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|  | **VOS Report for 2018** | **Country =** | **United Kingdom** |
|  |
|  | **a.** | **Programme description:** |
| **Category** | **No. of ships at** **31 Dec 2018** | **Recruitments in 2018** | **De-recruitments****In 2018** | **Comments** |
| *Selected* | 15 | 0 | 1 | * The UK Selected fleet was further reduced in 2018 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* Inactive and underperforming UK selected ships are gradually being withdrawn from the fleet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* | 211 | 9 | 19 | * The VOSClim fleet reduced in 2018, largely in part to the loss of a number of ships from one of our main shipping companies – BP, from which we lost 11 VOS due to vessels being sold or redelivered.
* UK VOSClim ships operate in all ocean regions
 |
| *VOSClim AWS* | 0 | 0 | 0 |  |
| *Supplementary* | 0 | 0 | 0 |  |
| *Supplementary AWS* | 60 | 1 | 1 | * All vessels fitted with a Met Office built AMOS system
* No expansion to the network, but one vessel was replaced like-for-like, operating on the same route.
* Network expansion plans for 2019 include recruitment of NERC’s new, flagship research vessel, RRS Sir David Attenborough and a further 3 stations for our Falkland Island Defence sites (although the latter not included as VOS)
* The first phase of network upgrade to our MKII, Cloud compatible model, AMOS2X will begin from Q2 2019 (due for completion by 2021)
 |
| *Auxiliary* | 0 | 0 | 0 |  |
| *Auxiliary AWS* | 0 | 0 | 0 |  |
| *Other* | 0 | 0 | 0 | * Third Party support ships have been recruited for PR & capacity building/outreach purposes but are not included with national fleet statistics and therefore added to the ZZ fleet

 * The 3 remaining manually reporting mobile rigs supplied with Met Office equipment are now included within our Selected fleet
* Our third-party systems on North Sea rigs and platforms are not included in these figures
 |
| **National VOS Total** | 286 |   |  |  |
|  |  |  |  |  |  |
|  | **National VOS Target** | 275 active |  |  |  |  |
|  | **National VOSClim Target**  | 200 active |  |  |  |  |
|  |  |  |  |  |  |  |
|  | **b.** | **Data management:** |
|  | *Total number of ship observations (BBXX) distributed on the GTS in 2018* | UK recruited VOS: 490,147 78,145 manual obs412,002 AWS obsThird-Party offshore data: 689,165 Total on GTS: 1,179,312 SHIP observations |
|  | *Dates when VOS data submitted to the GCCs in 2018* | Q1: 09/03/2018Q2: 02/07/2018Q3: 27/09/2018 Q4: 16/01/2019 Total of 71,752 obs. |

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|  | c. | **Shipboard Automatic Weather System** |
| **Type** | **No. of ships at 31 Dec 2018** | **Manual Input****Yes / No** | **Method of Comms** | **Year1 Plans** |
| Autonomous Marine Observing System (AMOS) | 60 | No | Iridium Satellite (SBD) |  * The first phase of the AMOS network upgrade to our MKII, Cloud compatible model, AMOS2X will begin from Q2 2019, and is due for completion by 2021. Where possible, solar powered systems will be replaced with 24V systems connected to the ship’s power supply.
* All AMOS network LoggerNet software to be upgraded to V1.0 after substantial improvements to coding following collaboration with Campbell Scientific.
* One new AMOS installation planned for RRS Sir David Attenborough
* 3 further AMOS systems to be installed on land Defence sites in the Falklands (original model – to be upgraded at a later date)

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|  | **d.** | **Electronic logbooks: (TurboWin, SEAS, OBSJMA)** |
| **Software & version** | **No. of ships at**  **31 Dec 2018** | Implementation plans |
| TurboWin V4.0 | 11 | Gradually replaced by latest TurboWin version, or moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V4.5 | 4 | Gradually replaced by latest TurboWin version, or moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V5.0 | 25 | Gradually replaced by latest TurboWin version, or moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V5.1 | 1 | Gradually replaced by latest TurboWin version, or moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V5.01 | 132 | Gradually replaced by latest TurboWin version, or moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V5.5 | 15 | Will remain, or be moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWin V5.6 | 10 | Will remain, or be moved to TurboWeb/Win+ where suitable internet connections allow |
| TurboWeb  | 17 | Currently 18 VOS transmitting using Format 101 – we plan to increase this and migrate suitable vessels. All Turboweb ships are provided with TurboWin software as a back-up for when internet connections are not available |
|  | TurboWin+  | 4 | Provided with TurboWin software as a back-up for when internet connections are not available |

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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) | Vaisala PTB110 barometer (preferred) |
| Vaisala PTB220 Barometer (triple cell) | Druck digital barometer |
| *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 due to Minamata/REACH regulations (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   |
|  | Rotronic hand held Hygropalm HP220-A temp/humidity sensor (10 ships only) | Vaisala HMP110 (preferred)  |
| 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 (now actively being withdrawn due to Minamata/REACH regulations) 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 | 87 | 44 | There were additionally 485 remote VOS inspections carried out |
| VOS recruitment visits | 2 | 0 | A further 9 VOSClim were recruited remotely |
| VOS de-recruitment visits | 1 | 0 | A further 21 VOS were de-recruited remotely |
| VOS courtesy or foreign visits | 1 | 4 | 1 VOSClim inspection by PMO New Zealand and 4 AMOS from Met Office Field Service Engineering team |
| *Total visits to VOS* | 139 |  |
| 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) | 8 |  | 10 x Met Office Southern Ocean; 10 x AOML; 10 x ESURFMAR (AtlantOs) |
| 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* | 8 |  |  |
| **Total visits by national PMOs** | 147 | *Sum of all ship visits (VOS + ASAP + SOOP) + visits to other program (DBCP + Argo)* |
| **Total number of PMOs(FTE\*)** | 2.5 |  |
| (\*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 carried in 2018 (currently only one full time UK PMO). A significant proportion (c.20%) of the UK recruited 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.  However, with the planned changes to Maersk management and interaction with the VOS, we are hoping to see things improve throughout 2019.
* The restriction placed on Maersk ships and their use of the TurboWin software caused substantial data loss in the UK VOS fleet. Whilst we are now working with DWD and Maersk on a top-down management approach which should prove successful, at the time this issue required a significant amount of effort and resource to establish the root of the issue and distribute the work within the team to re-establish observing practice in what was an un-assigned area of the UK fleet.
* With the ongoing developments to metadata formats and the consequent delay this has had on the migration to JCOMMOPS, it has been a challenge to ensure that all metadata is being updated correctly, and maintaining a single source of truth. For example, having to provide newly recruited ships as a CSV file for uploading to the ESURFMAR VOS database is increasing the likelihood of errors being made and the fact that there is variation in what we can and can’t update manually has proved difficult to manage and keep on top of.
* Whilst we still issue annual Excellent certificates to the top performing ships each year, for those vessels contributing >350 timely, high quality observations, 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 – something which we don’t have the resource to cover. Some ships are also changing their email settings on TurboWin, which can prevent the observations from automatically passing through our message switching systems. [Note- 153 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 Iron-Key, 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 2018 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. This issue should be resolved when full use of WIGOS-SOT-IDs comes to fruition.

 * 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 in-active observing ships and establishing contact in order to recover 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. However, by concentrating and establishing closer links with a smaller number of major shipping companies, we have been successful in the majority of cases with recovering our equipment.
* Increasingly this year we have been impacted by the blocking of AMOS Iridium signals in certain ports. In some ports, e.g. Frederikshavn, we are aware of a ‘jammer’ which blocks the transmission of our AMOS observations, so we know to expect an outage, but we are seeing the same issue more frequently in other ports including Immingham & Aberdeen. The source of the problem is often very difficult to identify and has required a significant amount of time and resource to identify, manage and work around. It would be helpful to find out if other SOT members are experiencing this same issue and how they are dealing with it.

 * With the pressures of the Minamata Convention and EU REACH regulations upon us, the recovery of all mercury instrumentation onboard UK VOS continues. Whilst we have recovered around 70% of the mercury installed in the UK VOS network, we are facing challenges with a number of ships that rarely return to the UK. The strict governance surrounding the movement and transporting/importing of restricted substances has posed problems when trying to find suitable overseas ports to land equipment ready for collection and return to the UK. 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. The recovery effort is expected to be largely complete by the end of 2019, with the Zeal Liquid-in-Glass alternative made available 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 network wide upgrade to AMOS2X 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 an operational challenge during 2018.  Although no marine data in TAC format is being distributed on the GTS, our BUFR coded messages are being converted from them, so as a consequence, are not in a high resolution format. Additionally, the BUFR templates being used are the now deprecated 3-08-009 VOS template as opposed to the new 3-08-14 version. However, the Met Office is currently undertaking a major project (named ‘SurfaceNet’) to revolutionise our data processing capability, something we are hoping to start seeing output for in 2019/2020.
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| **h.** | **Research / development / testing:** |
| * Development & acceptance of the new AMOS2X shipborne AWS system, developed by the Met Office has continued throughout 2018. Substantial work has been carried out with Campbell Scientific in order to refine and compress the logger coding & software. The resulting compressed format has been based around the ESURFMAR Format 100, with the intention that all data will eventually be transmitted via an Iridium IP connection, to newly developed Cloud-based processing server.
* Processing of all our marine automatic network data (ships, moored buoys & light vessels) is currently contracted out to a third party for conversion to TAC and onward forwarding to our message switching team. As part of the current Met Office ‘SurfaceNet’ project, we intend to bring the newly developed Cloud-processing structure in-house, where capability is being developed to accept, process and distribute data in any format (and in the most recent BUFR templates (cut-down version of 3-08-14 for AWS-VOS).
* It is intended that the new AMOS2X 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.
* 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, in order to incorporate an AMOS2X 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. The vessel has had a test launch and is due to be officially launched in 2019, before which time the new AMOS2X will be installed.

 * 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.

 * The Met Office continues to assist KNMI and E-SURFMAR with its ongoing efforts to enhance the TurboWin logbook software. Until such time that the Met Office SurfaceNet project is operational, all UK VOS set up to send observations in ESURFMSR format 101 will continue to be routed via KNMI and Meteo-France to process.

 * We are continuing to roll out 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.  There are currently 109 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 (35/60 so far), to replace either the PTB330 or Druck barometers originally installed. All new AMOS2X systems will be ready installed with a PTB110.

 * Each UK PMO 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).
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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.  In 2019 we will look to increase our participation in the GDP barometer upgrade programme and investigate the use of alternative drifting buoy manufacturers (currently purchase from MetOcean)

 * 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). The new AMOS2X automatic weather station will also start being deployed on all these sites as part of the network wide upgrade.

 * In addition to the VOS ships recruited to the UK fleet, 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 c.700,000 hourly SHIP coded observations on the GTS in 2018.  The quality 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 build on our current relationship with these data providers, with a particular focus on metadata management.
* In 2019, we intend to make some fairly significant changes to our current PMO distribution in an attempt to cover the currently vacant southeast region of the UK. By automating many of our office-based tasks we have been able to free some resource from our team coordinator and move them into a full time PMO role covering the southwest. The result of these changes should be that we no longer have any un-assigned VOS ships and the newly managed Maersk fleet will have a full time PMO to coordinate VOS activities.
 |