

# Report on the Quality of Marine Surface Observations

Report Number 41

January to June 2009

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2009

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# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2009

## CONTENTS

1. Introduction
2. Monitoring methods
3. Monitoring results:
  - 3.1 *Pressure*
  - 3.2 *Wind*
  - 3.3 *Sea-surface temperature*
4. Summary

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2009

## LIST OF TABLES

1. Frequency distribution of the number of observations of pressure, wind and SST.
2. Number of observations of pressure for past six-month periods.
3. Platforms reporting suspect pressure observations:
  - 3a *Stations reporting in DRIFTR code.*
  - 3b *Stations reporting in SHIP code.*
4. Platforms reporting in SHIP code, not listed in table 3 but listed as suspect in the previous six-month period.
5. Platforms reporting suspect wind speed observations:
  - 5a *Stations reporting in DRIFTR code.*
  - 5b *Stations reporting in SHIP code.*
6. Platforms reporting in SHIP code, not listed in table 5 but listed as suspect in the previous six-month period.
7. Platforms reporting suspect wind direction observations:
  - 7a *Stations reporting in DRIFTR code.*
  - 7b *Stations reporting in SHIP code.*
8. Platforms reporting in SHIP code, not listed in table 7 but listed as suspect in the previous six-month period.
9. Platforms reporting suspect sea surface temperature:
  - 9a *Stations reporting in DRIFTR code.*
  - 9b *Stations reporting in SHIP code.*
10. Platforms reporting in SHIP code, not listed in table 9 but listed as suspect in the previous six-month period.
11. Number of platforms reporting suspect pressure, wind and sst observations for each of the six-month periods covered by the WMO reports on the quality of marine observations.

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2009

## LIST OF FIGURES

1. Number of observations of pressure for past six-month periods.
- 2a Distribution of O-B SHIP pressure differences, all observations.
- 2b Distribution of O-B SHIP pressure differences, flagged observations only.
- 2c Distribution of O-B SHIP pressure differences, unflagged observations only.
- 2d-f As 2a-c but for wind speed.
- 2g-l As 2a-c but for wind direction.
- 2j-l As 2a-c but for SST.
3. Geographical distribution of bias of SHIP pressure.
4. Geographical distribution of standard deviation of SHIP pressure.
5. Geographical distribution of the number of SHIP pressure observations.
- 6-8 As figures 3-5 but for wind speed.
- 9-11 As figures 3-5 but for wind direction.
- 12-14 As figures 3-5 but for SST.

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2009

## 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 41<sup>st</sup> report and covers the period January to June 2009. For each observing platform identified as suspect, values are supplied for the number of observations received at the Met Office, the number of these observations with gross errors, the observations' mean differences from the background values used by the global numerical data assimilation system and the standard deviations of these differences.

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

## 2. MONITORING METHODS

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

Some errors can be detected by applying checks on the code format and the internal consistency of the report (for example: are the position and pressure consistent with a report 6 hours earlier?). Checks on spatial consistency are possible 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. 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. 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 their departures from the model background values. All observations are assimilated, 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. 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, 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. 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 due to a representative sample only being obtained over several months or deterioration occurring at the end of the period for platforms reporting very frequently. The 6-month list is longer than most of the monthly lists because many ships cease reporting for variable periods of time, in many cases while they are in port or out of service. Only over a relatively long period, probably more than 6 months, is a representative sample obtained from all those ships providing observations.

### 3. MONITORING RESULTS

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

#### 3.1 Pressure

In the six-month period, January to June 2009, 4219660 observations of pressure were monitored at Exeter from 2633 manual ships, 832 drifting buoys, and 495 automatic ships. The number of reports received from individual ships varies greatly as Table 1 demonstrates: apparently a large percentage of ships continue to report only once, which may be due to erroneous call signs, caused by errors in the part of the message giving the ship identifier. A comparison with the corresponding table in report number 40 shows that the number of manual ships reporting pressure observations continued to decrease (by 9.0%), as did the number of drifting buoys (by 5.2%), but the largest decrease was in the number of automatic ships reporting pressure (30.4%). Since most marine observations are located in the northern hemisphere, there is inevitably some seasonal variation in the number of vessels reporting, especially in the case of buoys, since new or replacement buoys are generally deployed in better weather conditions. Considering the general trends over previous reports, there continues to be a slow decline in the number of manual ships, but the large decline in the number of automatic ships reverses the increases seen in previous reports.

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. Reports from drifting buoys now account for 60.5% of the total, while those from manual ships make up just 11.0% of the total, and those from automatic ships account for the remaining 28.5%. 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 fairly steady increase in the total number of pressure reports, which has only recently levelled-off, with a decrease in the latest 6 month period due to the decrease in the number of ships reporting.

A histogram of O-B differences for all ship pressure reports in the period January to June 2009 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 -0.2hPa 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 1.0-1.5 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 January to June 2009. 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 40 (July to December 2008) have been indicated with an asterisk. A comparison of the statistics given here with those in the report number 39 (January to June 2008), 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 40 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 many of these platforms, but 59% of platforms on the list 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 (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 January to June 2009, 1723600 wind observations were available for monitoring at Exeter, from 2645 manual ships, 65 drifting buoys, and 534 automatic ships. (More detail is given in Table 1.) The number of reported manual ship identifiers went down by 10% from the previous report period, but has changed little over the past 4 years. The number of reported automatic ship identifiers went down by 27% from the previous report period, but has also changed little over the past 4 years. 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 93.3% of the observations are nearly Gaussian and they have an overall speed bias of  $+1.2 \text{ ms}^{-1}$  relative to the background and a direction bias of just  $-1.0^\circ$ .

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 tropics. The standard deviation is generally between 20 and 30 degrees globally but in some data-sparse areas it is as large as 40-50 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 January to June 2009, 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 January to June 2009, a total of 6373790 observations of SST were monitored at the Met Office, from 2400 manual ships, 1772 drifting buoys and 344 automatic ships. Of the total, 448702 were from manual ships, 4777363 from drifting buoys and 1147725 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 3 years, although the number of manual ships increased by about 12% a year ago and has now decreased again. 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 86.8% of the observations is nearly Gaussian and they have a bias of just +0.1°C relative to the background.

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

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

#### 4. SUMMARY

There are 100 marine observing platforms listed as producing suspect observations of pressure over the period January to June 2009, 77 listed as producing suspect wind observations and 44 listed 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 and since then the numbers have fluctuated around 130. The decrease to 100 in this report (a drop of 17% from the previous period) may be partly associated with the decrease in total number of platforms reporting. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to be little overall trend in observation quality. For wind observations, over previous years there has been a tendency for a small increase in the number of wind observing platforms listed as suspect, but comparing this report period with the previous report there has been a drop of 27%. There has also been a drop (of 24%) in the number of SST observing platforms listed as being suspect for this report period.

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 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, JANUARY TO JUNE 2009.**

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	226	234	208	7	8	10	17	19	1
2-10	276	276	305	5	4	16	11	11	1
11-20	155	153	191	6	7	11	7	11	1
21-40	286	294	299	10	2	37	13	12	2
41-100	571	581	484	12	0	23	24	33	1
101-200	557	550	445	13	3	38	27	26	5
201-500	428	432	317	38	8	107	25	33	17
501-1000	59	58	53	61	4	193	40	45	23
1001-1500	32	29	36	43	6	139	46	51	22
1500+	43	38	62	637	23	1198	285	293	271
<b>Total</b>	2633	2645	2400	832	65	1772	495	534	344
(Report 40)	(2894)	(2925)	(2767)	(878)	(90)	(1788)	(711)	(736)	(374)

\* 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
Jan - Jun 2009	41	466628	2551270	1201762	4219660



**TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2009.**

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

*Notes:*

1. Units are hPa.
2. Observing platforms marked with an asterisk were listed in the previous report (July to December 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
16524	2401	20	3.9	4.8	4	4	4	5	4	Bias
16529	2535	1214	3.8	10.2	5	5	5	5	5	Bias & gross errors
16556	136	0	1.9	5.2	1	1	1	1	1	Bias
16587	275	0	1.4	4.8	1	1	1	1	1	Bias
16604	1627	27	5.2	0.4	1	1	1	1	0	SD
16954	1909	2	2.3	5.4	4	4	4	4	4	Bias
17519	3098	205	4.9	0.0	1	1	1	1	1	SD
21513	87	87	---	---	1	1	1	0	1	Gross Errors
21898	112	0	0.4	7.3	2	1	2	1	2	Bias
33660	145	0	5.4	2.5	1	0	0	0	0	SD & Bias
33674	2426	1221	2.5	11.9	5	5	5	5	5	Bias
33967	2861	355	4.2	3.7	2	2	2	2	2	Bias
46639	51	5	5.7	2.2	1	0	0	0	1	SD
48535	384	337	5.6	11.5	1	1	1	1	1	GE & Bias
48655	184	84	4.0	-6.9	1	1	1	1	1	GE & Bias
48685	615	615	---	---	1	1	1	0	1	GE
56505	860	289	0.4	0.0	1	1	1	0	1	GE
62516	102	12	5.4	1.5	1	1	1	0	1	SD
63665	65	26	1.7	10.5	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
17666	3314	25	3.6	-2.4	1 0 0 1 0	SD

**Table 3b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments	
17178	*	1786	0	0.7	-5.7	4	0	4	3	4	Bias
23451	*	1224	0	1.1	3.4	2	0	0	0	0	Bias
2AJI3		184	0	3.5	5.6	2	1	2	0	3	Bias
3EHT6		70	2	1.2	-4.0	1	0	0	0	1	Bias
62138		161	1	5.3	-0.1	2	2	2	0	2	Bias & SD
7854	*	106	5	3.5	-4.5	2	1	0	0	2	Bias
8PPK	*	669	15	5.1	1.5	1	0	1	0	1	SD
9VDN3		102	0	1.5	-3.7	1	0	0	0	0	Bias
9VKQ3		162	7	1.6	11.8	2	0	2	0	2	Bias
A8AT8		275	0	1.8	3.7	1	0	1	0	1	Bias
A8ET7		50	0	0.8	3.7	0	0	0	0	0	Bias
A8IQ2		161	0	1.6	3.8	3	2	3	0	3	Bias
A8IT6	*	49	0	2.7	4.7	1	1	1	0	1	Bias
A8JR5	*	70	0	1.6	4.4	1	1	1	0	1	Bias
A8JV7	*	48	0	0.9	-3.5	0	0	0	0	0	Bias
A8LC5		43	0	1.5	-3.9	0	0	0	0	0	Bias
A8MG8		73	0	2.5	-5.5	1	1	1	0	1	Bias
A8PO4		145	2	1.8	4.1	2	1	1	0	3	Bias
A8PQ8		330	1	2.2	4.0	1	0	1	0	1	Bias
ATSJ	*	102	0	1.7	4.0	1	0	0	0	0	Bias
AUBD	*	63	0	1.9	10.9	1	1	1	0	1	Bias
AUBL		41	4	4.3	8.6	0	0	0	0	0	Bias
AUFI	*	49	0	0.7	4.7	0	0	0	0	0	Bias
AVOSTE	*	78	0	0.8	-11.9	1	0	0	0	0	Bias
C6FV8		120	109	1.4	-13.1	3	1	2	0	3	GE & Bias
C6FY5	*	199	1	3.2	4.5	3	2	3	0	4	Bias
C6LU3		270	0	1.4	5.3	6	6	6	0	6	Bias
C6QF6		142	0	1.5	4.1	3	2	3	0	3	Bias
C6SE8	*	128	0	1.0	-5.1	3	1	1	0	3	Bias
C6TX6	*	100	0	4.0	-2.4	1	0	0	0	2	
C6VF3	*	140	1	3.2	6.4	3	2	3	0	3	Bias
C6YW	*	53	0	1.7	3.9	1	1	1	0	1	Bias
CG2960	*	1128	1128	---	---	6	4	6	0	6	Gross Errors
CGDS		754	215	1.4	-8.8	4	1	4	0	4	Bias
DNFA		79	0	1.0	3.7	1	0	0	0	0	Bias
ELXO3		72	0	1.0	4.4	1	2	1	0	1	Bias
HPNV	*	514	139	4.4	-9.8	5	4	4	0	5	Bias & GE
HPYE	*	431	0	4.5	-1.1	2	0	1	0	1	Biases
HRRF	*	98	0	1.3	-7.9	1	0	1	0	1	Bias
HZZD	*	45	0	3.0	-4.1	0	0	0	0	0	Bias

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
ICRA	64	46	0.6	14.4	2	1	2	0	2	Bias
MINUK02	637	204	6.0	-0.2	1	1	1	0	0	Gross Errors
MRWF2	144	0	2.8	5.9	3	1	1	0	1	Bias
ONCA *	156	1	1.8	8.6	5	0	5	0	5	Bias
ONCF *	259	56	4.7	10.8	4	2	4	0	4	Bias & GE
ONEH	59	0	1.0	-4.5	0	0	0	0	0	Bias
ONEV *	166	1	2.5	-6.6	5	1	5	0	5	Bias
OUOW2 *	95	3	1.6	12.0	2	0	1	0	3	Bias
OYAU2	55	0	2.0	4.5	1	0	1	0	1	Bias
OYNM2	47	1	2.1	-9.7	1	1	1	0	1	Bias
PBAD	277	3	4.4	-4.7	2	0	1	0	2	Bias
PBCJ	150	0	1.3	-4.2	3	2	2	0	2	Bias
PHFV	446	1	1.3	-4.2	4	0	3	0	5	Bias
UBHE9 *	93	0	2.5	7.3	2	1	2	0	2	Bias
UCUF *	254	3	5.0	1.7	2	1	1	0	1	SD
UFCK	47	4	4.7	-1.9	0	0	0	0	0	SD
UGWJ *	69	0	2.8	3.5	1	0	1	0	1	Bias
UHWZ	65	9	3.8	-4.1	1	2	1	0	2	Bias
UISD	103	9	4.9	-2.7	0	0	0	0	1	Bias
UITR *	152	7	3.3	-4.5	3	2	3	0	3	Bias
V7BW6 *	243	2	2.3	-3.3	3	0	2	0	2	Bias
V7BW8 *	287	0	2.5	6.1	6	0	6	0	6	Bias
V7DI8 *	103	0	1.2	7.6	2	1	2	0	4	Bias
V7HP2 *	123	0	2.1	6.7	3	0	2	0	2	Bias
V7JM2	76	0	1.0	-6.2	2	2	2	0	2	Bias
VCDT	304	222	0.7	-10.9	3	3	1	0	3	Bias
VRBW4	53	0	2.8	-4.3	1	1	1	0	1	Bias
VRDN3	141	0	1.9	-3.7	1	1	1	0	1	Bias
VRWE7	83	1	3.7	4.5	0	0	0	0	0	Bias
VTST	62	1	2.7	7.6	0	0	0	0	0	Bias
VTXG	82	0	2.0	3.8	1	1	1	0	1	Bias
VWSZ	42	0	1.4	-3.5	0	0	0	0	1	Bias
WBN5982	49	0	5.0	2.3	0	0	0	0	0	SD
WCZ6534	50	4	5.0	-7.6	1	0	0	0	1	Bias & SD
WDA3359	45	0	3.0	5.2	0	0	0	0	0	Bias
WDC8307	40	1	1.9	3.9	0	0	0	0	0	Bias
WDD420 *	125	0	2.4	-5.4	1	0	1	0	1	Bias
WED228 *	168	2	2.2	-5.5	3	0	2	0	3	Bias
ZCBO6	58	0	1.0	3.6	1	0	0	0	1	Bias
ZCDT7	41	0	3.2	5.4	1	0	1	0	1	Bias

**TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 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.
<i>Notes:</i>	1.	Units are hPa

Identifier	N Obs.	NGE	SD	Bias	Comments
9MCR4	2	0	7.7	-0.5	Less than 40 reports
A8HA7	2	0	0.2	2.2	Less than 40 reports
A8IU7	46	0	2.0	0.9	Bias reduced
A8JS5	85	0	1.3	0.0	No bias from January
A8LO9	48	0	1.1	-3.2	Bias reduced
A8NO6	87	0	1.3	-0.2	No bias from January
C6VG7	433	1	2.9	-4.0	Bias reduced in June
DARU	101	0	1.3	2.8	Bias reduced
DBUT	176	3	2.4	3.3	Bias reduced from March
DCAY2	269	0	2.0	3.0	Bias reduced
DDID2	248	0	2.1	-1.6	Bias reduced from Feb
ELTY9	34	0	1.2	0.5	Less than 40 reports
ELZA9	50	0	2.4	2.1	Bias reduced from May
IBHD	1	0	0.0	-2.0	Less than 40 reports
J8PE3	135	0	3.6	2.1	No bias from March
KS059	15	0	0.5	-0.1	Less than 40 reports
LAOW5	186	11	2.6	-0.7	Bias reduced
MGDM	152	0	2.6	4.9	No bias from June
MQYA3	121	0	2.4	3.7	Reduced bias
MSDM7	35	0	0.8	4.5	Less than 40 reports
NWS0010	1846	84	5.3	-5.3	No bias from June
NWS0016	733	0	5.6	4.4	No bias from June
ONAN	51	0	2.8	3.4	Bias reduced
ONCV	6	0	4.8	-0.3	Less than 40 reports
OUQK2	1	0	0.0	11.7	Less than 40 reports
OVYQ2	186	1	1.8	2.0	Bias reduced
S6JQ	26	0	3.0	0.0	Less than 40 reports
S6JS	24	0	2.5	-1.6	Less than 40 reports
TBWUK30	159	0	2.2	-0.1	Bias reduced
UCKB	74	0	1.3	-2.0	Bias reduced
UFJN	16	0	1.9	-2.8	Less than 40 reports
UGJA	38	2	5.1	-2.8	Less than 40 reports
UHFV	90	0	1.5	0.6	No bias
UHWM	81	0	2.7	0.3	Reduced bias
UINM	78	0	2.8	3.6	Bias reduced in May
V2BR5	144	0	2.8	-1.7	No bias from March
V7HD3	39	1	2.2	3.2	Less than 40 reports
VRBH6	23	0	1.1	7.1	Less than 40 reports
VRCQ2	26	0	2.3	2.6	Less than 40 reports
VVCZ	11	0	3.5	7.1	Less than 40 reports
VVFI	19	0	1.2	-1.7	Less than 40 reports
WBHU	122	0	1.2	-3.4	Bias reduced
ZCDJ5	23	0	0.6	-5.0	Less than 40 reports
ZCDY2	327	0	2.2	0.9	Bias reduced from Jan

**TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2009.**

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 (July to December 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
41580	3175	687	6.5	14.5	2	2	2	0	2	Bias
41611	1027	0	2.8	-7.1	1	1	1	1	1	Bias
41921	4609	56	5.4	7.3	2	3	2	0	2	Bias
41936	8322	0	4.4	-6.9	3	2	3	3	3	Bias

*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 5b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
23171	51	0	1.0	-5.9	1	1	0	0	1	Bias
A8AY3	123	3	4.7	9.6	3	3	2	0	3	Bias
A8MG8	73	1	3.8	5.5	1	0	0	0	0	Bias
A8PQ6	113	0	5.9	6.8	1	1	2	0	0	Bias
C6KD5	359	15	4.9	6.1	4	4	3	0	4	Bias
KS078	* 563	10	3.8	5.0	3	0	0	0	2	Bias
SYOM	69	1	6.6	6.0	1	0	1	0	1	SD & Bias
VEP717	* 1248	0	4.9	6.1	4	4	4	0	3	Bias
VWSZ	44	1	4.8	5.4	0	0	0	0	0	Bias
WBN5982	50	0	4.7	5.3	1	0	1	0	1	Bias



**TABLE 6: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 5 BUT LISTED AS SUSPECT 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 Comments on quality of wind speed observations.

Notes: 1. Units are  $\text{ms}^{-1}$

Identifier	N Obs.	NGE	SD	Bias	Comments
46088	7486	0	2.9	3.4	Bias reduced
BSH63	100	0	3.8	-4.2	Bias reduced
DGXS	105	0	3.6	2.2	Bias reduced
DLCT	5	0	3.6	1.8	Less than 40 reports
KS060	1	0	0.0	10.4	Less than 40 reports
WDD9287	173	0	3.6	4.8	Bias reduced

**TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2009 .**

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 (July to December 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
42902	726	0	41.2	52.9	0	0	0	1	1	Bias
44637	277	0	36.2	34.1	0	0	1	0	0	Bias

*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	
21210	1354	32	74.2	-6.5	2	0	2	1	2	Std Dev	
23102	*	655	0	31.6	27.5	1	2	4	0	2	Bias
23170	*	2129	0	24.1	40.1	2	2	2	1	5	Bias
23491	*	2376	2	65.7	135.0	3	5	6	4	6	SD & Bias
23494		748	0	124.4	-36.9	1	3	3	1	2	SD & Bias
3FCA9	*	116	0	56.4	-10.9	0	0	0	0	0	SD
42362	*	190	11	36.2	-55.9	1	0	1	0	0	Bias
46081	*	2070	0	43.1	-50.3	2	0	2	1	4	Bias
62128		260	0	49.9	35.0	0	0	0	0	0	Bias
7854		107	0	66.6	6.6	0	1	0	0	2	SD
9VAY4		275	0	80.0	2.7	1	1	1	0	4	SD
9VDN3		103	1	78.2	-10.4	0	0	0	0	1	SD
9VEN5		376	2	61.8	0.6	0	0	0	0	1	SD
9VJC5		92	0	60.1	-15.0	0	0	0	0	1	SD
9VVN8		152	6	66.0	0.2	0	0	0	0	2	SD
A8AL3	*	176	0	59.2	22.1	0	1	1	0	3	SD
A8EH3		86	0	63.0	0.7	0	0	0	0	2	SD
A8IH2		328	2	73.8	-2.7	2	2	2	0	2	SD
A8KM9		80	0	51.2	30.8	0	1	0	0	1	Bias
A8LL9		122	1	52.4	-35.8	1	1	1	0	2	Bias
A8ME4		177	0	67.0	-9.7	0	1	1	0	5	SD
A8NH4		151	0	63.2	-20.7	0	0	0	0	1	SD
ATVX		90	0	69.7	10.0	0	0	0	0	3	SD
C6JD4		55	0	37.5	-38.5	0	0	0	0	0	Bias
C6KD5	§	359	15	88.7	12.4	5	6	5	0	6	SD
CG2350	*	113	0	50.5	117.4	1	1	1	0	1	Bias
DDAL2		135	0	63.2	-9.0	0	0	0	0	3	SD
DGVZ	*	123	1	68.7	22.4	0	0	0	0	0	SD
DPUA		121	5	87.9	21.4	1	1	1	0	1	SD
E5U2135	*§	40	9	67.0	-32.5	0	0	0	0	1	SD & Bias
ELOV9		56	0	62.7	-1.7	0	0	0	0	0	SD
ELVB3		70	0	67.1	0.1	0	0	0	0	0	SD
ELVL8		90	0	65.0	-11.6	0	0	0	0	0	SD
J8NW	*§	101	0	50.2	-36.0	0	0	0	0	0	Bias
JNCJ		79	1	65.7	-3.9	0	0	0	0	0	SD
KS034	*	155	0	73.7	-1.4	0	0	0	0	2	SD
KS073		134	0	66.2	-123.8	3	1	2	0	3	Bias & SD
KS078	§	563	10	82.1	-49.6	3	0	4	0	4	Bias & SD
LAVD4		100	1	65.8	-19.7	0	1	0	0	1	SD
MLFB4		55	0	62.5	-15.9	0	0	0	0	0	SD

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
NWS0011	472	0	63.2	-10.0	0	0	0	0	1	SD
OXQP2	52	1	71.4	12.4	0	1	0	0	1	SD
PCBU *	307	0	75.2	4.2	2	2	2	0	4	SD
TBWGR00	192	0	65.3	-8.6	0	0	0	0	3	SD
TBWUK18	218	1	63.1	15.1	1	1	0	0	2	SD
UCUC	99	0	58.6	53.6	0	1	1	0	2	Bias & SD
UDYG	131	0	44.2	68.3	0	0	0	0	1	Bias
UGPK *	78	0	68.7	-11.3	0	0	0	0	1	SD
V2BM5	180	0	61.3	-0.3	0	0	0	0	4	SD
V2FN *	52	0	50.6	-43.5	0	0	0	0	0	Bias
V2NA1	98	0	72.3	-2.0	0	0	0	0	0	SD
V2OW1 *	93	0	58.8	-14.6	0	0	0	0	1	SD
V2PO8 *	97	0	66.0	-10.5	0	0	0	0	2	SD
VCDT	304	0	101.0	-1.7	2	2	1	0	3	SD
VQBW2 *	42	3	71.9	12.5	0	0	0	0	0	SD
VRDC6	57	0	60.5	-11.2	0	0	0	0	0	SD
WBN846 *	65	0	53.8	-58.8	0	0	0	0	1	Bias
WBP321 *	1966	17	70.5	-16.3	2	0	2	0	2	SD
WCX744 *	3664	59	71.7	8.1	1	2	3	0	5	SD
WCX9106	162	2	66.9	-35.3	0	0	0	0	5	Bias & SD
WWU8	994	0	49.6	52.3	0	0	1	0	4	Bias
ZCDH7 §	87	0	68.2	-22.4	0	0	0	0	1	SD
ZCDJ6	78	0	68.6	-5.9	0	0	0	0	0	SD

**TABLE 8: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 7 BUT LISTED AS SUSPECT 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	Comments on quality of wind direction observations.
<i>Notes:</i>	1.	Units are degrees (°)

Identifier	N Obs.	NGE	SD	Bias	Comments
23451	866	0	17.3	-19.5	Reduced SD
2AJU5	40	0	51.0	-4.0	Reduced SD
3FFG7	22	0	60.0	17.1	Less than 40 reports
46145	1156	0	42.7	-31.1	Bias reduced
9HJD9	903	1	50.8	-0.7	SD reduced
9HXA5	63	0	43.2	-12.9	SD reduced
9MBW7	74	0	43.6	-16.1	SD reduced
9VAR2	7	0	15.6	-20.4	Less than 40 reports
A8FA5	203	0	55.7	-29.8	Reduced SD
A8FA6	41	0	40.4	25.7	Reduced SD & Bias
A8IP4	368	0	55.2	-3.3	Reduced SD
A8K14	14	0	38.6	58.4	Less than 40 reports
A8LA6	2	0	0.0	-22.3	Less than 40 reports
A8MI2	44	0	56.7	-1.4	Reduced SD
AUCU	14	0	50.4	17.8	Less than 40 reports
AUPO	70	0	51.8	15.2	Reduced SD
C6HS4	47	0	22.9	9.1	Reduced SD
C6JE5	15	0	37.9	-18.8	Less than 40 reports
C6YW	53	1	42.2	-6.0	Reduced bias
DCTA2	123	0	56.3	10.3	Reduced SD
DDJS2	130	0	32.3	-3.7	Reduced SD
DFCX2	113	1	54.0	-1.9	Reduced SD
ELRJ6	29	0	25.6	-26.5	Less than 40 reports
ELXO3	70	0	47.7	-2.8	Reduced SD
H3VT	209	1	49.8	-20.8	Reduced bias & SD
J8NX	49	0	54.9	-17.5	Reduced bias & SD
LAJV4	127	0	26.9	7.7	Reduced SD
MPJH9	166	0	34.2	2.2	Reduced SD
MSDM7	33	1	64.1	2.1	Less than 40 reports
ONCF	258	0	58.2	-12.8	Reduced SD
P3NB5	40	0	54.7	12.4	Reduced SD
PCTG	123	0	46.9	6.0	Reduced SD
SLCI	24	0	57.5	-11.5	Less than 40 reports
SYQO	65	0	54.0	-4.5	Reduced SD
UDUR	191	1	30.6	3.9	Reduced SD
UGJA	30	0	43.7	30.8	Less than 40 reports
V2AP6	28	0	44.6	18.5	Less than 40 reports
V2JZ	112	0	36.4	-8.2	Reduced SD & bias
V7KA6	297	4	43.6	7.9	Reduced SD
V7LD4	69	0	49.7	27.5	Reduced bias & SD
VRBH6	23	0	56.5	29.4	Less than 40 reports
VRCU7	22	0	53.8	7.7	Less than 40 reports
VRCV	38	0	43.3	25.9	Less than 40 reports
VRVA5	64	0	35.4	-8.2	Reduced bias & SD
VRZT8	89	1	42.1	-20.7	Reduced bias & SD
VSJG7	14	1	52.1	57.0	Less than 40 reports
WCZ6534	48	0	59.1	4.0	Reduced SD
ZCAS2	132	0	51.2	14.3	Reduced SD
ZCBN5	109	1	47.4	-4.3	Reduced SD & Bias
ZCBP5	142	0	47.7	-18.3	Reduced SD & Bias
ZCDJ7	21	0	37.8	-14.7	Less than 40 reports

**TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2009.**

- Column 1 Call sign or identifier.  
 Column 2 Number of sea-surface temperature observations available for monitoring over the six-month period, excluding duplicates, but including any observations with gross errors.  
 Column 3 Number of sea surface temperature observations differing by more than 10 °C from background (gross error).  
 Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.  
 Column 5 Mean of observation-minus-background differences excluding cases of gross error.  
 Columns 6-10 Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.  
 Column 11 Comments on quality of sea surface temperature observations.
- Notes:*
1. Units are °C
  2. Observing platforms marked with an asterisk were listed in the previous report (July to December 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
21544	351	149	2.5	1.1	1	-	1	-	1	Bias
21938	149	149	---	---	1	-	0	-	1	Bias & GE
31733	1628	1547	4.4	6.4	3	-	3	-	3	Bias
44503	1125	1	2.0	-2.9	0	-	1	-	2	Bias
44622	193	98	1.5	-2.2	1	-	0	-	1	Bias
46634	1499	0	0.6	-3.1	4	-	0	-	0	Bias
53964	179	55	0.9	0.0	1	-	0	-	1	Bias
56528	529	269	0.1	9.2	2	-	0	-	2	Bias
63941	182	14	3.5	-5.2	1	-	1	-	0	Bias
65581	244	4	3.6	-5.1	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
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**Table9b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments	
9HJB9	*	1613	1228	3.4	-6.0	6	-	6	-	6	Bias
9KKS		296	0	1.3	-3.3	3	-	2	-	0	Bias
9VAH		98	14	2.8	6.4	3	-	3	-	3	Bias
9VEN5	*	166	5	2.5	-3.1	3	-	3	-	1	Bias
A8HF6		178	4	4.3	1.5	5	-	4	-	0	Bias
A8IX8		145	0	0.9	-3.0	2	-	1	-	0	Bias
DAJL		41	0	0.4	3.3	1	-	1	-	0	Bias
DEAL	*	79	0	0.7	-3.5	1	-	1	-	0	Bias
DGTX		127	0	1.5	3.4	2	-	2	-	1	Bias
DIBZ	*	75	0	0.6	-3.1	2	-	2	-	0	Bias
KHRC	*	93	0	1.3	-2.7	1	-	0	-	0	Bias
KS034		154	0	0.6	3.6	3	-	3	-	2	Bias
KS063		115	115	---	---	1	-	0	-	1	GE
KS066	*	45	2	1.4	7.0	1	-	1	-	1	Bias
KS067		444	4	2.1	3.3	1	-	0	-	0	Bias
KS078		496	0	1.7	-4.1	4	-	4	-	4	Bias
KS080		72	71	0.0	9.1	2	-	0	-	2	Bias
KS087		120	120	---	---	3	-	3	-	3	GE
KS088		88	17	2.9	-3.7	1	-	1	-	1	Bias
KS089		93	93	---	---	1	-	0	-	1	GE
MGSM3		85	47	3.9	-1.7	1	-	1	-	1	GE
ONAN	*	159	2	2.8	-5.0	5	-	0	-	3	Bias
PDUJ		53	0	2.2	3.1	1	-	1	-	0	Bias
SFRZ		157	0	1.7	3.6	4	-	4	-	0	Bias
SGBA	*	51	0	0.8	3.2	1	-	1	-	1	Bias
UCJL		105	0	1.5	3.0	2	-	1	-	0	Bias
UHWZ		68	11	3.4	4.9	2	-	1	-	2	Bias
V2LA8	*	42	0	1.4	-4.3	0	-	0	-	0	Bias
V7DI7	*	191	0	1.0	3.3	4	-	3	-	1	Bias
VRWE7		74	22	3.5	-2.2	0	-	0	-	0	Bias & GE
VRXK9	*	71	71	---	---	2	-	1	-	1	GE
WAAH	*	88	0	1.4	3.0	1	-	1	-	0	Bias
WZZF		269	1	1.2	3.6	5	-	4	-	0	Bias
ZDGR8		74	10	1.6	5.0	2	-	2	-	2	Bias



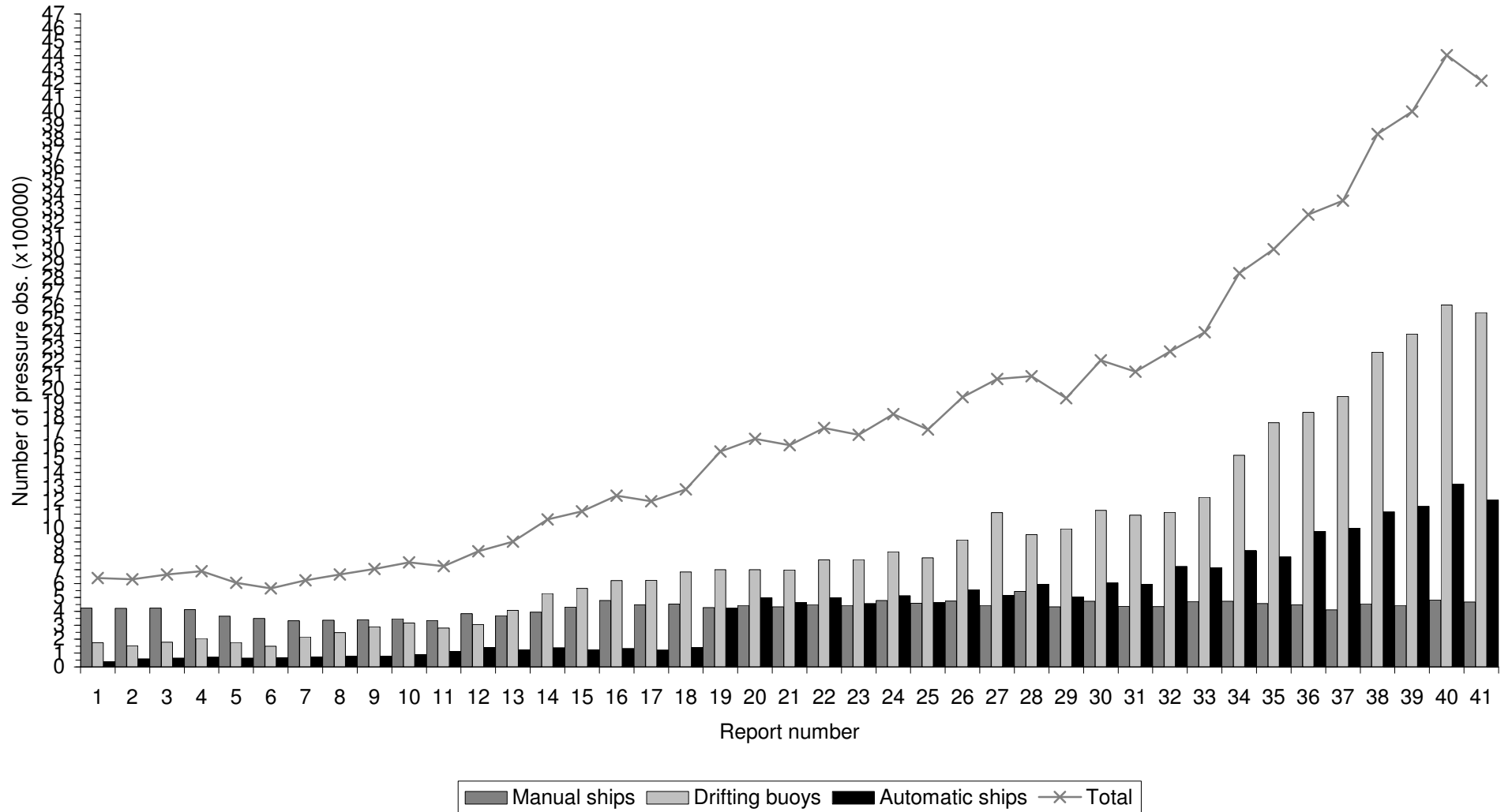
**TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2008.**

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.

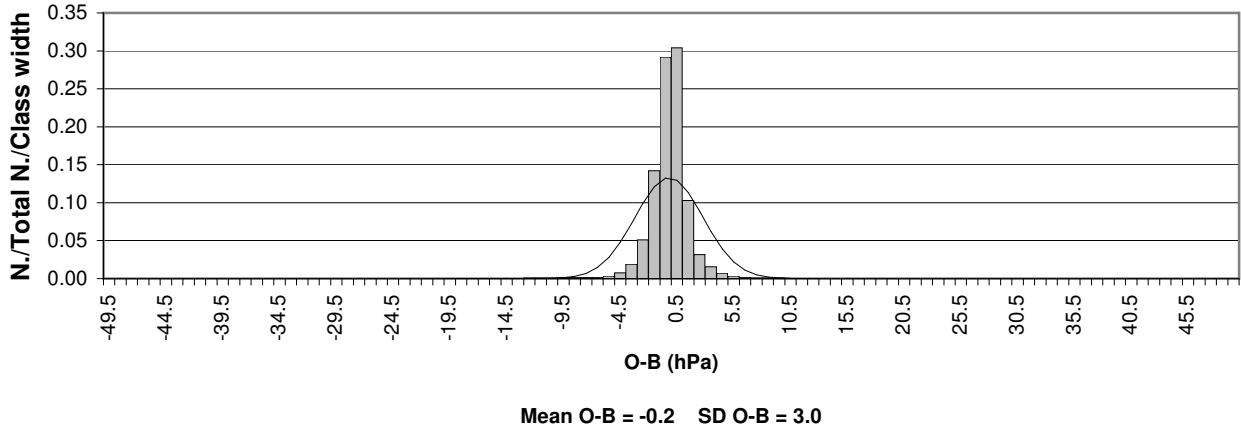
Notes: 1. Units are °C

Identifier	N Obs.	NGE	SD	Bias	Comments
A8KO3	59	0	1.9	-2.8	Reduced bias
BATFR46	1112	395	1.2	1.7	Reduced bias
C6UB2	98	3	3.2	-3.0	Reduced bias
DDFL2	145	0	1.0	0.2	Reduced bias
DPCK	208	0	1.1	-1.1	Reduced bias
HZZD	30	0	1.4	-3.3	Less than 40 reports
KRHX	64	0	1.7	-1.3	Reduced bias
LADR4	76	0	0.8	0.5	Reduced bias
LAVX4	112	3	2.9	0.0	Reduced bias
SLCI	22	0	1.7	-1.1	Less than 40 reports
SVMA	8	0	1.6	-2.6	Less than 40 reports
SYMK	82	6	2.8	-2.1	Reduced bias
UCDM	36	0	2.1	-0.9	Less than 40 reports
VGDT	5	0	0.2	1.6	Less than 40 reports
VRCJ9	2	0	0.1	-0.5	Less than 40 reports
VRCU7	22	0	1.2	-4.3	Less than 40 reports
VVJT	16	0	2.1	-1.3	Less than 40 reports
WMLH	3	0	0.1	4.7	Less than 40 reports

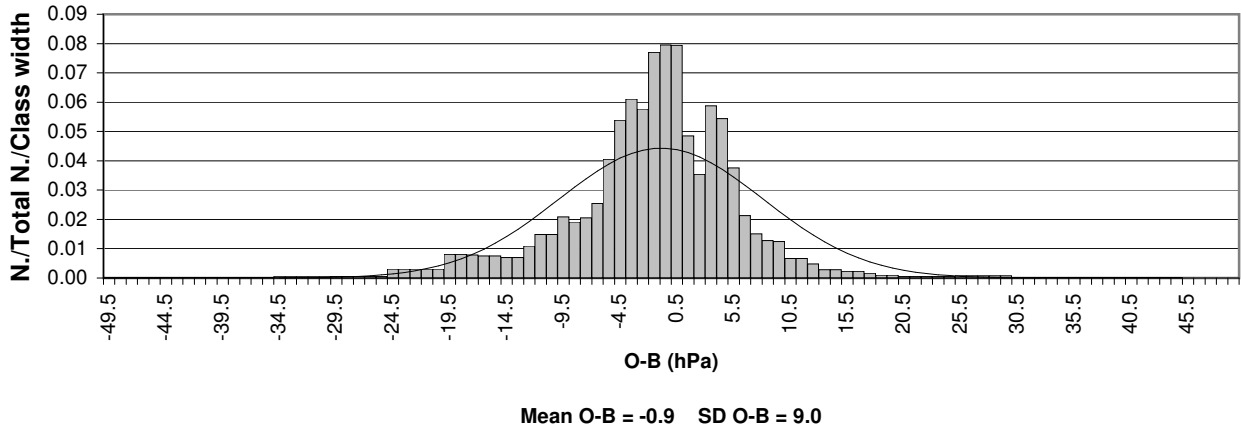
**Figure 1: Number of observations of pressure received at Exeter on the GTS for each of the six-month periods covered by the WMO reports on the quality of marine surface observations**



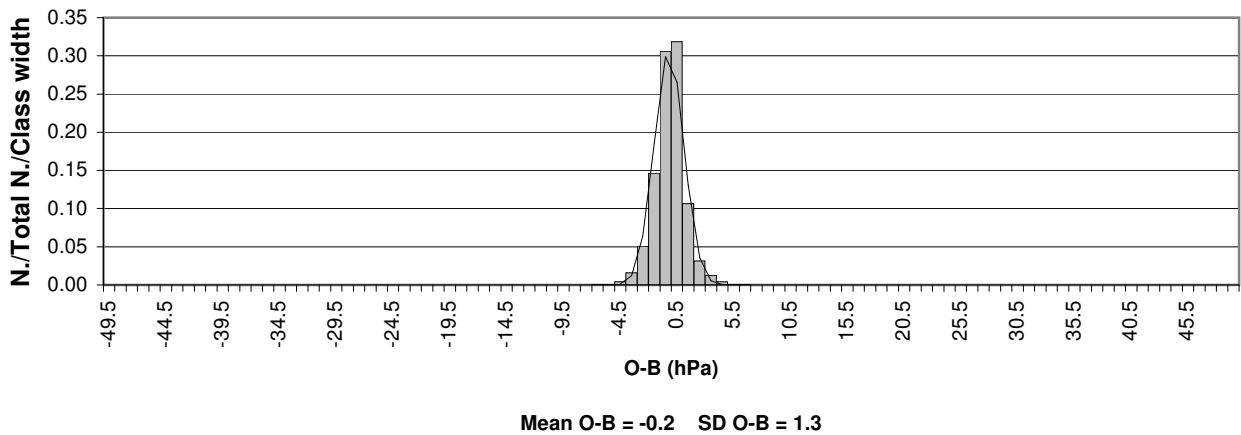
**Figure 2a: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2009 Data used: All observations



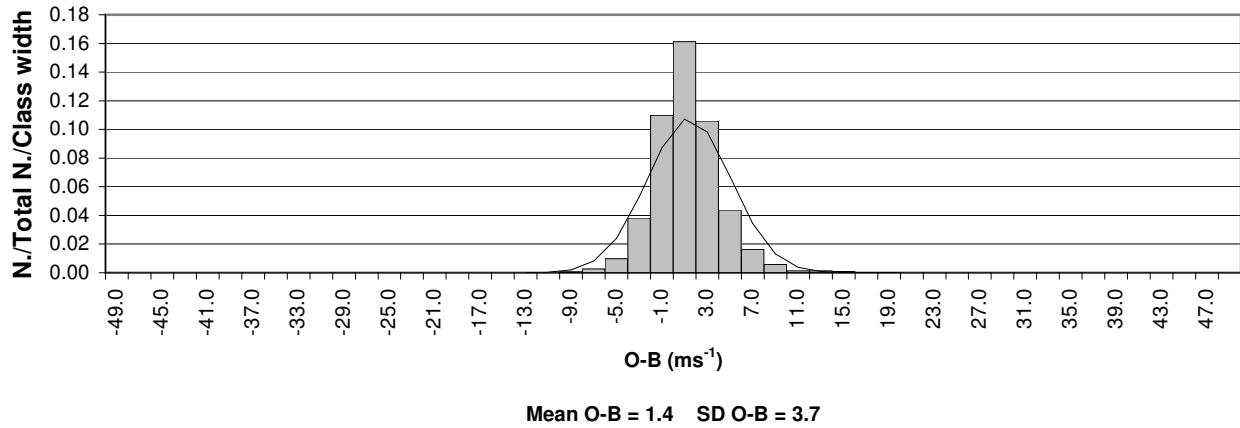
**Figure 2b: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2009 Data used: Flagged observations



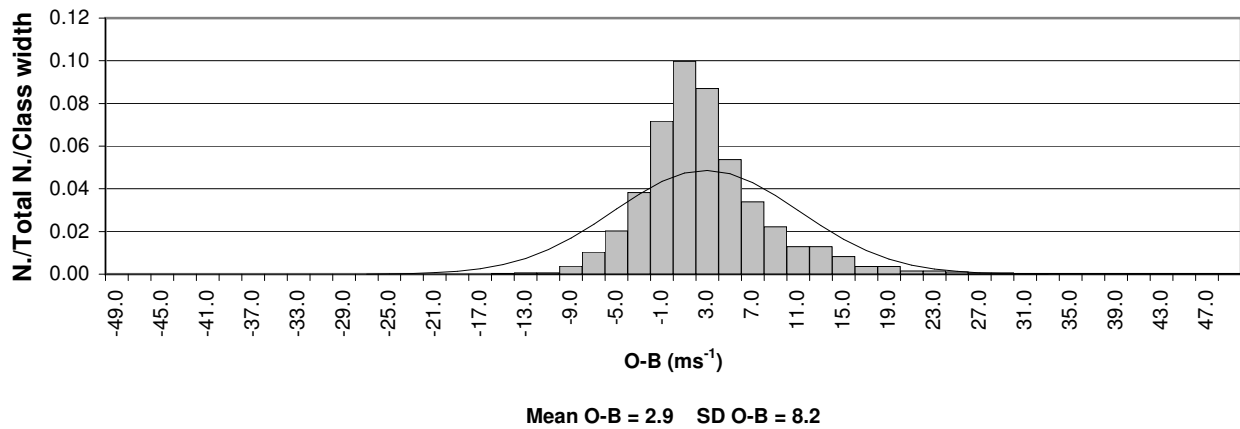
**Figure 2c: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2009 Data used: Unflagged observations



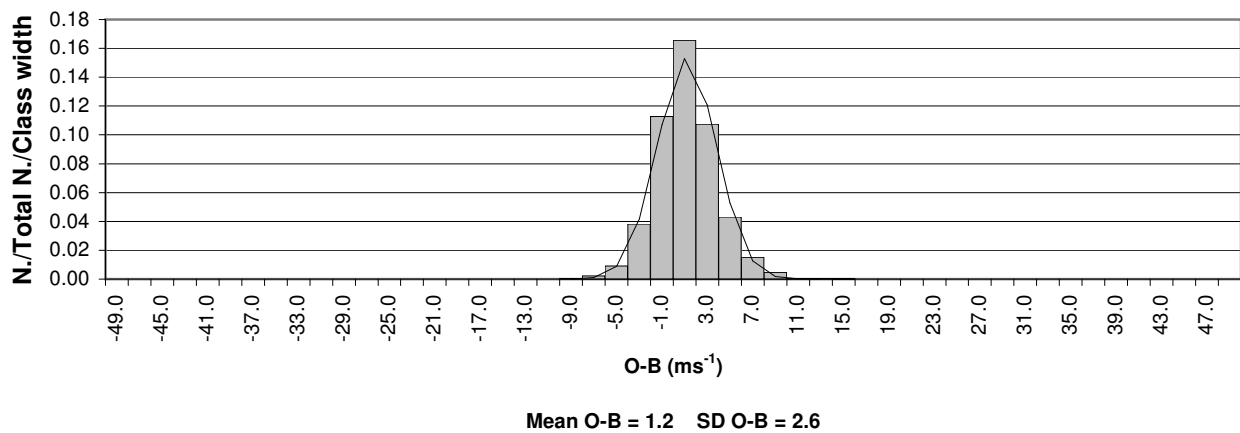
**Figure 2d: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2009 Data used: All observations



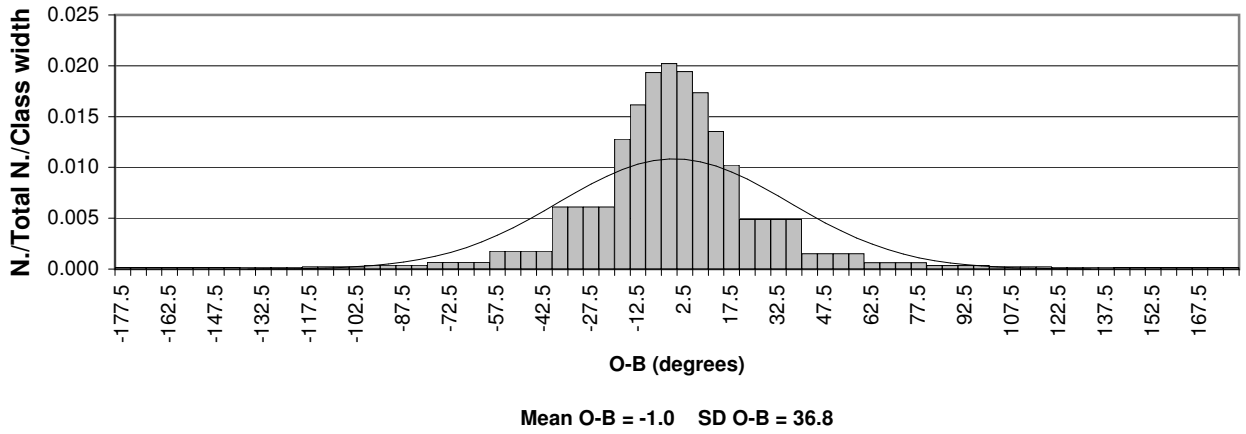
**Figure 2e: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2009 Data used: Flagged observations



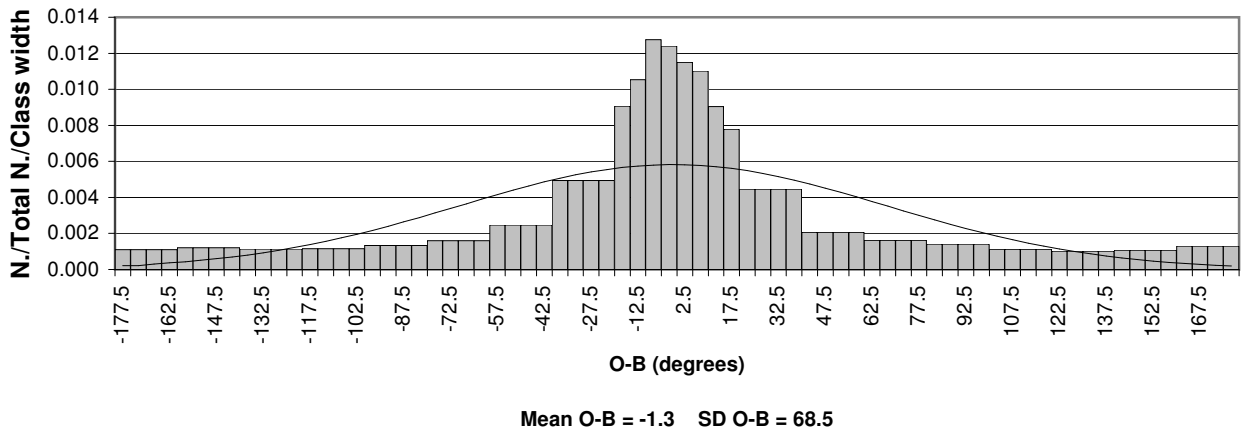
**Figure 2f: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2009 Data used: Unflagged observations



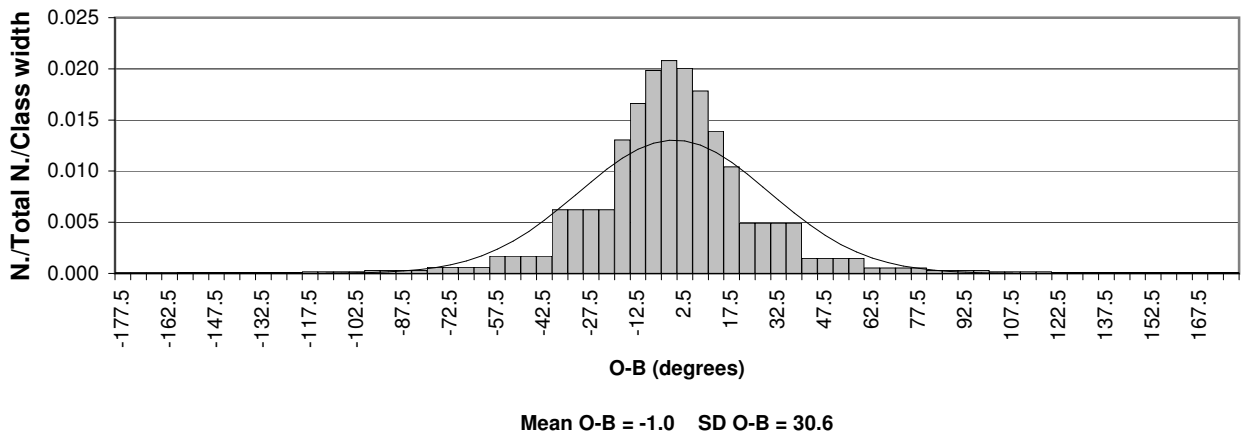
**Figure 2g: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2009 Data used: All observations



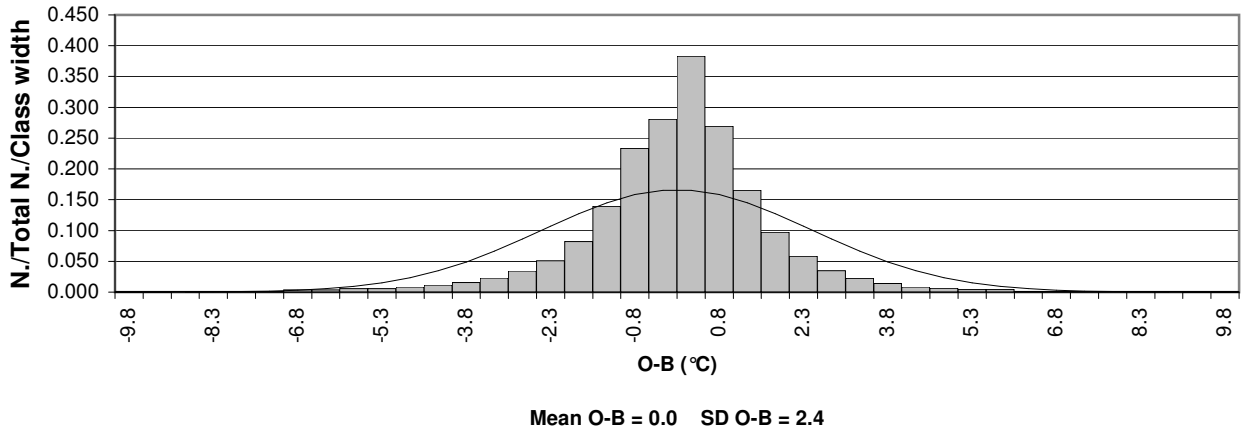
**Figure 2h: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2009 Data used: Flagged observations



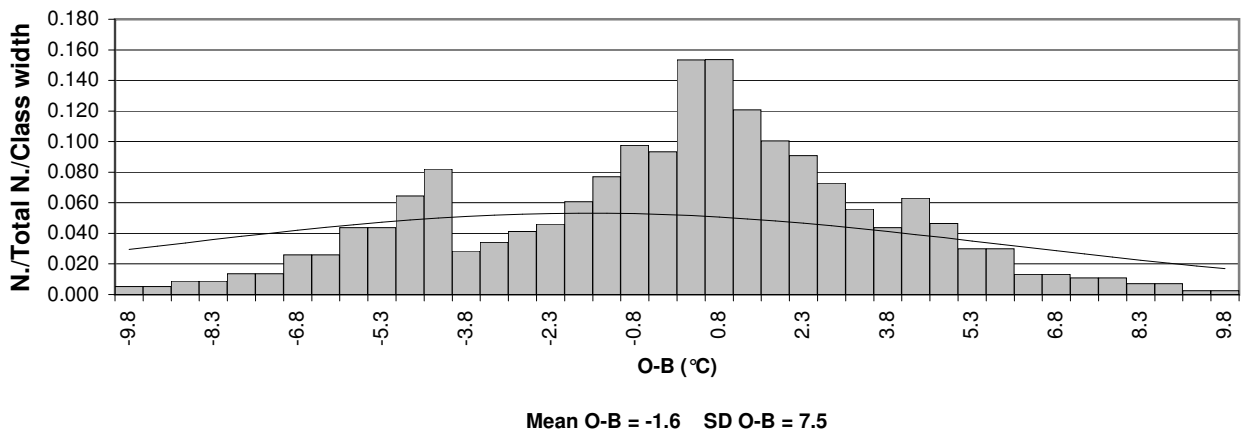
**Figure 2i: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2009 Data used: Unflagged observations



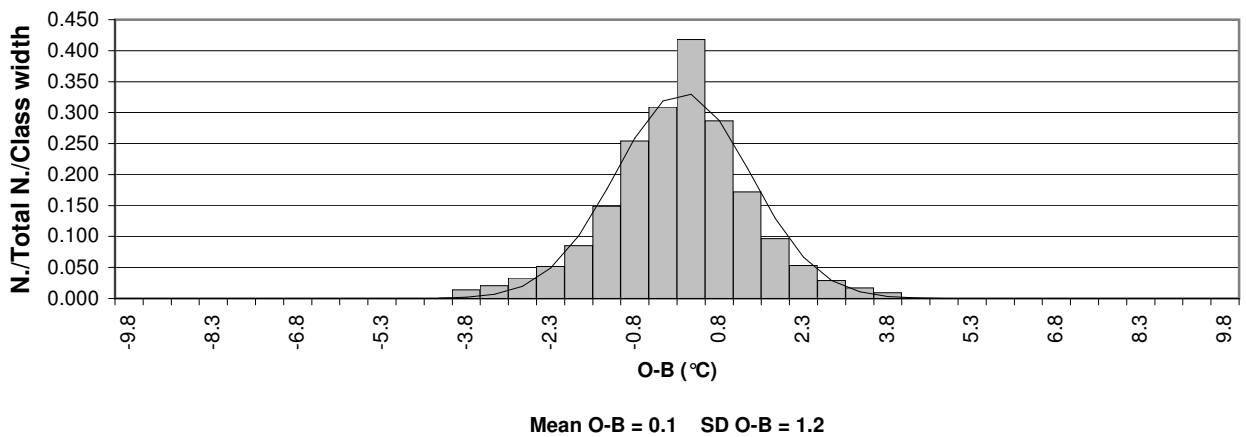
**Figure 2j: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2009 Data used: All observations



**Figure 2k: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2009 Data used: Flagged observations

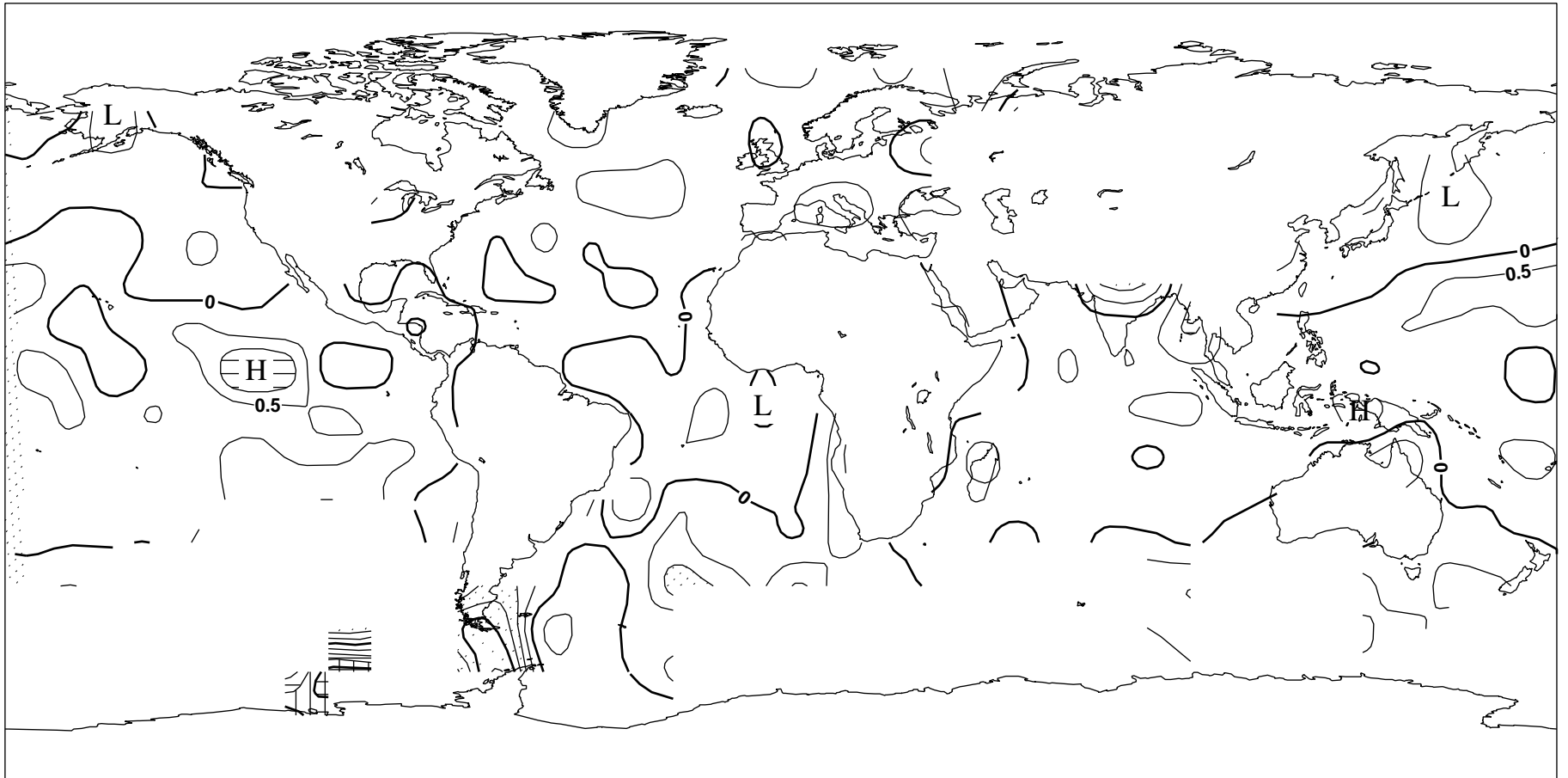


**Figure 2l: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2009 Data used: Unflagged observations



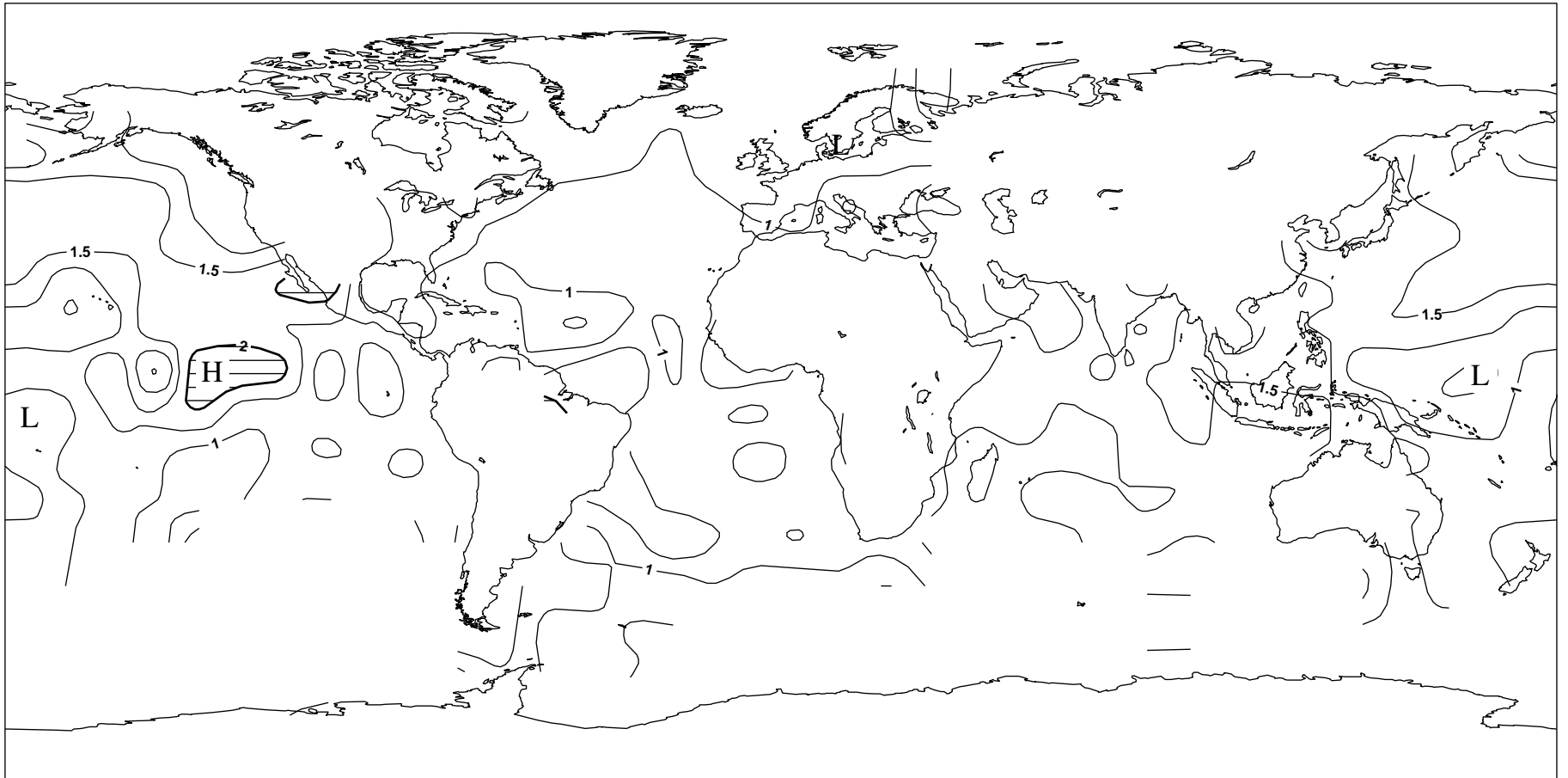


**Figure 3: Bias of Ship O-B Pressure (hPa). Date:- January - June 2009**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 1.0 hPa**

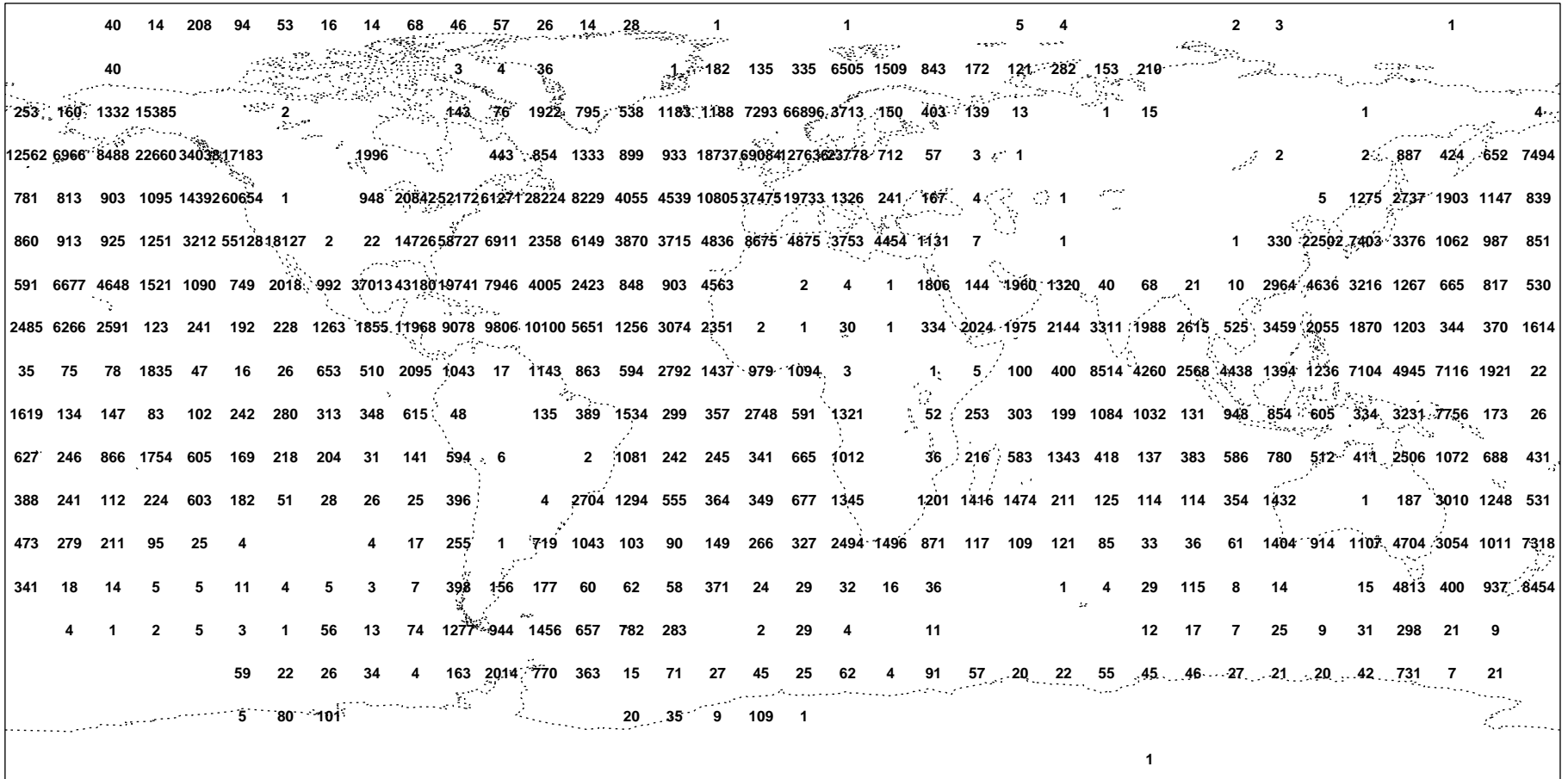




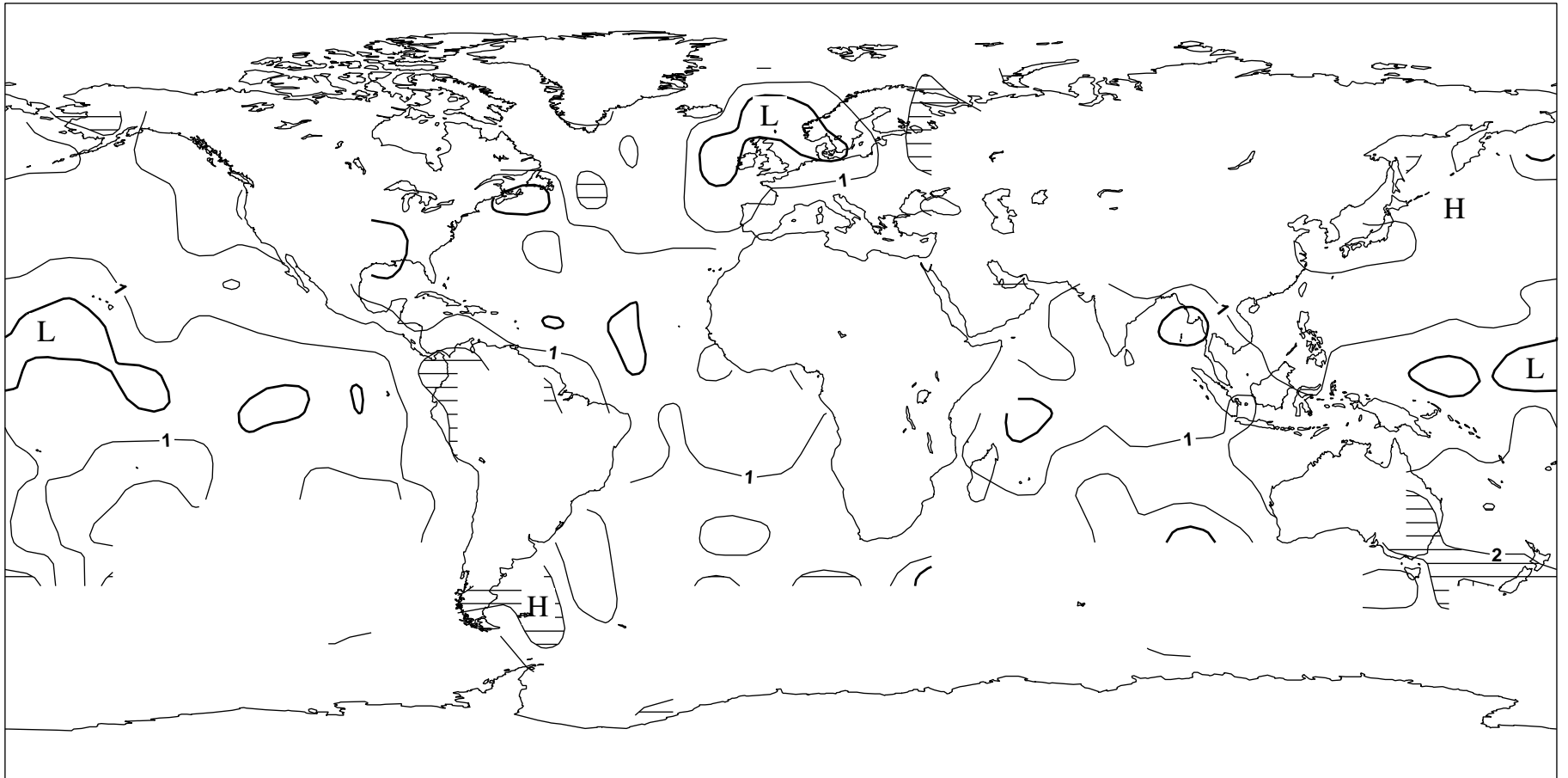
**Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- January - June 2009**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 2.0 hPa**



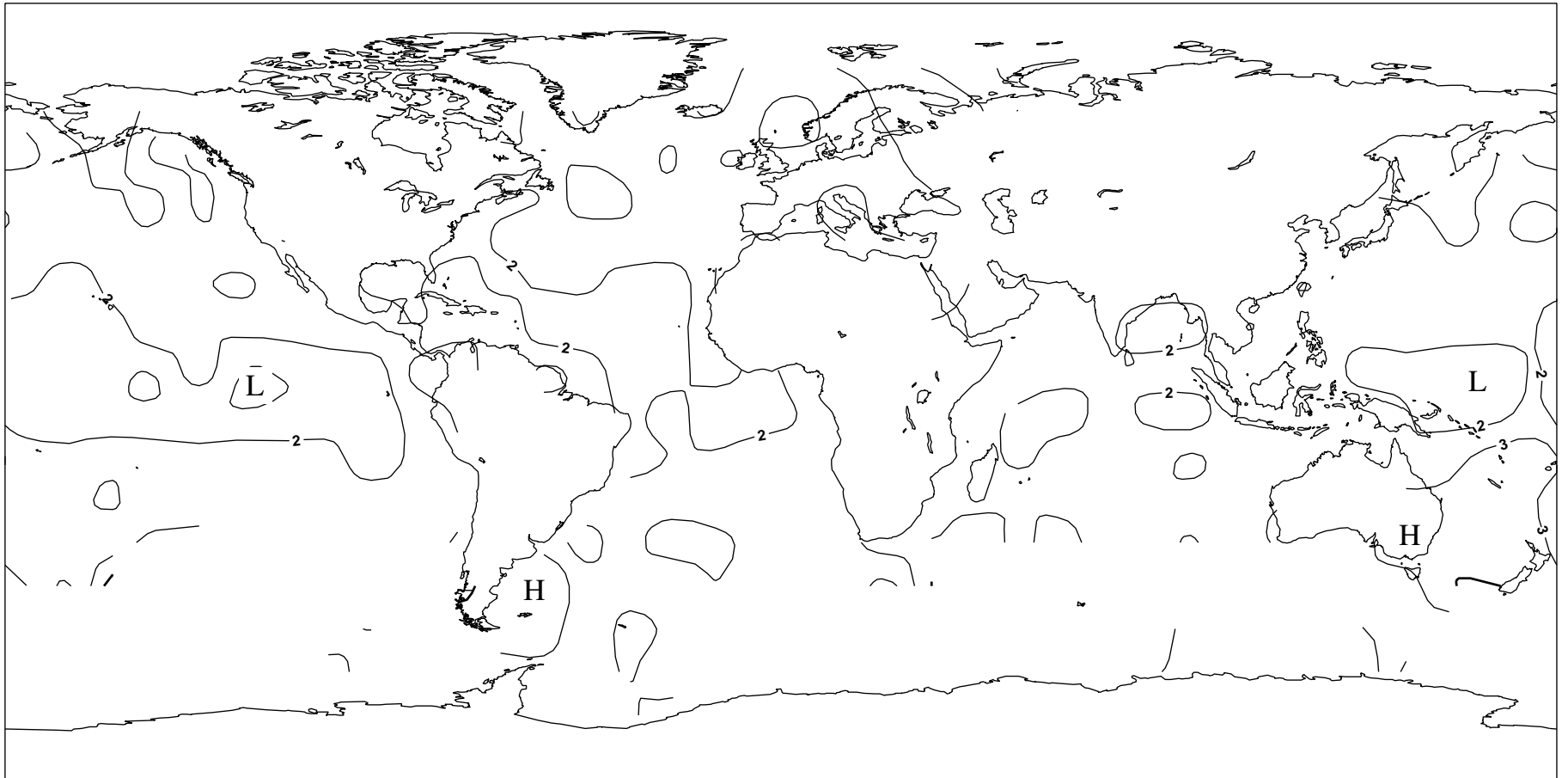
**Figure 5:**  
**Plot of the Number of Ship Pressure Observations. Date:- January - June 2009**  
**Only observations passing quality control included**



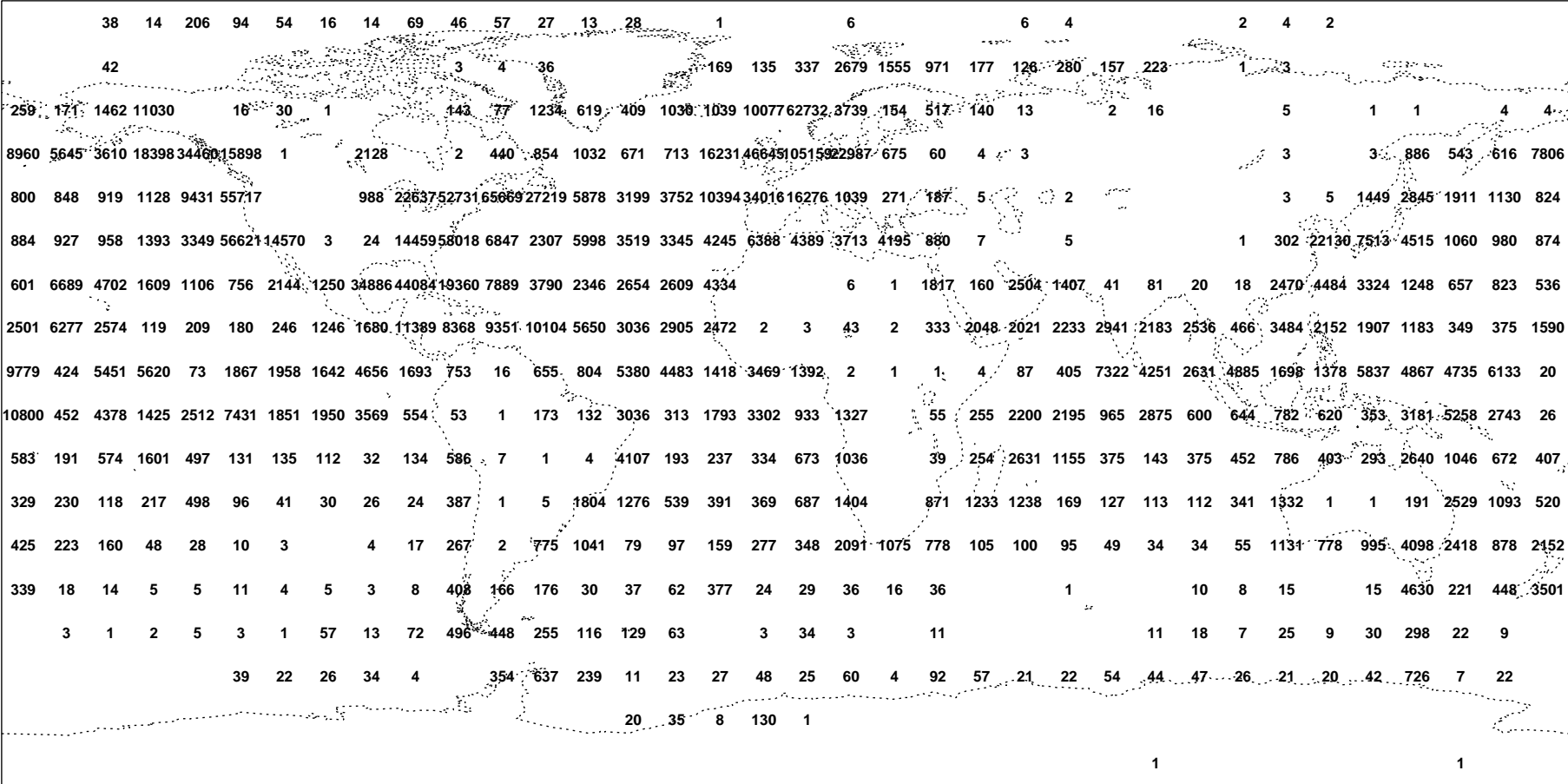
**Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- January - June 2009**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 2.0 ms-1**



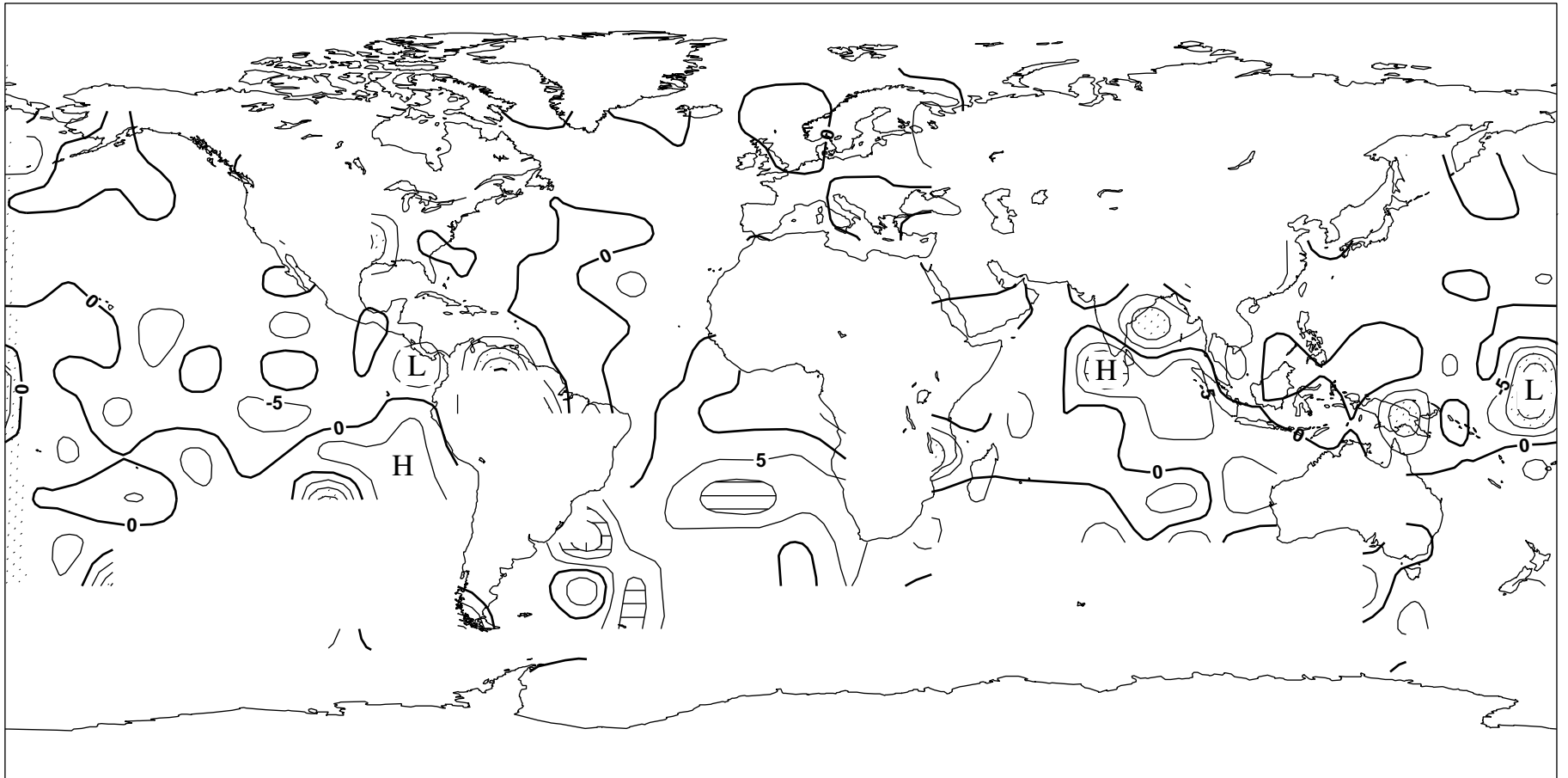
**Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- January - June 2009**  
**Only Observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a standard deviation of greater than 4.0 ms-1**



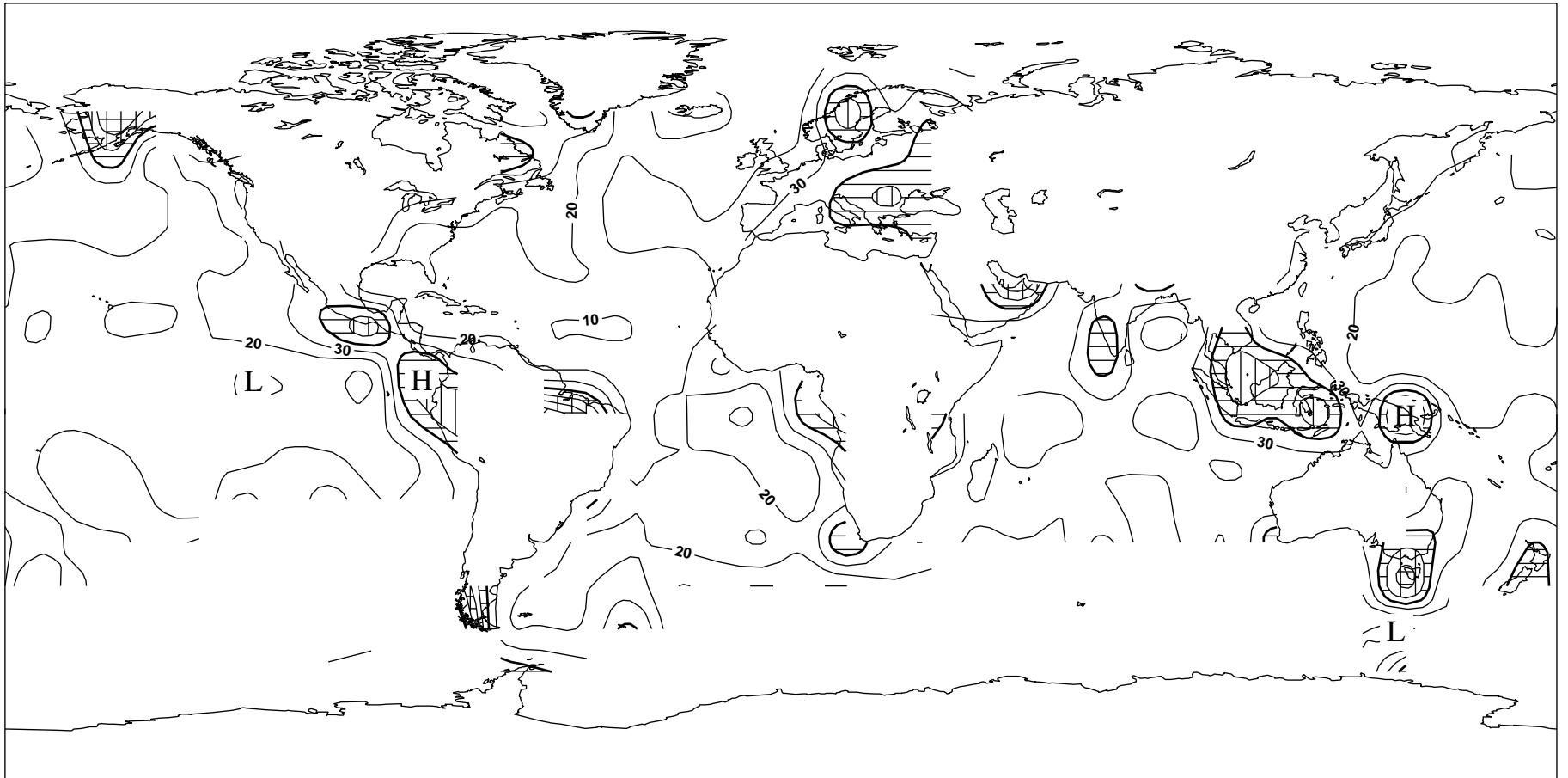
**Figure 8:**  
**Plot of the Number of Ship Wind Speed Observations. Date:- January - June 2009**  
**Only observations passing quality control included**



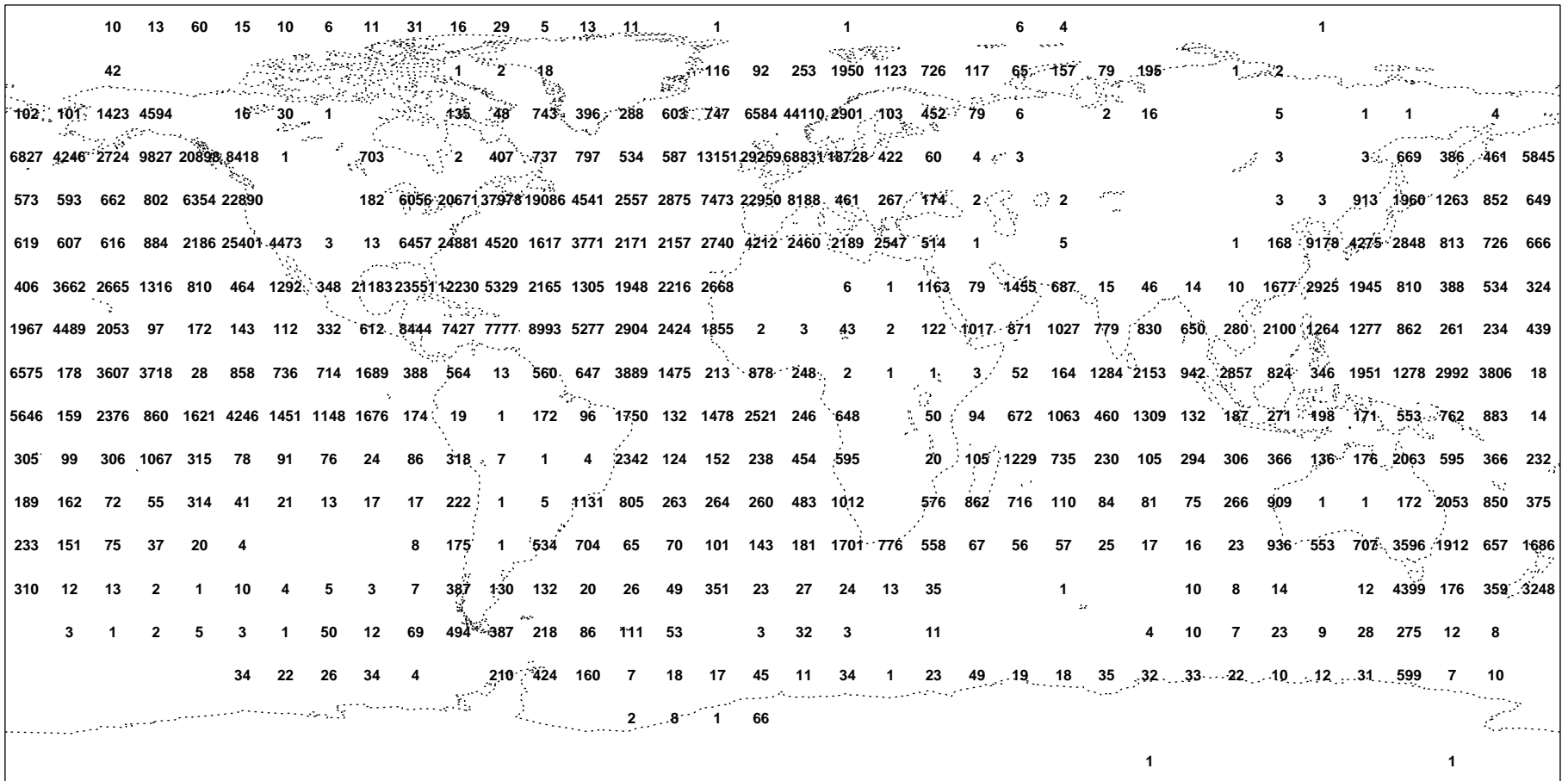
**Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- January - June 2009**  
**Only observations passing quality control used in statistics**  
**Contours drawn to 10 degree boxes, if the number of observations is greater than 10**  
**Shaded areas have a bias of magnitude greater than 10 degrees**



**Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- January - June 2009**  
**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**

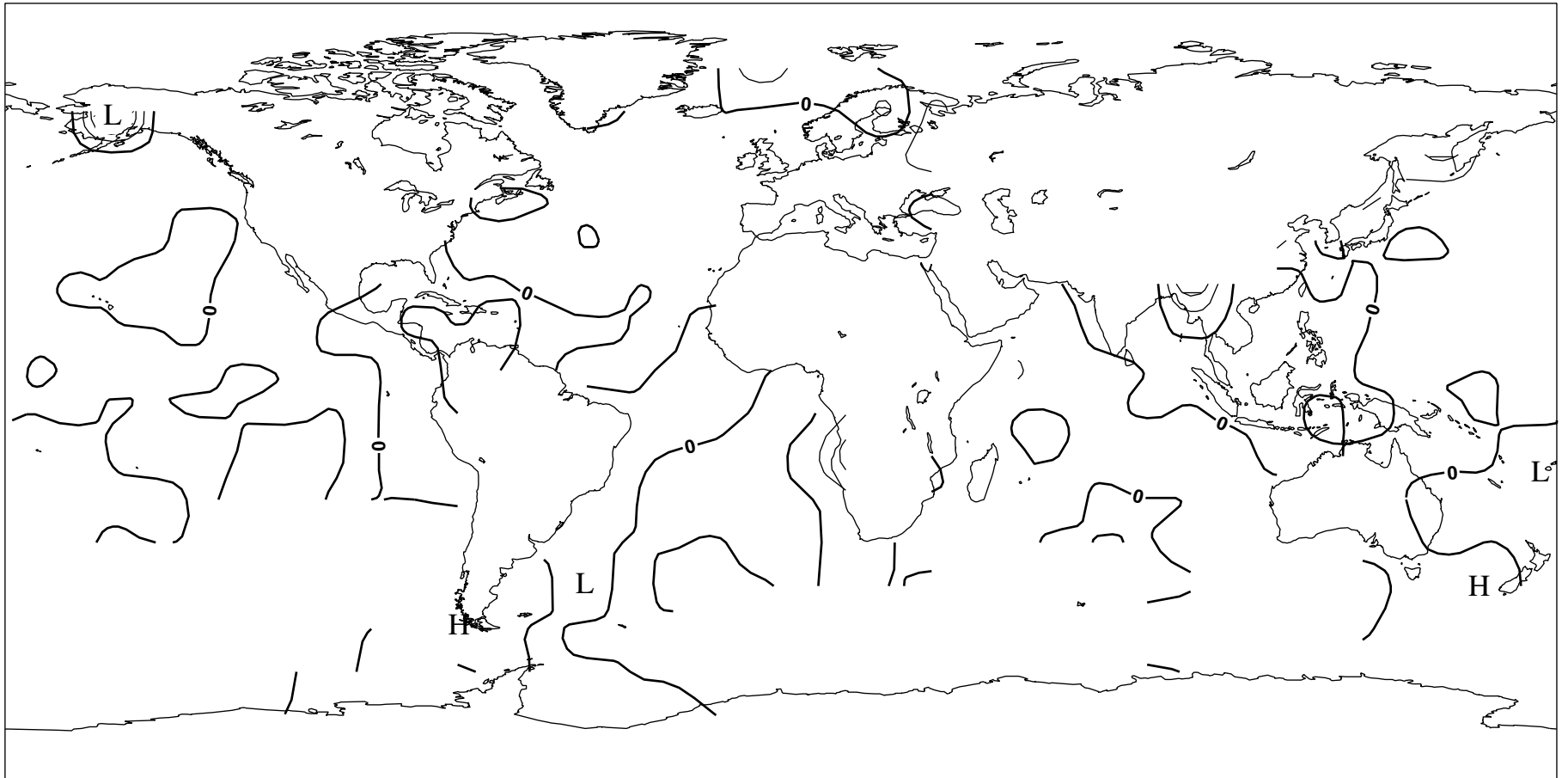


**Figure 11:**  
**Plot of the Number of Ship Wind Direction Observations. Date:- January - June 2009**  
**Only observations passing quality control included**





**Figure 12: Bias of Ship O-B SST (degrees C). Date:- January - June 2009**  
**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:- January - June 2009**  
**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**

