOS publications, or in relevant national newsletters or publications
5	Issue the 2015 VOS Scheme Questionnaire and collate replies to assess the performance of the VOS Scheme, identifying issues that need to be addressed by SOT
6	Review relevant JCOMM publications to ensure they are up to date (e.g. with respect to VOS Classes)
7	Review the suitability of the current VOS Classes and prepare proposals, as appropriate, for consideration at SOT-9
8	In collaboration with the Task Team on Training develop a new JCOMM guidance document to address, in so far is practicable, the full scope of PMO work instructions, duties and responsibilities
9	Consider the need, value and mechanisms for establishing a Third Party 'Support' Fleet and make proposals to SOT-9 on how this might be developed and operate in practice
10	Review existing promotional aids (flyer, certificates etc.) and recommend new promotional aids

Task Team members:

Ms Sarah C. NORTH (Chairperson, United Kingdom)	Ms Annina KROLL (Germany)
Mr David BERRY (United Kingdom) - VOSClim Scientific Advisors	Ms Gerie Lynn LAVIGNE (Canada)
Mr Pierre BLOUCH (E-SURFMAR & France)	Mr Steven PRITCHETT (USA)
Mr Joel CABRIE (Australia)	Ms Paula RYCHTAR (USA) - VOSClim Focal Point
Mr Eric FREEMAN (USA) - VOSClim DAC	Mr Johan STANDER (South Africa)
Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*	

4. TASK TEAM ON METADATA FOR WMO PUBLICATION NO. 47

The Task Team shall:

ToR no.	*Terms of Reference*
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.

Task Team members:

Dr David BERRY (Chair, United Kingdom)	Dr Elizabeth C. KENT (United Kingdom)
Mr Pierre BLOUCH (France)	Ms Sarah C. NORTH (United Kingdom)
Ms Lily FUNG (Canada)	Mr Steven PRITCHETT (USA)
Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*	Mr Joel CABRIE (Australia)
Rob Niemeyer (USA)	

5. TASK TEAM ON INSTRUMENT STANDARDS

The Task Team shall:

ToR no.	*Terms of Reference*
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 dedicated WebPages containing this information, to be made widely available through the JCOMM web site and linked from other relevant websites (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.

Task Team members:

Mr Henry KLETA (Chairperson, Germany)	Ms Sarah C. NORTH (United Kingdom)
Mr Joel CABRIE (Australia)	Mr Hiroshi OHNO (Japan)
Dr David BERRY (United Kingdom)	Mr Shawn RICKARD (Canada)
Mr Francis BRINGAS (USA)	Mr René ROZEBOOM (the Netherlands)
Mr Jean-Baptiste COHUET (France)	Ms Paula RYCHTAR (USA)
Ms Caridad Ibis GONZALES (USA)	Mr Shawn SMITH (United States)
Dr Elizabeth C. KENT (United Kingdom)	Mr Johan STANDER (South Africa)
Mr Rudolf KROCKAUER (Germany)	Mr Scott WOODRUFF (United States)
Mr Martin MACLELLAN (Canada)	HMEI representative (Associated Member, HMEI)
Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*	

6. TASK TEAM ON CALL SIGN MASKING AND ENCODING (TT-MASKING)

The Task Team shall:

ToR no.	*Terms of Reference*
1	Oversee the implementation of **MASK**[71], **SHIP**[72] and **ENCODE**[73] 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**[74] 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.

Task Team members:

[Chair TBD by G. Ball]	Ms Sarah C. NORTH (United Kingdom)
Mr Etienne CHARPENTIER (WMO Secretariat)	Mr Colin PARRETT (United Kingdom)
Dr David BERRY (United Kingdom)	Mr Scott WOODRUFF (United States)
Ms Lily FUNG (Canada)	Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*
Mr Chris MARSHALL (Canada)	Hiroshi OHNO (Japan) - Security requirements expert
JCOMM Focal Point on Ship Masking (to be appointed)	

71: MASK - Unique, repeating identifier. The masking identifier is assigned by the NMS that recruited the ship.
72: SHIP: Letters "SHIP" used in place of the real ship identifier.
73: ENCODE - Unique, non-repeating identifier. The identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude.
74: REAL - Official ITU callsign of the ship.

7. TASK TEAM ON TRAINING (TT-TRAINING)

The Task Team shall:

ToR no.	***Terms of Reference***
1	Develop global standards, practices and functions for Port Meteorological Officers
2	Maintain Reference Guides for PMOs and national VOS, SOOP and ASAP Program Managers
3	Coordinate international PMO Training Workshops
4	Encourage the development of VOS Programmes in data sparse areas by supporting and participating in the drifter donation programme as well as the PMO buddy programme
5	Assist the TT-VRPP in the development of PMO resources
6	Provide advice to Nautical Colleges about training syllabuses and assist with the training or the provision of training material
7	Maintain User Manuals, Best Practices, and Reference Guides for ship riders collecting XBT data or performing drifter and Argo float deployments.
8	Maintain a website with relevant training documents.
9	In collaboration with the Task Team on VOS Recruitment and Programme Promotion, develop a new JCOMM guidance document to address, in so far as is practicable, the full scope of PMO work instructions, duties and responsibilities.

Task Team members:

Ms. Paula RYCHTAR (Chairperson, USA)	Mr. Ben LEMON (Canada)
Mr. Joel CABRIE (Australia)	Mr Henry KLETA (Germany)
Ms. Sarah NORTH (UK)	Mr Shawn RICKARD (Canada)
Mr. Francis BRINGAS (USA)	Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*
Ron WILLIAMS (USA)	Jim LUCIANI (USA)
Matt THOMPSON (USA)	

8. Task Team on High-Resolution Marine Meteorology (TT-HRMM)

The Task Team shall:

ToR no.	***Terms of Reference***
1	Review existing requirements (including WMO Rolling Review of Requirements, and other satellite data requirements not covered by WMO Application Areas) for marine meteorological observations sampled at sub-hourly intervals (defined as high-resolution; HR).
2	Develop new requirements for HR marine meteorology in coordination with the ETMC and relevant scientific communities.
3	Define requirements for sampling rates, data formats, data averaging, minimum metadata, calibration, etc. to be recommended using AWS on VOS to collect HR marine meteorological observations.
4	Define processes to collect HR marine meteorological data on AWS from vessels and to transfer these observations to appropriate data assembly centers in a timely manner.

Task Team members:

Shawn R. Smith (USA, Chair)	Peter Minnett (USA)
David Berry (UK)	Sarah North (UK)

Jean-Baptiste Cohuet (France)	Jan Rozema (the Netherlands)
Henry Kleta (Germany)	Paula Rychtar (USA)
Annina Kroll (Germany)	Natheer Tofa (South Africa)

9. *Ad hoc* Task Team on SOOP Metadata

The *ad hoc* Task Team on SOOP metadata will start working immediately and report to the SOT Chair no later than mid-2016 and shall

ToR no.	***Terms of Reference***
1	Review the SOOP metadata format
2	Create a list of active SOOP agencies and programmes, with contacts
3	Create a SOOP platform metadata format and collection, linked to a ship list

Task Team members:

Joaquin Trinanes (USA, Chair)	Representative of Japan
Rebecca Cowley (Australia)	SOT Technical Coordinator
Francis Bringas (USA)	

10. *Ad hoc* Task Team on WIGOS Identifiers

The Task Team shall:

ToR no.	***Terms of Reference***
1	be responsible for proposing an SOT scheme for ship identifiers that will be compatible with WIGOS Identifiers.
2	deliver its recommendations within six months, and liaise with the TT-Pub47 and the TT-Masking as needed to address this issue

16.3.1.

Dr David Berry (Chairperson, UK)	Mr Pierre Blouch (E-SURFMAR)
Ms Paula Rychtar (USA)	Mr Martin KRAMP, SOT Technical Coordinator (JCOMMOPS) – *ex officio*
Ms. Sarah NORTH (UK)	

ANNEX V

PROPOSED CHANGES TO THE SOT TERMS OF REFERENCE
(As proposed by SOT-8, Cape Town, South Africa, 20-24 April 2015)

DRAFT TERMS OF REFERENCE OF THE SHIP OBSERVATIONS TEAM

(on the basis of excerpt of Annex to Resolution 3 (JCOMM-4), Terms of Reference and General Membership of the Coordination Group and Teams of the Observation Programme Area)

Note: The proposed insertions are highlighted in yellow. Proposed deletions are ~~stroked-through~~.

(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) Oversee and monitor the implementation of ~~Develop methodology~~ methodologies as determined by the scientific and operational communities 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, and greater PMO collaboration;
(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, other relevant Technical Commissions, executive bodies working groups, and GCOS, GOOS, as well as with other interested parties, such as the International Maritime Organization (IMO) and other relevant international organizations;
(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 and research ships;
(i) Seek new opportunities for deploying and/or recover various kinds of measuring devices as recommended by the relevant panels and widely publicise those opportunities;
(j) Develop as necessary new pilot projects and/or operational activities and establish new specialized panels as required;
(k) Carry out outreach and other activities as agreed by participating Members/Member States to implement and operate the SOT programme and to promote and expand it internationally, seek collection of third party data from ships, and collaborate with the industry in the view to enhance the collection of data from ships;
(l) Develop improved real-time feedback to volunteer ships regarding the quantity and quality of the observations that they submit and that are inserted on the GTS.

GENERAL MEMBERSHIP

- Chairperson and vice-Chairperson of the Ship Observations Team, selected by the Commission
- Chairpersons and vice-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.

TERMS OF REFERENCE OF COMPONENT PANELS

Ship-of-Opportunity Implementation Panel (SOOPIP)

The Ship-of-Opportunity 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:

(a) ~~Review, recommend on and, as necessary, coordinate the implementation of~~ Implement, maintain, and monitor 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 SOOP data are carried out to the GTS and relevant data centres according to operational and scientific requirements ~~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~~Facilitate the formation of ~~an XBT~~ SOOP related Science Teams dedicated to meet and discuss on a periodic basis results and ongoing research performed with ~~XBT~~ shipboard 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 standard, and encourage other new ships to be recruited to the VOSClim class;
(d) Develop and implement activities to optimize ship inspections and ~~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.

ANNEX VI

REGIONAL SPECIALIZED METEOROLOGICAL CENTER (RSMC) / EXETER MONITORING REPORT

Appendices: **A.** Met Office on-line monthly VOS suspect list for February 2015
B. Criteria for monthly monitoring of marine surface observations
C. Timeliness of VOS observations received at the Met Office, February 2015
D. Met Office on-line time of receipt statistics for individual ships, February 2015
E. Met Office on-line time of receipt statistics for national fleets, February 2015
F. Met Office monthly national fleet ranking for manual VOS, February 2015
G. Met Office monthly ranking for automatic VOS, February 2015

Monitoring the quality and timeliness of VOS observations

1 The Met Office (RSMC Exeter), as WMO-designated lead centre for monitoring the quality of surface marine meteorological data (observations from ships, buoys and other in situ marine platforms), 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.

2 Monthly lists of suspect marine platforms are sent to the WMO Secretariat and also exchanged among other monitoring centres (including JMA, NCEP, MeteoFrance and ECMWF) for comparison. Generally there is considerable agreement between the different centres, both in terms of suspect platforms (using the same criteria) and mean and standard deviation of differences from the background fields. The Met Office monthly suspect lists are available via the Met Office web site at http://research.metoffice.gov.uk/research/nwp/observations/monitoring/index.html . A recent example of our on-line VOS suspect list for February 2015 is shown in Appendix A. Monthly QC plots are also available from the website for each ship that is listed as suspect.

3 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 new monthly monitoring criteria for the 6 variables that were agreed at SOT-7 are shown in Appendix B, together with the previous selection criteria. The selection criteria for labeling ships as 'suspect' had previously remained unchanged for about 25 years (for pressure), during which time there have been large improvements in data assimilation, numerical modeling and data coverage, resulting in more accurate short-range background forecasts and smaller observation-background (o-b) differences overall. Consequently, some of the monitoring criteria for manual observations have been tightened slightly.

4 Also, over recent years there has been a large increase in the number of ships that send in reports from automatic weather stations, which are generally more accurate and less prone to errors than manual reports. Therefore the monitoring of 'automatic ships' has been separated from the monitoring of 'manual ships' and tighter limits imposed for automatic ships, as shown in Appendix B (numbers in brackets). The splitting of the ships into manual and automatic reports is helped if "i_X" is set correctly in all reports; although the Met Office also uses lists of manual and automatic ships compiled using "atm" from the ship metadata, but these are only updated monthly.

5 Due to the stricter monitoring criteria, there will be more 'suspect' ships than previously and the increases for pressure and temperature for February 2015 can be seen by comparing the two lists in Appendix A. For pressure, there were 16 VOS ships on the suspect list using the old criteria, compared to 38 using the new criteria (35 manual and 3 automatic ships). [N.B. If

the new criteria are applied to all reporting ships, we get 57 'suspect' ships (seen in Table 1 of the 'Global Monthly Monitoring Report', available from the Met Office web site); so there are 19 suspect ships (or an extra 50%) that are not in any national VOS fleet, or at least not in the E-SURFMAR database of 'active VOS'.] The old criteria will be used to produce 'parallel' suspect lists that will be compared with the new lists by the Met Office and the changes in criteria will be noted in the RSMC's Biannual Report, with a report on any changes in the time-series of suspects.

6 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 the meta-data available from the E-SURFMAR web-site.

7 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.

8 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 mailing list information is kept up to date. However, national 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.

9 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. Unfortunately, there have been problems producing the latest report for July-December 2014 (for which the Met Office apologizes) and the format may have to change somewhat, with the individual time-series plots for each suspect platform being removed. There are in any case doubts as to the usefulness of these time-series for correcting problems, considering the more timely monthly information available (mentioned above).

10 Timeliness statistics for VOS reports received at the Met Office are available on our web site at http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/index.html 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 February 2015 data is shown in Appendix C, where it can be seen from the upper graph that the majority of ship reports were received promptly, with about 70% received within 15 minutes and more than 90% received within 60 minutes of the observation time. The cut-off time for operational NWP global data assimilation is typically 90-150 minutes after the analysis times of 00, 06, 12 and 18 UTC, so that about 95% of global VOS data are being received in time to be assimilated. Examples of timeliness information for February 2015 for individual call-signs and for national fleets are shown in Appendices D and E, respectively. The overall timeliness continues to improve due to increased automation. The Met Office plans to separate the automatic ships from the manual ships to produce two sets of timeliness statistics for national VOS fleets.

11 For the last 5 years the Met Office has been producing annual lists of all VOS ships, ranked in order of importance to the numerical weather prediction (NWP) system, available from the Met Office web-site at http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/VOSranking/ind

ex.html . 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). This system was extended about 3 years ago to produce monthly scores and ranking lists, separately for automatic and manual ships and for national VOS fleets, and these monthly lists are also available from the above link. Extracts of the monthly results for February 2015 are shown in Appendices F and G.

12 As mentioned at previous SOT meetings, 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 a new ENCODE masking scheme is rolled out.

Appendices: 7

APPENDIX A OF ANNEX VI

MET OFFICE ON-LINE MONTHLY VOS SUSPECT LIST FOR FEBRUARY 2015 (extracts)

1. USING OLD CRITERIA

Pub47 VOS Suspects for Feb 2015

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.

PRESSURE (hPa)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
		VRCS2	49	0	**5.0**	2.6	QC plot
		VRIA4	25	0	**5.6**	1.2	QC plot
GB	AL BAHIYA	V7QF5	30	0	**-4.3**	0.5	QC plot
HK	Min Lu	VRFI7	64	0	**5.0**	1.8	QC plot
IT	COSTA DELIZIOSA	IBJD	77	5	**-10.4**	4.1	QC plot
JP	TOYO	H3ZA	30	0	**-4.4**	1.0	QC plot
RU	KAPITAN KREMS	UFLT	32	0	**10.7**	0.9	QC plot
RU	PURGA	UASU	25	24	-3.8	**8.0**	QC plot
US	ALGOSTEEL	VDJB	21	**100**	0.0	0.0	QC plot
US	DISNEY DREAM	C6YR6	51	2	**-5.1**	0.9	QC plot
US	HOOD ISLAND	C6LU4	47	0	**4.8**	1.6	QC plot
US	HORIZON ENTERPRISE	KRGB	62	2	**-5.2**	0.7	QC plot
US	NIEUW AMSTERDAM	PBWQ	179	0	**-4.5**	0.9	QC plot
US	OKEANOS EXPLORER (AWS)	WTDH	195	6	**10.9**	5.1	QC plot
US	PRINSENDAM	PBGH	72	1	**6.7**	0.7	QC plot
US	SEVEN SEAS NAVIGATOR	C6ZI9	38	0	**-5.6**	1.8	QC plot

TEMPERATURE (deg C)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
GB	HMS Protector	GXRK	416	0	**-4.8**	3.7	QC plot
RU	ABAKAN	UISD	36	0	**4.2**	2.5	QC plot
US	OKEANOS EXPLORER (AWS)	WTDH	188	**76**	-2.9	4.9	QC plot
US	OVERSEAS MARTINEZ	WPAJ	28	**46**	-0.2	1.5	QC plot
US	WHITTIER RESEARCH (AWS)	KXI29	669	0	**4.9**	1.9	QC plot

WIND SPEED (m s-1)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
HK	Dapeng Moon	VRDW2	39	0	**5.4**	5.1	QC plot

WIND DIRECTION (deg)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
		7JGY	22	0	**-69.4**	63.2	QC plot
		VRNF8	22	0	**50.4**	72.6	QC plot
DE	H-G BUELOW	A8YF5	25	4	-1.3	**81.1**	QC plot
GB	Mozu Arrow	C6NI8	39	0	**44.6**	30.6	QC plot
GB	Seago Antwerp	OZDB2	27	0	10.3	**92.7**	QC plot
GB	Spruce Arrow	C6SD9	26	0	3.1	**101.8**	QC plot
NL	FLINTERSKY	PBHZ	39	0	0.6	**109.8**	QC plot
US	NORWEGIAN DAWN	C6FT7	34	0	**-32.1**	19.4	QC plot
US	NORWEGIAN EPIC	C6XP7	40	3	14.2	**90.2**	QC plot

RELATIVE HUMIDITY (%)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Graph
CA	CCGS CAPE ROGERS	VCBT	311	0	**31.6**	11.5	QC plot
CA	DARA DESGAGNES	VCBW	519	3	**-23.2**	16.7	QC plot
CA	GORDON REID	CGBR	181	0	**18.2**	7.0	QC plot
DE	CHICAGO EXPRESS	DCUJ2	26	0	**-15.4**	14.2	QC plot
DE	CMA CGM DON GIOVANNI	A8IE7	33	0	**17.2**	12.4	QC plot
DE	CONTI GREENLAND	A8QM9	35	0	**19.4**	12.2	QC plot
DE	GRAL. MANUEL BELGRANO	D5FS6	26	0	**22.4**	8.8	QC plot
GB	AL MAFYAR	V7QG5	21	0	**28.3**	8.7	QC plot
GB	Maersk Bentonville	OZCZ2	34	0	**17.4**	13.8	QC plot
GB	Oceana	ZCDN9	65	0	**-18.5**	18.5	QC plot
HK	Star Pisces	C6AV5	27	0	**18.0**	12.3	QC plot
NO	JOHAN HJORT	LDCJ	596	**84**	**55.0**	4.6	QC plot

2. USING NEW CRITERIA

PRESSURE (hPa)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Timeseries
		OWDW2	20	0	4.3	1.3	QC plot
		VRCS2	49	0	5.0	2.6	QC plot
		VRIA4	25	0	5.6	1.2	QC plot
AU	PAPUAN CHIEF	VRRC	16	0	3.8	0.7	QC plot
CA	ALGOMA ENTERPRISE	VCJM	606	0	-2.2	0.6	QC plot
DE	CALEDONIA	9HCX7	18	0	5.2	1.7	QC plot
DE	MSC ALICANTE	A8YN7	25	0	3.2	0.9	QC plot
GB	AL BAHIYA	V7QF5	30	0	-4.3	0.5	QC plot
HK	Min Lu	VRFI7	64	0	5.0	1.8	QC plot
HK	OOCL Singapore	VRMX7	28	0	-3.5	3.2	QC plot
IS	HELGAFELL	OZ2049	58	0	-3.9	1.7	QC plot
IT	COSTA DELIZIOSA	IBJD	77	5	-10.4	4.1	QC plot
JP	TOYO	H3ZA	30	0	-4.4	1.0	QC plot
NL	EMMA MAERSK	OYGR2	18	0	0.8	5.1	QC plot
NZ	SHANSI	9V9710	19	0	3.1	1.1	QC plot
RU	KAPITAN KREMS	UFLT	32	0	10.7	0.9	QC plot
RU	PURGA	UASU	25	24	-3.8	8.0	QC plot
US	ALGOSTEEL	VDJB	21	100	0.0	0.0	QC plot
US	ALLIANCE FAIRFAX	WLMQ	17	0	-5.8	1.9	QC plot
US	CARNIVAL ELATION	3FOC5	17	0	-4.2	0.6	QC plot
US	CARNIVAL VICTORY	3FFL8	24	0	-3.4	2.3	QC plot
US	CHARLES ISLAND	C6JT	19	0	-6.9	1.7	QC plot
US	DISNEY DREAM	C6YR6	51	2	-5.1	0.9	QC plot
US	EAGLE KUANTAN	9V8376	36	0	-4.0	2.2	QC plot
US	EVER LIVING	9V9791	20	0	-3.2	1.0	QC plot
US	EXCELSIOR	ONCD	18	0	3.3	2.4	QC plot
US	HOOD ISLAND	C6LU4	47	0	4.8	1.6	QC plot
US	HORIZON ENTERPRISE	KRGB	62	2	-5.2	0.7	QC plot
US	HYDRA VOYAGER	C6AB8	42	0	-3.1	1.2	QC plot
US	LAURENCE M. GOULD (AWS)	WCX7445	151	1	-1.6	4.2	QC plot
US	MAERSK MISSOURI	WAHV	50	0	3.5	1.6	QC plot
US	MAERSK NIAGARA	VREO9	18	0	3.8	2.2	QC plot
US	NIEUW AMSTERDAM	PBWQ	179	0	-4.5	0.9	QC plot
US	OKEANOS EXPLORER (AWS)	WTDH	195	6	10.9	5.1	QC plot
US	PRINSENDAM	PBGH	72	1	6.7	0.7	QC plot
US	SEVEN SEAS NAVIGATOR	C6ZI9	38	0	-5.6	1.8	QC plot
US	STAR ISMENE	LANT5	19	0	-3.1	0.6	QC plot
US	TANGGUH HIRI	C6XC2	43	0	3.7	2.4	QC plot

TEMPERATURE (deg C)

CTRY CODE	SHIP NAME	CALL SIGN	TOTAL	GE (%)	BIAS	SD	Timeseries
CA	ARCTIC	VCLM	624	0	3.0	3.7	QC plot
CA	BELLA DESGAGNES	CZJG	669	0	2.9	1.9	QC plot
CA	DES GROSEILLIERS	CGDX	669	0	2.9	1.7	QC plot
CA	PIERRE RADISSON	CGSB	637	0	2.9	1.7	QC plot
DE	HELGOLAND TRADER	A8XA3	18	0	3.8	2.0	QC plot
GB	HMS Protector	GXRK	416	0	-4.8	3.7	QC plot
NL	NEDLLOYD BARENTSZ	PHKL	35	0	3.8	2.1	QC plot
RU	ABAKAN	UISD	36	0	4.2	2.5	QC plot
US	ADVANTAGE	WPPO	17	0	-3.4	1.2	QC plot
US	HI\'IALAKAI (AWS)	WTEY	569	0	1.6	4.9	QC plot
US	OKEANOS EXPLORER (AWS)	WTDH	188	76	-2.9	4.9	QC plot
US	OVERSEAS MARTINEZ	WPAJ	28	46	-0.2	1.5	QC plot
US	ROGER REVELLE (AWS)	KAOU	477	0	3.2	1.6	QC plot
US	VALDEZ RESEARCH (AWS)	WXJ63	669	0	3.6	3.7	QC plot
US	WHITTIER RESEARCH (AWS)	KXI29	669	0	4.9	1.9	QC plot
ZY	APL CHONGQUING	9V9373	51	0	3.1	1.7	QC plot

APPENDIX B OF ANNEX VI

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, split into manual and automatic observing systems.
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 (^oC).
: Relative Humidity (%).
: Sea surface temperature (^oC).

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 Limits : 15 hPa (pressure)
25 ms^{-1} (vector wind)
15 ^oC (air temperature)
50% (relative humidity)
10 ^oC (sea surface temperature)

Selection Criteria *(split into manual/automatic from January/February 2015)*

Manual (Automatic) : NOBS >= [20] 15 (50), + one or more of the following:
[Previous]

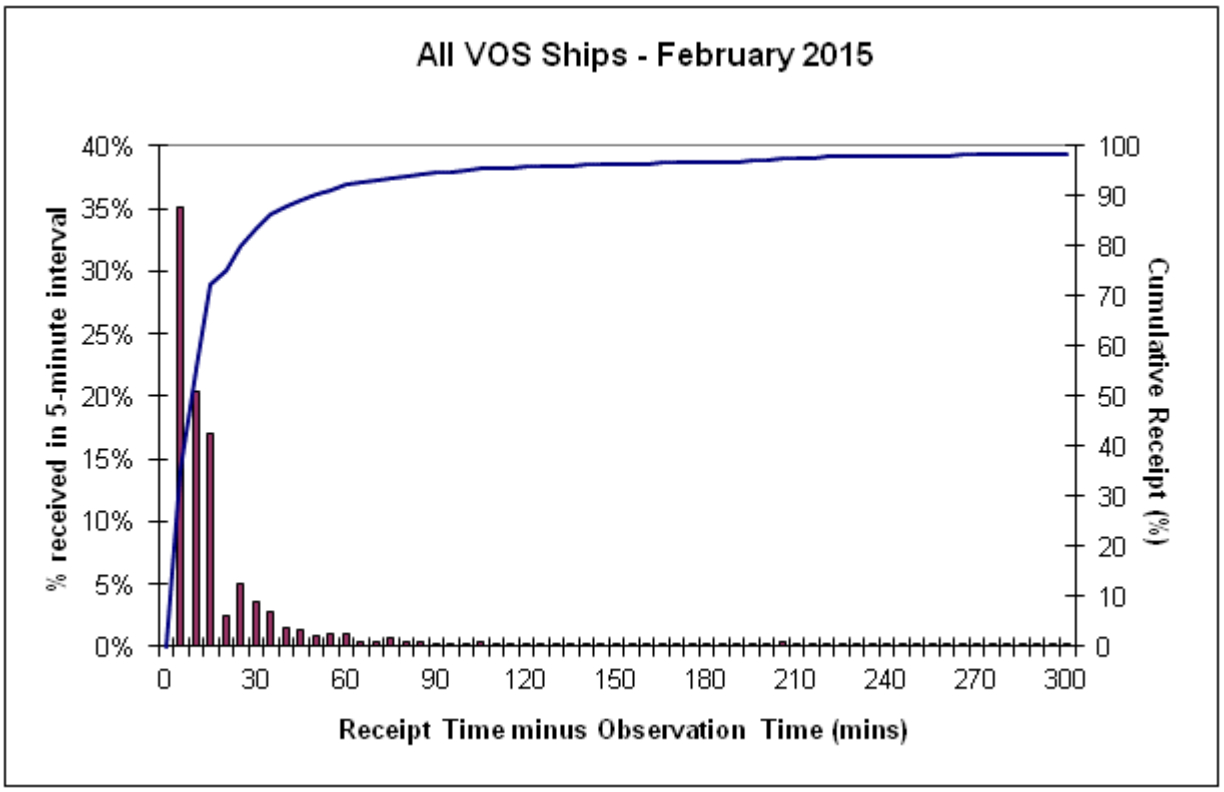
1. Bias >= [4] 3 (2) hPa (pressure)
>= [5] 4 (4) ms^{-1} (wind speed)
>= [30] 30 (25) degrees (direction)

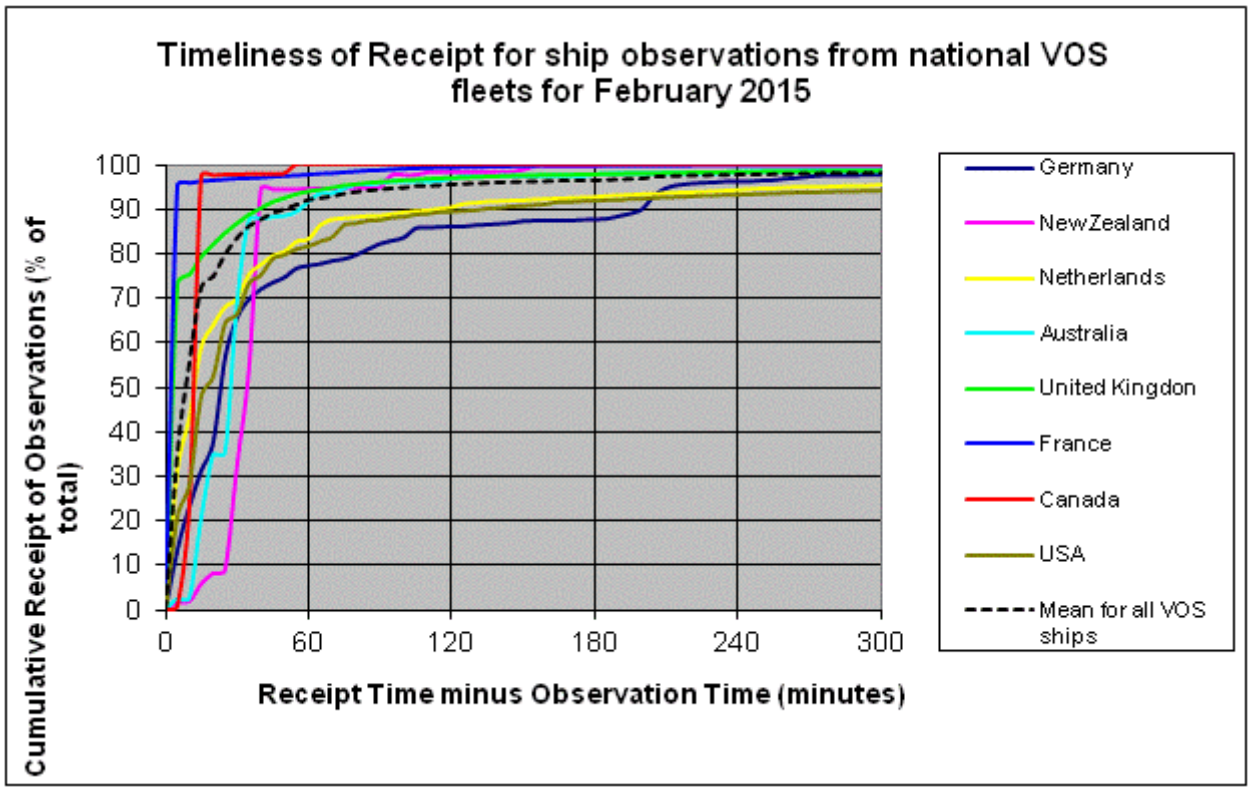
		>=	[4]	3 (2.5)	°C	(air temperature)
		>=	[15]	15 (12)	%	(relative humidity)
		>=	[3]	2.5 (2)	°C	(SST)
	2. SD	>=	[6]	5 (4)	hPa	(pressure)
		>=	[80]	70 (50)	degrees	(direction)
		>=	[6]	5 (4)	°C	(air temperature)
		>=	[25]	25 (20)	%	(relative humidity)
		>=	[5]	4 (3)	°C	(SST)
	3. PGE	>=	[25]	25 (15)	%	

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}

APPENDIX C OF ANNEX VI

TIMELINESS OF VOS OBSERVATIONS RECEIVED AT THE MET OFFICE, FEB 2015





APPENDIX D OF ANNEX VI

MET OFFICE ON-LINE TIME OF RECEIPT STATISTICS FOR INDIVIDUAL SHIPS, FEB 2015 (extract)

Pub47 Time of Receipt Statistics by SHIP for February

CTRY	CALLSIGN	NAME	Observations	N<30	N<60	N<120	N>360	Average (R-O) (mins)
	N8Z001		4	2	3	3	0	68.2
	TBWZZ00		15	8	14	15	0	24.4
NL	PCAM	AALSMEERGRACHT	22	21	22	22	0	4.0
NL	PHHD	ARNEBORG	17	16	17	17	0	15.6
NL	2EZE5	BERGE STAHL	28	9	13	18	2	142.7
NL	A8IP4	COMOROS STREAM	51	48	49	50	0	0.0
NL	PDKK	COOL EXPRESO	74	73	73	73	0	7.2
NL	PCFW	CORAL CARBONIC	3	3	3	3	0	7.7
NL	ELXG9	CORAL PAVONA	23	4	5	5	11	610.1
NL	PBOF	DAMGRACHT	49	44	44	46	0	11.9
NL	PBSY	DONAUGRACHT	6	6	6	6	0	14.8
NL	PDWZ	EDAMGRACHT	18	16	16	16	1	40.2
NL	OXOR2	EDITH MAERSK	6	1	2	3	0	143.8
NL	PDXQ	EEMSGRACHT	2	2	2	2	0	9.0
NL	PDVN	EENDRACHT	22	18	22	22	0	18.0
NL	PDWT	EGELANTIERSGRACHT	8	8	8	8	0	1.2
NL	PDYI	ELANDSGRACHT	53	5	7	22	13	225.0
NL	OXHY2	ELLY MAERSK	87	69	80	83	1	28.5
NL	A8IO2	ELSEBETH	48	46	48	48	0	15.4
NL	9HA3770	EMERALD	36	30	35	36	0	18.8
NL	OYGR2	EMMA MAERSK	23	8	14	16	4	244.5
NL	9HA3564	ESMERALDA	35	30	35	35	0	14.5
NL	PDZS	EUROPA	22	17	20	22	0	22.3
NL	PHEC	FAIRPARTNER	2	2	2	2	0	11.0
NL	PEBT	FLINTERDUIN	34	12	13	15	2	170.7
NL	PBHZ	FLINTERSKY	54	51	51	52	1	16.7
NL	PBEN	FLINTERSUN	5	3	4	5	0	29.0
NL	PEND	HAPPY BUCCANEER	21	9	9	20	0	42.0
NL	PCER	HAPPY RANGER	6	0	6	6	0	35.7
NL	PCAW	HAPPY RIVER	6	6	6	6	0	6.3
NL	PCBZ	HAPPY ROVER	13	9	9	12	0	27.1
NL	ZDND7	IVER EXACT	20	19	20	20	0	12.2
NL	PECF	IVER EXPERIENCE	66	58	65	65	1	24.9
NL	PCEX	IVER EXPERT	2	2	2	2	0	6.5
NL	PFBF	IVER EXPORTER	27	24	26	26	1	58.1
NL	OWFD2	JOHANNES MAERSK	29	16	19	19	8	494.1
NL	OWKI2	LAURA MAERSK	36	28	31	32	2	68.0
NL	OWAY2	LICA MAERSK	17	7	13	15	1	133.0
NL	9V2003	MAERSK INNOSHIMA	1	0	0	1	0	84.0
NL	9V2005	MAERSK INVERNESS	48	29	41	47	1	37.7
NL	9V2004	MAERSK IZMIR	35	34	35	35	0	0.5
NL	PDHP	MAERSK KALMAR	106	40	82	96	2	62.6
NL	PFDH	MAERSK KAMPALA	287	160	243	280	0	27.0

APPENDIX E OF ANNEX VI

MET OFFICE ON-LINE TIME OF RECEIPT STATISTICS FOR NATIONAL FLEETS, FEB 2015

Pub47 Time of Receipt Statistics by COUNTRY for February

COUNTRY	Ships	Observations	Average (Obs/Ships)	N<30 mins	N<60 mins	N<120 mins	N>360 mins	%<30 mins	%<60 mins	%<120 mins	%>360 mins	Average (R-O) (mins
AU	42	2447	58.3	1690	2249	2373	26	69%	92%	97%	1%	38.5
DK	2	515	257.5	515	515	515	0	100%	100%	100%	0%	3.0
ES	1	110	110.0	93	99	102	6	85%	90%	93%	5%	50.9
EU	21	7900	376.2	7896	7897	7897	3	100%	100%	100%	0%	3.1
FR	51	15595	305.8	15104	15256	15507	0	97%	98%	99%	0%	5.1
GB	236	28405	120.4	24650	26698	27556	334	87%	94%	97%	1%	23.5
GR	1	42	42.0	41	42	42	0	98%	100%	100%	0%	10.4
HK	45	2171	48.2	32	1645	2146	4	1%	76%	99%	0%	72.9
NL	70	2370	33.9	1657	1974	2142	78	70%	83%	90%	3%	56.1
NZ	17	779	45.8	252	736	766	1	32%	94%	98%	0%	36.5
US	403	24329	60.4	16175	19897	21778	1191	66%	82%	90%	5%	81.5
ZZ	10	249	24.9	127	190	215	17	51%	76%	86%	7%	120.2
CA	48	27537	573.7	26887	27506	27521	15	98%	100%	100%	0%	12.3
DE	336	18921	56.3	12368	14601	16259	387	65%	77%	86%	2%	73.8
IE	2	34	17.0	23	28	29	1	68%	82%	85%	3%	54.6
IL	3	27	9.0	27	27	27	0	100%	100%	100%	0%	4.8
IN	1	2	2.0	0	0	2	0	0%	0%	100%	0%	101.0
IS	3	108	36.0	94	95	96	3	87%	88%	89%	3%	42.3
IT	1	78	78.0	51	73	75	1	65%	94%	96%	1%	29.6
JP	23	1284	55.8	1059	1233	1256	14	82%	96%	98%	1%	43.9
KR	3	4	1.3	0	0	0	2	0%	0%	0%	50%	706.0
MY	2	41	20.5	0	30	37	2	0%	73%	90%	5%	100.2
NO	4	2250	562.5	2242	2243	2249	0	100%	100%	100%	0%	11.2
RU	30	785	26.2	460	692	719	33	59%	88%	92%	4%	58.5
SE	18	2071	115.1	505	2016	2039	13	24%	97%	98%	1%	38.8
ZY	15	757	50.5	144	690	720	15	19%	91%	95%	2%	56.9
XX	1	25084	25084.0	23305	24324	24786	165	93%	97%	99%	1%	19.6
un	94	5968	63.5	4180	5447	5696	94	70%	91%	95%	2%	39.9
Total	1483	169863	114.5	139577	156203	162550	2405	82%	92%	96%	1%	35.0

APPENDIX F OF ANNEX VI

MONTHLY VOS NATIONAL FLEET RANKINGS FOR FEBRUARY 2015 – MANUAL SHIPS (extract)

February 2015 national VOS fleet scores for manual ship reports [lower scores are better quality]
(Note: 'manual' ship reports are those based on the reported ix value; all reports with call-sign 'SHIP' are included together

Country	NumShip	Combine_Score	NumObs_Total	Pressur_Score	NumObs_P	WindSpd_Score	NumObs_Spd	WindDir_Score	NumObs_Dir ...
NO	**4**	**0.149**	12148	0.067	**2239**	0.169	2250	0.095	1200
"SHIP"	**1**	**0.173**	23092	0.222	**3513**	0.176	3545	0.191	2329
CA	**1**	**0.186**	1310	0.075	**222**	0.323	222	0.073	200
GR	**1**	**0.468**	289	0.457	**42**	0.532	42	0.413	37
SE	**14**	**0.548**	3406	0.506	**576**	0.546	574	0.511	374
IT	**1**	**0.581**	508	0.838	**77**	0.442	78	0.431	51
GB	**193**	**0.598**	42074	0.585	**6518**	0.624	6515	0.621	4067
NL	**69**	**0.609**	14274	0.586	**2302**	0.620	2290	0.597	1476
FR	**1**	**0.612**	48	0.551	**8**	0.717	8	0.551	3
DE	**294**	**0.614**	45644	0.600	**7200**	0.622	7152	0.586	4186
NZ	**15**	**0.649**	1582	0.639	**259**	0.661	262	0.606	151
IS	**3**	**0.653**	545	0.595	**106**	0.681	107	0.532	93
Ancillary	**10**	**0.654**	1471	0.655	**231**	0.648	232	0.605	170
AU	**38**	**0.665**	5868	0.616	**913**	0.674	924	0.630	579
US	**366**	**0.687**	101791	0.682	**16718**	0.648	17217	0.606	11369
IL	**3**	**0.720**	158	0.733	**27**	0.685	27	0.521	23
HK	**42**	**0.730**	5232	0.773	**824**	0.711	825	0.682	431
JP	**18**	**0.767**	1983	0.808	**330**	0.772	331	0.738	189
Unknown	**177**	**0.774**	29935	0.775	**5129**	0.707	5167	0.669	2725
Unknown	**52**	**0.784**	11198	0.754	**1712**	0.707	1712	0.720	923
ZY	**12**	**0.797**	1541	0.831	**253**	0.709	251	0.652	167
RU	**29**	**0.797**	3674	0.765	**695**	0.712	686	0.639	442
IE	**2**	**0.798**	203	0.730	**33**	0.860	33	0.644	27
MY	**1**	**0.818**	250	1.016	**37**	0.684	37	0.728	27
IN	**1**	**0.934**	12	1.010	**2**	0.779	2	MISSING	0 ...

APPENDIX G OF ANNEX VI

MONTHLY VOS RANKINGS FOR FEBRUARY 2015 – AUTOMATIC REPORTS (extract of best ships)

February 2015 VOS scores for automatic ship reports

(Note: 'automatic' ship reports are those based on the reported ix value)

	Min:	**0.119**	**3**	**0.036**	**0**	**0.070**	**0**	**0.050**	**0**	**0.045**	**0**	**0.056**	**0**	**0.000**	**0**	**0.012**	**0**	**0.000**
	Max:	**1.764**	**4099**	**1.618**	**672**	**1.674**	**670**	**1.263**	**545**	**1.748**	**672**	**1.416**	**672**	**1.072**	**669**	**1.271**	**671**	**2.000**
	Ave:	**0.778**	**1912**	**0.466**	**451**	**0.535**	**317**	**0.506**	**155**	**0.467**	**425**	**0.501**	**362**	**0.489**	**20**	**0.494**	**184**	**0.119**

		Combined		Pressure		Wind Speed		Wind Direction		Temperature		Relative Humidit		Visibility		Sea Surface Tem		ToR
Country	ShipId	Score	NumObs	Score	NumObs	Score	NumObs	Score	NumObs	Score	NumObs	Score	NumObs	Score	NumObs	Score	NumObs	Score
DE	DBLK	**0.119**	3897	0.110	**662**	0.172	662	0.143	452	0.099	662	0.118	662	0.058	127	0.111	670	0.166
US	WKWB	**0.132**	3457	0.056	**669**	0.079	669	0.650	92	0.068	669	0.092	669	0.729	20	0.073	669	0.031
DE	DBBH	**0.136**	3670	0.115	**660**	0.140	660	0.288	356	0.119	660	0.133	660	0.046	78	0.162	596	0.179
##	BATFR0	**0.167**	3560	0.181	**600**	0.210	585	0.121	439	0.182	600	0.193	600	0.020	136	0.117	600	0.000
##	BATFR5	**0.177**	3499	0.134	**623**	0.221	623	0.289	363	0.136	623	0.187	623	0.643	22	0.095	622	0.000
DE	DBEA	**0.179**	3837	0.101	**662**	0.130	662	0.091	528	0.102	662	0.142	662	MISSINC	0	0.075	661	0.236
DE	DBKR	**0.204**	3619	0.115	**651**	0.145	651	0.268	364	0.118	651	0.129	651	MISSINC	0	0.108	651	0.169
DE	DBKV	**0.217**	3641	0.113	**662**	0.199	662	0.305	349	0.149	654	0.156	653	MISSINC	0	0.085	661	0.241
DE	DBBC	**0.218**	3558	0.095	**662**	0.179	662	0.474	253	0.101	662	0.119	658	MISSINC	0	0.152	661	0.237
DE	DBCK	**0.220**	3625	0.118	**659**	0.140	659	0.265	388	0.117	659	0.235	652	MISSINC	0	0.176	608	0.310
DE	DBBU	**0.227**	3761	0.135	**660**	0.195	660	0.180	463	0.148	660	0.158	659	MISSINC	0	0.153	659	0.391
DE	DBJM	**0.233**	3745	0.150	**653**	0.193	653	0.189	475	0.175	653	0.169	652	MISSINC	0	0.124	659	0.411
US	WXJ63	**0.255**	4099	0.170	**662**	0.268	669	0.991	128	0.327	669	0.225	669	0.115	669	0.108	633	0.000
CA	CFN303	**0.256**	3268	0.088	**662**	0.188	662	0.274	352	0.118	662	0.115	662	MISSINC	0	0.531	268	0.000
DE	DBBI	**0.263**	3317	0.128	**661**	0.182	661	0.494	210	0.119	661	0.129	661	MISSINC	0	0.351	463	0.237
US	WTEY	**0.270**	3204	0.232	**604**	0.185	617	0.522	187	0.507	569	0.270	557	0.235	60	0.134	610	0.045
CA	CGJK	**0.275**	3005	0.088	**657**	0.126	657	0.554	156	0.115	657	0.120	657	MISSINC	0	0.605	221	0.000
DE	DBFH	**0.283**	3397	0.191	**628**	0.239	628	0.444	264	0.202	628	0.193	628	MISSINC	0	0.151	621	0.298
CA	CGDT	**0.292**	3216	0.152	**670**	0.174	670	0.444	253	0.143	661	0.266	618	MISSINC	0	0.442	344	0.000
AU	FHZI	**0.293**	3368	0.204	**609**	0.264	609	0.280	361	0.251	609	0.309	571	MISSINC	0	0.135	609	0.161
CA	CGCX	**0.297**	3033	0.071	**666**	0.126	666	0.329	306	0.153	666	0.411	557	MISSINC	0	0.752	172	0.000
DE	DBFR	**0.305**	3555	0.244	**618**	0.287	613	0.201	461	0.222	618	0.251	618	MISSINC	0	0.176	627	0.423
CA	VCLM	**0.312**	2757	0.112	**660**	0.144	660	0.592	139	0.396	624	0.597	446	0.748	17	0.615	211	0.009
CA	CZJG	**0.322**	2788	0.084	**669**	0.070	669	0.657	109	0.219	669	0.215	669	MISSINC	0	0.838	3	0.000
##	BATFR3	**0.328**	2958	0.307	**532**	0.395	522	0.355	287	0.349	532	0.337	532	0.591	21	0.191	532	0.000
CA	CG2960	**0.329**	2956	0.199	**629**	0.157	646	0.597	137	0.159	646	0.166	646	MISSINC	0	0.551	252	0.000
AU	VNSZ	**0.349**	2855	0.133	**636**	0.255	636	0.501	207	0.183	636	0.172	636	MISSINC	0	0.802	104	0.055
...																		

ANNEX VII

REPORT BY THE REAL TIME MONITORING CENTRE (RTMC) OF THE VOSCLIM

Appendices: **A.** VOSClim suspect ships in February 2015
B. Monitoring criteria for VOSClim suspect ships
C. Number of VOSClim ships reporting 2010-2014 by variable
D. Number of VOSClim ships reporting pressure and percentage suspect

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APPENDIX A OF ANNEX VII

VOSClim suspect ships in February 2015

Callsign	Element	NumObs	%GE	StdDvn	Bias	RMS
C6AV5	PMSL	26	0	1.0	2.6	2.8
OYGR2	PMSL	17	0	4.9	0.3	4.9
PCIH	PMSL	34	0	0.8	-2.0	2.1
TBWUK74	PMSL	30	0	0.5	-4.3	4.3
VOCJ	PMSL	84	10	0.8	-0.4	0.9
VRDW2	PMSL	38	0	2.9	2.3	3.7
2EZE5	T	26	0	2.4	2.9	3.8
BATEU07	T	276	11	0.6	0.0	0.6
CGHL	T	132	0	2.9	-2.0	3.5
PBBB	T	22	0	1.7	2.5	3.0
PDHO	T	40	0	2.1	2.8	3.5
2AUO5	RH	82	0	11.6	14.3	18.5
8PSH	RH	121	0	6.0	13.5	14.7
C6AV5	RH	27	0	12.3	18.0	21.8
DCUJ2	RH	26	0	14.2	-15.4	20.9
DDVK2	RH	72	0	8.7	-13.2	15.8
DQVM	RH	22	0	16.1	13.8	21.2
MYMY6	RH	20	0	4.3	14.6	15.2
OXOS2	RH	25	0	14.2	12.4	18.8
OZCZ2	RH	34	0	13.8	17.4	22.2
PJHA	RH	19	0	8.2	17.2	19.1
TBWUK52	RH	21	0	8.7	28.3	29.6
VCBT	RH	15	0	8.1	29.5	30.6
VCBW	RH	135	5	17.1	-21.7	27.6
ZCDN9	RH	65	0	18.5	-18.5	26.2
ZCEF3	RH	83	0	13.0	-12.7	18.2
DQVM	SPEED	29	0	2.4	-4.4	5.0
MGRL4	SPEED	20	15	3.1	0.1	3.1
VRDW2	SPEED	38	0	5.1	5.5	7.5
C6AV5	DIRN	19	0	58.6	66.9	89.0
C6CU6	DIRN	19	0	35.0	-30.7	46.5
C6NI8	DIRN	39	0	30.6	44.5	54.1
LXSQ	DIRN	16	0	11.9	27.4	29.9
MYSU5	DIRN	15	0	78.0	-29.1	83.3
OZDB2	DIRN	27	0	92.7	10.3	93.3
PBHZ	DIRN	39	0	109.8	0.6	109.8
VRJC9	DIRN	51	0	67.5	29.2	73.5
ZCBP5	DIRN	28	0	25.6	-25.1	35.9
2FGX5	SST	25	0	0.4	2.2	2.2
C6TQ3	SST	31	0	2.0	-2.9	3.5
CGBY	SST	184	0	0.6	2.5	2.6
DJBF2	SST	53	0	0.6	-2.4	2.5

LAMG7	SST	79	0	3.0	-2.5	3.9
TBWUK70	SST	28	0	1.6	-2.4	2.9
V7OE6	SST	35	0	2.4	-2.0	3.1
VCBW	SST	127	0	0.7	2.3	2.4
VCRG	SST	57	0	1.5	3.3	3.6
VRDW2	SST	39	0	0.9	-2.0	2.3
VRJC9	SST	107	0	1.2	2.7	3.0
VRLI7	SST	33	0	0.7	2.4	2.5

APPENDIX B OF ANNEX VII

MONITORING CRITERIA FOR VOSCLIM SUSPECT SHIPS

1. For each ship and each variable there should be at least **15** reports for **manual** ships and **50** reports for **automatic** ships 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 following tables should be exceeded for either:

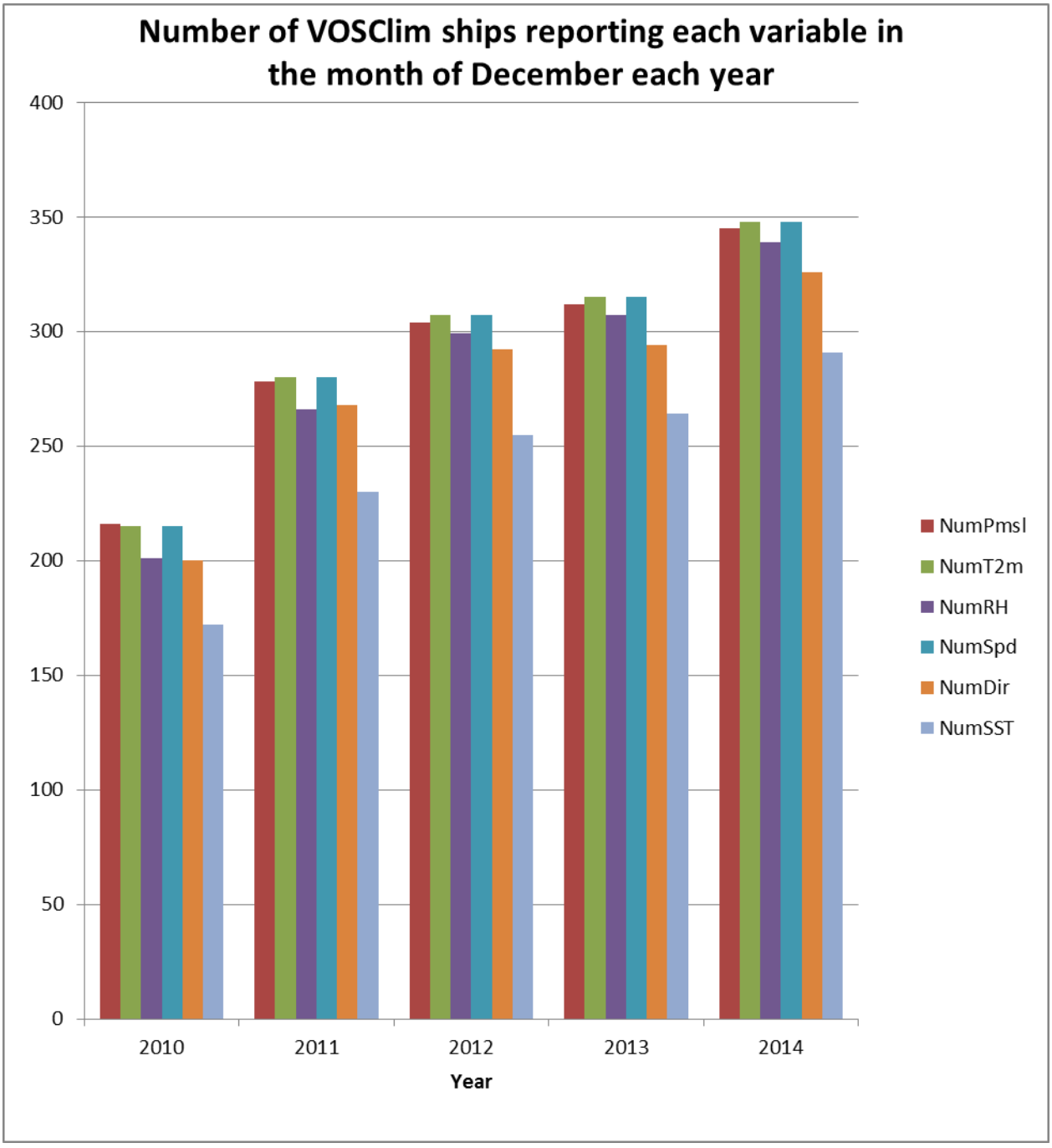
(i) the mean value of o-b over the period (absolute value), or
(ii) the standard deviation of o-b over the period

(1) **Manual Ships** Variable	(2) Mean o-b limit	(3) Std. Dev. o-b limit	(4) Gross error limit
Pressure (hPa)	**2.0**	**4.0**	**15.0**
Wind speed (m/s)	**4.0**	**10.0**	**25.0**
Wind direction (degrees)	**25.0**	**60.0**	**150.0**
Air Temperature (^{0} C)	**2.0**	**4.0**	**10.0**
Relative humidity (%)	**12.0**	**20.0**	**50.0**
Sea surface temp. (^{0} C)	**2.0**	**4.0**	**10.0**

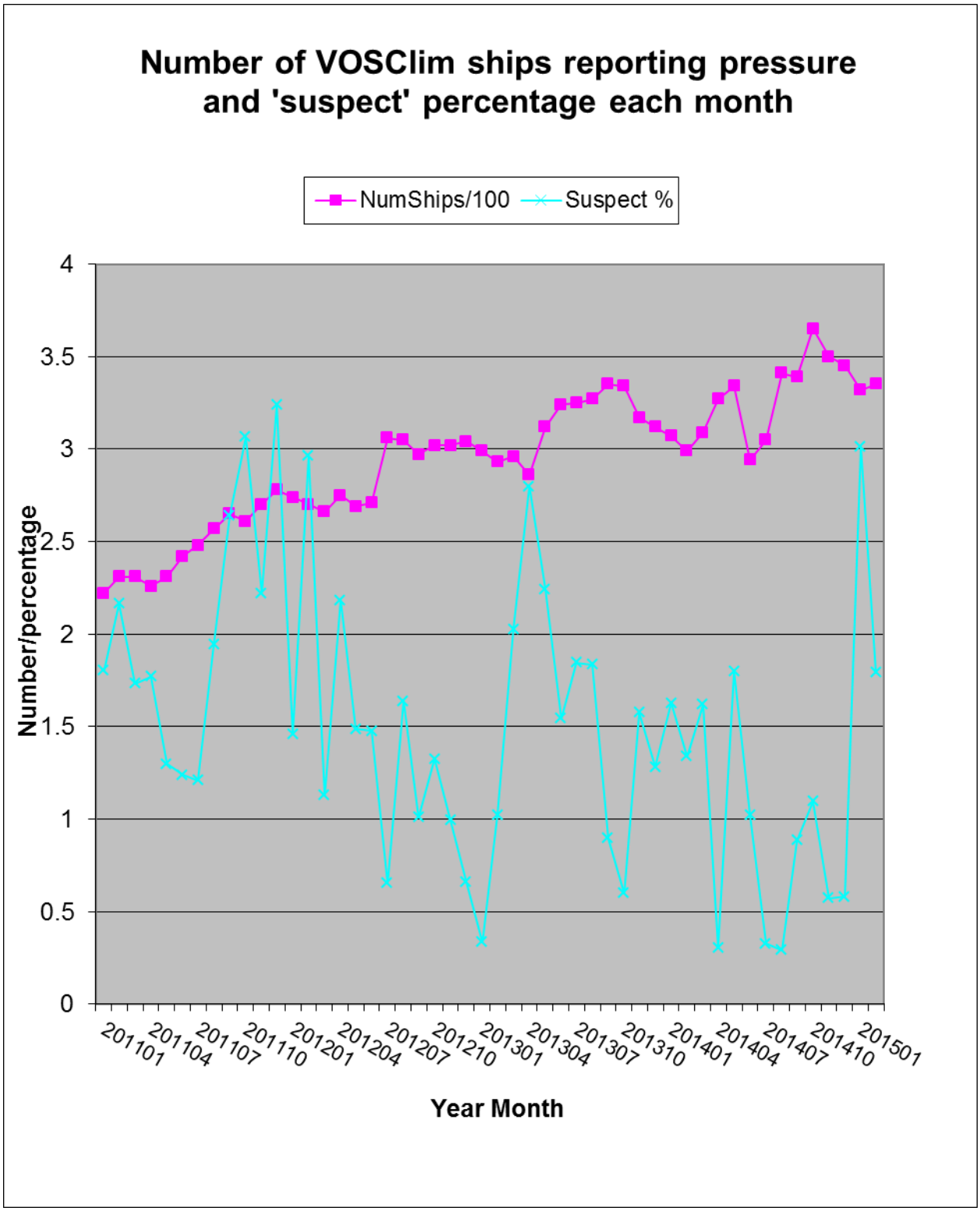
(1) **Automatic Ships** Variable	(2) Mean o-b limit	(3) Std. Dev. o-b limit	(4) Gross error limit
Pressure (hPa)	**1.5**	**3.0**	**15.0**
Wind speed (m/s)	**4.0**	**10.0**	**25.0**
Wind direction (degrees)	**20.0**	**50.0**	**150.0**
Air Temperature (^{0} C)	**1.5**	**3.0**	**10.0**
Relative humidity (%)	**10.0**	**15.0**	**50.0**
Sea surface temp. (^{0} C)	**1.5**	**3.0**	**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'.

APPENDIX C OF ANNEX VII



APPENDIX D OF ANNEX VII



ANNEX VIII

REPORT BY THE TASK TEAM ON ASAP

(Submitted by Mr Rudolf Krockauer, Chairperson of the JCOMM ASAP Task Team)

1) Task Team members

- Rudolf KROCKAUER (Germany)
- Sarah NORTH (United Kingdom)
- Johan STANDER (South Africa)
- Hiroshi OHNO (Japan)
- Association of Hydro-Meteorological Equipment Industry (HMEI) representative (Associated Member)

2) The Task Team addressed its Terms of Reference as detailed below.

ToR no.	***Terms of Reference***	***Action(s) undertaken during the intersessional period***
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;	The European E-ASAP is the only operational ASAP programme worldwide which is mainly based on merchant ships. Coordination, implementation etc. is performed by the ASAP Task Team Chairperson under his tasks as E-ASAP Operational Service Manager. Further ASAP operations are performed on board some Japanese Research Vessels and occasional campaigns of other Research Vessels.
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;	No funds and/or in kind contributions available.
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;	Done within the framework of the European E-ASAP.
4	Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;	Coordination with JCOMMOPS & SOT TC regarding ASAP metadata. Quality Management of the European E-ASAP (ca. 85% of all soundings) is handled by the EUMETNET Observations Programme Management.
5	Prepare annually a report on the status of ASAP operations, data availability and data quality	Annual SOT reports are submitted to JCOMM SOT.

3) Recommendations of the Task Team to SOT-8

1. Introduction

The number of ships which routinely provide upper air soundings on the GTS throughout the year is around 21 worldwide. Occasional campaigns of some further research vessels contribute to the total amount of soundings.

After the reduction of the Japanese ASAP fleet from 5 to 2 research ships in 2010, there is only one significant ASAP programme left: The European (EUMETNET) E-ASAP fleet with 18 ships plus one 'laid up' station in NE Iceland (operated as land station since 2010).

E-ASAP is the only programme worldwide which is mainly based on a fleet of commercial vessels (plus 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:

- 15 out of 18 stations 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 lifespan 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.
- ASAP stations on merchant ships 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 technical and operational problems than in the E-ASAP fleet.

3. E-ASAP fleet

Table 1 lists 18 active E-ASAP ships (status Feb 2015). 10 out of 18 stations (ASEU- and ASDE-) are operationally managed by the E-ASAP management team of the Deutscher Wetterdienst DWD in Hamburg, Germany. The other stations are part of the E-ASAP fleet but 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 Dec 2014

Station	Service	Sounding equipment
ASEU01	No regular service, Research ship	The ship is equipped with a 10' container launcher and Vaisala MW31 inside the container. Launches are usually carried out by the electronic engineer (system administrator).
ASEU02	Northern Europe – Chile	The ship is equipped with a 10' container launcher and Vaisala MW31 on the bridge. Launches are usually carried out by the officers and cadets.
ASEU03	Northern Europe – East coast US	The ship is equipped with a 10' container launcher and Vaisala MW31 on the bridge. Most crew members are involved in launching operations.
ASEU04	Montreal – Northern Europe	The ship has a 10' container launcher portside and a manual deck launcher starboard. The Vaisala MW31 system is installed on the bridge. Launches are usually carried out by two cadets on board.
ASEU05	Northern Europe – East coast US	The ship is equipped with a 10' container launcher and Vaisala MW31 on the bridge. Most crew members are involved in launching operations.
ASEU06	Northern Europe – East coast US	The ship is equipped with a 10' container launcher and Vaisala MW31 on the bridge. Most crew members are involved in launching operations.
ASDE01	Northern Europe – East coast US	The 20' container launcher was replaced by a manual deck launcher. The sounding system Vaisala MW21 is placed on the bridge. Most crew members are involved in launching operations.
ASDE02	No regular service, Research ship	The 20' container launcher is equipped with a Vaisala MW21. Launches are carried out by a professional observer of Deutscher Wetterdienst DWD.
ASDE03	Northern Europe – East coast US	The ship is equipped with 2 manual deck launchers starboard and portside and Vaisala MW21 sounding system on the bridge. Most crew members are involved in launching operations.
ASDE04	Northern Europe – Chile	The ship is equipped with an manual deck launcher and Vaisala MW21 on the bridge. Launches are usually carried out by the officers and cadets.
ASDK01	Denmark – West coast Greenland	The ship is equipped with a 10' container launcher. The Vaisala DigiCORA III (MW21) sounding system is installed on the bridge.
ASDK02	Denmark – West coast Greenland	The launcher is integrated in the ship. The Vaisala DigiCORA III (MW21) sounding system is installed on the bridge.
ASDK3	Denmark – West coast Greenland	The ship is equipped with a 10' container launcher. The GRAW GS-E sounding system is installed on the bridge.
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 –	The ship is equipped with a open deck launcher and

Station	Service	Sounding equipment
	French West Indies	MODEM SR2K sounding system in the wheelhouse. Launches are usually carried out by the electricians.
ASES01	No regular 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 participating ships in the reporting period 2013-2014 was 18. However, some stations had to be transferred to other ships due to changes in the trade pattern of the ships. EUMETNET is mainly interested in soundings in the North Atlantic. If ships leave this geographical area for new services the station is transferred to another ship.

Table 2 shows the development of the E-ASAP fleet since 2003.

Table 2: Development of the fleet from 2003 to 2014.

Year	Ships leaving the E-ASAP fleet[1)]	Ships joining the E-ASAP fleet	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
2011	- 1	+ 1	18 + 1 temporary land station
2012	- 2	+ 2	18 + 1 temporary land station
2013	- 1	+ 1	18 + 1 temporary land station
2014	0	0	18 + 1 temporary land station

[1)] Usually due to changes in the trade pattern of the ships (i.e. routes away from the North Atlantic).

Figures 1 and 2 demonstrate the different types of launchers on board the ships.

Figure 1: Examples of 10ft container launchers.

Figure 2: Examples of manual launchers.

4. Performance of the E-ASAP fleet

The performance of the ASAP stations is included in the annual EUMETNET SOT ASAP report. Figure 3 shows the spatial distribution of bulletins in 2014 on a 2x2° grid without interpolation.

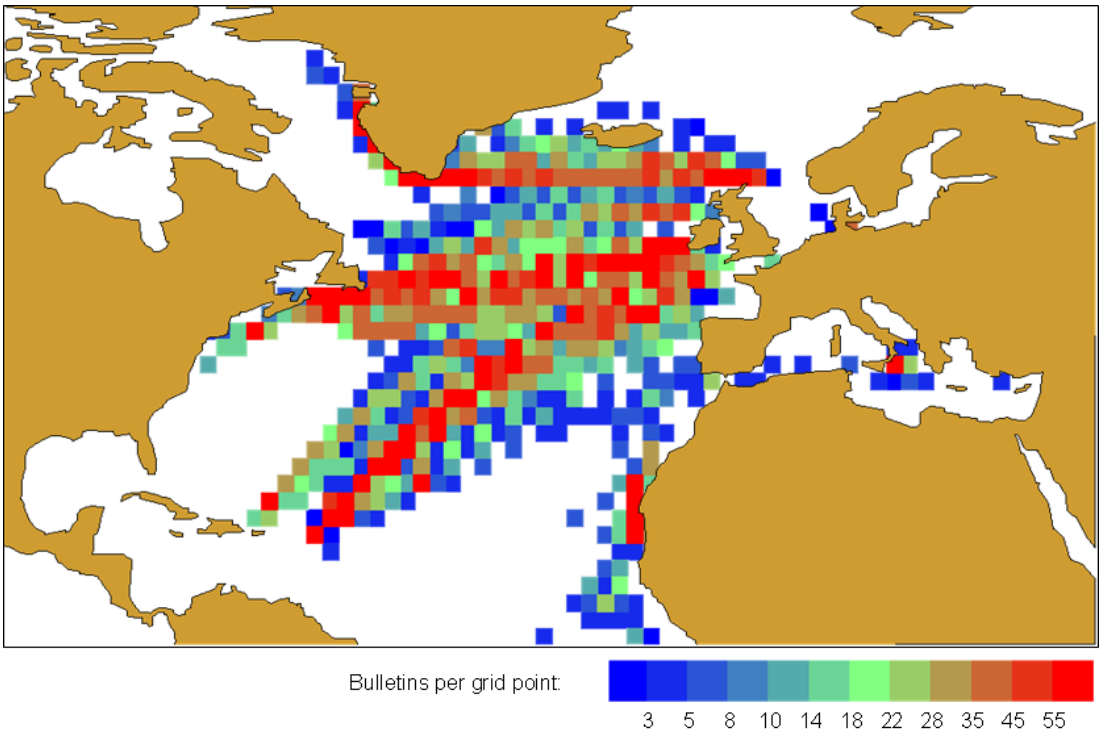


Figure 3: Distribution of TEMP bulletins in 2014 on a 2x2° grid without interpolation.

The distribution demonstrates the main trading routes between Europe and North America of the participating container vessels. Basically, there are three legs:

- Northern leg: Denmark – Greenland,
- 'Fifties' leg: along 50°N,
- Southern leg: Channel – West Indies.

The individual performances differ widely from month to month and from ship to ship. Red spots away from the three main legs are soundings performed on board the Research Vessels MARIA S. MERIAN and METEOR (Mediterranean) and the Spanish hospital ship ESPERANZA DEL MAR (off West Africa).

The total number of soundings on the GTS was 4216 (without temporary land station in Iceland) in 2014. Taking into account the total number of launches on board versus the received soundings on the GTS, the average output (GTS/Launches ratio) was 89%. Main reasons for failed launches are

- technical problems of the equipment,
- unfavourable wind conditions at 15-20 knots sailing speed,
- unexperienced operators, and
- poor satellite communication.

5. Other ASAP ships

Table 3 lists five ships providing ASAP soundings on the GTS in 2014. The Japanese Met Service JMA operates an ASAP station on board the research vessel RYOFU MARU 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 total, 429 soundings were received from the Japanese ASAP ships in 2014.

The German research vessel POLARSTERN operates in polar regions in the summer periods (Apr-Sep in the Arctic, Oct-Mar in the Antarctic) and provided 421 soundings. The Swedish research vessel ODEN provided 324 soundings during an Arctic campaign in Jul-Sep as temporary ASAP station ASUK02. The German research vessel SONNE performed 76 soundings in the Indian Ocean in Jul-Aug. These three research vessels transmit their upper air data to the GTS but do not cooperate with any WMO or regional ASAP programme

Table 3: Japanese ASAP ships.

Ship name	Station	Area	Sounding equipment	Received soundings in 2014
Mirai (JAMSTEC)	JNSR	North West Pacific	Semi-automatic Container, Vaisala sounding system, Vaisala RS92 GPS radiosondes, Inmarsat-C satcom.	267
Ryofu Maru (JMA)	JGQH	North West Pacific	Semi-automatic Container, Vaisala sounding system, Vaisala RS92 GPS radiosondes, DCP satcom	162
Polarstern	DBLK	Arctic and Antarctic	unknown	421
Oden	ASUK02	Arctic	unknown	324
Sonne	DFCG	Indian Ocean	unknown	76

6. Satellite communication and migration to BUFR

All 18 ships in the E-ASAP fleet are equipped with Iridium satcom systems to enable binary HiRes Bufr reporting from the ships. Most ships report HiRes Bufr and TEMP. The average timeliness of all stations in the E-ASAP fleet in 2014 was around HH+20 min.

Soundings from the two Japanese stations are transmitted via Inmarsat-C or DCP (through Meteosat). The timeliness of the soundings on the GTS in 2012 was HH+157 min.

The vertical resolution of the HiRes Bufr of the E-ASAP stations is 10 sec (ca. 50 m) plus mandatory and significant levels. Purpose is to limit the file size to <20 Kbyte to reduce transmission time. A vertical resolution of 50 m is fully compliant to the minimum WMO requirements (Goal = 100 m, Breakthrough = 200 m, Updated on 28 May 2010).

Data exchange in BUFR format became standard WMO practice in 2010. The Commission for Basic Systems (CBS) set the deadline for the distribution of alphanumeric codes for category 1 data (SYNOP, TEMP, PILOT, and CLIMAT) to November 2014. As of November 2014 only BUFR are to be disseminated to the GTS.

The EUMETNET Observations Programme Management and the E-ASAP Operational Service Management agreed to comply with the CBS decision. Since November 2014 only BUFR is transmitted to the GTS from all stations which transmit their data to the Regional Telecommunication Hub Offenbach (i.e. ASDE01, ASDE02, ASDE03, ASDE04, ASEU01, ASEU02, ASEU03, ASEU04, ASEU05, ASEU06, ASES01). The other stations of the E-ASAP fleet (ASFR1, ASFR2, ASFR3, ASFR4, ASDK01, ASDK02, ASDK3) shall follow by June 2015.

The dissemination of E-ASAP sounding data in TEMP format shall end in June 2015. Only BUFR is to be disseminated as of July 2015 from all 18 ships of the E-ASAP fleet.

7. Summary and recommendations

In total, around 5466 soundings were received in 2014 from all ASAP stations worldwide. The distribution is as follows:

- 77% E-ASAP,
- 8% POLARSTERN,
- 5% MIRAI, 3% RYOFU MARU, 6% ODEN, 1% SONNE.

The spatial distribution is shown in figure 4.

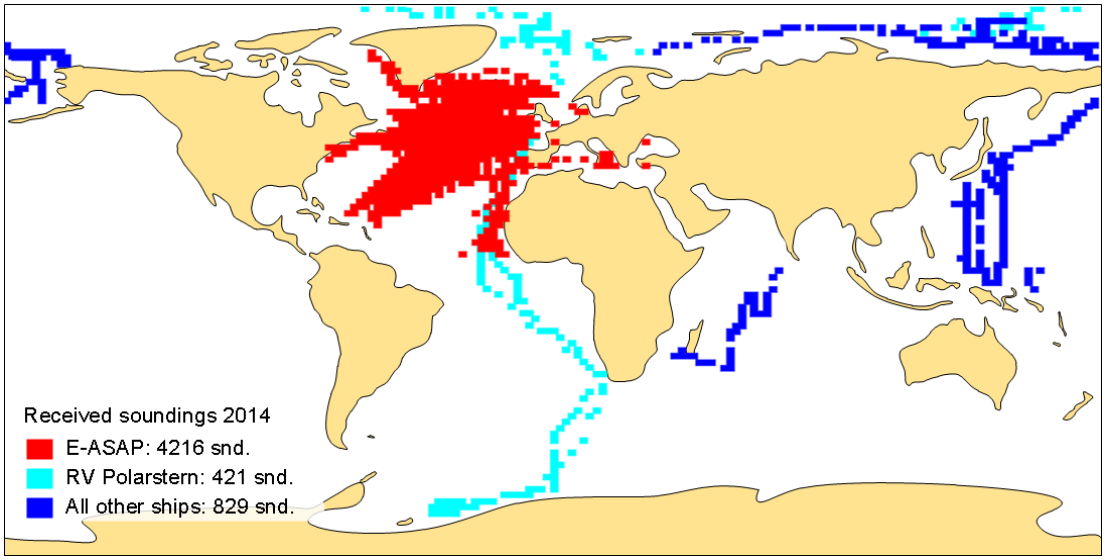


Figure 4: Distribution of global ASAP soundings from sailing ships in 2014.

The spatial distribution of global ASAP soundings show clearly the predominant and unique coverage of the North Atlantic by the European E-ASAP fleet.

Scientific studies confirm the positive impact of upper air soundings in data sparse ocean regions. WMO members are therefore encouraged to participate in global ASAP observations by operating ASAP stations on board ships.

ANNEX IX

STATUS OF THE ASAP TRUST FUND

1. ASAP TRUST FUND STATEMENT OF ACCOUNT FOR 2013

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

Weather • Climate • Water
Temps • Climat • Eau

ASAP Trust Fund
Statement of income and expenditure
For the period 1 January to 31 December 2013
Amounts in Swiss Francs

1. Balance of fund at 1 January 2013			33,946
2. Income			-
3. Funds available for the period			33,946
4. Expenditure			
4.1 Direct costs			
4.1.1 Travel	9,074		
4.1.2 Total direct costs		9,074	
4.2 Indirect costs			
4.2.1 Support costs (7%)	635		
4.2.2 Bank charges	41		
4.2.3 Unrealized loss on exchange difference	32		
4.2.4 Total indirect costs		708	
4.3 Total expenditure			9,782
5. Balance of fund at 31 December 2013			24,164

Certified correct:

Luckson Ngwira
Chief, Finance Division
12 March 2014

2. ASAP TRUST FUND STATEMENT OF ACCOUNT FOR 2014

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

Weather • Climate • Water
Temps • Climat • Eau

ASAP Trust Fund
Statement of income and expenditure
For the period 1 January to 31 December 2014
Amounts in Swiss Francs

1. Balance of fund at 1 January 2014		24,164
2. Income		
2.1 Unrealized gain on currency exchange	17	
2.2 Total income		17
3. Funds available for the period		24,181
4. Expenditure		
4.1 Bank charges	1	
4.2 Total expenditure		1
5. Balance of fund at 31 December 2014		24,180

Certified correct:

Luckson Ngwira
Chief, Finance Division
4 March 2015

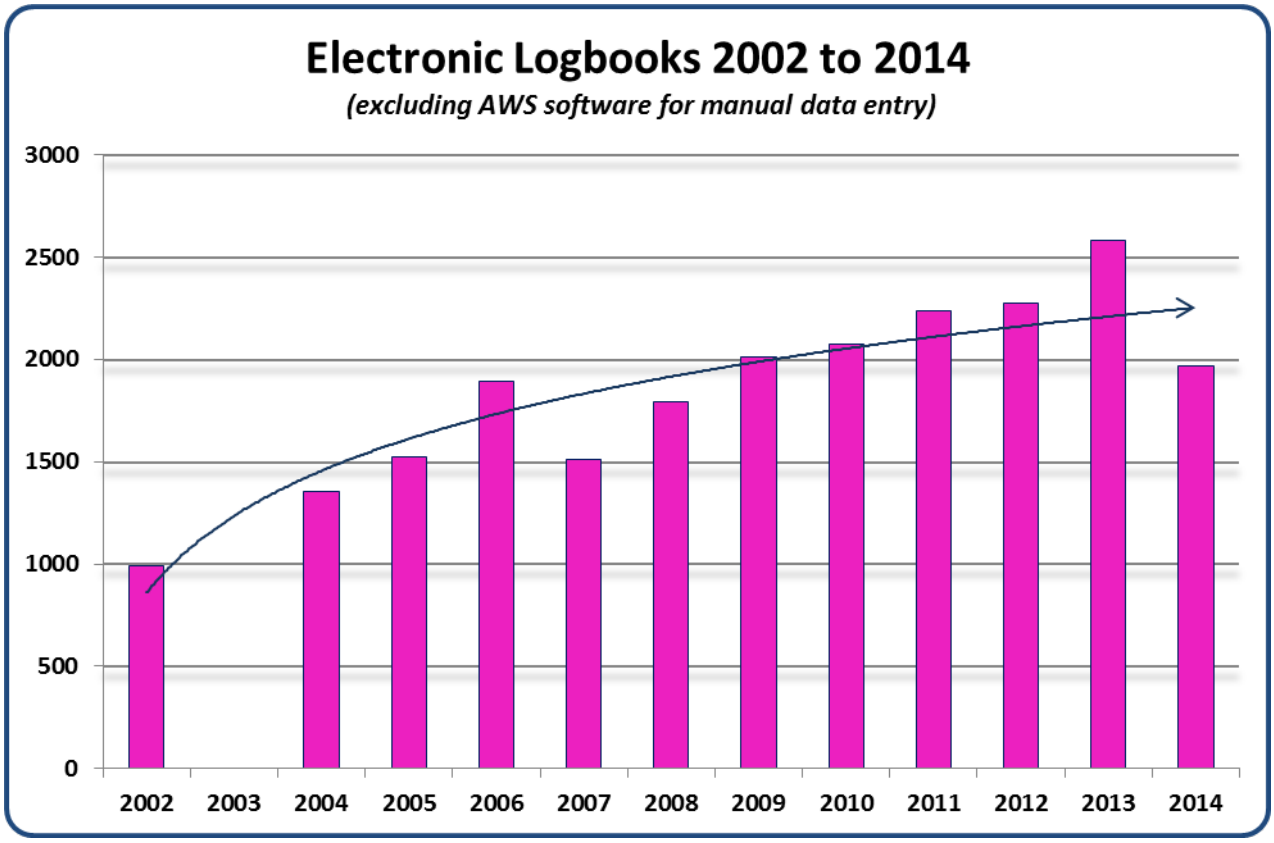
ANNEX X

STATUS OF AUTOMATED SYSTEMS

1. STATUS OF VOS USING ELECTRONIC LOGBOOK SOFTWARE

(excludes AWS software for manual data entry)

Country	Electronic Logbook type	Number of Ships *(@ 31 December)*											
		2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia	TurboWin	33	41	50	51	64	61	58	57	72	64	69	57
Canada	TurboWin	-	-	-	-	-	-	-	2	2	1	1	(1)
Chile	TurboWin										10	10	(10)
Croatia	TurboWin	3	4	3	7	(7)	(7)	(7)	(7)	-	-	-	
Denmark	TurboWin	-	-	-	32	0	-	-	-	-	-	-	-
France	TurboWin	-	7	6	7	10	4	4	2	3	2	1	2
Germany	TurboWin	315	412	556	600	709	730	780	800	825	695	637	551
Greece	TurboWin	2	0	0	0	1	3	1	4	3	2	2	2
Hong Kong	TurboWin	-	-	1	2	2	2	2	3	22	34	44	52
India	TurboWin	-	21	28	33	(33)	(33)	(33)	(33)	-	40	(40)	(40)
Indonesia	TurboWin									-		12	(12)
Italy	SEAS										-	7	9
Ireland	TurboWin	-	-	-	-	-	-	-	2	2	2	(3)	10
Japan	OBSJMA	-	49	61	70	74	95	102	100	141	129	162	171
Netherlands	TurboWin	200	259	198	195	193	195	185	172	112	96	97	93
	TurboWeb/ TurboWin+	-	-	-	-	-	-	-	-	-	6	5	5
New Zealand	TurboWin	0	12	15	22	20	19	22	24	25	26	25	23
Poland	TurboWin	-	-	-	-	-	-	-	61	-	-	-	-
Singapore	TurboWin	-	-	2	3	1	1	1	(1)	-	7	-	7
South Africa	TurboWin	5	5	8	(8)	8	14	14	19	15	17	-	15
Sweden	TurboWin	-	-	-	-	-	1	1	3	20	-	20	(20)
United Kingdom	TurboWin	82	104	147	241	261	286	272	276	268	263	263	248
	TurboWeb	0	0	0	0	0	0	0	0	0	1	1	2
United States	AMVERSEAS	353	439	447	622	129	344	524	507	722	849	1115	486
	TurboWin+	-	-	-	-	-	-	-	-	-	-	-	27
	TurboWin	-	-	-	-	-	-	3	-	5	30	67	122
	TurboWeb	-	-	-	-	-	-	-	-	-	-	2	2
TOTAL		**993**	**1353**	**1522**	**1893**	**1512**	**1795**	**2009**	**2073**	**2237**	**2274**	**2583**	**1967**


Electronic Logbooks 2002 to 2014
(excluding AWS software for manual data entry)
3000
2500
2000
1500
1000
500
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

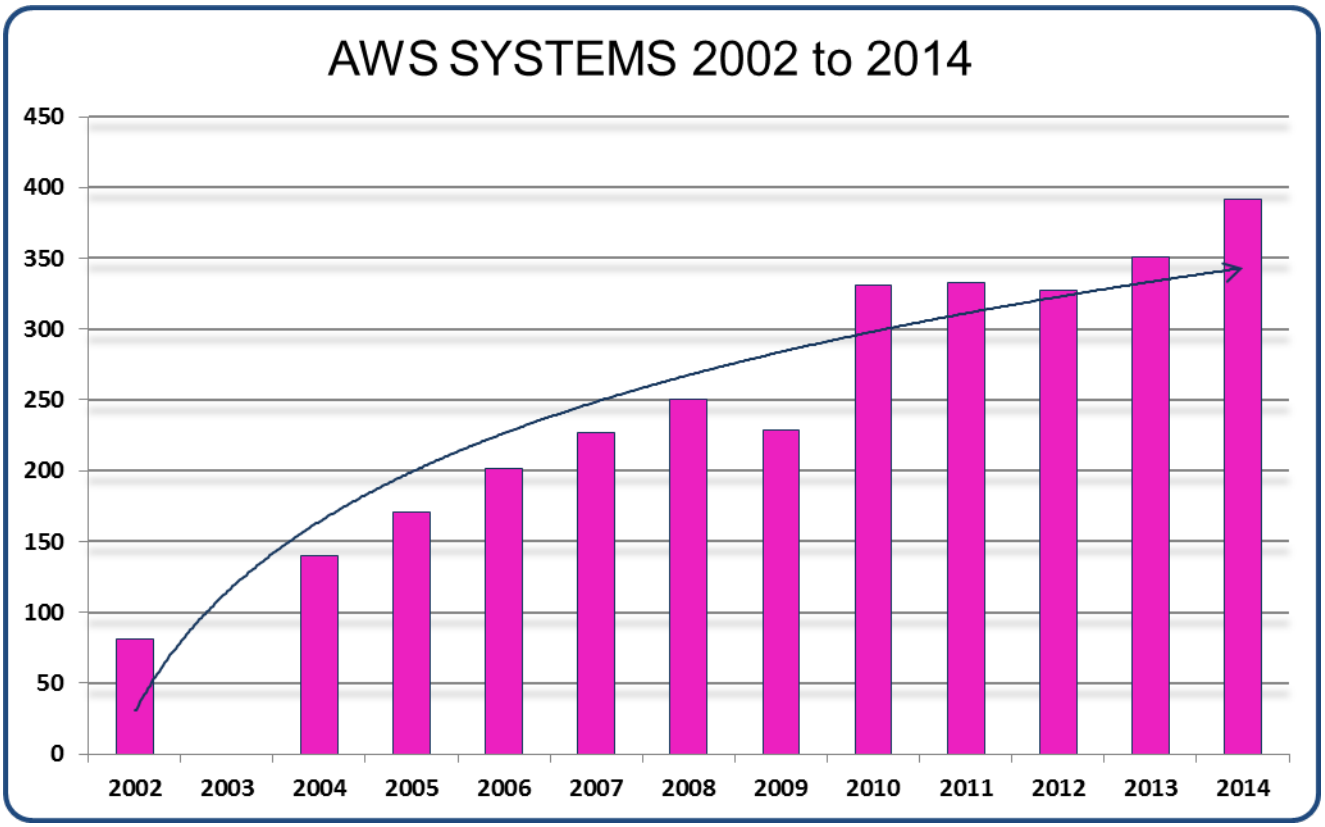
2. STATUS OF VOS AUTOMATIC WEATHER STATIONS

(derived for information submitted in SOT/VOS National reports)

Country	Type of AWS	Method of Comms	Manual Entry Facility	Number of Ships with AWS *(@ 31 December)*											
				2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia	Vaisala Milos 500 AWS	Inmarsat C (Data Mode)	Yes	9	11	10	8	9	9	8	8	8	6	6	5
	TECHSAS/ Other	Inmarsat Fleet Broadband	No	-	-	-	-	-	-	-	1	1	1	1	0
Brazil	VAISALA Maritime Observation System MAWS410	(not known)	No						-		4	6	6	(6)	6
Canada	AVOS – AXYS Technologies	Inmarsat C	Yes	13	14	14	39	41	45	35	18	4	2	-	-
		Iridium	Yes	-	-	-	-	1	1	17	35	48	49****	52	(52)
China	*DJQ-1*	BDS	No	-	-	-	-	-		-	33	(2)	2	(2)	15
	XZC2-2SA	Inmarsat C CDMA,BDS	Yes	-	-	-	-	-		-	12	(12)	12	(12)	11
	ZZ6-5	GPRS	No												5
	XZC5-1	(non real time)	Yes												5
	ZQZ-A/ZQZ-C II-Pro	GPRS	No												44
	XZC2-2SC	Inmarsat C CDMA,BDS, BeiDou nav satellite	Yes	-	-	-	-	-		-	-	(36)	36	(36)	8
	XZC6-1	Inmarsat C CDMA, BDS, BeiDou nav satellite	Yes	-	-	-	-	-		-	35	(17)	17	(17)	18
Croatia	BAROS	Iridium SBD	No									1*****	1*****	1*****	1*****
Denmark	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	2	*****	*****	*****	*****	*****	*****	*****	
Ecuador	Vaisala 101C	Tarjeta	Yes	-	-	-	-	-	-	-	-	-	-	-	1
EUMETNET	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	-	5	5	6	8	10	10	11	11
	BAROS	Iridium SBD	No					0	4	9	13	15	16	17	17
France	BATOS	Inmarsat C (Data Mode)	Yes	19	30	39	45	48	54	56	58	56	58	58	57
	Mini BATOS	Inmarsat C (Data Mode)	No		1	2	3	3	1	-	-	-	-	-	-
	Mercury	Iridium	Yes	-	-	-	-	-	-	-	-	-	-	-	2
	MINOS	Argos	No		6	7	8	8	7	8	7	6	5	4	3
	BAROS	Iridium	No	-	-	-	-	1	-	-	-	-	-	-	0
Germany	Vaisala Milos 500 AWS	Meteosat DCP	No	23	21	21	17	18	17	16	17	17	17	16	16
	AbWst Mk2	Email	No	-	-	-	-	-	-	-	-	-	-	3	2

	Ships' own data logger	Inmarsat/ Iridium	Yes	-	-	-	-	-	2	2	2	2	2	-	-
Hong Kong China	*AMOS*	Iridium	No	-	-	-	-	-	-	-	-	-	-	1¥	1¥
	Metocean deck drifter	Iridium	No	-	-	-	-	-	-	-	-	-	-	1	1
Indonesia	TECHSENSE MET	Inmarsat/Thuraya	No								(6)	6		12	(12)
	PROJEX DX4 PRO	GPRS	No								(1)	1	(1)	-	-
Ireland	Vaisala Milos AWS	Meteosat	No	1	1	1	1	1	1	-	-	-	-	-	-
	BATOS	Iridium	No	-	-	-	-			1	2	-	-	2*****	-
Italy	BAROS ++	Iridium	No										3*****	3*****	3*****
	BAROS	Iridium	No										3*****	6*****	6*****
Japan	Integrated System for Marine Met Observation (Koshin Denki Kogyo Co)	Inmarsat (4) MTSAT(2)	Some	13	12	13	9	9	9	9	6	6	6	6	5
	Weather Observation System (Nippon)	Inmarsat C	Some	-	-	-	4	5	5	6	6	6	5	5	5
	SOAR - Shipboard Oceanographic & Atmospheric Radiation (Brookhaven National Laboratory)	Inmarsat C	Yes	-	-	-	1	1	1	1	1	1	1	1	1
	Ogasawara Keiki Seisakusho Co (Japan)	Inmarsat	No	-	-	-	3	1	1	-	-	-	-	-	-
	JRCS MFG. Co. Ltd (Japan)	Inmarsat F	No	-	-	-	-	1	1	-	-	-	-	-	-
New Zealand	Sutron 9000RTU	MTSAT	Yes	1	1	1	1	1	1	1	1	1	1	1	1
	mSTAR-SHIP	GPRS Cell	No	-	-	-	-	1	1	1	1	1	1	1	1
Norway	AWS	VSAT	some	-	-	17	17	18	16	(15)	(15)	(15)	(5)	(5)	(5)
Portugal	BAROS ++	Iridium	No	-	-	-	-	-	-	-	-	-	-	1*****	1*****
Russia	GM6	Inmarsat C	Yes	-	38	(38)	(38)	(38)	(38)	0	0	0	0	-	
South Africa	Vaisala Milos 520	Inmarsat C	Yes	-		1	-1	1	1	1	1	1	2	(2)	2
Spain	Vaisala MAWS 410	Inmarsat C	Yes	1	1	(1)	1	1	1	1	1	1	1	(1)	(1)
United Kingdom	Automet	Inmarsat	No	1	1	1	1	1	0	0	0	0	0	0	0
	MINOS – GP	Argos	No	-	-	1	2	6	5	5	5	3	2	2	2
	MINOS-GPW	Argos	No	-	-	1	2	1	1	1	1	1	1	1	1
	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	1	3	3	2	5**	4**	4**	1	1
	AVOS	Inmarsat	Yes	-	-	-	-	1	1***	0	0	0	0	0	0
	Metpod	Iridium	No	-	-	-	-	-	1	1	0	0	0	0	0

	Metocean Deck Buoy	Iridium	No	-	-	-	-	-	2	2	2	1	0	0	0
	AMOS - Automated Marine Observing System (Met Office)	Iridium	No	-	-	-	-	-	-	-	-	21	33	37	39
United States	SEAS-Version 8.00/6.57 AutoImet NOAA SCS (Science Computing System) Type 1	VSAT Email	Yes	-	3	(3)	0	3	16*	25	9	12	12	10	7
	SEAS-Version >9.1 AutoImet NOAA SCS (Science Computing System) Type 2	VSAT Email	Yes	-	-	-	-	-	-	0	0	0	0	5	6
	NOAA SCS Type 3 (developed by Alaska region)	Email	No								8	3	3	0	-
	Non NOAA (developed by Alaska Region)	Email	No	-	-	-	-	-	-	-	-	7	7	7	-
	Integrated - using no e-logbook	Email	No												24
	Other ship owned AWS systems	Email	Yes	-	-	-	-	-	-	-	12	5	6	11	-
TOTAL AWS SYSTEMS				**81**	**140**	**171**	**202**	**227**	**250**	**229**	**331**	**333**	**327**	**351**	**392**


AWS SYSTEMS 2002 to 2014
450
400
350
300
250
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

ANNEX XI

CONTRIBUTIONS TO THE DBCP/SOT TRUST FUND FOR 2015

Budget / Country	JCOMMOPS	DBCP	OceanSITEs	SOT	JTA	COMMENT
Australia	EUR 11,700		USD 5,000			JCOMMOPS: including DBCP (50%) and SOT (50%)
Canada	CAD 30,000					JCOMMOPS, including DBCP and SOT
CLS					USD 50,000	USD 30,000 for the JTA-Executive Committee 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 DBCP
India		USD 5,000				
New Zealand	Eur 1,800					JCOMMOPS, including DBCP (50%) and SOT (50%)
South Africa		EUR 4,000				
USA	USD 59000	USD 70,000	USD 30,000	USD 100,000		Contribution to TC-DBCP and SOT made to WMO as of 2012 SOT contribution includes SOT TC (USD 40,000), Ship Coordinator (USD 50,000), and GO-SHIP Coordination (USD 10,000)

ANNEX XII

WORKING PRIORITIES OF THE SOT TECHNICAL COORDINATOR

(as agreed by SOT-8, Cape Town, South Africa, 20-24 April 2015)

Work plan item	**Frequency**	**Priority (1 highest)**
Monitoring of performance of VOS, ASAP and SOOP status, analysis tools	monthly	1
SOOP monitoring based on operational metadata provided by SOOP agencies	yearly	1
Metadata management: Control flow into JCOMMOPS, control external sources (Pub47, GTS,...) and relay issues to operators	ongoing	1
Maintain SOT websites and mailing lists, and facilitate information exchange in general	ongoing	2
Provide problem solution, in particular on GTS issues	as appropriate	2
Gather, compile and provide Mask2Real information for authentified users (VOS, ASAP)	ongoing	3
Maintain or develop QC tools, such as VOS QC relay	ongoing	3
Promote SOT activities whenever and wherever possible inside and outside the community (Outreach)	ad hoc	3
Focal point: SOT community, GOOS community, and outside the observing community, in SOT related matters	ongoing	3
(Self) training on SOT related matters (instrumentation, ...)	ongoing	3
Report to governance	SOT, OCG	3
Support JCOMMOPS infrastructure	ongoing	3
Support DMCG	DMCG	3
Missions	as appropriate	3
Secretariat/communication	ongoing	3
Create and maintain platform metadata database for SOOP and ASAP	ongoing	4
Support the SOT implementation, in particular through ancillary project and VOS DP	ongoing	4
Review and update promotion material	ad hoc	4

ANNEX XIII

VOS ANCILLARY PILOT PROJECT PROPOSAL SUMMARY

The VOS Ancillary Pilot Project is an initiative to allow more ships to join the global VOS without some of the constraints of being part of a national VOS fleet.

The SOT Task Team on VOS Recruitment and Programme Promotion (TT-VRPP) proposes that a 'VOS Ancillary Pilot Project' be created, to respond to offers from ships that want to join the VOS scheme, but which for various reasons cannot be recruited to a national VOS in the traditional way. Due to a finite pool of NMS calibrated instruments for ships, and a lack of PMO support in some areas, it is recognized that NMS may not be in a position to recruit all ships wishing to join VOS.

The TT-VRPP wants to encourage the participation of these ships and recognizes that with the support of shipping companies, these vessels could provide useful observations, particularly in data sparse regions. Under the VOS Ancillary Pilot Project, ships will prepare observations using their own instruments and TurboWin software, and will be actively supported in their VOS participation by their shipping companies, who will take responsibility for data quality and the feedback of performance monitoring information.

Background

About 25 countries are listed as having a VOS fleet, with approx. 4000 ships listed in WMO Pub 47, of which around 2000 ships are considered to be active on a monthly basis. This is however, only a small percentage of the global merchant fleet of about 29,000 ships, and the TT-VRPP has considered ways to increase VOS participation and deal with potential offers of ships wanting to join VOS.

In recent years, some countries have withdrawn funding for their VOS programmes and the number of PMOs has also been decreasing. Budget constraints and a lack of PMO resources have resulted in some NMS rationalising their VOS fleets to discard inactive ships and to concentrate their efforts on supporting ships in the Selected and VOSClim classes.

The TT-VRPP recognizes there is a need to find a solution to deal with ships that volunteer to join VOS, but which do not fit under the traditional national VOS recruitment process. The need to address this has arisen because of the following reasons:

- The number of shipping companies wanting to be involved in 'green' environmental monitoring activities has increased in recent times. There is a greater awareness of SOT activities and bodies like the WOC are promoting SOT participation, which could lead to a sudden increase in the numbers of ships wanting to join the VOS Programme.

- NMS have an inability to recruit a sudden influx of ships, for example if a company suddenly offered 10 or more ships to join the VOS, it is unlikely that these ships could be accommodated within a national VOS programme.

- Some ships want to join VOS while trading in areas where there are no PMOs. Consequently these offers have not been utilized because formal recruitments were not possible.

The VOS Ancillary Pilot Project has been conceived to respond to offers from ships wanting to join the VOS scheme, but which for various reasons cannot be recruited to a national VOS in the traditional way. These 'Ancillary' ships will be seen as supporting the global VOS.

The definition of the term Ancillary as quoted from www.yourdictionary.com means: '*something that is helping or subordinate but not as necessary*'.

How the VOS Ancillary Pilot Project will operate

1. At SOT-VIII, the TT-VRPP will report on the progress of the Ancillary Pilot Project. If the review is positive, then, in conjunction with the TT-Pub47, the SOT will be asked to consider a proposal to create a new Ancillary class of VOS, and possibly an Ancillary AWS class of VOS. Creating a new class will involve in particular (i) updating Chapter 6 describing the VOS Scheme of the WMO No. 471 (Guide to Marine Meteorological Services), (ii) updating JCOMM TR No. 4 (VOS Framework Document), (iii) updating WMO No. 47, and (iv) proposing an implementation date, and (v) communicating with the PMO network about the new class and its requirements. Until the new Ancillary class is approved (by SOT and JCOMM), the metadata element 'type of reporting ship' (Pub 47 table 2202) will be reported as OT, with 'Ancillary Pilot Project' denoted in the footnote for this element.

2. Ancillary Pilot Project ships will report using their own shipboard instruments, with their Shipping Companies taking responsibility for data quality, and for the maintenance and inspection of the shipboard instruments.

3. Ancillary Pilot Project ships will be supplied with TurboWin version 5.0 software. They will select 'Not Assigned' as the country option in the 'Station Data'. The 'Not Assigned' country option assumes the Barometer data will be sea level pressure. The next version of TurboWin will require 'Ancillary Pilot Project' to be added as an option under 'Projects', until the new class is introduced. Selecting this option will disable the standard VOS class options.

4. Ancillary Pilot Project ships will report in real-time in the full code with Email being the primary means of communication (only if it does not impact on data timeliness). Ships may use SAC services when email is not an option**,** but this raises concerns about increased communications costs for NMS at a time when NMS are trying to reduce costs. There is also an overhead in resource time in setting up ship addresses on an email 'white list' and in ensuring that observations are actually received.

5. The ships and shipping companies must provide a minimum suite of Pub 47 metadata (e.g. Ship name, callsign, registry, IMO number, vessel type) to populate the ESURFMAR database for operational requirements. Operators will be encouraged to provide the metadata pertaining to instrument type and location. The TurboWin Pub47 module can be installed and used to collect these data.

6. The new SOT TC/Ship Logistics Coordinator could be tasked to gather and check the accuracy of the metadata before entry into the ESURFMAR database.

7. Ancillary Pilot Project ships will report using REAL callsign where possible. The use of a MASK callsign, within a dedicated callsign series for the Ancillary Pilot Project, would firstly need approval by the Task Team on Callsign Masking and would then require administration of the allocated MASK callsign series. This task could be assigned to the SOT TC/Ships Logistics Coordinator.

8. The Real-Time observations from Ancillary Pilot Project ships will be monitored by the RSMC. There is a risk that some poor quality data (from un-calibrated ships' instruments) could be assimilated into the models prior to the poor quality ships being rejected/black-listed. For this reason it is proposed that the RSMC would produce monthly monitoring statistics for the Ancillary Pilot Project ships as a separate list, and this be provided to the companies operating Ancillary Pilot Project ships. Consideration could be given to possibly recruiting good quality Ancillary Pilot Project ships into a national VOS programme as a Selected or VOSClim ship in the future as resources allow.

9. The emphasis for data quality will be put on the Shipping Companies. The Companies will use the QC monitoring tools as provided to them, with the new SOT TC/Ship Logistics Coordinator acting as the intermediary. The Shipping Companies will use the monthly

monitoring statistics to provide feedback to their ships (in the same way as a PMO would) and will take responsibility to improve bad performance. The sort of text that accompanies the ESURFMAR-generated monitoring reports would be included with the statistics sent to Shipping Companies, so that they know how to interpret the results.

10. The GCCs will be consulted about the usefulness of delayed mode data from Ancillary Pilot Project ships. Some data maybe of questionable quality, so the GCCs should advise if they wish to receive this data and what the preferred method of submission is.

Terms of Reference for the VOS Ancillary Pilot Project

- Promote the VOS Ancillary Pilot Project as a means of getting more ships to join VOS.
- Ensure steps are in place to get the data from the VOS Ancillary Pilot Project ships distributed in real-time.
- Monitor the data quality and provide feedback to the responsible shipping companies.
- Provide a detailed report on the progress of the Pilot Project to SOT-VIII. If considered appropriate, liaise with TT-Pub47 to recommend the creation of new VOS classes as necessary, and propose relevant changes to WMO No. 471, WMO No. 47, and JCOMM TR No. 4.

Membership and chair

Existing members of TT-VRPP, plus
SOT TC/Ship Logistics Coordinator
RSMC
GCCs
Scientific Advisors
Chair – same as TT-VRPP

Bullet Point List of what is required from a Ship/Shipping company point of view

- Support of shipping company for ship to become an Ancillary Pilot Project ship
- Ship to use ship's own instruments
- Ship to be supplied with TurboWin 5.0 software
- TurboWin setup to show 'Not assigned' country code
- Ship/Shipping company to supply essential metadata, plus as much additional metadata as possible
- Ship to send real-time reports
- Reports to be emailed where email is timely
- Shipping company to be provided with QC monitoring feedback and to take action with ship to improve data where necessary
- Shipping company to inspect and maintain the instruments

ANNEX XIV

PROPOSED TERMS OF REFERENCE OF THE JCOMM FOCAL POINT ON SHIP MASKING

In order to be able to further proceed with the validation (and later with managing and operating the encryption system), it is proposed to establish a JCOMM focal point on ship masking with the following Terms of Reference.

The JCOMM Focal Point on Ship Masking shall:

1) Review ship masking requirements and maintain information about such requirements, and solutions proposed by Members;
2) Act as a focal point on ship masking issues, including providing Members (incl. ship operators, and GTS users) with information on the ship masking requirements, and collecting information from Members of possible problems and unauthorized use of masked data;
3) Keep the JCOMM Security requirements for the encryption/decryption of ship's call signs within BUFR reports distributed on GTS under review, suggest changes if necessary, and have them approved by JCOMM;
4) Create when needed, and record the private and public keys for the encryption/decryption of masked ship reports;
5) Make the public key available to the end users with no restriction;
6) Make the private key operationally available to the legitimate end users and request them to sign an agreement for not releasing the key to external users; and
7) Maintain a template for such agreement, and have it reviewed and endorsed by JCOMM.

ANNEX XV

OUTCOME OF THE SIDE MEETING REGARDING HIGH-SAMPLING-RATE DATA COLLECTION FROM VOS-AWS

(Cape Town, Wednesday 22 April 2015)

Attendees:

- Jan Rozema, KNMI, jan.rozema@knmi.nl
- Henry Kleta, DWD, henry.kleta@dwd.de
- David Berry, NOC, dyb@noc.uc.uk
- Annina Kroll, DWD, Annina.kroll@dwd.de
- Jean-Baptiste Cohuet, Météo-France, jean-baptiste.cohuet@meteo.fr
- Peter Minnett, U. Miami, pminnett@rsmas.miami.edu
- Sarah North, UK Met Office, sarah.north@metoffice.gov.uk
- Etienne Charpentier, WMO, echarpentier@wmo.int
- Paula Rychtar, NOAA NWS, Paula.Rychtar@noaa.gov

- Concept – To obtain high-sampling-rate (focus on 1-min) marine meteorological (including SST if possible) data from VOS using AWS technology
- What is needed?
    - User requirements
        - Start with a review on Rolling Review of Requirements to determine if any requirements exist for 1-min data
        - **Action**: Shawn Smith to visit OSCAR database to conduct this review
        - Follow up with science community to resolve gaps in the requirements and ensure that they meet needs of community
            - Requirements should set need for sampling rates, parameters, metadata, etc.
    - Standards (what sampling rate, average vs. instantaneous values)
        - Attendees agreed that accepting different data formats is desirable
            - AWS used by different countries may have different output formats
        - Some standards for sampling rates, averaging, etc. would be required to constrain the processes on the AWS.
            - Jean-Baptiste noted that the ECUAWS is capable of reporting 1-sec (instantaneous?) and 1-min average data using NMEA 0183 format (proprietary sentence)
            - Additional notes from Henry - EUCAWS is providing 1Hz instantaneous data (except pressure, as that sensor has normally a data rate of 1/10sec… EUCAWS handles that by simply repeating the last value for up to 15 seconds)
        - A minimum metadata requirement for the data is needed
            - Base on SAMOS and Pub47
            - Work towards enhancing Pub47 to better capture new metadata elements for AWS
            - Elements commented on include:
                - Time/Date basis for measurement (e.g., GPS, PC, time server)
                    - Henry recommends GPS time stamp (UTC, possibly from RMC sentence)
                - Documentation to decode proprietary AWS data sentences
                - Date of sensor calibration
                - Sensor make/model
    - Transfer technologies (PMO collect, automate)
        - Preliminary consensus of group was that the data could be collected by PMOs during required ship visits

        - Adding this to the required job tasks of PMOs would be possible (formally adding this to requirements and metrics of job performance)
        - Need to determine whether or not AWS in use have capability to store the data and have easy access to download on a ship visit
            - **Action**: Henry (in collaboration with TT-IS) to review list of existing AWS in use or planned for VOS (e.g., BAROS, BATOS, UK SAMOS, etc.) and contact operating countries to determine if the above capabilities exist. May also be in specification documents for these systems.
        - **Action**: Shawn to contact Sterela to raise this user requirement.
    - Data transfer by PMO could be facilitated by
        - Cloud storage (e.g., drop box or similar)
        - Form based web upload system
            - Advantage would be to allow PMO to select ship, automatically link to Pub47 metadata, and upload relevant files from their USB or other device.
    - Where would the data go?
        - Under MCDS structure, would be reasonable to establish one or more DACs responsible for high-sampling-rate data
- Way forward
    - Group proposed establishing a task team for high-resolution marine meteorology (TT-HRMM) under SOT
    - Shawn Smith willing to chair TT
    - Initial membership to be the participants of this group meeting (if individual agree) and we would make a call for additional members (as appropriate within JCOMM/SOT)
    - Action for ETMC to contribute to the user requirements for HRMM from VOS-AWS
    - Focus first on user requirements and standards
- General comments from group
    - Peter raised the question whether it would be possible to investigate adjusting winds for flow over vessels
    - Inspection forms for ship visits
        - Would be good to provide “best practices” from SAMOS, national VOS programs into forms for PMO use
    - Recording peak gust within sampling period (e.g., within minute sample) may be a desirable quantity.
    - Would be beneficial to contact Sterela (France) with user requirements, note that there is a user community interested in 1-min data

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ANNEX XVI

CHANGES AGREED BY SOT-8 TO THE SOT IMPLEMENTATION STRATEGY

The Team agreed to make the following changes in the SOT Implementation Strategy:

- The consideration of third party data in line with WIGOS objectives (an in-Session working group was set up). 3.1.7: addition to be provided by David Berry on third party data.
- D. Berry: Page 14, 3.1.2: OOPC to be referenced, acronym to be updated.
- Emphasis to be made on other Satcom systems than Inmarsat; and references to Inmarsat-C to be replaced by more generic Satcom reference.
- S. North: Page 15: goals & targets, e.g. 90% of the fleet should have an e-logbook. Target for the number of observations is needed. Number of ships to be recommended for ship routes (as defined in Pub47).
- All ongoing actions arising from this meeting will be inserted in the implementation strategy.
- Page 16, bullet 12
- 3.1.11, bullet 18 on users not having access to the GTS. Bullet 19: organize international meetings. Bullet 14: submission of metadata at least quarterly.
- Page 18, 3.3.9: encouraging R/S to make ASAP measurements, and funding issue.
- Para 3.3.5: Replace 'Manual or remote launching techniques ...' by 'Manual or semi-automatic launching techniques ...'
- Para 3.3.8: South African ASAP to be mentioned.
- Page 23, table 3: ASAP data should end up in data centres. INSAT to be included under data collection for VOS.
- Page 28, 4.4.8: Remove reference for BUFR to be made more readable. Add a point on JCOMMOPS providing information on BUFR resources.
- 4.2.7: Make ref. to E-SURFMAR format.
- Reference to E-SURFMAR database
- 4.2: Ref to use of E-SURFMAR formats
- Page 38, item e: D. Berry to provide text on outcome of CLIMAT-4.
- 4.6.Reference to MCDS to be added
- 4.6.5: Reference to the global archives to be clarified in a new Annex.
- Page 16, bullet 8: Remove ref. to the UK in brackets.
- Page 38, 7.7 item a: Change reference to the Ocean Data Standards and Best Practices (ODSBP).

ANNEX XVII

FUTURE TASKS FOR THE JCOMM OCG

(Draft by D Legler and D Meldrum, Sept 2014)

1. Develop better ways of routinely expressing the state of the observing network (possibly using the SWOT framework), including by platform type and by EOV.

2. Horizon scan for platforms, sensors, technologies and methodologies that will in due course become part of the composite observing system, and seek to establish pilot activities to help evaluate and transition them to the sustained observations arena when ready.

3. Continue to participate in new initiatives to expand ocean observing capabilities, such as the joint ITU/WMO/IOC initiative to use sub-sea comms cables for ocean observation and tsunami warning, and the increased activity in coastal regions.

4. Encourage JCOMMOPS to continue its outreach to new platform groups, such as the glider community.

5. Seek to assure the growth and continuity of the JCOMMOPS service, and its relationship with the NOAA OSMC.

6. Promote the adoption of consistent standards and practices for data management amongst the observing networks to facilitate discoverability and accessibility of integrated data for the research, forecast, and end-user communities as well as for product development. [make full use of Keeley report]

7. Promote the creation and timely updating of JCOMM best practice documentation.

8. Strengthen links with the satellite community, especially in the field of in situ validation of EOVs/ECVs and for integrated product development.

9. Continue to guide WMO through the mindset change that will allow them to be comfortable with data submitted by 3rd party organizations, and will allow such organizations to have access to the WIS/GTS for verification purposes.

10. Engage with other ocean and cryosphere observation groups (e.g. GOOS, OOPC, POGO, SCOR, SCAR, SOOS, …) to develop a consistent and seamless road map for ocean (including polar ocean/sea-ice) observations.

ACRONYM LIST

ABOM	Australian Bureau of Meteorology
ACE CRC	Antarctic Climate & Ecosystems Cooperative Research Centre
ADCP	Acoustic Doppler Current Profiler
AIS	Automatic Identification System
AMOS	UK Met Office's Autonomous Marine Observing System
AMVER	Automated Mutual-Assistance Vessel Rescue System
AmverSEAS	US e-logbook software
AOML	NOAA Atlantic Oceanographic and Meteorological Laboratory (USA)
ASAP	Automated Shipboard Aerological Programme
AST	Argo Science Team
AtlantOS	Optimizing and Enhancing the Integrated Atlantic Ocean Observing System
AVOS	Automatic Voluntary Observing Ships System
AWS	Automatic Weather Station
AXIS	automated XBT launchers
BAMS	Bulletin of the American Meteorological Society
BAROS	A shipboard Automatic Weather Station
BATHY	FM-63 BATHY code form – Report of bathythermal observation
BATOS	A shipboard Automatic Weather Station
BOM	Australian Bureau of Meteorology
BUFR	Binary Universal Form for the Representation of Meteorological Data
CBS	WMO Commission for Basic Systems
CCHDO	CLIVAR and Carbon Hydrographic Data Office
CCl	WMO Commission for Climatology
CCOG	Center for Coasts, Oceans, and Geophysics
CDIAC	Carbon Dioxide Information Analysis Center
CDO[75]	NCEI Climate Data Online
CG	Climate and Forecast
CIMO	WMO Commission for Instruments and Methods of Observation
CLIVAR	Climate and Ocean – Variability, Predictability, and Change (WCRP, IOC, ICSU, WMO)
CM	Contributing Member
CMM	Former WMO Commission for Marine Meteorology
CMOC	Centre for Marine-Meteorological and Oceanographic Climate Data
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTD	Conductivity Temperature and Depth
DAC	MCDS Data Acquisition Centre
DAC	VOSClim Data Assembly Centre
DBCP	Data Buoy Cooperation Panel
DMCG	JCOMM Data Management Coordination Group (DMCG)
DMPA	JCOMM Data Management Programme Area
E-ASAP	EUMETNET ASAP
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecasts
ECV	Essential Climate Variable
EIG	Economic Interest Group
ENCODE	Unique, non-repeating identifier. The identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude
E-SURFMAR	Surface Marine Operational Service (E-SURFMAR) of EUMETNET
ETMC	JCOMM Expert Team on Marine Climatology
EU	European Union

75 https://www.ncdc.noaa.gov/cdo-web/

EUCAWS	European Automatic Weather Station
EUMETNET	EIG grouping of European National Meteorological Services
FAT	Factory Acceptance Test
FOO	GOOS Framework for Ocean Observing
FR, FRX	Frequently repeated XBT lines
FRE	XBT Fall Rate Equation
FSU	Florida State University
GCC	MCSS Global Collecting Centre
GCOS	WMO-IOC-UNEP-ICSU Global Climate Observing System
GCOS-IP	GCOS Implementation Plan for Climate
GDAC	MCDS Global Data Assembly Centres
GFCS	Global Framework for Climate Service
GHRSST	Group for High-Resolution SST
GIS	Geographical Information System
GMDSS	Global Maritime Distress and Safety System
GOOS	IOC-WMO-UNEP-ICSU Global Ocean Observing System
GO-SHIP	Global Ocean Ship-Based Hydrographic Investigations Programme
GOSUD	Global Ocean Surface Underway data Pilot Project
GRT	Gross Register Tonnage
GTS	Global Telecommunications System
GTSPP	Global temperature and Salinity Profile Programme
HD, HDX	High Density repeated XBT lines
ICG-WIGOS	Inter Commission Coordination Group on WIGOS
ICS	International Chamber of Shipping (ICS)
ICT-IOS	CBS Implementation Coordination Team on the Integrated Observing System
Ifremer	French Institute for Sea Research
IIOE-2	Second International Indian Ocean Expedition
IMMT	International Maritime Meteorological Tape
IMO	International Maritime Organization
IMSO	International Maritime Satellite Organization
INMARTECH	International Marine Technician Workshop
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange
IPET-DRMM	CBS Inter-Programme Expert Team on Data Representation Maintenance and Monitoring
IPET-OSDE	CBS Inter Programme Expert Team on Observing System Design and Evolution
IQUOD	International Quality controlled Ocean Data Base
I-RAWS	Indian Real-time Automatic Weather Station
IRSO	International Research Ship Operators forum
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM in situ Observations Programme Support Centre
JMA	Japan Meteorological Agency
KAA	WIGOS framework implementation Key Activity Area
KNMI	Royal Netherlands Meteorological Institute
KPI	Key Performance Indicator
LES	Land Earth Station
MADIS[76]	Meteorological Assimilation Data Ingest System (USA)
MARPOL	International Convention for the Prevention of Pollution from Ships
MASK	Unique, repeating identifier. The masking identifier is assigned by the

76 https://madis.noaa.gov/

	NMS that recruited the ship
MAWS	Marine Automatic Weather Station
MCDS	Marine Climate Data System
MCSS	Marine Climatological Summaries Scheme
MHT	meridional heat transport
MiG	mercury in glass
MILOS	A shipboard Automatic Weather Station
MOC	Meridional Overturning Circulation
MODIS	MODerate-resolution Imaging Spectroradiometers
MoU	Memorandum of Understanding
MQCS	Minimum Quality Control Standard
NCEI	US NOAA National Centers for Environmental Information
NCP	national contact point
NCSR	IMO Sub-Committee on Navigation, Communications and Search and Rescue
NFP	National Focal Point
NMDIS	China National Marine Data Information Service
NMEA	National Marine Electronics Association
NMHS	National Meteorological and Hydrological Service
NMS	National Meteorological Service
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Centre
NWP	Numerical Weather Prediction
OBSJMA	JMA e-logbook software
OceanScope	SCOR/IAPSO working group no. 133
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	JCOMM Observations Coordination Group
OOPC	GCOS / GOOS / WCRP Ocean Observations for Physics and Climate
OPA	JCOMM Observations Programme Area
OSCAR	Observing Systems Capability Analysis and Review tool – oscar.wmo.int
OSD	Oceanography and Scientific Data
OSMC	Observing System Monitoring Centre
PANGEA	JCOMM Partnerships for New GEOSS Applications
PEC	Programme Evaluation Committee
PMO	Port Meteorological Officers
PP	Pilot Project
Pub 47	WMO Publication No. 47, International List of Selected, Supplementary and Auxiliary Ships
QC	Quality Control
QCR	JCOMMOPS Quality Control Relay tool
R/V	Research vessel
RAN	Royal Air Navy (Australia)
REAL	Official ITU callsign of the ship
RM	Responsible Member
RSMC	Regional Specialized Meteorological Centre
RTMC	VOSClim Real-Time Monitoring Centre
SAC	Inmarsat Special Access Code
S-AIS	Satellite AIS
SAMOS	Shipboard Automated Meteorological and Oceanographic System Project
SAT	Site Acceptance Test
Satcom	International Forum of Users of Satellite Data Telecommunication Systems
S-AWS	Shipboard AWS
SAWS	South Africa Weather Service

SBD	Iridium Short Burst Data
SC	Steering Committee
SCAR	Scientific Community on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SG-GTSPP	Joint IODE-JCOMM Steering Group of the GTSPP
SHIP	FM-13 SHIP code form – Report of surface observation from a sea station
SHIP	Letters "SHIP" used in place of the real ship identifier
SIO	Scripps Institution of Oceanography
SLSTR	Sea and Land Surface Radiometer
SOA	State Oceanic Administration of China
SOCAT	Surface Ocean CO2 Atlas
SOOP	Ship of Opportunity Programme
SOOPIP	SOOP Implementation Panel
SO-SI	WOC Smart Ocean/Smart Industries program
SOT TC	SOT Technical Coordinator
SOT	JCOMM Ship Observations Team
SPURS	Salinity Processes in the Upper Ocean Regional Study
SRN	Ship infrared Radiometer Network
SSA	Special Service Agreement
SST	Sea Surface Temperature
STCW[77]	IMO International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TAC	Traditional alphanumeric Code
TC	Technical Coordinator
TDC	Table Driven Code
TESAC	FM-64 TESAC code form – Temperature, salinity and current report from a sea station
ToR	Terms of Reference (ToR)
TPOS	Tropical Pacific Observing System
TR	Technical Report
TRACKOB	FM-62 TRACKOB code form – Report of marine surface observation along a ship's track
TSG	Thermosalinograph
TT-HRMM	SOT Task team for high-resolution marine meteorology
TT-IS	SOT Task Team on Instrument Standards
TT-Masking	SOT Task Team on ship callsign masking and encoding
TT-MCDS	JCOMM Cross-cutting Task Team on the Marine Climate Data System
TT-Pub47	SOT Task Team on metadata for WMO Publication No. 47
TT-Satcom	SOT Task Team on Satellite Communication Systems
TT-TDC	JCOMM Task Team on Table Driven Codes
TT-VOSRPP	SOT Task Team on VOS Recruitment and Programme Proomotion
TurboWin	Electronic logbook developed by the Netherlands
UK	United Kingdom
UN	United Nations
UNEP	UN Environment Programme
UNESCO	UN Educational, Scientific and Cultural Organization
USA	United States of America
VIIRS	Visible Infrared Imager Radiometer Suite
VOS	Voluntary Observing Ship scheme
VOS-AWS	VOS Automatic Weather Station
VOSClim	VOS Climate Class vessel
VOS-DP	VOS Donation Programme
VOSP	VOS Panel

77 http://www.imo.org/OurWork/HumanElement/TrainingCertification/Pages/STCW-Convention.aspx

WG	Working Group
WIGOS	WMO Integrated Global Observing System
WIP	WIGOS Implementation Plan
WMO	World Meteorological Organization
WOC	World Ocean Council
WOD	World Ocean Database
WOW[78]	Weather Observations Website
WRAP	Worldwide Recurring ASAP Project
XBT	Expendable Bathythermograph
XCTD	Expendable CTD
XML	Extensible Markup Language

78 http://wow.metoffice.gov.uk/

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