WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)
SHIP OBSERVATIONS TEAM (SOT)

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VOS PROGRAMME STATUS AND IMPLEMENTATION

(Submitted by Sarah North (United Kingdom), acting VOSP Chair)

Summary and purpose of the document

This document provides information on the status of the VOS Programme, and its implementation, including trends and developments, VOS automation and electronic logbook software.

ACTION PROPOSED

The Team will review the information contained in this report, and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices: A. Status of global VOS participation – 2012
B. Compliance with VOSCLIM KPIs
C. Status of global VOS automation
D. DBCP/SOT Drifter Donation Programme

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

7.2.1 VOS status, trends and developments

7.2.1.1 The Panel reviewed the status of the VOS fleet, including trends in recent years, and considered proposals for the evolution of the fleet, in particular taking into account the 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).

7.2.1.2 The Panel noted that there were 29 countries listed as having a total of 3,359 active VOS on the E-SURFMAR database (based on figures extracted on 7 March 2013). Of this total the number of ship recruited to each VOS class was as follows;

1,979	Selected
627	Supplementary
305	VOSClim
191	Auxiliary
109	VOSClim AWS
68	Selected AWS
57	Supplementary AWS
0	Auxiliary AWS
8	Ancillary
15	Other

In terms of ship numbers the size of the international VOS fleet was now less than half than the size it was a decade ago (in 2002 there were 6,896 VOS).

7.2.1.3 In considering the distribution of VOS classes in relation to VOS recruiting country, the Panel noted that there were several countries with ships listed in the E-SURFMAR metadata database from which no observations had been received in 2012. In addition there were several countries that had reported large numbers of VOS and yet very few of these ships were actively submitting observations. The Panel recognised that while 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. With a view to ensuring that the E-SURFMAR and WMO metadata records are maintained as accurate as possible, the Team agreed that such discrepancies should be raised with the VOS operating countries concerned (***action; SOT TC ; SOT-8***).

7.2.1.4 Despite the decreasing size of the international VOS fleet, the Panel was pleased to note that in 2012 more than 1.80 million observations were received from recruited VOS that are identified as active on the E-SURFMAR metadata database. This represented an increase from 1.67 million observations in 2011, and more than a threefold increase over the last decade. Whilst this was therefore a very positive growth year on year, the Panel noted, however, that almost ninety percent of observations in 2012 came from just six national VOS fleets. Consequently there remained a need to increase the capacity of other countries that are seeking to implement VOS networks of their own, and to involve other countries that have large national merchant fleets but which currently have no established VOS fleet.

7.2.1.5 The Panel further noted that a further ~228,415 observations were received under the anonymous call sign ‘SHIP’ and a further ~118,418 observations were received from ships not recognized as having been recruited by a particular national VOS operator. Consequently a total of approx 2.14 million observations were actually received in 2012 of which approximately 16% were from unidentified ships. VOS Focal Points were therefore encouraged to check the list of unidentified ships on the database and to ensure that the metadata for these ships is recorded in their WMO Pub 47 submissions, as well as on the E-SURFMAR metadata database (***action; VOS FPs ;ongoing***).

7.2.1.6 The Panel reviewed the maps and graphs prepared by JCOMMOPS showing VOS status, coverage and parameters reported and encouraged JCOMMOPS to make these products more readily available via the JCOMMOPS website rather than via ftp links at present, and to ensure that they are routinely updated. (***action; SOT TC ; SOT-8***).

7.2.1.7 In order to make reasoned judgements about the future strategy for evolution of the VOS observing networks, the Panel considered that there was a need for more detailed metrics and graphs. For example the information contained in the annual VOS national reports could be extracted and displayed in a format that would enable the SOT and VOS focal points to assess observing trends and to compare data availability and quality. The Panel recommended that such metrics should be compiled by the SOT Coordinator, in liaison with the Panel Chair and the TT on VRPP, and made available on the JCOMMOPS website (***action; VOSP Chair & SOT TC; SOT-8***).

7.2.2 VOSClim status, and upgrading of ships to VOSClim standard

7.2.2.1 The Panel noted that taking into account all VOS Classes (listed in paragraph 7.2.1.2), VOSClim and VOSClim AWS ships amount to just over 12% of the total global fleet (an increase of just 3% since the last SOT session).

7.2.2.2 The Panel further noted that 779,400 observations were received and processed from VOSClim registered ships by the Global Collecting Centres during 2012, and that this represented 49% of data received - the largest number of received VOSClim observations since collection began in 2003.

7.2.2.3 The Panel recalled that at the last SOT session a KPI target was set for 25% of the global active VOS to be upgraded to VOSClim class by SOT-7 (the global active VOS being defined as the number of VOS registered in WMO Pub 47 and reporting at least once per month). Although a total of approximately 2150 ships had submitted at least one report during 2012, the average monthly number was currently approximately 1480 ships. Consequently on this monthly basis the percentage of ships that had been upgraded to VOSClim standard had therefore reached 27%. However, analysis of observations received from the VOS and VOSClim class ships at the UK Met Office (based upon ships that had submitted more than 5 pressure reports per month) indicated that, on average over the year, the figure was nearer to 22%. On balance the Panel therefore considered that the KPI target had been achieved, but agreed that the KPI should continued to be measured until SOT-8 **(*action; VOSClim FP & RTMC; SOT-8***). In considering this issue, The VOSP Chair reported that initial analysis of the real time data suggested that 17% of observations carried out by conventional VOS in 2012 were from VOSClim ships (declared in the E-SURFMAR metadata database) and that 45% of automated observations were from automated VOSClim ships.

7.2.2.4 The Panel was pleased to note that the KPI set at the last session for less than 3% of VOSClim class ships being flagged on the suspect list for air pressure had also been met. However in view of the decisions taken at this session to tighten the VOSClim monitoring criteria the Panel agreed that the KPI should continue to be measured until SOT-8 **(*action; RTMC; SOT-8***).

7.2.2.5 The KPI set for 95% of VOSClim class observations to be received within 120 minutes had also been achieved. The Panel agreed that this KPI should continued to be measured and reported to SOT-8 **(*action; RTMC; SOT-8***).

7.2.2.6 The Panel reminded the VOS operators that at SOT 6 it had also been agreed that a reporting KPI criteria for an 'active' VOS should be set at 20 observations per month. In this respect the Panel noted that from the annual ranking list for 2012 produced by the UK Met Office, 43.2% of VOS ships (1192 out of 2756) reported an average of at least 20 pressure reports per month, while 93.7% reported at least one pressure per month on average. VOS Focal points were encouraged to monitor compliance of their national fleets with this criteria **(*action;***

VOS FPs; ongoing).

7.2.2.7 In considering the KPIs the Panel recognized that it was ambitious to expect VOS Operators to upgrade all classes of existing VOS to VOSClim standards. For instance it was unrealistic to expect VOS operators to upgrade all Auxiliary class ships which use their own instruments for making observations. Similarly it was unrealistic to expect Supplementary AWS ships to be upgraded as such ships have no facility to take manual observations unless the ships officers are additionally recruited to perform manual observations and provided with the necessary electronic logbook software.

7.2.2.8 However the Panel agreed that upgrading 'Selected' ships to 'VOSClim' standard would require only limited effort by the Port Meteorological Officers, especially where ships are equipped with TurboWin electronic logbook software. Taking into account that Selected VOS amounted to almost 60% of the VOS fleet and the preference expressed by the VOSClim scientific advisers that enhanced VOSClim parameters should be collected for as many VOS as possible, the Team recommended that VOS focal points and PMOs should make renewed efforts to upgrade all suitable 'Selected' VOS in their fleets to VOSClim standard at their next inspection. (***action; PMOs & VOS FPs; ongoing***).

7.2.2.9 The Panel agreed that a new KPI should be introduced based upon ship classes that can realistically be upgraded to VOSClim without undue resource and cost implications. The Panel therefore recommended that a new KPI should be introduced as follows:

- That at least 25% of the active international VOS Fleet registered on the E-SURFMAR metadata database to be VOSClim Class by SOT-8 (***action; VOS Operators; SOT-8***).

7.2.2.10 Although there had been a steady year on year growth in the number of ships recruited to VOSClim class the VOSClim scientific advisers had advised that the current volume of VOSClim data was too small to form a climate quality data set (sampling errors would currently dominate any fields produced and the benefit of the high quality observations would be lost).

7.2.2.11 To further encourage the growth of collection of enhanced delayed mode VOSClim data the Panel proposed that Selected VOS that that are using TurboWin software should be encouraged to self-recruit This would only require a small change to the TurboWin station data and wouldn't incur any significant extra effort for the observers when compiling their observations. The Panel were generally of the view that such self recruiting ran counter to the concept of VOSClim which aimed to develop a higher quality climate subset of VOS observations from the best performing ships. Nevertheless the Panel accepted that Port Meteorological Officers could select VOSClim on the TurboWin program provided that;

- the ships concerned continue to be listed in the WMO Pub 47 metadata as 'Selected' ships i.e. until such time as they meet all the other requirements for VOSClim class;
- it is recognised and acknowledged by those investigating the dataset that not all ships supplying the additional VOSClim data are in fact VOSClim ships; and
- there is no inference made to correlate the number of ships supplying the additional VOSClim data to the size of the actual VOSClim fleet.

7.2.2.12 The Panel also recognised that the requirement for VOSClim ships to be inspected at less than six monthly intervals was presenting an obstacle for good quality ships that trade globally. In addition, because the availability of PMO resources was diminishing in several countries it was becoming increasingly difficult to meet this criteria. Whilst the Panel agreed that the definition of a VOSClim class ship (in WMO Pub 47 Table 2202) remained valid the Panel considered that the criteria could be relaxed where ships are remotely vetted at regular intervals by PMOs to ensure that they maintain VOSClim standard. The VOS acting Chair undertook to prepare a proposal on how remote vetting should be conducted and to circulate this to VOS focal points for consideration and with a view to possible approval at the next session (***action; VOSP Chair; SOT-8***).

7.2.2.13 The Panel noted that, for a variety of reasons, there were often differences between the list of VOSClim ships recorded on the DAC website, and those recorded on the E-SUFMAR Metadata database. A common reason was due to changes in call signs not being advised early enough, or a backlog of VOSClim recruits/changes being notified to the DAC after the event. Occasionally some ships had also continued to use their old call signs in their electronic logbooks after the change had been made. In early March 2013, a total of 430 active VOSClim Class ships were recorded on the DAC website compared to 414 recorded on the E-SURFMAR metadata database. These differences were recently addressed by the VOSClim DAC and the E-SURFMAR Programme team and figures are now in close harmony.

7.2.2.14 The Panel recalled that at the last session the VOSClim Focal Point was requested to consider whether the E-SURFMAR database could be used for obtaining the list of VOSClim ships. In this regard a link to the E-SURMFAR database, and to the relevant E-SURFMAR ftp listing, had already been added on the DAC website so that climate users could continue to have access to accurate VOSClim ship lists. The Panel noted that whilst the Task Team on VOS Recruitment and Programme Promotion had agreed that the DAC website should be discontinued, this could take some time. In the interim, the Panel reminded the VOS operators to ensure that the DAC were also notified of any changes to VOSClim ships when updating their metadata on the E-SURFMAR metadata database, or when submitting metadata lists to WMO (***action; VOS FPs; ongoing***).

7.2.2.15 The Panel recognised that keeping two separate VOSClim lists represented a duplication of effort for VOS Focal points and PMOs, especially when large national VOSClim fleets are involved. The Panel recommended that the E-SURFMAR metadata database should be the main listing for ships recruited to VOSClim class and that the existing Excel VOSClim ship list on the DAC should be deleted (***action; DAC; ASAP***).

7.2.2.16 The Panel agreed with this recommendation although the Panel recognised that there were potential resource implications for how the DAC processes the ship lists in future. The Panel requested the VOSClim DAC and the E-SURFMAR Programme team to harmonise the two listings and to advise the SOT Chair when this work is completed so that the information can be disseminated to VOS focal points and PMOs via the JCOMMOPs mailing lists (***action; SOT Chair; end 2013***).

7.2.2.17 To ensure the accuracy of the VOSClim metadata, the Panel strongly urged VOS Focal Points to ensure that the metadata for their national VOSClim fleets is maintained up to date in the E-SURFMAR database, or is regularly submitted in Pub47 format. The Panel also urged the VOS Focal Points to check the accuracy of historical VOSClim recruits to ensure that no metadata is omitted. In particular, the Panel requested the VOS focal points to check that the digital imagery and drawings required for both active and inactive VOSClim ships is up to date in the E-SURFMAR metadata database (***action; VOS Focal Points; ongoing***). The need to update metadata listings as soon as possible after upgrading ships to VOSClim Class was also stressed, to ensure that data is readily available to climate users.

7.2.2.18 The Panel recognised that it was difficult for VOS operators to keep abreast of changes to call signs arising from changes of flag/owners, and VOS focal points often had to rely on being notified by the ships officers. In this respect, the Panel noted that call signs were registered with the International Telecommunications Union (ITU) and suggested that an approach might be made to the ITU to obtain more accurate information on call sign changes. (***action; VOS Panel Chair; SOT-8***).

7.2.3 Electronic logbook software

7.2.3.1 The Panel reviewed the status of its work to increase the number of e-logbooks, thereby avoiding the need for traditional hardcopy logbook data to be manually digitised. The Panel noted although there had been a gradual increase in the number of ships reporting use of electronic logbook software between 2003 and 2008, in recent years the number based on SOT reports had

been relatively stable, and had not increased in the last year. This was possibly a reflection of the gradual decline in VOS ship numbers in recent years.

7.2.3.2 There are three main types of electronic logbook currently in use on VOS – OBSJMA developed by the JMA, SEAS developed by NOAA, and TurboWin developed by KNMI in cooperation with E-SURFMAR. Information on the known status of e-logbooks installed on VOS is given in **Appendix C, Table 2**.

7.2.3.2 The Panel noted that Version 9.0 of the AmverSEAS program was now ready to be used and could be downloaded from the web[1] together with the installation and setup information. Earlier versions of SEAS were no longer being supported. The Panel was pleased to note that the latest version of SEAS was able to generate IMMT-IV formatted messages so that the software was now VOSClim compliant. In addition it had the capability to generate metadata reports which could be transmitted in binary format, and could also be used to recruit Ancillary Pilot Project ships using the recruiting country 'Not Assigned'.

7.2.3.3 The Panel noted that Version 5.0 of the TurboWin program had been released in 2012. To help to reduce position or quadrant errors a new mapping tool was now included in the software to store and display observation positions. The software also permits IMMT-4 data storage and allows VOSClim ships to be entered as a separate class. It was now also suitable for use by Ancillary Pilot Project ships.

7.2.3.4 The Panel noted that, by default, ships recruited by the Netherlands would in future be using a compressed code form to compile and transmit their TurboWin weather reports. This necessitated the use of a new three figure Inmarsat Special Access Code dedicated to the Netherlands VOS. Other European VOS operators were also being encouraged to move over to this system to help reduce the currently unfair cost burden borne by the small number of NMS that host SAC 41 Land earth stations.

7.2.3.5 The Panel further noted that seven VOS were now successfully using the web-based TurboWeb software which allows ships with internet access and suitable bandwidth to send their observations direct to the TurboWeb server maintained by KNMI. The advantage of the system is that any updates to the software can be done remotely thereby avoiding the need for ships officers or visiting Port Meteorological Officers to install new versions on the ships computers. In the not too distant future it was expected that further development of the TurboWin software would be discontinued in favour of the TurboWeb based approach.

7.2.3.6 In considering the electronic compilation and transmission of observations, the Panel noted that "mobile-based" applications for Android hand-held and tablet platforms were being developed that have the potential capability to be used for weather reporting. The Panel considered that such systems could help to enhance data collection and agreed that such initiatives should be monitored and VOS Focal Points kept informed of developments (***action; VOSP Chair; SOT-8***).

7.2.4 Status of VOS automation

7.2.4.1 The Panel Chairperson reported on the present status of VOS Automation. According to VOS national reports received in 2012 there were now 20 countries with AWS systems installed on their VOS amounting to approximately 336 shipborne AWS systems. In the last couple of years this number has been largely unchanged. Information on the reported status of known shipborne AWS installed on ships, and derived from annual VOS reports, is included in **Appendix C, Table 1**.

7.2.4.2 However, in contrast, the Panel noted that only 234 AWS systems had been recorded in the E-SURFMAR database (figures March 2013). The Panel therefore encouraged the VOS Focal

1 http://www.aoml.noaa.gov/phod/goos/seas/amverseas_software.php

Points to ensure that metadata for their automated VOS ships is maintained up to date in the E-SURFMAR metadata database, and in their WMO Pub 47 submissions (***action; VOS Focal Points;ongoing***).

7.2.4.3 Although at least half the AWS systems currently installed have a computer facility to manually add the traditional visual observations to the measured automated observations, this is often not being done by the observers. Linking AWS systems to recognised electronic logbook displays, such as TurboWin, may help overcome this problem in the future. The Panel requested the VOS Focal points to encourage the officers on such ships to add visual observations (***action; VOS Focal Points; ongoing***).

7.2.4.4 In considering this issue, the VOS Panel Chair reported that several major VOS operators now had plans to automate their national fleets and to substantially reduce the number of manually reporting VOS, concentrating on VOSClim quality ships. Some national VOS operators were also advising their intention to withdraw all manually reporting VOS in the near future. Such developments therefore had serious implications for the future of the VOS Scheme and continuity of the climate records.

7.2.5 E-SURFMAR S-AWS developments

7.2.5.1 Henry Kleta (Germany) reported on the extensive work that had been undertaken by E-SURFMAR members to develop detailed design specifications and recommendations for a new E-SURFMAR Shipboard AWS system (S-AWS). Discussions had taken into account the varying requirements of the individual E-SURFMAR members and it had eventually been decided to develop an autonomous system requiring no intervention form the ships staff during routine operation. The system would primarily consist of a Basic Observing Unit (BOU) consisting of a processing unit, a satellite position system and a two way satellite communication system providing global coverage. A service unit would allow a PMO or technician to check and configure the system, while a Land Based Monitoring Facility would enable shore based staff to configure the system remotely.

7.2.5.2 The Panel noted that tendering documents for the new S-AWS system were issued in June 2012 and following detailed evaluation of the tenders it had been decided to establish a Framework Agreement with the winning bidder ‘Sterela’. The Framework agreement is signed by the EUMETNET EIG and will last 7 years. Under the agreement participating E-SURFMAR members will eventually be able to purchase the S-AWS systems through national contracts. Expressions of interest to purchase as many as 300 E-SURFMAR S-AWS had already been received from several European National Meteorological Services (notably Germany, France and the Netherlands).

7.2.5.3 Sterela will initially build three prototype S-AWS systems that will be subject to intensive scrutiny and a 6 month in-situ trial period on board participating members’ ships. These prototypes will be ordered in 2013 and, subject to satisfactory trials beginning in 2014 it is hoped that the first operational systems would be ready to roll out by the end of that year.

7.2.6 PMO activities and inspections - implications of automation

7.2.6.1 The Panel discussed the role of the Port Meteorological Officers (PMO), and PMO activities and inspections, as well as the implications of VOS automation on their activities.

7.2.6.2 The fact that many National Meteorological Services are in the process of automating their fleets was already having an impact on the PMO role and the skills required. Whereas the traditional PMO role had required inspection and training skills combined with practical seagoing experience, there was now an increasing requirement for technical or engineering competencies.

7.2.6.3 However, the Panel recognized that the level of skill required largely depended on the type of AWS system being installed. In the case of simple autonomous AWS systems which require minimal interface with the ships infrastructure or systems a PMO could simply replace the whole unit with a new one, and return the faulty one for repair ashore. Whereas a complex integrated AWS system connected to the ships power supply and systems (e.g., Gyro compass), and requiring cabling to sensors (e.g. SST sensor in engine room) either required PMOs with greater technical ability, or required shore based technicians to visit to maintain and repair the system. This inevitably had logistic, resource and cost implications.

7.2.6.4 The Panel also recognised that there was a wide variety of AWS systems currently being used by VOS operators, with a corresponding variety of data formats, transmission systems, sensor types etc. Each system therefore called for specialist knowledge and experience. This inevitably makes it difficult for traditional PMOs to perform inspections of, or maintain, AWS systems on overseas VOS that may be visiting their ports. 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 observations compiled by the AWS.

7.2.6.5 The Panel recognized that in order to verify the quality of the AWS data a PMO would 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, or to go on line to check the quality of the parameters that are automatically being transmitted and routed to the GTS. In the absence of training in the various types of AWS in use, there were therefore clear limitations on the ability of traditional PMOs to inspect AWS systems.

7.2.6.6 In order to increase PMO awareness of different AWS system functionality the Panel recommended to the Team that consideration should be given to convening an international Shipborne AWS Workshop during the next intersessional period. This would not only afford a knowledge transfer opportunity for technicians but could also be used as a training workshop for PMOs to gain a basic understanding of the capability and operation of different AWS systems now being used on VOS. In a wider context there may also be merit in inviting shipowners and AWS manufacturers to such a workshop (***action; SOT Chair, WMO Secretariat;SOT-8***).

7.2.6.7 The Panel considered the limitations of the current national and international inspection forms (e.g. VSOP001- Report of Inspection to Foreign VOS) for inspecting shipborne AWS system while in service. In addition, the Panel recognized that prior to installation of a shipborne AWS system there was often a need to arrange a pre-installation site inspection to consider the suitability of a proposed host ships arrangements e.g. power supply, exposure, installation location, satellite visibility, proximity of other transmission systems/aerials etc.. The Panel therefore recommended that consideration should be given to developing new ‘Shipborne AWS – VOS’ inspection, and site inspection forms (***action; TT-VRPP & SOT Chair;SOT-8***).

7.2.6.8 The Panel recognized, that to some extent, the use of shipborne AWS challenged the ‘voluntary’ nature of the VOS Scheme, especially as shipowners were often required to sign contractual agreements or Memorandums of Understanding prior to installing shipborne AWS systems of their vessels.

7.2.7 VOS Donation Programme

7.2.7.1 The Panel recalled that the concept of a drifter donation programme was initiated at the Fourth International Port Meteorological Officer Conference (PMO-IV Orlando, 8-10 December 2010) as a means to assist developing countries to establish national VOS programmes. The VOS Drifter Donation Programme (VOS-DP) was subsequently developed as a joint DBCP/SOT initiative with clearly defined criteria. Under the VOS-DP a ’deck’ drifting buoy would be installed on suitable ships - in effect acting as an autonomous AWS. Details on the conditions that must be

met in order to be eligible to receive a drifter, which would be donated by the Global Drifter Program (GDP), are at **Appendix D**, and are also available on the web[2].

7.2.7.2 Unfortunately whilst the programme is well defined and documented, the VOS-DP Programme Evaluation Committee (PEC) has received very limited response from interested developing countries. Moreover one potential drifter recipient country had reported that, despite determined efforts, it had been very difficult to find any ships willing to participate.

7.2.7.3 Despite this disappointing response to the program a recent opportunity had recently arisen in connection NOAA's planned support for the Pacific Partnership 2013 mission. The Pacific Partnership initially began as a global response to the 2004 Indian Ocean tsunami, and the widespread goodwill and cooperation that resulted, formed the genesis of Pacific Partnership's mission to proactively deliver humanitarian assistance from the sea. The Panel therefore considered that the VOS-DP would make a good fit with the objectives of the mission and help to fill a traditionally data sparse area.

7.2.7.4 The Panel proposed that the Port Meteorological Officer in Hawaii should act as the 'buddy' PMO for the Polynesian islands involved in the mission (Samoa, Tonga, Guam, Noumea, Marshall Islands, Kiribati, Solomon Islands), although it has yet to be formally agreed who should act as the National Contact Point for Donations in this area. Efforts are now being made to source suitable ships, to collect the necessary metadata and to start setting up the local VOS programme. Once this has been done, and the recipient country is ready to receive the drifter, the Hawaii PMO will notify the chair of the VOS-DP Evaluation Committee (PEC) accordingly. A positive response by the PEC will result in a drifter being provided free of charge by the Global Drifter Programme (GDP), who will also pay the shipping and data telecommunication costs.

7.2.7.5 The Panel noted that another area where the VOS-DP could possibly become involved was in the Western Indian Ocean Region, where it has been proposed that an SOT Pilot Project should be established to recruit a pool of local VOS with a view to enhancing data availability.

7.2.7.6 The Panel noted that the WMO Secretary General had recently 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. Developed countries were also invited to consider whether they could contribute by donating drifter units.

7.2.7.7 In considering this issue the VOS Chair also invited the Panel to consider the potential for extending the programme to include low cost autonomous Automatic Weather Stations that are currently being developed and used by several VOS operators. These systems could either be entirely independent of the ships systems (e.g. using solar power) or solely require connection to the ships power supply.

7.2.8 The meeting made the following recommendations:

(i) That a new KPI target should be introduced to aim for least 25% of the active international VOS Fleet registered on the E-SURFMAR metadata database being recorded as VOSClim Class by SOT-8 (***action; VOS Operators;***);

(ii) That consideration should be given to convening an International Shipborne AWS Workshop;

(iii) That consideration should be given to developing new 'Shipborne AWS – VOS' inspection and site inspection forms.

2 http://www.wmo.int/pages/prog/amp/mmop/JCOMM/OPA/SOT/documents/DBCP-SOT-Drifter-Donation-for-VOS.pdf

- B - BACKGROUND INFORMATION

- **VOS status, trends and developments**

A breakdown of the current composition of the active national VOS fleets drawn from the E-SURFMAR Metadata Database, together with the number of observations received from VOS fleets during 2012, is at **Appendix A**. The Appendix also includes graphs showing the growth of VOS observations over the last decade and a map of the last recorded observations positions for the VOS.

- **VOSClim status, and upgrading of ships to VOSClim standard**

Graphs showing the level o f compliance with VOSClim KPIs set at SOT 6, together with information on the growth of the VOSClim fleets in recent years are at **Appendix B.** A graph showing the volume of data received in delayed mode from VOSClim participants is also included.

- **Automation and electronic logbooks**

Tables showing the growth in shipboard AWS systems and the growth in the use of electronic logbook software over the last decade are included at **Appendix C.**

- **VOS Donation Programme**

Full details of how to participate in the VOS Donation programme are included at **Appendix D.**

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APPENDIX A

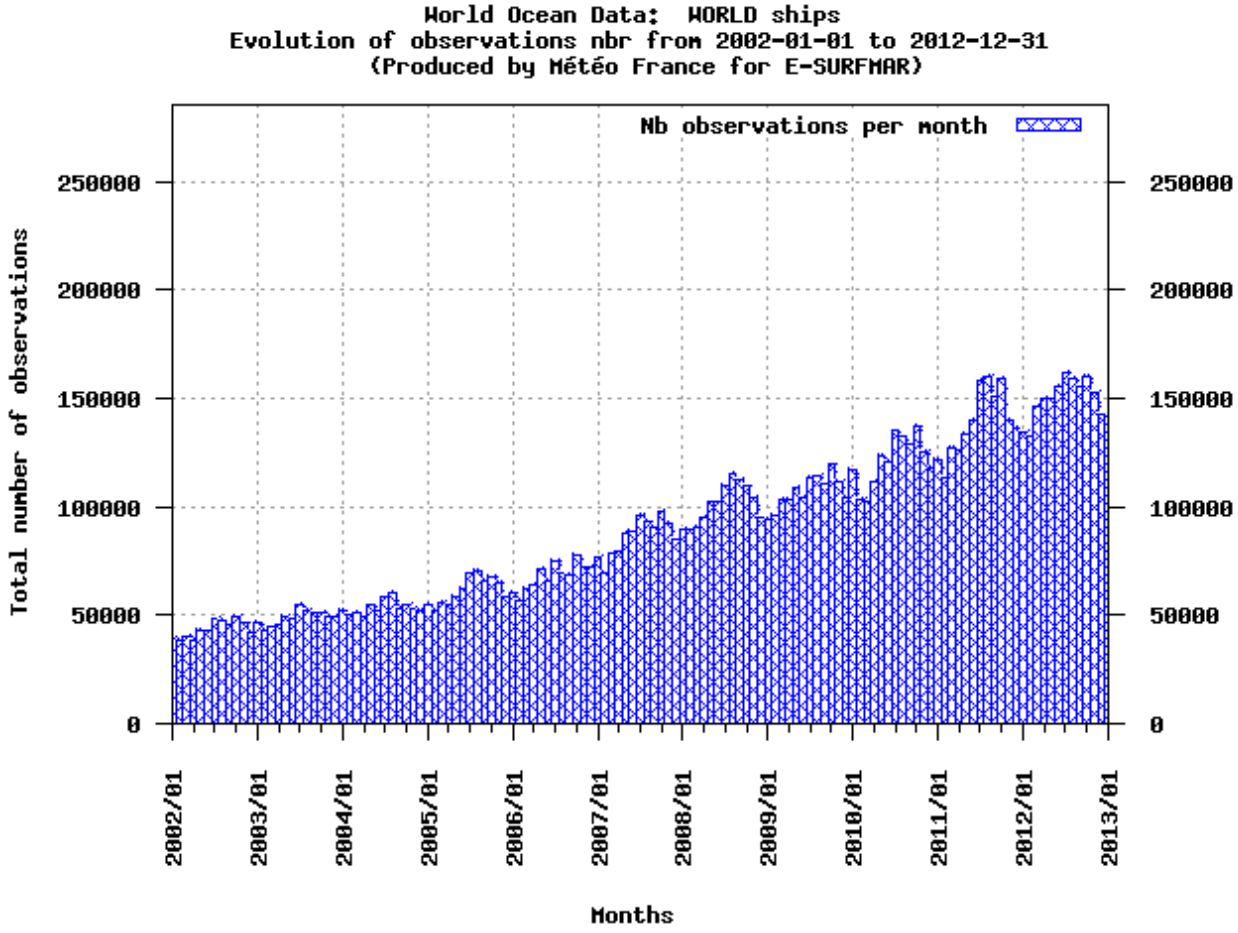
STATUS OF GLOBAL VOS PARTICIPATION -2012

Recruiting Country	Number of VOS reported in 2012 SOT report	Number of GTS obs in 2012 SOT report	Number of VOS listed as Active in E-SURFMAR database *(March 2013)*	Number of VOS that real time obs were received from in 2012 *(from E-SURFMAR Obs Counters)*	Number of observations in 2012 (*from E-SURFMAR obs counters*)	Percentage of Manned observations
AR	-	-	1	0	0	0
AU	75	59099	74	85	56630	27
BR	12	230	0	0	0	-
CA	52	304974	52	50	295254	0
CL	7	620	2	2	602	100
CN	67	0	0	0	0	-
DE	753	273657	741	696	258905	58
EC	-	-	1	0	0	0
ES	1	-	1	0	0	0
EU	26	113685	28	33	124053	0
FR	65	219195	65	63	215994	0
GB	321	333388	333	306	307747	31
GR	7	343	7	4	116	100
HK	54	4082	50	38	5326	100
HR	-	-	30	0	0	0
ID	[10]	Not submitted	0	0	0	-
IE	10	960	10	2	208	100
IL	-	-	20	5	1167	100
IN	138	48368	100	22	744	100
IS	-	-	6	4	1772	100
IT	6*	-	0	-	-	-
JP	526	34058	526	[18]	[11107]	48
KR	33	132	33	14	96	100
MY	90	Not submitted	17	12	1270	100
NL	102	44026	104	105	44303	100
NO	-	-	5	5	29977	3
NZ	32	17965**	32	34	16848	38
PL			47	1	74	96
RU	148	12452	188	96	18331	100
SE	24	[7189]	29	21	17619	45
SG	20	Not submitted	1	0	0	0
US	899	457534	843	808	391079	67
ZA	19	55600	5	2	93	100
ZZ			8	5	1963	100
SHIP	N/A	N/A	-	(1)	228415	17
Unassigned (on E-SURFMAR database)	-	-	-	559	[118418]	-

* E-SUFMAR BAROS systems

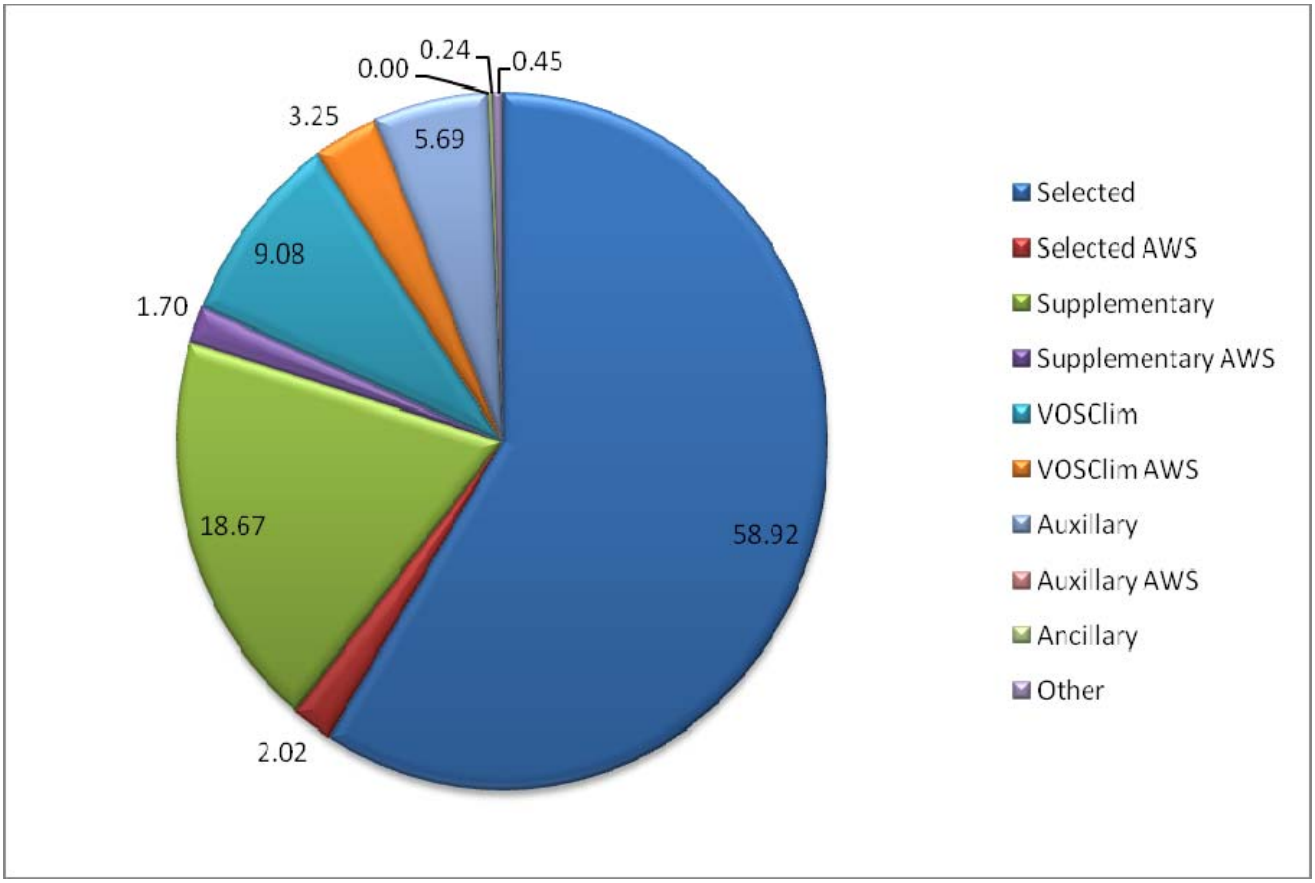
** Only includes BBXX in quadrants 3 and 5

GROWTH IN VOS OBSERVATIONS 2002 to 2012

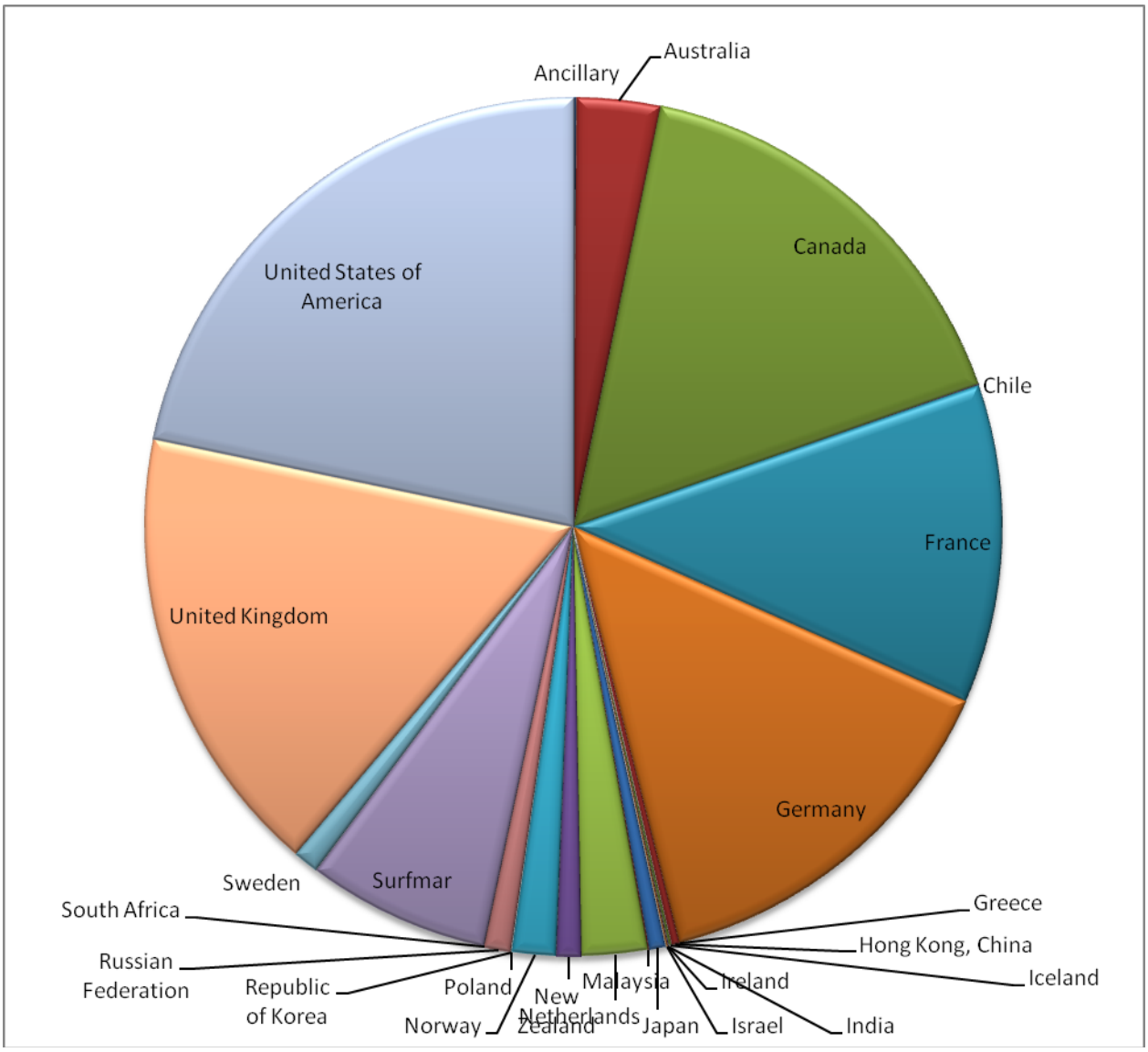


WORLD ships from 2012-01-01 to 2012-12-31	World Ocean			EUCOS Area						
Country	Total	Manned	Pressure	Total	Manned	Pressure	Main synop.	Intermediate	Hourly	Others
Ancillary	1963	1962	1945	605	605	604	255	127	223	0
Australia	56630	15824	56043	475	472	465	173	54	248	0
Canada	295254	1257	272807	130491	793	129555	23669	22037	84785	0
Chile	602	602	600	141	141	141	141	0	0	0
France	215994	11701	211454	144550	7778	140227	22762	24683	97102	3
Germany	258905	155747	256076	150306	49930	148035	48005	23547	78754	0
Greece	116	116	116	115	115	115	79	32	4	0
Hong Kong, China	5326	5323	5307	183	183	181	158	10	15	0
Iceland	1772	1772	1759	1771	1771	1758	873	897	1	0
India	744	743	709	1	1	1	1	0	0	0
Ireland	208	208	208	208	208	208	55	28	125	0
Israel	1167	1167	1142	556	556	553	555	0	1	0
Japan	11107	5336	11081	38	38	37	28	4	6	0
Malaysia	1270	1270	1247	0		0	0	0	0	0
Netherlands	44303	44214	44257	21245	21209	21220	14292	2872	4081	0
New Zealand	16848	7183	16753	0		0	0	0	0	0
Norway	29977	993	29883	25152	993	25058	4205	4175	16772	0
Poland	74	71	72	24	22	23	24	0	0	0
Republic of Korea	96	96	95	0		0	0	0	0	0
Russian Federation	18331	18329	18119	8390	8390	8337	8354	0	36	0
South Africa	93	93	93	0		0	0	0	0	0
Surfmar	124053	265	118143	110159	256	105134	18023	18526	73610	0
Sweden	17619	7892	17449	13529	3890	13367	4906	2224	6399	0
United Kingdom	307747	96094	299067	229973	37163	222683	48555	37630	142373	1415
United States of America	391079	252806	381723	87368	66108	85823	34387	13791	39169	21
Total	**1801278**	**35%**	**1746148**	**925280**	**22%**	**903525**	**229500**	**150637**	**543704**	**1439**

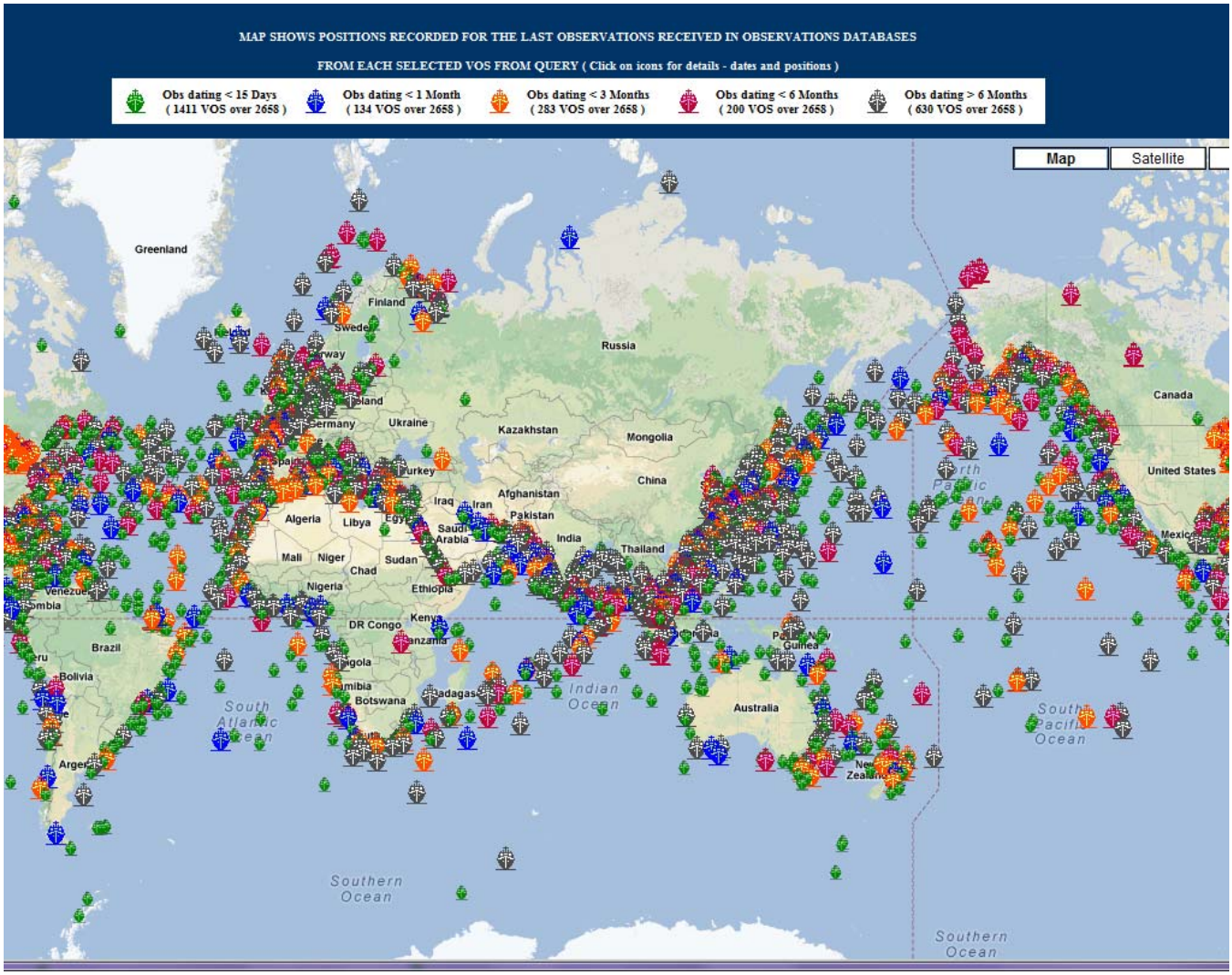
COMPOSITION OF INTERNATIONAL VOS CLASSES (PERCENTAGES)



COMPOSITION OF INTERNATIONAL VOS FLEET

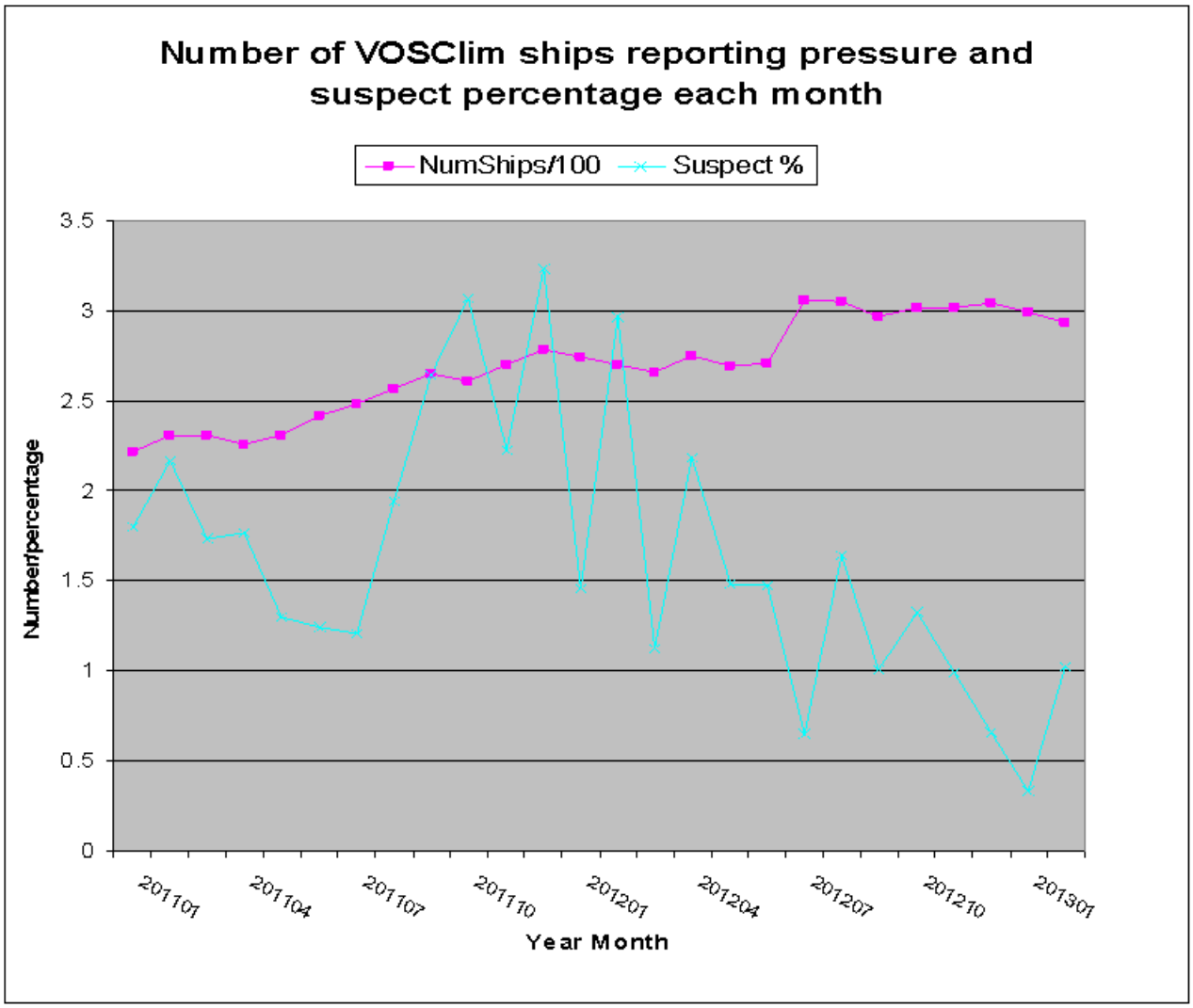


LOCATION OF VOS



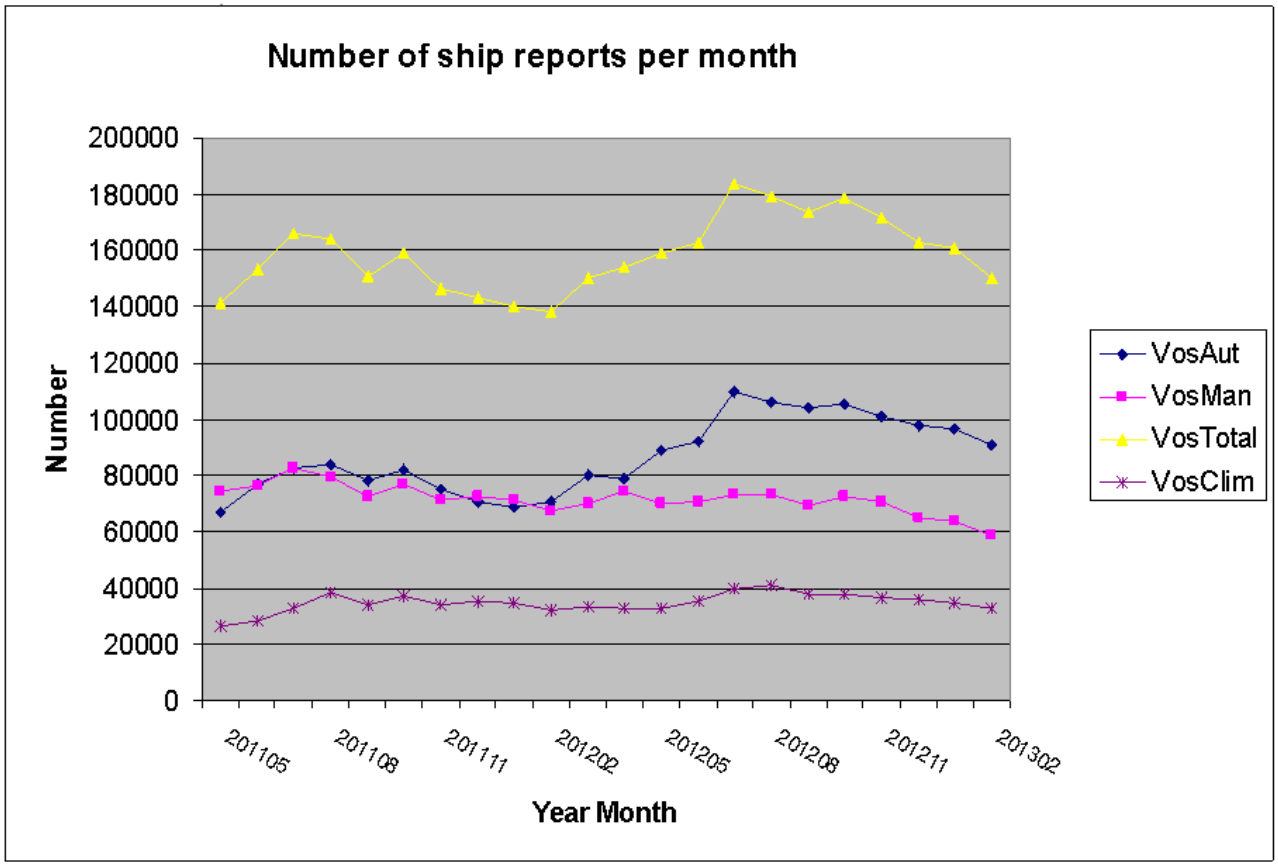
APPENDIX B

COMPLIANCE WITH VOSCLIM KPIs



Note – based upon number of ships reporting 5 or more pressure reports per month

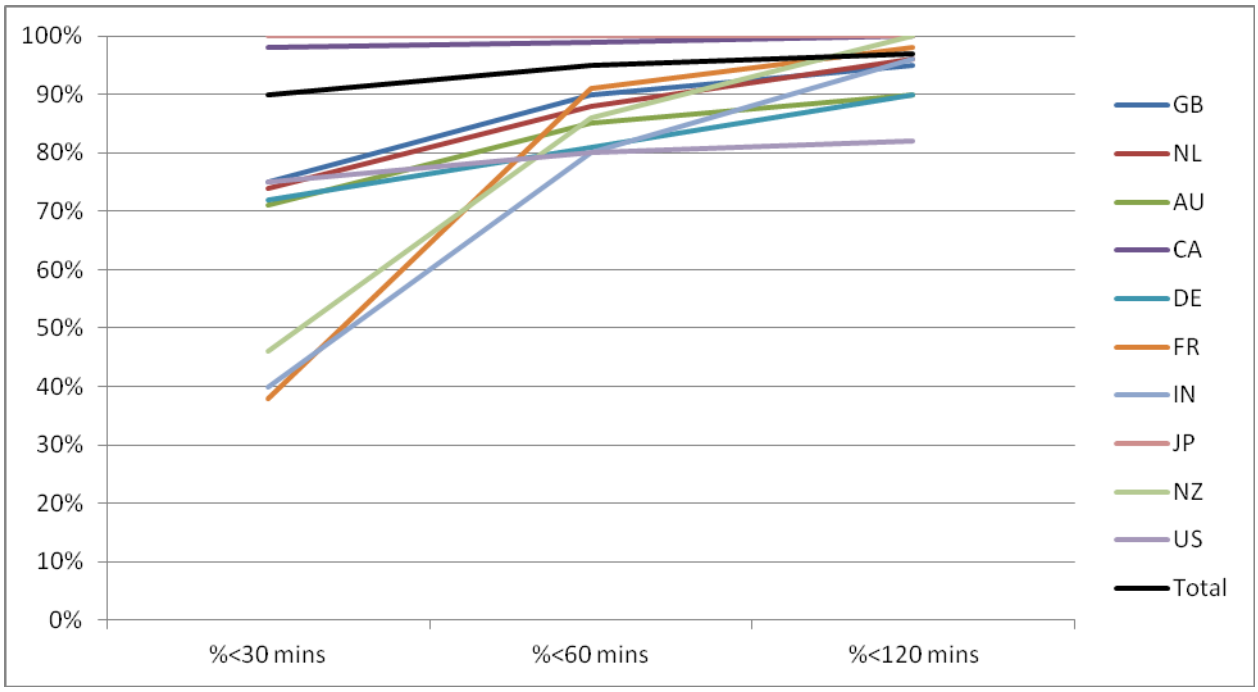
Year Month	VOSClim Number	VOSClim Flag	Suspect %
201201	274	4	1.5
201202	270	8	3.0
201203	266	3	1.1
201204	275	6	2.2
201205	269	4	1.5
201206	271	4	1.5
201207	306	2	0.7
201208	305	5	1.6
201209	297	3	1.0
201210	302	4	1.3
201211	302	3	1.0
201212	304	2	0.7



Note – based upon number of ships reporting 5 or more pressure reports per month

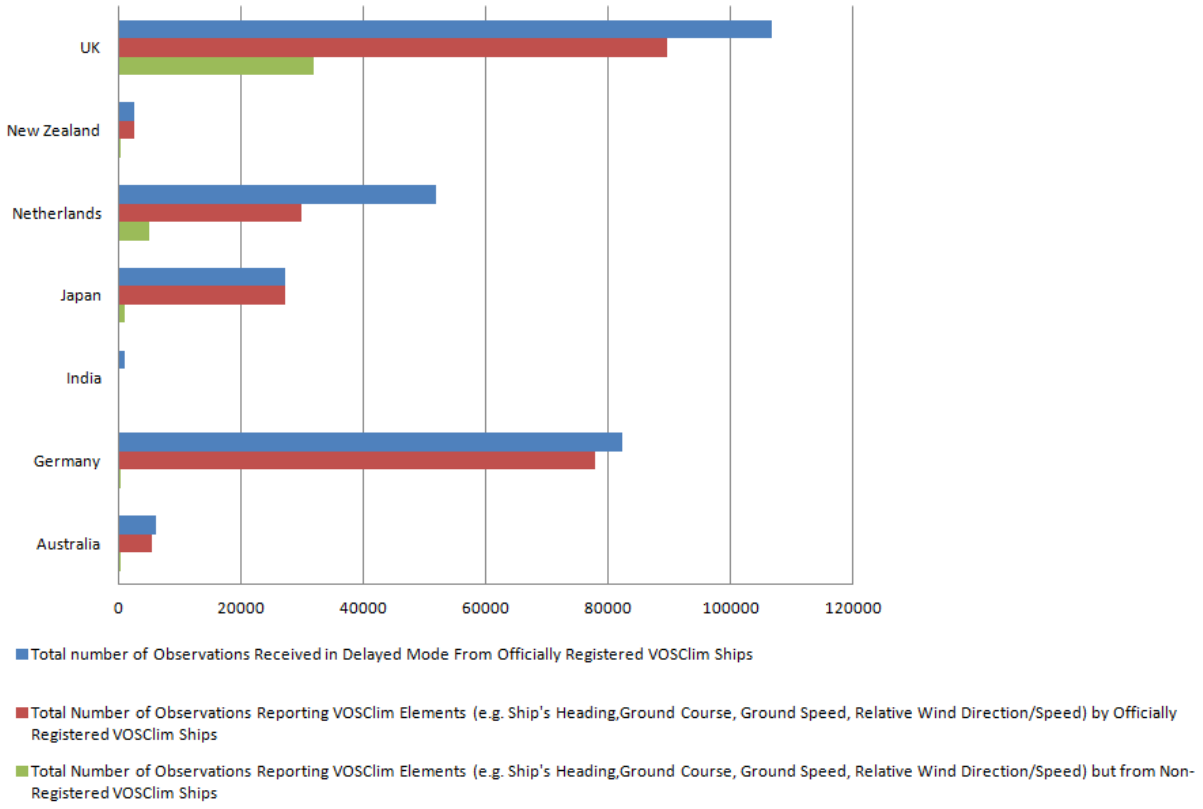
Year Month	VosAut	VosMan	VosTotal	VosClim	% VOSClim/VOSTotal	VOSTot (all ships)
201201	68529	71605	140134	34413	**24.6**	142174
201202	70591	67663	138254	32268	**23.3**	140352
201203	80187	69910	150097	33414	**22.3**	153669
201204	78965	74693	153658	32829	**21.4**	156520
201205	88917	70037	158954	32949	**20.7**	161941
201206	92151	70770	162921	35311	**21.7**	165282
201207	109987	73461	183448	39674	**21.6**	185600
201208	106309	73183	179492	41099	**22.9**	181775
201209	103845	69675	173520	37934	**21.9**	176340
201210	105539	72852	178391	37694	**21.1**	179841
201211	101141	70635	171776	36788	**21.4**	174031
201212	97802	65008	162810	35821	**22.0**	165983

Time of receipt for VOSClim Observations – February 2013



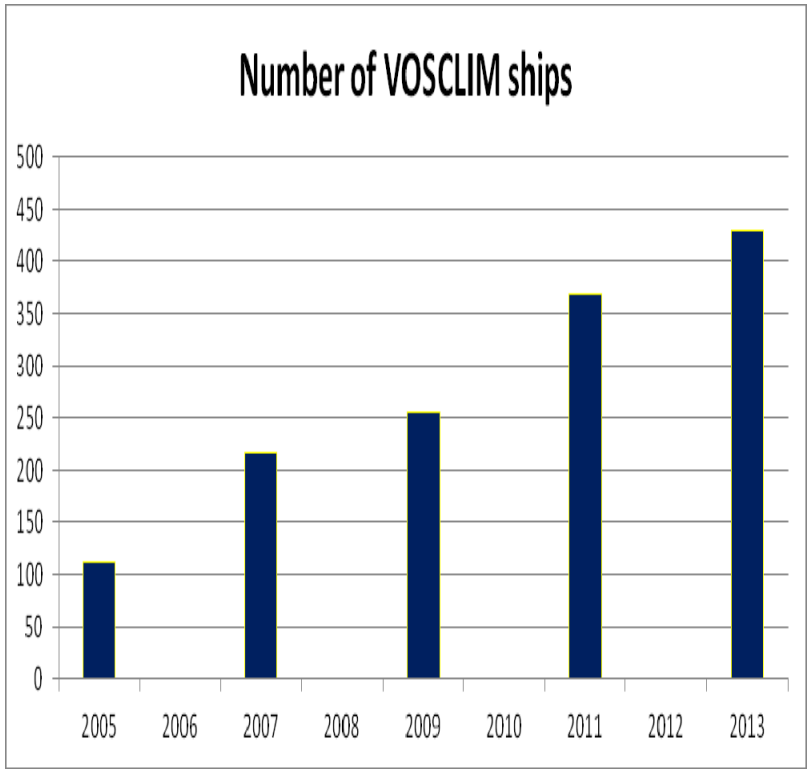
COUNTRY	Ships	Observations	Average (Obs/Ships)	N<30 mins	N<60 mins	N<120 mins	N>360 mins	%<30 mins	%<60 mins	%<120 mins	%>360 mins	Average (R-O) (mins)
GB	156	6733	43.2	5067	6050	6387	207	75%	90%	95%	3%	72.6
NL	48	1544	32.2	1138	1358	1483	34	74%	88%	96%	2%	36.5
AU	6	124	20.7	88	106	111	9	71%	85%	90%	7%	63.4
CA	40	21349	533.7	21003	21218	21278	12	98%	99%	100%	0%	12.3
DE	44	2592	58.9	1864	2088	2342	12	72%	81%	90%	0%	35.9
FR	1	55	55	21	50	54	0	38%	91%	98%	0%	33.9
IN	3	25	8.3	10	20	24	0	40%	80%	96%	0%	42.8
JP	2	961	480.5	958	959	959	1	100%	100%	100%	0%	28.8
NZ	3	117	39	54	101	117	0	46%	86%	100%	0%	38.1
US	12	1231	102.6	918	990	1013	191	75%	80%	82%	16%	187.8
Total	315	34731	110.3	31121	32940	33768	466	90%	95%	97%	1%	33.8

VOSClim Observations collected by GCCs in Delayed Mode 2010-2012



GROWTH OF THE VOS CLIMATE FLEET

Country	Number of VOSClim ships at SOT III	Number of VOSClim ships at SOT IV	Number of VOSClim ships at SOT V	Number of VOSClim ships at SOT VI	Number of VOSClim ships at SOT VII [March 2013]
Australia	10	12	10	9	7
Canada	14	40	47	55	50
France	6	23	25	45	51
Germany	11	22	32	53	63
India	21	22	22	22	*22*
Japan	5	5	5	5	2
Netherlands	1	19	37	48	64
New Zealand	0	1	1	1	3
UK	33	62	59	113	167
USA	[12]	[12]	[17]	[17]	1
TOTALS	113	218	255	368	430



NOTE – figures in square brackets are US ships that were originally reported as VOSClim recruits but were unable to record the required delayed mode IMMT VOSClim elements.

APPENDIX C

STATUS OF GLOBAL VOS AUTOMATION AS AT DECEMBER 2012

Table 1 – Status of VOS Automatic Weather Stations

Country	Type of AWS	Method of Comms	Manual Entry Facility	Number of Ships with AWS									
				31/12/2002	31/12/2004	31/12/2005	31/12/2006	31/12/2007	31/12/2008	31/12/2009	31/12/2010	31/12/2011	31/12/2012
Australia	Vaisala Milos 500 AWS	Inmarsat C (Data Mode)	Yes	9	11	10	8	9	9	8	8	8	6
	TECHSAS/ Other	Inmarsat Fleet Broadband	No								1	1	1
Brazil	VAISALA Maritime Observation System MAWS410	(not known)	No								4	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****
China	*DJQ-1*	BDS	No								33	(2)	2
	XZC2-2SA	Inmarsat C CDMA、BDS	No								12	(12)	12
	XZC2-2SC	Inmarsat C CDMA、BDS	No									(36)	36
	XZC6-1	Inmarsat C CDMA、BDS	No								35	(17)	17
Croatia	BAROS	Iridium SBD	No									1*****	
Denmark	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	2	See EUMETNET					
EUMETNET	BATOS	Inmarsat C (Data Mode)	Yes					5	5	6	8	10	10
	BAROS	Iridium SBD	No					0	4	9	13	15	16
France	BATOS	Inmarsat C (Data Mode)	Yes	19	30	39	45	48	54	56	58	56	58

	Mini BATOS	Inmarsat C (Data Mode)	No		1	2	3	3	1	-	-		
	MINOS	Argos	No		6	7	8	8	7	8	7	6	5
	BAROS	Iridium	No					1	-	-	-		
Germany	Vaisala Milos 500 AWS	Meteosat DCP	No	23	21	21	17	18	17	16	17	17	17
	Ships' own data logger	Inmarsat/ Iridium	Yes							2	2	2	2
Indonesia	TECHSENSE MET	Inmarsat	No								(6)	6	
	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		-
Italy	BAROS ++	Iridium	No										3*****
	BAROS	Iridium	No										3*****
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
	Weather Observation System (Nippon)	Inmarsat C	Some				4	5	5	6	6	6	5
	SOAR - Shipboard Oceanographic & Atmospheric Radiation (Brookhaven National Laboratory)	Inmarsat C	Yes				1	1	1	1	1	1	1
	Ogasawara Keiki	Inmarsat	No				3	1	1	-	-		
	Seisakusho Co (Japan)	Inmarsat F	No				-	1	1	-	-		
	JRCS MFG. Co. Ltd (Japan)												
New Zealand	Sutron 9000RTU	MTSAT	Yes	1	1	1	1	1	1	1	1	1	1
	mSTAR-SHIP	GPRS Cell	No					1	1	1	1	1	1
Norway	AWS	VSAT	some	-	-	17	17	18	16	15	(15)	(15)	(5)

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
Spain	Vaisala MAWS 410	Inmarsat C	Yes	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
	MINOS –GP	Argos	No	-	-	1	2	6	5	5	5	3	2
	MINOS-GPW	Argos	No	-	-	1	2	1	1	1	1	1	1
	BATOS	Inmarsat C (Data Mode)	Yes	-	-	-	1	3	3	2	5**	4**	4**
	AVOS	Inmarsat	Yes					1	1***	0	0	0	0
	Metpod	Iridium	No						1	1	0	0	0
	Metocean Deck Buoy	Iridium	No						2	2	2	1	0
	AMOS - Automated Marine Observing System (met Office)	Iridium	No						-	-	-	21	33
United States	SEAS-AutoImet NOAA SCS (Science Computing System) Type 1	VSAT Email	Yes	-	3	(3)	0	3	16*	2	9	12	12
	NOAA SCS Type 2	VSAT Email	No	-	-	-	-	-	-	23	8	3	3
	Non NOAA (developed by Alaska Region)	Email	No									7	7
	Other ship owned AWS systems	Email	Yes								12	5	6
TOTAL				**81**	**140**	**171**	**204**	**227**	**250**	**229**	**334**	**337**	**336**

Notes -

Numbers in brackets not confirmed

Sweden advised 1 AWS system in 2012 but details not yet confirmed

*2008 number corrected in 2009 - different from 2008 report

** (includes 3 systems installed by Met Office on behalf of E-SURFMAR)

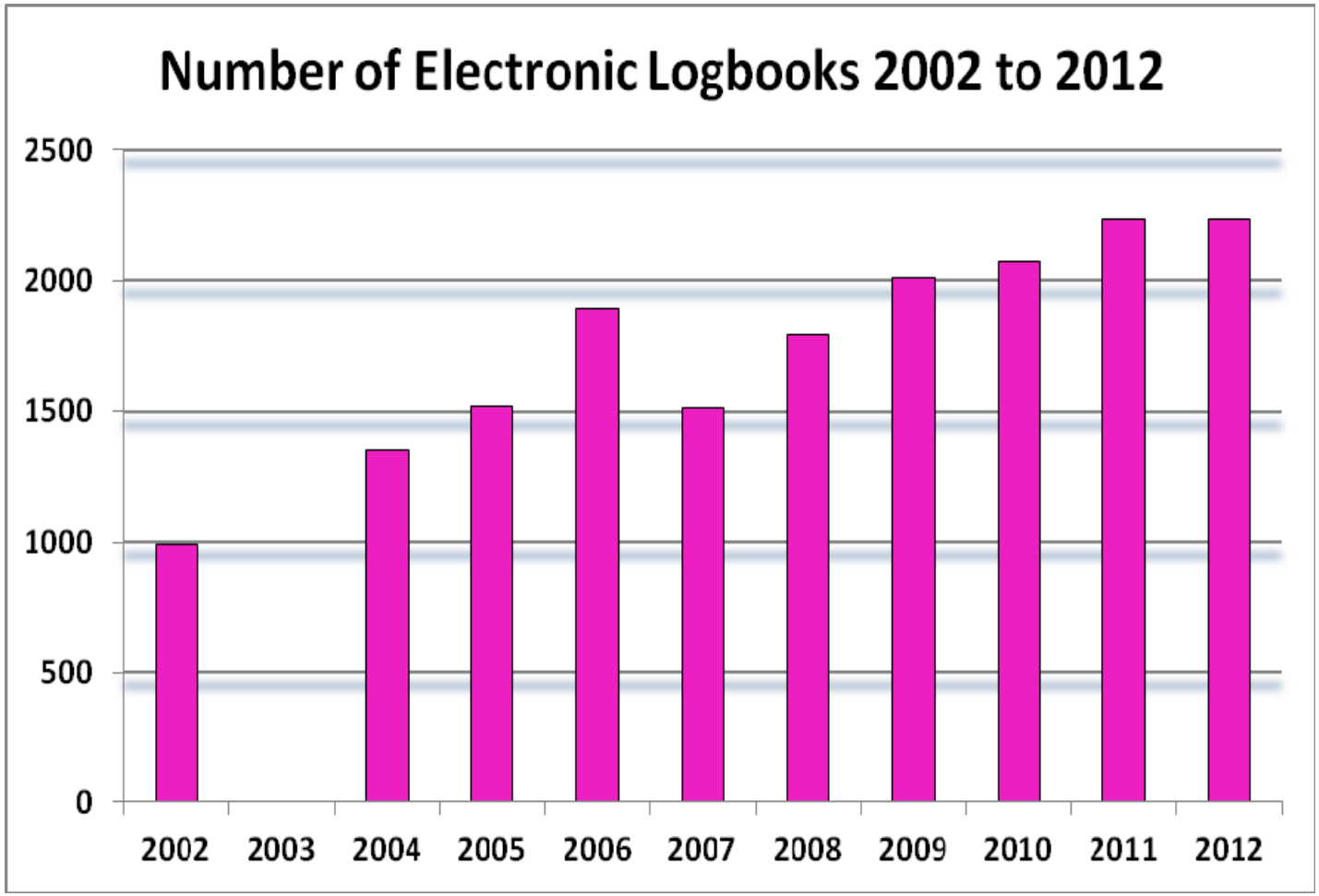
*** System Transferred to Environment Canada

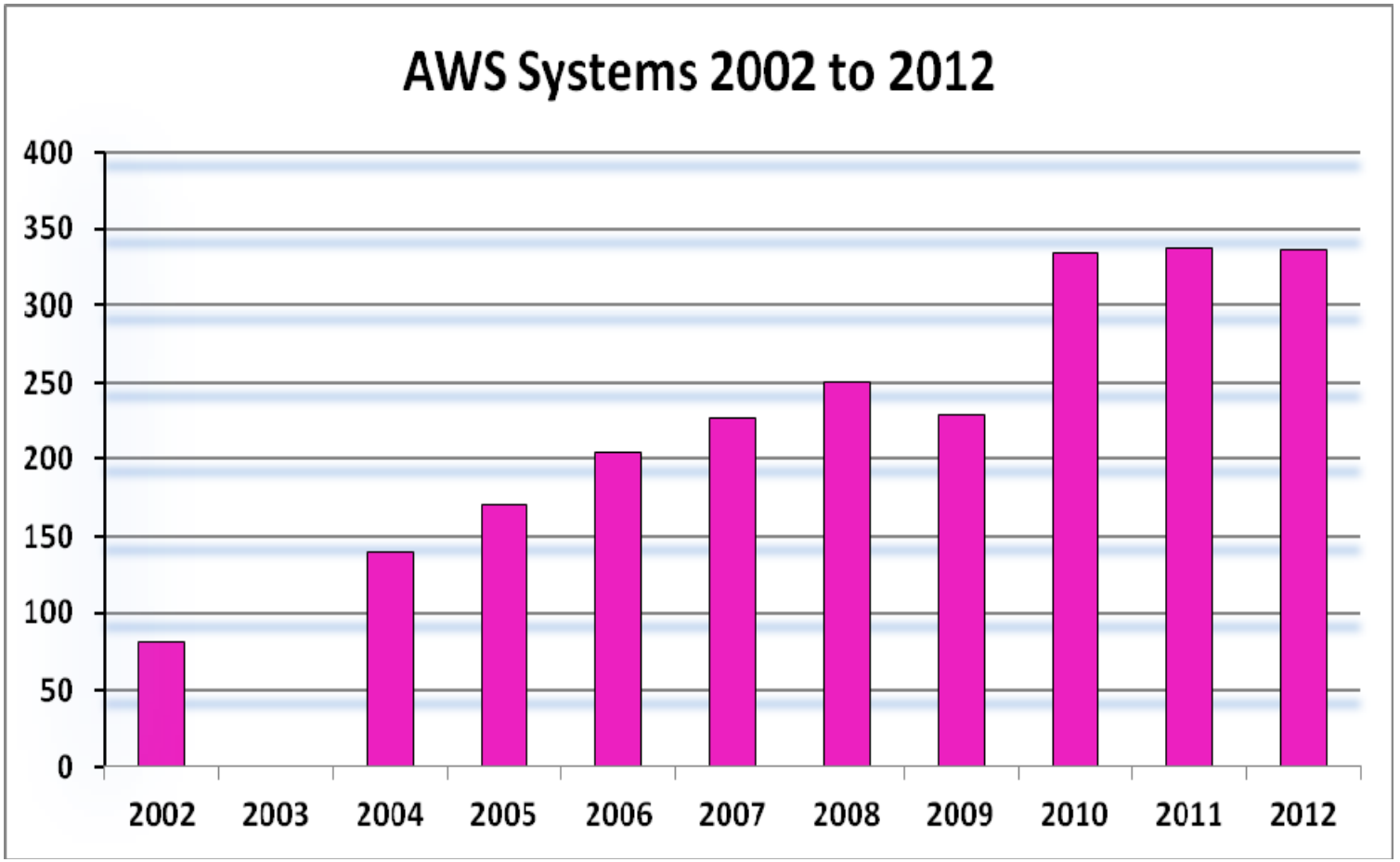
**** 2 systems on training establishments

***** (E-SURFMAR systems)

Table 2 – Status of VOS using Electronic Logbook Software (excludes AWS software for manual data entry)

Country	Electronic Logbook type	Number of Ships at 31/12/2002	Number of Ships at 31/12/2004	Number of Ships at 31/12/2005	Number of Ships at 31/12/2006	Number of Ships at 31/12/2007	Number of Ships at 31/12/2008	Number of Ships at 31/12/2009	Number of Ships at 31/12/2010	Number of Ships at 31/12/2011	Number of Ships at 31/12/2012
Australia	TurboWin	33	41	50	51	64	61	58	57	72	64
Canada	TurboWin								2	2	1
Chile	TurboWin										10
Croatia	TurboWin	3	4	3	7	(7)	(7)	(7)	(7)	-	-
Denmark	TurboWin	-	-	-	32	0	Finished	-	-	-	-
France	TurboWin	-	7	6	7	10	4	4	2	3	2
Germany	TurboWin	315	412	556	600	709	730	780	800	825	695
Greece	TurboWin	2	0	0	0	1	3	1	4	3	2
Hong Kong	TurboWin	-	-	1	2	2	2	2	3	22	34
India	TurboWin	-	21	28	33	(33)	(33)	(33)	(33)	-	40
Ireland	TurboWin	-	-	-	-	-	-	-	2	2	2
Japan	OBSJMA	-	49	61	70	74	95	102	100	141	129
Netherlands	TurboWin	200	259	198	195	193	195	185	172	112	57
	TurboWeb										6
New Zealand	TurboWin	0	12	15	22	20	19	22	24	25	26
Poland	TurboWin								61	-	-
Singapore	TurboWin	-	-	2	3	1	1	1	(1)	-	7
South Africa	TurboWin	5	5	8	-8	8	14	14	19	15	17
Sweden	TurboWin	-	-	-	-	-	1	1	3	20	-
United Kingdom	TurboWin	82	104	147	241	261	286	272	276	268	263
	TurboWeb	0	0	0	0	0	0	0	0	0	1
United States	SEAS	353	439	447	622	129	344	524	507	722	849
	TurboWin							3	-	5	30
TOTAL		**993**	**1353**	**1522**	**1893**	**1512**	**1795**	**2009**	**2073**	**2237**	**2235**


Number of Electronic Logbooks 2002 to 2012
2500
2000
1500
1000
500
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


AWS Systems 2002 to 2012
400
350
300
250
200
150
100
50
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

APPENDIX D

DBCP/SOT DRIFTER DONATION PROGRAMME IN SUPPORT OF THE VOS SCHEME FOR DEVELOPING COUNTRIES (VOS-DP)

The Fourth International Port Meteorological Officer Conference (PMO-IV), and support to Global Ocean Observations using Ship Logistics (8-10 December 2010, Orlando, Florida, USA) recommended to initiate a DBCP/SOT drifter donation programme (VOS-DP) to assist developing countries in setting up embryo national VOS Scheme[3] 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 (see Annex I).

WMO Members or IOC Member States interested in joining the VOS Scheme are eligible to receive a drifter donated by the Global Drifter Programme (GDP) under the following conditions:

- The country is a developing country and has currently no VOS programme;
- The country must identify one or two suitable vessels as prime candidates for installing a “deck drifter” on-board;
- The country shall designate a National Contact Point (NCP) to JCOMMOPS (support@jcommops.org) responsible for managing and operating the embryo national VOS programme;
- The NCP shall request JCOMMOPS to propose a Port Meteorological Officer (PMO) who can assist with regards to the collection of ship metadata, and setting up the VOS programme;
- The ship metadata for WMO Publication No. 47[4] should be initially collected and provided to the designated PMO. In particular, the route(s) (see Annex III) of each ship, and the reason for selecting each ship shall be indicated;
- The designated PMO shall notify the Chair of the VOS-DP Programme Evaluation Committee (PEC) (see Annex IV for Terms of Reference and membership) when the country is ready to receive the drifter.
- Following decision by the Chair of the PEC, the donor, a participant in the Global Drifter Programme (GDP), will provide the drifter free of charge to the country, and pay for shipping and the associated satellite data telecommunication costs.
- All other related costs shall be supported by the country receiving the drifter.
- All custom issues shall be cleared by the country receiving the drifter. If required (e.g. for custom clearance), JCOMMOPS will issue a letter to formalize the donation

Annex II provides for a template of milestones required to track progress when a developing country is participating in the VOS-DP.

Annex V provides a simple guide for VOS start-up countries participating in the VOS-DP.

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3 : http://www.bom.gov.au/jcomm/vos/
4 : http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm

ANNEX I OF APPENDIX D

COUNTRIES WHICH EXPRESSED INTEREST IN PARTICIPATING IN THE DBCP/SOT DRIFTER DONATION PROGRAMMME AT PMO-IV:

- Kenya
- Chile
- Bahamas
- Gambia
- Peru
- Guatemala
- Indonesia

POTENTIAL DRIFTER DONORS:

- Meteorological Services, Canada
- NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML), USA

CANDIDATES AND PMOS WILLING TO ASSIST:

Developing country receiving drifter	***Candidate National Contact Points (NCP)***	***Buddy PMO***
Bahamas	Godfrey BURNSIDE - Godfrey.burnside@gmail.com	Ms Paula RYCHTAR - Paula.Rychtar@noaa.gov Mr Robert NIEMEYER - pmojax@noaa.gov
Indonesia	Ms Nelly FLORIDA RIAMA - nelly_frm@yahoo.com	Mr. John WASSERMAN - john.wasserman@noaa.gov
Guatemala	Julio Amilcar MUNOZ - jrico39@hotmail.com	Mr Tim KENEFICK - pmochs@noaa.gov
Chile	LCdr Alejandro DE LA MAZA - adelamazad@dgtm.cl	Mr Tim KENEFICK - pmochs@noaa.gov
Gambia	George STAFFORD - staffordmaria@yahoo.co.uk	Mr David DELLINGER - pmomia@noaa.gov Mr Brian HOLMES - pmolax@noaa.gov
Kenya	Mr David MWARUMA - davidmwaruma@gmail.com	Mr David DELLINGER - pmomia@noaa.gov Mr Brian HOLMES - pmolax@noaa.gov
Peru	Ms Amanda Yolanda LAPA POCOMUCHA - alapa@senamhi.gob.pe	Mr Chris FAKES - pmohou@noaa.gov

ANNEX II OF APPENDIX D

TEMPLATE OF MILESTONES REQUIRED TO TRACK PROGRESS

No.	***Step***	***By***	***Status***
1	National Contact Point (NCP) notified to JCOMMOPS	NCP	
2	Requirements provided to NCP	JCOMMOPS	
3	Candidate ship(s) identified	NCP	
4	NCP provides information to JCOMMOPS and requests assistance from a PMO	NCP	
5	Buddy PMO proposed by the VOS-DP Programme Evaluation Committee (PEC)	PEC	
6	Ship metadata provided to the assisting PMO for each ship, including route, and rationale for recruitment	NCP	
7	Buddy PMO checks metadata and coordinates necessary corrections with the national contact point	Buddy PMO	
8	Buddy PMO notifies the committee about readiness of the candidate country	Buddy PMO	
9	Evaluation by the committee	PEC	
10	Decision by the committee	PEC	
11	Drifter purchased and shipped by donor to the country	Donor	
12	Customs cleared by receiving country	NCP	
13	Drifter received and checked by NCP	NCP	
14	Discussions with recruited vessel for preparing drifter installation	NCP	
15	Drifter installation onboard the ship	NCP	
16	Drifter turned on, and data checked	NCP	
17	NCP requests service Argos to distribute the data on GTS in FM-13 SHIP format[1]	NCP & Donor	
18	Data monitored by JCOMMOPS	JCOMMOPS	
	NCP checks for receipt of buoy data at his local forecast centre[2]	NCP	
19	GTS distribution stopped in case of systematic errors; or bias correction in case this can be done	NCP & Donor	
20	NCP to provide feedback to the ship on the usefulness of the buoy data[3]	NCP	
21	Recovery of the drifter in case of failure or batteries dead	NCP	
22	Drifter shipped back to the donor for evaluation/refurbishment	NCP	

Note: JCOMMOPS should be regularly informed on progress of each milestone so that it can effectively assist and promote the initiative.

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[1]: Including provision of calibration curves, ship's call sign, GTS bulletin headers, and height of the drifter on the deck of the ship; as of 2013, FM-94 BUFR format shall be used instead

[2]: This is to ensure that the country receiving the drifter is able to receive and use the data for local applications

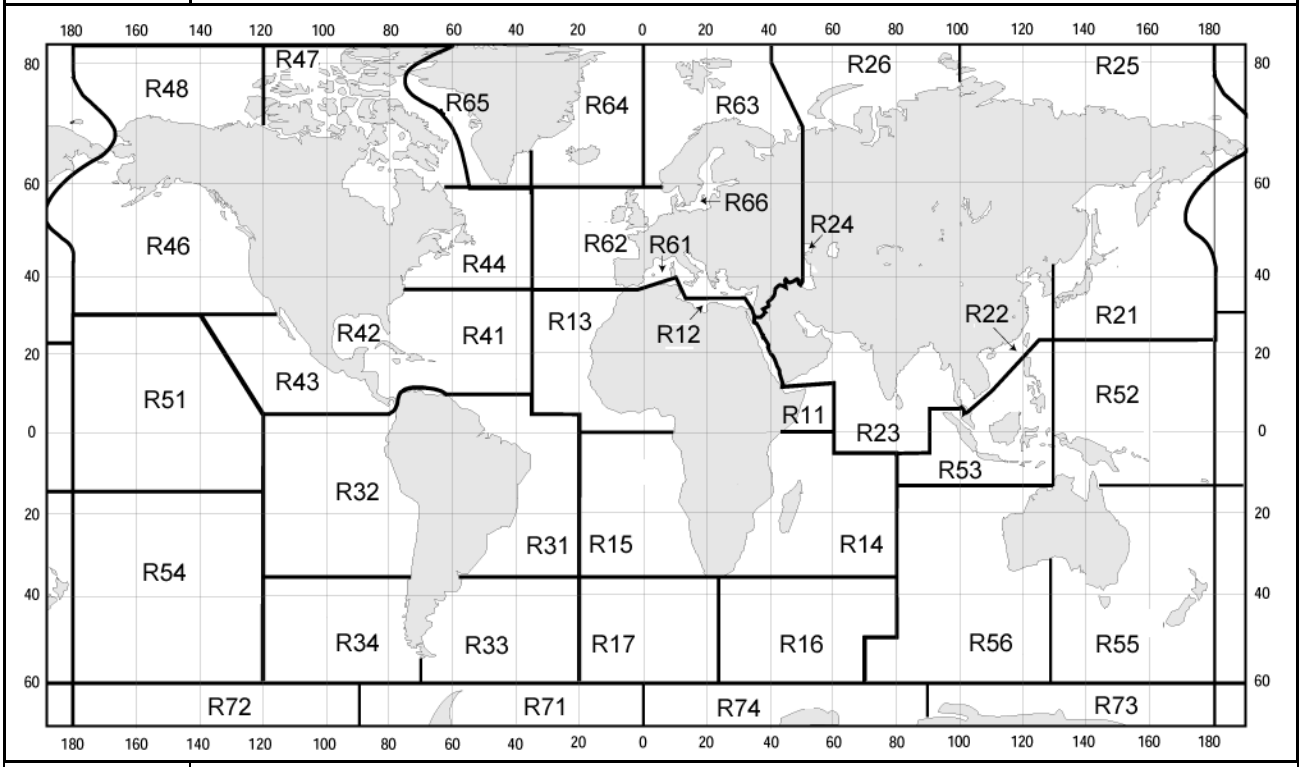
[3]: This to build cooperation and trust with the ship

ANNEX III OF APPENDIX D

VOS ROUTES[4]

1802

Rte Route

Code	Description/marine area
	
R90	More than 10 separate marine areas (see Note 2).
R91	Inland sea or river (see Note 3).
R92	Variable or no fixed route (see Note 2).

Note 1 A maximum of 10 marine areas visited by the ship can be reported individually, otherwise use R90.

Note 2 For R90 or R92, specify the most visited marine area(s) by the ship in the footnote if this can be determined, e.g. “most visited - R62, R41”.

Note 3 For R91, specify the location in the footnote, e.g. “Black Sea”, “Mackenzie River”.

Note 4 Use footnotes as necessary to provide more detail, e.g. “coastal service”, “fixed location”.

Note 5 If using the semi-colon delimited metadata exchange format, include the relevant marine area in the footnote if more than one **rte** is defined, e.g. “R73 – Austral Summer only”, otherwise format the footnote as shown in the examples for Notes 2 – 4.

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[4] : From WMO Publication No. 47

ANNEX IV OF APPENDIX D

TERMS OF REFERENCE AND MEMBERSHIP OF THE VOS-DP[5] PROGRAMME EVALUATION COMMITTEE (PEC)

The VOS-DP Programme Evaluation Committee (PEC) shall:

1. Collect all applications from developing countries willing to participate in the VOS-DP;
2. Evaluate the applications;
3. Communicate with the applicants and provide information about requirements as necessary;
4. Propose a Buddy Port Meteorological Officer (PMO) for assisting the applicant with regard to the collection of ship metadata, and setting up the VOS programme;
5. Decide whether applicants are eligible to receive one or more drifter(s);
6. Prepare and maintain a simple guide for VOS start-up countries which will cover the following:
   - Ship selection
   - Obtaining shipping company permission
   - Recording metadata
   - Buoy installation
   - Height offsets for barometer processing
   - GTS data distribution and QC monitoring.

In addition,

1. Applicants shall communicate with the PEC through JCOMMOPS;
2. JCOMMOPS shall record all relevant information collected from the applicants and make it available to the PEC through dedicated web pages; dedicated tracking tools shall also be developed;
3. The designated Buddy PMO shall notify the Chair of the PEC when the country is ready to receive the drifter.

Membership:

Name	***Country/Agency***	***Email***
Sarah North (Chair, PEC)	United Kingdom/Metoffice	sarah.north@metoffice.gov.uk
Graeme Ball	Australia/BOM	G.Ball@bom.gov.au
Martin Kramp	JCOMMOPS	kramp@jcommops.org
Etienne Charpentier	WMO	echarpentier@wmo.int
Shaun Dolk	USA/NOAA	Shaun.Dolk@noaa.gov
Rick Lumpkin	USA/NOAA	Rick.Lumpkin@noaa.gov
Chris Marshall	Canada/MSC	Chris.Marshall@ec.gc.ca
Paula Rychtar	USA/NOAA	Paula.Rychtar@noaa.gov
John Wasserman	USA/NOAA	john.wasserman@noaa.gov

[5] : DBCP/SOT drifter donation programme in support of the VOS Scheme for developing countries

ANNEX V OF APPENDIX D

GUIDE FOR VOS START-UP COUNTRIES PARTICIPATING IN THE VOS-DP[1]

1. **Ship Selection**
   a. Liaise with NMS Forecasting Centre to determine the preferred sea area for observations
   b. Use JCOMMOPS VOS maps ftp://ftp.jcommops.org/sot/VOS/Maps to identify data sparse areas where observations are needed
   c. Use local port and shipping information to find ships which trade in the area of interest
   d. Prioritise suitable ships by considering length of time at sea (long sea time with short port stays is preferable to maximise useful observations), ease of visiting at a local port, the language spoken by ship's personnel, and any information about the shipping company.
   e. Select one or two ships to follow up

2. **Obtaining Shipping Company Permission**
   a. Contact shipping company or shipping agent to explain the VOS-DP programme
   b. Use the VOS advertising tools such as, the SOT powerpoint presentation, the VOS brochure, the Maritime Safety Committee MSC Circ 1293, all available from from the VOS website http://www.bom.gov.au/jcomm/vos/information.html
   c. Explain that the only requirement from the ship is some space on a deck with a clear view of the sky, on which to install a buoy approximately 60 cm in diameter.
      i. The buoy is a self-contained system, with its own power and satellite transmitter
   d. Explain that the atmospheric pressure data from the buoy will assist local forecasters in the preparation of marine forecasts and warnings
   e. Request permission to install a buoy on their ship
   f. Request permission to visit the ship to discuss the installation with the Master and crew and to select a suitable installation site

3. **Recording Metadata**
   a. Visit the ship, taking care to comply with the security and safety regulations for the port and the ship
   b. Meet with the Master to discuss the installation and to select a suitable site
   c. With assistance from the Ship's Officers, and reference to the General Arrangement Plan and the list of 'Ships Particulars', record the ship's metadata in accordance with WMO Pub 47 requirements. For metadata instructions, refer to: http://www.bom.gov.au/jcomm/vos/documents/pub47_documentation_version3.pdf
   d. Send the metadata to designated Buddy PMO for checking
   e. Send the checked metadata to WMO pub47@wmo.int after the buoy has been installed
      i. Future metadata to be updated at least quarterly intervals following Pub 47 requirements

4. **Buoy Installation**
   a. Record the Buoy Identification number – this is currently a 5 digit number usually painted on the antenna or hull
   b. To keep the buoy batteries cool, the buoy should be painted white. Take care not to block the barometer breathing holes at the base of the antenna with paint
   c. The buoy should be installed in an upright manner, it could be lashed to a railing, or secured in a wooden box arrangement to prevent it rolling about.

[1]: DBCP/SOT drifter donation programme in support of the VOS Scheme for developing countries

d. Activate the buoy following the manufacturer's instructions, this is generally done by removing a magnet from the hull
e. When installed, determine height of the buoy/barometer above the sea level. Measure this height from ship plans, or drop a string to the water to measure the distance. This method is suitable for a small ship where the draft does not change much. For larger ships apply an average draft to compute an average height above sea level. The buoy barometer height is metadata element brmH, recorded to 0.1 metres

5. Height offsets for Barometer Processing

a. Advise Buddy PMO and Buoy Donor that buoy has been activated
b. Advise Buoy number, Ship name, Ship callsign, Ship position, and buoy height above sea level to Buddy PMO and Buoy Donor
c. Request Buoy Donor to put buoy on GTS in FM-13 SHIP format, with barometer height offset applied in the Technical File
d. Request Buoy Donor to advise the name of the GTS Bulletin that the buoy data will be disseminated in.

6. GTS data distribution and QC monitoring

a. Advise local NMS to ensure arrangements are made to receive the GTS bulletin containing the buoy data.
b. Use monitoring tools to check the pressure data from the buoy. Tools found at http://www.meteo.shom.fr/qctools/

In conjunction with the above information, refer to the VOS website
http://metservice.com/national/index
and the Quick Reference Guide for PMOs
http://www.bom.gov.au/jcomm/vos/quick_reference_pmo.html

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