Report on the Quality of Marine Surface Observations

Report Number 51

January to June 2014

Met Office Data Assimilation

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1. INTRODUCTION

In 1985, the WMO Commission for Basic Systems (CBS) agreed that there was a need for GDPS / Global NWP centres to monitor the quality of observations available on the GTS and to exchange monthly lists of stations providing seemingly erroneous data. In 1988 three lead centres were nominated which would have a co-ordinating role of producing, at six-monthly intervals, consolidated lists of suspect stations for given data types together with information on the nature of the error. NCEP was given responsibility for aircraft and satellite data and ECMWF responsibility for upper-air data. The Met Office was allocated the role as lead centre for marine surface observations, which encompass observations from ships, drifting buoys, moored buoys and other fixed marine platforms. This is report number 51 and covers the period January to June 2014. For each observing platform identified as suspect, values are supplied for the number of observations received at the Met Office, the number of these observations with gross errors, the observations' mean differences from the background values used by the global numerical data assimilation system and the standard deviations of these differences.

Following the CBS recommendations, by the end of the 1980s there were four centres active in the monthly exchange of monitoring information: the Met Office, ECMWF, RSMC Tokyo and NCEP. Since then, a number of other centres have also begun to exchange this information and these reports have included data provided by Météo-France as of report number 23. Initially, the only monitoring information exchanged on marine surface observations related to pressure, and the first two WMO reports addressed that parameter alone. Since then, these reports have contained monitoring statistics for wind observations, now being exchanged between centres on a consistent monthly basis. In addition, the report contains monitoring results for sea-surface temperature (SST). [Due to changes in the observation processing system and database structure, there was no monitoring of SST data at the Met Office from May 1998 to September 2000. The SST information presented in reports 20 to 23 was therefore compiled, with permission, from the monthly NCEP monitoring data and so is not directly comparable with that presented in other reports. SST monitoring was reinstated at the Met Office from October 2000.]

2. MONITORING METHODS

Errors in observations may arise from a number of sources: the instrument may be malfunctioning, figures may be mistaken while being transferred manually, or there may be corruption of data during transmission. Errors can also arise in the pressure report if the adjustment to sea level is made incorrectly or not at all, and a poorly sighted anemometer can result in errors in the observations of wind. For SST observations, the depth at which the observation is made can be crucial. 'Surface' observations from buoys are usually made at a depth of around 0.5m, whereas ships may take a measurement between a depth of 10m and the surface, depending on the method used. At present, there is no indication given within the report of the observation's depth, so it is not possible to determine the significance of this factor. (By contrast, satellites measure the temperature of the ocean's 'skin' which is generally slightly cooler than the temperature immediately beneath, by several tenths of a °C, as a result of evaporative cooling and other surface processes.)

Some errors can be detected by applying checks on the code format and the internal consistency of the report (for example: are the position and pressure consistent with a report 6 hours earlier?). Checks on spatial consistency are possible where there are other observations nearby. However, such quality checks are unable to identify errors on all occasions and it is recognised that numerical data assimilation systems can provide global reference values applicable in observation monitoring. The short-term forecast from the previous numerical analysis, commonly known as the first-quess or background field, provides the most useful information on observation quality, as it represents an accurate and spatially consistent estimate of the observed value which is independent of the observation itself. Observation-minus-background (hereafter referred to as O-B) differences are at the core of all monitoring work by GDPS centres. Due to the thermal-inertia of the oceans and the slowly varying nature of SST, the background SST is in fact the previous analysis (daily analyses are produced at the Met Office from an assimilation of both surface and satellite observations).

Taking all marine surface observations together, the values of O-B have distinct characteristics. The vast majority of the observations show quite small departures from background and the distribution of O-B is nearly Gaussian, with little or no bias. These O-B differences are generally made up from random errors in the background fields and/or the observations, which are statistically of similar magnitude. However, there is a smaller group of observations that depart much more from the background, for which observation error is the only reasonable explanation for the large values of O-B. Studies of the distribution and variation of O-B at different points around the globe enable reasonably accurate estimation of background error, and this provides the basis for the monitoring methods described here. Those marine observing platforms for which, in a sufficiently large sample, the observed values differ from the background by an amount significantly in excess of the estimate of background error, may be labelled as 'suspect' with a high degree of confidence. The limits used here to identify suspect observing platforms have been set appropriately to preclude much likelihood of the background, rather than the observations, being in error.

Each monitoring centre produces a monthly list of the identifiers of marine observing platforms considered suspect according to their departures from the model background values. All observations are used, both synoptic and asynoptic, and the background fields are interpolated to the observation time.

Given that the number of observations made during the month is at least 20, then the condition used by all centres for obtaining platforms for the suspect lists is that at least one of the following criteria are satisfied:

Pressure | mean of O-B | 1. ≥ 4.0 hPa ≥ 6.0 hPa standard deviation of O-B 2. percentage of gross errors **≥** 25 3. Wind \geq 5.0 ms⁻¹ (Speed) | mean of O-B | 1. ≥ 30° (Directn) 2. standard deviation of O-B ≥ 80° (Directn) 3. percentage of gross errors \geq 25

Criteria used for monthly monitoring

Gross errors are defined as observations that depart from the background by more than 15hPa (pressure) or $25ms^{-1}$ (vector wind). The mean and standard deviation of the samples are evaluated excluding gross errors, so that occasional extreme values resulting from, for example, corruption during transmission, do not influence the sample characteristics. Direction statistics are also calculated excluding values in light winds, where either the observed or background speeds are less than $5ms^{-1}$.

The monthly results for pressure from all five monitoring centres show considerable agreement, both on the observing platforms listed as suspect and the values of the mean and rms difference from each centre's background. Differences between the monthly suspect lists are usually due to the different numbers of observations available at each centre, due to different cut-off times. There are also some unexplained variations in the data receipt between the centres, which may be due to problems on the GTS or in the local procedures for handling the data. Monitoring results for wind speed also show reasonable agreement on the mean and standard deviation from each centre's background.

This report draws together all the monthly monitoring results exchanged on marine surface data and identifies a list of observing platforms that have provided observations of poor quality over the 6-month period. In drawing up this list, there have been a number of guiding principles:

- 1. As with the monthly lists, accuracy is assessed relative to background values.
- 2. Observing platforms are listed only where there is a reasonable degree of confidence that the observations rather than the background values are in error.
- 3. At least 40 reports are required over the period in which the observations are considered suspect.
- 4. The perceived accuracy over the last part of the six-month period is of greatest importance; observing platforms are not listed if there has been recent improvement and their reports are at present without major error.

5. Given that the number of observations made during the period is greater than or equal to 40, then the condition for listing a platform as suspect in this report is that at least one of the following criteria are satisfied:

Pressure

- 1. | mean of O-B | ≥3.5 hPa
- 2. standard deviation of O-B \geq 5.0 hPa
- 3. percentage of gross errors ≥ 25

Wind

1.	mean of O-B	\geq 5.0ms ⁻¹ (Speed)
		≥30° (Directn)
2.	standard deviation of O-B	\geq 6.0ms ⁻¹ (Speed)
		≥60° (Directn)
3.	percentage of gross errors	>25

SST

1.	mean of O-B	≥3.0 °C
2.	standard deviation of O-B	≥5.0 °C
3.	percentage of gross errors	>2.5

Criteria used for biannual monitoring

Those observations having gross errors are excluded from the calculation of the mean and standard deviation of O-B. The same gross error limits apply in these reports as in the monthly lists. (The Met Office now sets a limit of 10° C for SST but this was 5° C pre-2000 and NCEP use 15° C.)

The limits on the bias and standard deviation of O-B are slightly more stringent than those for the monthly lists because the sample sizes are larger. If there has been a recent change in quality, they are only applied at the end of the period. Identifiers can be listed in this report without appearing on any of the monthly lists. This is due to a representative sample only being obtained over several months or deterioration occurring at the end of the period for platforms reporting very frequently. The 6-month list is longer than most of the monthly lists because many ships cease reporting for variable periods of time, in many cases while they are in port or out of service. Only over a relatively long period, probably more than 6 months, is a representative sample obtained from all those ships providing observations.

3. MONITORING RESULTS

The monitoring results presented in this report relate only to data exchanged over the GTS. Observations from marine platforms are transmitted in one of two formats: the SHIP code, used for most observations from ships, moored buoys and other fixed platforms, and the BUOY code, used mostly for observations from drifting buoys. In this report, the term "ship observations" refers to those received in the SHIP code and the "drifting buoy observations" to those received in BUOY code. The SHIP code indicates whether the observation was made manually or by an automatic system and accordingly the sub-divisions "manual ship" and "automatic ship" will be defined.

3.1 Pressure

In the six-month period, January to June 2014, 4939909 observations of pressure were monitored at Exeter from 2363 manual ships, 978 drifting buoys, and 649 automatic ships. The number of reports received from individual ships varies greatly as Table 1 demonstrates: apparently a large percentage of ships continue to report only once, which may be due to erroneous call signs, caused by errors in the part of the message giving the ship identifier. A comparison with the corresponding table in report number 50 shows small increases in the number of manual and automatic ships and fixed buoys reporting, but another quite large increase in the number of drifting buoys reporting during the period (following a large decrease from report number 48). Since most marine observations are located in the northern hemisphere, there is inevitably some seasonal variation in the number of vessels reporting, especially in the case of buoys, since new or replacement buoys are generally deployed in better weather conditions. Considering the general trends over previous reports, there continues to be a slow decline in the number of manual ships reporting, whereas the number of drifting buoys reporting has returned to values close to the peak reached during 2010 and 2011.

Table 2 and Figure 1 show the number of observations of pressure that have been received over the GTS at the Met Office and processed, over past 6-month periods. It can be seen that the total number of observations remained fairly steady with only minor fluctuations until report number 11 (January-June 1994). Since that time however, there has been a steady increase in the total up to 2008, with the number of observations of pressure nearly doubling between reports 11 and 16 (1994-1996) and doubling again between reports 33 and 40 (2005-2008). The first increase was largely due to the increase in number of drifting buoy reports, due to the larger number of reports from each drifting buoy. The second increase was due to increased numbers of both drifting buoys and automatic ships, with the number of reports from manual ships remaining fairly constant over recent years, despite the slow reduction in the number of manual ships reporting pressure. The number of reports from drifting buoys seems to have peaked through 2008-2011, with a decrease of ~25% from 2011 to 2013, but the numbers have increased again now to the 2011 value. Reports from drifting buoys now account for 55% of the total, while those from manual ships make up just 10% of the total, and those from automatic ships account for the remaining 35%. The sudden increase seen in the number of automatic ships in report number 19 (January-June 1998) was due to observation processing changes at the Met Office, whereby all reports from 'automatic ships' began to be processed, rather than only one report per 6hour assimilation period, as previously. From 1998 through to 2011 there was a fairly steady increase in the total number of pressure reports from automatic ships, but that increase seems to have stopped since 2011.

A histogram of O-B differences for all ship pressure reports in the period January to June 2014 is shown in Figure 2a, together with the Gaussian distribution with the same mean and standard deviation. Although almost all values fall within the range +5 to -5 hPa, a small number of much larger values, presumably resulting from erroneous observations, contribute to the large standard deviation of the population. The distribution for all those observations which fail the automatic quality-control checks is broad (Figure 2b). The remaining 94% of the observations, that pass the quality checks, show a distribution of O-B which is very close to Gaussian (Figure 2c) with mean 0.0 hPa and standard deviation 1.0 hPa. The principal contribution to the standard deviation is assumed to be from background and representativeness errors.

A global estimate of the background error, such as that provided above, can conceal large spatial variations. Background values will be more accurate in data-rich areas (e.g. in the North Sea or Mediterranean) or where the meteorological variability is low (e.g. the tropics). Figures 3 and 4 show the geographical distributions of the mean and standard deviation of the values of O-B from ship observations that passed the quality control checks, calculated for 10-degree latitude-longitude boxes. In most areas, the magnitude of the mean is less than 0.5 hPa, the exceptions being generally where the sample size is small. The standard deviation is generally in the range 0.5 to 1.5 hPa. The number of ship pressure reports that passed the quality control checks are shown in Figure 5.

Table 3 contains a list of those ships and drifting buoys considered to have produced suspect observations of pressure in the period January to June 2014. Values over the six-month period are given for the number of observations of pressure available for Met Office global model runs, the number of observations differing from the model background value by more than 15 hPa (gross errors), and the mean and standard deviation of the model O-B. The number of times the identifier has appeared on the monthly suspect lists from the five monitoring centres is also given. In order to give a detailed picture of the frequency of reporting and any changes in the observation accuracy, 6-month time-series of O-B differences are given at the end of the report for each of the identifiers listed.

Most of the errors identified here (as seen in the time-series charts) can be attributed to a bias in the observed pressure. In some cases the bias is constant over most of the monitoring period; although some values depart greatly from the sample mean due to some gross errors in the observation. In fewer cases there are regular large random departures from background. Those observing platforms listed in Table 3 which appeared in report number 50 (July to December 2013) have been indicated with an asterisk.

Statistics for those marine observing platforms listed in report number 50 and which do not appear in Table 3b, are given in Table 4 along with comments on the quality of their pressure observations. Time-series of the pressure observations from these platforms are not given. Less than 40 reports were received in the 6-month period for some of these platforms, but the other 62% of platforms on the list have shown some improvement in the quality of their observations.

3.2 Wind

Monitoring observations of wind is more problematical than pressure. On most observing platforms, wind is measured using anemometers; the reported speed depends upon the averaging period and instrument height above sea level, which varies a great deal between platforms. Since large structures distort wind flow, the anemometer position relative to the wind bearing and platform structure affect the measurement. (These factors do not apply to those ship observations where wind speed is based on visual estimates of the sea state.)

In these monitoring results, the background winds are valid at a height of 10 metres above mean sea level; rather lower than the average height of ship anemometers. Where anemometer height is much different from 10 metres, a significant O-B speed bias may be evident. Examples of this are (i) observations from oil rigs or tankers with anemometer heights of 50m or more, although the wind speeds reported by most rigs are now adjusted on board to be nominal 10m values, and (ii) buoys, where the anemometer can be as low as 2m.

In the period January to June 2014, 2162373 wind observations were available for monitoring at the UK Met Office, from 2372 manual ships, 28 drifting buoys, and 623 automatic ships (more detail is given in Table 1). The number of reported manual ship identifiers shows the same trends as for pressure, but with slightly more identifiers reporting wind.

Histograms of O-B differences for ship observations of wind speed are presented in Figures 2d, 2e and 2f and of wind direction in Figures 2g, 2h and 2i. As with observations of pressure, those wind observations that fail the quality-control checks differ most from the background, some by as much as 50 ms⁻¹, and they make a large contribution to the variance of O-B. The distributions of O-B wind speed and direction for the remaining 93% of the observations are nearly Gaussian, with a speed bias of 0.4 ms⁻¹ relative to the background and a direction bias of just 0.6°.

Figures 6 and 7 show the geographical distributions over the six-month period of the mean and standard deviation of O-B for ship observations of wind speed that pass the quality-control checks. The numbers of wind reports used to generate these statistics are presented in Figure 8. The standard deviation of O-B wind speed is typically about $2ms^{-1}$ in middle latitudes and around $1.5ms^{-1}$ in the tropics. The |bias| is generally less than $1ms^{-1}$, but exceeds $2ms^{-1}$ in a few places. Similar distributions of the mean and standard deviation of O-B wind direction are shown in Figures 9 and 10. Only reports where both the observed and background wind speeds are greater than 5 ms^{-1} were used to obtain these values. The magnitude of the bias is less than 5 degrees in most places, but is greater than 10 degrees in a few data sparse areas. The standard deviation is generally between 15 and 30 degrees globally, but in some data-sparse areas and near some coasts it is greater 40 degrees. The numbers of reports of wind direction used to generate these statistics are presented in Figure 11.

Figures 6-11 provide reference values against which to compare the O-B characteristics for different marine observing platforms. Table 5 contains a list of those ships and drifting buoys considered to have produced suspect observations of wind speed in the period January to June 2014, and in Table 7 a similar list is provided for wind direction. Values are given for the number of observations of wind received at the Met Office, the number of observations having a vector difference from background of more than 25 ms^{-1} (gross errors), and the mean and standard deviation of O-B. Time-series of O-B are given at the end of the report for each listed identifier. In the majority of the cases of suspect speed observations, a constant bias is clearly evident. Errors in observations of direction are more random in nature. Tables 6 and 8 contain statistics for platforms reporting in ship code which are not included in Tables 5 and 7 but that were listed in the previous report, for wind speed and direction respectively. Time-series for these identifiers are not included in this report.

3.3 Sea-surface temperature

In the 6-month period January to June 2014, a total of 7338665 observations of SST were monitored at the Met Office, from 1960 manual ships, 1796 drifting buoys and 590 automatic ships. Of the total, 342903 were from manual ships, 5425837 from drifting buoys and 1569925 from automatic ships. (More detail is given in Table 1.) For the same reasons as stated for pressure observations, it appears that many ship identifiers report only once during the 6-month period. There are similar numbers of manual ships reporting SST as there are drifting buoys and automatic ships combined, but manual ships account for only about 5% of the total number of observations. This is due to the greater frequency of automatic ship and buoy observations, hourly in many cases, with manual ships tending to report only at the main synoptic hours.

Histograms of O-B differences for all ship SST reports are shown in Figures 2j, 2k and 2l. As with observations of pressure and wind, those SST observations that fail the quality-control checks differ most from background and make a large contribution to the variance of O-B. The distribution of O-B SST for the remaining 86% of the observations is nearly Gaussian, with a bias of just 0.2°C relative to the background and a standard deviation of 0.7°C.

Figures 12 and 13 show the geographical distributions over the 6-month period of the mean and standard deviation of O-B for ship observations that passed the quality control checks. The numbers of reports used to generate these statistics are presented in Figure 14. The bias is generally less than 0.5°C and the standard deviation is around 1°C.

Table 9 contains a list of the ships and drifting buoys considered to have produced suspect observations over the 6-month period. The comments given in each case provide an indication of the main reason for the station to be listed as suspect; time-series charts have also been plotted for SST and are included at the end of the report. The majority of the identifiers appearing on the list do so because of bias. Table 10 gives details of the performance over the latest 6-month period of ships which were considered suspect in the previous period but which do not appear in Table 9.

4. SUMMARY

There are 36 marine observing platforms listed as producing suspect observations of pressure over the period January to June 2014, 91 as producing suspect wind observations and 64 as producing suspect SST observations. The first report issued by RSMC Bracknell, for the period January to June 1989, listed 150 marine platforms producing suspect observations of pressure. With the selection criteria remaining unchanged, an initial reduction in the number of platforms listed as suspect was followed by a series of reports listing similar numbers of suspects, around 80. There was an increase in suspect numbers during 1999 and 2000, then the numbers fluctuated around an average of 130 through to the end of 2008; they dropped slightly during 2009 and have averaged about 70 until 2012, since when they have dropped further. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to be little overall trend in observation quality, as measured by the percentage of suspect platforms; although there are signs of some improvement in quality over the past few years.

For wind observations, over the years up to 2002 there was a tendency for a small increase in the number of wind observing platforms listed as suspect, then the numbers fluctuated between about 100 and 150 until 2008. There was a slight decrease in the number of suspect wind platforms up to 2010 and since then the number has averaged about 75.

The number of SST observing platforms listed as being suspect has been fairly constant since 2007, averaging about 60, following a decrease in numbers from a high value of 225 in 2005.

The most common characteristic in the case of identifiers listed as producing suspect pressure observations is bias in the reported pressure, sometimes remaining constant for many months. In the case of wind suspects, the most common reason for listing a platform is either a bias in the reported wind speed or a large standard deviation in wind direction, with fewer having a bias in wind direction. For sea-surface temperature observations, bias is again the most common cause of error.

The selection criteria have been set appropriately to ensure that the platforms listed are only those for which there is a high degree of confidence in their reports having errors. There are many others, not listed here, for which there must be considerable doubt over the quality of the observations. A wider range of monitoring results is available from the Met Office on request.

TABLE 1: FREQUENCY DISTRIBUTION OF THE NUMBER OF REPORTS OF PRESSURE, WIND AND SEA SURFACE TEMPERATURE FROM INDIVIDUAL IDENTIFIERS AVAILABLE FOR MONITORING AT EXETER, JANUARY TO JUNE 2014.

Number	Number of manual			Numb	oer of d	rifting	Number of automatic			
of	shi	ps repo	rting	buoy	ys repo	rting	ships reporting			
reports	Press.	Wind	SST	Press.	Wind	SST	Press.	Wind	SST*	
1	234	236	156	1	2	5	38	41	41	
2-10	302	307	279	8	0	9	20	21	18	
11-20	159	164	149	4	1	9	9	8	6	
21-40	221	224	215	2	0	6	8	11	14	
41-100	500	501	412	15	1	20	10	12	12	
101-200	444	454	346	27	1	40	24	26	20	
201-500	366	361	294	41	3	126	30	36	42	
501-1000	52	49	48	94	1	180	46	50	64	
1001-1500	19	22	19	76	5	148	55	55	40	
1500+	66	54	42	710	14	1253	409	363	333	
Total	2363	2372	1960	978	28	1796	649	623	590	
(Report 50)	(2283)	(2299)	(1931)	(811)	(32)	(1609)	(640)	(640)	(611)	

 * numbers are for fixed buoys only

TABLE 2: NUMBER OF OBSERVATIONS OF PRESSURE RECEIVED AT EXETER ON THE GTS FOR EACH OF THE 6-MONTH PERIODS COVERING THESE WMO REPORTS

	WMO	Number of Observations							
Period	report	Manual	Drifting	Automatic	Total				
	number	ships	buoys	ships	Total				
Jan - Jun 1989	1	424087	174971	40082	639140				
Jul - Dec 1989	2	421315	151972	58016	631303				
Jan - Jun 1990	3	424335	177927	63847	666109				
Jul - Dec 1990	4	412430	205488	71146	689064				
Jan - Jun 1991	5	364760	177069	64401	606230				
Jul - Dec 1991	6	348710	148604	68456	565770				
Jan - Jun 1992	7	332443	216872	73893	623208				
Jul - Dec 1992	8	336958	247873	80862	665693				
Jan - Jun 1993	9	340293	288208	77317	705818				
Jul - Dec 1993	10	348082	316261	88650	752993				
Jan - Jun 1994	11	334134	279963	111928	726025				
Jul - Dec 1994	12	383760	305618	142468	831846				
Jan - Jun 1995	13	369781	407111	124537	901429				
Jul - Dec 1995	14	394016	528938	138653	1061607				
Jan - Jun 1996	15	430162	566035	122909	1119106				
Jul - Dec 1996	16	477928	621869	133221	1233018				
Jan - Jun 1997	17	446530 623835		122178	1192543				
Jul - Dec 1997	18	453399	684292	140227	1277918				
Jan - Jun 1998	19	426622	700743	423217	1550582				
Jul - Dec 1998	20	443548	700239	497313	1641100				
Jan - Jun 1999	21	432506	697983	466311	1596800				
Jul - Dec 1999	22	448996	771624	500070	1720690				
Jan - Jun 2000	23	443023	772510	455799	1671332				
Jul - Dec 2000	24	4//828	829588	329588 512338					
Jan - Jun 2001	25	458345	/84686	465887	1/08918				
Jul - Dec 2001	26	4/388/	914/44	554002	1942633				
Jan - Jun 2002	27	443876	1111699	51/200	20/2//5				
Jul - Dec 2002	28	544433	952313	595959	2092705				
Jan - Jun 2003	29	432672	994877	506185	1933734				
Jul - Dec 2003	30	4/3591	1128039	605241	2206871				
Jan - Jun 2004	31	435824	1092461	596495	2124780				
Jul - Dec 2004	32	434160	1113527	724014	22/1/01				
Jan - Jun 2005	33	4/1113	1221528	717207	2409848				
	34 25	4/2000	1750070	83/39/ 700705	2833900				
Jan - Jun 2006	35	436847	1/082/0	/92/65	3007888				
	30 97	44/4/4	10333/0	9/0000	3230403				
Jul Doc 2007	31 20	410070	194/900	9904/4 1116750	2020230				
Jui - Dec 2007	30 20	404012	2203113	1156069	2000/67				
Jul - Dog 2009	<u>79</u>	444200 121512	2391240	1315606	3990407 1102027				
JUI - DEC 2008	40	401313	2003/20	1313090	4402937				

continued ...

	WMO	Number of Observations								
Period	report	Manual	Drifting	Automatic	Total					
	number	ships	buoys	ships						
cont										
Jan - Jun 2009	41	466628	2551270	1201762	4219660					
Jul - Dec 2009	42	452548	2473739	1381174	4307461					
Jan - Jun 2010	43	442069	2606292	1325666	4374027					
Jul - Dec 2010	44	534594	2730518	1563232	4828344					
Jan - Jun 2011	45	470337	2631956	1608822	4711115					
Jul - Dec 2011	46	545536	2651020	1889732	5086288					
Jan - Jun 2012	47	515154	2242441	1687722	4445317					
Jul - Dec 2012	48	491700	2331570	1899860	4723130					
Jan - Jun 2013	49	457038	1723955	1646432	3827425					
Jul - Dec 2013	50	484885	2042223	1896909	4424017					
Jan - Jun 2014	51	470934	2707428	1761547	4939909					

TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2014.

Column	1	Call sign or identifier.
Column	2	Number of pressure observations available for
		monitoring over the 6-month period, excluding
		duplicates, but including any observations with
		gross errors.
Column	3	Number of pressure observations differing by more
		than 15 hPa from background (gross error).
Column	4	Standard deviation of observation-minus-background
		differences excluding cases of gross error.
Column	5	Mean of observation-minus-background differences
		(bias) excluding cases of gross error.
Columns	6-10	Number of times observing platform has appeared on
		suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance,
		T=Tokyo, W=Washington.
Column	11	Comments on quality of pressure observations.
Notes:	1.	Units are hPa.
	2.	Observing platforms marked with an asterisk were
		listed in the previous report July to December

Table 3a: Platforms reporting in BUOY code

2013)

i): Platforms non-operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments
13972	48	48			1 0 1 0 0 GE
15635	161	62	1.8	6.2	1 1 1 1 0 Bias
23967	550	140	4.6	2.1	1 0 0 1 0 Bias
26543	1175	1175			2 2 0 0 0 GE
33567	167	58	3.4	-9.3	1 1 1 1 0 Bias
46540	1140	375	0.6	0.4	1 1 1 1 0 GE
54955	152	3	2.7	4.7	1 0 1 1 0 Bias
56558	96	28	4.3	1.4	1 1 1 1 0 GE
72514	148	53	5.8	5.3	1 1 1 1 0 Bias
73650	571	77	6.4	-0.2	1 1 1 1 0 SD

ii): Platforms operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments

Identifier	N Obs.	NGE	SD	Bias	В	Ε	F	Т	W	Comments
31262 *	1630	1630			3	3	0	0	0	GE
3FOC5	61	1	2.5	-4.1	1	0	1	0	0	Bias
3FYO6	51	0	3.0	3.9	1	0	1	0	0	Bias
62087	891	201	6.3	-0.4	1	2	1	1	0	SD
C6ZL6	58	0	12.0	2.0	0	0	0	0	0	Bias
ELPP9	80	0	2.7	-3.7	2	0	2	0	0	Bias
FKWL	55	0	1.5	4.3	1	0	1	0	0	Bias
HQTEST	293	0	0.6	-12.5	1	0	0	0	0	Bias
IBJD	53	2	4.2	-6.5	1	0	1	1	0	Bias
UASU	56	18	2.0	-1.0	1	0	1	0	0	GE
	05					~		•	•	
	95	1	3.6	-4.2	1	0	1	0	0	Bias
UBXS *	125	106	0.7	14.2	0	0	0	0	0	Bias
UCTS *	137	39	3.5	4.0	2	0	2	0	0	Bias & GE
UDKG	43	8	7.2	-2.7	1	0	1	0	0	SD
UDYG	94	64	1.3	0.8	2	0	1	0	0	GE
	10	0	0.4	0.0		~	4	~	~	
	42	0	2.4	-3.9		0	1	0	0	Blas
	64 75	0	6.4 7.0	-4.7	0	0	0	0	0	
VRHE3	/5	0	7.2	0.2	0	0	0	0	0	SD & blas
VRKX8	40	0	1.4	-5.9	0	0	0	0	0	Blas
VRWK5	41	2	2.9	5.6	1	0	1	0	0	Bias
	60	0	50	0.0	4	0	4	0	0	SD
	2008	500	0.0 E 1	0.0		0	1	0	0	Biog
	2008	- 203 ₁	D.1	-2.4	4	2	4	0	0	Dias
	93		2.2	3.8		0	0	0	0	
	156	9	6.9	0.3	3	0	2	0	0	
WWMZ	45	1	3.1	/.4	1	0	1	0	0	Bias

TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2013.

Column	1	Call sign or identifier.						
Column	2	Number of pressure observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.						
Column	3	Number of pressure observations differing by more than 15 hPa from background (gross error).						
Column	4	Standard deviation of observation-minus-background differences excluding cases of gross error.						
Column	5	Mean of observation-minus-background differences (bias) excluding cases of gross error.						
Column	6	Comments on quality of pressure observations.						
Notes:	1.	Units are hPa						

Identifier	N Obs.	NGE	SD	Bias	Comments
AUTR	24	0	1.7	5.6	Less than 40 reports
AUYN	43	0	1.1	-0.4	Reduced GE
AVLQ	23	0	2.1	-0.9	Less than 40 reports
C6ZI9	414	10	4.1	2.2	Reduced SD
CFK9698	7	0	2.0	-4.1	Less than 40 reports
ICGU	232	0	1.0	-0.1	Reduced SD
LAOW5	58	0	1.9	-0.8	Reduced bias
OUJN2	32	0	1.3	1.7	Less than 40 reports
UAEV	187	39	3.7	-0.6	Reduced SD
UCJX	26	0	4.1	4.0	Less than 40 reports
UCUC	88	0	1.3	-1.3	Reduced bias
UFJN	50	0	1.1	-3.3	Reduced SD
V7JX5	54	14	2.3	1.0	Reduced bias & SD
VCTV	2	2			Less than 40 reports
VGMV	14	0	4.4	1.5	Less than 40 reports
VRDT7	100	1	4.8	-1.2	Reduced bias
VRJZ9	263	1	2.0	1.2	Reduced SD
WC5932	690	1	1.3	2.5	Reduced SD
WCX9104	38	0	4.6	5.0	Less than 40 reports
WDB7815	504	2	1.8	-0.4	Reduced bias
WXY6216	2592	9	3.6	0.6	Reduced bias

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TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2014.

- Column 2 Number of wind speed observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
- Column 3 Number of wind observations with vector difference from background of more than 25ms $^{-1}$ (gross error).
- Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.
- Column 5 Mean of observation-minus-background differences (bias) excluding cases of gross error.
- Column 6-10 Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
- Column 11 Comments on quality of wind speed observations.
- Notes: 1. Units are ms⁻¹
 2. Observing platforms marked with an asterisk were
 listed in the previous report (July to December
 2013)

Table 5a: Platforms reporting in BUOY code

i): Platforms non-operational at the end of the reporting period

Identifier N Obs. NGE	SD	Bias B E F T W Comments
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ii): Platforms operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments

Table 5b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	ΒΕΙ	FΤ	W	Comments
31053	3995	0	3.2	-7.3	660	66	-	Bias
62087	2200	1	3.6	-7.0	4 6 4	4 0	-	Bias
CGCX [*]	[•] 1419	0	4.5	-6.8	30	30	-	Bias
SYSV	70	0	6.0	5.9	10	10	-	Bias & SD
UDKG	44	5	6.6	3.0	0 0 0	0 0	-	SD

TABLE 6: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 5 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2013.

Column	1	Call sign or identifier.
Column	2	Number of wind speed observations available for
		monitoring over the 6-month period, excluding
		duplicates, but including any observations with
		gross errors.
Column	3	Number of wind observations with vector difference
		from background of more than $25 \mathrm{ms}^{-1}$ (gross error).
Column	4	Standard deviation of observation-minus-background
		differences excluding cases of gross error.
Column	5	Mean of observation-minus-background differences
		(bias) excluding cases of gross error.
Column	6	Comments on quality of wind speed observations.
Notes:	1.	Units are ms ⁻¹

Identifier	N Obs.	NGE	SD	Bias	Comments
31262	1639	0	1.4	-2.8	Reduced bias
UFJN	49	0	1.7	0.7	Reduced SD

TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2014 .

- Column 1 Call sign or identifier.
- Column 2 Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
- Column 3 Number of wind observations with vector difference from background of more than 25ms^{-1} (gross error).
- Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.
- Column 5 Mean of observation-minus-background differences (bias) excluding cases of gross error.
- Column 6-10 Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
- Column 11 Comments on quality of wind direction observations.
- Notes: 1. Units are degrees ($^{\circ}$).
 - 2. Observing platforms marked § had a significant speed bias at some time within the period and the statistics and their plots refer to direction reports associated with background wind speeds greater than 5 ms⁻¹. If no significant speed bias was present, the statistics and plots refer to direction reports with an observed speed greater than 5 ms⁻¹.
 - Observing platforms marked with an asterisk were listed in the previous report (July to December 2013)
- Table 7a: Platforms reporting in BUOY code

i): Platforms non-operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	BEFTW	Comments
48533	70	1	36.5	40.5	5 0 0 0 5 Bias	

ii): Platforms operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	В	Ε	F	Τ	W	Comments
48597	2829	6	41.9	75.3	6	0	0	0	2	Bias
48598	1724	0	37.8	54.5	2	0	0	0	0	Bias

Table 7b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	BEFTW	Comments
23002	426	0	27	-52.3		Bias
23170	694	0	54.4	-30.8		Bias
23492 *	568	0	44.9	42.2		Bias
31051 *	394	1	115.6	26.1		SD
31260	1789	0	59.1	58.3		Bias
3FFL8	69	1	93.3	3.6		SD
3FTO6	220	6	88.8	35.2		Bias + SD
3FZO8 *	122	0	51.7	-31.5		Bias
45022	1833	0	70.9	47.2		Bias + SD
45027 *	1007	0	41.3	-32.3		Bias
45136	164	0	92.5	11.7		SD
45166 *	3649	0	36.8	45.6		Bias
46092	2449	0	44.2	-56.1		Bias
46131	4036	0	46.9	68.2		Bias
4XFV	73	0	66.3	-10.3		SD
50005	2000		20 7			C :
53005	2066	0	29.7	-64.8		Bias
53040	2010	0	163.9	-8.4		SD
53056	2079	0	157.4	22.6		
53057	6/1 1055	0	156.5	44.9		Blas + SD
62086	1855	109	107.2	20.6		5D
аніса	1056	0	54.4	-116		Rias
94169	1050	0	102.5	-41.0		SD
OK/WH	113	0	62	3 1		SD
9V7956	88	0	75.9	-23.3		SD
9V9144	74	0	64.2	-11.2		SD
0.01		Ŭ	0			00
9V9746	639	0	65.8	-0.2		SD
9VAX2	82	0	68.8	-12.3		SD
9VKQ2	107	0	72.2	-5.9		SD
A8HO3	130	0	60.1	-9.9		SD
A8NF2	122	2	100.6	-10.6		SD
A8PQ7	129	0	67.7	-10.4		SD
A8PX5	133	3	93.6	11.2		SD
A8RW5	127	0	64.2	21.7		SD
A8SC4	83	0	72.1	-24.1		SD
A8VG3	64	0	71.8	10.7		SD
C6AB8	173	2	68.8	-16		SD
C6QK	71	0	70.3	-32.9		Bias + SD
CGCX	698	0	92.8	-10.9		SD
DDSC2	217	14	84.1	34.3		Bias + SD
DVRF	242	0	52.7	-52.1		Bias

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments
continued					
H3VR	64	0	44.8	-35.6	Bias
H9XE	122	0	62	10.6	SD
J8NW	29	0	70.4	-26.7	SD
J8NY	137	0	62.7	-8.1	SD
J8PB	183	0	58.5	-38.8	Bias
J8PD *	115	0	25.4	-85.6	Bias
J8PE4 *	523	1	51.4	-49.8	Bias
KCDK	182	0	60.3	-31.2	Bias + SD
LAQJ7	174	0	60.7	-1.4	SD
LAVW4	160	1	62.4	-0.6	SD
MHNN5	96	0	73.7	-5.6	SD
MMER9	217	2	60.1	-4.8	SD
MVQP8	175	1	64.6	-7.5	SD
MYSU5	237	8	62.4	-3.8	SD
ONFI *	104	0	66.8	-5.5	SD
OXBB2	242	1	62.9	39.7	Blas + SD
PCCL	98	0	63.5	14.8	SD
PENR	148	7	80.2	-16.4	SD
S6ES6	1609	1	68.5	2.8	SD
S6NK3	87	1	57.2	-32.9	Bias
	- 120	0	65.2	21 /	Rigg & SD
	230	0	05.5 61	51.4	Blas + 3D
	00	2	547	-5 412 1	Bias
	84 176	0	54.7	42.2 E 2	BIAS
UFLC	251	0	07.0 64.7	-5.5	50 80
UFLI	251	0	64.7	-8.9	50
UISD	86	0	60.5	5.4	SD
V7AT9	48	0	67.9	21.3	SD
V7UT8	237	4	78	9	SD
VBB02	144	1	60.4	-16.2	SD
VRCO2	80	0	60.6	_9	SD
		Ŭ		, j	-
VREF5	114	0	61.4	-20.6	SD
VRFI2	137	0	63.8	-7	SD
VRGN7	93	0	69.1	-1.9	SD
VRGO2	100	0	64.8	10.7	SD
VRKC8	142	1	63.1	-5.2	SD
VRWS4	89	0	61	0.1	SD
VRWY9	81	0	63.7	-21.3	SD
VRZZ2	57	0	44.3	-32.3	Bias
WBN4113 *	436	0	60.5	-16.9	SD
WBP3210 *	1505	9	64.5	6.8	SD
	2002		70.4	6.0	
WCX/445	2002	4	/9.4	-6.8	SU Biog
	160	1	51.9	-42	Bias
	166	5	65.2	-10.3	
WIEF *	/13	0	80.3	-27.9	SU

TABLE 8: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 7 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2013.

- Column 1 Call sign or identifier.
- Column 2 Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
- Column 3 Number of wind observations with vector difference from background of more than 25ms $^{-1}$ (gross error).
- Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.
- Column 5 Mean of observation-minus-background differences (bias) excluding cases of gross error.
- Column 6 Comments on quality of wind direction observations.
- Notes: 1. Units are degrees (°)

Identifier	N Obs.	NGE	SD	Bias	Comments
3ETA7	485	8	57.7	3.4	Reduced SD
3EZP7	1	0	0	3.9	Less than 40 reports
3FAV5	70	0	50.3	3.2	Reduced SD
46053	1835	0	42.8	-26.9	Reduced bias
9VHG	574	0	44.6	2.1	Reduced SD
A8EH3	69	0	60.9	11.7	Reduced bias
A8IY2	105	0	42.6	14.4	Reduced SD
A8OH5	107	0	31.9	8.8	Reduced bias
C6NI8	146	1	58.4	-21.5	Reduced SD
DDYL2	150	0	22.5	1.7	Reduced SD
DQVH	234	0	37.6	-4.9	Reduced SD
MZDL7	47	0	41.4	1	Reduced SD
NRLY	120	0	33.3	-17.5	Reduced SD
ONGA	208	0	51.6	-5.2	Reduced SD
OZDB2	183	0	55.9	10	Reduced SD
SBPQ	2903	0	31.4	4.4	Reduced SD
IBWUK31	390	0	53.5	5.5	Reduced SD
UBZG2	6/	0	44.3	7.9	Reduced SD
UCAD	58	0	49.4	-9	Reduced SD
UFIVIK	68	0	55.1	7.6	Reduced SD
VRDF2	222	0	37.3	3.7	Reduced SD
VRDO9	3	0	58.5	-27.6	Less than 40 reports
VRJM7	117	0	50.3	13	Reduced bias
VRKM2	83	2	56.2	-12.7	Reduced SD
VRLQ3	61	0	57.7	-3.1	Reduced SD
WDG8555	222	1	50.1	-7.6	Reduced SD
ZCDU9	129	0	39.9	0.5	Reduced SD
ZCDY2	289	0	35.2	-8.6	Reduced SD
ZCEG4	95	0	51	0.1	Reduced SD
ZQCP3	130	0	20.1	0.9	Reduced SD

- TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2014.
 - Column 1 Call sign or identifier.
 - Column 2 Number of sea-surface temperature observations available for monitoring over the six-month period, excluding duplicates, but including any observations with gross errors.
 - Column 3 Number of sea surface temperature observations differing by more than 10 °C from background (gross error).
 - Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.
 - Column 5 Mean of observation-minus-background differences excluding cases of gross error.
 - Columns 6-10 Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
 - Column 11 Comments on quality of sea surface temperature observations.
 - Notes: 1. Units are °C 2. Observing platforms marked with an asterisk were listed in the previous report (July to December 2013)
 - Table 9a:Platforms reporting in BUOY code
 - i): Platforms non-operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	В	Ε	F	Т	W	Comments
11902	178	178			1	-	1	-	0	Bias/GE
13574	755	337	0.1	0.1	1	-	1	-	0	Bias/GE
13587	233	233			1	-	1	-	0	Bias/GE
14924	965	255	3.3	-1.7	1	-	1	-	0	Bias/GE
22716	57	1	2.6	-5.1	0	-	1	-	0	Bias
23660	1238	51	4.0	-1.6	1	-	0	-	0	SD
25618	4317	1679	4.0	-4.3	5	-	1	-	0	Bias
25650	3026	1754	1.1	-8.3	5	-	0	-	0	Bias
26538	1294	9	3.9	-0.8	1	-	1	-	0	Bias
31507	1005	270	3.5	-2.4	1	-	1	-	0	Bias
31533	543	3	4.3	3.8	1	-	0	-	0	Bias
31868	1163	542	0.6	0.1	1	-	1	-	0	GE
33658	244	7	1.1	6.3	2	-	2	-	0	Bias
43567	215	97	0.5	-9.7	1	-	1	-	0	Bias
46540	1147	0	4.7	-3.3	1	-	0	-	0	Bias
48524	237	0	0.7	-6.6	1	-	0	-	0	Bias
48550	1323	618	3.7	5.5	3	-	3	-	0	Bias
55619	74	4	2.8	4.3	1	-	0	-	0	Bias
55634	701	46	3.3	-3.6	1	-	0	-	0	Bias
56560	445	384	0.3	-0.1	1	-	1	-	0	GE
									_	
64931	411	58	3.3	-5.5	1	-	0	-	0	Bias
72514	172	140	0.3	9.6	1	-	1	-	0	Bias

ii): Platforms operational at the end of the reporting period

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments
25605	4307	2817	4.0	-2.4	5 - 0 - 0 Bias
26537	1338	49	4.1	-0.3	1 - 1 - 0 Bias
32627	204	0	0.3	7.9	1 - 0 - 0 Bias
41651	99	56	2.8	2.3	1 - 1 - 0 GE
47580	855	97	2.8	4.0	2 - 2 - 0 Bias

Table9b:

Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B E F T W Comments
45027	1054	0	1.1	-3.0	1 - 0 - 0 Bias
45166	316	0	0.4	4.6	1 - 0 - 0 Bias
46199 *	144	144			0 - 1 - 0 GE
9V8798 *	138	5	1.5	5.6	3 - 2 - 0 Bias
A8AX8	61	0	1.0	-3.1	1 - 0 - 0 Bias
A ON 41A/O *	010	0	1.0	0.0	
A8IVIV8 A8SC4 *	∠18 Ω1	0	1.3	3.2	4 - 5 - 0 Blas
	60	1	21	-3.0	0 - 0 - 0 Bias
BATEB12	1062	0	0.6	4.0	6 - 5 - 0 Bias
C6FY8	68	36	1.3	1.4	1 - 1 - 0 GE
C6RM7 *	54	0	1.0	-2.9	0 - 0 - 0 Bias
C6YZ5	154	0	2.1	-3.5	1 - 2 - 0 Bias
CFO383	71	71			1 - 0 - 0 GE
	214	0	1.5	3.6	4 - 4 - 0 Bias
DCCM2 *	47	0	0.7	3.0	0 - 0 - 0 Bias
DGTX	481	0	16	3.1	3 - 4 - 0 Bias
FLWG7	171	0	2.3	3.1	2 - 2 - 0 Bias
HO7723	48	0	1.6	-3.2	0 - 0 - 0 Bias
ICIC	235	0	3.3	-3.1	3 - 3 - 0 Bias
J8PB *	167	0	1.1	3.8	3 - 3 - 0 Bias
KGTZ	127	68	3.0	-0.6	3 - 0 - 0 GE
	1297	127	5.0	-3.0	5 - 4 - 0 Blas
	60	0	1.8 2.1	3.0	
	135	42	2.1	-3.3	1 - 1 - 0 Bias
0010	100	42	0.0	-0.0	
UDKG	52	0	2.4	4.5	1 - 1 - 0 Bias
V2OB9 *	290	0	1.9	4.4	3 - 3 - 0 Bias
VCRG	422	0	1.2	3.5	2 - 4 - 0 Bias
VREO9	202	2	2.8	3.2	4 - 4 - 0 Bias
VYNG	77	4	3.3	5.1	2 - 2 - 0 Bias
	1019	1015	0.2	0.0	3 0 0 CE
WDF919 *	1010	31	0.5	9.0 -0.3	2 - 0 - 0 GE
WDF3296	76	4	20	4 2	2 - 2 - 0 Bias
WL3108 *	1334	1334			3 - 0 - 0 GE
WOSI	58	0	3.5	-3.4	2 - 0 - 0 Bias
WZJD	487	1	1.5	-3.5	5 - 5 - 0 Bias
WZZF	123	0	1.1	3.1	3 - 2 - 0 Bias

TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2013.

Column	1	Call sign or identifier
Column	2	Number of sea-surface temperature observations
		available for monitoring over the 6-month period,
		including any observations with gross errors.
Column	3	Number of sea surface temperature observations
		differing by more than 10 °C from the background
		(gross error).
Column	4	Standard deviation of observation-minus-background
		differences excluding cases of gross error.
Column	5	Mean of observation-minus-background differences
		excluding cases of gross error.
Column	6	Comments on quality of sea surface temperature
		observations.

Notes: 1. Units are °C

Identifier	N Obs.	NGE	SD	Bias	Comments
9V7962	272	5	3.2	-2.5	Reduced bias
9V8472	63	5	3.5	-0.9	Reduced bias
9VHG	172	8	3.4	-1.7	Reduced bias
A8IX8	32	1	0.7	-3.6	Less than 40 reports
A8KC6	180	0	1.2	1.8	Reduced bias
AUYP	8	0	1.5	-2.4	Less than 40 reports
C6FN4	132	2	1.6	-1.7	Reduced bias
CCCH	3	0	1.4	-4.5	Less than 40 reports
DCDO2	2	0	0.4	4.7	Less than 40 reports
KIRH	443	6	2.5	-0.2	Reduced bias
S6JO	64	4	4.6	-0.3	Reduced bias
S6NK5	307	26	3.5	-2.0	Reduced bias
S6TF	146	1	2.7	-0.4	Reduced bias
UCJB	37	0	5.0	1.2	Less than 40 reports
VMGO	144	0	2.5	-2.9	Reduced bias
VRET5	3	0	0.0	0.7	Less than 40 reports
VRJS2	46	0	2.3	2.9	Reduced bias
WADN	68	2	2.2	1.0	Reduced bias
WCX7445	1324	117	3.3	2.8	Reduced bias
WSLH	28	0	1.6	-3.9	Less than 40 reports
WZA4027	1	0	0.0	-3.8	Less than 40 reports
WZD2465	52	0	2.8	-0.5	Reduced bias

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Figure 3: Bias of Ship O-B Pressure (hPa). Date:- January - June 2014 Only observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

		-0.5						e Mare Arresta Arresta				1297 1711	-0.7				-0.2	0.1	0.2	0	-0.3	-0.2	0.2	0	0.8	0.1	0.5	0.9	<u>.</u>				Altress V			
-0.	3	-0.2	-0.6	-0.4			0.2	eendd 4	신상한 도		0.5	0.1	-0.3	-0.4	0.1	-0.1	-0:2	0	-0.1	-0.4	0.1	-0.2	-0.4	0.7	stredy.						••					-0.9
-0.	3	0.2	-0.5	-0.2	-0.2	0		قر حدر	اند. مري <mark>1</mark>	·····		-0.4	- <u>0</u> .1	-0.3	-0.5	-0.1	0.1	0	0	-0.2	-0.4	95 Y											0.1	0	-0.2	-0.7
-0.	4	-0.3	-0.1	0	-0.2	-0.1			0.5	0.4	-0.4	-0.2	0	-0.3	-0.2	0	0.1	0	-0.1	0	-0.1	0.2	1.4		•	en e				-	0.3	-0.4	-0.2	-0.4	-0.4	-0.5
-0.	2	-0.1	-0.3	-0.1	0.2	-0.3	0		-1.2	-0.3	-0.5	-0.4	-0.3	-0.1	-0.1	0.1	0.1	0	0	0	-0.1	-0.1	Č.	- Y 1						0	0.2	-0.2	-0.2	-0.2	-0.2	0
-0.	2	-0.3	-0.2	-0.1	0.1	0.3	0.2	0.3	-0.1	0	0	0	0	0.1	-0.1	0.1	0.1					-0,1	-0.1	0.1	0:3	0.4	-2.4	5.	0.7	0	0.2	0.3	0.3	-0.1	0	0.1
1		0.3	0.2	0.7	0.9	0.9	0.7	0.3	0:2	-0:1	-0.2	-0.6	-0.4	0.1	-0.1	0.2	0.3					0.1	0.1	0.2	0.3	0.3	0.2	0.2	0.4	0.2	0.3	0.5	0.4	0.5	0.2	0.3
1.2	2	0.5	0.7	0.6	0.4	-0.7	0.2	0	0.2	0.2	0.1		-0.2	-0.1	0.2	0	0.2	·- - 0:2-	-0.2					0	0.4	0.4	0.2	0.4	0.5	0.4	0.4	0.3	0.3	0.2	0.8	1
1.1	1	0.6	1	0.9	1.1	0.8	0.7	0.5	0.4	0.5	0.2		,	0.5	-0.4	0.1	0.3	-0.1	-0.3	-0.9		0.7	0.4	0.2	0.1	0.5	0.2	0.5	<mark>0.7</mark>	0.6	0.5	0.5	0.3	0.3	0.8	1
0.7	7	0.7	0.3	0.5	0.3	0.9	0.3	0.2	0.4	0.5	0	·.			-0.1	0	0.1	0.1	0	-0.5		0.1	0.2	0	0.1	0.4	0	0.5	0.6	0.6	0:5	0.4	-0:3	0.5	0.5	0.7
0.5	5	0.6	-0.2	0.4	0.4	0.7	0.4	0.4	0.2	0.1	-0.1			-0.5	0	0	-0.3	-0.2	-0.1	-0.3		-0.2	-0.1	0.2	0	-0.4	-0.7	-1.1	0	0.2			0.5	0.4	0.3	0.6
-0.	2	0.1	0.1	0.7	0.5	1.2	1.1	0.1	0.5	0.6	0	-0.7	- <mark>0.6</mark>	-0.8	-0.4	0.1	0	-0.1	-0.1	-0.2	-0.4	-0.4	-0.3	-0.4	-0.6	-0.1	-0.2	-1.1	0	0	0	0.4	0.1	0	0.2	-0.1
0		0.1	0.3	0.1	0.2	0.4	0.6	0.3	0.4	0.3	-0.1	-0.4	-0.4	-0.1	0	0	0		-0.6	-0.1	-0.5			0.1	0	-0.4				-0.5	0.2	0.3	-0.1	-0.3	-0.1	0.1
				-0.2						-0.3	0```	-0.4	-0.3	-0.2	-0.3	-0.1	0.1		-0.3	-0.3	0				-0.1	-0.4		0.5	-0.2	0.4	0.1	-0.6	0.3	0.2	0.6	0.1
0.4	4	0.6	0.4	0.1				0.6	0.3	0.4	0.4	-0.2	··· 0	-0.2	0.9	0.1	0.3	0.6	0.6	0.3	0.5			.0.8	0.6	0.3	0.4	0.6	-0,4	.0.6	1.2	0.4	0.5	-0.8	0	0.4
		523			··0:5	10.5.	0.6	0	2251 2			89 - <u>)</u> 	0.4	0	0.7	0,5.	0.4	0.5							52										-0.8	-0.7
		•••••	·····	 1.1.1.1.1								2022				-																		~	· · · · · · · · ·	••••••

Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- January - June 2014 Only Observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

													/2.			11114						- 5 3 1													
	1.1						a seri Alto e Attalia					0.6				0.7	0.5	0.5	0.8	0.9	0.9	1.3	2.1	1.6	1.4	1.9	1.6				د	1111 ago 214	2		
0.5	1.3	1	0.8	•••••		0.7	eseradi ar			.0.8	1	0.8	1	0.5	0.7	1	0.6	0.6	0.8	1.1	1.2	1.7	2.4	arredo,							*			······	1.7
1	0.7	0.7	0.9	0.7	0.7	**1=*	در تر	ية 1.	·····		0.9	0.9	1.3	0.9	1.1	0.6	0:7	0.6	07	0.8	. Gr. 21							<u>.</u>			4	1.3	1.4	1.2	0.8
1.3	1.4	1.6	1.5	0.8	0.8			1.2	Â.,	0.9	0,9	0.9	1.3	1.1	1	1	0.7	0.8	0.9	0.9	14	1.9	S	2	er-v					1.1	1.5	1.3	1.3	1.2	1.3
1.5	1.4	1.1	1.1	1	0.7	0.7		0.6	0.6	.0.8	1	1.4	1.2	1	1	1	0.9	0.9	0.9	ند بر 1	0.6								1.7	0.8	1.2	1.2	1.4	1.4	1.6
1	0.6	0.9	1.6	1.6	1.5	1.4	1.1	0.6	0.8	0.9	0.7	0.6	0.7	0.5	0.9	1					1.2	1.1	12	1:3	1	1.7		1.5	1.2	1.3	1.5	1.3	1.2	1.2	1.3
11	0.5	0.6	1.3	1.2	13	1.6	1	1.	0.7	• • •	0.6	0.6	0.5	0.6	0.8	11					1.2		. 11	0.8	0.8	0.6	0.5	1.4	13	1.5	1 /	1.3	13	1.1	1
1.1	0.5	0.0	1.0	1.2	0.0	0.4			1.1	0.5		·	0.0	0.0	0.0	4.4		100			1.2	، <u>کو ان</u> ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ،	- 1.1 	0.0	0.0	0.0	1.0	1.7	1.0		0.7	0.7	0.7	0.5	
1.3	0.5	1.5	1.3	1.4	0.6	0.4	0.8	1.1	1.1	91.1 2		1.5	1.3	1.1	0.8	1.1	- Arth	1.2			Б.	e e e e e e e e e e e e e e e e e e e	1.1	1.1	0.8	0.8	1.2	1.2	1.4	1.5 (11) (12) (12) (12) (12) (12) (12) (12)	0.7	0.7	0.7	0.5	0.6
0.7	1	1.2	1.2	1	0.8	0.7	0.7	1.2	1.1 :	1.1 N			1.4	0,9	0.9	0.7	0.6	0.9	1.1		0.7	0.8	1.2	0.5	0.8	0.8	0.8	1.1	1.3	1.3	1.4	0.8	0,6	0.9	0.6
0.7	1	1	0.7	0.8	0.9	0.9	0.8	1.4	1.5	1.				0.7	1.1	1.1	0.6	1.2	1.1		0:6	8.0	. 0.6	0.7	1.3	0.5	1.2	1.1	1.3	1.4	1.4	1.1	1.3	1.1	0.8
0.9	1.1	2	0.6	0.6	0.9	0.7	0.8	1.3	1.5	1			1.1	1.2	1.4	1.3	1.3	1	1,1		1	1.1	1	1.2	1.6	1.6	1.6	1.3	1.3			1.3	1.1	1	0.9
0.8	0.6	0.8	1	0.8	0.6	0.6	1.3	1.1	1.2	1	0.9 , .	1.3	0.7	1	1.1	1.2	1.2	1.3	1	1.2	1.3	1.6	1.3	1.5	0.7	0.9	1.6	1.1	0.8	1	0.9	0.9	1.2	1.4	0.6
0.7	0.5	1.2	0.6	0.8	0.4	0.6	0.6	1.5	1.2	1.1	1.5	1.1	0.5	1	0.7	0.5		0.8	0.8	0.4			0.5	0.5	0.7				0.7	0.9	1	1	1.3	1.3	0.8
			1						0.5	1.1	4.1	0.6	0.6	1	0.7	0.8		0.6	0.6	0.4				0.4	0.4		0.3	0.8	1.1	1.1	1	0.8	0.7	0.9	0.3
0.5	0.7	0.6	1.4				0.5	0.9	0.6	0.6	0.9	^{•••} 0.7	0.9	0.6	0.7	0.6	0.5	0.5	1	0.4			.0.5	0.9	0.7	0.6	0.5	0.9	1	1	.0.6	0.7	0.9	0.9	1.2
		·····		0:5		···0:9·	0.9	9972		ر میک سرچی		0.6	0.8	0.5	0.6.	0.6	0.6			••••••				e e										1	;, 0.9
))) 20099							· · · · ·	2001)				2																			· · · · · · · · · · · · · · · · · · ·	••••••

Figure 5: Plot of the Number of Ship Pressure Observations. Date:- January - June 2014 Only observations passing quality control included

											1.1.1/2							1		1		3	6	3						1	1				
22	193			1	یں میچ میچ کر ا		e ser Stores Astropol				(1997) Straats Geografie	12				293	249	765	1455	1824	566	197	66	137	197	.21	24	1	3		2	5	1	1	1
483	154	482	7010			396	i genaal) aa			1342	491	1183	538	644	1142	570	26527	74151	1790	4267	239	97	39	377533	<u>.</u> 22								1		13
200	1 5836	416259	11695	37565	519197		قر حدير	924	·····		1879	8782	2789	1694	1774	19372	12730	\$ 13888	817552	561	7	4	3			1					4	428	256	885	5453
644	725	804	1232	9649	80117	•		1412	35887	45101	78670	38375	511984	4219	4760	6775	46699	28238	8 5694	481	1868	19		t	1. ²⁸⁸ .49					12	805	2391	2517	1416	866
303	305	1143	2031	2891	37179	16817	,	146	11221	16004	47416	2167	2991	3712	4341	6309	13688	7303	7551	6183	6068	1							162	38097	13432	3305	713	620	309
412	4636	3967	795	564	470	1578	1273	50179	941434	17424	14377	7130	2861	3658	921	4170	1				2001	111	2120	1226	56	19	ē.	91	3524	6101	2382	1578	461	451	271
235	4502	3144	184	158	139	138	1643	2373	11037	9200	10612	09761	4847	2577	5062	2886		1	1		440	2803	2693	5196	5474	10134	2653	932	5621	1,161	1359	1687	573	462	224
22	4232	109	74	80	22	1290	600	297	2161	1423	6	599	780	406	3562	1431	1108	732	1			10	264	423	4876	6381	3698	6682	1407	984	2989	3778	8028	212	432
60	181	94	43	43	134	168	193	259	1718	194		3	219	5523	911	486	3008	3531	1907	;	1111	567	320	2922	476	3805	252	1312	1270	651	355	2905	10163	73	154
413	103	1348	2790	576	64	104	187	38	78	1280	-, ,			5114	300	332	1087	628	1178		198	662	3849	3237	1071	2732	248	471	971	247	196	1578	998	503	505
201	157	36	370	963	197	140	35	15	28	858			2786	951	323	296	461	876	2607		1236	1531	1982	495	153	168	93	152	979			72	2319	1719	301
518	460	252	237	79	14	28	23	39	65	716	22 _,	991	4131	82	170	371	361	411	1893	1386	926	244	188	109	210	59	65	59	1937	879	1689	3852	1670	581	7856
261	187	16	87	14	19	16	15	16	17	347	176	260	120	69	90	73		16	135	27	3	1	160	124	460	4	8		38	24	30	1236	174	405	4754
		4	80					5	48	823	1108	1917	441	751	145	20		70	35	38	1			87	39	3	11	30	56	55	77	359	244	27	12
15	16	17	57				29	61	47	78	2201	**384	237	105	99	90	75	111	156	164	6	7	. 23	85	47	43	46	66	145	128	667	323	28	71	49
1	2	3	3	- 36		~ 151 ·	601	883 S		کی ۔۔ روچ	est in the energy of the	141	75	685	699	192	104							2										22	56
			1,1559									•••••																						· · · · · ·	•••••

Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- January - June 2014 Only observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

									ي مر م							·····e.					,		- 4 2 1					47 ⁻¹¹ -1								
		0.2						e Mari Arre H Artigue					1.3				1.6	1.6	1.3	0.8	1.1	0.9	1	1.6	2.2	2.4	2.1	0.8		22		tt. Maria	1117 esta Stat			
 	1.5	1.2	0.7	0.1			-0.5	eend? 	1. 1. 1.		1.1	0.4	0.3	-0.1	-0.1	0	-0.3	0	-0.5	0.9	2	1.5	2.1	0.3	روف جو						-					0.7
	0	-1.5	0.3	0.4	0.2	0.2	·•:127	۔ تر	-1.1	· · ·		0.8	• •0.4	0	0.2	0	0.4	0:2	-0.2	0.4	0.8	2.1	2.2	1.8					A				2.4	0.7	-0.3	-0.2
	0.1	0.4	0.5	0.2	0.2	1 4			۳. <u>ب</u>	- 5-2-	4	a a	0.2	0.6	0.2	0.2	0.4	0.2	0.7	1	0.0	i n é	0.7	- ta - a		en e					0.6	4.4		0.2	0.1	0.1
	0.1	0.4	0.5	0.2	0.2		\$r'		0.9	0.0	31	0	-0.5	0.0	0.2	0.5	0.4	0.5	0.7		0.0	0.0	0.7	- 17						< <u></u>	0.0		0.4	0.2	-0.1	0.1
	0.2	0.5	0.1	0.2	0.1	1.1	0.1		-0.3	0.6	.0.9	-0.1	0.2	0.3	0.3	0.2	0.3	0.4	0.3	0.5	0.4	0.3	ŗ	•						0.7	0.2	0.4	0.4	0.2	0.4	0.6
	0.2	0.6	0.5	0.8	0.7	0.8	0.8	1.2	0.1	0.4	0.6	0.3	0.4	0.4	0.3	0.3	0.1					0.4	0.3	0.2	0.3	-0.2	-0.6	0	1.4	0.1	0.5	0.2	0.1	0.5	0.7	0.1
-	0.1	0.2	0.3	-0.2	0.2	0.6	0.4	0.9	0.7	0.4	0.6	0.4	0.1	0.3	0.2	0.5	0.7			0.4		0.2	0.1	0.4	0	0.5	0.1	-0:3	0.7	0.3	0.2	0.1	-0.1	0.2	0.2	0.2
	0.1	0.7	0.4	0.4	0.7	1	0.5	0	0.9	1.4	1.3		0.6	0.9	0.6	1	0.8	0.8	· 1					0.2	0.8	0.5	0.5	0.7	0.6	0.6	0.4	0.2	0.6	0.4	0.3	-0.6
	0.5	0.4	0.4	-0.1	1.4	0.3	0.1	0.4	0.5	0.9	1.6		2	1.1	0,6	1	0.4	0.6	1	0.9	5	0.1	0.6	0.9	0.1	0.3	0.7	1.2	0.5	Ò.8	0.2	0.3	0.6	0,6	0.5	0.5
	1 1	0.6	0.2	0.2	0.1	-0.1	0.4	0.4	0.2	0.6	Ч.				0.4	0.2	-0.2	-0.1	0.4	1		0.6	0.4	0.1	0.4	0.4	0.5	0.6	0.1	0.4	0 0	04	-0.3	0.1	», 0.6	15
		0.0	0.2	0.2	0.1	-0.1	0.4	0.4	0.2	0.0		•				0.2	-0.2	-0.1	0.4	S.		0.0	0.4	. 0.1	0.4	0.4	0.5	0.0	0.1	0.4	. 0	0.4	-0,5	·	0.u	1.0
	0.8	0.1	0.4	0.2	0.3	0.4	0	0.1	0	0.5	0.7		, j	0.6	0.8	0	0.3	0.2	0.1	0.6		0.9	0:4	-0.2	0.6	0.4	0.4	0.3	0.6	0.2			-0.1	0.7	0.8	0.7
	0.7	0.4	0.3	0.6	-0.6	0	0.7	0.8	0.4	0.7	0.4	1.2	`0.7	0.5	0.1	-0.1	-0.1	0.1	0.5	0.3	1	0.7	0.6	0.7	0.5	0.5	0.3	0.6	0.2	0.5	0.2	0.6	1.3	<u>í</u> 1	0.7	0.7
	0.8	0.6	-0.1	-0.1	-0.5	-0.2	0.5	0.5	0.7	1.5	1.2	1.7	1	0.8	-0.4	-0.2	-0.5		0.4	0.8	-0.6			-0.2	0.3	0		0.9		-0.4	0.5	-0.9	1	1.2	1.6	0.8
				0.1						-0.5	-0.3	0.3	1.6	-0.3	-0.8	-0.3			1.2	2.4	-0.2				0.1	0.3		-0.6	-0.6	0	0	-0.7	0.3	0.2	-0.9	-1
	0.3	-1	0.3	-0.3							0.7	0	0.8	-0.2	1.7	1.7	1.7	0.8	1.4	3.7	-0.1			0.	0.8	0.3	0.1,	1.2	-0,1	.0.7	1.4	1.7	0.8	-0.2	0.8	0.6
					9.9.			0.0	PP21						1	14	.4 1	0		• . , • • • • •	••••••				t. T				,				· · · ·	····.	0.6	,
		122		144 133 1				0.0				- 2016				, , , , , , , , , , , , , , , , , , ,		Ŭ																		

Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- January - June 2014 Only Observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

									ي. يوسي م					¹			1,114						- 6 2 7					e;****,								
		1.6						e Mar Sire H NM es					1.6				2.4	2	1.9	2.3	2.9	2.5	2	2.8	3.5	3.7	2.8	1.7		2	····	ین. *د	111 ess as	••••••		
•	1.8	2.2	2.5	2.5		n an	1.6	iersel s	r state r		2.7	2:3	2.3	2.6	1.5	2.4	2.6	1.7	1.7	2.3	3.1	3	3.2	1.8	prosity.											2.2
	2	2.9	2	1.9	1.8	2.2		قر محدر	1.8	·····		2.6	2.9	2	2.3	2.1	1.7	2:2	1.9	1.8	2.3	2.5	3.4	2.4								4	3.5	3.2	2.7	2.6
	2.3	2.4	2.5	2.2	1.5	2.5			2.8	2.1	2.3	2,6	3	2.7	3.1	3.1	2.6	2.2	2.3	2.4	2.2	1.9	2		3	errer.				:	2.2	3	2.7	2.5	2.7	2.2
	2.3	2.3	2	1.8	1.6	2.1	1.8		1.6	1.7	.2.1	1.8	2.6	2.3	2.1	2	2.3	2.4	2.4	2.3	2.3	2	Č.	- V 						2.4	1.9	2.1	2.2	2.5	2.4	2.7
	1.6	1.4	1.9	2.2	2.1	2.2	2.2	2.3	1.7	2	1.9	1.4	1.4	1.7	1.3	1.2	2.6	2		···.	;	2.4	2.5	2.3	-2:4	2.3	1.7	1.9	2.4	2.4	2.4	2	1.9	2.3	2.3	1.8
	1.5	1.3	1.5	2.1	2.1	2.5	2.1	2.2	2.3	1.7	1.8	: 1.7	1.2	1.1	1.1	1.6	2.3			2.3		2.2	2.3	2	1.7	1.8	1.5	1.7	2.3	2.2	2.3	1.8	1.7	1.6	1.7	1.7
	2.5	1.3	1.5	1.3	1.7	1.7	1.4	1.4	1.8	2.4	2.5	·····»;	2.1	2.2	1.7	1.8	2.1	· 1.6	1:9				م مدین مربعہ کی تعلق مور	2	2.1	1.9	1.9	2.1	2	2.3	2.3	1.5	1.7	1.8	1.7	1.6
	14	12	11	2	25	11	1	11	13	2	23			23	1.5	18	14	11	17	18		16	17	23	18	17	17	29	2	2'2	2 ⁰⁰⁰	2.1	1.8	1.8	18	26
	2.5	2	2.1	1.0	1 7	1 /	1.0	2.1	1.6		2.0			210	1.6	1.0	1.0	1.5	1.0	1.0		1.6	2.2	1.6	1 7	2.2	1.6	2.0	2.1	، بېرىم، دىكى سېرىم، دىكى	- 1.0./	2 4	2	2.2	2.2 2.2	2.0
	2.0	47	2.1	1.5	1.7	0	1.5	2.1	1.0	2.2	2:1			g ()	1.0	1.5	1.5	1.5	1.0	1.9		1.0	2.4	. 1.0	1.7	2.2	1.0	2.2	2.1	2	j.0	2.1	4	2.2 ``	2.3	2.0
	2	1.7	2.4	1.4	1.4	2	1.6	1.8	1.5	2.1	2.1		<i></i>	2.3	2.2	1.7	2	1.8	1.7	1,8		2.2	2.7	2.5	2.1	1.8	2.1	2.1	2.2	2.2		·	1.7	2.2	2.5	2.1
	1.8	1.5	1.9	2.2	2.9	2.1	1.6	2.3	1.4	2	2.4	2.3	2.4	2.3	2	1.9	2.1	2.2	2	2.4	~2.7	2.6	2.2	2.3	1.8	1.6	1.4	1.7	2.1	2	2	1.9	2.7	√ 2.5	2.2	2.3
	1.9	1.5	1.9	1.6	2.2	1.4	1.5	1.5	2.3	2.6	2,9	3	2.3	3.5	2.2	2.8	1.7		2	1.8	1.8			2	2.1 :	2		1.5		1.1	1.3	2.5	2.9	2.5	2.8	2.7
				1.4						2.4	3.2	2.6	2.9	1.4	2.9	1.9			2	2.5	1.2				0.9	1.7		1.5	1.2	1.8	1.9	1.6	1.6	2	2.2	2.1
	1.9	2	1.3	1.4							2	2.3	2.9	2	2.1	2.6	3.4	1.7	1.8	4.8	1.3			.2.9 _.	2.2	1.8	2.1	2.5	1.9	2.1	2.8	2.7	2.1	1.3	2.1	2.2
		122			3.4		21	2.5	885) 2			229 -), 222 - 22 222 - 22	. ,		1.5	2,1	2	1.8								- **									4.4	2.2
-		•••••	· · · · · · · · · · · · · · · · · · ·	eet Aante								200) ;				-																		,	·····	••••••

Figure 8: Plot of the Number of Ship Wind Speed Observations. Date:- January - June 2014 Only observations passing quality control included

											1.114		· ·					1		1		3	6	3						1	1				
2.	193						e an Bistari Alterati					12			۲۰۰۰ ۲۰ ۲۰	297	249	770	1571	1913	647	245	69	136	197	.20	24	1	4		2	5	1	1	1
476	167	528	7152		11	431	esennadi N			1340	491	1078	485	613	1085	525	12812	66989	1495	3642	276	107	51	3115432											13
209	3 58503	14713	10648	37974	119218	}	قر محمد	972	····		1932	7992	2339	1270	1364	16711	53447	203068	23839	519	12	17	12			2		ر. مشکرین			4	485	282	951	1295
684	744	804	1221	9679	78184	ł.		2691	56181	82584	74572	233545	10045	3197	3700	5742	41789	23628	2779	157	1475	22			e ^{rree}	1				12	929	2521	2630	1471	906
295	306	1171	2078	2941	38328	17162	2 1	146	12981	15889	17374	2001	2493	3319	4007	6003	11204	6082	4979	3723	1015		- 1						185	41885	13536	4927	698	616	310
434	4670	4662	907	657	528	1744	967	56328	348301	16849	1238	1 6667	2533	3583	3624	3804	1			,,	1888	111	2010	1187	57	23	12	94	2247	5626	2512	1396	439	456	278
246	4511	3208	193	157	148	142	1252	1490	11171	8276	: <u>.</u> 11381	09578	4726	2533	4957	3121			34		404	2658	2545	4653	4226	10418	1784	917	5231	1,261	1265	1407	355	404	242
25	4233	15130	4226	4223	530	1407	913	1436	1718	996	6	601	778	1848	6041	1332	3763	1281	1			10	262	419	4017	4324	3938	5791	1439	1121	2980	3301	8149	12473	32
411	5 3717	4263	41	50	638	1460	4251	5675	1256	84		3	222	8672	887	649	4343	3178	1910		1108	573	319	5108	450	4717	3772	767	1350	705	372	2861	10042	5776	25
115	82	1289	2729	522	68	89	134	32	53	739	•,			5100	239	266	459	634	1177		192	650	3831	3183	1066	2746	260	312	1071	309	209	1602	916	394	136
140	115	38	364	950	145	96	35	22	36	391			2608	. [;] 886	313	315	441	562	2516		1116	1489	1969	524	169	174	94	149	843	2		74	2076	1655	218
494	398	197	172	39	14	31	22	38	64	492	23	1138	ب 270	61	169	372	362	448	1519	1448	953	259	196	115	210	59	64	60	1693	744	1581	2563	1400	550	3148
240	185	16	77	15	10	15	15	15	19	288	1.81	167	26	69	93	73	1	11	135	26	3	2	159	124	458	4	11		38	23	30	831	195	416.	2093
240	100	10	60	10	10	10	10	5	20	216	996		1/1	216	11	0		60	25	20	1	2	100	24	20	2	11	20	57	55	76	350	244	26	2000
45	10	4	69				0	5	20	315		101	141	310	11	0	50	09	30	30	1	7	00	00	39	3	11	50	57	55	70	309	244	20	25
15	16	17	55				2	5	,	25	930	202	65	14	16	24	50	110	153	164	6 		. 23	85	47	43	46	6/	1.39	116	<u>.66</u> (322	27	67	65
1	2	3	3	- 36	3	9	45	2				4	6	602	428	143	80																	25	62
											• •	******																							•••••

Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- January - June 2014 Only observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

									ي. مرج														- ()													
	-	0.7						e see Store e Astrope									-2.8	-0.5	1	-1.4	-2.2	-1.5	-3.2	-3.8	-4.9	3.7	ç			8		یته کدینیه	tito ese pre			
2	7	1.7	9.2	5.9			-31.2	erski s	가 작작되 도		-21.3	1.5	4.1	3.2	2.2	5.6	3	-4.4	-0.8	2	-0.1	- <mark>8</mark>	3.7	-1.6	arreda,											تىمىمىيى كىر
3.	8 -	3.4	1.6	-1	0.3	-2.9	**:.*	مر. تر	- <mark>26</mark> .9	·····		- <mark>6</mark> .4	0.2	-2	0.8	1.2	0.5	1.4	0.6	-3.8	-4.5	0.3	-19.9	10.1								1. 1	-1.3	6.6	3.9	3.6
7	•	3.5	1.9	1	0.1	-4.3			-7.2	-3.3	-5	-2.8	-3.7	-2	-2.3	1.4	1.5	-2.9	-3		-4.4	2.4	20		:	e ^{rran}						-0.5	2.3	1.8	4	6
-4	.6	-4	-6.6	-6.9	-5.3	-3.6	-6.3		-21.6	-0.9	.4.1	-1.6	-0.3	0.8	0.5	0	-0.7	-0:9	1.1	-1.5	-0.5	-0.1		- \$? ?						-5.3	5.2	2.3	1.5	-2.3	-3.4	-4.7
-0	.9 -	·5.5	-5.4	-1.3	-0.2	-4.3	-4.1	-7.9	- <u>6.5</u>	-4.8	-2.7	-1.1	0.4	1.3	-0.9	-7.4	-2.6	2			· · · · ·	1.3	0.8	5	0:3	3.1	3.4	16.7	2.2	-2.9	0.4	-2.3	-0.1	-3.3	-4	-1.9
-1	.8	-6	-5.5	-4.4	-2.1	-0.4	-5.9	-4.2	0.9	-2:3	0.1	∴ -2	1.7	0.7	3.1	-6.3	-3.1			-20.4		-2.1	3.1	0.1	-4.5	4.4	-3.5	-7:9	0.6	0.4	-4.3	0	-0.1	2	-2.3	-0.6
1	7	3.8	3.4	-0.2	4 1	2.6	7.6	-19	3.6	13	17.7	·····»;	72	6.6	15	-0.3	0.2	.22.	11.1					1	-5.2	-5.1	-6.8	-0.6	03	-2.1	0.5	0.6	1	-0.5	-29	0.6
	5	1.0	1.6	1.9	0.0	2.0	7.6	0.0	1 1	22.2	5.5			0.0	`.e.7	1.5	0.2	0.6	8.0	2.5			0.2	5.6	2	6.2	0.7	27.5	7.6		300 2010	о.о м о	Тагы	24.6	2.5	0.0
-4		1.0	1.0	4.0	0.9	0.4	7.0	-0.5	-1.1	20.2.	5.5			0.0	0,7	1.5	0	0.0	0.9	5.5		2.0	-0.5	5.0	-5	0.5	-0.7	21.5	1.0	۰ ۲۰۱ چندر مدت				- 1.0	-5.5	
4.	3	3.8	3.8	5.2	4.9	0.9	3.3	-5.9	-6.2	6.3	8.5				-1.9	0.7	1.8	1.6	2.7	-1.6		2	3.6	-5.5	9.5	1.3	5.4	-1.3	3.9	5	1.8	1.4	0.3	2.8	2.1	11.8
0.	5	4	9.2	2.8	1.2	5.4	-2.8	6.3	-1.7	0.4	8.5			5.9	3	1.8	6.4	2.7	3.3	10.2		2.4	6.2	0.9	0.8	3.6	-0.6	3.6	-2.2	5.7		• -	0.7	6.7	6.1	-1.6
-0	.8	3.6	1	-2.7	6.4		6.5			2.2	14	12.9	4	5.3	6.1	2.8	0.8	1.3	0.7	2.8	1.6	3.3	-1	4.9	8	4.3	8.9	-1.4	6.7	1.3	2.5	5.6	9.3	5.6	3.9	3.8
0.	5	3.5	-5.1	-6	6.4	3.9	-11.1		-4	-12.3	-1	2.5	1.8	-0.1	-1.7	-1.4	-3.6		1.2	-2.3	3.6			-0.4	1.9 :	1.5		12.1		2	-1.4	-2.7	7.3	1	3.3()	3.1
				8.8						5.6	-3.7	4.4	-3.7	-1.7	10.5				0.4	0.4	5.1				1.8	4.2		-2.9	-4.3	-0.3	1.1	6.7	-1.6	-6.1	11.2	-3.4
-4	.7	5.7		3.2							-0.1	-3.4	-5.7	-0.9		-10.3	0.7	1.8	-1.7	-1.6	10.6	<i>.</i>		11.3	-0.8	6.6	8.2	-0.7	-1,4	-0.4	-0.7	-12.3	-0.1	4	-4	-1.9
							<i></i>	8.7	8955 S	· · · · · · · · ·				,	3.3	-10.5	-3	-2.4		,					S.										-1.6.7	12.3
		••••	· · · · · · · · · · · · · · · · · · ·	13 11.112							· · · · ·	· · · Priti				12																				•••••

Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- January - June 2014 Only Observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10

								ي مر ا								111144						- 6 1													
.,	19.3						e Mari Alter A Active A					•				17.3	10.3	12.7	20.7	26.7	15.7	19.3	18	34	23.8				····			llin es a sete	••••••		
11.1	30.5	31.8	41.2	••••••		77.3	ernit v	1 1992. 12		61.7	26.2	30.7	38.6	14.4	29.6	27	14	14.5	32.3	23.2	32.9	24.4	19.9	3***-às,											تىمىمىيى كىرى
19.1	23.5	23.6	19	24.9	35.7		قر محدر	. 31	•••••		41.3	37	14.1	19.3	19.6	13.3	17.3	13.7	<mark>29.3</mark>	26.8	66.1	45.2	41.5					نې مېرې			4	<mark>39</mark>	26.2	20.8	21.4
25.8	3 24.5	20.4	21.4	14.1	44.5			62.1	41,1	31.7	31.2	28.6	16.7	21.6	20.6	21	20.9	37	42.5	46	66.5	41.3	i j					~ ~			37.3	28.8	23.7	21.6	23.6
23.8	3 20	17.8	17.3	16.8	13.6	50.9		31.2	17.6	17.3	, 18.2	23.9	23.2	20.8	17.3	20.4	31.1	27.8	32.6	34.8	43		- 17						24.4	22	.27,5	22.2	22.4	20.4	26
16.3	3 12.9	21.3	19.5	24.2	25.2	21.8	31.9	17.1	21.7	49.5	14.2	14.9	15.2	11.6	11.3	19.6	1		· · · · ·	<u> </u>	34.4	46	53.1	26.5	18.9	19.1	21.9	28.6	21.2	32.8	23.9	21.2	21.4	21.8	19
15.7	13.3	20.4	19.4	23.2	22.4	26.6	37.6	29	14.8	13.5	13 9	11.2	94	10.8	12.6	197			47 9		24.5	23.4	22.1	20.9	30.7	17	197	26.4	21.1	32.6	18	17 5	15.6	14	14.2
17.0	10.0	14	10.1	15.7	12	12.0	11 5	10.1	44.2	24 5	"- ·	10.4	10.0	17.0	17.0	22.4	16.1	7 90 7	11.0		21.0	, , , , , ,	10.7	20.0	24.2	26.2	26-1	20.1	200	22.0	17.0	10.2	10.0	16.5	20.6
17.8	10.7	14	13.1	15.7	13	13.2	11.5	10.1	44.3	34.5		10.1	19.9	17.0	17.1	23.4	10.1	20.7			÷.		10.7	20	24.3	20.3	20.1	38.5	33.2	32.9 (77 %	17.9	19.2	10.2	10.5	29.0
14.5	5 12.1	9.5	16.5	19.3	11.8	11.1	10.2	12.1	53.6.	33			30.6	21.9	19.4	11.8	11.3	23.7	47.3		31.4	17.1	26.1	17.4	27.4	20.8	95	33.7	44.9	28.2	18.2	31.5	.22.5	19.7	
28.4	24.9	18	18.2	17	17.3	19.9	15.2	22.1	26.5	44.4			,	22.6	22	17.6	18.5	17.7	25.1		29.1	26.8	17.3	17.1	20.5	13.4	19.9	19.8	25.2	25	18:6	25.1	22.2	19.9	19.7
15.4	16.1	35.2	20.2	15.7	21.5	12	18	24.7	13.3	29.8			44.1	24.4	22.6	25.6	21.9	16.8	44.6		25.2	20.1	21.2	20.6	26.5	21.2	28.7	21.3	20.7			33.1	24.8	26.7	25.5
15.2	2 13.7	12.4	25.8	29.4		23.6			21.5	56.3	46.8	26.1	27	20.6	23.3	23.6	20.7	21	48.8	30.1	28.4	22.3	16	18.2	11.3	12	25.5	19.8	26.6	17.8	30.4	37.8	26.4	19.5	27.7
11.3	3 10.4	9	51.2	35.6	10.2	33.5		14.5	17.5	35	21.3	20	15.7	19.3	11.8	12.6		5.2	9.7	7.4			13.3	9.5	. 19.4		17.6		11	14.4	11.8	39.8	12.5	22.3	35.4
			22.1						9.9	65.8	42.4	13.6	10.9	33.7				11	6.9	8.5				10.2	9.7		8.5	33	9.8	11.8	12.3	10	12.7	18.8	23.3
28.7	14.6		22							14.4	68.8	21.8	14.6		18.4	14	6.9	8.2	12	19.3			.8.6	15.5	16.5	22.3	8.6	12.8	.16	19.1	23.7	13.7	40.2	47.1	14.5
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Figure 11: Plot of the Number of Ship Wind Direction Observations. Date:- January - June 2014 Only observations passing quality control included

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Figure 12: Bias of Ship O-B SST (degrees C). Date:- January - June 2014 Only observations passing quality control used in statistics 10 degree box values plotted if the number of observations is greater than 10



Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- January - June 2014 Only Observations passing quality control used in statistics

10 degree box values plotted if the number of observations is greater than 10



Figure 14: Plot of the Number of Ship SST Observations. Date:- January - June 2014 Only observations passing quality control included

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