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|  | **VOS Report for 2017** | **Country =** | **UK** |
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|  | **a.** | **Programme description:** |
| **Category** | **No. of ships at** **31 Dec 2017** | **Recruitments in 2017** | **De-recruitments****In 2017** | **Comments** |
| *Selected* | 18 | 0 | 2 | * The UK Selected fleet was further reduced in 2017 with new VOS being solely recruited to the VOSClim fleet
* Inactive and underperforming UK selected ships are gradually being withdrawn from the fleet
* UK selected ships operate in all regions
 |
| *Selected AWS* | 0 | 0 | 0 |  |
| *VOSClim* | 222 | 19 | 25 | * The UK VOSClim fleet has grown in 2017 with all new manual recruits added to this VOS class.
* Recruits also includes those ships that were upgraded from Selected class during the year
* UK VOSClim ships operate in all ocean regions
 |
| *VOSClim AWS* | 0 | 0 | 0 |  |
| *Supplementary* | 0 | 0 | 0 |  |
| *Supplementary AWS* | 60 | 1 | 0 | * AMOS systems are primarily aimed at ships operating in UK or near continental waters
* 3 further systems operate on land in the Falkland islands
* Minor expansion of the network planned for 2018, including the recruitment of the NERC RRS Sir David Attenborough and a further 3 sites for the Falkland Island land network
* The first phase of network upgrades to the 2nd generation model AMOS-2 will begin from Q3 2018
 |
| *Auxiliary* | 0 | 0 | 0 |  |
| *Auxiliary AWS* | 0 | 0 | 0 |  |
| *Other* | 0 | 0 | 2 | * Third Party support ships added to ZZ fleet
* The 3 remaining manually reporting mobile rigs supplied with Met Office equipment are now included within our Selected fleet [third party systems on rigs and platforms are not included in these figures]
 |
| **National VOS Total** | 300 |   |  |  |
|  |  |  |  |  |  |
|  | **National VOS Target** | 275 active |  |  |  |  |
|  | **National VOSClim Target**  | 200 active |  |  |  |  |
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|  | **b.** | **Data management:** |
|  | *Total number of ship observations (BBXX) distributed on the GTS in 2017* | 87,276 real time observations from manually reporting UK VOS and VOSClim ships (80,166 obs within threshold for forecast model run HH+120minutes)420,210 AWS real time observations from shipborne AWS installed on UK VOS (406,501 obs within HH+20minutes)(Note – this excludes moored buoy and light vessel ship coded observations and observations from third party offshore rigs and platforms) |
|  | *Dates when VOS data submitted to the GCCs in 2017* | Although delayed mode IMMT data from UK VOS are submitted to the UK GCC as soon as they are received, official submission dates for UK data are as follows: 28th June 2017 (22,685); 29th November 2017 (22,667) |

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|  | c. | **Shipboard Automatic Weather System** |
| **Type** | **No. of ships at 31 Dec 2017** | **Manual Input****Yes / No** | **Method of Comms** | **Year1 Plans** |
| Autonomous Marine Observing System (AMOS) | 60 | No | Iridium (SBD) | One ship installation planned3 systems to be installed on land sites in the FalklandsThe upgrade of the network to the second generation AMOS2 model is scheduled to begin in Q3 of 2018. Due for completion by 2021 |
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|  | **d.** | **Electronic logbooks: (TurboWin, SEAS, OBSJMA)** |
| **Software & version** | **No. of ships at**  **31 Dec 2017** | Implementation plans |
| TW 3.6  | 1 | Ships and mobile rigs that have been difficult to contact/upgrade to newer versions |
| TW 4.0 | 14 | Will gradually be replaced by Version 5.5/5.6 (or Turboweb on suitable ships) during 2018 |
| TW 4.1 | 3 | Will gradually be replaced by Version 5.5/5.6 (or Turboweb on suitable ships) during 2018 |
| TW 4.5 | 11 | Will gradually be replaced by Version 5.5/5.6 (or Turboweb on suitable ships) during 2018 |
| TW 5.0 | 27 | Will gradually be replaced by Version 5.5/5.6 (or Turboweb on suitable ships) during 2018 |
| TW 5.1 | 147 | Will gradually be replaced by Version 5.5/5.6 (or Turboweb on suitable ships) during 2018 |
| TW 5.5 | 9 | Will gradually increase rollout throughout 2018 |
| TW 5.6 | 5 | Will gradually increase rollout throughout 2018 |
| TURBOWEB (non 101) | 6 | Provided with TurboWin software as a back-up for when internet connections are not available |
|  | TURBOWEB (101 format) | 15 | Will install on ships with suitable internet connections |

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| **e.** | **Standard Meteorological Equipment: (Types and Settings)** |
| **Equipment Type / Element** | **Manual Instrumentation** | **AWS Instrumentation** |
| Barometer | MK2 Precision Aneroid Barometer (N&Z) | Vaisala PTB330 Digital Barometer (single cell) |
| Vaisala PTB330 Digital Barometer (single cell) | Druck digital barometer |
| Vaisala PTB220 Barometer (triple cell) | Vaisala PTB110 barometer (preferred) |
| *Default national setting* | *Station Level*  | *Station Level*  |
| Barograph | N&Z MK2 Barograph (open scale/7 day) | N/A (tendency derived from hourly barometer output) |
| Fischer MK3 Marine Barograph |  |
| Vaisala PTB330 Digital Barometer |  |
| *Default national setting* | *Mean Sea Level* | *Station Level (as read pressure transmitted)* |
| Thermometers | Phase out and recovery of all 2/C Mercury Thermometers (BS 692 Spec -30C to +45C).These are being replaced by Zeal Ordinary 2/C Liquid in Glass (BS 692 -30C to +40C) thermometers fitted in both port and starboard marine screens | Rotronic Hygroclip 2 temp/humidity sensor Vaisala HMP110 humidity sensor (as of Nov.2016 this will replace the Rotronic Hygroclip across the network) |
|  | Rotronic hand held Hygropalm HP220-A temp/humidity sensor (18 ships only) |  |
| Sea Surface Temperature | Engine room hull sea water intake temperatures now used for most UK VOS | Sensing Devices Limited (IEC:EN:60751:2008 Class ‘B’ housed in potting compound with copper conductors) |
|  | MK2 Mercury Sea Thermometer (-5C to +35C) with MK3 sea bucket (only supplied to low freeboard ships) being phased out and replaced due to reliance on sea water intake. |  |
| Wind Speed | Anemometer not provided to UK VOS fleet (wind speed estimated from sea state) | Gil windsonic (if wind system used)  |
|  |  |  |
| Wind Direction | Anemometers not provided to UK VOS fleet (wind direction inferred from sea state) | Gill windsonic (if wind system used) |
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| **f.**  | **PMO ship visit activities: (if a visit is for dual purposes, include all purposes)** |
| **Activity** | **Manual Ship**  | **AWS****Ship** | **Comment** |
| Routine VOS inspections | 129 | 38 | 102 in person, 27 via muster |
| VOS recruitment visits | 6 | 1 | A further 13 ships were recruited remotely, the majority to the BP fleet |
| VOS de-recruitment visits | 11 | 0 | A further 17 ships were de-recuited remotely, all from the BP fleet |
| VOS courtesy or foreign visits | 9 | 0 | 5 inspections from PMO based in Bremen; 2 from New Zealand, 2 from Rotterdam |
| *Total visits to VOS* | 192 |  |
| Routine ASAP inspections | 0 |  | UK involvement in ASAP activities is now integrated into E-ASAP. Inspections are only undertaken if so requested by the E-ASAP Programme Manager |
| ASAP recruitment visits | 0 |  |  |
| ASAP de-recruitment visits | 0 |  |  |
| ASAP courtesy visits | 0 |  |  |
| *Total visits to ASAP* | 0 |  |  |
| Routine SOOP visits | 0 |  |  |
| SOOP recruitment visits | 0 |  |  |
| SOOP de-recruitment visits | 0 |  |  |
| SOOP courtesy visits | 0 |  |  |
| *Total visits to SOOP* | 0 |  |  |
| Visits in support of DBCP (drifting buoys) | 5 |  | Arranged ships for deployment of 7 E-SURFMAR drifters in North Atlantic, and 6 SVP-B Met Office drifters in Atlantic tropical regions and the Southern Ocean  |
| Visits in support of Argo (profiling floats) | 0 |  | ARGO floats are usually shipped direct to research ships for subsequent deployment (PMO visits rarely required).ARGO floats rarely deployed from other VOS ships |
| *Total visits to other programs* | 0 |  |  |
| **Total visits by national PMOs** | 183 | *Sum of all ship visits (VOS + ASAP + SOOP) + visits to other program (DBCP + Argo)* |
| **Total number of PMOs(FTE\*)** | 9 |  |
| (\*FTE-Full Time Employee) |  |  |  |

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| **g.** | **Major challenges and difficulties:** |
| * A lack of PMO resource has continued to have a significant impact on the number of VOS inspections and consequently the availability/quantity of observations in 2017 (currently only one full time UK PMO). A large proportion of the UK fleet remains unassigned to a PMO, meaning that only very limited remote monitoring and contact is made with these vessels. Failure to routinely visit recruited ships also has implications for the ongoing training of observing officers and for establishing links with key ship owners.
* Similarly, whilst we still issue annual Excellent certificates to the top performing ships each year, we are no longer able to continue our tradition of issuing awards to individual observers, due to limited resources and time constraints.
* Whilst the increased use of ships own email to send observations has many benefits, including cost savings, routine monitoring is required to ensure that emailed observations are not stored up on board prior to transmission, thereby preventing them from being received in time for our forecast models. Careful monitoring of our message switching systems is therefore needed to ensure that corrupt or incorrectly formatted observations are not rejected. Some ships are also changing their email settings on TurboWin, which can prevent the observations from automatically passing through our message switching systems. [Note- 172 UK VOS are now using ships own email systems to send their TurboWin observations]
* We are increasingly receiving reports from PMOs about the restricted access to bridge computers for both installing TurboWin software and downloading log files due to increase security with fleet IT. Traditionally, log files would be downloaded to a Met Office issued and password protected IronKey, but the use of these devices is becoming increasingly restricted onboard UK VOS ships.
* A large percentage of the UK VOS fleet is trading on a worldwide basis and as a consequence, is often difficult to ensure routine inspection of these ships without the assistance of overseas PMO’s. Each year there can be up to 100 ships in the UK fleet that we are unable to inspect for this reason. Muster check lists are emailed to these ships to determine the condition of their instruments and to request the download of TurboWin log files. Quality monitoring and performance feedback is also provided by PMO’s on a regular quarterly basis, whenever possible. However, given the limited PMO resource, this task is often challenging to complete and maintain on a regular basis
* At the end of 2017 a total of 50 manually reporting VOS were sending their observations using masked call signs (for a variety of commercial, legal and security reasons). Use of masked call signs complicates database access and data quality monitoring procedures, particularly where the VOS also hosts an AWS.
* Coding/transmission problems arising from the use of Code 41 to send observations via Goonhilly Inmarsat Land Earth Station are monitored on an ongoing basis (for both UK and overseas VOS). The number of such problems has however decreased significantly due, in part, to the increasing use of email to send observations from manned VOS [Details of such problems are promulgated internationally via the JCOMMOPS mailing lists for non UK VOS focal points to take action as necessary].
* Met Office requirements for the security of data held on laptop computers has an impact on our ability to loan such computers to ships. Dedicated laptops computers continue to be gradually withdrawn from use, with very small numbers remaining in the fleet, and we now only recruit ships that are willing to load the TurboWin software onto their own bridge computers, or use the web based versions.
* Whilst we have installed AMOS systems on 5 military ships, for security reasons we are unable to share their data on the GTS. This has necessitated the use of separate bulletin headers to ensure that the data is not available to third parties. Whilst this has worked well, and ensures that we can receive their data in real time for our models, it makes it difficult to monitor the data quality. Furthermore due to security concerns these AMOS systems can sometimes be deactivated when the ships are engaged in sensitive operations, resulting in a loss of data.
* Tracking down non active observing ships and recovering their equipment can be a time consuming task and some equipment has had to be written off when ships have gone to scrap without giving prior notice. Use of AIS movement information has helped with tracking some of these ships. However concentrating on a smaller number of major shipping companies and establishing closer links with these companies has helped with the recovery of equipment
* With the pressures of the Minamata Convention upon us, the recovery of all mercury instrumentation onboard UK VOS continues. We are facing challenges with a number of ships that rarely return to the UK, with the strict governance surrounding the movement and transporting/importing of restricted substances. We endeavour wherever possible to return the instruments to the UK for disposal, but in some instances where this has not been possible, we have made arrangements to dispose locally. These efforts are expected to continue throughout 2018, by the end of which we hope to have provided the Liquid-in-Glass alternative to all active UK manual VOS.
* More than half the AMOS AWS systems fitted to UK VOS are solar powered (36/60). Consequently a large number of systems operating in northern waters are prone to failure in the winter months. The planned rollout to AMOS-2 will focus efforts on the installation of 24v systems using the ships power supply, with those vessels unwilling/unable to switch possibly being withdrawn from the fleet
* Manual transcription of observations from TurboWin to the Sat -C transmitters can often result in coding errors. Sometimes it is necessary to provide external floppy disk drives to allow data to be transferred. However GMDSS Sat-C equipment fitted to some new ships may not accommodate floppy disk drives, while others are now fitted with SD card ports. The increasing use of TurboWeb software will help overcome this problem on suitable ships
* Migration to use of BUFR templates for the UK VOS continued to provide a significant operational challenge during 2017. Although WMO ship coded data is being converted to BUFR format at the Met Office (from TAC), for international data exchange on the GTS we are not yet in a position to circulate the higher resolution BUFR data using the validated VOS BUFR templates yet.
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| **h.** | **Research / development / testing:** |
| * Developments of the new AMOS-2 shipborne AWS systems developed by the Met Office have continued with trials carried out since early 2017. Use of the smaller Vaisala PTB 110 barometers will allow smaller enclosures to be used thereby simplifying the installation process. The software has been written directly by Campbell Scientific, which should reduce the number of bugs and coding errors experienced. The system has been designed to be simpler to install, with the capacity for additional modules to be included for the measurement of other parameters and connection to other sensors e.g. oceanographic (CTD/XBT etc). Consideration is also being given to linking the AMOS data to a visual display on the bridge, via cable or wifi, although this is not a high priority task. It is intended that this system will be installed across all Met Office marine AWS networks (current Ship-AWS and moored buoys/light vessels) thereby providing greatly increased continuity, improved maintenance efficiency and greater resilience across the networks.
* All work on the marine aspect of the new WOW engine for the Met Office Weather Observations Website (WOW) <http://wow.metoffice.gov.uk/> is on hold indefinitely, with all resource being allocated to the terrestrial network development. It was intended that the next release would allow ships at sea to upload observations for display on the WOW website, allowing amateur sailors such as yachtsmen to contribute to the crowd-sourcing of marine observations, but the Met Office is currently unable to continue with any development work for such plans at this time.
* At the request of NERC, we are working closely with the chief scientists and engineers from the RRS Sir David Attenborough, the new government commissioned polar research vessel due for completion in 2018, in order to incorporate an AMOS-2 system into the build of the vessel. The AMOS will be located in a bespoke position on the ‘met arm’ of the ship, with the potential inclusion of oceanographic parameters including CTD data.
* Work on the new Met Office marine data gateway project, which was designed to handle and process the various incoming marine format messages from our buoys, ships, offshore rigs and AWS systems, and to deliver data to the GTS in higher resolution BUFR format, has unfortunately been postponed. There are some major IT business projects currently underway within the Met Office which have put substantial delays on this work and removed the technical resource capability. However, we will be moving our current ‘virtual machine’ which contains the relevant coding/decoding software to the third party data processing company we currently use for our AMOS network. This will increase resilience, provide increased IT support of the software and provide a platform for development work which could potentially be brought back in-house when appropriate. Similarly, work has been undertaken with Campbell Scientific in order to develop coding to compress and decompress data being transmitted by Iridium satellite, the aim being to reduce transmission costs.
* The Met Office continues to assist KNMI and E-SURFMAR with its ongoing efforts to enhance the TurboWin+ and TurboWin V5.5 logbook software. We will continue to roll out V5.5/5.6 and TurboWin+ to suitable UK VOS, the obs from which are currently directed to KNMI/Meteo France in order to handle the E-SURFMAR 101 data format generated by the software.
* Following a comprehensive tendering exercise we are continuing to roll out higher quality Vaisala PTB 330 barometers to our manned VOS, to replace the ageing Precision Aneroid Barometers (PABs) that have been in for more than 60 years. So far 196 Vaisala PTB 330 barometers are in use on our manned VOS. In addition we are continuing to roll out Vaisala PTB110 barometers to all new AMOS AWS systems (31 so far), to replace either the PTB330 or Druck barometers originally installed.
* Each UK PMO now takes responsibility for routinely vetting the performance of a set number of shipping companies and ships. Monitoring and other feedback is emailed to each individual ship on a quarterly basis, and the activity of ships has increased as a consequence. We have also drawn on resource from other teams to carry out monitoring on behalf of the PMO’s. Our focus this year will be on data quality and we have started to send out monthly/quarterly monitoring reports containing a concise analysis of quality & performance to certain fleets. The response to this has been very positive and shipping companies are keen to engage and demonstrate an improvement in performance.
* Visits to the major UK based shipping companies are now arranged on an annual basis. Comprehensive fleet performance reports are issued to each company to encourage increased shipowner/manager participation and involvement.
* All manually reporting UK VOS are requested to return a minimum of 350 observations per year. Ships that fail to achieve this level are likely to be withdrawn from the fleet (or transferred to the new VOS support class).
* The rollout of Zeal Ordinary 2C thermometers has begun to replace all mercury thermometers across the UK VOS. We will periodically be carrying out data comparison tests to sample and analyse the network for any step changes that may have occurred. Whilst all new deployments will have undergone stringent calibration tests before being issued, we will also be routinely returning a random sample of Zeal thermometers to our calibration lab to analyse and compare drift levels with those experienced in mercury thermometers.
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| **i.** | **Other comments** |
| The goals and objectives for the UK voluntary fleet are also considered within the wider context of the EUMETNET Surface Marine Programme (E-SURFMAR) which aims to optimise the surface-marine observations from VOS, moored and drifting buoys. Closer cooperation and integration with other European VOS networks helps to reduce unnecessary duplication of effort, and permit objectives to be delivered in the most cost-efficient manner.* Drifting buoys are routinely deployed from UK observing ships on behalf of the E-SURFMAR Programme, and also for the UK DBCP contribution in the Southern Oceans.
* Research ships recruited to the UK VOS are also used for ARGO Float deployments and also for deep Argo float deployments
* In addition to the ship based systems listed in this report the Met Office also maintains automatic systems on 5 light vessels, one remote island site and 11 moored buoys (two operated jointly with Meteo France, two with the National Oceanography Centre, one with NERC and one with the Plymouth Marine Laboratory).
* In addition to the VOS observation numbers in this report, the Met Office also had access to third party data from a further ~110 offshore platforms on the UK Continental shelf that host automatic weather stations – which amounted to more roughly 700,000 hourly SHIP coded observations on the GTS in 2017. Because these automatic stations are not owned or operated by the Met Office, they have not been counted in the above observation figures. The volume of such data has increased significantly in recent years due to civil aviation authority guidelines for the availability of meteorological data for offshore helicopter operations. The Met Office hopes to increase the number of offshore platforms we receive data from in 2018.
 |