

# Report on the Quality of Marine Surface Observations

Report Number 49

January to June 2013

**Met Office** Data Assimilation

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# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2013

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Technical Coordinator of the SOT, Mr Mathieu Belbeoch ([belbeoch@jcommops.org](mailto:belbeoch@jcommops.org))  
Observing and Information Systems Dept., WMO, Mr E.Charpentier ([echarpentier](mailto:echarpentier))  
Diretoria de Hidrografia e Navegação (attn. [janice.trotte@terra.com.br](mailto:janice.trotte@terra.com.br))  
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Office of Marine Prediction, Japan Meteorological Agency ([wave@climar.kishou.go.jp](mailto:wave@climar.kishou.go.jp))  
Office of International Affairs, Japan Meteorological Agency (attn. [Dr S. Nakagawa](mailto:Dr.S.Nakagawa))

### ii) Internal

Observation Monitoring Scientist, [Mr. C. A. Parrett](mailto:Mr.C.A.Parrett)

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### **For further information, please contact:**

Manager of Global Data Assimilation  
Discovery 2  
The Met Office  
Fitzroy Road  
Exeter  
Devon  
EX1 3PB  
United Kingdom.

E-mail: [rick.rawlins@metoffice.gov.uk](mailto:rick.rawlins@metoffice.gov.uk)

# REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2013

## 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 2013

## 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 2013

## 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 2013

## 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 report number 49 and covers the period January to June 2013. For each observing platform identified as suspect, values are supplied for the number of observations received at the Met Office, the number of these observations with gross errors, the observations' mean differences from the background values used by the global numerical data assimilation system and the standard deviations of these differences.

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

## 2. MONITORING METHODS

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

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

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

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

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

#### Pressure

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

#### Wind

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

#### Criteria used for monthly monitoring

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

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

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

1. As with the monthly lists, accuracy is assessed relative to background values.
2. Observing platforms are listed only where there is a reasonable degree of confidence that the observations rather than the background values are in error.
3. At least 40 reports are required over the period in which the observations are considered suspect.
4. The perceived accuracy over the last part of the six-month period is of greatest importance; observing platforms are not listed if there has been recent improvement and their reports are at present without major error.
5. Given that the number of observations made during the period is greater than or equal to 40, then the condition for listing a platform as suspect in this report is that at least one of the following criteria are satisfied:



### Pressure

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

### Wind

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

### SST

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

#### Criteria used for biannual monitoring

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

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

### 3. MONITORING RESULTS

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

#### 3.1 Pressure

In the six-month period, January to June 2013, 3827425 observations of pressure were monitored at Exeter from 2343 manual ships, 703 drifting buoys, and 628 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 48 shows a small decrease in the number of manual ships reporting, little change in the numbers of automatic ships and fixed buoys reporting, but quite a large decrease in the number of drifting buoys reporting during the period. Since most marine observations are located in the northern hemisphere, there is inevitably some seasonal variation in the number of vessels reporting, especially in the case of buoys, since new or replacement buoys are generally deployed in better weather conditions. Considering the general trends over previous reports, there continues to be a slow decline in the number of manual ships reporting and a larger decline in the number of drifting buoys reporting over the last 18 months, following a peak during 2010-2011.

Table 2 and Figure 1 show the number of observations of pressure that have been received over the GTS at the Met Office and processed, over past 6-month periods. It can be seen that the total number of observations remained fairly steady with only minor fluctuations until report number 11 (January-June 1994). Since that time however, there has been a steady increase in the total up to 2008, with the number of observations of pressure nearly doubling between reports 11 and 16 (1994-1996) and doubling again between reports 33 and 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 a slow reduction in the number of manual ships reporting pressure. The number of reports from drifting buoys seems to have peaked through 2008-2011, but from 2011 to 2013 the number has decreased by about 30%. Reports from drifting buoys still account for 45% of the total, while those from manual ships make up just 12% of the total, and those from automatic ships account for the remaining 43%. The sudden increase seen in the number of automatic ships in report number 19 (January-June 1998) was due to observation processing changes at the Met Office, whereby all reports from 'automatic ships' began to be processed, rather than only one report per 6-hour assimilation period, as previously. From 1998 through to 2011 there was a fairly steady increase in the total number of pressure reports from automatic ships, but that increase seems to have stopped since 2011.

A histogram of O-B differences for all ship pressure reports in the period January to June 2013 is shown in Figure 2a, together with the Gaussian distribution with the same mean and standard deviation. Although almost all values fall within the range +5 to -5 hPa, a small number of much larger values, presumably resulting from erroneous observations, contribute to the large standard deviation of the population. The distribution for all those observations which fail the automatic quality-control checks is broad (Figure 2b). The remaining 94% of the observations, that pass the quality checks, show a distribution of O-B which is very close to Gaussian (Figure 2c) with mean 0.0 hPa and standard deviation 1.0 hPa. The principal contribution to the standard deviation is assumed to be from background and representativeness errors.

A global estimate of the background error, such as that provided above, can conceal large spatial variations. Background values will be more accurate in data-rich areas (e.g. in the North Sea or Mediterranean) or where the meteorological variability is low (e.g. the tropics). Figures 3 and 4 show the geographical distributions of the mean and standard deviation of the values of O-B from ship observations that passed the quality control checks, calculated for 10-degree latitude-longitude boxes. In most areas, the magnitude of the mean is less than 0.5 hPa, the exceptions being generally where the sample size is small. The standard deviation is generally in the range 0.5 to 1.5 hPa, being less than 1.0 hPa in some areas of the north Atlantic, the north-west Pacific and the tropics. The number of ship pressure reports that passed the quality control checks are shown in Figure 5.

Table 3 contains a list of those ships and drifting buoys considered to have produced suspect observations of pressure in the period January to June 2013. 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 48 (July to December 2012) have been indicated with an asterisk. A comparison of the statistics given here with those in report number 47 (January to June 2012), shows 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 48 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 8 of these platforms, but the other 10 platforms on the list have shown some improvement in the quality of their observations.

### 3.2 Wind

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

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

In the period January to June 2013, 2068129 wind observations were available for monitoring at the UK Met Office, from 2354 manual ships, 36 drifting buoys, and 625 automatic ships (more detail is given in Table 1). The number of reported manual ship identifiers shows the same trends as for pressure, but with slightly more identifiers reporting wind.

Histograms of O-B differences for ship observations of wind speed are presented in Figures 2d, 2e and 2f and of wind direction in Figures 2g, 2h and 2i. As with observations of pressure, those wind observations that fail the quality-control checks differ most from the background, some by as much as  $50 \text{ ms}^{-1}$ , and they make a large contribution to the variance of O-B. The distributions of O-B wind speed and direction for the remaining 93% of the observations are nearly Gaussian, with a speed bias of  $0.4 \text{ ms}^{-1}$  relative to the background and a direction bias of just  $0.7^\circ$ .

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 about  $2 \text{ ms}^{-1}$  in middle latitudes and around  $1.5 \text{ ms}^{-1}$  in the tropics. The  $|\text{bias}|$  is generally less than  $1 \text{ ms}^{-1}$ , 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 5 degrees in most places, but is up to 15 degrees in a few data sparse areas. The standard deviation is generally between 15 and 30 degrees globally, but in some data-sparse areas and near some coasts it is greater 40 degrees. The numbers of reports of wind direction used to generate these statistics are presented in Figure 11.

Figures 6-11 provide reference values against which to compare the O-B characteristics for different marine observing platforms. Table 5 contains a list of those ships and drifting buoys considered to have produced suspect observations of wind speed in the period January to June 2013, 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 2013, a total of 6154042 observations of SST were monitored at the Met Office, from 1984 manual ships, 1514 drifting buoys and 605 automatic ships. Of the total, 331236 were from manual ships, 4225449 from drifting buoys and 1597357 from automatic ships and fixed buoys. (More detail is given in Table 1.) For the same reasons as stated for pressure observations, it appears that many ship identifiers report only once during the 6-month period. There are similar numbers of manual ships reporting SST as there are drifting buoys and automatic ships combined, but manual ships account for only about 5% of the total number of observations. This is due to the greater frequency of automatic ship and buoy observations, hourly in many cases, with manual ships tending to report only at the main synoptic hours.

Histograms of O-B differences for all ship SST reports are shown in Figures 2j, 2k and 2l. As with observations of pressure and wind, those SST observations that fail the quality-control checks differ most from background and make a large contribution to the variance of O-B. The distribution of O-B SST for the remaining 87 % of the observations is nearly Gaussian, with a bias of just  $0.2 \text{ }^{\circ}\text{C}$  relative to the background and a standard deviation of  $1.1 \text{ }^{\circ}\text{C}$ .

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

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

#### 4. SUMMARY

There are 39 marine observing platforms listed as producing suspect observations of pressure over the period January to June 2013, 62 as producing suspect wind observations and 64 as producing suspect SST observations. The first report issued by RSMC Bracknell, for the period January to June 1989, listed 150 marine platforms producing suspect observations of pressure. With the selection criteria remaining unchanged, an initial reduction in the number of platforms listed as suspect was followed by a series of reports listing similar numbers of suspects, around 80. There was an increase in suspect numbers during 1999 and 2000, then the numbers fluctuated around an average of 130 through to the end of 2008; they dropped slightly during 2009, then averaged about 70 until 2012, since when they have dropped further. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to have been little overall trend in observation quality, as measured by the percentage of suspect platforms, although there are signs of some improvement in quality over the past few years.

For wind observations, over the years up to 2002 there was a tendency for a small increase in the number of wind observing platforms listed as suspect, then the numbers fluctuated between about 100 and 150 until 2008. There was a slight decrease in the number of suspect wind platforms up to 2010 and since then the number has averaged about 70.

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

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

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

**TABLE 1: FREQUENCY DISTRIBUTION OF THE NUMBER OF REPORTS OF PRESSURE, WIND AND SEA SURFACE TEMPERATURE FROM INDIVIDUAL IDENTIFIERS AVAILABLE FOR MONITORING AT EXETER, JANUARY TO JUNE 2013.**

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	201	201	152	4	3	1	35	42	40
2-10	261	265	269	5	1	10	26	24	20
11-20	127	123	142	3	1	6	11	9	12
21-40	269	273	228	6	1	6	13	14	16
41-100	503	510	429	9	2	21	13	15	10
101-200	490	491	378	8	1	31	16	16	15
201-500	357	358	280	57	10	88	28	35	29
501-1000	51	52	47	95	3	200	37	61	68
1001-1500	26	23	21	97	2	145	66	62	55
1500+	58	58	38	419	12	1006	383	347	340
<b>Total</b>	2343	2354	1984	703	36	1514	628	625	605
(Report 48)	(2504)	(2540)	(2116)	(860)	(48)	(1687)	(640)	(634)	(613)

\* numbers are for fixed buoys only

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

Period	WMO report number	Number of Observations			
		Manual ships	Drifting buoys	Automatic ships	Total
Jan - Jun 1989	1	424087	174971	40082	639140
Jul - Dec 1989	2	421315	151972	58016	631303
Jan - Jun 1990	3	424335	177927	63847	666109
Jul - Dec 1990	4	412430	205488	71146	689064
Jan - Jun 1991	5	364760	177069	64401	606230
Jul - Dec 1991	6	348710	148604	68456	565770
Jan - Jun 1992	7	332443	216872	73893	623208
Jul - Dec 1992	8	336958	247873	80862	665693
Jan - Jun 1993	9	340293	288208	77317	705818
Jul - Dec 1993	10	348082	316261	88650	752993
Jan - Jun 1994	11	334134	279963	111928	726025
Jul - Dec 1994	12	383760	305618	142468	831846
Jan - Jun 1995	13	369781	407111	124537	901429
Jul - Dec 1995	14	394016	528938	138653	1061607
Jan - Jun 1996	15	430162	566035	122909	1119106
Jul - Dec 1996	16	477928	621869	133221	1233018
Jan - Jun 1997	17	446530	623835	122178	1192543
Jul - Dec 1997	18	453399	684292	140227	1277918
Jan - Jun 1998	19	426622	700743	423217	1550582
Jul - Dec 1998	20	443548	700239	497313	1641100
Jan - Jun 1999	21	432506	697983	466311	1596800
Jul - Dec 1999	22	448996	771624	500070	1720690
Jan - Jun 2000	23	443023	772510	455799	1671332
Jul - Dec 2000	24	477828	829588	512338	1819754
Jan - Jun 2001	25	458345	784686	465887	1708918
Jul - Dec 2001	26	473887	914744	554002	1942633
Jan - Jun 2002	27	443876	1111699	517200	2072775
Jul - Dec 2002	28	544433	952313	595959	2092705
Jan - Jun 2003	29	432672	994877	506185	1933734
Jul - Dec 2003	30	473591	1128039	605241	2206871
Jan - Jun 2004	31	435824	1092461	596495	2124780
Jul - Dec 2004	32	434160	1113527	724014	2271701
Jan - Jun 2005	33	471113	1221528	717207	2409848
Jul - Dec 2005	34	472565	1523938	837397	2833900
Jan - Jun 2006	35	456847	1758276	792765	3007888
Jul - Dec 2006	36	447474	1833376	975555	3256405
Jan - Jun 2007	37	410076	1947986	998474	3356536
Jul - Dec 2007	38	454512	2265115	1116750	3836377
Jan - Jun 2008	39	444253	2397246	1156968	3998467
Jul - Dec 2008	40	481513	2605728	1315696	4402937
Jan - Jun 2009	41	466628	2551270	1201762	4219660
Jul - Dec 2009	42	452548	2473739	1381174	4307461
Jan - Jun 2010	43	442069	2606292	1325666	4374027
Jul - Dec 2010	44	534594	2730518	1563232	4828344
Jan - Jun 2011	45	470337	2631956	1608822	4711115
Jul - Dec 2011	46	545536	2651020	1889732	5086288
Jan - Jun 2012	47	515154	2242441	1687722	4445317
Jul - Dec 2012	48	491700	2331570	1899860	4723130
Jan - Jun 2013	49	457038	1723955	1646432	3827425



**TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2013.**

- Column 1 Call sign or identifier.  
 Column 2 Number of pressure observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.  
 Column 3 Number of pressure observations differing by more than 15 hPa from background (gross error).  
 Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.  
 Column 5 Mean of observation-minus-background differences (bias) excluding cases of gross error.  
 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 2012)

**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
16603	786	30	5.1	2.3	1	1	1	1	1	SD
21623	460	69	6.0	-1.0	1	2	2	1	2	SD
26540	1135	1135	---	---	3	3	0	0	3	GE
26541	1142	1142	---	---	3	3	0	0	3	GE
46622	249	74	4.3	-2.3	1	0	1	1	1	GE
48518	224	68	0.5	13.6	1	0	1	1	1	Bias
48539	437	0	3.8	-4.4	2	0	1	1	1	Bias
54915	480	183	2.0	1.1	1	1	1	1	1	GE
56918	420	0	3.2	4.3	1	0	1	1	1	Bias
61535	96	0	5.3	-0.1	0	1	0	0	0	SD
64622	41	13	5.6	7.6	1	0	1	0	1	Bias
72510	1669	119	5.5	-0.2	1	0	1	1	1	SD
72831	1566	270	5.7	2.2	2	1	1	2	2	SD
72832	1251	779	9.1	5.7	3	3	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
16615	4255	91	1.2	-0.4	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
31262	660	336	1.0	0.5	3	3	0	1	3	GE
9MCY6	43	3	5.4	-0.8	0	0	0	0	0	SD
9V9373	105	0	2.8	4.3	0	0	0	0	1	Bias
A8YN2	95	0	5.1	-1.1	1	0	1	0	1	SD
AUFI	57	1	4.2	5.1	1	0	1	0	1	Bias
AUYI	42	1	4.2	3.8	0	0	0	0	0	Bias
AVLQ	55	0	5.3	-3.0	1	0	1	0	0	SD
C6YM7	185	54	8.4	-2.5	3	0	3	0	4	SD
CFK9698	68	16	5.2	-4.8	1	0	1	0	1	Bias
ICPO	97	0	4.1	-5.5	3	0	2	0	3	Bias
LAOW5	80	0	5.4	1.9	2	0	1	0	1	SD
TBWUK19	58	0	1.4	-4.1	0	0	0	0	0	Bias
UASX	91	23	5.3	-5.1	2	0	1	0	2	Bias
UBSH	103	10	7.4	-0.3	2	0	2	0	2	SD
UDYG	281	114	4.0	-0.1	2	1	2	0	2	GE
UFJN	* 123	10	5.2	-2.0	2	0	1	0	1	SD
UGWJ	43	0	1.8	-3.8	0	0	0	0	0	Bias
UGYU	93	0	1.9	-6.8	0	0	0	0	0	Bias
UICO	* 127	25	6.9	-3.8	1	1	0	0	1	SD
V7EM3	100	0	3.7	3.0	3	0	1	0	3	Bias
VRCX7	289	33	12.0	1.4	2	0	2	0	2	Biases + SD
VRJZ9	59	1	7.1	3.0	1	0	1	0	1	Bias + SD
VRKQ7	69	0	2.4	4.3	1	0	1	0	2	Bias
WCX9104	107	0	5.2	0.1	0	0	0	0	0	SD

**TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2012.**

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
42362	892	0	0.9	0.1	Reduced bias
9MGF7	56	0	3.4	-1.8	Reduced bias
9V8640	313	0	2.0	1.5	Reduced bias
AUFH	58	3	3.7	-1.6	Reduced SD
AUYR	54	0	1.4	1.3	Reduced SD
C6SE3	123	0	1.7	-1.3	Reduced bias
FTCO	42	0	1.2	-0.7	Reduced bias
UAHF	33	15	4.6	-4.5	Less than 40 reports
V7RP7	25	0	2.6	1.6	Less than 40 reports
VCTV	9	7	1.4	9.4	Less than 40 reports
VDFP	21	1	3.3	0.9	Less than 40 reports
VDWC	18	9	3.1	-5.2	Less than 40 reports
VGJD	4	0	5.1	1.5	Less than 40 reports
VGPY	1	0	0.0	-1.0	Less than 40 reports
VRBR5	6	0	0.6	2.0	Less than 40 reports
VRCY7	45	0	1.0	0.1	Reduced SD
VRKC2	211	1	2.1	2.6	Reduced bias
WDB9951	119	11	1.8	0.1	Reduced bias

**TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2013.**

- Column 1 Call sign or identifier.  
 Column 2 Number of wind speed observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.  
 Column 3 Number of wind observations with vector difference from background of more than  $25\text{ms}^{-1}$  (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 2012)

**Table 5a: Platforms reporting in BUOY code**

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

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
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**Table 5b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
41037	3839	12	3.2	5.1	3	2	0	0	0	Bias
9V7953	192	8	5.2	7.7	4	0	4	0	4	Bias
BAREU5 *	534	6	3.1	6.2	2	0	2	0	2	Bias
J8NW	174	5	2.0	5.1	4	0	1	0	4	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 2012.**

- 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
9MGF7	56	0	4.1	-2.0	Reduced bias
AVBD	67	0	3.7	-0.5	No GE
ULUN	683	0	3.6	3.1	Reduced bias
VRCG8	18	0	2.4	1.1	Less than 40 reports

**TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2013 .**

Column 1	Call sign or identifier.
Column 2	Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column 3	Number of wind observations with vector difference from background of more than $25\text{ms}^{-1}$ (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 2012)

**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
48737	540	0	42.2	50.4	2 0 0 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
47501	423	21	69.7	-118.0	2 0 0 0 2	Bias

**Table 7b: Platforms reporting in SHIP code**

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
15007	231	0	42.4	44.1	0	0	0	0	0	Bias
23459	42	0	120.9	-83.6	1	0	1	0	6	Bias
23492	* 1758	0	62.9	-26.6	1	0	5	2	1	SD
31051	* 2548	420	123.3	4.6	6	5	6	6	6	GE + SD
31053	* 1015	3	54.9	-54.5	1	2	2	1	3	Bias
3ETA7	* 235	18	65.2	-6.0	1	0	1	0	1	SD
3FAV5	108	0	60.9	42.6	0	0	0	0	1	SD
3FPS9	112	0	45.8	-39.5	0	0	0	0	0	Bias
45025	* 2566	0	53.8	-33.3	0	0	1	0	2	Bias
46111	* 1423	3	149.7	1.9	2	0	3	2	3	SD
46146	4046	0	48.7	-37.2	0	0	0	1	6	Bias
7JHS	118	0	76.8	-7.5	0	0	1	0	1	SD
9HOM8	67	0	65.2	4.0	0	0	0	0	1	SD
A8GU8	153	5	68.5	11.2	0	0	1	0	1	SD
AULT	116	0	108.0	0.3	1	0	1	0	1	SD
AUTP	109	0	72.7	-6.4	0	0	1	0	2	SD
BAREU5	*\$ 534	6	92.5	4.6	1	0	2	0	2	SD
BAREU6	* 233	0	63.9	19.9	0	0	0	0	0	SD
BAREU6	* 464	24	84.7	50.6	2	0	2	0	2	SD
C6VF5	188	0	44.8	30.6	0	0	0	0	1	Bias
C6YM7	187	12	89.0	23.6	1	0	2	0	4	SD
CZ9742	3201	0	31.9	-31.7	5	0	5	0	5	Bias
DVRF	285	0	49.9	-38.7	0	0	0	0	1	Bias
ELPP9	98	3	89.7	-3.5	0	0	2	0	2	SD
H9UY	* 69	1	86.9	-40.0	1	0	1	0	2	SD
HO7723	* 55	0	65.2	-31.7	0	0	0	0	0	Bias + SD
IBLQ	419	0	65.9	-4.6	0	0	0	0	3	SD
J8NW	* 174	5	110.6	-5.0	5	0	6	0	6	SD
J8PD	51	0	79.1	-33.0	0	0	0	0	0	Bias
J8PR3	188	30	42.9	-70.1	0	0	3	0	2	Bias
MCCN6	130	1	74.1	-7.1	0	0	1	0	2	SD
MDGV9	* 126	0	62.0	12.9	0	0	0	0	0	SD
MEPP3	336	0	65.1	11.0	2	0	3	0	2	SD
MGRX2	* 207	0	41.5	-29.9	1	0	1	0	1	Bias
PCPR	102	0	70.3	-1.5	0	0	0	0	1	SD
Continued..										





Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
> Continued										
S6ES6	1249	0	64.9	6.3	0	0	0	0	3	SD
S6NK4 *	85	0	90.9	11.9	1	0	2	0	3	SD
TBWAA1 *	49	1	96.4	-28.8	0	0	0	0	0	SD
TBWUK19	59	0	73.5	2.1	1	0	1	0	1	SD
UCAD	76	2	80.0	-30.1	1	0	1	0	2	SD
UDYG	218	7	64.2	79.9	0	0	1	0	3	Bias
UFMK *	138	0	63.6	-6.1	0	0	0	0	1	SD
V7HP3 *	314	0	76.1	-7.8	0	0	0	0	5	SD
V7QK3	144	4	79.7	4.7	0	0	0	0	4	SD
V7QN8	99	0	68.9	2.5	0	0	0	0	0	SD
VAAP	1576	162	120.1	52.1	3	0	3	0	4	SD + Bias
VC6750	351	0	27.3	77.4	1	0	0	0	2	Bias
VQIC2	56	1	80.4	8.7	0	0	0	0	1	SD
VRJI2	81	2	66.9	11.4	0	0	0	0	2	SD
VRKF5 *	115	0	65.3	-11.0	0	0	0	0	2	SD
VRZT5	87	3	68.9	16.3	0	0	0	0	0	SD
VRZZ2 *	41	0	62.5	8.1	0	0	0	0	1	SD
WBN411: *	408	0	59.4	-25.0	1	0	0	0	6	SD
WBP321: *	1645	1	52.7	5.5	0	0	0	0	0	SD
WCX744: *	2639	23	78.8	-8.4	3	0	5	0	5	SD
WNFQ	96	0	68.6	-1.1	0	0	0	0	1	SD
ZCDV9	127	0	74.9	4.7	0	0	1	0	3	SD
ZCEI6	48	3	64.8	2.4	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 2012.**

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

Identifier	N Obs.	NGE	SD	Bias	Comments
31260	932	0	36.1	25.0	Reduced SD
31374	3200	0	29.8	23.7	Reduced Bias + SD
44027	1833	0	33.7	-2.8	Reduced bias
45138	1206	0	31.6	-11.7	Reduced bias
4XFV	31	0	46.7	-18.3	Less than 40 reports
62087	1136	46	58.1	1.7	Reduced SD
9V9373	102	0	41.7	1.4	Reduced SD
9V9746	81	0	37.2	6.5	Reduced SD
A8AD7	112	0	53.7	4.0	Reduced SD
A8GJ5	188	0	53.0	-5.9	Reduced SD
A8IJ4	140	0	51.6	-19.3	Reduced SD
A8IP9	91	0	44.2	-4.3	Reduced SD
A8PQ8	7	0	12.6	0.9	Less than 40 reports
A8QM9	47	0	48.1	5.6	Reduced SD
A8QY2	251	0	57.4	-3.5	Reduced SD
A8SO7	36	0	33.2	20.9	Less than 40 reports
C6SD9	14	0	41.6	18.5	Less than 40 reports
C6SI3	109	0	61.0	-6.6	Reduced SD
DDIG2	82	0	49.8	-0.6	Reduced SD
KNJK	162	0	52.6	7.2	Reduced SD
MCUV3	110	0	54.2	23.2	Reduced SD
MRGU3	56	1	92.2	25.2	SD
UCKD	65	0	35.6	-8.5	Reduced SD
V7DY3	22	0	29.4	0.4	Less than 40 reports
V7EE5	8	0	44.9	44.0	Less than 40 reports
V7HC6	742	1	61.0	15.5	Reduced SD
VRXK4	65	3	53.1	-6.1	Reduced bias
WBM5091	11	0	60.3	-37.7	Less than 40 reports
WBN3015	28	0	54.5	-23.6	Less than 40 reports
WCX9106	244	0	58.2	-32.5	Reduced bias
WDB3834	3	0	8.4	-7.9	Less than 40 reports
WDB7815	168	0	62.7	9.2	Reduced SD
ZCDN9	148	1	52.2	0.2	Reduced SD
ZCEG5	70	0	58.2	-11.4	Reduced SD

**TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2013.**

- 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 2012)

**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
13647	1705	12	2.2	4.1	3	-	0	-	0	Bias
13648	1508	71	2.6	3.6	2	-	0	-	0	Bias
14963	206	13	2.9	-4.8	1	-	0	-	0	Bias
23952	1006	62	3.0	3.9	1	-	0	-	1	Bias
32623	189	0	0.1	-3.2	1	-	0	-	0	Bias
41560	123	123	---	---	1	-	0	-	1	GE
42552	471	117	3.6	-0.2	1	-	0	-	0	GE
42554	453	138	3.7	0.4	1	-	0	-	1	GE
48549	892	444	2.3	0.4	1	-	0	-	1	GE
51684	405	19	3.3	-3.7	1	-	0	-	0	Bias
51858	552	194	3.4	2.6	1	-	0	-	1	GE
51920	42	29	6.8	0.7	1	-	1	-	1	SD
52750	549	549	---	---	1	-	1	-	1	GE
52906	171	80	5.1	-3.8	1	-	1	-	1	Bias + GE
55570	45	0	0.2	3.9	1	-	0	-	0	Bias
56958	244	16	3.1	-4.5	1	-	0	-	0	Bias
64722	1307	980	0.8	0.4	2	-	0	-	2	GE
72809	2247	39	2.2	-4.8	3	-	2	-	4	Bias
73634	2246	978	2.9	-4.4	3	-	2	-	4	Bias

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
13644	2373	8	2.1	4.2	5	-	0	-	3	Bias
48512	4248	288	3.6	-5.2	5	-	1	-	4	Bias
72808	2240	1416	1.5	-7.9	4	-	0	-	4	Bias

Table9b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
3EFD9	43	2	3.6	3.1	0	-	0	-	0	Bias
3FAV5	* 109	0	1.5	-6.4	2	-	2	-	2	Bias
3FPQ9	47	0	1.8	-3.9	0	-	0	-	0	Bias
4XFA	112	4	1.9	3.1	1	-	1	-	0	Bias
9MCY6	* 57	10	1.6	-4.2	2	-	0	-	0	Bias
9V8779	193	18	2.9	-4.8	4	-	5	-	5	Bias
9V9241	63	54	4.4	-3.5	2	-	2	-	2	Bias + GE
9V9375	53	2	2.8	-3.9	1	-	1	-	1	Bias
9VKQ2	138	15	3.5	-3.1	1	-	1	-	0	Bias
A8CB4	104	0	1.3	3.0	1	-	1	-	0	Bias
A8DM9	46	0	1.8	-3.9	1	-	1	-	1	Bias
A8IX8	* 114	0	0.8	-3.5	4	-	3	-	0	Bias
A8MW6	* 68	0	1.7	2.9	0	-	0	-	0	Bias
A8PK9	* 44	0	0.7	2.8	0	-	0	-	0	Bias
A8SC4	43	0	0.6	-3.2	0	-	0	-	0	Bias
A8TI2	71	0	1.6	3.4	1	-	1	-	0	Bias
A8VG3	57	1	2.6	-4.0	0	-	0	-	0	Bias
DGTX	* 125	0	1.5	2.7	1	-	1	-	1	Bias
ELPP9	94	24	0.7	0.1	2	-	0	-	2	GE
ELWG7	120	0	0.9	3.5	2	-	2	-	0	Bias
J8PE4	205	65	1.4	3.0	5	-	3	-	3	Bias
KIRH	* 423	2	1.4	-3.1	5	-	5	-	0	Bias
MHNN5	69	2	2.5	4.0	2	-	0	-	0	Bias
MNAN4	146	12	3.2	-3.9	5	-	2	-	2	Bias
SBPQ	1779	347	2.4	3.2	2	-	3	-	2	Bias
TCTX2	144	0	2.1	-4.2	3	-	3	-	3	Bias
UBMC	83	2	2.0	5.2	1	-	1	-	1	Bias
UBSH	101	27	2.4	1.1	0	-	0	-	0	GE
UBSH5	69	21	3.7	-0.9	1	-	0	-	0	GE
UCUD	76	0	2.4	-6.4	1	-	1	-	1	Bias
V7SJ3	201	0	1.7	-3.3	2	-	1	-	1	Bias
V7SY6	* 99	0	3.4	-4.8	3	-	2	-	3	Bias
VMGO	80	0	1.2	-3.8	2	-	0	-	0	Bias
VRDT7	43	4	3.9	-5.2	1	-	0	-	1	Bias
VRKX8	* 78	0	2.1	-3.1	1	-	2	-	0	Bias
VRXO6	60	31	3.6	1.7	0	-	0	-	0	GE
VYNG	70	4	2.7	4.7	1	-	1	-	1	Bias
WDE919:	* 75	38	0.8	-0.1	1	-	0	-	1	GE
WFLG	* 294	0	1.1	-3.4	4	-	4	-	0	Bias
WKWB	3093	17	2.4	3.0	3	-	3	-	2	Bias
WTEA	43	20	0.3	-0.4	0	-	0	-	0	GE
WZJD	* 70	2	0.8	-2.9	0	-	1	-	0	Bias

**TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JULY TO DECEMBER 2012.**

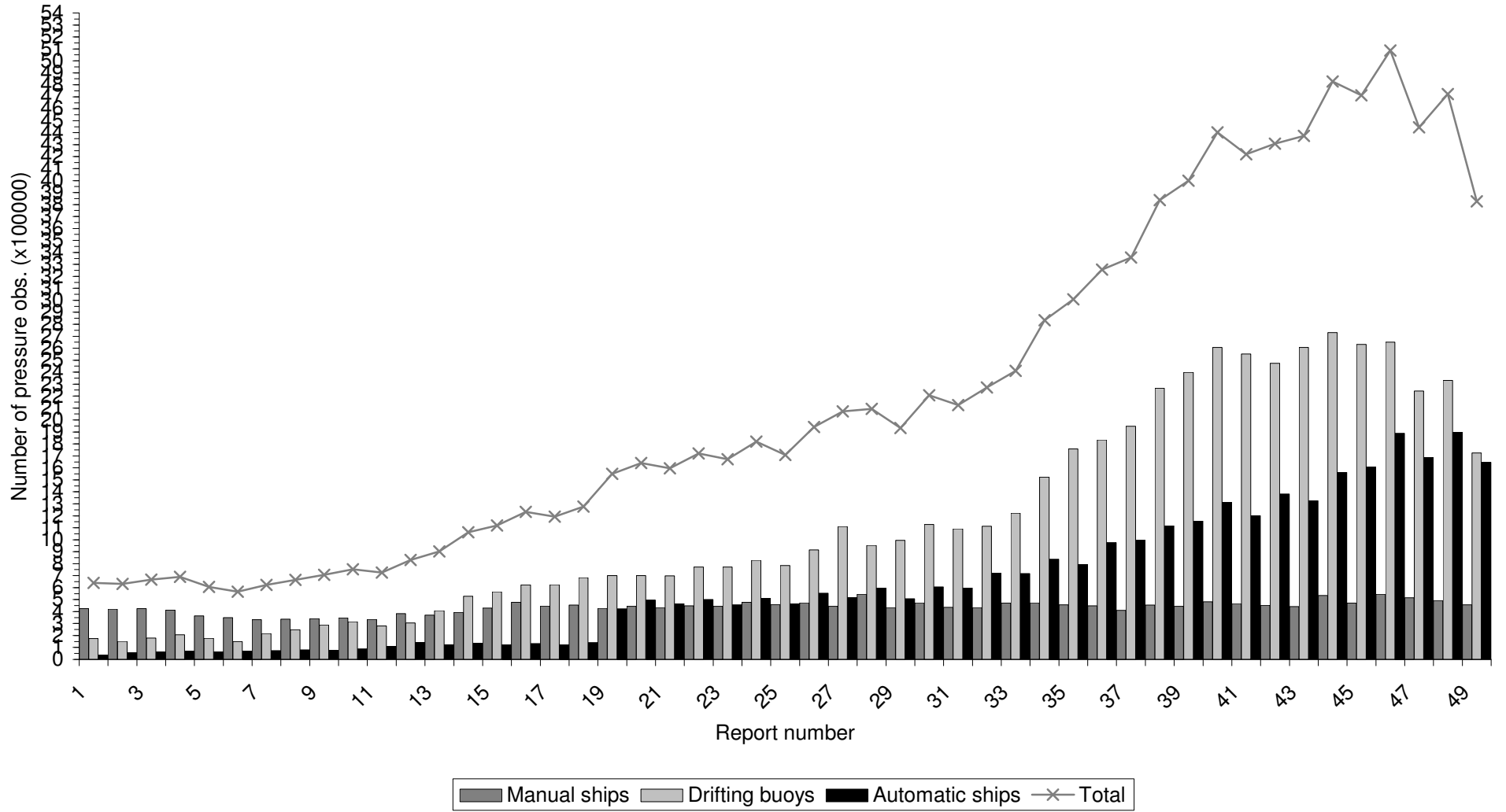
- Column 1 Call sign or identifier  
 Column 2 Number of sea-surface temperature observations available for monitoring over the 6-month period, including any observations with gross errors.  
 Column 3 Number of sea surface temperature observations differing by more than 10 °C from the background (gross 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

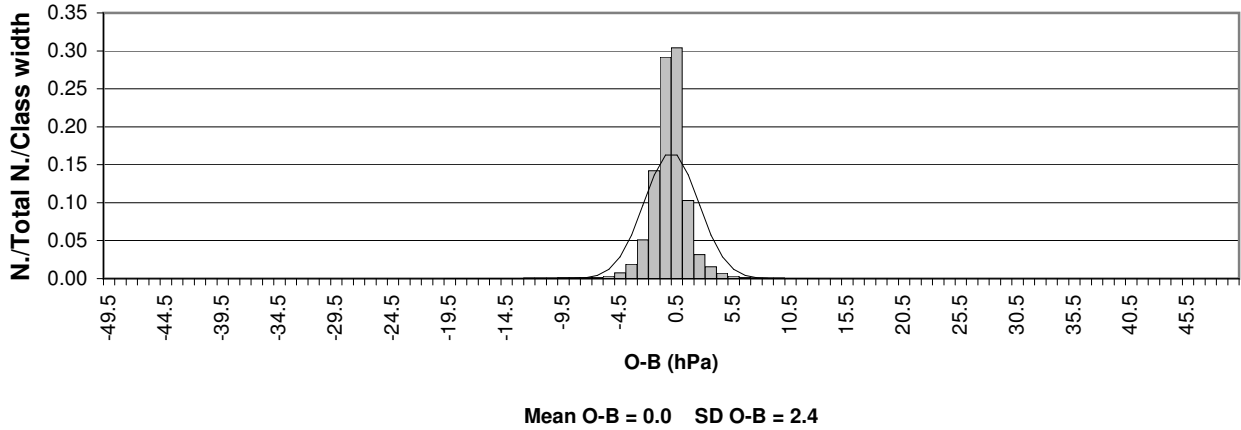
Identifier	N Obs.	NGE	SD	Bias	Comments
44137	3284	397	3.2	1.6	Reduced bias
A8VG7	178	10	3.5	-1.9	Reduced Bias
BSH05	352	9	4.7	4.2	Reduced Bias
C6CN4	90	1	2.2	0.1	Reduced bias
C6SD9	13	0	1.5	-1.1	Less than 40 reports
C6YT4	226	1	1.8	2.5	Reduced bias
IBQQ	96	0	2.0	-0.9	Reduced bias
ICSW	256	1	3.2	-2.0	Reduced bias
J8AZ2	89	0	2.6	-0.1	Reduced bias
MCLJ8	65	0	2.5	-1.3	Reduced bias
PBHZ	167	0	2.5	1.0	Reduced bias
S6TB	209	0	3.7	-1.1	Reduced bias
UCDM	37	0	2.4	-0.6	Less than 40 reports
UCDN	25	0	1.9	-0.2	Less than 40 reports
UCJX	139	0	2.5	-1.8	Reduced bias
V7QK3	155	10	2.7	1.2	Reduced bias
V7VQ3	13	0	3.3	2.1	Less than 40 reports
VRKJ7	189	1	1.8	1.8	Reduced bias
WDC6923	2	2	---	---	Less than 40 reports
WE4879	39	0	1.7	0.5	Less than 40 reports
WSLH	19	0	1.9	-3.5	Less than 40 reports
WXU3434	7	0	0.4	-0.2	Less than 40 reports
ZDNC5	183	0	2.3	-0.4	Reduced bias



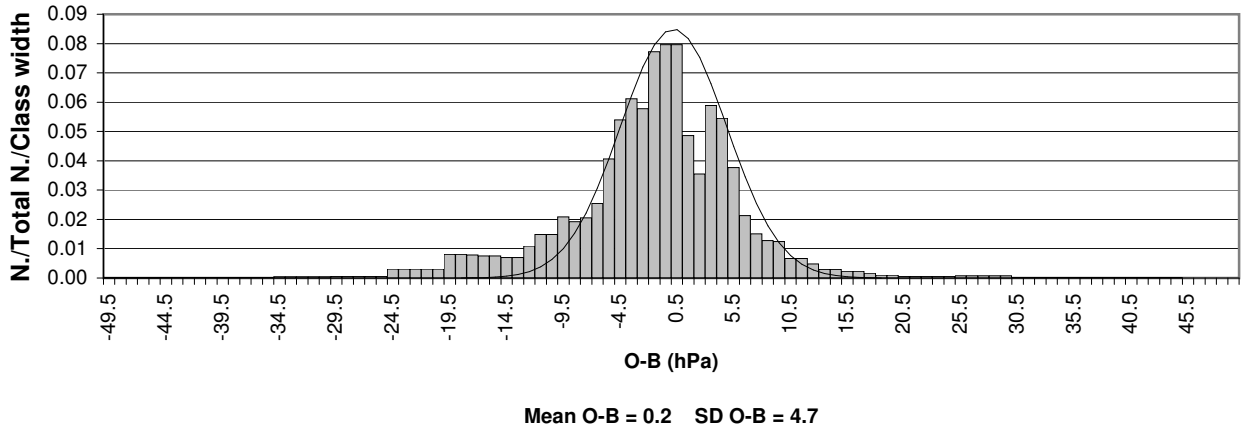
**Figure 1: Number of observations of pressure received at Exeter on the GTS for each of the six-month periods covered by the WMO reports on the quality of marine surface observations**



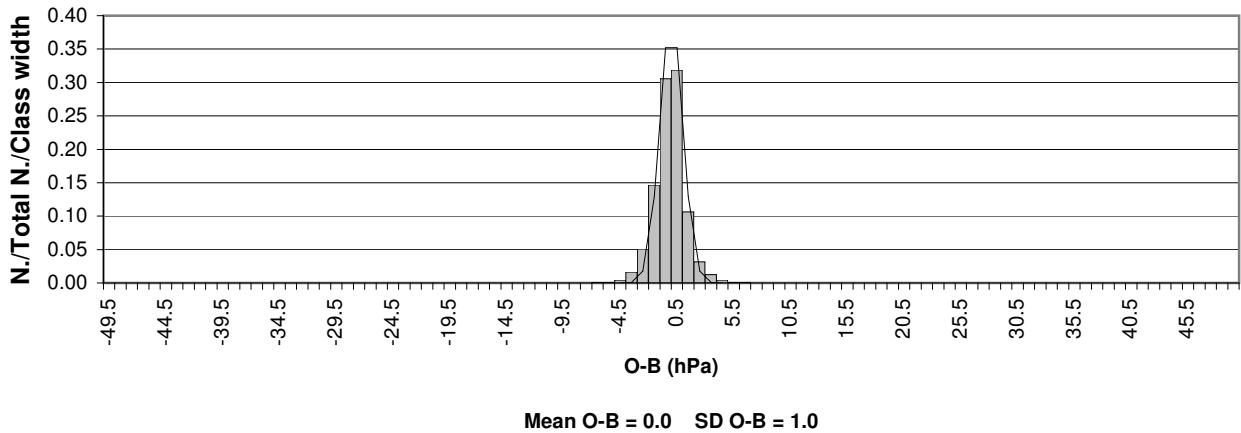
**Figure 2a: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2013 Data used: All observations



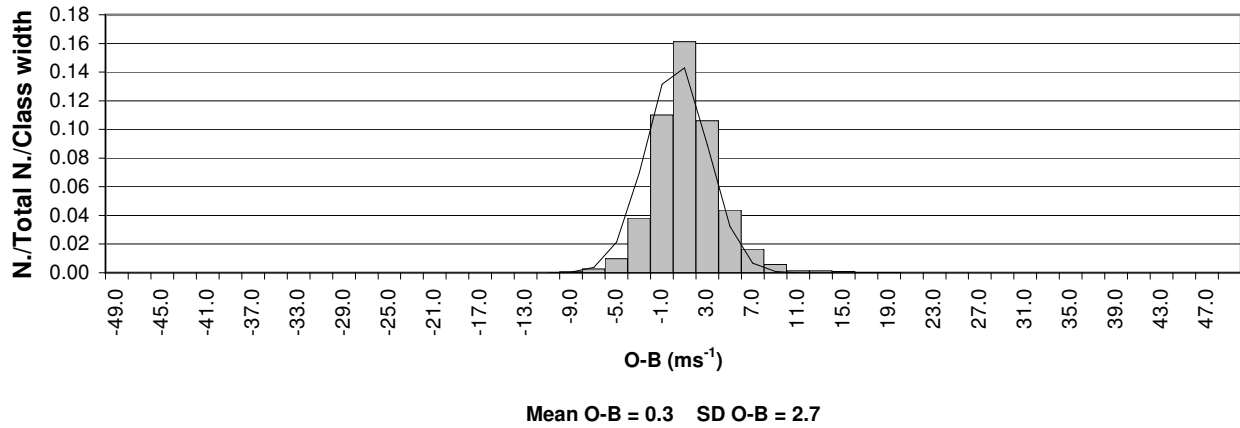
**Figure 2b: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2013 Data used: Flagged observations



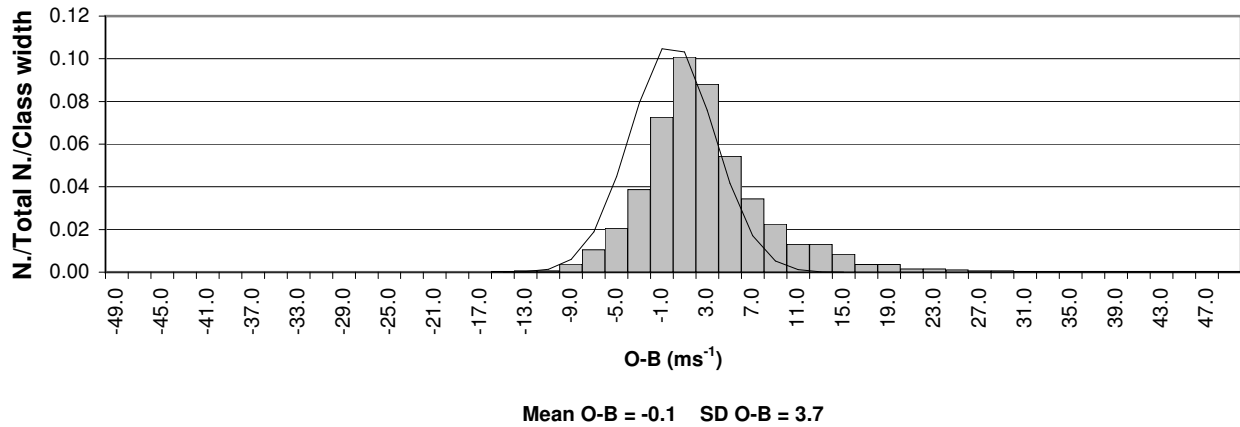
**Figure 2c: Distribution of ship O-B pressure (hPa)**  
Period of data: JAN-JUN 2013 Data used: Unflagged observations



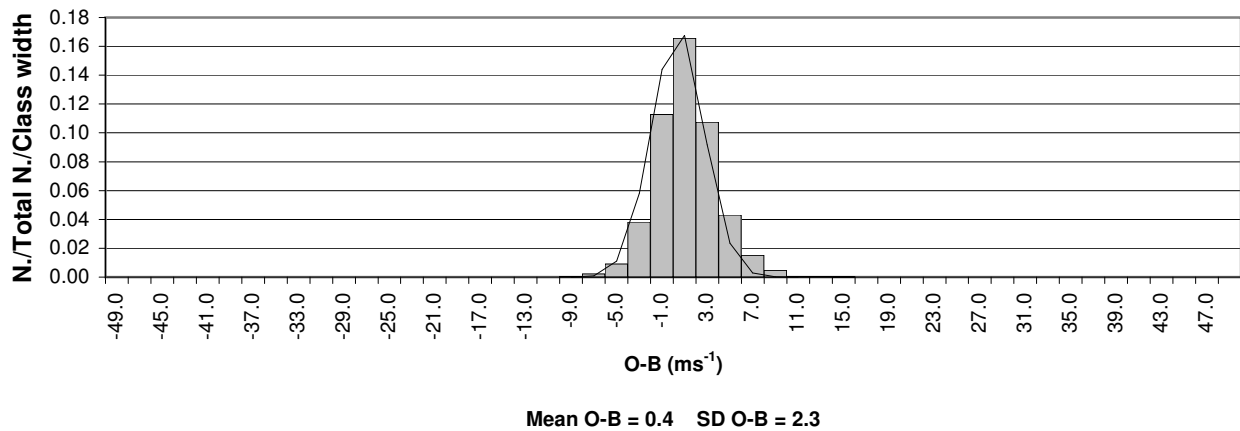
**Figure 2d: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2013 Data used: All observations



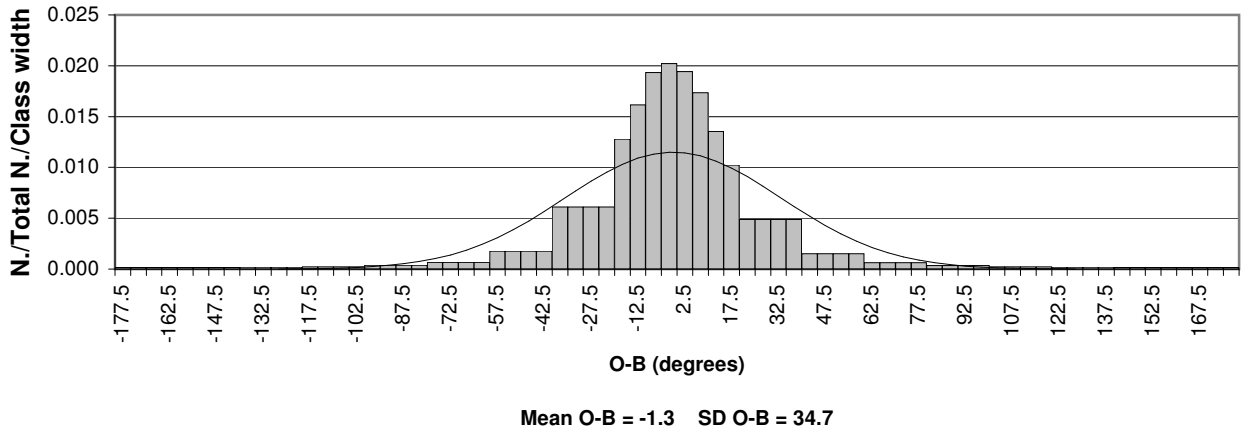
**Figure 2e: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2013 Data used: Flagged observations



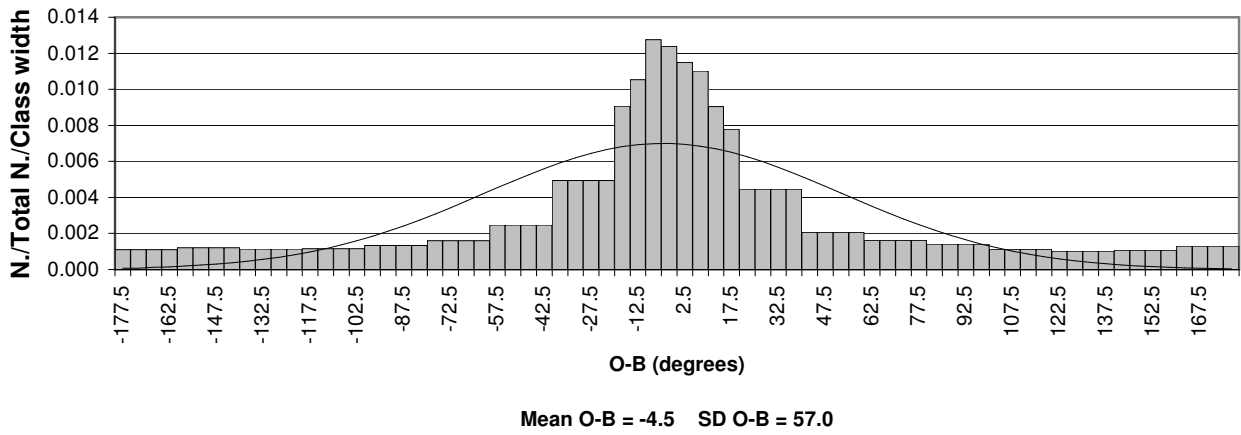
**Figure 2f: Distribution of ship O-B wind speed ( $\text{ms}^{-1}$ )**  
Period of data: JAN-JUN 2013 Data used: Unflagged observations



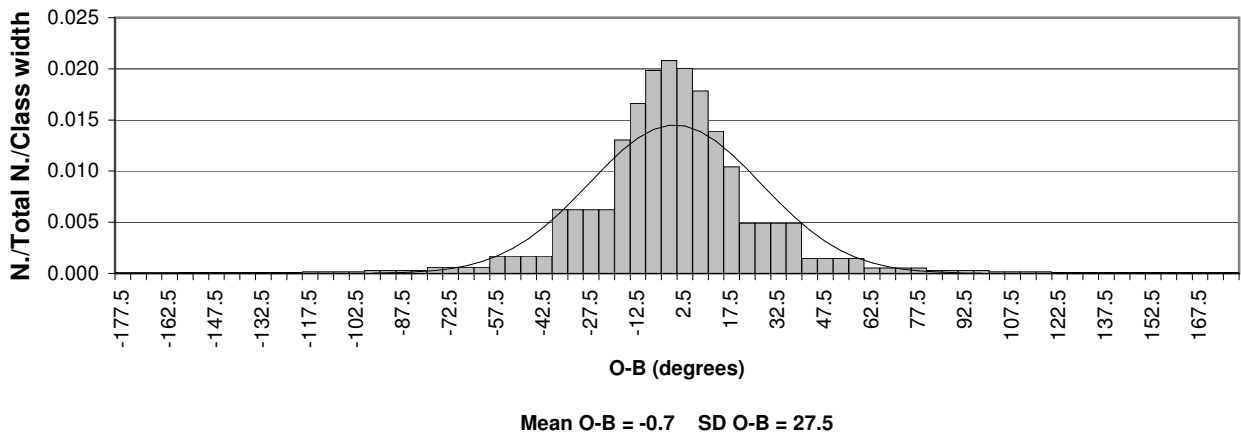
**Figure 2g: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2013 Data used: All observations



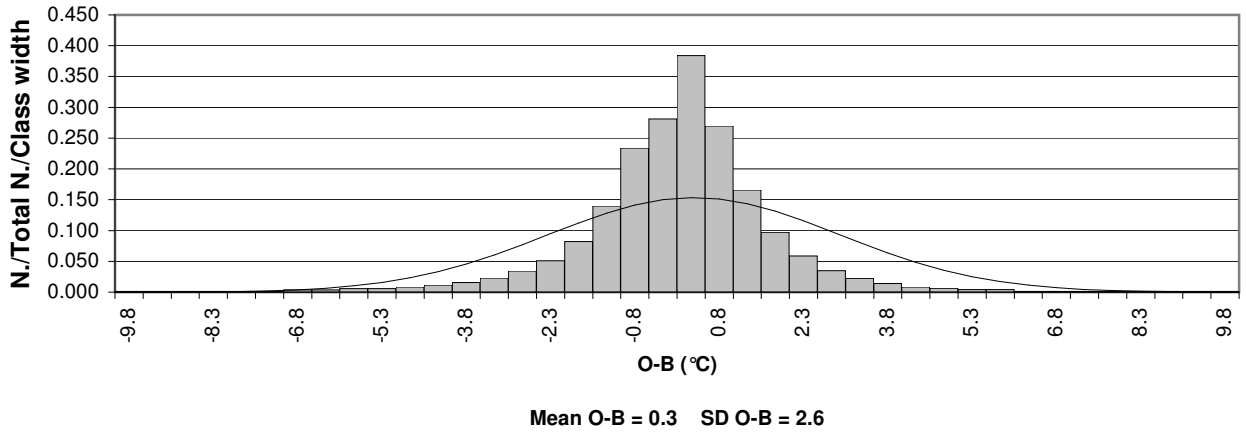
**Figure 2h: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2013 Data used: Flagged observations



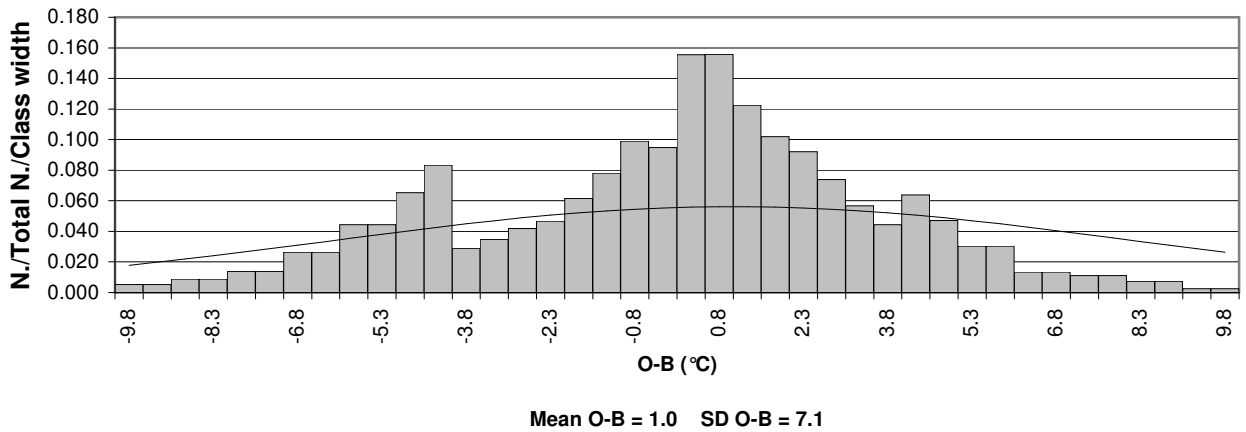
**Figure 2i: Distribution of ship O-B wind direction (degrees)**  
Period of data: JAN-JUN 2013 Data used: Unflagged observations



**Figure 2j: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2013 Data used: All observations



**Figure 2k: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2013 Data used: Flagged observations



**Figure 2l: Distribution of ship O-B SST (°C)**  
Period of data: JAN-JUN 2013 Data used: Unflagged observations

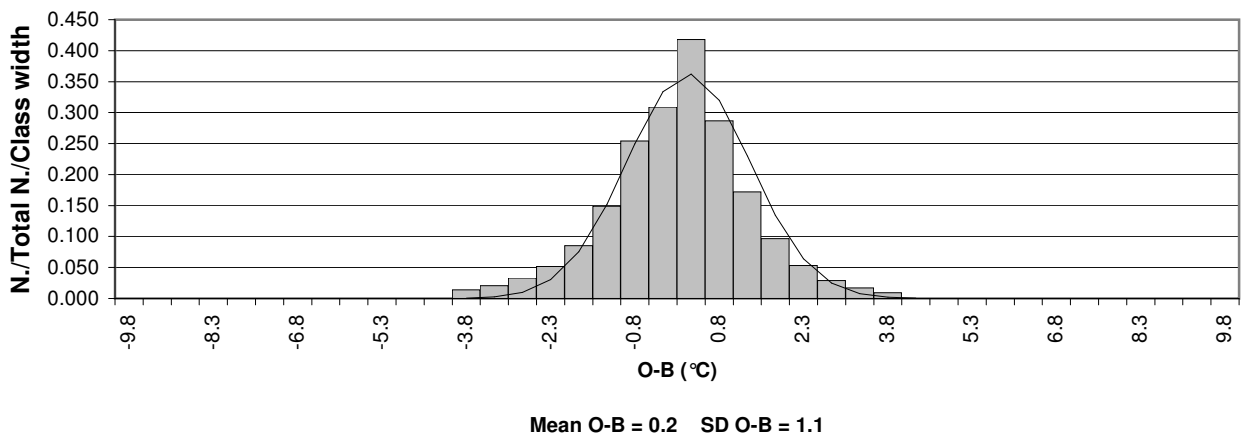




Figure 3: Bias of Ship O-B Pressure (hPa). Date:- January - June 2013  
Only observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a bias of magnitude greater than 1.0 hPa

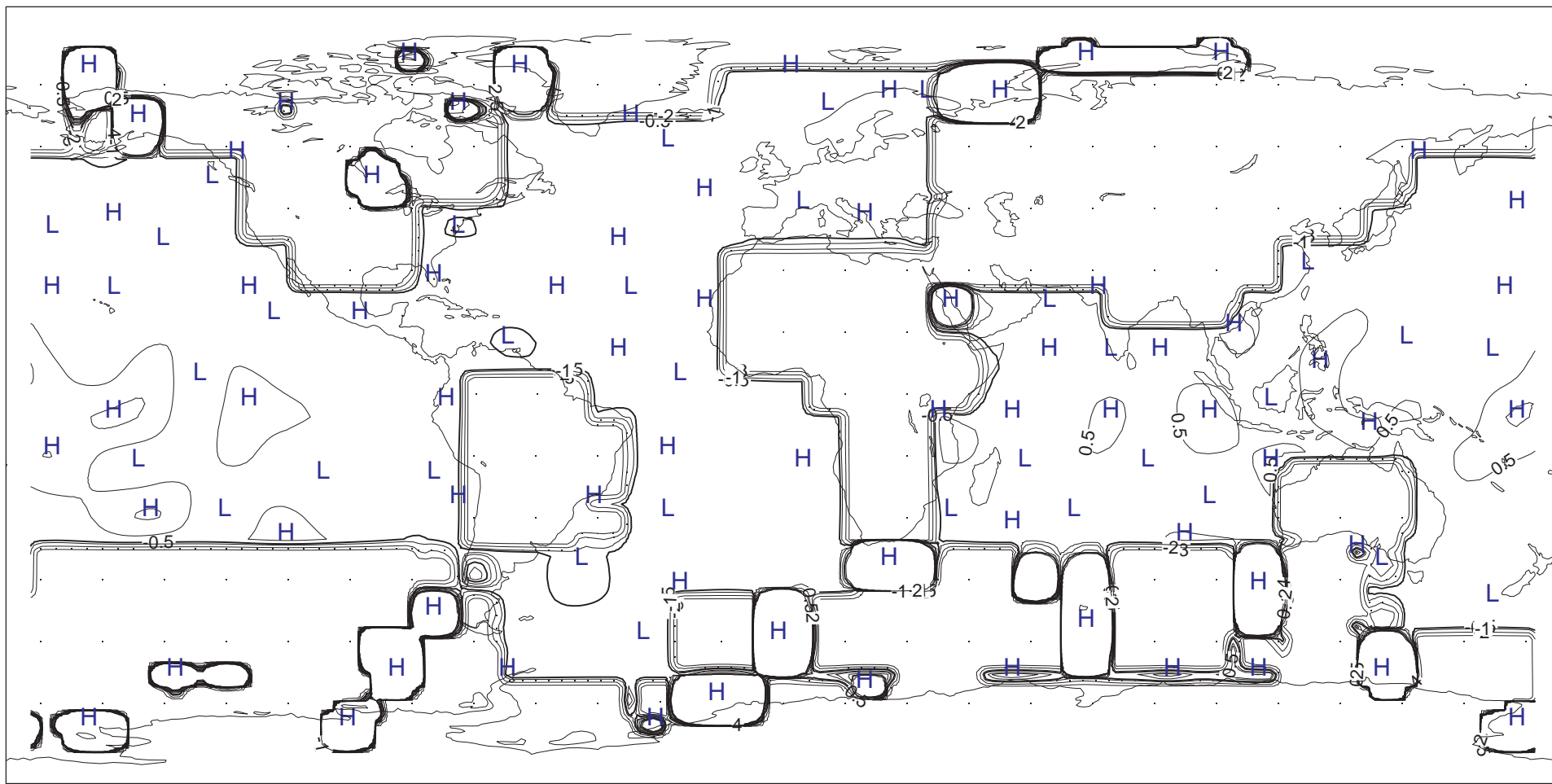


Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- January - June 2013  
Only Observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a standard deviation of greater than 2.0 hPa

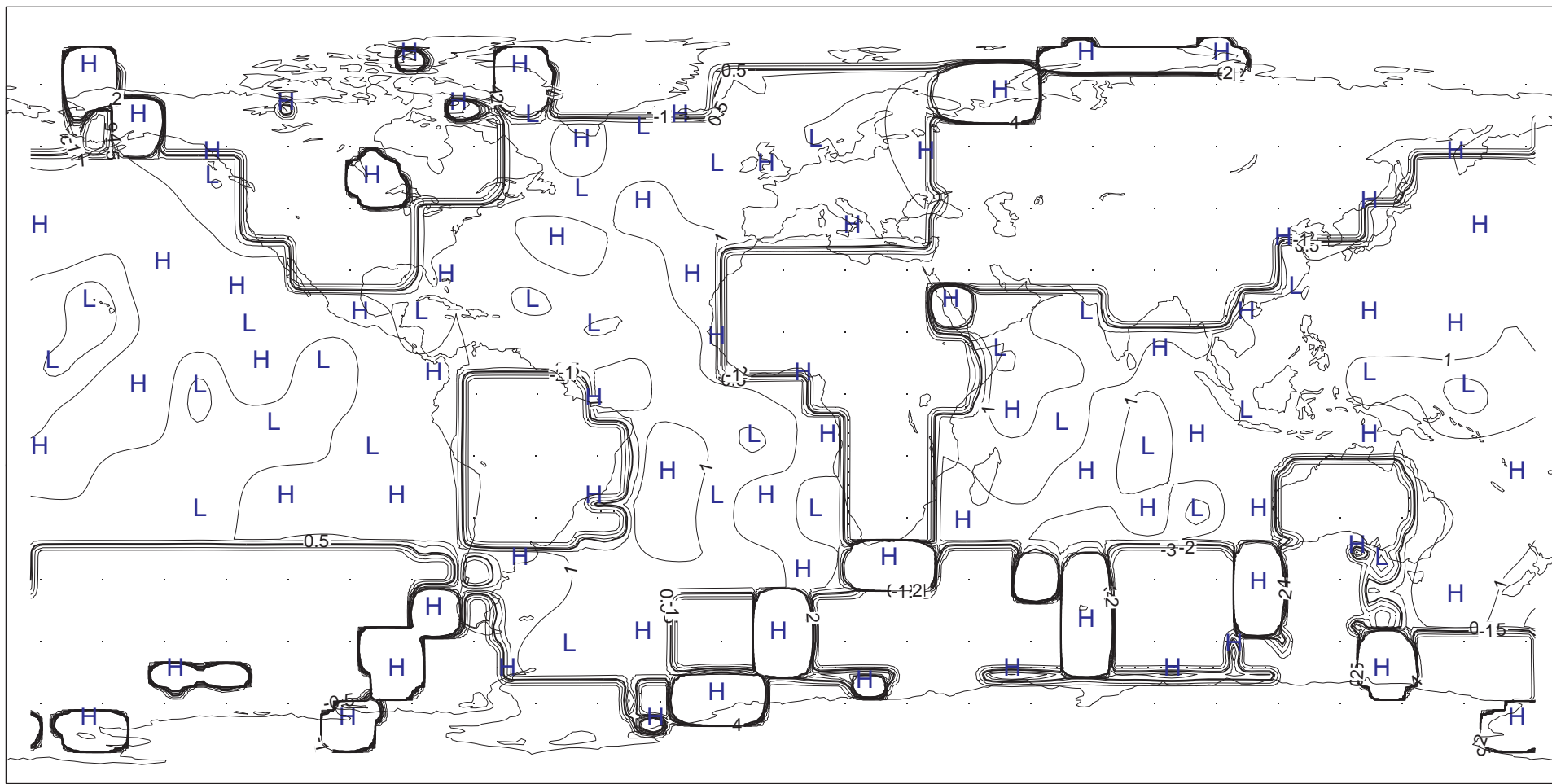






Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- January - June 2013  
Only observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a bias of magnitude greater than 2.0 ms-1

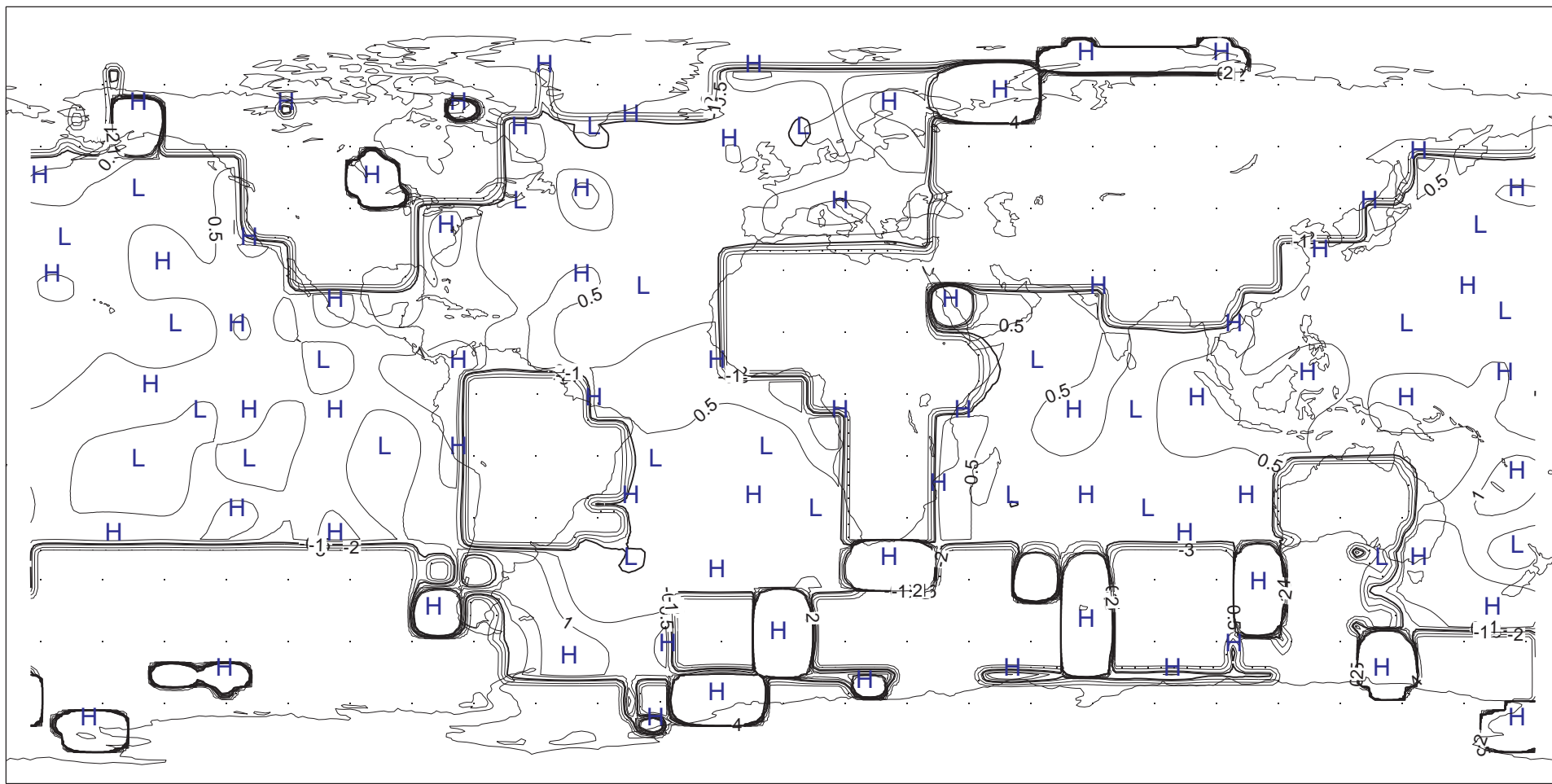


Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- January - June 2013  
Only Observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a standard deviation of greater than 4.0 ms-1

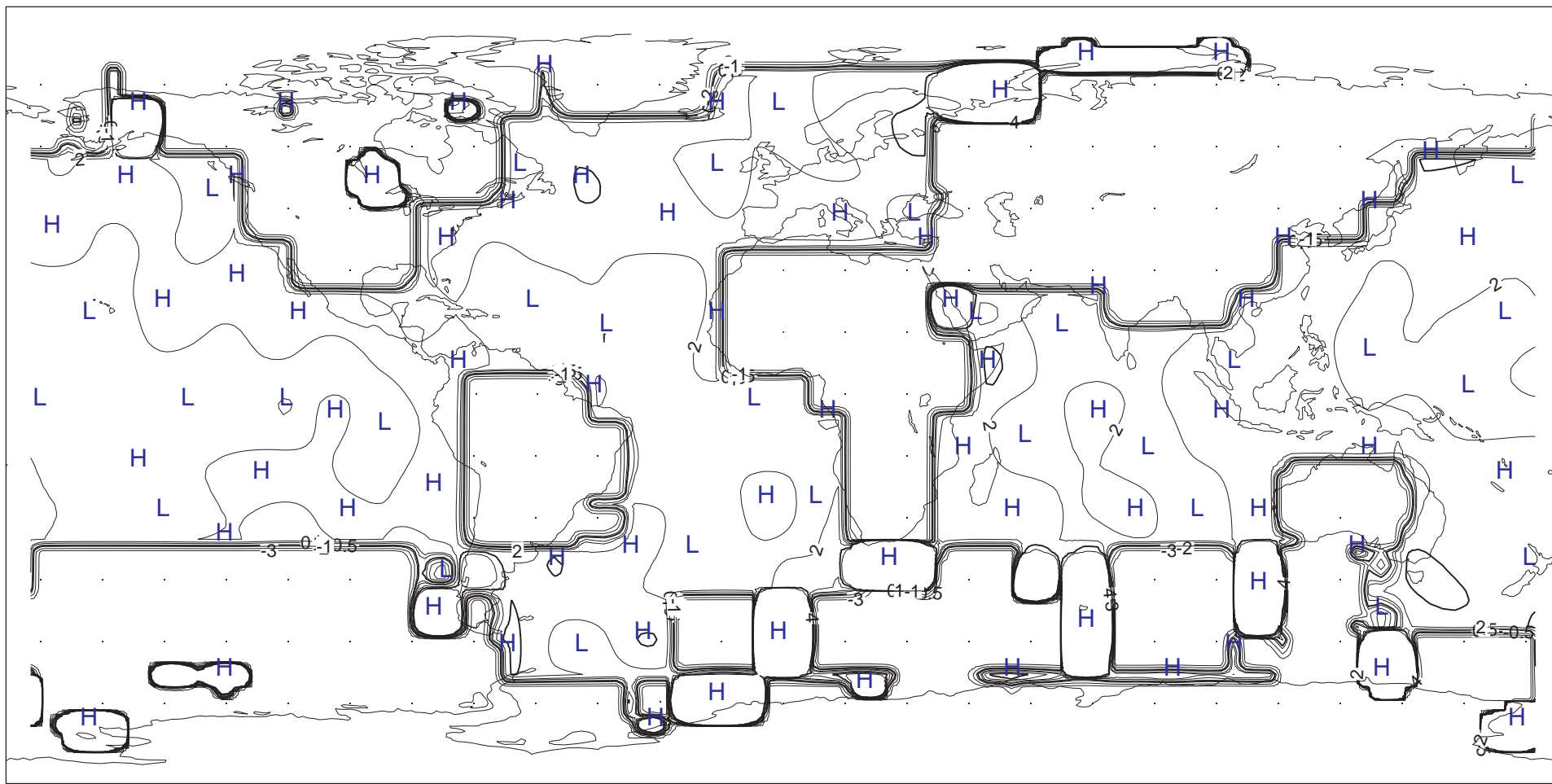


Figure 8:  
 Plot of the Number of Ship Wind Speed Observations. Date:- January - June 2013  
 Only observations passing quality control included

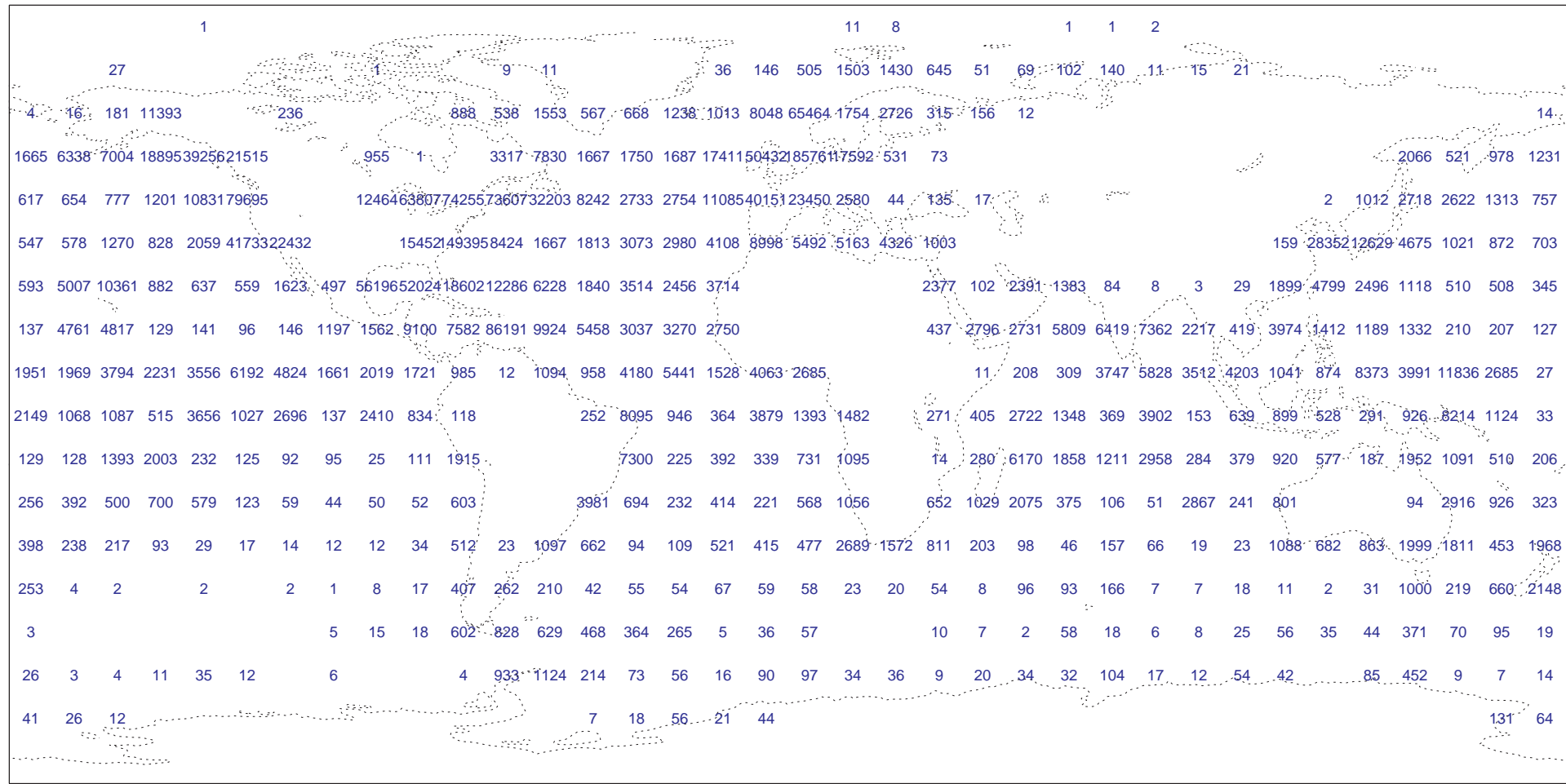






Figure 11:  
 Plot of the Number of Ship Wind Direction Observations. Date:- January - June 2013  
 Only observations passing quality control included

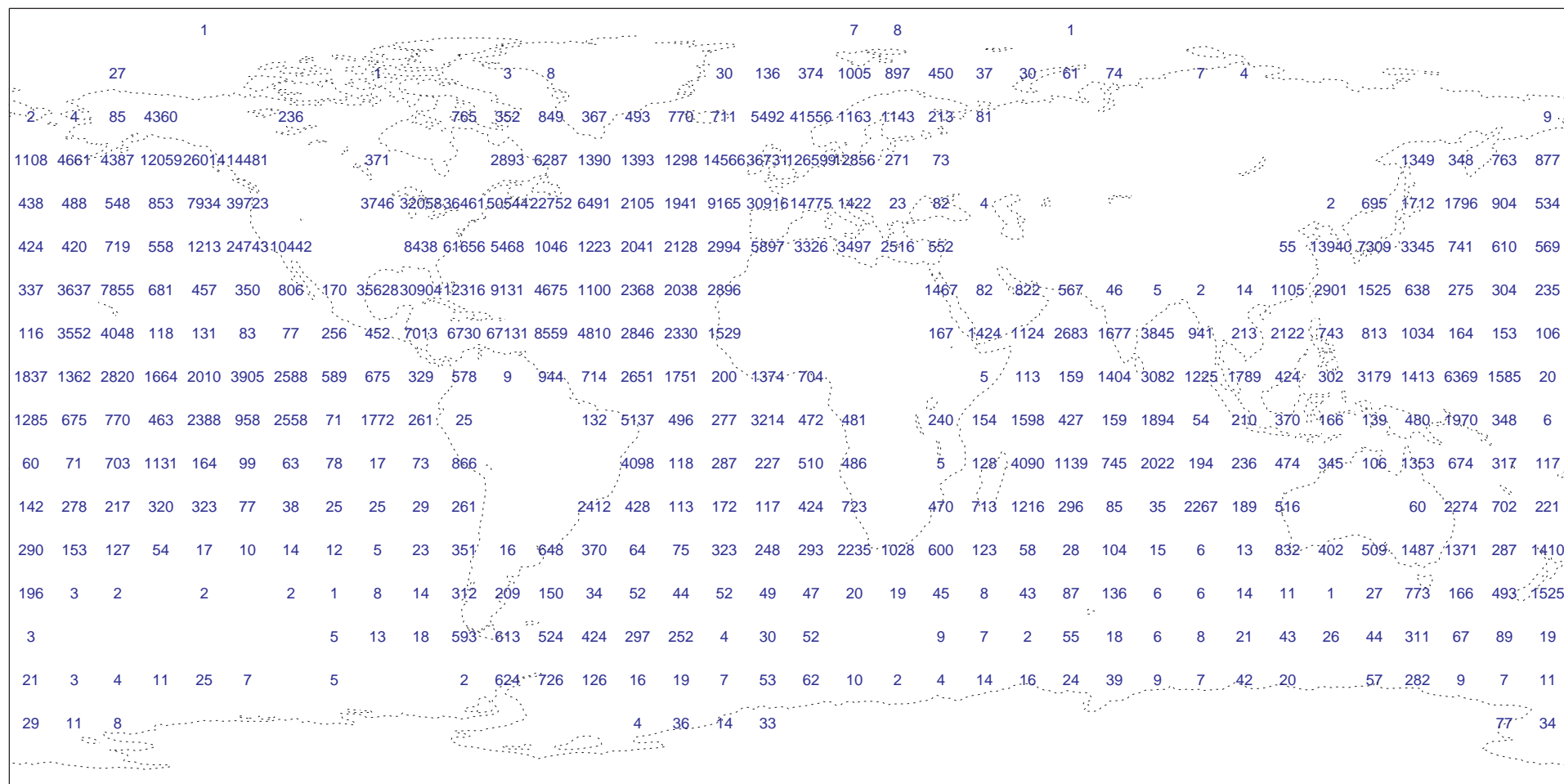


Figure 12: Bias of Ship O-B SST (degrees C). Date:- January - June 2013  
Only observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a bias of magnitude greater than 1.0 degree C

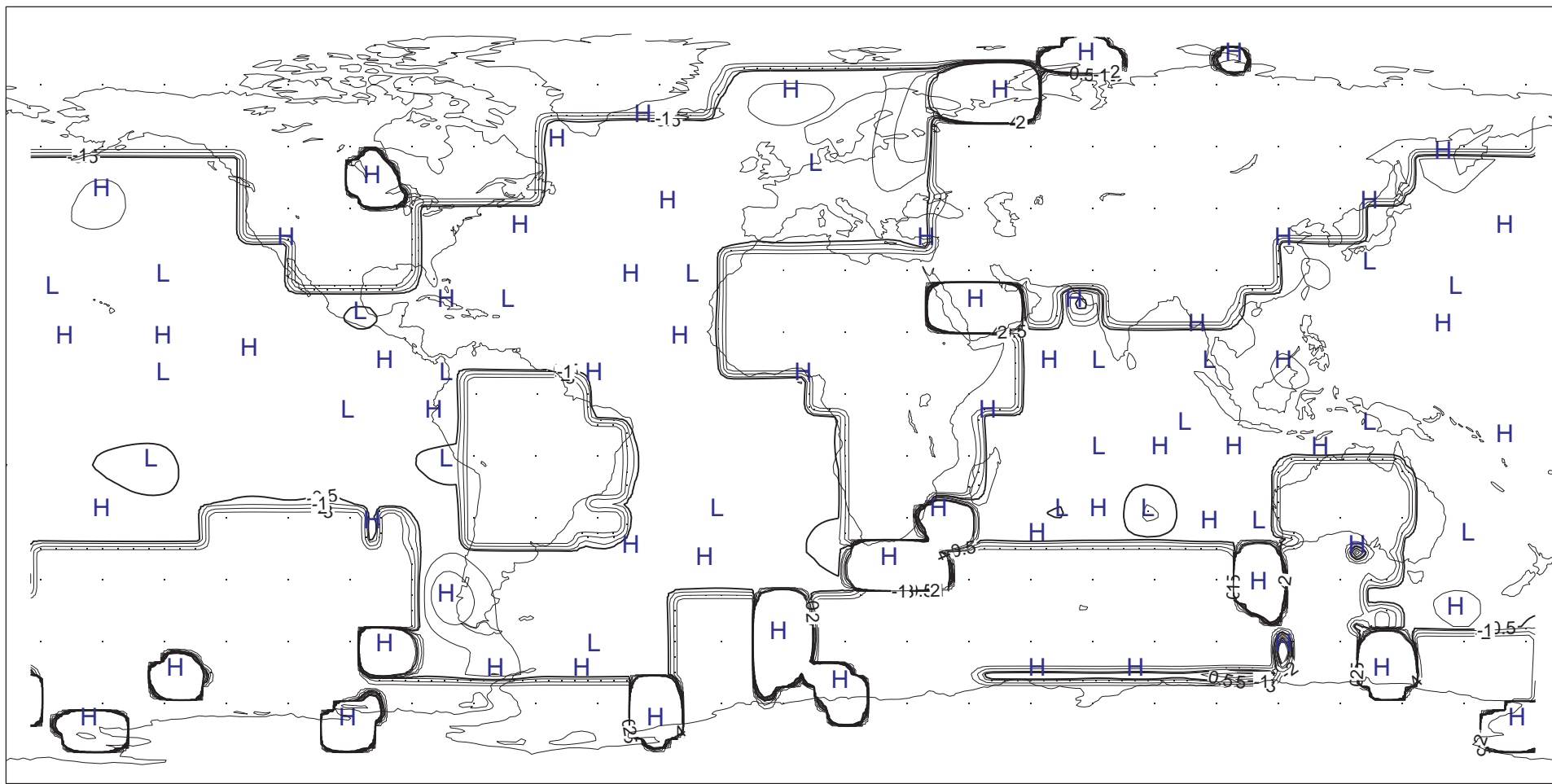




Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- January - June 2013  
Only Observations passing quality control used in statistics  
Contours drawn to 10 degree boxes, if the number of observations is greater than 10  
Shaded areas have a standard deviation of greater than 2.0 degrees C

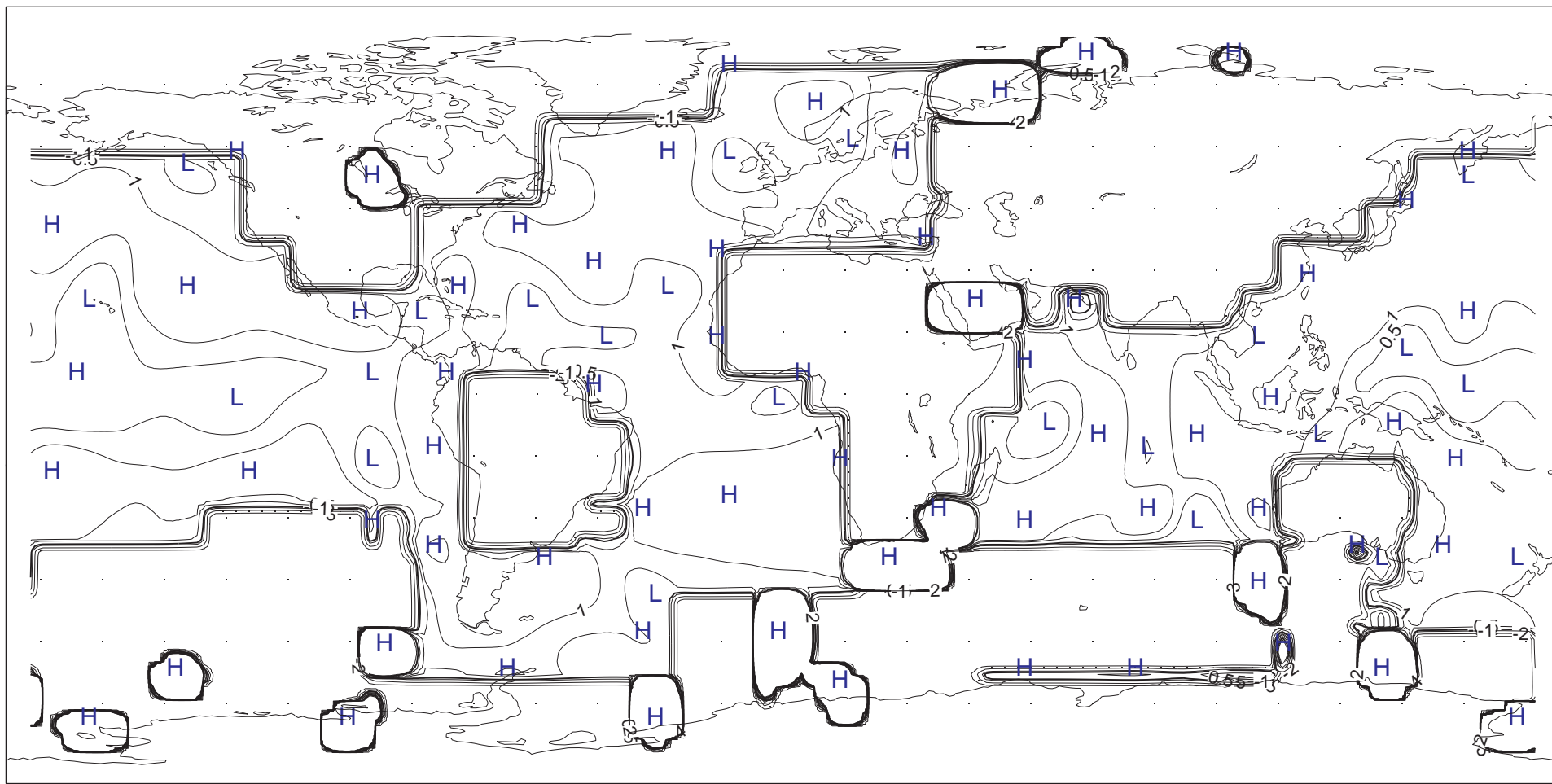


Figure 14:  
 Plot of the Number of Ship SST Observations. Date:- January - June 2013  
 Only observations passing quality control included

