

# Report on the Quality of Marine Surface Observations

Report Number 40

July to December 2008

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2008

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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 fortieth of its reports and covers the period July to December 2008. 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 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 if there are other nearby observations. 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. Unlike wind and pressure, SST monitoring at the Met Office used to be performed against the latest analysis field, a reasonable approximation to truth due to the thermal-inertia of the oceans. However, as of October 2000, this practice was changed and the SST background field has also been used, but, with the slowly varying nature of SST relative to parameters measured above the surface, the background is in fact the previous analysis (these analyses are performed daily at the Met Office from an assimilation of both surface and satellite observations). Nonetheless, the SST monitoring at the Met Office is no longer limited by a dependence upon the observations themselves.

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. The fractions of O-B error contributed by errors in the background field and by observation errors are generally similar. There is often, however, a smaller group of observations departing 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 sufficiently stringent 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 the departure from the model background values. All observations, both synoptic and asynoptic, are assimilated. At the Met Office (as of May 2000) the background fields are interpolated to the observation time by 4D-Var. Most other centres now also use interpolation schemes, including ECMWF, Météo-France, Tokyo and Washington.

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

#### **Wind**

1. the | mean of O-B |  $\geq 5.0\text{ms}^{-1}$  (Speed)  
 $\geq 30^\circ$  (Direction)
2. the standard deviation of O-B  $\geq 80^\circ$  (Direction)
3. the 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 and in this way occasional 'wild' 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  $5\text{ms}^{-1}$ .

Relatively little information is exchanged between centres on a regular monthly basis for SST.

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. The cut-off varies between 6 and 24 hours. There are also some unexplained variations in the data receipt between the centres, which may be due to problems in 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; there is less agreement as to which platforms are listed, reflecting the greater uncertainty when monitoring wind speed.



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

#### **Wind**

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

#### **SST**

1. the | mean of O-B |  $\geq 3.0$  °C
2. the standard deviation of O-B  $\geq 5.0$  °C
3. the 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 previously used in these reports were based on O-A statistics. Data presented here is, then, not directly comparable with that in earlier reports.

The limits on the bias and standard deviation O-B are 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 can be 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 2008, 4402937 observations of pressure were monitored at Exeter from 2894 manual ships, 878 drifting buoys, and 711 automatic ships. The number of reports received from individual ships varies greatly as Table 1 demonstrates; apparently, a large percentage only report once. The reason for this is unclear but it may be a result of errors in the part of the message giving the ship identifier. A comparison with the corresponding table in report number 39 shows that the number of pressure observations reported by automatic ships has increased by another 12% on the last reporting period, giving a total increase of 55.6% during 2008. The number of pressure reports from drifting buoys also increased (by 2.9%) whereas the number of manual ship pressure reports decreased by 0.7%. 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 we can confirm the move towards fewer manual ships reporting pressure compensated by an increasing number of automatic platforms.

Table 2 shows the number of observations of pressure that have been received over the GTS at the Met Office and processed, over past 6-month periods. Due to changes in data storage methods in May 1991, report number 5 covered the period January to May 1991 only, thence figures for January to June 1991 have been scaled-up in order to make a fair comparison with other 6-month periods; this may not be entirely accurate. Further changes in November 1993 for drifting buoys and automatic ships for pressure and winds, may have allowed duplication of a few identifiers in totals for the period June to December 1993, as reclassification from one observation type to another occurred. The observation distribution shown in Table 2 will also have been affected in the long term with a slight shift towards drifting buoys; no duplication of observations occurred however. (SST observations were not affected by the November 1993 change.) The period January to June 1998 is also based on only 5 months data (February-June), but the numbers of observations received have been scaled up, as in the 1991 case.

Figure 1 shows the information presented in Table 2 more clearly. 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, with the number of observations of pressure nearly doubling between reports 11 and 16 (July-December 1996), a period of just 2.5 years. This increase was due to the larger number of reports from each drifting buoy, as reliability has improved; many drifting buoys now make several thousand observations of pressure during a 6-month period. The number of reports from drifting buoys is now 541% that from manual ships, with a little under 60% of all marine pressure observations now being made by drifting buoys. 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' are processed,

rather than only one report per 6-hour assimilation period, as previously. Since then there has been a steady increasing trend in the total number of pressure reports.

A histogram of O-B differences for all ship pressure reports in the period July to December 2008 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 93.9% of the observations, that pass the quality checks, show a distribution of O-B which is very close to Gaussian (Figure 2c) with mean -0.1 hPa and standard deviation 1.3 hPa. The principal contribution to the standard deviation is assumed to be from background 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). The geographical distributions of the mean and standard deviation of the values of O-B from all ship observations which pass the quality-control checks, have been calculated for 10-degree latitude-longitude boxes and are plotted in Figures 3 and 4. In most areas, the magnitude of the mean is less than 1.0 hPa, the exceptions being generally where the sample size is small. The standard deviation is generally around 1.5 hPa. The number of ship pressure reports accepted by the model quality control in each 10-degree box is 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 2008. 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 most can be attributed to a bias in the observed pressure. In many 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. In only a few cases are there regular large random departures from background. Those observing platforms listed in Table 3 which appeared in report number 39 (January to June 2008) have been indicated with an asterisk. A comparison of the statistics given here with those in the report number 38 (July to December 2007), 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 39 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 charts of the pressure observations from these platforms are not given. Less than 40 reports were received in the 6-month period for many of the ships on this list. Approximately 60% of them, however, do show 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 VOF fleet.)

In these monitoring results, the background winds are valid at a height of 10 metres above mean sea level; slightly 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, observations from oil rigs or tankers with anemometer heights of 50m or more (although the speeds reported by some rigs are now adjusted on board to be nominal 10m values) and buoys, where the anemometer can be as low as 2m.

In the period July to December 2008, 1937128 wind observations were available for monitoring at Exeter, from 2925 manual ships, 90 drifting buoys, and 736 automatic ships. (More detail is given in Table 1.) The number of reported manual ship identifiers has decreased since report number 39 but by only 1.3%. The long-term trend seems to be that, after an initial decrease, the number of manual ships reporting wind is settling around the 3000 mark. There were increases in both the number of automatic ships and the number of drifting buoys reporting wind of 8.4% and 45.2% respectively. 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 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. There is a speed bias of  $1.0 \text{ ms}^{-1}$  relative to background, with a direction bias of just  $-0.5^\circ$ .

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  $2.5$  to  $4 \text{ ms}^{-1}$  in middle latitudes and  $2$  to  $3 \text{ ms}^{-1}$  in the tropics. The bias is generally around  $+1 \text{ ms}^{-1}$ , but exceeds  $+2 \text{ ms}^{-1}$  in a few places. 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 10 degrees in most places. The standard deviation is generally between 20 and 30 degrees globally but in some data-sparse areas, it is as large as 40 or 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 2008, 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 plots for these identifiers are not included in this report.

### 3.3 *Sea-surface temperature*

In the six-month period July to December 2008, a total of 6930505 observations of SST were monitored at the Met Office, from 2767 manual ships, 1788 drifting buoys and 374 automatic ships. Of the total, 647648 were from manual ships, 5138521 from drifting buoys and 1144336 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 six-month period. In the last six months we have seen an increase in the number of each type of platform reporting SSTs, most significantly in the numbers of automatic ships which rose by 9.7%. Manual ships and drifting buoys each saw increases of 3%. Despite there being fewer drifting buoys reporting than ships, they contribute a substantial percentage of the total number of SST observations received. This is due to the frequency of buoy observations; hourly in many cases, with 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 86.9% of the observations is nearly Gaussian. There is a bias of 0.0°C relative to background.

Figures 12 and 13 show the geographical distributions over the three-month period of the mean and standard deviation of O-B for ship observations that pass the quality control checks. The numbers of reports used to generate these statistics are presented in Figure 14. The bias is generally around 0.5°C and the standard deviation 1 to 2°C. Particular exceptions to this tend to show up where the number of observations is relatively low.

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

121 marine observing platforms are listed as producing suspect observations of pressure over the period July to December 2008, 105 as producing suspect wind observations and 58 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 suspect platforms reporting pressure was followed by a series of reports listing the number of suspects as fluctuating around about the 80 mark. Between January 1999 and June 2000 (reports 21 and 23) there was an increase in the number of suspects reported and the figures now fluctuate around ~130. When considered alongside the fluctuations in numbers of platforms reporting and observations monitored, this trend does not, it seems, represent decreasing observation quality. Over the same period, there have been increasing numbers of wind observing platforms listed as suspect, although this also appears not to be a worrying trend.

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 a bias in the reported wind speed, while a few show large standard deviations or biases in wind direction. For sea-surface temperature observations, bias is again the most common cause of error.

The selection criteria have been set sufficiently stringent 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, JULY TO DECEMBER 2008.**

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	448	459	489	36	14	24	192	169	37
2-10	275	274	314	11	6	27	24	33	6
11-20	153	163	177	4	4	9	8	11	1
21-40	254	256	247	8	2	15	13	14	1
41-100	557	569	498	12	1	25	20	21	6
101-200	631	629	510	12	4	38	24	25	7
201-500	435	433	323	45	7	106	37	38	10
501-1000	64	66	61	70	9	149	34	42	17
1001-1500	34	35	38	76	7	175	37	44	30
1500+	43	41	110	604	36	1220	322	339	259
<b>Total</b>	2894	2925	2767	878	90	1788	711	736	374
(Report 39)	(2915)	(2963)	(2686)	(853)	(62)	(1735)	(635)	(679)	(341)

\* numbers are for automatic (fixed) buoys only



**TABLE 2: 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 OBSERVATIONS.**

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

**TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2008.**

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 (January to June 2008)

**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
16597	2398	2396	7.4	-3.0	2	4	4	1	4	GE
16598	1312	0	3.4	3.3	1	1	0	1	1	Bias from mid-August
17672	171	0	3.2	4.3	1	1	1	1	1	Bias
17678	46	0	0.2	-5.8	0	1	1	0	1	Bias
21536	816	277	0.3	0.4	1	1	1	0	1	GE
22533	418	416	0.8	-5.5	2	2	2	0	2	GE
22537	193	193	---	---	1	1	1	0	1	GE
23596	2294	0	0.5	-3.9	0	5	5	5	5	Bias
23598	1674	1	0.5	-5.6	2	4	4	4	4	Bias
23599	826	3	0.9	-3.6	0	2	0	2	0	Bias
23602	414	0	0.5	7.6	1	1	1	1	1	Bias
31737	1533	1299	5.5	-6.3	2	5	5	2	5	Bias
33691	87	0	0.5	-6.0	1	1	0	0	1	Bias
33952	88	0	0.5	-6.3	1	1	0	0	1	Bias
42550	705	117	2.3	11.9	1	2	2	1	2	Bias
44755	1184	1	4.4	-4.3	0	0	0	1	0	Bias
46636	170	0	1.7	-4.1	1	0	0	0	1	Bias
48559	447	154	0.5	0.0	1	1	1	1	1	GE
48660	685	53	5.4	3.8	0	1	1	0	1	Bias and GE
48685	2000	1275	2.8	-1.3	0	2	2	1	2	GE from November
55616	637	462	7.8	-2.2	1	1	1	1	1	GE
56551	874	191	6.9	-1.0	2	2	1	2	2	SD
63982	45	0	1.2	-4.4	1	1	1	0	1	Bias
71630	632	87	5.2	-0.6	0	0	0	0	0	SD
71641	1029	455	6.5	-5.7	2	2	2	2	2	GE
74541	250	74	0.9	0.2	1	0	1	1	1	GE

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
16529	3791	2321	2.7	11.0	2	6	6	6	6	Bias and GE
33674	3801	1664	2.7	11.5	2	6	6	6	6	Bias and GE
55568	500	83	4.3	3.7	0	0	0	0	0	Bias

Table 3b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
17178	1442	0	0.8	-5.7	0	1	3	3	3	Bias
23451	1536	0	1.7	5.1	0	3	4	4	4	Bias
23493	* 387	75	1.4	13.0	2	3	3	1	3	Bias
7854	88	7	4.6	-4.9	2	1	0	0	2	Bias
8PPK	393	32	4.9	3.8	1	2	2	0	3	Bias from November
9MCR4	164	2	3.8	6.9	0	3	4	0	4	Bias
9VAK8	185	1	2.5	4.0	0	1	2	0	2	Bias from October
9VAK9	126	1	3.7	6.7	0	1	1	0	2	Bias
A8AH6	54	1	1.0	3.8	0	0	0	0	0	Bias
A8DG7	118	0	1.1	3.7	1	0	3	0	3	Bias
A8HA7	41	0	1.2	3.5	0	0	0	0	0	Bias
A8IT6	94	5	2.6	6.4	1	3	3	0	3	Bias
A8IU7	153	0	1.2	4.1	0	0	2	0	3	Bias
A8JR5	163	0	2.4	6.0	1	1	4	0	5	Bias
A8JS5	* 136	0	1.6	3.7	1	0	0	0	2	Bias
A8JV7	99	0	4.7	2.9	2	2	2	0	2	Bias
A8LO9	47	0	1.8	-4.2	0	0	0	0	0	Bias
A8NO6	132	0	1.9	-4.4	0	1	2	0	2	Bias
ATSJ	* 163	1	1.6	4.2	1	1	4	0	1	Bias
AUBD	85	4	2.4	10.2	1	2	1	0	2	Bias
AUFI	* 46	1	2.4	5.2	0	0	0	0	0	Bias
AVOSTES	* 884	0	0.6	-11.4	2	0	0	0	0	Bias
C6FY5	123	0	2.0	5.3	0	1	2	0	2	Bias
C6SE8	* 98	0	1.0	-4.5	2	0	1	0	3	Bias
C6TX6	* 133	0	2.8	-4.7	2	0	2	0	3	Bias
C6VF3	47	0	1.3	8.0	0	0	1	0	1	Bias
C6VF4	70	2	0.8	13.4	0	1	1	0	1	Bias
C6VG7	* 197	0	1.2	-4.6	2	2	4	0	3	Bias
C6YW	53	0	2.2	4.1	0	0	0	0	0	Bias
CG2960	605	514	3.6	-1.8	0	3	3	0	3	GE
DARU	75	0	1.3	3.5	0	1	0	0	0	Bias
DBUT	* 171	0	1.4	6.3	1	1	4	0	4	Bias
DCAY2	40	0	0.6	5.1	0	0	1	0	1	Bias
DDID2	98	0	1.0	-5.0	0	1	3	0	3	Bias
DDSK	* 46	0	2.1	4.0	1	0	1	0	1	Bias
ELTY9	75	0	1.2	5.7	0	0	1	0	1	Bias
ELZA9	* 70	1	0.6	5.3	0	0	0	0	0	Bias
HPNV	184	84	6.4	-6.0	0	2	3	0	3	GE from October
HPYE	231	0	0.8	-3.5	0	0	0	0	0	Bias
HRRF	* 248	0	0.9	-6.7	2	0	6	0	6	Bias
HZZD	60	0	2.4	-5.6	0	0	0	0	0	Bias
IBHD	105	12	4.4	-4.7	0	0	1	0	1	Bias
J8PE3	110	0	1.1	6.6	1	0	3	0	4	Bias
KS052	* 183	0	0.4	4.5	1	0	1	0	1	Bias
KS059	91	28	2.1	0.1	0	0	1	0	1	GE

KS062	183	166	1.7	-8.5	1	1	1	0	1	Bias and GE
KS081	189	125	0.9	2.1	0	1	1	0	1	GE
LAOW5	59	0	2.5	3.9	0	0	0	0	0	Bias



**TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2008.**

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
14907	0	---	---	---	No reports
14909	0	---	---	---	No reports
16937	0	---	---	---	No reports
16938	0	---	---	---	No reports
16941	0	---	---	---	No reports
22584	0	---	---	---	No reports
23600	0	---	---	---	No reports
23912	0	---	---	---	No reports
23924	0	---	---	---	No reports
33510	0	---	---	---	No reports
33664	0	---	---	---	No reports
3FIF8	1	0	0.0	2.5	Less than 40 reports
3FOC5	241	0	1.8	1.3	Bias reduced
4XFX	115	0	1.5	0.6	Bias reduced
9VDN3	27	1	3.6	-3.9	Less than 40 reports
9VVD6	122	1	5.1	6.0	Bias reduced
A8DM9	1	0	0.0	4.5	Less than 40 reports
A8KD9	213	0	1.0	-1.0	Bias reduced
A8MG8	34	0	1.1	-5.3	Less than 40 reports
AUBC	38	4	1.8	7.7	Less than 40 reports
BATFR41	486	0	0.9	-0.1	SD reduced
C6FM8	136	0	3.2	2.8	Bias reduced
C6FP5	26	0	1.2	1.6	Less than 40 reports
C6FZ7	1440	0	1.3	2.6	Bias reduced
C6TZ9	1888	7	2.1	4.2	Bias reduced
C6VG8	733	1	2.1	-2.6	Bias reduced
DCFB2	215	0	2.1	-0.3	Bias reduced
DDRE2	12	0	0.6	0.9	Less than 40 reports
DEDM	50	0	2.8	2.7	Bias reduced
DFHE2	89	0	2.4	-4.5	Bias reduced
DIDC	79	0	0.7	1.3	Bias reduced
ELVZ7	80	0	1.7	2.3	Bias reduced
GBQM	30	0	2.5	3.5	Less than 40 reports
H3WD	30	1	1.7	7.7	Less than 40 reports
HZZC	53	1	4.2	-1.3	SD reduced
J8PR3	38	27	0.8	14.1	Less than 40 reports
KMJL	18	0	1.7	-0.7	Less than 40 reports
MGGK4	3	0	1.1	1.4	Less than 40 reports
MINUK02	357	17	4.0	2.2	SD and GE reduced
MLEX8	52	0	2.0	1.3	Bias reduced
ONCE	200	0	0.8	0.6	Bias reduced
ONEH	8	0	0.7	-4.2	Less than 40 reports
OWTW2	117	0	4.5	3.2	Bias reduced
OZWA2	122	0	1.5	-2.8	Bias reduced
SCJP	5	0	1.2	2.7	Less than 40 reports

SYAQ	57	0	1.1	-2.2	Bias reduced
SYQO	83	1	1.0	-1.3	Bias reduced
TBWUK03	257	0	3.2	3.3	Bias and SD reduced





**TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2008.**

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 2008)

**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
41552	9655	279	4.9	3.7	0	1	0	0	0	Bias from mid December
41681	669	124	6.6	0.9	2	2	2	0	2	Bias
41936	11219	0	3.6	-3.8	0	0	0	1	0	Bias
41974	7724	156	5.4	5.3	1	1	1	0	1	Bias

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
41623	1955	225	6.8	3.2	2	2	1	0	1	SD
41928	5740	2757	6.1	16.1	4	4	4	0	4	Bias, SD and GE

**Table 5b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
46088 *	8661	0	3.0	3.1	1	0	0	0	0	Bias from December
BSH63 *	2785	0	3.0	-5.0	2	0	2	0	0	Bias
DGXS	54	4	4.8	6.8	0	0	0	0	0	Bias
DLCT	54	0	5.6	5.0	0	0	0	0	0	Bias
KS060	123	0	3.5	5.1	1	0	0	0	0	Bias
KS074 *	215	18	5.5	3.0	1	1	1	0	1	Bias
KS077	177	29	5.0	7.1	5	1	5	0	5	Bias
KS078	120	1	4.2	6.1	2	0	2	0	2	Bias
VEP717 *	1282	0	4.3	5.8	5	2	2	0	2	Bias
WDD9287	168	0	5.7	6.4	1	1	1	0	0	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 2008.**

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 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	Comments on quality of wind speed observations.

Notes: 1. Units are ms<sup>-1</sup>

Identifier	N Obs.	NGE	SD	Bias	Comments
23499	148	0	2.4	-1.1	Bias reduced
46054	2936	0	2.7	3.5	Bias reduced
9VKY3	8	0	3.3	1.9	Less than 40 reports
A8JE6	43	1	4.6	3.2	Bias and SD reduced
A8JS4	102	6	4.4	3.8	Bias reduced
KS056	67	0	3.8	2.8	Bias reduced
PINX	1135	0	3.2	4.1	Bias reduced
SCKM	142	0	3.9	4.9	Bias reduced
V7FN7	34	1	4.2	1.7	Less than 40 reports
WBM5091	23	0	3.3	3.1	Less than 40 reports
ZCDG8	418	1	3.0	4.3	Bias reduced

**TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2008 .**

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 6-10	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  $5\text{ms}^{-1}$ . If no significant speed bias was present, the statistics and plots refer to direction reports with an observed speed greater than  $5\text{ms}^{-1}$ .
  3. Observing platforms marked with an asterisk were listed in the previous report (January to June 2008)

**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
23925	73	0	41.9	20.0	1	1	1	0	1	Bias
23927 §	542	16	53.4	23.4	1	1	1	1	2	Bias
41681 §§	669	91	43.4	-3.6	1	0	0	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
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**Table 7b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments	
23102	690	0	27.1	30.5	1	5	4	1	4	Bias	
23170	*	1620	0	28.8	42.3	2	4	4	1	4	Bias
23172	*	126	0	93.5	60.9	1	2	2	2	2	Bias and SD
23451		1410	0	96.2	-1.1	3	4	4	3	4	SD
23491		1784	0	97.1	106.0	1	5	5	5	6	SD
23499		144	0	126.4	108.7	1	1	1	1	3	Bias and SD
2AJU5		173	0	62.0	1.0	0	0	0	0	0	SD
3FCA9		65	0	67.7	-10.8	0	0	0	0	0	SD
3FFG7		57	0	47.7	33.3	0	0	0	0	0	Bias
42362	§§	1080	0	37.5	-43.3	2	1	2	1	2	Bias
44053		1116	0	122.5	-8.2	1	0	1	0	1	SD
46081	*§	3435	0	39.3	-37.9	1	0	4	2	5	Bias
46145		4143	0	32.2	-35.8	3	5	3	5	5	Bias
9HJD9		80	1	63.1	-12.6	0	0	0	0	0	SD
9HXA5		85	0	62.2	4.3	0	0	0	0	2	SD
9MBW7		117	0	62.9	-22.9	0	0	0	0	2	SD
9VAR2		72	1	70.9	2.7	0	0	0	0	0	SD
A8AL3		177	1	75.7	12.2	2	2	1	0	3	SD
A8FA5		123	0	71.4	23.8	0	0	0	0	0	SD
A8FA6	*§	52	0	67.8	35.1	1	0	0	0	0	Bias and SD
A8IP4		97	0	66.7	1.6	0	0	0	0	0	SD
A8IP9		91	0	66.3	-21.1	0	0	0	0	1	SD
A8JE6	*§	43	1	82.0	-14.0	0	0	0	0	0	SD
A8JS4	§	102	6	79.4	-43.6	1	1	1	0	1	SD
A8KI4	*§	64	0	72.9	-3.2	0	0	0	0	1	SD
A8LA6		150	0	61.9	-31.1	0	0	0	0	2	SD
A8MI2		77	0	66.3	-22.1	0	0	0	0	0	SD
AUCU		96	0	60.3	-22.3	1	1	1	0	1	SD
AUPO		89	0	69.3	-12.5	0	0	0	0	3	SD
BATFR08	§	488	51	73.8	-0.9	1	1	1	0	2	GE and SD
C6HS4		79	0	64.9	9.4	0	0	0	0	0	SD
C6JE5		102	1	67.8	-22.4	0	0	0	0	0	SD
C6YW		53	0	43.4	-38.1	0	0	0	0	0	Bias
CG2350	*	1118	0	102.0	60.8	6	6	6	0	6	Bias and SD
DCTA2		264	0	60.1	20.5	0	0	0	0	1	SD
DDJS2	§	161	9	84.7	15.6	2	2	2	0	2	SD
DFCX2	*	240	2	64.6	11.8	1	2	2	0	2	SD
DGVZ	*	133	0	66.9	-13.9	1	1	1	0	2	SD
E5U2135	§	77	0	56.8	-32.8	0	0	0	0	0	Bias
ELRJ6	§	163	0	61.7	-37.6	0	0	0	0	0	Bias and SD
ELXO3	*	212	0	63.6	14.2	1	0	0	0	0	SD
H3VT		289	1	61.2	-26.5	0	0	0	0	0	Bias and SD
H9YP	§	78	0	84.0	5.9	0	0	0	0	0	SD
J8NW	*	119	0	60.5	-7.7	0	0	0	0	0	SD
J8NY		155	1	62.7	14.4	0	0	0	0	1	Bias and SD

KS034		402	0	78.0	-5.7	1	0	1	0	3	SD
KS060	*§	123	0	56.6	-34.3	0	0	0	0	1	Bias
KS062	*	748	2	66.7	21.4	1	1	1	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 2008.**

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
46022	3718	0	46.3	39.5	Bias reduced in December
46091	1934	0	48.5	-24.0	Bias reduced
9HIH5	188	0	47.9	-0.2	SD reduced
9VDN3	28	1	75.8	29.0	Less than 40 reports
9VVN	63	0	43.0	16.7	SD reduced
A8FB9	25	0	33.8	1.6	Less than 40 reports
A8IP3	103	0	38.0	-4.1	SD reduced
A8KW3	72	0	31.9	5.9	SD reduced
A8OZ3	201	0	37.0	-5.1	SD reduced
BSH52	2112	0	33.1	-2.6	Bias and SD reduced
C6FM8	135	0	47.2	-5.4	SD reduced
C6T2062	170	0	51.3	-12.2	SD reduced
CGBY	448	0	43.4	-11.1	Bias and SD reduced
CGDP	988	0	42.1	-2.5	SD reduced
DBUY	4	0	146.4	16.1	Less than 40 reports
DCPI2	180	7	75.8	-0.6	Bias and SD reduced
ELTV3	83	0	53.5	-9.5	SD reduced
ELWC5	195	0	48.1	-12.7	SD reduced
HPNV	179	0	55.6	9.6	SD reduced
HZGH	142	0	48.7	7.5	SD reduced
J8AZ3	47	0	51.5	-51.6	Bias reduced
JNCJ	133	1	52.0	-8.8	SD reduced
LAEP4	22	1	65.4	-8.3	Less than 40 reports
MPMM5	4	0	19.0	13.0	Less than 40 reports
MZIF7	148	1	56.5	-19.0	SD reduced
PBJF	146	0	47.8	-13.3	SD reduced
PCIP	235	4	73.3	-4.8	SD reduced
PDKU	211	0	44.3	-3.3	SD reduced
PDMK	102	0	39.3	-15.1	SD reduced
PDWG	185	0	37.8	1.4	SD reduced
PHHB	229	0	38.1	7.7	SD reduced
S6JR	5	0	0.0	-18.1	Less than 40 reports
SYMK	51	0	39.0	4.2	SD reduced
TBWUK08	513	0	40.3	-8.9	SD reduced
TBWUK18	274	0	37.4	-7.4	SD reduced
TBWUK35	288	0	44.6	2.9	SD reduced
UCAB	53	0	54.6	11.0	SD reduced
UCJC	59	1	40.7	-1.1	SD reduced
UCKD	52	0	49.4	6.0	SD reduced
UCUC	123	0	48.2	-7.2	SD reduced
UCUE	30	0	19.5	81.8	Less than 40 reports
UCUQ	138	0	55.1	4.6	SD reduced
UDWE	234	6	56.8	-17.0	SD reduced
UITP	288	0	37.1	-2.5	SD reduced
V2QB2	260	0	50.4	12.8	SD reduced
V2PP2	1	0	0.0	11.5	Less than 40 reports
VQIC2	45	0	40.7	-16.9	SD reduced
VRBQ2	81	0	55.0	17.2	SD reduced





**TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2008.**

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 2008)

**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
11932	78	64	4.8	0.0	1	-	1	-	1	GE
13949	143	0	0.2	4.3	2	-	2	-	2	Bias
15905	246	62	1.6	-0.8	0	-	0	-	0	GE
22585	58	20	4.1	4.4	1	-	1	-	1	GE
23960	99	99	---	---	1	-	1	-	1	GE
33691	50	0	1.6	5.7	1	-	0	-	1	Bias
33952	45	0	1.1	5.6	1	-	0	-	1	Bias
41927	1301	90	2.7	-2.2	0	-	0	-	0	Bias
42536	1625	696	1.1	0.0	1	-	1	-	1	GE
44741	127	82	0.1	-0.1	2	-	0	-	2	GE
48521	126	126	---	---	1	-	0	-	1	GE
48525	96	96	---	---	1	-	0	-	1	GE
52664	753	218	3.0	-2.3	1	-	1	-	1	GE
56528	52	0	0.3	3.1	1	-	0	-	0	Bias
63990	4444	2	2.8	0.9	1	-	0	-	1	Bias

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
17673	3946	10	0.8	-0.4	0	-	0	-	0	Bias
31733	4195	1899	1.6	0.1	3	-	3	-	3	Bias and GE from October
42542	3952	199	2.2	-0.6	0	-	0	-	0	Bias
63529	11812	75	2.3	-1.3	1	-	0	-	0	Bias

Table9b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
9HJB9	411	148	3.3	-2.9	2	-	2	-	2	GE
9VEN5	216	0	2.3	-3.1	4	-	4	-	2	Bias
A8KO3	99	0	2.1	-3.2	2	-	2	-	0	Bias
BATFR11	81	81	---	---	2	-	2	-	3	GE
BATFR46	1754	540	1.7	1.1	3	-	0	-	3	GE
C6UB2	141	6	2.9	-3.5	2	-	2	-	2	Bias
DDFL2	42	0	2.5	-3.4	1	-	1	-	0	Bias
DEAL	53	0	0.6	-3.1	1	-	1	-	0	Bias
DIBZ	49	0	2.7	-3.4	0	-	0	-	0	Bias
DPCK	237	0	0.8	-3.0	3	-	3	-	0	Bias
HZZD	44	1	2.8	-4.2	0	-	0	-	0	Bias
KHRC	274	0	1.0	-3.0	3	-	2	-	0	Bias
KRHX	179	0	2.2	-3.3	3	-	3	-	1	Bias
KS059	62	20	3.9	-4.6	1	-	1	-	1	Bias and GE
KS065	73	6	2.1	6.2	1	-	1	-	1	Bias
KS066	103	91	0.8	-8.6	2	-	2	-	2	Bias and GE
LADR4	95	1	1.3	3.5	2	-	1	-	0	Bias
LAVX4	88	0	1.6	-3.9	2	-	2	-	1	Bias
ONAN	183	4	2.8	-3.8	3	-	1	-	3	Bias
PHHQ	41	0	1.0	8.0	1	-	1	-	1	Bias
S6TS	100	1	2.3	-4.0	2	-	2	-	2	Bias
SGBA	186	0	0.8	3.2	3	-	2	-	0	Bias
SLCI	131	0	1.4	-4.0	4	-	3	-	2	Bias
SVMA	57	0	1.1	-3.7	0	-	0	-	0	Bias
SYMK	46	5	4.9	-2.9	0	-	0	-	0	SD
UACU	100	5	1.1	-3.4	1	-	2	-	1	Bias
UCDM	94	1	2.5	-3.4	2	-	1	-	0	Bias
UELS	56	0	1.4	-4.0	1	-	0	-	0	Bias
V2LA8	70	0	1.5	-3.1	1	-	1	-	0	Bias
V7DI7	204	0	1.5	3.0	2	-	1	-	1	Bias
VGDT	41	0	1.7	-6.7	0	-	0	-	0	Bias
VRCJ9	56	1	2.0	-3.8	1	-	1	-	1	Bias
VRCU7	57	1	0.9	-4.3	2	-	2	-	2	Bias
VRXK9	95	95	---	---	1	-	0	-	1	GE
VRZT8	280	103	1.8	-3.8	4	-	3	-	2	Bias
VVJT	80	0	1.4	3.2	1	-	0	-	0	Bias
WAAH	588	0	1.2	2.7	1	-	0	-	0	Bias
WMLH	100	0	0.9	3.6	3	-	3	-	1	Bias
WSRH	88	1	1.4	-4.7	3	-	3	-	3	Bias

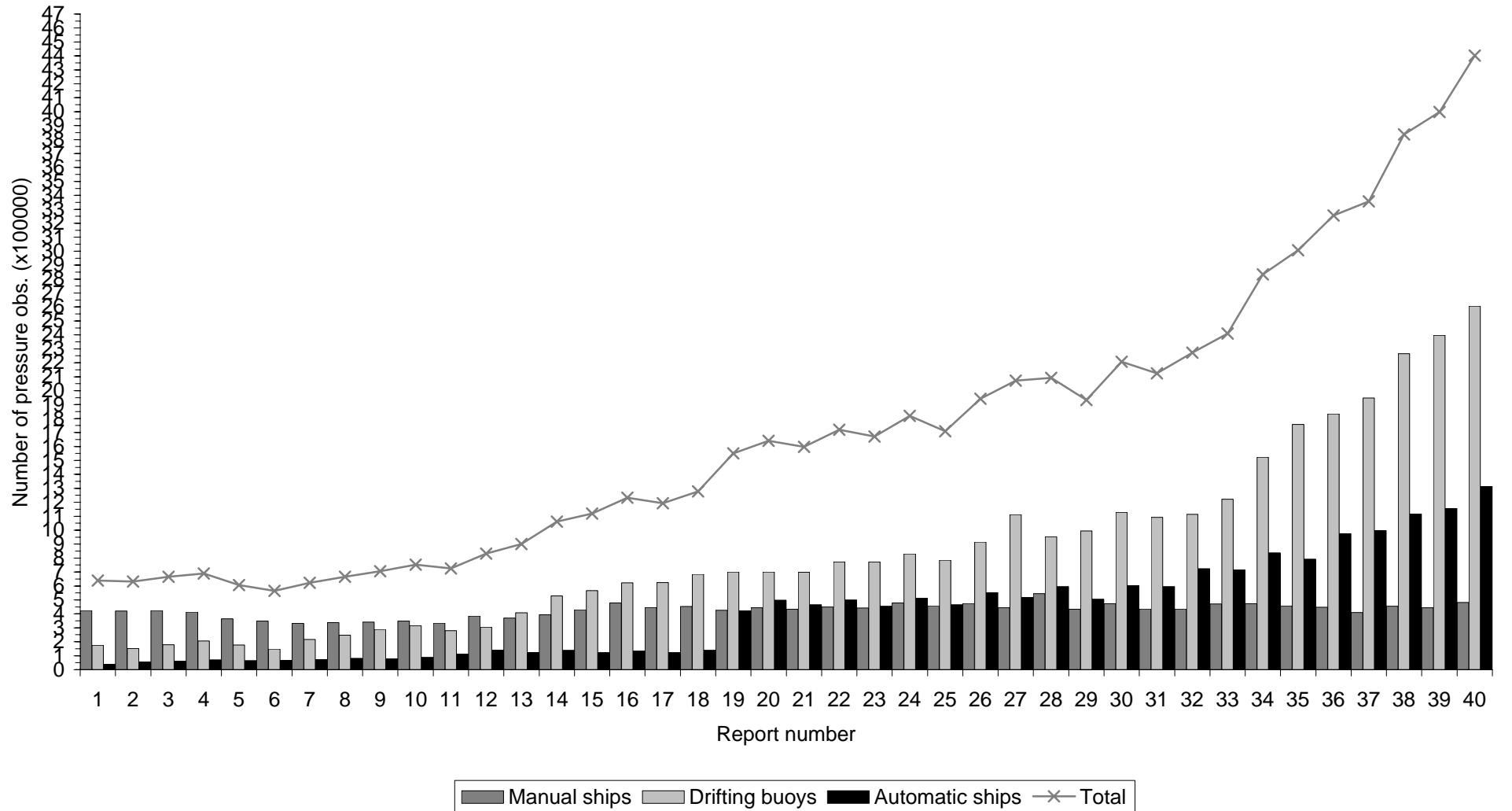
**TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2008.**

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.

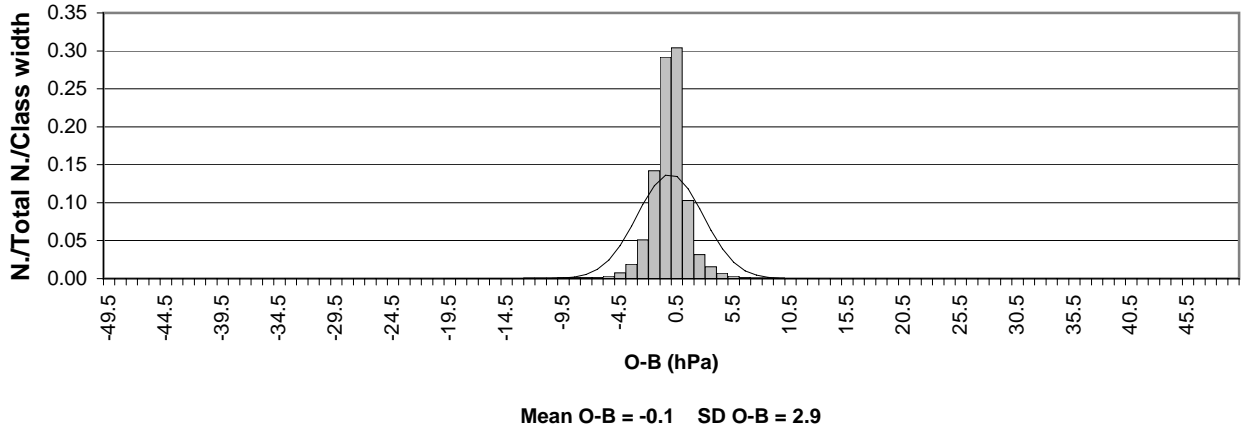
Notes: 1. Units are °C

Identifier	N Obs.	NGE	SD	Bias	Comments
23100	119	0	2.4	0.2	Bias reduced
3FBE8	52	0	1.6	-2.6	Bias reduced
3FYB3	18	0	2.7	2.0	Less than 40 reports
9MBG3	4	0	0.5	2.3	Less than 40 reports
A8GA2	214	0	1.7	-0.1	Bias reduced
A8IN8	302	0	1.8	2.1	Bias reduced
AVOUK00	230	0	1.2	2.4	Bias and GE reduced
BATFR12	1	1	---	---	Less than 40 reports
BATFR16	2126	3	0.4	0.6	Bias reduced
BATFR48	1007	29	0.6	0.9	GE reduced
DFFA2	100	0	1.7	-2.1	Bias reduced
DGTX	163	0	1.3	2.6	Bias reduced
DHZQ	148	0	2.6	-3.7	Bias reduced
DNDD	162	0	1.5	2.4	Bias reduced
ELYP7	68	1	4.3	-3.0	Bias reduced
J8PE4	127	0	1.3	0.5	Bias reduced
LAEP4	23	0	2.2	2.2	Less than 40 reports
PHQX	98	0	1.0	0.8	Bias reduced
TEST	3	3	---	---	Less than 40 reports
UEYO	235	1	2.0	1.9	Bias reduced
V2OW1	161	4	2.9	-1.2	Bias reduced
V7DP7	163	1	1.8	-2.5	Bias reduced
V7ND9	82	0	2.1	-2.5	Bias reduced
WNDG	29	0	1.2	-5.0	Less than 40 reports

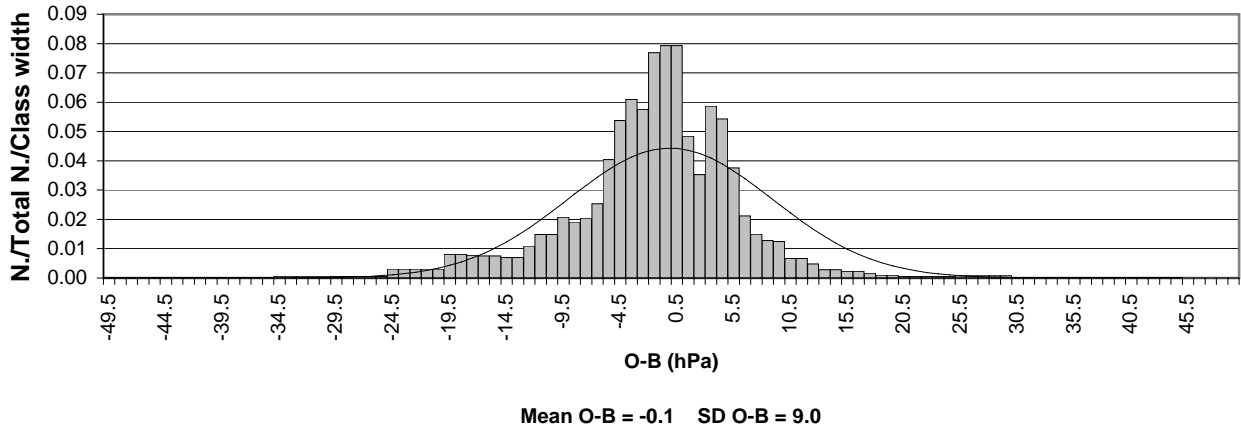
**Figure 1: Number of observations of pressure received at Exeter on the GTS for each of the six-month periods covered by the WMO reports on the quality of marine surface observations**



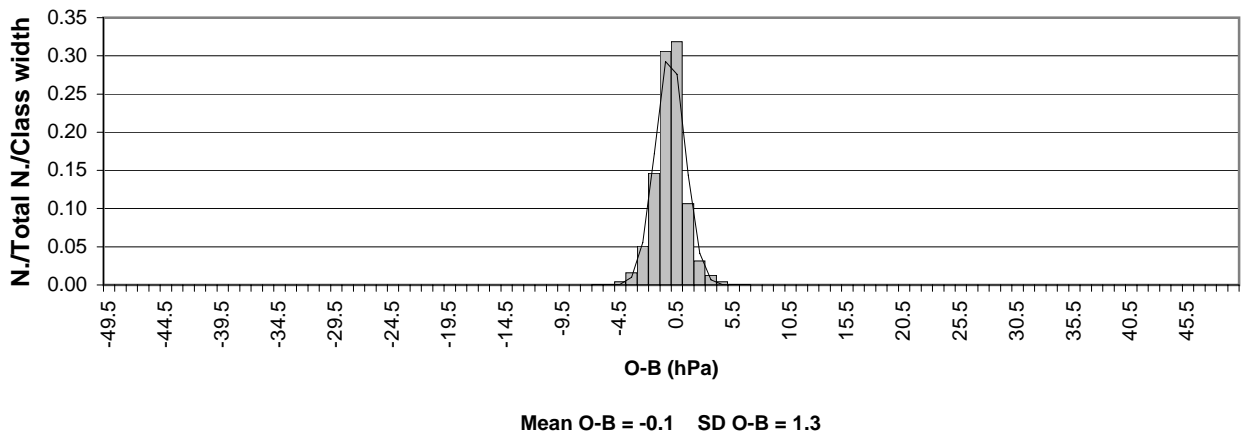
**Figure 2a: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2008 Data used: All observations



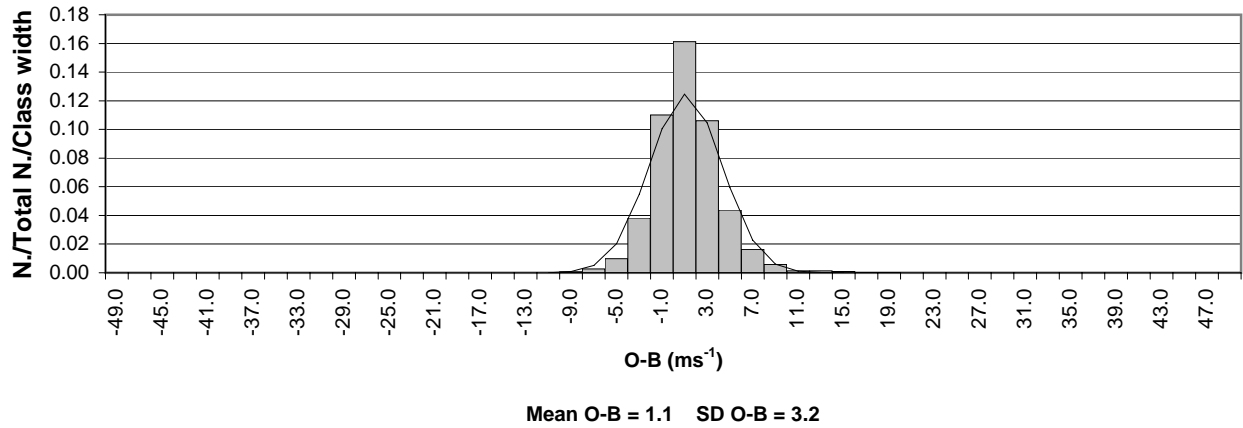
**Figure 2b: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2008 Data used: Flagged observations



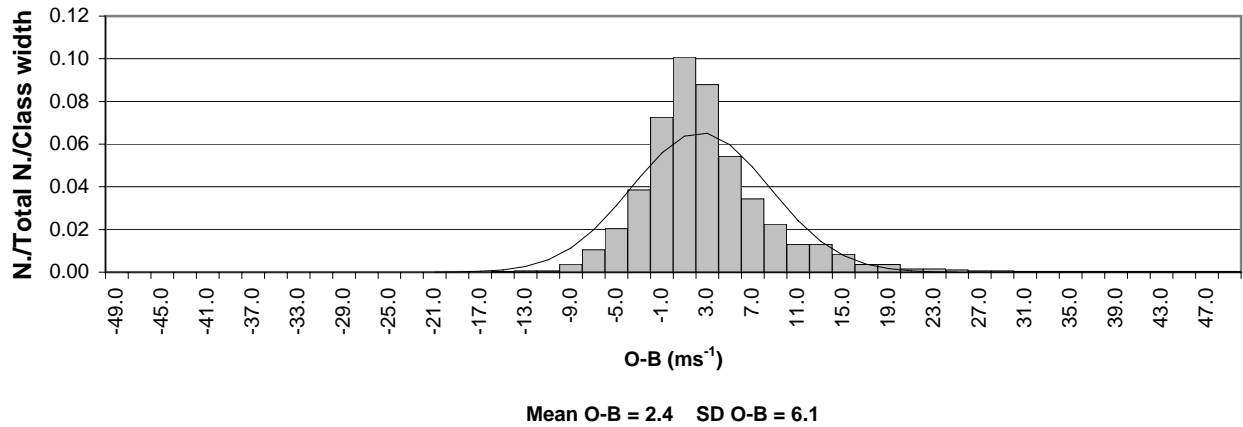
**Figure 2c: Distribution of ship O-B pressure (hPa)**  
Period of data: JUL-DEC 2008 Data used: Unflagged observations



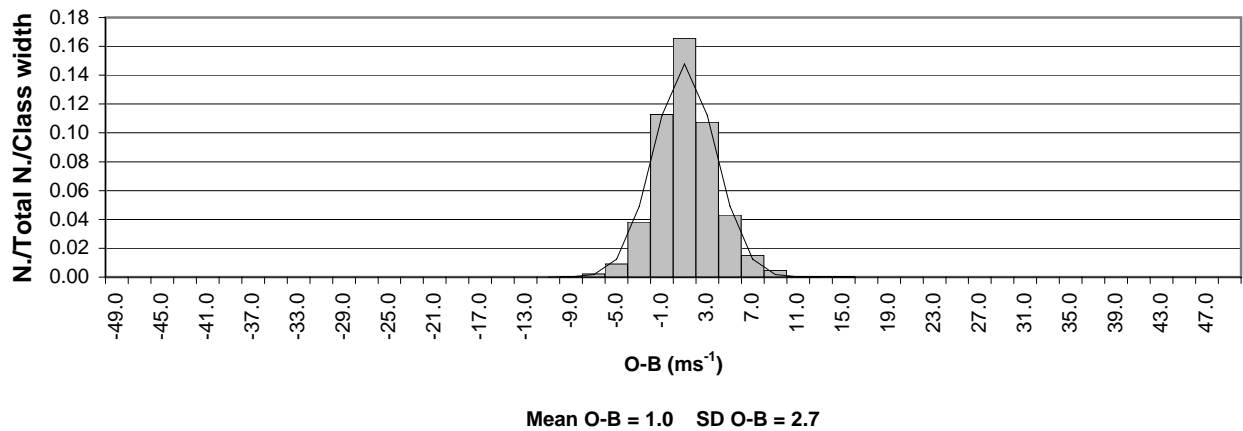
**Figure 2d: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2008 Data used: All observations



**Figure 2e: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2008 Data used: Flagged observations

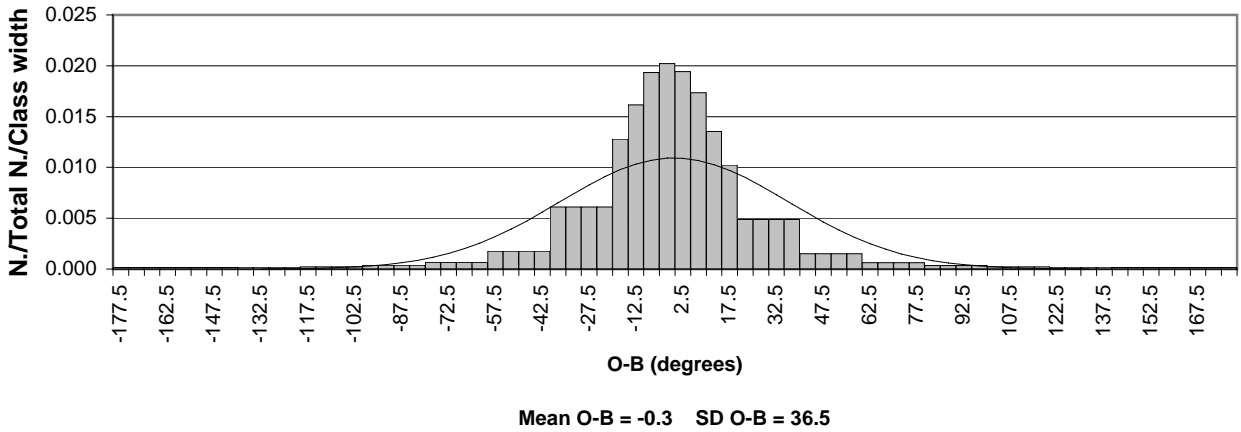


**Figure 2f: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JUL-DEC 2008 Data used: Unflagged observations

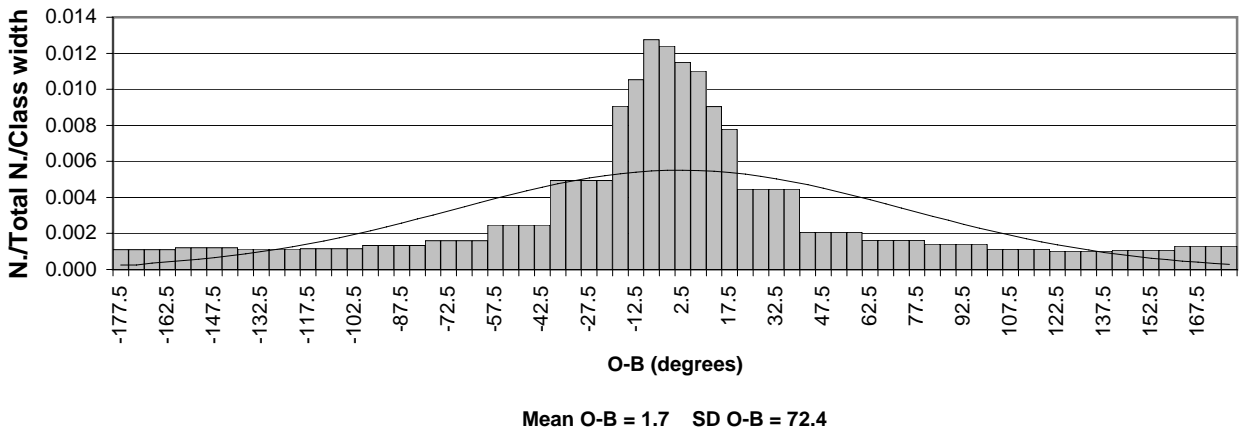




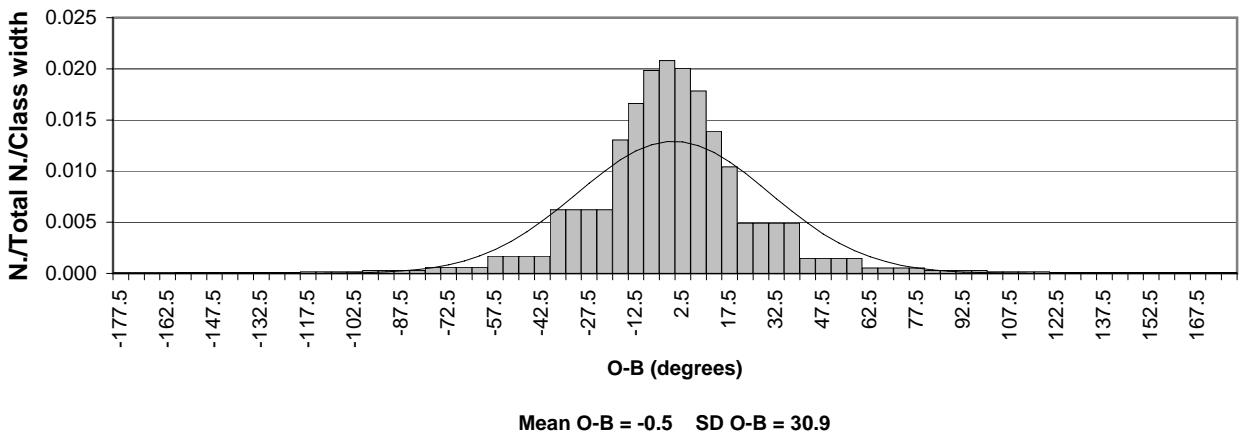
**Figure 2g: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2008 Data used: All observations



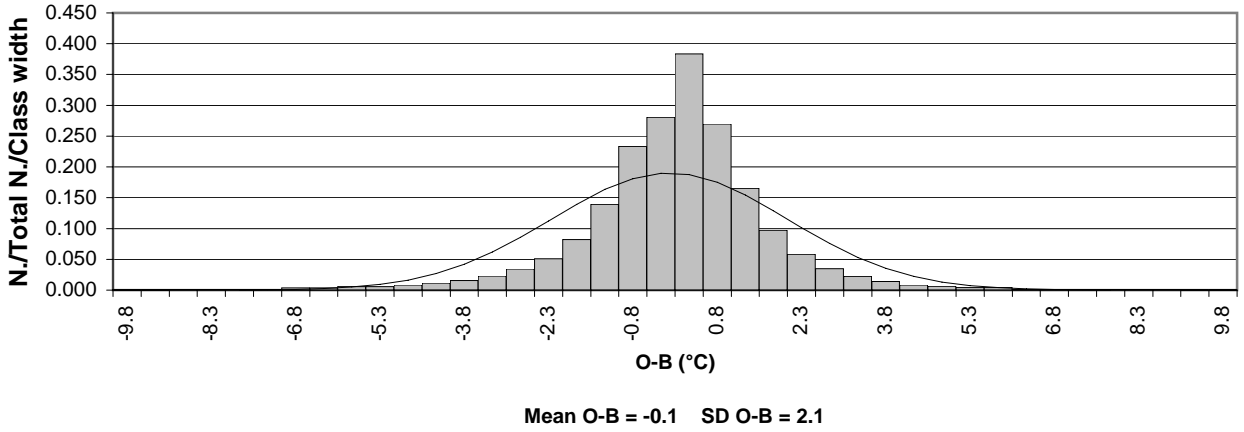
**Figure 2h: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2008 Data used: Flagged observations



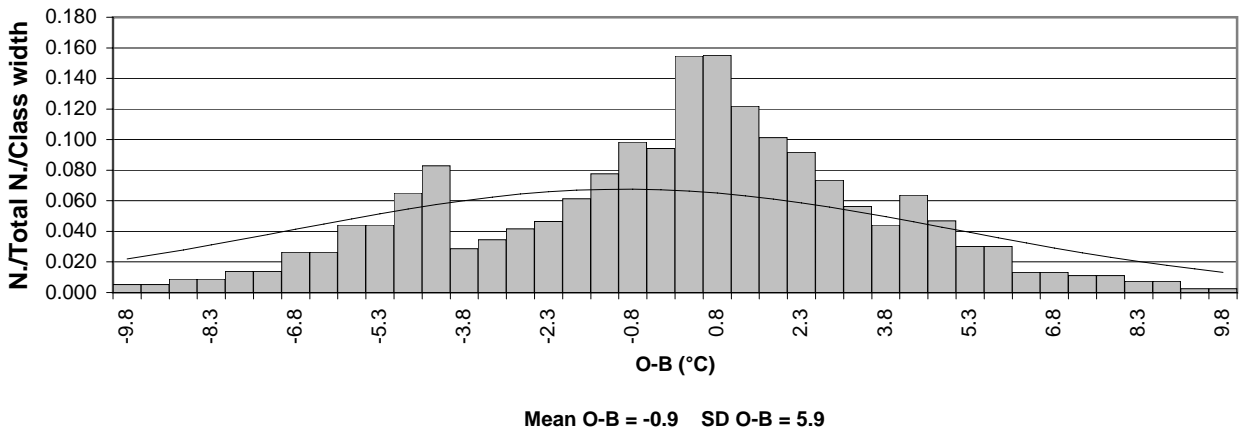
**Figure 2i: Distribution of ship O-B wind direction (degrees)**  
Period of data: JUL-DEC 2008 Data used: Unflagged observations



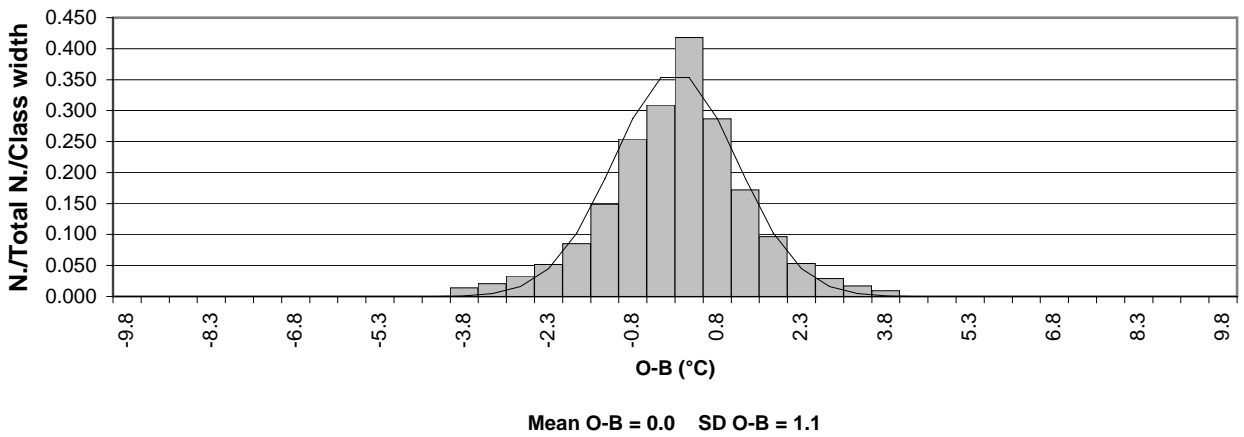
**Figure 2j: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2008 Data used: All observations



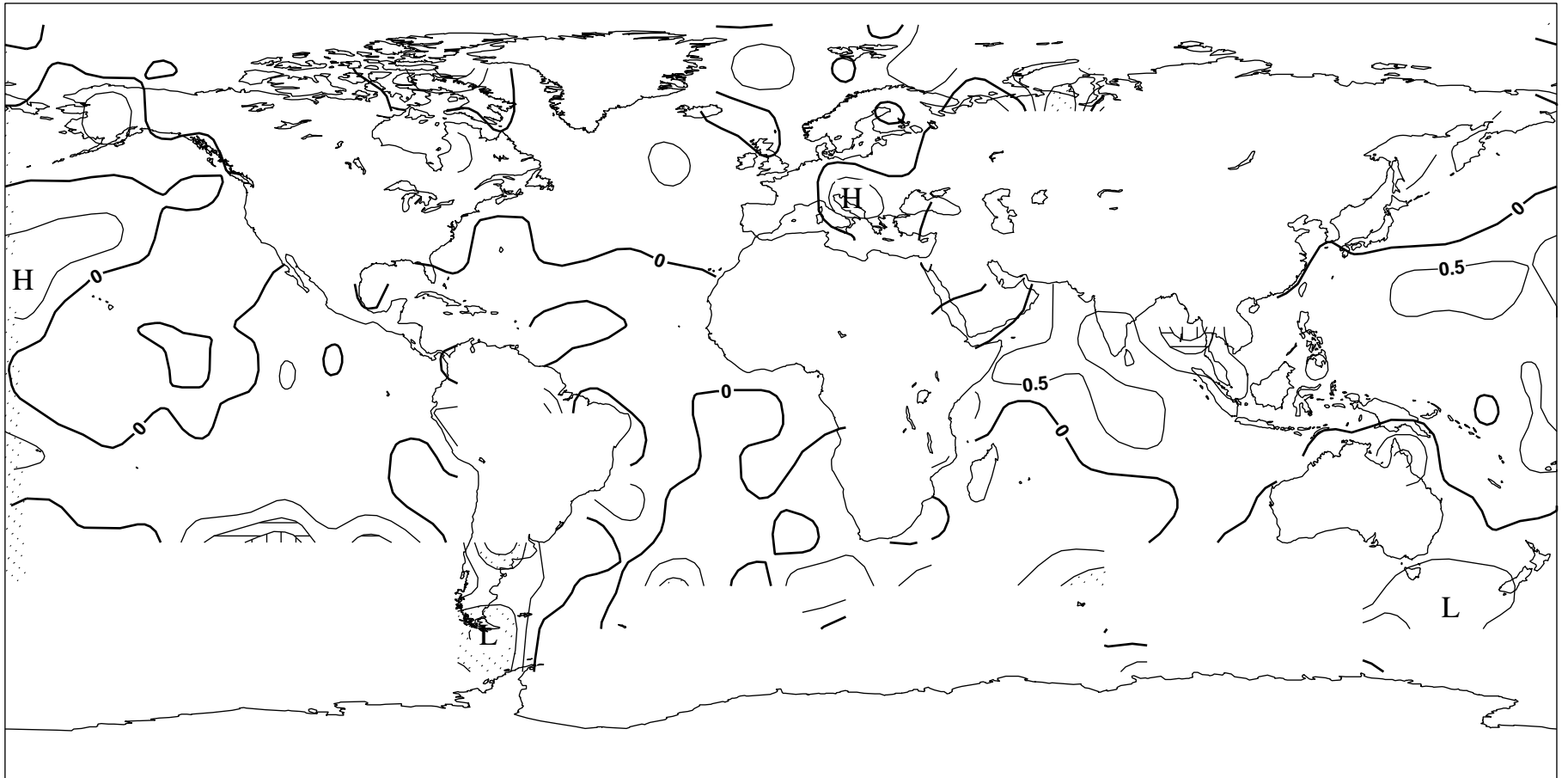
**Figure 2k: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2008 Data used: Flagged observations



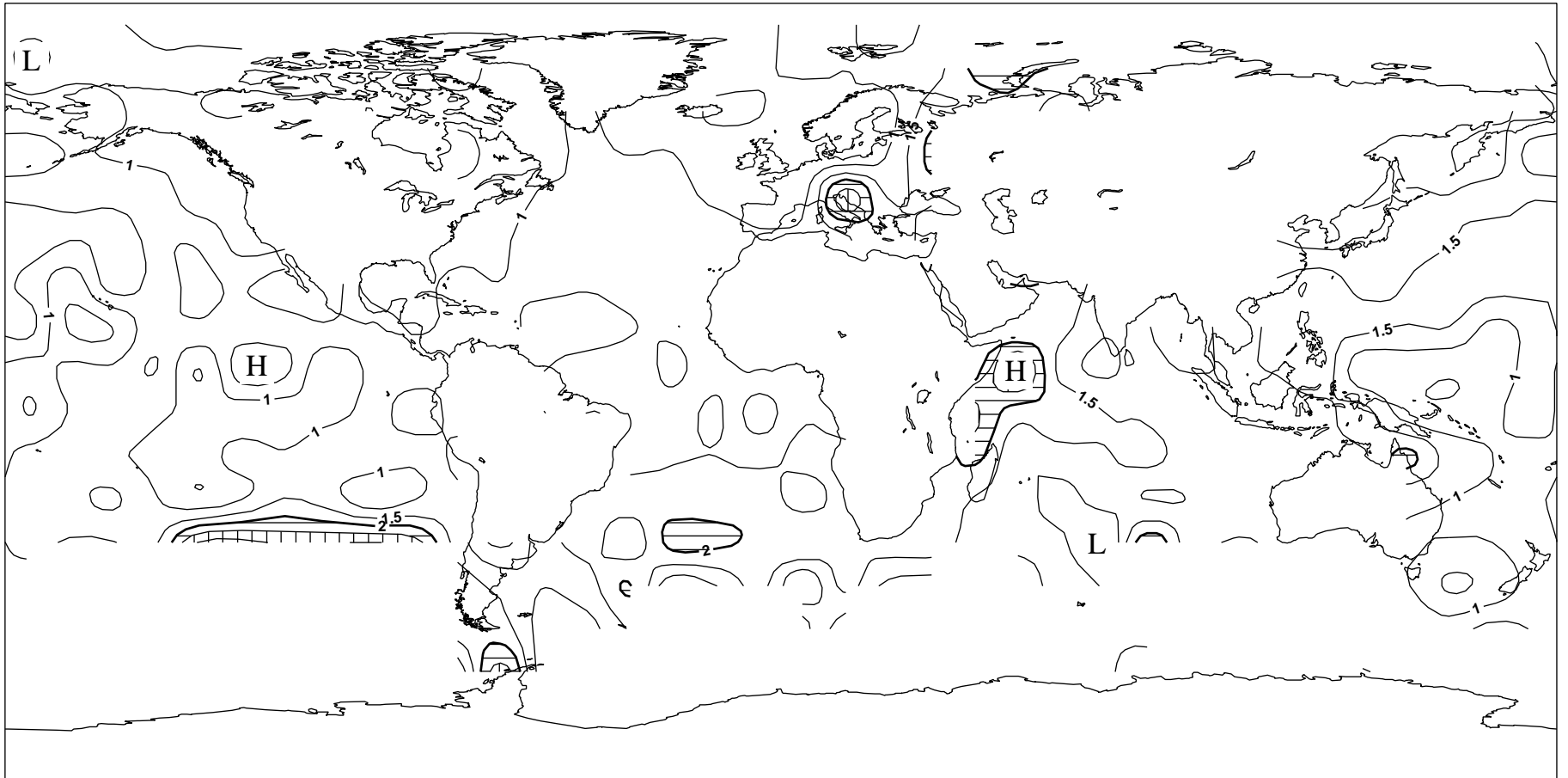
**Figure 2l: Distribution of ship O-B SST (°C)**  
Period of data: JUL-DEC 2008 Data used: Unflagged observations



**Figure 3: Bias of Ship O-B Pressure (hPa). Date:- July - December 2008**  
**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**

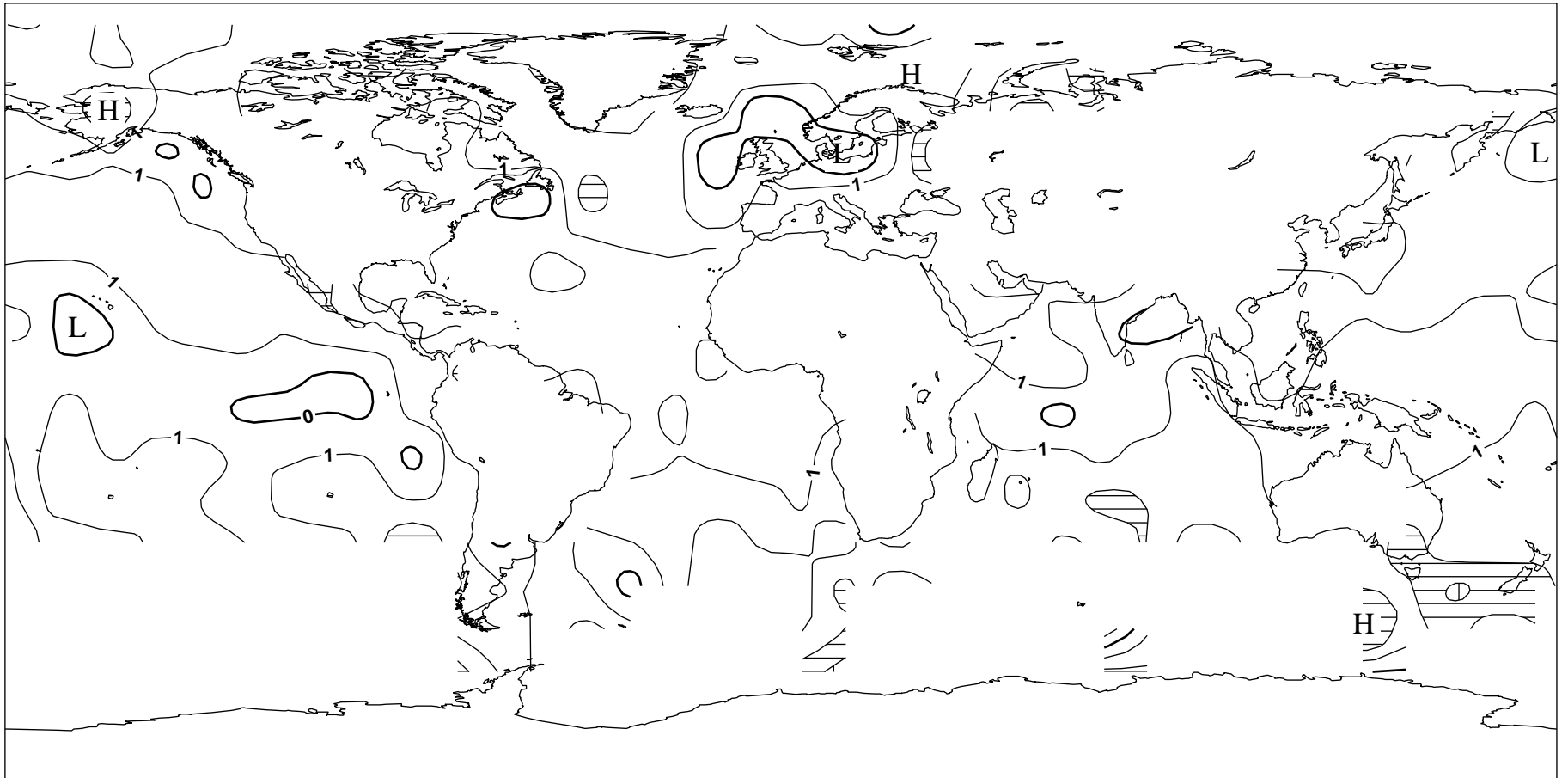


**Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- July - December 2008**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 2.0 hPa**





**Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- July - December 2008**  
**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**



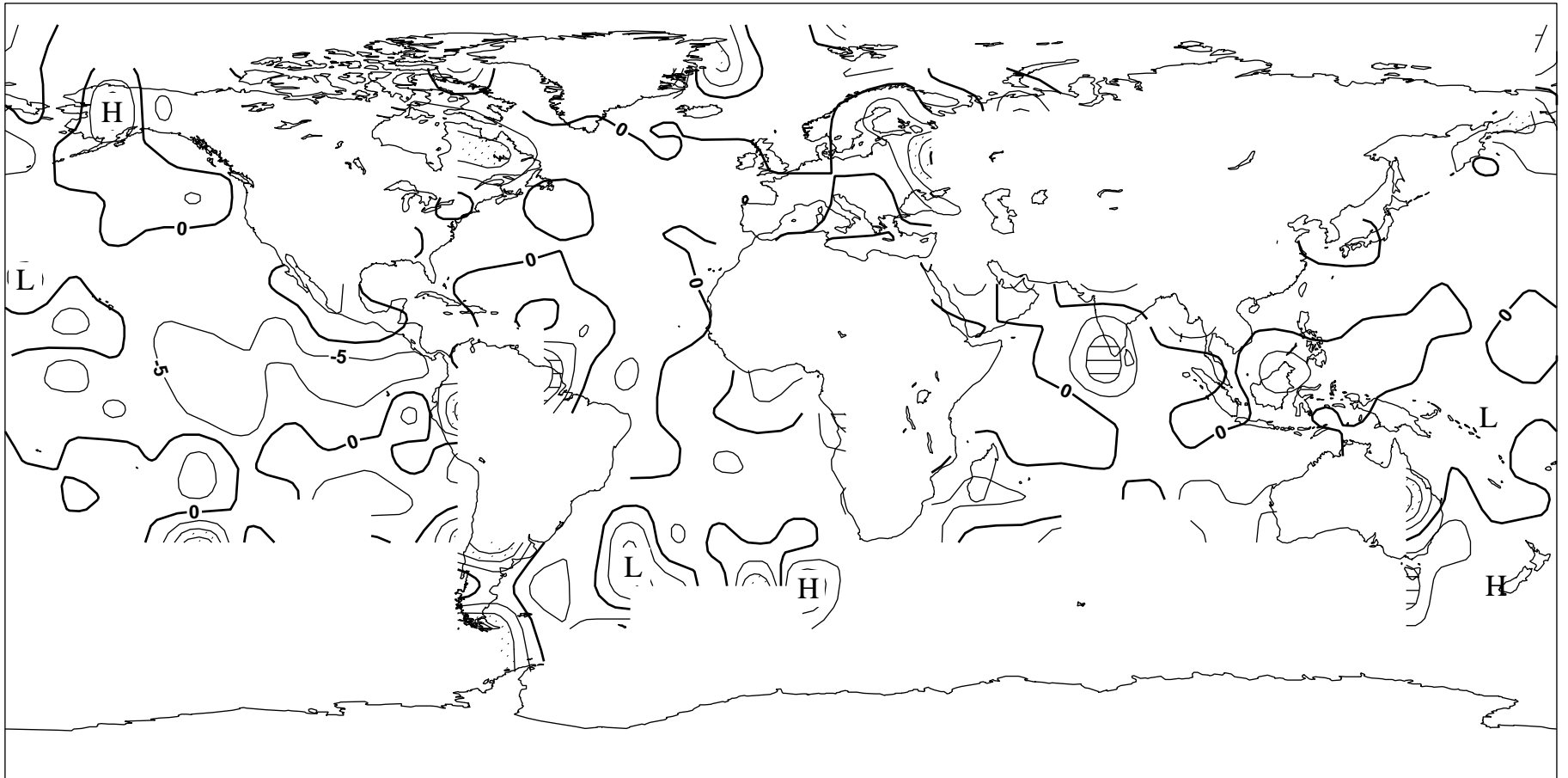
**Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- July - December 2008**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 4.0 ms-1**







**Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- July - December 2008**  
**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**

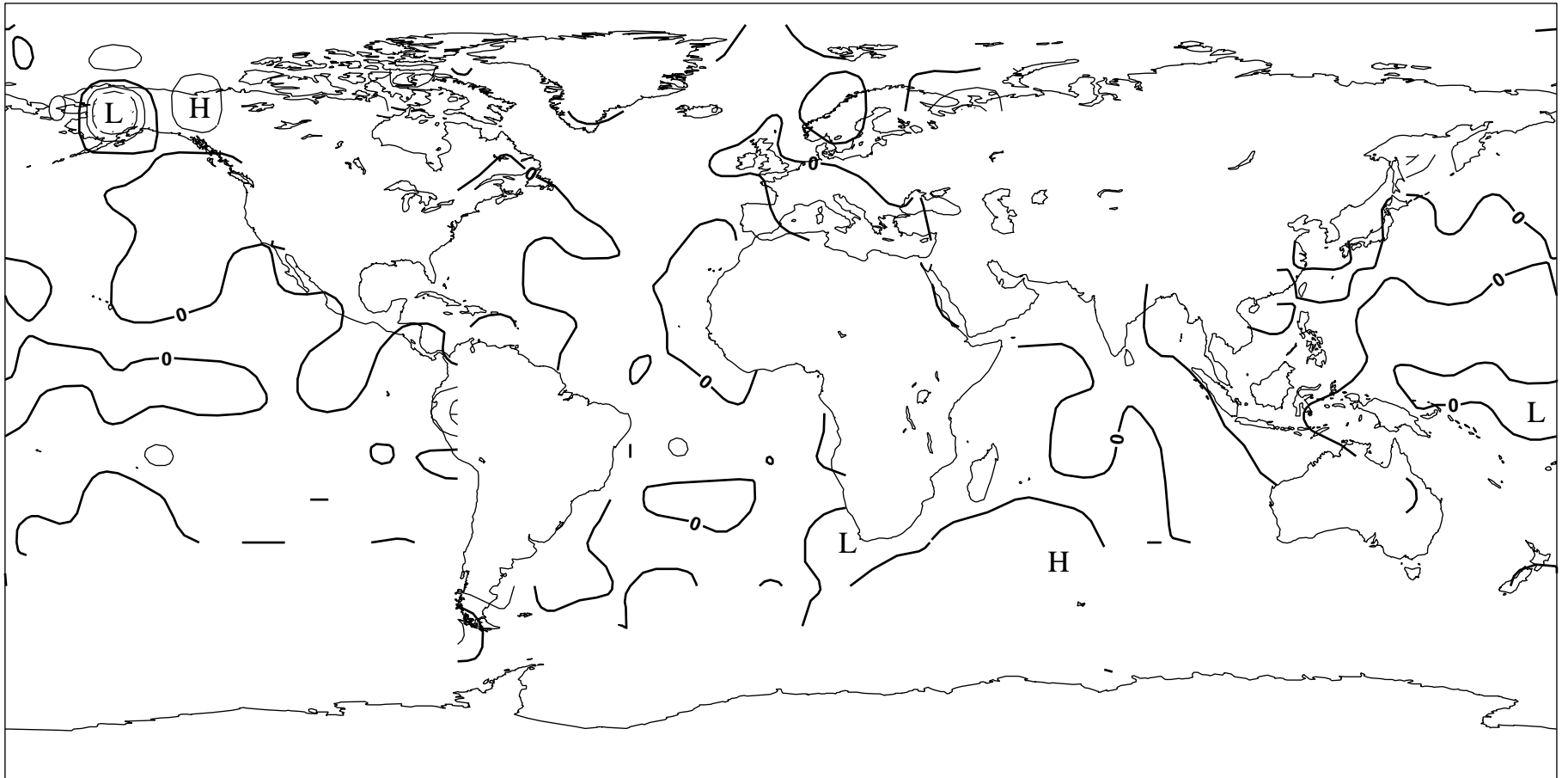


**Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- July - December 2008**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 40 degrees**





**Figure 12: Bias of Ship O-B SST (degrees C). Date:- July - December 2008**  
**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 2008**  
**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**

