

# Report on the Quality of Marine Surface Observations

Report Number 44

July to December 2010

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2010

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# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

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## 1. INTRODUCTION

In 1985, the 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, that 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 the forty-fourth report and covers the period July to December 2010. 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 SST 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 the numerical data assimilation systems in use today can provide global reference values applicable in observation monitoring. The short-term forecast from the previous numerical analysis, commonly known as the first-guess or background field, provides perhaps 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

1. | mean of O-B |  $\geq 4.0$  hPa
2. standard deviation of O-B  $\geq 6.0$  hPa
3. percentage of gross errors  $\geq 25$

#### Wind

1. | mean of O-B |  $\geq 5.0\text{ms}^{-1}$  (Speed)  
 $\geq 30^\circ$  (Direction)
2. standard deviation of O-B  $\geq 80^\circ$  (Direction)
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  $25\text{ms}^{-1}$  (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  $5\text{ms}^{-1}$ .

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

### Wind

1. | mean of O-B |  $\geq 5.0\text{ms}^{-1}$  (Speed)  
 $\geq 30^\circ$  (Direction)
2. standard deviation of O-B  $\geq 6.0\text{ms}^{-1}$  (Speed)  
 $\geq 60^\circ$  (Direction)
3. percentage of gross errors  $\geq 25$

### SST

1. | mean of O-B |  $\geq 3.0$  °C
2. standard deviation of O-B  $\geq 5.0$  °C
3. percentage of gross errors  $\geq 25$

#### Criteria used for biannual monitoring

All 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 previously 5°C and NCEP use 15°C. Also, criteria used in early reports were based on O-A statistics. Consequently, data presented here is not directly comparable with that in older reports.

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, July to December 2010, 4828344 observations of pressure were monitored at Exeter from 2716 manual ships, 1043 drifting buoys, and 551 automatic ships. The number of reports received from individual ships varies greatly as Table 1 demonstrates: apparently a large percentage of manual 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 43 shows an increase of 36% in the number of manual ships reporting only once, but a decrease of 30% in those reporting 21-40 times and an increase of 56% in those reporting 201-500 times; although there were much smaller differences with report number 42 (July-December 2009). 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, the recent slow decline in the number of manual ships reporting pressure seems to have stopped for now, with a small increase, while the recent decrease in automatic ships has also been reversed, and there was another increase in the number of drifting buoys reporting pressure.

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 38 (2005-2007). 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 peaked in the second half of 2008, then decreased slightly, but has increased again in the second half of 2010. Reports from drifting buoys now account for 57 % of the total, while those from manual ships make up just 11% of the total, and those from automatic ships account for the remaining 32%. 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 6-hour assimilation period, as previously. Since then there has been a fairly steady increase in the number of pressure reports from automatic ships.

A histogram of O-B differences for all ship pressure reports in the period July to December 2010 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 -0.1hPa and standard deviation 1.1hPa. 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, being less than 1.0 hPa in some areas of the north Atlantic, the north-west Pacific and the tropics. 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 July to December 2010. 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.

An interesting characteristic of the errors identified here, which soon becomes obvious on inspection of the time-series charts at the end of this report, is that many can be attributed to a bias in the observed pressure. In some cases the bias is constant over the whole monitoring period; although some values depart greatly from the sample mean, presumably due to some gross error in the observation, these are generally isolated instances. The number of cases with large random departures from background has increased somewhat over recent reports. Those observing platforms listed in Table 3 which appeared in report number 43 (January to June 2010) have been indicated with an asterisk. A comparison of the statistics given here with those in the report number 42 (July to December 2009), clearly indicates that the bias in the pressure observations from a few ships has hardly changed for more than a year.

Statistics for those marine observing platforms listed in report number 43, 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 two of these platforms, but the other 90% 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 does affect the measurement. (These factors do not apply to those ship observations where wind speed is based on visual estimates of the sea state e.g. the UK VOS fleet.)

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 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 July to December 2010, 2190098 wind observations were available for monitoring at Exeter, from 2732 manual ships, 37 drifting buoys, and 576 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. As stated for pressure observations, the large increase in the number of monitored wind observations, seen in report number nineteen, was largely due to the inclusion of all 'automatic ship' data, not just one report in each six hour period.

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  $50 \text{ ms}^{-1}$ , 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  $0.4 \text{ ms}^{-1}$  relative to the background and a direction bias of just  $-0.4^\circ$ .

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  $2\text{-}3 \text{ ms}^{-1}$  in middle latitudes and around  $2 \text{ ms}^{-1}$  in the tropics. The bias is generally around  $+1 \text{ ms}^{-1}$ , but exceeds  $+2 \text{ ms}^{-1}$  in a few places and is slightly negative to the north of the UK and in some tropical areas. 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  $5 \text{ ms}^{-1}$  were used to obtain these values. The magnitude of the bias is less than 5 degrees in most places, but is up to 15 degrees in a few places in the southern hemisphere. The standard deviation is generally between 15 and 30 degrees globally, but in some data-sparse areas and near some coasts it is as large as 50 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 July to December 2010, 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  $25 \text{ ms}^{-1}$  (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 July to December 2010, a total of 7912939 observations of SST were monitored at the Met Office, from 2299 manual ships, 2040 drifting buoys and 372 automatic ships. Of the total, 483225 were from manual ships, 6125975 from drifting buoys and 1303739 from automatic ships. (More detail is given in Table 1.) For the same reasons as stated for pressure observations, it appears that many identifiers report only once during the 6-month period. There has been little change in the numbers of ships and drifters reporting SST over the last 4 years. There are similar numbers of manual ships reporting SST as there are drifting buoys and automatic ships combined, but manual ships account for only 6% 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 86.5% of the observations is nearly Gaussian and they have a bias of  $0.0^\circ\text{C}$  relative to the background and standard deviation of  $1.2^\circ\text{C}$ .

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  $0.5^\circ\text{C}$  and the standard deviation is around  $1^\circ\text{C}$ .

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 78 marine observing platforms listed as producing suspect observations of pressure over the period July to December 2010, 71 as producing suspect wind observations and 57 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 about 130 through to the end of 2008, and from 2009 there has been a slight downward trend, with numbers between 50 and 100 over the last two years. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to have been little overall trend in observation quality, as measured by the percentage of suspect platforms.

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, but since then the numbers have fluctuated, mostly between 100 and 150, except for the last 4 report periods which have averaged 80. 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 their 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, JULY TO DECEMBER 2010.**

Number of reports	Number of manual ships reporting			Number of drifting buoys reporting			Number of automatic ships reporting		
	Press.	Wind	SST	Press.	Wind	SST	Press.	Wind	SST*
1	291	302	197	2	1	5	28	34	6
2-10	296	295	276	13	6	15	17	17	6
11-20	155	158	171	0	0	6	8	7	1
21-40	212	216	219	17	1	20	10	10	1
41-100	616	615	547	7	0	11	15	10	1
101-200	561	570	420	17	0	39	19	21	2
201-500	415	413	289	63	6	122	22	21	12
501-1000	62	61	58	116	3	175	30	29	17
1001-1500	41	36	46	102	6	198	45	47	17
1500+	67	66	76	706	14	1449	357	380	309
<b>Total</b>	2716	2732	2299	1043	37	2040	551	576	372
(Report 43)	(2486)	(2514)	(2286)	(915)	(25)	(2009)	(507)	(535)	(362)

\* numbers are for automatic (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

Period	WMO report number	Number of Observations			
		Manual ships	Drifting buoys	Automatic 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	477828	829588	512338	1819754
Jan - Jun 2001	25	458345	784686	465887	1708918
Jul - Dec 2001	26	473887	914744	554002	1942633
Jan - Jun 2002	27	443876	1111699	517200	2072775
Jul - Dec 2002	28	544433	952313	595959	2092705
Jan - Jun 2003	29	432672	994877	506185	1933734
Jul - Dec 2003	30	473591	1128039	605241	2206871
Jan - Jun 2004	31	435824	1092461	596495	2124780
Jul - Dec 2004	32	434160	1113527	724014	2271701
Jan - Jun 2005	33	471113	1221528	717207	2409848
Jul - Dec 2005	34	472565	1523938	837397	2833900
Jan - Jun 2006	35	456847	1758276	792765	3007888
Jul - Dec 2006	36	447474	1833376	975555	3256405
Jan - Jun 2007	37	410076	1947986	998474	3356536
Jul - Dec 2007	38	454512	2265115	1116750	3836377
Jan - Jun 2008	39	444253	2397246	1156968	3998467
Jul - Dec 2008	40	481513	2605728	1315696	4402937
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



**TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2010.**

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.
<i>Notes:</i>	1.	Units are hPa.
	2.	Observing platforms marked with an asterisk were listed in the previous report (January to June 2010)

Table 3a: 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
13634	137	137	---	---	1	1	1	0	1	GE
15951	57	27	3.7	-0.4	1	1	1	0	1	GE
17514	602	0	1.5	9.5	2	2	1	2	2	GE
17673	110	110	---	---	1	1	0	0	1	GE
17674	640	0	1.8	12.1	2	2	1	2	2	Bias
17909	244	0	0.4	5.5	1	1	0	1	1	Bias
21932	1062	28	5.8	-3.5	1	1	1	1	1	Bias
21942	539	131	4.4	-8.9	1	1	1	1	1	Bias
21946	1030	380	5.1	-7.9	2	2	2	2	2	Bias
21965	400	354	0.4	-14.3	1	1	1	1	1	Bias
25592	881	118	6.3	-1.3	3	3	2	3	3	SD
25631	282	114	6.4	-6.7	1	1	1	1	1	Bias
26558	1074	18	5.5	4.5	3	3	3	0	0	SD + bias
31718	87	50	4.0	-0.8	2	2	2	0	2	GE
33580	481	87	6.7	0.0	1	1	1	1	1	SD
33887	1345	724	1.8	0.0	1	1	1	2	1	GE
33906	1423	56	3.1	4.6	3	3	2	3	3	Bias
33949	51	1	0.8	-5.1	1	1	1	0	1	Bias
34905	1757	584	7.6	-1.8	3	3	3	3	3	SD + GE
45631	49	49	---	---	1	1	0	0	1	GE
46538	363	109	0.5	-0.2	1	1	1	1	1	GE
46910	1576	146	3.9	-6.3	2	3	2	2	2	Bias
47503	307	103	4.0	-1.3	3	3	2	2	3	GE
47557	2710	2710	---	---	2	2	2	0	2	GE
48511	102	53	4.0	9.2	1	0	1	0	1	Bias
48533	9988	2525	2.7	-1.0	2	2	2	2	2	Bias + GE
48577	47	44	9.7	5.3	2	2	0	0	2	GE
54952	392	392	---	---	1	1	1	0	1	GE
55592	513	335	7.1	-6.6	1	1	1	1	1	Bias + SD + GE
55621	4003	39	5.0	0.4	0	0	0	0	0	SD
55624	1786	303	5.5	-1.2	1	1	1	1	1	SD
55969	2116	325	4.3	0.1	1	1	1	1	1	Bias in September
56901	467	467	---	---	1	1	1	0	1	GE
63592	626	85	3.9	8.6	2	0	2	1	2	Bias
63594	213	0	3.2	4.4	1	0	0	1	1	Bias
65501	323	323	---	---	2	2	0	0	2	GE
71640	4002	156	5.9	0.2	3	3	2	3	3	SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
17686	663	0	0.5	-7.0	1	1	1	1	1	Bias
34545	3895	704	5.6	0.7	3	3	3	3	3	SD
48515	2841	852	5.7	-2.2	2	2	2	3	3	Bias + SD + GE
48713	1651	1461	4.3	7.2	3	3	3	2	3	Bias + GE
63593	1985	1287	3.7	9.4	3	1	3	3	3	Bias + GE
71627	4040	241	4.4	0.2	0	0	0	0	0	SD

Table 3b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments	
3EFD9	43	0	2.3	6.7	1	1	1	0	1	Bias	
3ENU5	43	1	2.6	-4.0	0	0	0	0	0	Bias	
62165	320	280	1.4	0.8	1	1	1	1	1	Bias + GE	
C6FY8	436	2	5.3	2.0	3	2	1	0	2	SD	
C6XB2	*	255	0	5.2	1.5	0	0	0	0	SD	
CG2350	*	3172	902	10.4	2.2	5	5	5	0	5	SD + bias
CG2522	*	2107	580	6.0	-6.0	4	4	3	0	4	Bias + GE
CG2992	*	2901	539	2.7	-2.0	2	1	1	0	1	Bias in July & October
CGDS	*	1670	361	6.9	-2.0	3	4	4	0	4	SD + bias
CYGR		44	30	7.6	-4.6	0	0	0	0	0	Bias + SD + GE
CZ3695		1834	918	4.5	-0.8	3	1	1	0	1	GE
KS000	*	182	37	6.4	-1.0	2	2	1	0	2	SD
PHMH		224	75	1.7	-0.8	1	1	0	0	1	GE
TUSER1		52	3	5.1	3.2	0	0	1	0	0	SD
UASQ		43	6	7.1	-0.1	1	1	0	0	1	SD
UBHE9	*	56	0	2.2	5.9	2	2	1	0	2	Bias
UGOU		41	0	1.5	-4.2	1	1	1	0	1	Bias
UIDO		48	19	1.5	-0.3	0	0	0	0	0	GE
UITR		187	4	4.2	-5.0	3	5	4	0	5	Bias
VC6750	*	1919	1349	5.1	-1.8	3	1	1	0	1	SD + GE
VCPX		304	90	5.8	-5.7	5	2	5	0	5	Bias + SD + GE
VDFP		69	42	3.9	0.5	1	0	1	0	1	GE
VDRV		118	40	6.1	-1.5	2	0	2	0	3	SD + GE
VGWM	*	159	2	5.7	0.2	1	1	2	0	2	SD
VRCB4		126	1	5.2	-1.5	1	1	1	0	1	SD
WAV4647		94	18	6.3	-1.2	1	0	1	0	1	SD
WBN3014		72	49	10.3	4.0	1	1	1	0	1	SD + GE
WCF3012		91	8	5.7	-5.6	1	0	1	0	6	SD
WCX7445		2239	693	3.5	1.1	2	2	2	0	2	GE
WDC6644		137	0	6.1	-5.6	2	2	2	0	2	SD + bias
WQZ7791		213	28	5.7	-2.9	2	1	1	0	1	SD
WUW2120		106	76	6.0	-0.4	3	3	2	0	3	SD + GE
WXQ4511		148	23	6.0	-7.3	2	0	2	0	2	Bias + SD
WXS6134		86	20	4.2	-6.9	2	0	0	0	2	Bias
WYT8569		308	2	7.2	1.2	3	0	1	0	1	SD

**TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2010.**

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
A8JX8	72	0	1.2	0.0	Reduced bias
AUFI	56	0	2.9	0.2	Reduced bias
CG2960	3361	0	4.1	-1.6	No bias since August
NWS0010	1225	0	3.7	0.9	Reduced bias
NWS0016	1005	0	0.5	-0.2	Reduced bias
OUJI2	69	0	1.8	0.7	Reduced bias
S6NK5	43	0	2.6	1.9	Reduced bias
TBWUK36	200	2	2.1	0.6	Reduced SD
UAHF	142	0	3.0	0.6	Reduced bias
UCJP	22	2	2.8	-4.2	Less than 40 reports
UCTS	316	1	2.8	-0.4	Reduced SD
UIFU	128	3	2.8	0.0	Reduced bias
V2AC6	44	0	1.0	0.0	Reduced bias
V7DG6	161	0	3.3	-1.1	Reduced bias
VCJM	21	20	0.0	2.1	Less than 40 reports
WDC8307	172	1	2.5	-1.3	Reduced bias
WDE2652	57	1	2.4	-1.9	Reduced SD
WDE3569	1132	6	1.8	-1.2	Reduced SD
YJUF5	60	0	0.8	-0.5	Reduced bias
ZCDL9	203	0	3.1	-1.6	reduced bias

**TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2010.**

- 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  $25\text{ms}^{-1}$  (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 6-10 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  $\text{ms}^{-1}$   
 2. Observing platforms marked with an asterisk were listed in the previous report (January to June 2010)

**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
21522	887	534	5.6	17.0	2	2	1	0	2	Bias
21523	306	170	6.5	15.6	2	2	1	0	3	Bias
21939	236	137	6.5	18.6	1	1	1	0	3	Bias
21941	1052	593	5.5	16.1	2	2	2	0	2	Bias
21952	2240	1727	7.3	14.0	4	4	4	0	4	Bias + GE
25592	1211	0	5.0	-0.1	1	0	0	0	0	Bias from September
53550	273	2	7.2	-2.8	0	0	0	0	1	SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
21525	3506	2648	6.9	14.8	4	4	4	0	4	Bias
21991	3633	2807	7.1	13.9	4	4	4	0	4	Bias + GE

Table 5b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
46181	4322	2	3.4	4.0	1	1	0	1	0	Bias
53040	1816	2	2.7	-5.3	3	3	1	2	3	Bias
62152	2753	0	3.7	-4.2	1	0	3	2	1	Bias
9VVN	74	3	7.1	6.8	0	0	0	0	0	Bias
DDFD2	52	1	3.7	5.0	0	0	0	0	0	Bias
HPYK	40	12	9.5	8.2	2	0	0	0	2	Bias + SD
KS000 *	182	18	6.5	8.4	2	2	2	0	3	Bias
WXS6134	86	0	4.9	-5.6	1	0	0	0	1	Bias

**TABLE 6: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 5 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2010.**

- 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  $25\text{ms}^{-1}$  (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  $\text{ms}^{-1}$

A8JR5	290	2	3.4	2.2	Reduced bias
A8RH4	83	0	2.5	2.0	Reduced bias
BATFR20	1707	1	3.3	2.5	No bias
DHDH	43	0	3.1	0.9	Reduced bias
HP6038	514	0	3.8	3.7	Reduced bias
UCUE	169	1	3.7	-3.1	Reduced bias
VEP717	1290	0	3.9	4.1	Reduced bias



**TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2010 .**

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 <sup>-1</sup> (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 (°).
  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<sup>-1</sup>. If no significant speed bias was present, the statistics and plots refer to direction reports with an observed speed greater than 5 ms<sup>-1</sup>.
  3. Observing platforms marked with an asterisk were listed in the previous report (January to June 2010)

**Table 7a: 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
21523 §	300	114	72.5	-43.8	1	2	1	0	1	Bias + SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
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**Table 7b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments	
3EJM9	*	48	0	71.1	-4.4	0	0	0	0	0	SD
3EUS		156	0	74.8	10.9	0	0	0	0	0	SD
3FPH8		70	0	71.0	-0.5	0	0	0	0	1	SD
45145	*	2647	0	50.8	56.7	4	3	4	4	4	Bias
45150		918	0	91.8	5.2	0	2	2	2	3	SD
46081	*	4244	0	47.4	-40.0	0	1	3	3	5	Bias
51023		1538	0	45.9	-35.2	0	0	0	0	0	Bias
9HOB8	*	371	1	58.1	2.8	0	0	0	0	1	SD
A8GU7		98	0	65.7	-2.7	0	0	0	0	1	SD
A8IH6	*	85	0	63.1	25.1	0	0	0	0	0	SD
A8IN9	*	134	0	69.2	-16.6	0	0	0	0	1	SD
A8IP2		169	1	98.3	-0.6	2	2	2	0	3	SD
A8IV9		144	2	137.9	10.7	0	4	3	0	6	SD
A8ME3		64	0	71.1	-22.6	0	0	0	0	0	SD
A8NQ7		177	1	77.4	-0.1	0	0	1	0	0	SD
A8PQ8	*	156	0	58.8	-22.7	0	0	0	0	1	SD
A8QJ7		230	5	76.2	-3.1	2	2	2	0	3	SD
BATFR3½	*§	146	0	81.6	-17.5	0	1	1	0	2	SD
C6KD8		240	8	95.9	-11.7	5	6	5	0	6	SD
C6XE5		85	1	76.2	12.4	0	0	0	0	0	SD
DDFD2	§	52	1	66.7	15.8	0	0	0	0	0	SD
DDSB2		217	1	68.5	-0.8	0	1	1	0	2	SD
DPCK	*	215	0	58.3	-2.7	0	0	0	0	1	SD
ELEI6		79	0	54.3	-38.7	0	0	0	0	0	Bias + SD
H9UY	*	75	1	68.6	30.9	1	1	1	0	0	Bias + SD
J8NW	*	220	0	120.7	-5.4	3	5	4	0	6	SD
KF001	*	40	0	45.1	-33.3	0	0	0	0	0	Bias
KS000	§	182	15	84.6	-16.1	2	1	1	0	3	SD
KS049	*	932	0	102.4	5.4	6	6	6	0	6	SD
KS073		1739	2	135.9	-65.5	4	3	4	0	5	Bias + SD
KS078	§	664	4	67.0	-54.4	2	1	3	0	5	Bias + SD
MGDM		87	1	90.3	3.1	0	1	1	0	0	SD
MGRX2		82	1	67.6	-11.6	0	0	0	0	0	SD
MYNJ6		68	0	68.2	7.6	0	0	1	0	1	SD
PHEB		156	0	68.4	7.3	0	1	1	0	3	SD

Continued >

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
(Cont.)										
SJEI	83	1	72.8	-7.1	0	0	0	0	0	SD
SXSQ *	56	0	88.8	23.9	0	0	0	0	0	SD
TBWUK37	385	7	80.0	-11.3	3	3	3	0	3	SD
UBAW	51	0	77.5	-18.7	0	0	1	0	0	SD
UDYN *	48	1	55.8	46.6	0	0	0	0	1	Bias
V2EU7	68	0	100.0	-0.5	0	0	0	0	1	SD
V7DW6 *	56	0	62.7	-11.7	0	0	0	0	1	SD
V7HP6	78	1	89.0	-32.1	0	0	0	0	0	Bias + SD
VC6750	2269	0	65.9	79.5	4	4	3	0	4	Bias + SD
VRDR8 *	213	0	65.5	-6.1	0	0	0	0	1	SD
VREQ5 *	78	0	81.7	11.2	1	0	1	0	0	SD
VRGA6 *	59	0	67.6	31.9	0	0	0	0	0	SD
VRZL3	81	0	73.0	3.5	0	0	0	0	0	SD
WBP321i *	1687	14	83.2	2.7	1	1	1	0	2	SD
WCX744 *	2464	15	74.4	-11.4	2	2	3	0	4	SD
WDA3359	129	0	69.7	-12.8	0	0	0	0	3	SD
WDC-8307	78	0	73.0	-3.7	0	0	0	0	0	SD
WTER	3153	1	93.2	-8.8	2	2	2	0	2	SD
ZCBN5	188	0	64.7	3.3	0	0	0	0	3	SD
ZDIQ7	1562	2	61.7	-14.0	0	0	0	0	1	SD
ZDLP	118	1	73.0	-13.0	1	1	0	0	3	SD

**TABLE 8: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 7 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2010.**

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 $25\text{ms}^{-1}$ (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 direction observations.
<i>Notes:</i>	1.	Units are degrees (°)

Identifier	N Obs.	NGE	SD	Bias	Comments
31260	29	0	0.0	29.6	Less than 40 reports
3EBL5	93	0	54.7	4.8	Reduced SD
42364	14551	0	36.8	5.1	Reduced SD
45144	1459	0	47.7	-20.7	Reduced bias & SD
46022	3305	0	44.6	24.8	Reduced bias
46146	4256	0	34.8	-21.9	Reduced bias
61010	1298	0	34.8	-13.5	Reduced bias
62128	2496	0	46.0	13.9	Reduced bias
9HJH9	49	0	29.9	5.6	Reduced bias
9HOM8	352	0	46.5	3.3	Reduced SD
9VAY4	201	0	56.2	-1.3	Reduced SD
A3CW4	142	0	39.7	-5.8	Reduced SD
A8CJ9	98	1	44.3	-14.5	Reduced SD
A8IP3	344	0	50.0	-0.9	Reduced SD
A8JH7	92	0	49.6	-3.0	Reduced bias & SD
A8RQ6	31	0	26.4	-21.5	Less than 40 reports
BATFR20	1706	1	35.4	-9.5	Reduced bias
C6KD4	323	0	48.5	-6.7	Reduced SD
C6ME8	126	0	39.5	-10.7	Reduced SD
C6OM7	74	0	31.8	-12.5	Reduced bias
DAQZ	198	0	41.8	9.7	Reduced bias
DFRZ	211	0	48.7	-15.0	Reduced SD
ELZY4	10	0	81.3	-8.1	Less than 40 reports
GLNE	291	0	38.8	13.9	Reduced SD
H3VR	159	0	39.9	-20.3	Reduced bias
H3VS	123	0	53.3	-6.8	Reduced SD
HZDD	253	0	47.9	-5.2	Reduced SD
HZZB	67	1	49.9	-9.2	Reduced SD
IBLQ	10	0	32.7	13.6	Less than 40 reports
J8AZ3	146	0	54.0	-26.9	Reduced bias
JNCJ	99	0	46.2	-1.5	Reduced SD
MNDC9	110	0	36.7	8.2	Reduced SD
OVYB2	103	0	36.7	3.0	Reduced SD
PBGH	76	0	30.5	0.5	Reduced SD
PDVN	93	0	24.9	0.3	Reduced SD

Continued >

Identifier	N Obs.	NGE	SD	Bias	Comments
(Cont.)					
S6TB	3	0	7.6	12.7	Less than 40 reports
SYVI	33	0	48.7	-7.8	Less than 40 reports
UASP	85	0	44.1	-8.7	Reduced bias
UCUF	183	0	48.4	-16.1	Reduced SD
V2AC6	43	0	42.1	7.5	Reduced SD
V2AM5	24	0	56.1	-3.3	Less than 40 reports
V2CJ8	65	0	34.2	6.4	Reduced SD
V7EE5	13	0	52.5	10.2	Less than 40 reports
V7OX3	158	0	53.6	15.6	Reduced SD
VCJM	21	0	40.5	27.0	Less than 40 reports
VQBW2	201	1	41.7	-3.3	Reduced SD
VRBK6	255	0	47.6	-8.0	Reduced SD
VREX7	109	0	43.2	-7.2	Reduced SD
YJZC5	117	0	52.9	-9.5	Reduced SD
ZCDL9	203	0	51.8	7.8	Reduced SD

**TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2010.**

- 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 (January to June 2010)

**Table 9a: 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
13627	282	0	2.0	3.1	1	-	0	-	0	Bias
13634	138	138	---	---	1	-	0	-	1	Bias
21571	2490	1843	0.2	0.1	2	-	2	-	2	GE
21701	2747	0	1.6	3.4	2	-	1	-	2	Bias
22540	173	67	1.7	-8.2	1	-	0	-	0	Bias
23706	3502	2000	0.2	-0.1	2	-	0	-	2	GE
44885	168	168	---	---	1	-	0	-	1	Bias
48714	1089	1081	0.7	-5.5	3	-	3	-	3	GE
52816	194	6	2.7	4.9	1	-	0	-	1	Bias
61866	89	89	---	---	1	-	1	-	0	GE
63641	1432	563	3.5	3.0	1	-	1	-	2	Bias
64556	412	223	2.0	-7.4	2	-	2	-	2	Bias
65501	278	278	---	---	1	-	2	-	2	GE
74544	157	113	0.1	0.1	1	-	0	-	1	GE

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
21520	2331	0	1.1	3.8	6	-	0	-	3	Bias
21703	4829	1	1.0	3.8	5	-	0	-	3	Bias
23505	284	105	3.5	-2.6	1	-	0	-	1	Bias + GE
48713	1342	1342	---	---	3	-	3	-	3	GE
52616	1188	213	3.2	3.7	1	-	0	-	1	Bias
56907	602	394	0.2	-0.1	1	-	0	-	1	GE
63507	3496	395	4.2	-1.7	3	-	1	-	0	Bias October-December

Table9b: Platforms reporting in SHIP code



Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
41036	1533	0	2.3	-4.4	1	-	0	-	0	Bias
41112	* 7054	0	2.3	-0.9	1	-	1	-	1	Bias in December
44041	* 3930	0	2.6	1.1	3	-	2	-	1	Bias in December
62086	1355	11	3.0	-3.6	3	-	1	-	0	Bias
9V7955	191	2	2.1	-5.4	5	-	4	-	5	Bias
A8MW8	66	1	1.0	3.4	0	-	0	-	0	Bias
A8RV6	45	2	1.1	4.2	1	-	1	-	1	Bias
A8SC4	188	0	0.9	-3.0	3	-	1	-	0	Bias
A8WC8	90	1	0.7	-7.4	2	-	2	-	2	Bias
BATFR20	* 214	38	1.3	7.0	1	-	1	-	1	Bias
BATFR52	775	295	1.1	-0.1	1	-	1	-	1	Bias/GE in August
C6FM9	* 58	0	2.2	3.5	0	-	0	-	0	Bias
C6FZ8	56	0	1.2	-2.9	1	-	0	-	0	Bias
CGDR	664	6	1.8	3.6	4	-	3	-	2	Bias
DCCR2	60	0	2.0	3.6	1	-	1	-	1	Bias
DGTX	* 139	0	1.2	3.1	2	-	1	-	0	Bias
DHQS	66	0	1.7	-3.3	1	-	1	-	1	Bias
DHZQ	165	1	2.6	-4.2	3	-	3	-	2	Bias
IBCF	887	12	3.0	-4.1	3	-	3	-	3	Bias
ICRA	* 304	61	2.4	-5.6	4	-	5	-	4	Bias
KS034	* 141	0	0.6	4.0	1	-	1	-	1	Bias
KS088	* 71	19	1.6	-8.2	1	-	1	-	1	Bias
KS091	3154	2467	2.5	-8.1	6	-	6	-	6	Bias + GE
LAHF7	46	0	2.5	3.2	1	-	0	-	0	Bias
LAZV5	121	1	2.7	-3.6	2	-	2	-	1	Bias
ONFN	53	0	2.6	-3.4	1	-	0	-	1	Bias
PDWZ	40	0	2.0	3.2	0	-	0	-	0	Bias
SIWN	271	1	1.9	3.5	3	-	4	-	2	Bias
SYMK	49	6	3.3	-5.7	0	-	0	-	1	Bias
TBWUK02	52	0	0.9	-3.7	1	-	1	-	1	Bias
V7BW6	45	0	0.9	-3.0	1	-	0	-	0	Bias
VRCL9	82	0	2.3	-3.6	2	-	1	-	0	Bias
VRDR8	* 187	4	2.6	-5.2	3	-	4	-	3	Bias
VRXK4	63	2	1.4	5.9	1	-	0	-	2	Bias
WCX7445	1662	5	3.7	3.4	1	-	4	-	3	Bias
WDC7379	309	0	0.8	-4.5	3	-	2	-	2	Bias

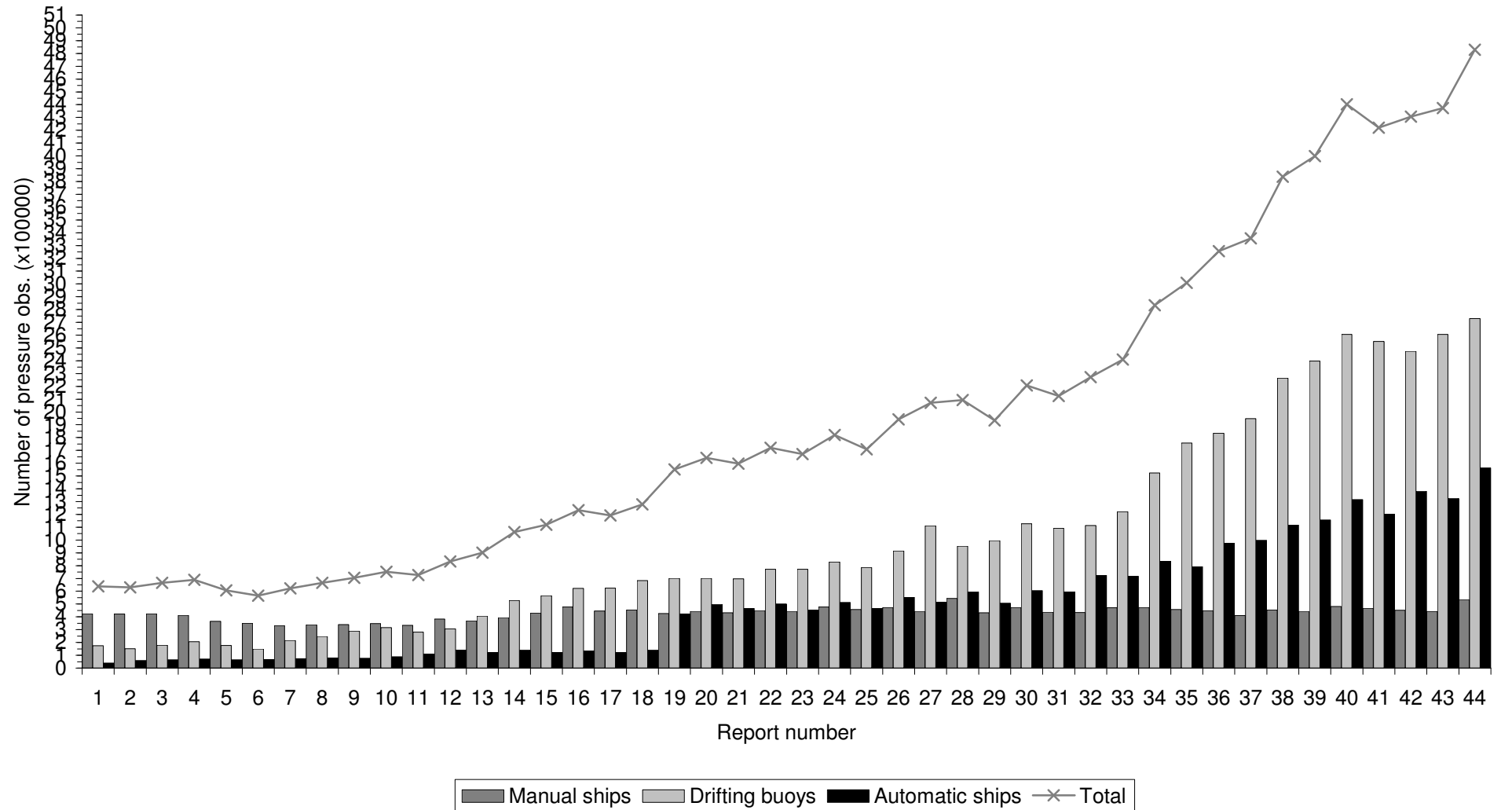
**TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2010.**

- 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.

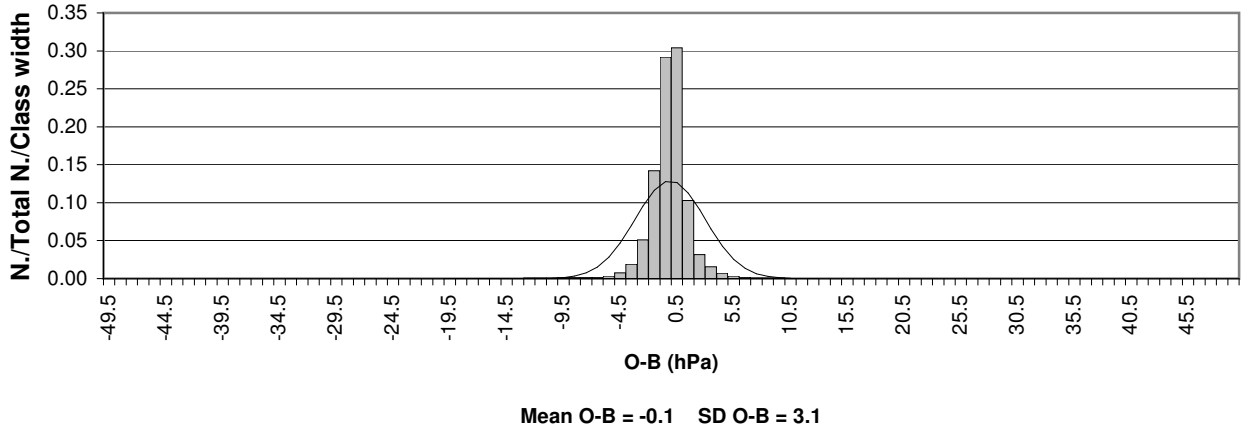
Notes: 1. Units are °C

Identifier	N Obs.	NGE	SD	Bias	Comments
3FNZ5	320	0	1.5	-2.4	Reduced bias
41113	5801	0	1.0	-0.5	Reduced bias
41114	6591	0	1.2	-0.8	Reduced bias
44043	3715	0	1.8	0.7	Reduced bias
44057	3575	0	3.1	1.9	Reduced bias
44063	3408	0	1.4	0.6	Reduced bias
A8GA8	92	0	1.7	-0.6	Reduced bias
A8JM3	12	1	1.3	-6.9	Less than 40 reports
DANV	16	0	1.1	-3.2	Less than 40 reports
DNDD	81	0	4.0	2.3	Reduced bias
LEQZ3	86	3	3.0	2.5	Reduced bias
UCJL	120	0	1.5	-0.4	Reduced bias
UEYO	159	60	2.2	0.7	Reduced bias & GE
V7LU5	36	0	3.0	3.1	Less than 40 reports
WGJT	163	0	1.6	-2.0	Reduced bias
WRFJ	19	0	1.7	0.6	Less than 40 reports
WZZF	285	1	0.7	2.8	Reduced bias
ZCBP6	13	0	2.9	4.3	Less than 40 reports

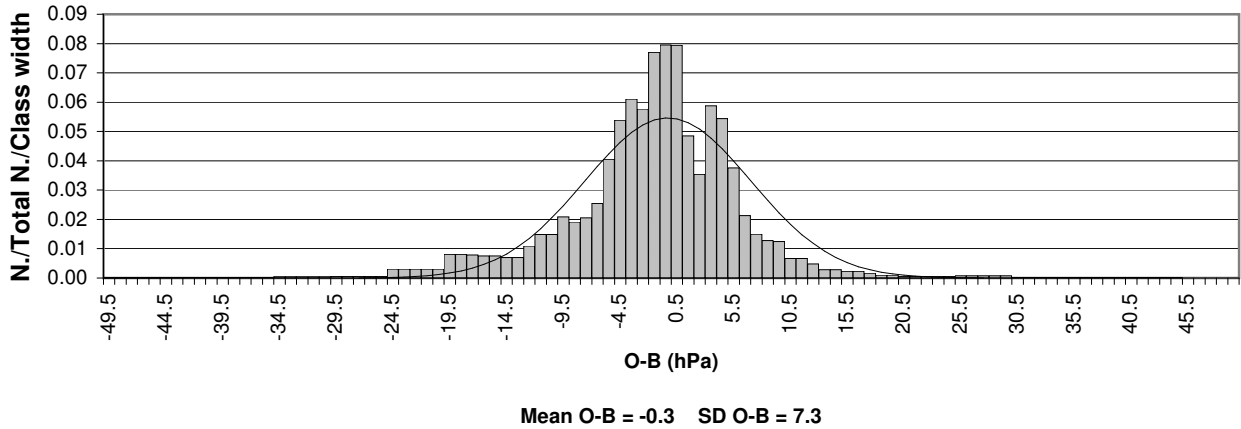
**Figure 1: Number of observations of pressure received at Exeter on the GTS for each of the six-month periods covered by the WMO reports on the quality of marine surface observations**



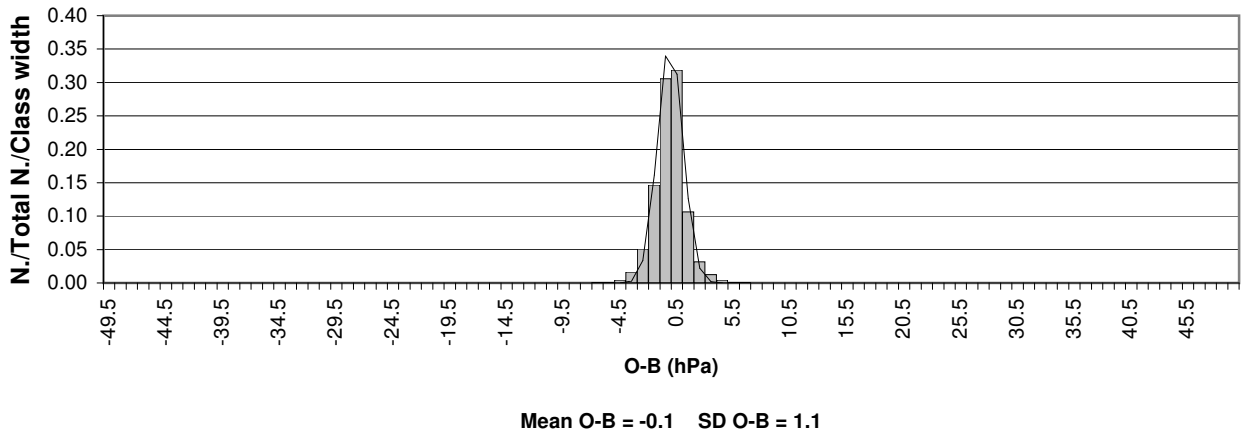
**Figure 2a: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2010 Data used: All observations



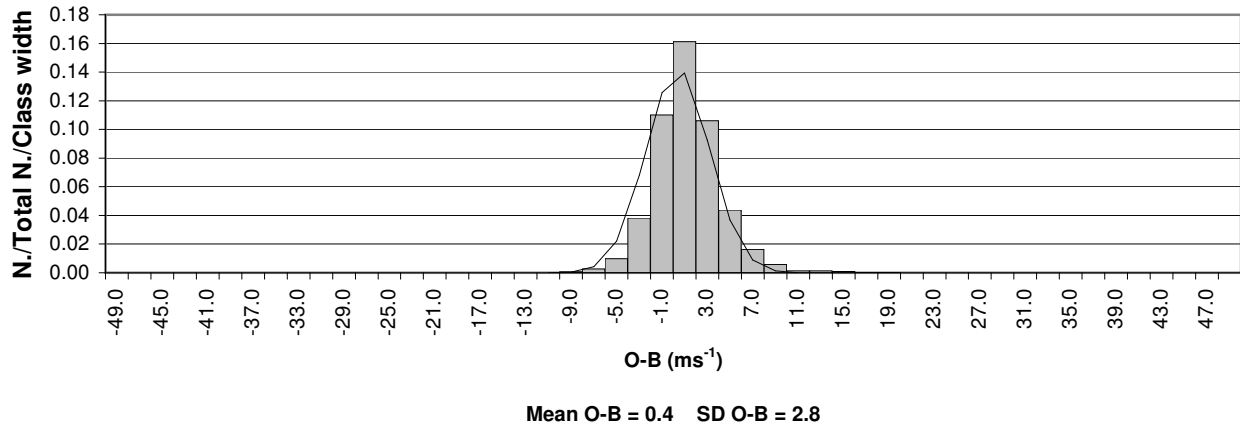
**Figure 2b: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2010 Data used: Flagged observations



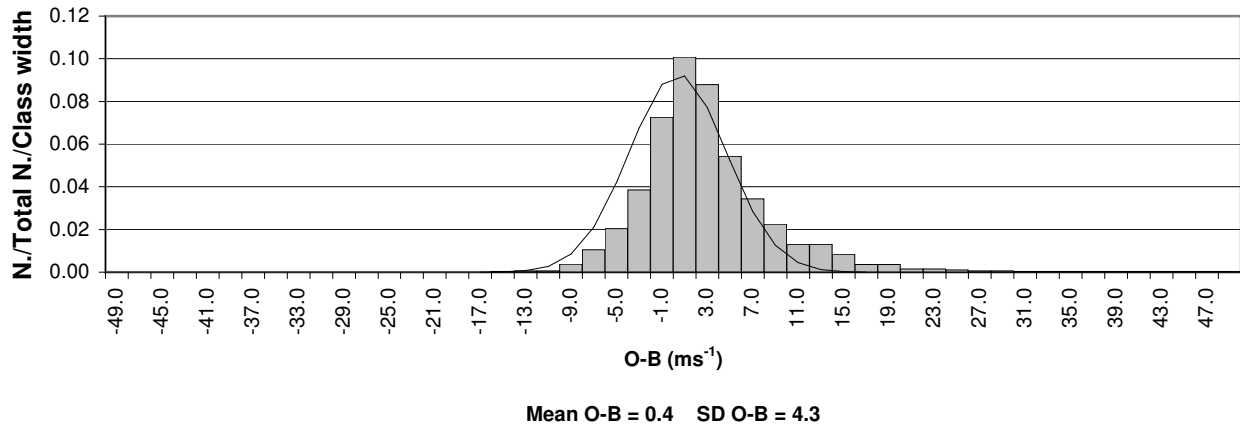
**Figure 2c: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2010 Data used: Unflagged observations



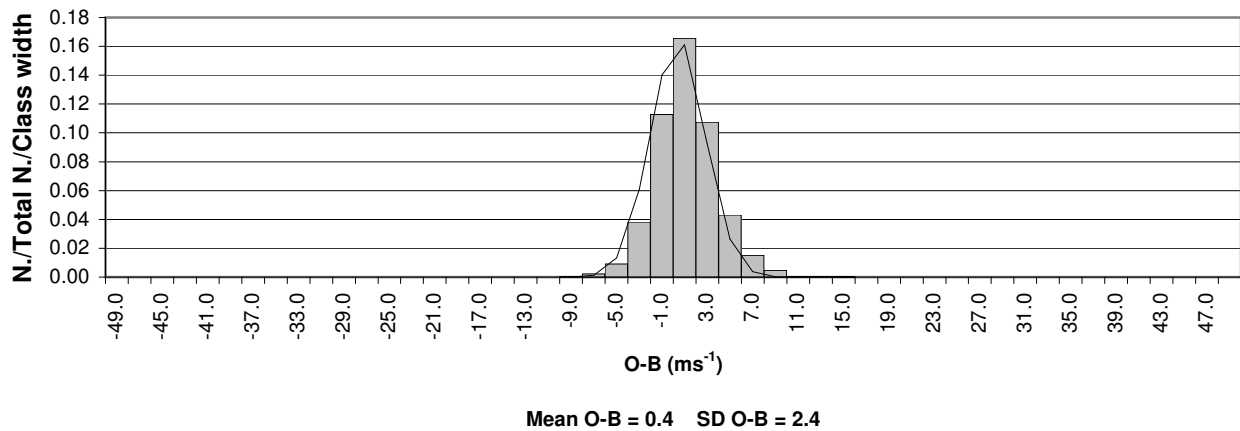
**Figure 2d: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2010 Data used: All observations



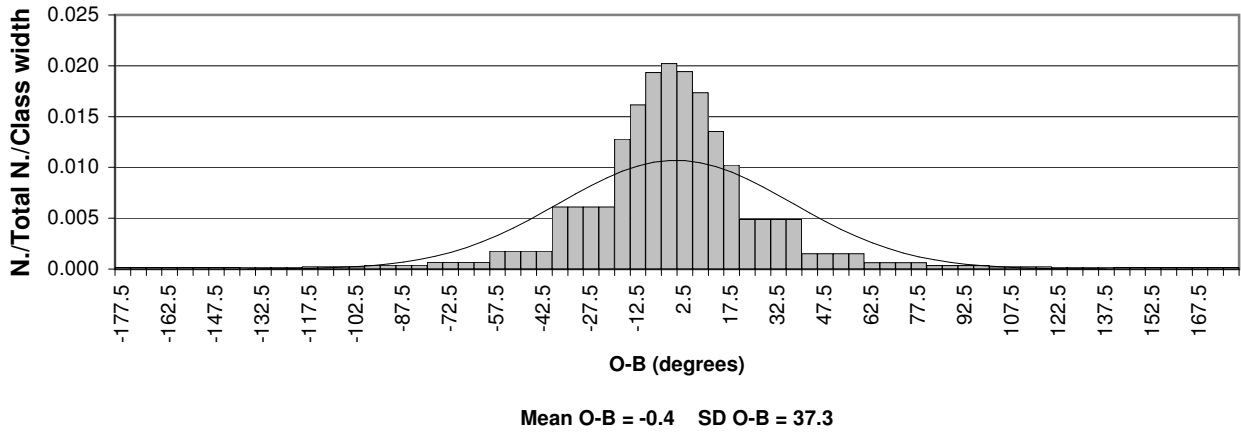
**Figure 2e: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2010 Data used: Flagged observations



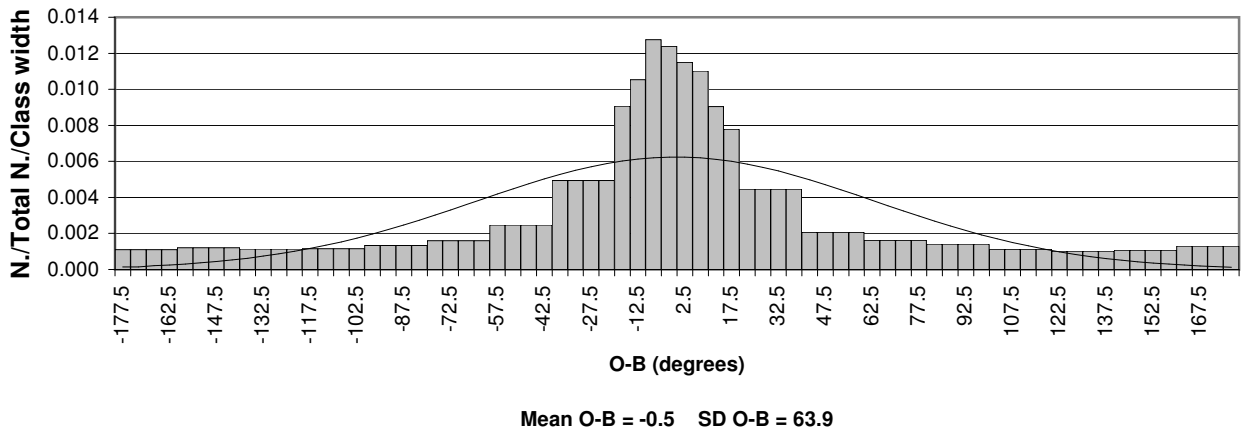
**Figure 2f: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2010 Data used: Unflagged observations



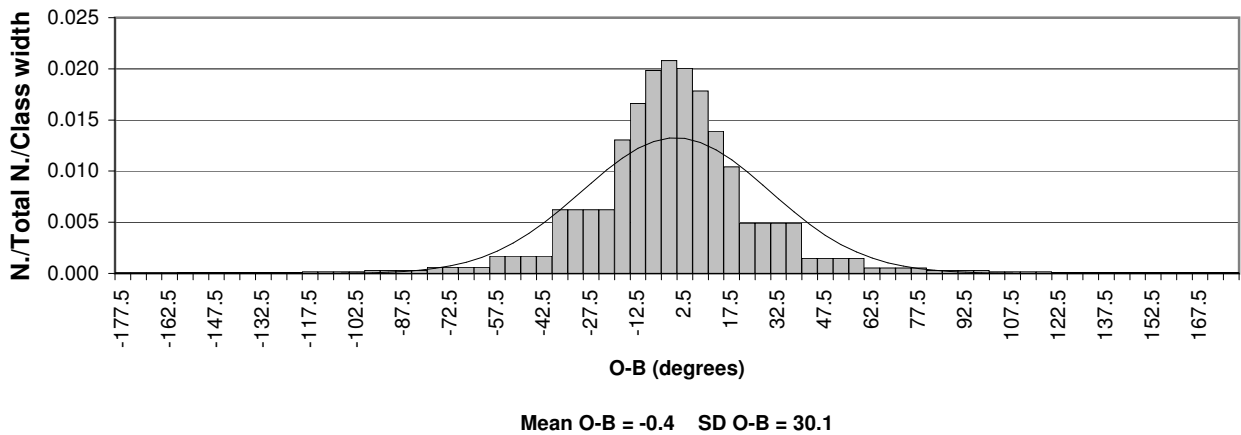
**Figure 2g: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2010 Data used: All observations



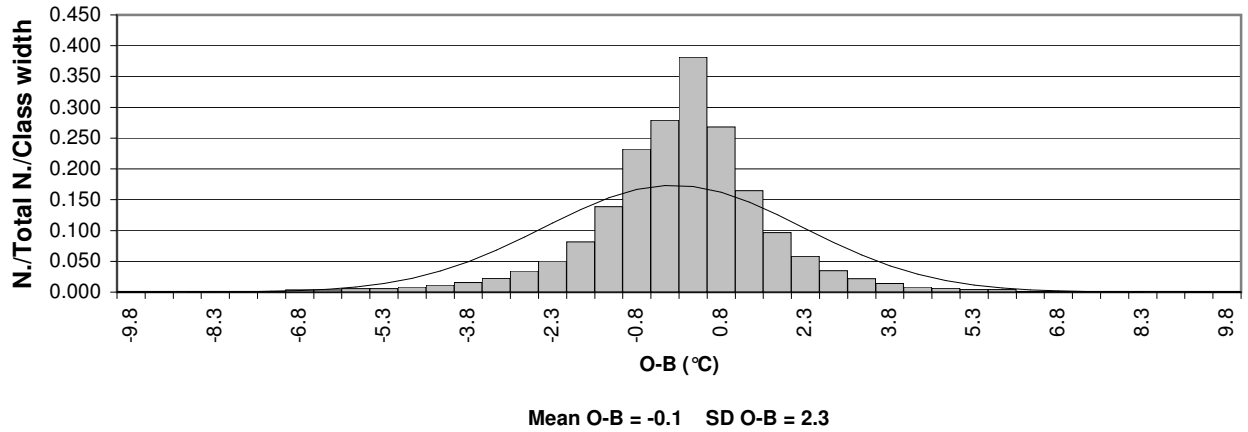
**Figure 2h: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2010 Data used: Flagged observations



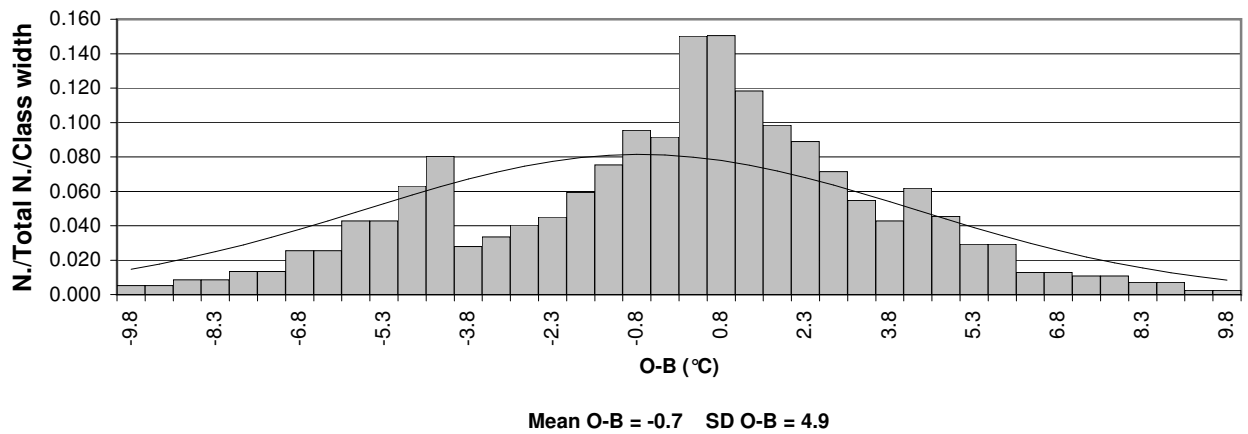
**Figure 2i: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2010 Data used: Unflagged observations



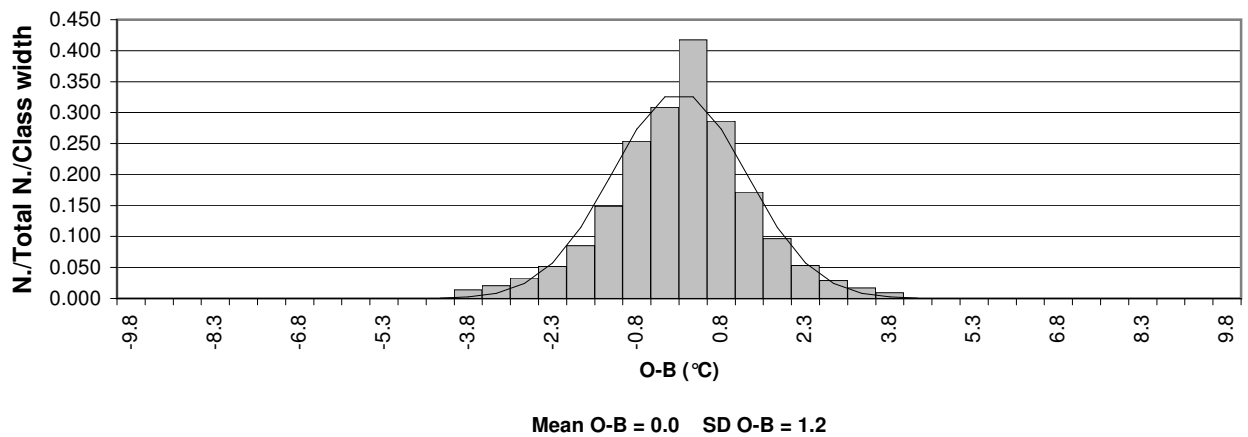
**Figure 2j: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2010 Data used: All observations



**Figure 2k: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2010 Data used: Flagged observations



**Figure 2l: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2010 Data used: Unflagged observations



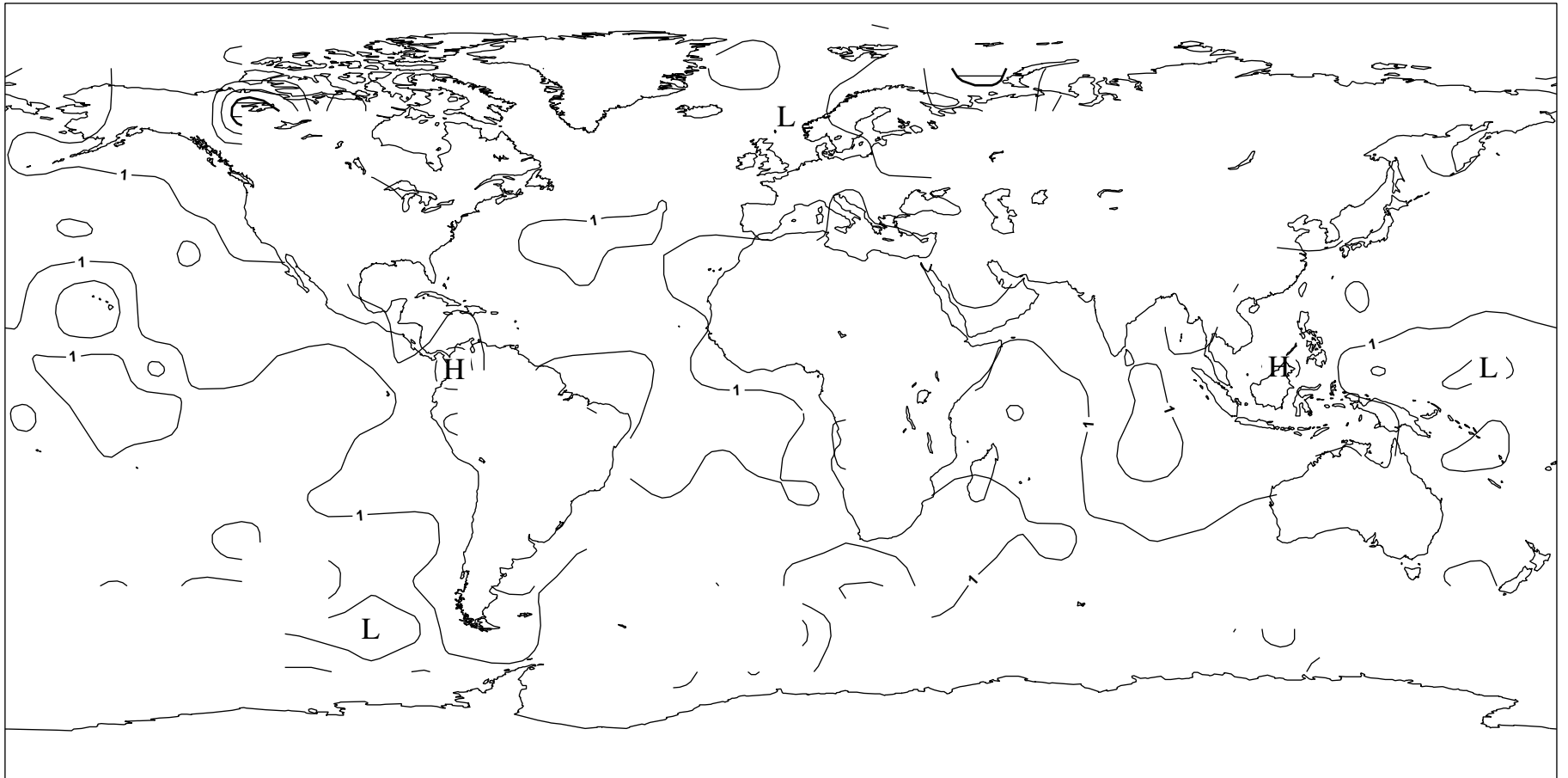




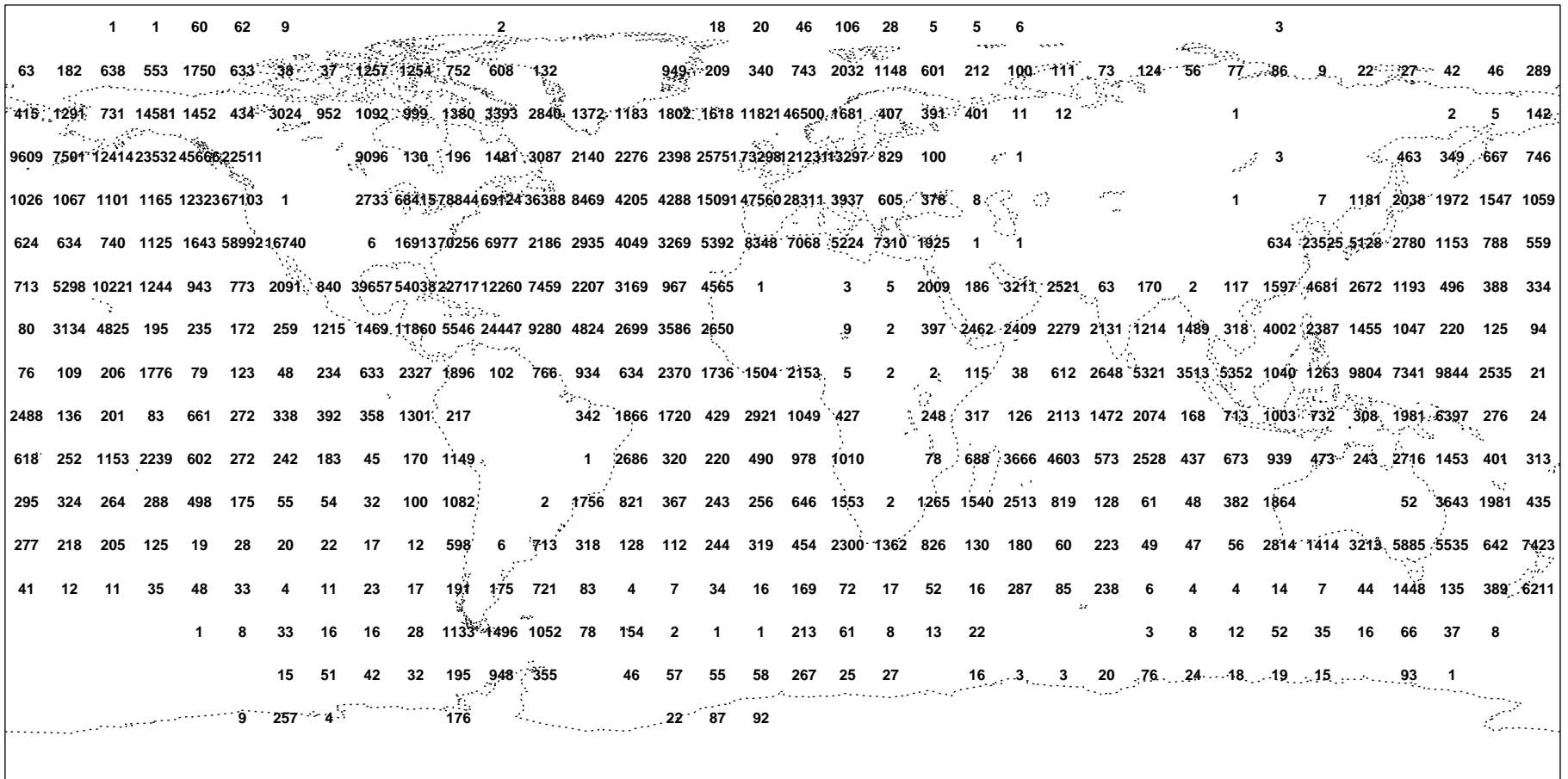
**Figure 3: Bias of Ship O-B Pressure (hPa). Date:- July - December 2010**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 1.0 hPa**



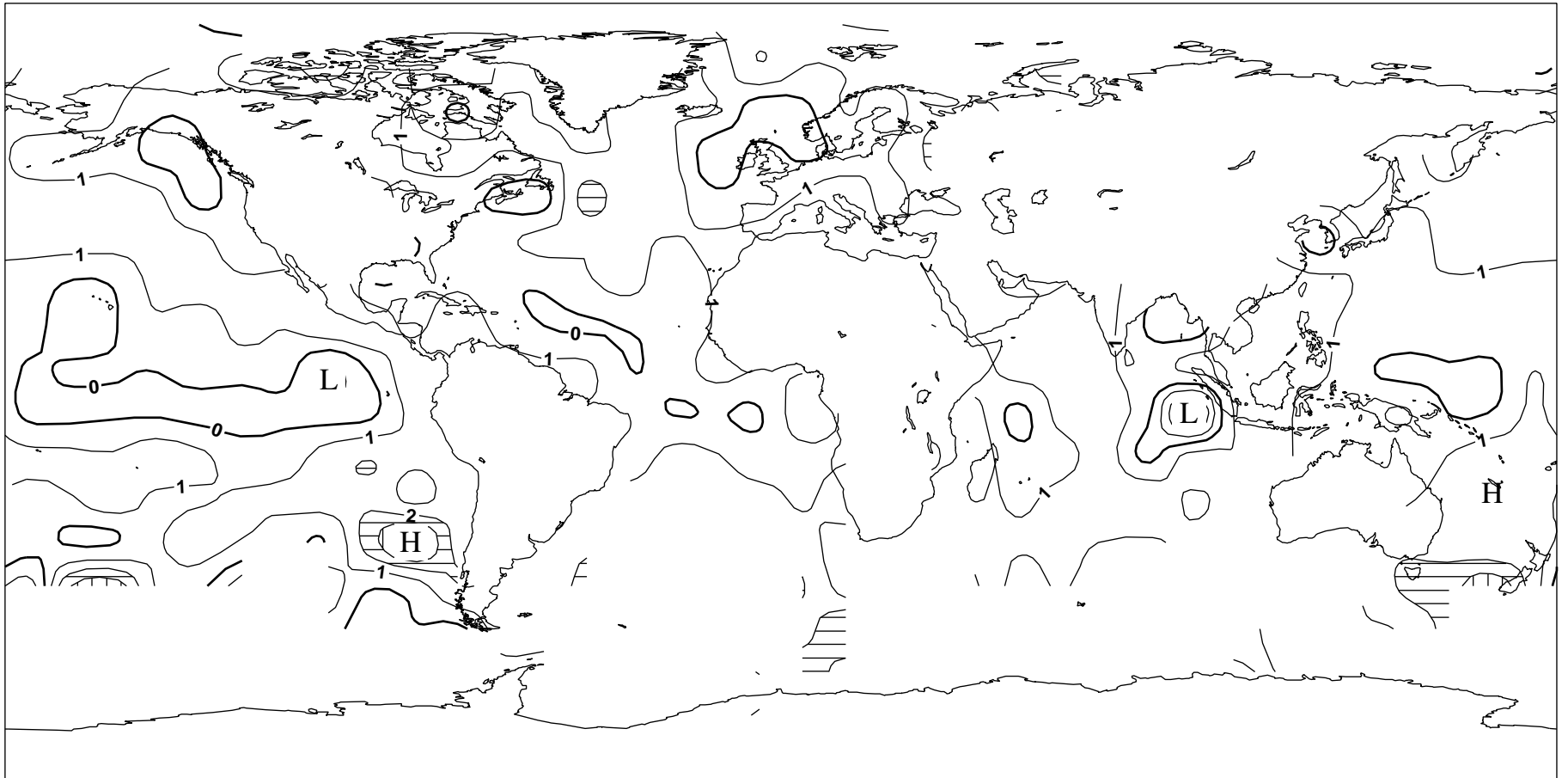
**Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- July - December 2010**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 2.0 hPa**



**Figure 5:**  
**Plot of the Number of Ship Pressure Observations. Date:- July - December 2010**  
**Only observations passing quality control included**



**Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- July - December 2010**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 2.0 ms-1**

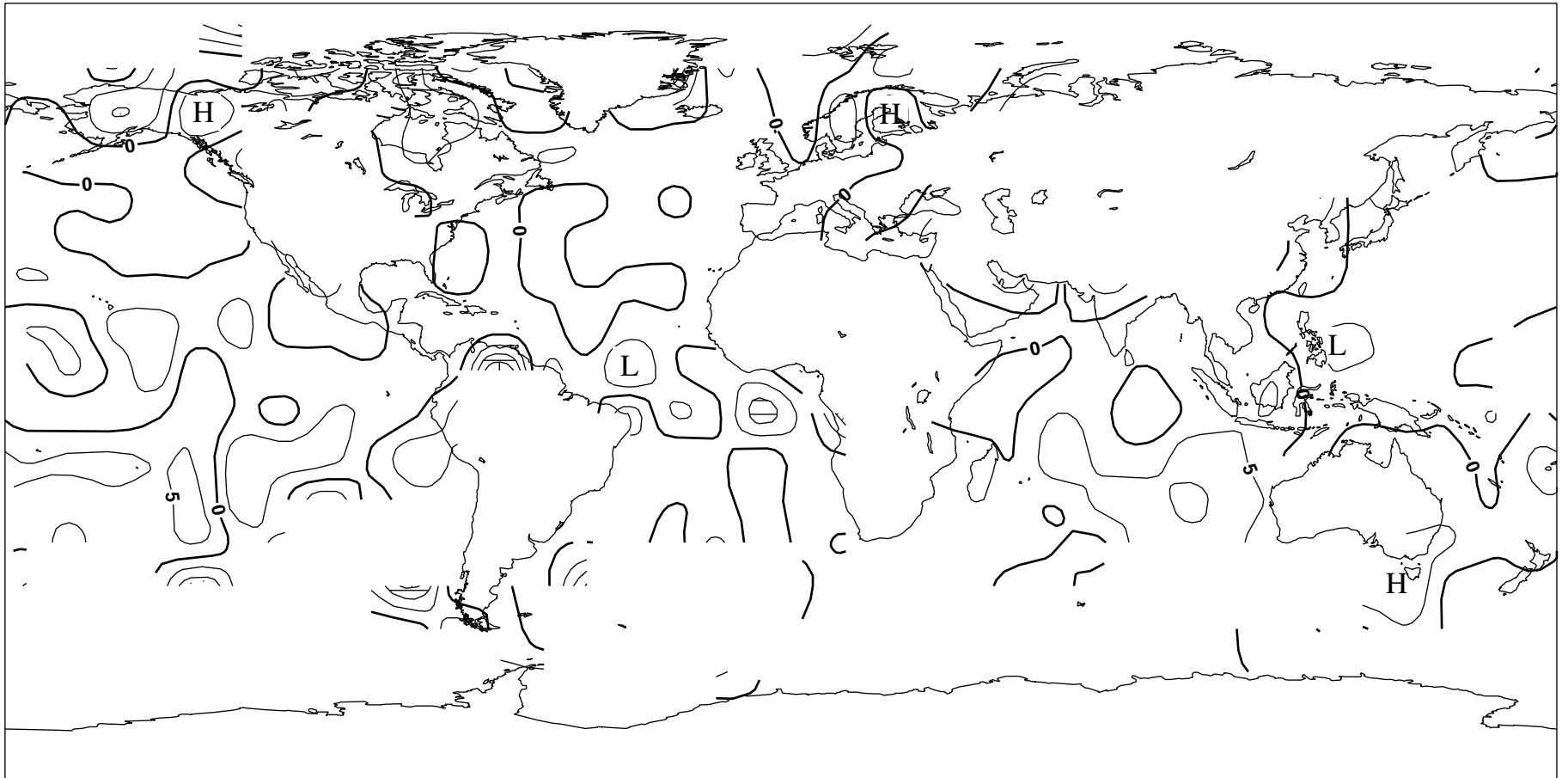


**Figure 7: Standard Deviation of Ship O-B Wind Speed (ms<sup>-1</sup>). Date:- July - December 2010**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 4.0 ms<sup>-1</sup>**

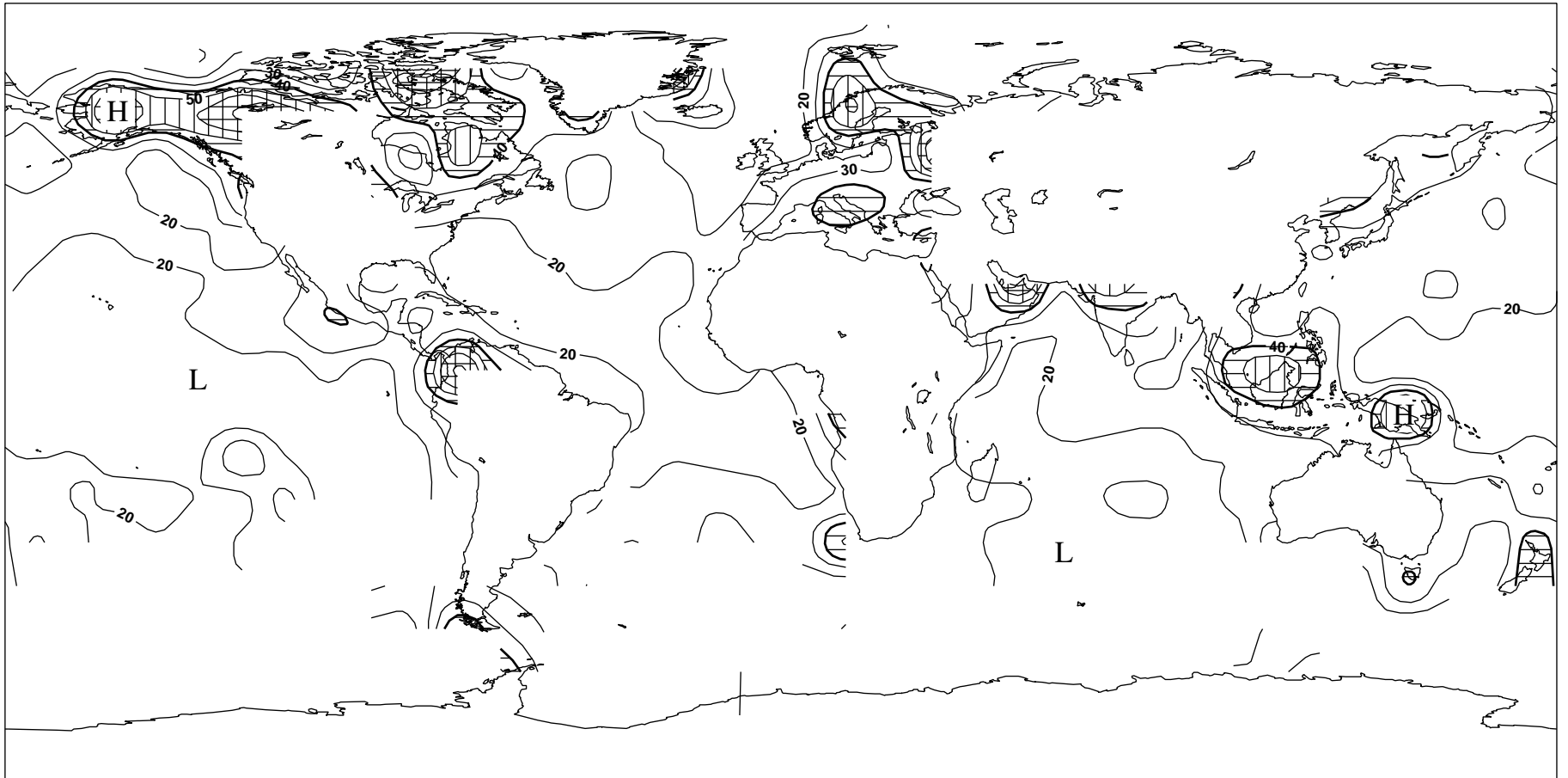




**Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- July - December 2010**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 10 degrees**



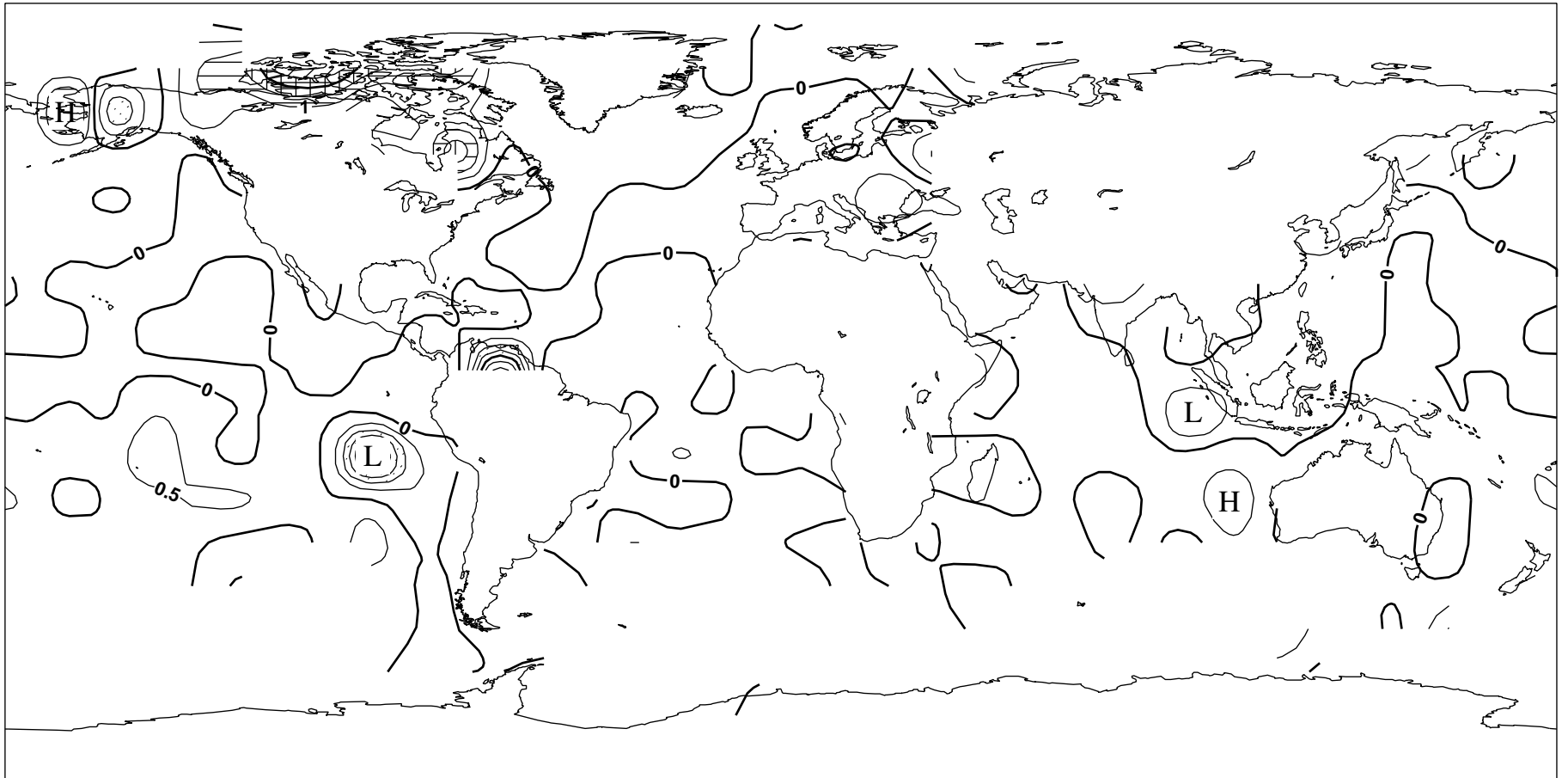
**Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- July - December 2010**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 40 degrees**







**Figure 12: Bias of Ship O-B SST (degrees C). Date:- July - December 2010**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 1.0 degree C**



**Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- July - December 2010**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 2.0 degrees C**

