REGINAL SPECIALIZED METEOROLOGICAL CENTRE (RSMC), EXETER, VOS MONITORING REPORT

(Submitted by Colin Parrett, RSMC Exeter)

Summary and purpose of the document

This document provides information on the VOS data quality monitoring conducted by the Regional Specialized Meteorological Centre (RSMC) operated by the United Kingdom Met Office in Exeter.

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.

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Appendices: A. Met Office on-line monthly VOS suspect list for Jan 2011
B. Criteria for monthly monitoring of marine surface observations
C. Timeliness of VOS observations received at the Met Office, Jan 2011
D. Met Office on-line time of receipt statistics for individual ships, Jan 2011
E. Scheme for ranking VOS ships by quantity and quality of reports

- A -   DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

9.1.1 - Regional Specialized Meteorological Centre (RSMC) Exeter VOS monitoring report

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

9.1.1.2 The Met Office (RSMC Exeter) continues to compile lists of ships that have produced suspect observations each month, which are sent to the WMO Secretariat. They are also available via the Met Office web site[1]. The Team agreed that the monitoring criteria are set at the correct levels as shown in Appendix B.

9.1.1.3 The Met Office also produces monthly lists of monitoring statistics for all VOS. To maintain up to date lists of ships, the Met Office advised that it was using the latest data downloaded from the online E-SURFMAR metadata database, as well as the latest WMO Pub47 data. In addition it uses the masked call sign data available from the JCOMMOPS FTP site[2].

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

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

9.1.1.6 Timeliness information for VOS reports received at the Met Office is also made available from the observation monitoring web site[3] in graphical format. This information showed that the majority of ship reports continue to be received promptly, with over 50% received within 15 minutes and 90% within 60 minutes of the observation time. Timeliness information for individual ships is also available from the website.

9.1.1.7 The Team noted that the Met Office had made its annual VOS ranking scheme results available on their website for all VOS (an action from SOT-5). The scheme ranks the VOS ships in terms of the timeliness, quantity and quality of their reports. This has been used to assess the annual performance of UK VOS and for determining which individual ships should be presented with awards. Details of the scheme are shown in Appendix E. VOS operators were invited to consider the value of the proposed performance ranking system and to advise the Met Office if they considered that the parameters used were appropriate (*action; VOS operators; end 2011*). VOS operators were also invited to consider performance rankings when issuing awards to their individual VOS fleets (*action; VOS operators; ongoing*).

9.1.1.8   The full report by the RSMC, Exeter, is provided in Annex VI.

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

- B -   BACKGROUND INFORMATION

Monitoring the quality and timeliness of VOS observations

1   The Met Office (RSMC Exeter), as WMO-designated lead centre for monitoring the quality of surface marine meteorological data (observations from ships, buoys and other in situ marine platforms), compares observations from individual platforms with the Met Office's global model background 6-hour forecast fields for each variable. Platforms for which the observed values differ from the background by a significant amount are flagged as suspect.

2   Monthly lists of suspect platforms are sent to the WMO Secretariat and also exchanged among the 4 lead monitoring centres (Met Office, JMA, NCEP and ECMWF), and other centres, for comparison. Generally there is considerable agreement between the different centres, both in terms of suspect platforms and mean and standard deviation of differences from the background fields. The Met Office monthly suspect lists are available via the Met Office web site[4]. A recent example of our on-line VOS suspect list for January 2011 is shown in Appendix A. Monthly QC plots are also available from the website for each ship that is listed as suspect.
(N.B. The link[4] to the Met Office web site will be replaced during 2011 and the new URL will be circulated to users via the JCOMMOPS mailing lists - it will probably be under
http://www.metoffice.gov.uk/research/weather.)

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

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

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

6   National focal points are notified when the latest VOS monthly monitoring reports and suspect lists become available on the Met Office website by means of an email sent by the Met Office to the SOT, VOS and PMO mailing lists, which are maintained by JCOMMOPS. It is important therefore that focal points wishing to receive this monitoring information check that their JCOMMOPS mailing list information is kept up to date. However, the monthly monitoring statistics continue to be emailed directly to major VOS operating countries, and as mentioned in reports to previous SOT meetings, any other national focal points who may wish to receive directly emailed copies of the monthly monitoring lists or 'suspect' ship lists should advise the Met Office of their email address.

7   Every 6 months more detailed monitoring reports, for all platforms, are produced and made available to the WMO Secretariat via the Met Office web site. The statistics relating to suspect VOS operated by specific members are extracted from the report and distributed by the

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

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

8   Timeliness statistics for VOS reports received at the Met Office are available from our web site[5] where monthly timeliness data for individual VOS is available as well as tables and graphs showing the relative timeliness of national VOS fleets. A graphical example for January 2011 data is shown in Appendix C, where it can be seen from the upper graph that the majority of ship reports were received promptly, with more than 50% received within 15 minutes and about 90% received within 60 minutes of the observation time. The timeliness has improved markedly in the past two years, probably due to increased automation. The cut-off time for operational NWP global data assimilation is typically 90-150 minutes after the analysis times of 00, 06, 12 and 18 UTC, so more than 90% of global VOS data should be received in time to be assimilated. An example of timeliness information for individual call-signs during January 2011 is shown in Appendix D.

9   Since SOT-5, the Met Office has started producing annual lists of all VOS ships, ranked in order of importance to the numerical weather prediction (NWP) system, and made them available from the Met Office web-site[6]. The ships are ranked in terms of their quantity, quality and timeliness of reports, largely to assist in presenting awards to the best performing ships (initially in the UK VOS fleet). The method and latest results for the UK fleet are shown in Appendix E.

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

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5 : http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/TOR/index.html
6 : http://research.metoffice.gov.uk/research/nwp/observations/monitoring/marine/VOSranking/index.html

APPENDIX A

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

Pub47 VOS Suspects for Jan 2011

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

PRESSURE (hPa)

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

TEMPERATURE (deg C)

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

WIND SPEED (m s-1)

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

WIND DIRECTION (deg)

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

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APPENDIX B

CRITERIA FOR MONTHLY MONITORING OF MARINE SURFACE OBSERVATIONS

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Monitoring procedures


Period                   :One calendar month.
Data monitored           :Reports from each unique identifier for ships,
                          fixed buoys and platforms.
Standard of comparison   :Background field from Exeter global model.
Observation times        :All hours
Elements monitored       :Mean sea level pressure (hPa).
                         :Wind speed (ms⁻¹).
                         :Wind direction (degrees).
                         :Air temperature (°C).
                         :Relative Humidity (%).
                         :Sea surface temperature (°C).
Parameters monitored
        NOBS             :Number of observations received, excluding duplicates.
        %GE              :Percentage of observations with gross errors.
        %REJ             :Percentage of observations flagged, excluding
                          those with gross errors.
        SD               :Standard deviation of difference of observations from
                          background values, excluding those with gross errors.
        BIAS             :Mean difference of observations from
                          background values, excluding those with gross errors
                          (N.B. a positive bias indicates the wind
                          observation is veered to the background).
        RMS              :Root Mean Square difference of observations from
                          background values, excluding those with gross errors.


GROSS ERROR LIMIT        :15 hPa       (pressure)
                         :25 ms⁻¹      (vector wind)
                         :15 °C        (air temperature)
                         :50%          (relative humidity)
                         :10 °C        (sea surface temperature)


SELECTION CRITERIA       :NOBS >= 20 , and one or more of the following:


                         1.Bias   >=      4 hPa        (pressure)
                                  >=      5 ms⁻¹       (wind speed)
                                  >=      30 degrees   (direction)
                                  >=      4 °C         (air temperature)
                                  >=      15%          (relative humidity)
                                  >=      3 °C         (SST)
                         2.SD     >=      6 hPa        (pressure)
                                  >=      80 degrees   (direction)
                                  >=      6 °C         (air temperature)
                                  >=      25%          (relative humidity)
                                  >=      5 °C         (SST)
                         3.PGE    >=      25
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N.B. Observations of wind direction are only included in the wind direction
statistics if the observed or background wind speed is greater than 5 ms⁻¹

APPENDIX C

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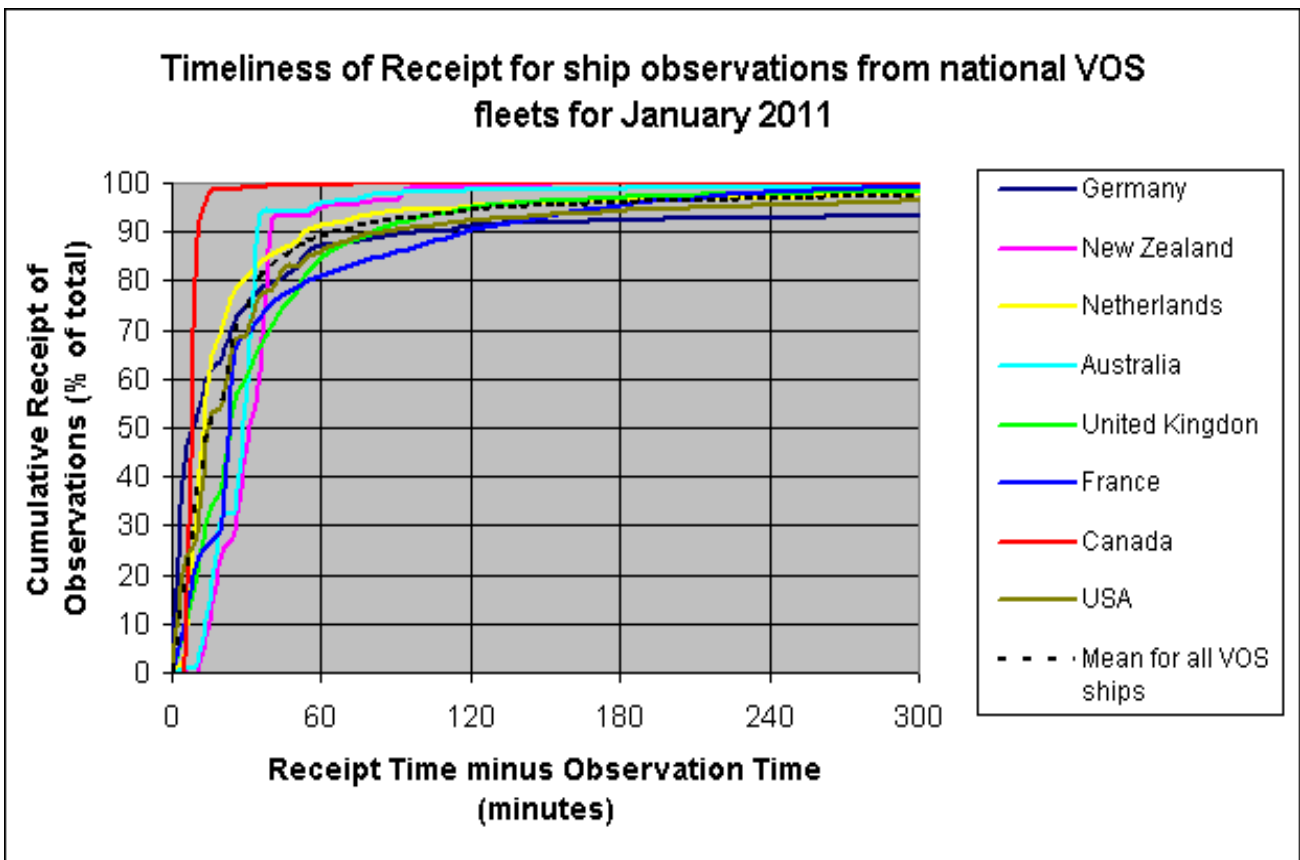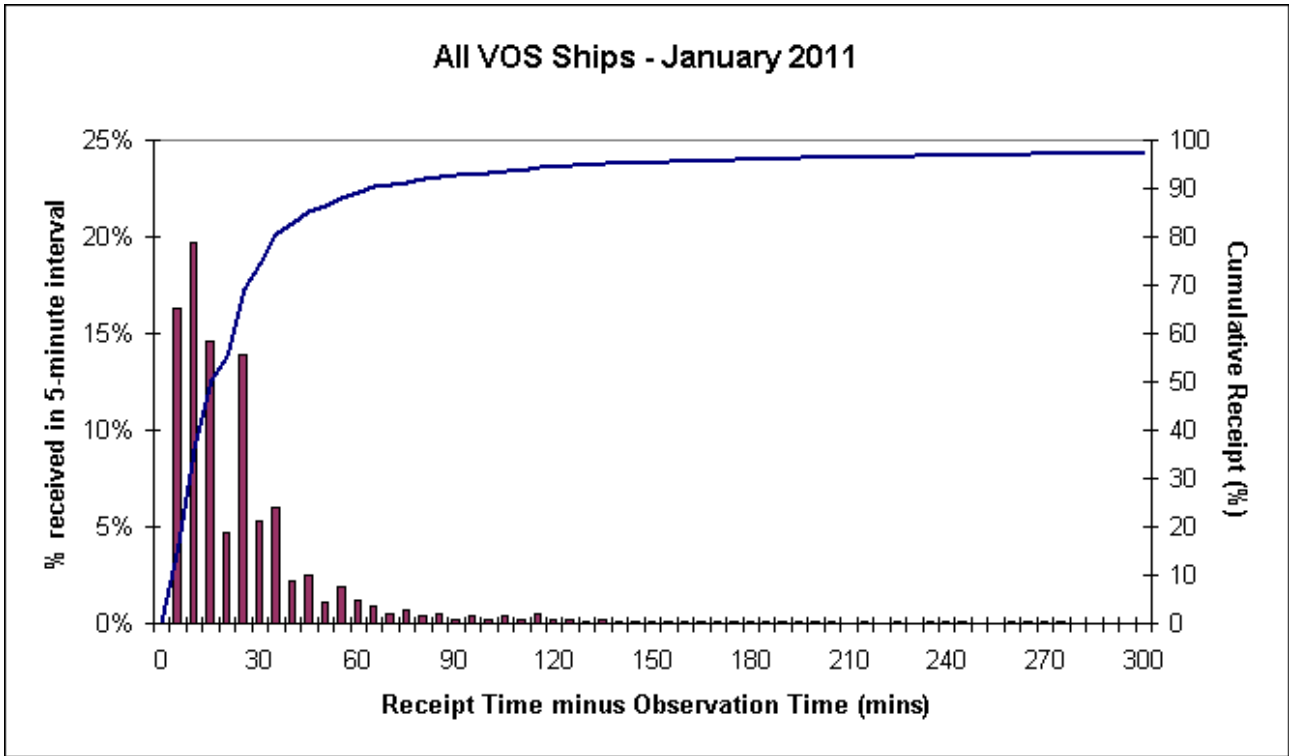
APPENDIX D

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

SEARCH Met Office [ ] GO

▶ Home ▶ Research ▶ NWP ▶ Observations ▶ Observation Monitoring ▶ Surface Marine ▶ VOS ToR Stats ▶ SHIP

NWP | Climate | Seasonal forecasting | Atmospheric processes | Oceanography | Projects | The stratosphere

Pub47 Time of Receipt Statistics by SHIP for January

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

APPENDIX E

SCHEME FOR RANKING VOS SHIPS BY QUANTITY AND QUALITY OF REPORTS

Ranking Method

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

The variables considered are:

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

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

Number of reports score

The set of numbers of reports received (Nobs) is 'capped' to limit the influence of any very high numbers from automatic stations, then a score is calculated for the number of observations (obs) received:
Firstly the values in Nobs are inversed to give low (good) scores to ships with high numbers of obs and vice-versa, **Nobs = MAX(Nobs) - Nobs**
Secondly, so that ships with below average numbers have scores greater than 1.0, and vice-versa, we set **NumObsScore = Nobs / MEAN(Nobs)**

Quality score

Quality scores for each variable are calculated, based on the following observation-minus-background (O-B) statistics:
MeanScore = (Absolute value of mean O-B) / VariableLimit
SDScore = (Standard Deviation of O-B) / VariableLimit
[where the following **VariableLimit** values are used, based on the Met Office reject list thresholds:
P = 2.0 hPa, **Spd = 3.0 m/s**, **Dir = 40 degrees**, **T = 3.0 C**, **RH = 15.0 %**, **Log(Vis) = 1.0**, **SST = 3.0 C**] and **GEScore = (Number of Gross Errors) / (Mean number of Gross Errors)**
(N.B. For ships with 100% gross errors, the Mean and SD scores are set to the worst in the set.)
All scores are capped at 2.0, then a "quality-score" is created for each variable:
QualityScore = (MeanScore + SDScore + GEScore) / 3

Time of receipt score

Time of receipt (ToR) scores are produced from yearly totals for the following ToR categories: reports received within 30 minutes of the report time, 30-60 minutes, 60-120 minutes, 120-360 minutes and after 360 minutes.
Each ship is given a score that is the sum of the following numbers of points for each category multiplied by the number of observations in that category:
points_30 = 0.0, points_60 = 30.0, points_120 = 75.0, points_360 = 225.0, points_after = 345.0
(These scores are just the values of the mid points of the ranges minus the mid-point of the first range (15 minutes) to make the best score zero; and 'points_after' has just been set to 360 minus 15 as the range is unbounded.)
The ToR scores are then divided by the scores the ships would have received had all of their

observations been received between 60 and 120 minutes, i.e. we are suggesting that observations should really have been received within two hours and that reports received later than that are less useful to NWP. The ToR scores are also capped at 2.0.

Combined score

The **NumObs, Quality and ToR** scores are combined with weights of **0.4, 0.4 and 0.2**, respectively, for each variable.
For ships that do not report certain variables the scores are set to the worst score for that variable (usually 2.0).
Then the scores for each variable are combined using the following weightings:
P = 2.0, **Spd = 1.0**, **Dir = 0.6**, **T = 1.0**, **RH = 0.6**, **Vis = 0.4**, **SST = 1.0** .
These weightings are estimates of the relative importance of each variable to the NWP models (their values may need some further tuning).

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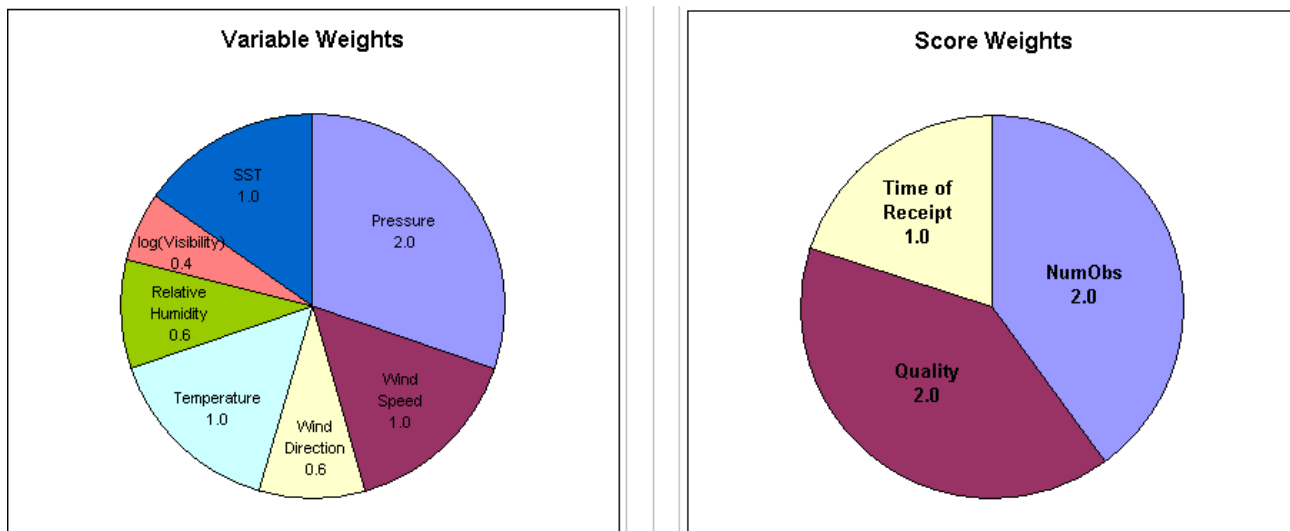
N.B. The above ranking scheme is only intended to give an indication of the relative performance of individual observing ships and marine platforms. It is primarily aimed at usefulness for NWP and therefore only takes into account observations that have been received in near real time. It takes no account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

Annual VOS ranking scheme – results for UK ships for 2010

	Cntry	ShipID	Combined Score	All vrbls NumObs	Pressure P_Score	NumObs	Wind Speed SP_Scor	NumObs	Wind Direction DR_Scor	NumObs	Temperature T_Score	NumObs	Relative Humidity RH_Scor	NumObs	Visibility VI_Score	NumObs	SST TS_Scor	NumObs	Time-of-receipt ToR_Scor
Min:			0.066	5	0.028	0	0.061	0	0.043	0	0.025	0	0.050	0	0.019	0	0.012	0	0.000
Max:			1.337	216380	1.653	37096	1.578	38478	1.569	20934	1.583	38173	1.394	26273	1.279	34092	1.551	31594	2.000
Average:			0.679	6076	0.642	1138	0.661	1189	0.614	615	0.593	1201	0.600	583	0.546	260	0.580	1090	0.394
230	GB	BATEU06	0.384	28111	0.340	5434	0.397	4833	0.305	3153	0.289	6157	0.537	3842	0.709	170	0.379	4522	0.457
241	GB	ZCDF4	0.397	27274	0.355	4313	0.514	4330	0.478	1411	0.483	4335	0.351	4335	0.159	4262	0.351	4288	0.173
320	GB	ZCDY2	0.458	19907	0.477	3016	0.591	3016	0.475	1624	0.438	3016	0.468	2990	0.079	2994	0.447	3251	0.396
325	GB	BATEU01	0.468	19880	0.365	3964	0.416	3854	0.370	2210	0.386	3974	0.418	3691	0.601	109	0.845	2078	0.154
389	GB	ZCDG8	0.505	10210	0.464	1563	0.780	1564	0.621	1022	0.455	1561	0.460	1560	0.083	1536	0.487	1404	0.079
393	GB	IDDUK02	0.507	6157	0.284	4631	0.664	276	0.670	178	0.544	276	0.559	257	0.738	234	0.540	305	0.163
400	GB	C6KD6	0.510	3333	0.526	517	0.546	517	0.531	304	0.499	515	0.579	515	0.285	493	0.488	472	0.050
428	GB	ZCDG7	0.524	9100	0.522	1413	0.680	1413	0.574	629	0.554	1412	0.503	1410	0.095	1411	0.496	1412	0.102
433	GB	ZCDP8	0.526	11140	0.582	1641	0.637	1644	0.534	1076	0.509	1645	0.492	1645	0.079	1644	0.513	1845	0.372
442	GB	C6QT3	0.528	1719	0.521	285	0.620	286	0.551	171	0.512	285	0.510	285	0.434	281	0.499	126	0.032
453	GB	C6KD5	0.533	3108	0.545	470	0.633	470	0.566	288	0.499	470	0.527	469	0.307	467	0.520	474	0.052
461	GB	C6NI8	0.536	924	0.528	143	0.563	143	0.595	98	0.522	142	0.528	142	0.470	143	0.533	113	0.090
462	GB	C6KD9	0.536	2155	0.575	341	0.557	340	0.533	198	0.494	340	0.505	340	0.354	341	0.572	255	0.034
510	GB	2AKI3	0.548	1826	0.552	280	0.622	279	0.550	153	0.536	280	0.548	277	0.426	280	0.530	277	0.193
519	GB	C6KD7	0.550	3213	0.619	499	0.609	498	0.559	290	0.502	499	0.523	499	0.296	499	0.515	429	0.094
520	GB	C6NZ3	0.550	3030	0.524	464	0.631	464	0.539	310	0.542	464	0.569	455	0.340	464	0.607	409	0.160
527	GB	MQSM5	0.552	2065	0.576	329	0.582	327	0.601	173	0.529	326	0.531	326	0.402	328	0.538	256	0.093
528	GB	2AKI4	0.552	1940	0.553	288	0.614	288	0.559	193	0.552	288	0.558	279	0.434	288	0.529	316	0.271
543	GB	ZCDM6	0.554	6057	0.590	927	0.709	927	0.530	651	0.529	927	0.524	926	0.151	925	0.550	774	0.236
556	GB	MGRH9	0.556	1138	0.580	184	0.581	184	0.555	106	0.544	184	0.551	177	0.470	184	0.534	119	0.164
560	GB	ZQCP3	0.557	2801	0.611	417	0.611	417	0.557	303	0.520	416	0.536	415	0.362	414	0.522	419	0.171
561	GB	ZCDV2	0.557	5956	0.591	904	0.679	904	0.557	534	0.554	902	0.539	902	0.148	899	0.545	911	0.195
570	GB	C6JE2	0.558	1484	0.531	230	0.644	229	0.545	155	0.527	227	0.531	227	0.431	230	0.630	186	0.074
582	GB	MZFR9	0.560	2838	0.578	448	0.625	448	0.581	288	0.540	448	0.551	445	0.352	447	0.557	314	0.235
583	GB	ZQTP2	0.560	2956	0.569	437	0.639	437	0.556	325	0.551	437	0.561	404	0.373	437	0.548	479	0.328
602	GB	DDJS2	0.562	974	0.658	152	0.564	152	0.515	75	0.518	152	0.546	152	0.452	152	0.494	139	0.043
621	GB	MIBR	0.564	2080	0.558	312	0.645	312	0.645	214	0.545	312	0.559	312	0.419	306	0.523	312	0.216
633	GB	OVSB2	0.565	3148	0.552	485	0.650	485	0.613	305	0.558	484	0.571	482	0.356	461	0.567	446	0.270
643	GB	MQPF2	0.566	1599	0.566	272	0.608	271	0.577	120	0.566	272	0.549	272	0.447	272	0.607	120	0.158
644	GB	ZCDF8	0.566	4561	0.571	701	0.573	701	0.534	391	0.565	700	0.542	700	0.265	693	0.552	675	0.176
654	GB	C6JD7	0.567	4638	0.581	708	0.679	713	0.618	482	0.535	708	0.549	707	0.309	704	0.543	616	0.255
655	GB	ZIPR7	0.567	1357	0.577	212	0.658	209	0.566	136	0.634	211	0.561	207	0.465	209	0.533	173	0.177
656	GB	A8DH2	0.567	2585	0.569	386	0.634	387	0.623	286	0.570	385	0.577	385	0.381	375	0.526	381	0.166
660	GB	C6OA3	0.568	1109	0.582	175	0.608	175	0.582	97	0.549	175	0.536	175	0.482	175	0.566	137	0.161
661	GB	C6OT4	0.568	777	0.585	118	0.617	117	0.565	72	0.524	118	0.556	118	0.551	118	0.546	116	0.092
667	GB	VQHO7	0.569	1328	0.575	203	0.643	203	0.585	105	0.552	203	0.554	201	0.452	202	0.551	211	0.167
691	GB	MCCN6	0.572	1881	0.561	279	0.662	286	0.568	178	0.548	286	0.585	286	0.435	285	0.582	281	0.190
704	GB	ZCDA9	0.574	6987	0.674	1049	0.711	1080	0.571	630	0.525	1033	0.535	1032	0.070	1050	0.516	1113	0.133
711	GB	ZCBU5	0.575	3304	0.618	493	0.667	493	0.548	352	0.549	493	0.555	493	0.342	491	0.547	489	0.195
712	GB	MHNL6	0.575	1281	0.549	198	0.626	198	0.616	111	0.523	198	0.556	193	0.494	198	0.649	185	0.136
713	GB	2AKI2	0.575	1773	0.592	266	0.638	266	0.662	188	0.539	266	0.530	266	0.429	262	0.546	259	0.149
722	GB	VQIB9	0.576	2919	0.567	448	0.666	446	0.621	269	0.570	448	0.571	444	0.373	447	0.570	417	0.332
732	GB	OYYK2	0.577	1146	0.569	177	0.631	177	0.548	118	0.609	177	0.592	176	0.475	177	0.554	144	0.199
733	GB	VQIV8	0.577	289	0.598	47	0.604	47	0.578	8	0.552	47	0.531	47	0.623	47	0.540	46	0.008