

Report on the Quality of Marine Surface Observations

Report Number 45

January to June 2011

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2011

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REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JANUARY TO JUNE 2011

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 2011

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 2011

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 2011

1. INTRODUCTION

In 1985, the Commission for Basic Systems (CBS) agreed that there was a need for GDPS / Global NWP centres to monitor the quality of observations available on the GTS and to exchange monthly lists of stations providing seemingly erroneous data. In 1988 three lead centres were nominated which would have a co-ordinating role of producing, at six-monthly intervals, consolidated lists of suspect stations for given data types together with information on the nature of the error. NCEP was given responsibility for aircraft and satellite data and ECMWF, that for upper-air data. The Met Office was allocated the role as lead centre for marine surface observations which encompass observations from ships, drifting buoys, moored buoys and other fixed marine platforms. This is the forty fifth report and covers the period January to June 2011. 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 the numerical data assimilation systems in use today can provide global reference values applicable in observation monitoring. The short-term forecast from the previous numerical analysis, commonly known as the first-guess or background field, provides perhaps the most useful information on observation quality, as it represents an accurate and spatially consistent estimate of the observed value which is independent of the observation itself. Observation-minus-background (hereafter referred to as O-B) differences are at the core of all monitoring work by GDPS centres. Due to the thermal-inertia of the oceans and the slowly varying nature of SST, the background SST is in fact the previous analysis (daily analyses are produced at the Met Office from an assimilation of both surface and satellite observations).

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

Each monitoring centre produces a monthly list of the identifiers of marine observing platforms considered suspect according to their departures from the model background values. All observations are used 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 | ≥ 4.0 hPa
2. standard deviation of O-B ≥ 6.0 hPa
3. percentage of gross errors ≥ 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 ≥ 25

Criteria used for monthly monitoring

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

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

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

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

Pressure

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

SST

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

Criteria used for biannual monitoring

All observations having gross errors are excluded from the calculation of the mean and standard deviation of O-B. The same gross error limits apply in these reports as in the monthly lists. The Met Office now sets a limit of 10°C for SST but this was previously 5°C and NCEP use 15°C. Also, criteria used in early reports were based on O-A statistics. Consequently, data presented here is not directly comparable with that in older reports.

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

3. MONITORING RESULTS

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

3.1 *Pressure*

In the six-month period, January to June 2011, 4711115 observations of pressure were monitored at Exeter from 2667 manual ships, 1029 drifting buoys, and 613 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 44 shows little change in the numbers. Since most marine observations are located in the northern hemisphere, there is usually some seasonal variation in the number of vessels reporting, especially in the case of buoys, since new or replacement buoys are generally deployed in better weather conditions. Considering the general trends over previous reports, the recent slow decline in the number of manual ships reporting pressure seems to have stopped for now, with a small increase, while the number of automatic ships has increased steadily over the last two years, and the increase in the number of drifting buoys reporting pressure has levelled-out.

Table 2 and Figure 1 show the number of observations of pressure that have been received over the GTS at the Met Office and processed, over past 6-month periods. It can be seen that the total number of observations remained fairly steady with only minor fluctuations until report number 11 (January-June 1994). Since that time however, there has been a steady increase in the total up to 2008, with the number of observations of pressure nearly doubling between reports 11 and 16 (1994-1996) and doubling again between reports 33 and 38 (2005-2007). The first increase was largely due to the increase in number of drifting buoy reports, due to the larger number of reports from each drifting buoy. The second increase was due to increased numbers of both drifting buoys and automatic ships, with the number of reports from manual ships remaining fairly constant over recent years, despite the slow reduction in the number of manual ships reporting pressure. The number of reports from drifting buoys peaked in the second half of 2008, then decreased slightly, but peaked again in the second half of 2010. Reports from drifting buoys now account for 56% of the total, while those from manual ships make up just 10% of the total, and those from automatic ships account for the remaining 34%. The sudden increase seen in the number of automatic ships in report number 19 (January-June 1998) was due to observation processing changes at the Met Office, whereby all reports from 'automatic ships' began to be processed, rather than only one report per 6-hour assimilation period, as previously. Since then there has been a fairly steady increase in the total number of pressure reports from automatic ships.

A histogram of O-B differences for all ship pressure reports in the period January to June 2011 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 failed the automatic quality-control checks is broad (Figure 2b). The remaining 93.8% of the observations, that passed the quality checks, show a distribution of O-B which is very close to Gaussian (Figure 2c) with mean 0.0hPa and standard deviation 1.1hPa. The principal contribution to the standard deviation is assumed to be from background and representativeness errors.

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

Table 3 contains a list of those ships and drifting buoys considered to have produced suspect observations of pressure in the period January to June 2011. 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 some cases, the bias is constant over the whole monitoring period; although some values depart greatly from the sample mean, presumably due to some gross error in the observation, these are generally isolated instances. 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 44 (July to December 2010) have been indicated with an asterisk. A comparison of the statistics given here with those in the report number 43 (January to June 2010), 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 44 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 4 of these platforms, but the other 11 (73%) of platforms on the list have shown some improvement in the quality of their observations.

3.2 Wind

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

In these monitoring results, the background winds are nominally 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 2011, 2115490 wind observations were available for monitoring at Exeter, from 2690 manual ships, 29 drifting buoys, and 632 automatic ships. (More detail is given in Table 1.) The number of reported manual ship identifiers shows the same trends as for pressure, but with slightly more identifiers reporting wind.

Histograms of O-B differences for ship observations of wind speed are presented in Figures 2d, 2e and 2f and of wind direction in Figures 2g, 2h and 2i. As with observations of pressure, those wind observations that fail the quality-control checks differ most from the background, some by as much as 50 ms^{-1} , and they make a large contribution to the variance of O-B. The distributions of O-B wind speed and direction for the remaining 93% of the observations are nearly Gaussian, with a speed bias of 0.5 ms^{-1} relative to the background and a direction bias of just 2.3° .

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 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 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. The standard deviation is generally between 15 and 30 degrees globally, but in some data-sparse areas and near some coasts it is as large as 50 degrees. The numbers of reports of wind direction used to generate these statistics are presented in Figure 11.

Figures 6-11 provide reference values against which to compare the O-B characteristics for different marine observing platforms. Table 5 contains a list of those ships and drifting buoys considered to have produced suspect observations of wind speed in the period January to June 2011, and in Table 7 a similar list is provided for wind direction. Values are given for the number of observations of wind received at the Met Office, the number of observations having a vector difference from background of more than 25 ms^{-1} (gross errors), and the mean and standard deviation of O-B. Time-series of O-B are given at the end of the report for each listed identifier. In the majority of the cases of suspect speed observations, a constant bias is clearly evident. Errors in observations of direction are more random in nature. Tables 6 and 8 contain statistics for platforms reporting in ship code which are not included in Tables 5 and 7 but that were listed in the previous report, for wind speed and direction respectively. Time-series for these identifiers are not included in this report.

3.3 *Sea-surface temperature*

In the 6-month period January to June 2011, a total of 8102977 observations of SST were monitored at the Met Office, from 2326 manual ships, 1938 drifting buoys and 411 automatic ships. Of the total, 530133 were from manual ships, 6171747 from drifting buoys and 1401097 from automatic ships. (More detail is given in Table 1.) For the same reasons as stated for pressure observations, it appears that many identifiers report only once during the 6-month period. There has been little change in the numbers of ships and drifters reporting SST over the last 4 years. There are similar numbers of manual ships reporting SST as there are drifting buoys and automatic ships combined, but manual ships account for only 6.5% of the total number of observations. This is due to the greater frequency of automatic ship and buoy observations, hourly in many cases, with manual ships tending to report only at the main synoptic hours.

Histograms of O-B differences for all ship SST reports are shown in Figures 2j, 2k and 2l. As with observations of pressure and wind, those SST observations that fail the quality-control checks differ most from background and make a large contribution to the variance of O-B. The distribution of O-B SST for the remaining 86.4% of the observations is nearly Gaussian and they have a bias of 0.1°C relative to the background and standard deviation of 1.2°C .

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

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

4. SUMMARY

There are 69 marine observing platforms listed as producing suspect observations of pressure over the period January to June 2011, 65 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, and from 2009 there has been a slight downward trend, with numbers between 50 and 100 over the last two years. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to be little overall trend in observation quality, as measured by the percentage of suspect platforms.

For wind observations, over the years up to 2002 there was a tendency for a small increase in the number of wind observing platforms listed as suspect, then the numbers fluctuated between about 100 and 150 until 2008 and since then the numbers have averaged about 80, but there has been a small decrease in suspect winds over the last year.

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 several months, although many of the suspect buoys had gross errors. 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, although again many of the suspect buoys had gross errors.

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 2011.

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	290	298	213	6	4	1	27	32	2
2-10	312	319	308	10	1	9	27	28	9
11-20	176	179	159	3	0	5	6	11	2
21-40	223	222	207	5	1	11	18	15	10
41-100	543	546	484	13	1	19	13	14	7
101-200	569	579	448	19	0	29	14	14	5
201-500	408	404	322	83	4	136	32	30	17
501-1000	74	72	58	93	3	166	58	55	27
1001-1500	24	22	38	79	2	148	54	56	20
1500+	48	49	89	718	13	1414	364	377	312
Total	2667	2690	2326	1029	29	1938	613	632	411
(Report 44)	(2716)	(2732)	(2299)	(1043)	(37)	(2040)	(551)	(576)	(372)

* numbers are for automatic (fixed) buoys only

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

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

TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2011.

Column	1	Call sign or identifier.
Column	2	Number of pressure observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column	3	Number of pressure observations differing by more than 15 hPa from background (gross error).
Column	4	Standard deviation of observation-minus-background differences excluding cases of gross error.
Column	5	Mean of observation-minus-background differences (bias) excluding cases of gross error.
Columns	6-10	Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
Column	11	Comments on quality of pressure observations.
<i>Notes:</i>	1.	Units are hPa.
	2.	Observing platforms marked with an asterisk were listed in the previous report (July to December 2010)

Table 3a: Platforms reporting in BUOY code

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
16555	2995	111	5.2	-0.8	3	2	2	3	2	SD
17690	863	37	7.4	-0.5	2	2	2	2	2	SD
21542	468	440	2.4	10.5	1	1	1	1	1	Bias
21709	136	4	5.4	8.1	1	1	1	2	0	Bias
21915	226	54	3.1	9.6	1	1	1	1	1	Bias
23674	969	247	0.6	-0.8	2	2	2	2	2	GE
32730	247	247	---	---	1	1	1	0	1	GE
33589	81	69	1.0	13.2	1	1	1	1	1	Bias
33592	2582	282	5.2	1.4	2	2	2	2	2	SD
33699	996	368	0.3	0.3	1	1	1	0	1	GE
46707	256	5	4.5	4.6	2	2	2	2	2	Bias
47555	1701	0	0.6	-8.7	2	0	0	2	2	Bias
48515	78	2	5.9	-1.3	0	1	0	0	1	SD
48657	969	551	8.5	0.4	2	2	2	2	2	SD + GE
48699	132	86	0.2	14.6	1	1	1	1	1	Bias
48713	940	679	8.4	5.0	2	2	2	2	2	SD + GE
54952	252	252	---	---	1	1	1	0	1	GE
55588	1423	81	6.0	-2.3	1	1	0	0	0	SD
55610	1605	680	0.3	0.2	2	2	2	1	2	GE
62538	186	22	2.1	9.9	1	0	1	1	1	Bias
62563	45	34	4.2	-11.9	1	1	1	0	1	Bias + GE
62714	257	55	5.9	-2.2	0	0	0	1	0	SD
63593	123	84	3.7	10.9	1	1	1	1	1	Bias + GE
66861	554	554	---	---	1	1	0	0	1	GE
66864	559	559	---	---	1	1	0	0	1	GE
71627	3963	674	6.7	-1.0	4	4	3	4	4	SD + GE
71640	901	49	6.8	0.5	2	2	1	2	2	SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
17667	2071	0	5.8	0.5	3	3	2	3	3	SD
23598	2600	806	5.1	-0.4	2	3	3	4	2	Bias + SD
33586	3748	258	5.3	-0.5	3	3	3	3	3	SD
48536	7783	2298	7.1	-0.5	6	4	5	6	6	SD + GE
71572	4042	1126	5.7	-0.6	4	4	4	4	4	GE + SD

Table 3b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
3FRY8	44	6	5.2	-0.9	1	1	0	0	1	SD
45023	818	806	1.6	12.8	1	1	1	0	1	Bias + GE
9MEU4	126	0	4.9	-4.3	2	2	2	0	1	Bias
9V7960	52	3	5.3	1.8	0	0	0	0	0	SD
A8PC7	69	0	6.3	-3.7	0	0	0	0	0	Bias + SD
A8SI4	61	0	3.6	7.2	1	1	1	0	1	Bias
A8UA9	110	0	1.7	3.5	2	2	2	0	2	Bias
A8VL5	75	0	1.6	7.9	2	1	2	0	2	Bias
A8VN7	202	1	3.9	-3.3	5	5	5	0	6	Bias
AUFH	53	2	3.2	3.5	1	1	0	0	1	Bias
AUYN	76	2	5.9	1.7	0	0	0	0	1	SD
C6FM8	79	0	2.4	-4.9	2	0	1	0	1	Bias
CFN4309	43	13	4.4	1.2	0	0	0	0	0	GE
CG2350 *	883	0	6.1	-6.2	4	3	3	0	4	Bias
CG2522 *	434	385	2.1	-1.3	1	1	1	0	1	Bias
CGDS *	2384	511	8.1	-2.9	6	6	6	0	6	Bias + SD
CYGR *	48	23	5.7	-7.7	2	0	1	0	2	Bias
CZ9742	368	199	0.8	0.8	2	0	2	0	2	Bias + GE
KS089	76	62	8.7	-1.0	1	1	1	0	1	SD
NWS0010	1419	51	4.6	-7.7	3	3	3	0	3	Bias
NWS0017	53	0	0.7	-5.7	1	0	0	0	0	Bias
ONFN	43	0	6.0	-4.4	1	0	1	0	1	Bias + SD
OUJN2	120	3	3.0	3.7	1	2	2	0	2	Bias
UAST	72	3	5.0	-3.1	2	2	2	0	2	SD
UCUF	209	40	8.0	-3.9	3	3	3	0	3	Bias
UFJN	54	18	3.5	-4.9	1	1	1	0	1	Bias
UITR *	66	3	3.5	-4.3	1	2	2	0	2	Bias
VDFP *	72	17	5.5	6.6	2	0	2	1	2	Bias + SD
VDRV *	79	21	6.3	-5.9	2	0	1	0	2	Bias + SD
VYNG	97	46	3.5	-9.7	1	1	1	0	1	Bias
WCX744: *	3687	557	6.1	-2.0	3	3	3	0	3	SD
WDC664 *	124	1	4.0	-6.9	3	2	3	0	3	Bias
WDF2728	74	0	3.5	5.1	1	0	1	0	1	Bias
WDF7994	47	5	6.2	-2.8	1	0	1	0	1	SD
WQZ779 *	81	24	8.0	-4.3	2	1	0	0	2	SD
WXQ451 *	85	15	4.1	-4.0	1	0	1	0	1	Bias
WYT856: *	119	0	5.5	-1.2	1	1	1	0	1	SD

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

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

Notes: 1. Units are hPa

Identifier	N Obs.	NGE	SD	Bias	Comments
3ENU5	50	0	2.6	1.6	Reduced bias
62165	3657	157	0.7	0.5	Reduced GE
C6FY8	335	0	1.8	1.2	Reduced SD
CG2992	615	0	0.7	0.9	Reduced bias
PHMH	27	0	0.6	-0.7	Less than 40 reports
TUSER1	1	0	0.0	-2.3	Less than 40 reports
UASQ	60	0	2.7	-1.2	Reduced SD
UBHE9	102	0	2.9	0.8	Reduced bias
UIDO	42	1	1.6	0.1	Fewer GE
VRCB4	58	0	2.3	0.7	Reduced SD
WAV4647	14	1	1.7	-0.2	Less than 40 reports
WBN3014	67	0	1.4	-1.6	Reduced SD
WCF3012	108	4	1.9	-0.8	Reduced SD
WUW2120	57	2	3.9	-0.2	Reduced SD
WXS6134	12	0	2.6	-7.8	Less than 40 reports

TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2011.

Column 1	Call sign or identifier.
Column 2	Number of wind speed observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column 3	Number of wind observations with vector difference from background of more than 25ms^{-1} (gross error).
Column 4	Standard deviation of observation-minus-background differences excluding cases of gross error.
Column 5	Mean of observation-minus-background differences (bias) excluding cases of gross error.
Column 6-10	Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
Column 11	Comments on quality of wind speed observations.

Notes:

1. Units are ms^{-1}
2. Observing platforms marked with an asterisk were listed in the previous report (July to December 2010)

Table 5a: Platforms reporting in BUOY code

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
21525	337	296	8.9	12.7	1	1	1	0	1	Bias + SD
21991	2505	2242	6.2	15.3	3	3	3	0	3	Bias + SD
44755	385	0	4.4	-6.5	1	1	1	1	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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Table 5b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
31375	1978	0	3.5	-7.6	4	4	3	4	4	Bias
9VVN	* 64	2	7.3	6.3	0	0	0	0	0	SD + Bias
A8H18	68	1	4.7	5.1	1	0	2	0	2	Bias
A8KO3	85	1	6.1	9.9	3	2	2	0	2	Bias + SD
UCUD	42	1	2.1	-5.0	1	1	1	0	0	Bias

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

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

Notes: 1. Units are ms^{-1}

Identifier	N Obs.	NGE	SD	Bias	Comments
46181	4260	0	3.2	3.8	Reduced bias
62152	1566	0	1.6	-1.4	Reduced bias
DDFD2	105	0	2.5	2.2	Reduced bias
HPYK	73	7	5.5	5.8	Reduced bias after January
WXS6134	12	0	4.0	-0.1	Less than 40 reports

TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2011 .

Column 1	Call sign or identifier.
Column 2	Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column 3	Number of wind observations with vector difference from background of more than 25ms^{-1} (gross error).
Column 4	Standard deviation of observation-minus-background differences excluding cases of gross error.
Column 5	Mean of observation-minus-background differences (bias) excluding cases of gross error.
Column 6-10	Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.
Column 11	Comments on quality of wind direction observations.

- Notes:*
1. Units are degrees ($^{\circ}$).
 2. Observing platforms marked § had a significant speed bias at some time within the period and the statistics and their plots refer to direction reports associated with background wind speeds greater than 5ms^{-1} . If no significant speed bias was present, the statistics and plots refer to direction reports with an observed speed greater than 5ms^{-1} .
 3. Observing platforms marked with an asterisk were listed in the previous report (July to December 2010)

Table 7a: Platforms reporting in BUOY code

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
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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
48631	593	23	135.1	57.8	3	0	0	0	3	Bias + SD

Table 7b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
13001	109	0	102.9	25.3	1	0	1	1	1	SD
21210	1947	60	85.0	-9.6	4	0	5	3	2	SD
2AKI4	§ 82	2	87.2	14.7	1	1	1	0	2	SD
3EBL5	159	1	69.1	-15.9	0	0	0	0	0	SD
3EUS	* 161	0	56.3	1.0	0	0	0	0	0	SD
42058	940	0	44.9	-31.7	0	0	0	0	0	Bias
45023	820	0	56.0	-52.6	1	0	1	0	1	Bias
46081	* 4088	0	40.2	-34.2	0	0	0	0	6	Bias
52086	2406	0	73.0	-39.6	4	5	5	4	5	Bias + SD
53057	2274	1	155.0	7.2	5	2	5	5	6	SD
9V8988	76	0	64.9	-3.5	0	0	0	0	0	SD
A8FA5	67	0	63.7	-13.1	0	0	0	0	0	SD
A8GU7	* 217	0	57.8	-10.7	0	0	0	0	2	SD
A8HI8	§ 68	1	78.7	-32.4	1	0	1	0	1	SD
A8IS7	156	0	65.1	-22.9	0	0	0	0	1	SD
A8ME3	* 171	1	64.5	-5.7	0	0	0	0	1	SD
A8NQ7	* 169	0	58.0	-27.0	0	0	0	0	0	SD
A8QJ7	* 193	3	60.3	1.0	0	1	1	0	2	SD
AGRF	98	0	71.9	12.1	0	0	0	0	1	SD
AUYL	102	0	67.3	11.7	0	0	0	0	1	SD
CBGR	209	0	54.4	-39.1	0	0	0	0	1	Bias
CZ3695	604	0	85.4	-68.9	1	1	0	0	1	Bias
DDJG2	107	0	65.8	3.1	0	0	0	0	0	SD
DYLD	80	0	64.9	-31.7	0	0	0	0	0	SD
ELWZ5	92	0	67.1	-4.0	0	0	0	0	0	SD
H9UY	*§ 303	11	77.8	6.3	2	4	3	0	4	SD
J8AZ2	86	0	50.5	-41.1	0	0	0	0	0	Bias
J8NW	* 236	0	119.1	-31.7	2	3	5	0	6	SD + bias
J8NY	202	0	71.5	-22.8	0	0	0	0	1	SD + bias
KS049	* 109	0	90.6	5.5	1	2	2	0	2	SD
KS073	* 228	0	80.2	20.1	0	0	0	0	1	SD
KS078	* 406	13	105.5	-31.5	4	1	4	0	4	SD + bias
LAJV4	516	8	74.3	72.6	1	1	1	0	1	Bias + SD
MCLJ8	63	0	71.9	-6.8	0	0	0	0	1	SD
ONAN	95	0	79.7	10.0	0	0	0	0	1	SD
PCUI	67	0	67.0	-40.9	0	0	0	0	1	Bias + SD
TBWUK1	§ 219	4	84.1	-0.4	2	2	2	0	3	SD
UBLH	70	0	75.7	-2.7	0	0	0	0	0	SD
UERK	79	0	62.0	13.1	0	0	0	0	0	SD
UGPK	107	1	64.1	2.6	0	0	0	0	2	SD
Continued>										

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
V2BE4	183	4	92.3	-14.5	1	4	4	0	4	SD
V2BF1	167	3	91.8	-23.5	1	1	4	0	4	SD
V7EM3	227	0	65.3	-10.9	0	0	0	0	3	SD
V7OX3	137	0	69.3	15.7	0	0	1	0	2	SD
V7QX2	181	0	78.3	-10.1	0	0	1	0	3	SD
VQBW2	144	3	63.5	-19.9	0	1	0	0	0	SD
VRCV5	93	0	69.9	-12.7	0	0	0	0	0	SD
VRDC6	117	0	57.8	-42.3	0	0	0	0	1	Bias
VRDO9	65	0	81.8	-25.4	0	0	1	0	2	SD
VRZQ9	72	0	89.0	-1.2	1	0	1	0	2	SD
WBN3013	78	0	65.6	-40.0	0	0	0	0	0	SD + bias
WBP321(*	3599	54	83.2	8.7	3	3	4	0	5	SD
WCX744: *§	3681	80	100.6	21.4	3	4	4	0	6	SD
WCX9106	676	0	50.7	-35.1	0	1	1	0	4	Bias
WDA335: *	108	0	61.4	-18.8	0	0	0	0	3	SD
ZCDY2	1532	26	101.7	28.5	6	5	6	0	6	SD
ZMENA	1068	18	63.9	5.3	0	1	0	0	2	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 2010.

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

Identifier	N Obs.	NGE	SD	Bias	Comments
3FPH8	6	0	49.8	38.8	Less than 40 reports
45145	376	0	29.4	1.7	Reduced bias
51023	2259	0	44.1	-23.5	Reduced bias
9HOB8	307	0	42.3	-10.7	Reduced SD
A8IN9	227	1	53.1	-13.8	Reduced SD
A8IP2	239	2	61.6	-13.6	SD
A8IV9	67	0	63.1	3.2	Reduced SD
A8PQ8	322	0	42.6	9.7	Reduced SD
BATFR32	850	0	41.5	0.9	Reduced SD
C6KD8	174	0	70.4	7.1	Reduced SD
C6XE5	37	0	51.4	-15.8	Less than 40 reports
DDFD2	105	0	37.9	13.0	Reduced SD
DDSB2	455	7	46.4	7.4	Reduced SD
DPCK	137	0	46.2	-9.7	Reduced SD
ELEI6	150	1	52.4	-0.6	Reduced SD + bias
KF001	69	0	52.3	-29.6	Reduced bias
MGRX2	265	0	44.5	-24.7	Reduced SD
PHEB	28	2	53.4	20.0	Less than 40 reports
SJEI	38	0	12.9	-11.7	Less than 40 reports
TBWUK37	410	1	36.9	-1.8	Reduced SD
UBAW	138	0	47.4	-8.6	Reduced SD
UDYN	113	0	48.6	-1.1	Reduced Bias
V7DW6	26	0	58.4	-0.6	Less than 40 reports
V7HP6	84	0	44.4	-16.6	Reduced bias + SD
VC6750	291	0	77.5	64.9	Bias + SD
VRDR8	316	0	57.5	-1.0	Reduced SD
VREQ5	20	0	46.3	-29.5	Less than 40 reports
VRGA6	36	0	63.8	-22.4	Less than 40 reports
VRZL3	50	0	35.1	17.4	Reduced SD
WTER	3189	0	36.8	-11.8	Reduced SD
ZDLP	409	0	36.7	6.6	Reduced SD

TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JANUARY TO JUNE 2011.

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 2010)

Table 9a: Platforms reporting in BUOY code

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
13615	1053	0	0.9	-3.5	1	-	1	-	0	Bias
13898	2402	861	0.2	0.1	1	-	1	-	1	GE
16570	70	69	0.0	4.6	1	-	0	-	1	Bias
16592	2199	0	1.8	3.4	3	-	1	-	2	Bias drift
16955	350	109	0.9	-0.6	1	-	1	-	1	GE
21514	90	0	0.6	4.5	1	-	1	-	1	Bias
21520	956	12	3.4	2.8	4	-	1	-	4	Bias
21703	393	0	1.3	4.1	1	-	0	-	1	Bias
22691	158	41	4.8	-2.0	2	-	0	-	2	GE
23660	904	1	3.0	3.0	1	-	0	-	2	Bias
31992	99	0	0.1	9.1	1	-	0	-	1	Bias
32736	353	353	---	---	1	-	0	-	1	GE
41614	122	122	---	---	1	-	0	-	1	Bias + GE
43558	3259	1077	3.7	1.5	3	-	2	-	2	GE
44643	441	295	0.8	0.0	1	-	0	-	1	GE
46606	105	88	2.4	1.5	1	-	1	-	1	GE + bias
48713	938	938	---	---	2	-	2	-	2	GE
52616	120	4	0.6	7.9	1	-	0	-	1	Bias
54922	102	102	---	---	1	-	0	-	1	GE
55970	425	164	0.4	0.1	1	-	0	-	1	GE
56907	101	101	---	---	1	-	0	-	1	GE
63507	2226	0	3.8	-4.2	3	-	0	-	0	Bias
63508	293	191	2.6	3.5	2	-	0	-	2	Bias + GE

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
21528	13505	11387	0.4	-0.4	6	-	6	-	6	GE
21732	1827	312	3.1	4.2	4	-	5	-	4	Bias
53590	955	440	5.3	1.8	3	-	2	-	2	GE + SD

Table9b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
2ALD3	140	0	2.1	3.5	3	-	3	-	3	Bias
44041	* 4080	0	2.0	1.9	3	-	0	-	0	Bias
44057	258	0	0.6	3.7	1	-	0	-	1	Bias
44140	4063	0	1.7	4.8	5	-	5	-	1	Bias
9V8072	58	19	4.1	-6.4	2	-	0	-	0	Bias + GE
9V8798	111	0	1.9	3.7	1	-	1	-	0	Bias
A8CS2	44	1	2.2	-4.6	0	-	0	-	0	Bias
A8IV4	52	13	2.5	-4.4	0	-	0	-	0	Bias + GE
A8IX8	44	0	1.0	-3.1	1	-	1	-	0	Bias
A8KI5	120	2	2.4	-3.8	1	-	1	-	1	Bias
A8KW3	99	0	1.3	3.4	1	-	1	-	0	Bias
A8MW8	* 53	0	0.6	3.6	1	-	1	-	0	Bias
A8WC8	* 142	6	1.0	-7.2	2	-	1	-	1	Bias
CGDR	* 927	2	1.6	3.6	6	-	6	-	6	Bias
DGTX	* 261	0	1.4	3.1	4	-	3	-	1	Bias
DIBZ	169	1	1.2	-3.8	4	-	4	-	1	Bias
ELWZ5	83	0	1.6	3.4	2	-	1	-	1	Bias
IBNY	69	3	2.1	-4.4	2	-	1	-	1	Bias
J8AZ3	183	0	1.5	-4.9	5	-	5	-	3	Bias
J8NW	234	1	2.7	-0.1	1	-	1	-	0	Bias
KRPP	73	2	2.3	-3.5	1	-	0	-	0	Bias
KS077	2462	2149	6.7	3.2	5	-	5	-	5	Bias + GE
KS091	* 1016	118	0.7	-8.5	3	-	3	-	3	Bias
LEQZ3	89	4	3.9	4.0	2	-	0	-	1	Bias
MGSG6	125	18	4.0	3.4	3	-	2	-	1	Bias
PCKU	114	1	1.9	-3.8	2	-	2	-	2	Bias
PDIB	42	15	2.0	7.0	1	-	0	-	0	Bias
SBPT	67	0	0.7	5.1	1	-	0	-	0	Bias
TBWUK11	224	70	3.4	-0.4	2	-	1	-	2	GE
UCDN	108	0	1.5	3.6	3	-	1	-	3	Bias
UCJX	82	0	1.4	-4.4	2	-	2	-	2	Bias
UDDD	96	2	2.5	-3.3	1	-	1	-	1	Bias
UFLC	212	0	2.1	3.9	5	-	5	-	4	Bias
VRCV5	73	1	4.5	-3.4	1	-	1	-	0	Bias
VREX8	44	1	2.3	-3.4	1	-	1	-	0	Bias
WSLH	145	1	2.0	-3.0	3	-	1	-	0	Bias
ZDGR8	83	4	3.7	4.6	2	-	1	-	2	Bias
ZDJT6	127	0	3.4	-3.8	1	-	1	-	1	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 2010.

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

Notes: 1. Units are °C

Identifier	N Obs.	NGE	SD	Bias	Comments
41036	8228	0	2.5	-2.3	Reduced bias
41112	6905	10	3.7	-2.5	Reduced bias
62086	3695	79	3.0	0.9	Reduced SD
9V7955	52	1	3.6	-2.0	Reduced bias
A8RV6	40	0	2.3	2.6	Reduced bias
A8SC4	24	0	0.6	-3.1	Less than 40 reports
BATFR52	2494	0	0.4	-0.2	Reduced bias
C6FM9	127	0	2.2	-1.2	Reduced bias
C6FZ8	25	0	0.5	-2.0	Less than 40 reports
DCCR2	120	0	1.6	1.2	Reduced bias
DHQS	58	0	1.0	-1.7	Reduced bias
DHZQ	28	0	0.9	-0.4	Less than 40 reports
IBCF	73	0	0.8	-0.1	Reduced bias
ICRA	14	2	3.6	-5.5	Less than 40 reports
KS088	1746	973	2.0	-0.1	Bias removed in May
LAZV5	77	0	2.4	-1.0	Reduced bias
ONFN	45	0	1.4	-1.1	Reduced bias
PDWZ	24	0	0.8	-0.4	Less than 40 reports
SIWN	289	0	1.1	1.9	Reduced bias
SYMK	3	1	1.2	1.0	Less than 40 reports
TBWUK02	39	0	1.2	-3.0	Less than 40 reports
VRCL9	34	0	3.2	-0.6	Less than 40 reports
VRDR8	204	0	3.0	-2.7	Reduced bias
VRXK4	70	1	2.2	-1.4	Reduced bias
WCX7445	3153	0	3.4	0.7	Bias removed on 10 June
WDC7379	2	0	0.4	-7.3	Less than 40 reports

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

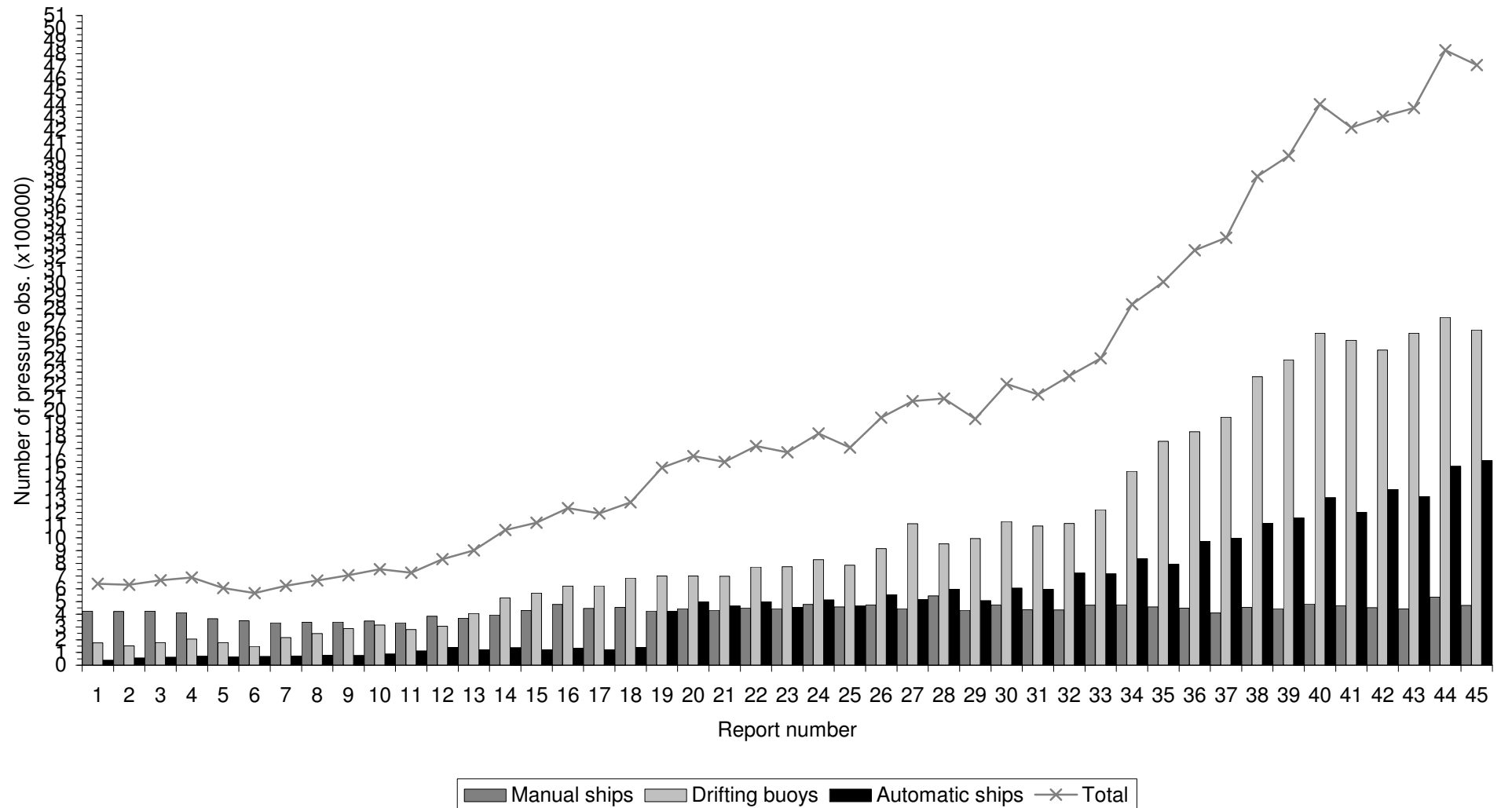


Figure 2a: Distribution of ship O-B pressure (hPa)
Period of data: JAN-JUN 2011 Data used: All observations

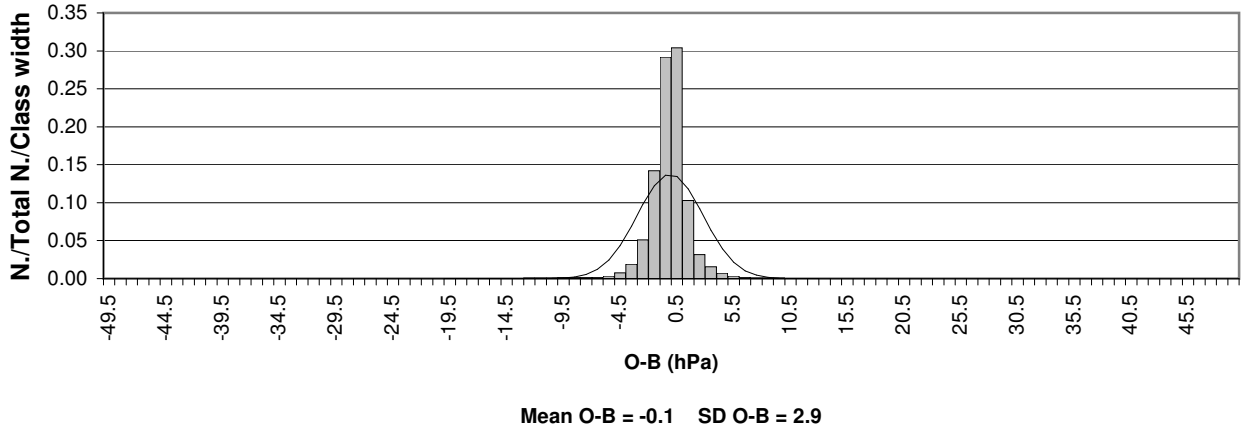


Figure 2b: Distribution of ship O-B pressure (hPa)
Period of data: JAN-JUN 2011 Data used: Flagged observations

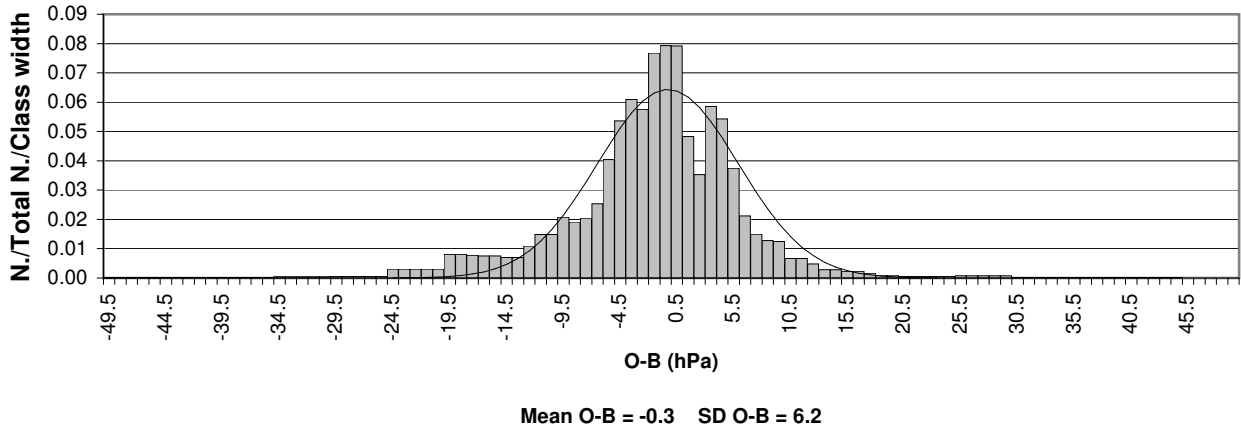


Figure 2c: Distribution of ship O-B pressure (hPa)
Period of data: JAN-JUN 2011 Data used: Unflagged observations

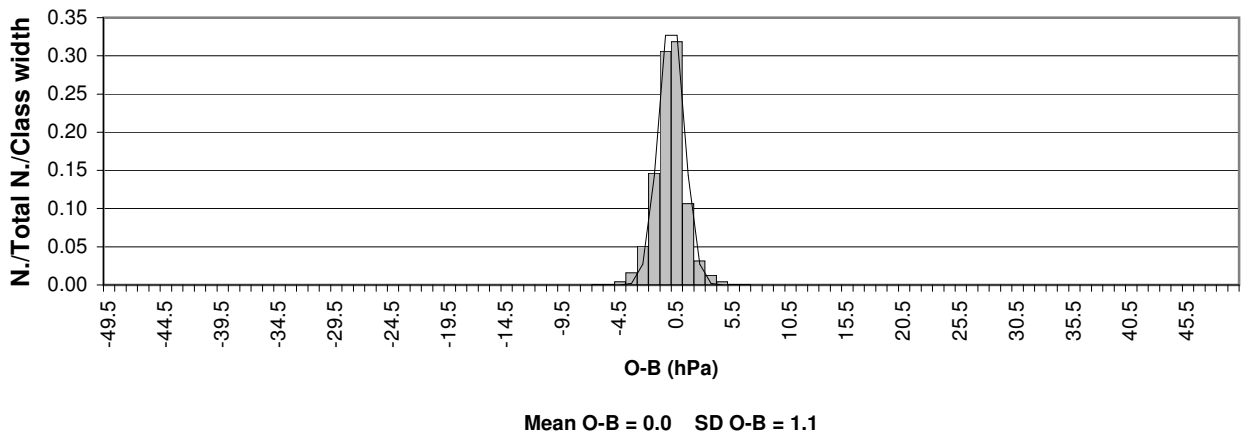


Figure 2d: Distribution of ship O-B wind speed (ms^{-1})
Period of data: JAN-JUN 2011 Data used: All observations

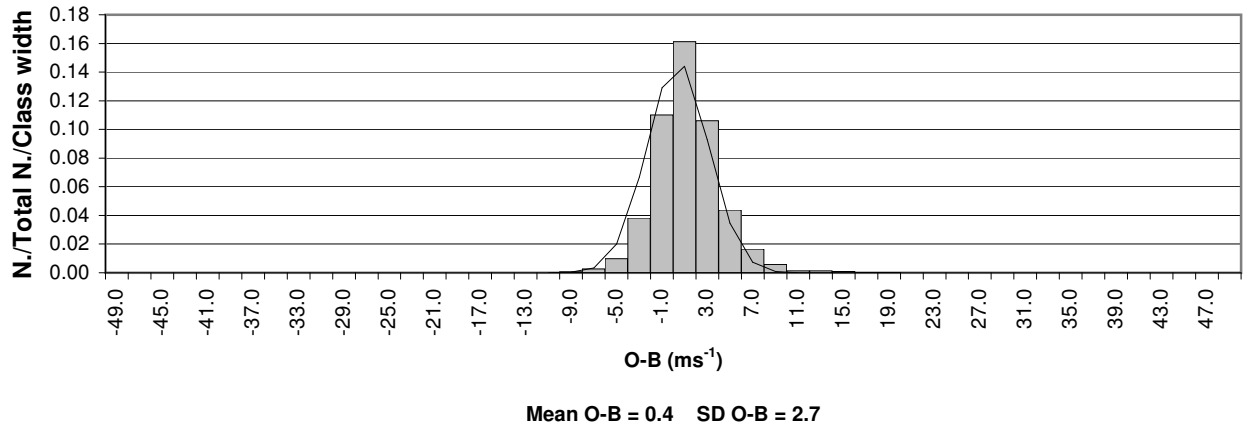


Figure 2e: Distribution of ship O-B wind speed (ms^{-1})
Period of data: JAN-JUN 2011 Data used: Flagged observations

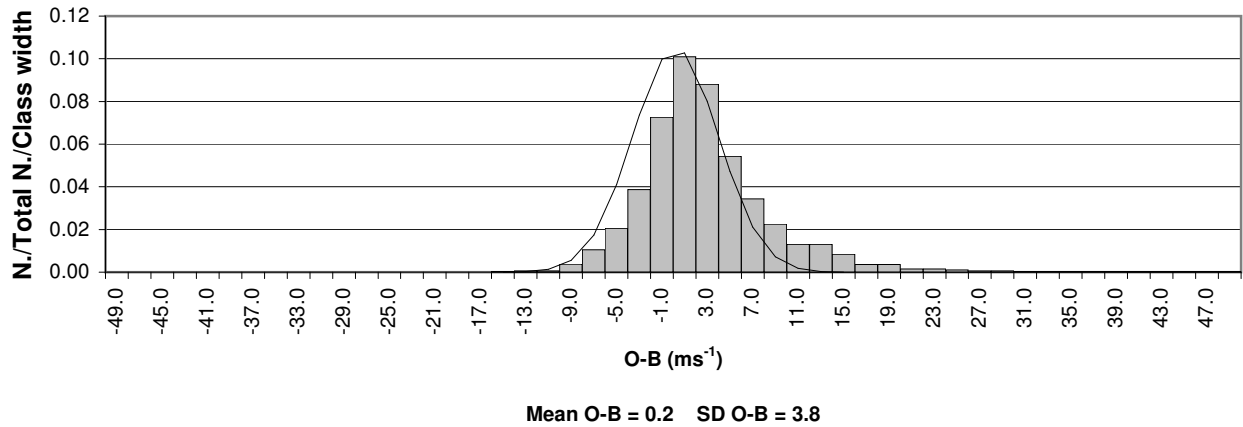


Figure 2f: Distribution of ship O-B wind speed (ms^{-1})
Period of data: JAN-JUN 2011 Data used: Unflagged observations

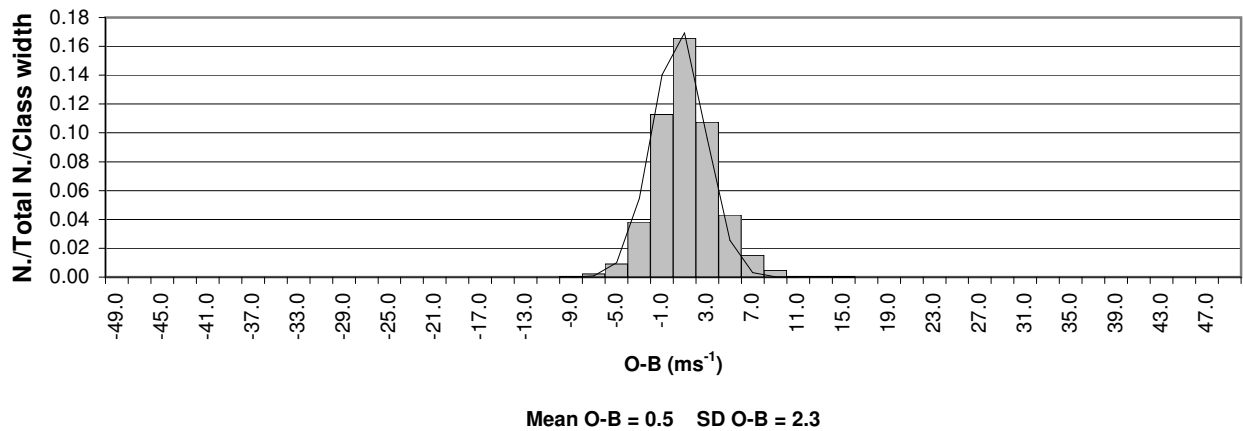


Figure 2g: Distribution of ship O-B wind direction (degrees)
Period of data: JAN-JUN 2011 Data used: All observations

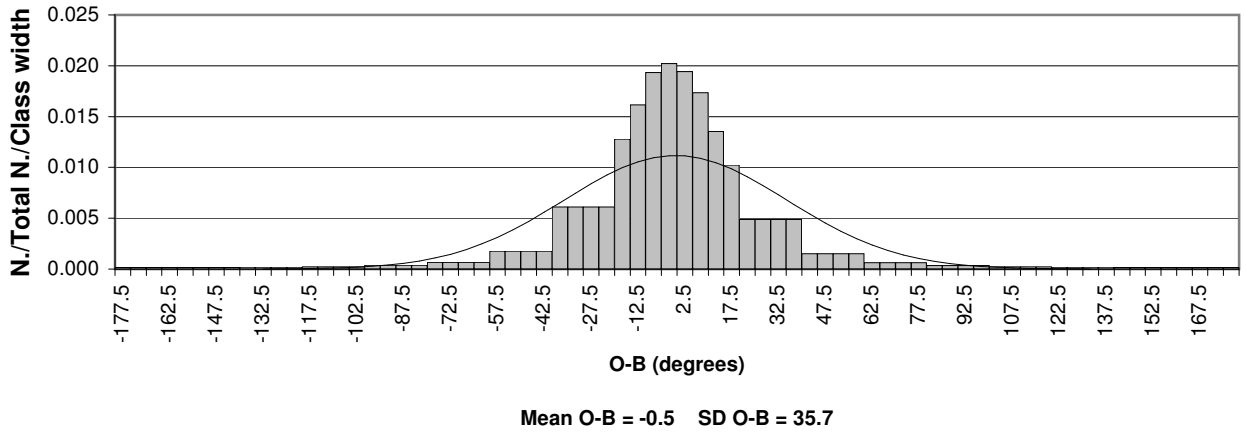


Figure 2h: Distribution of ship O-B wind direction (degrees)
Period of data: JAN-JUN 2011 Data used: Flagged observations

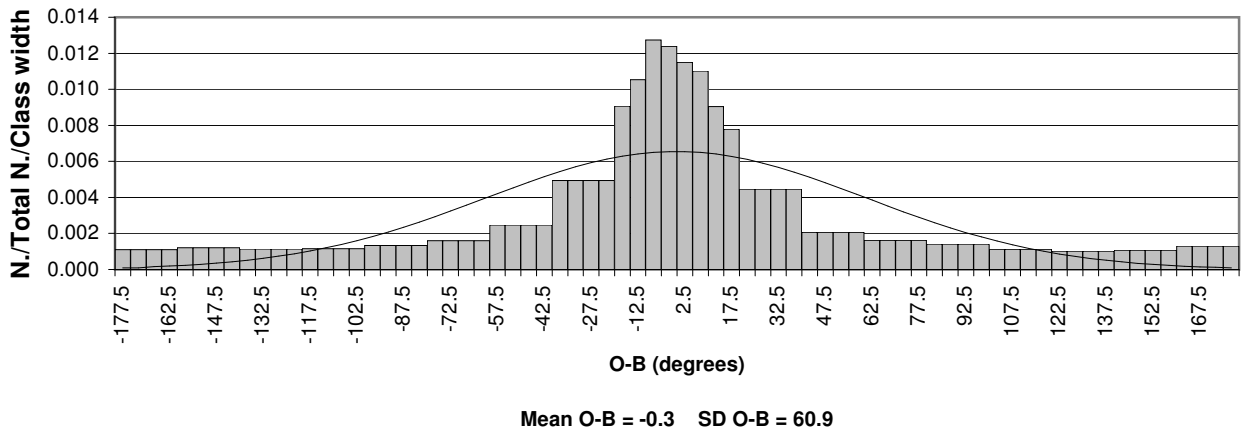


Figure 2i: Distribution of ship O-B wind direction (degrees)
Period of data: JAN-JUN 2011 Data used: Unflagged observations

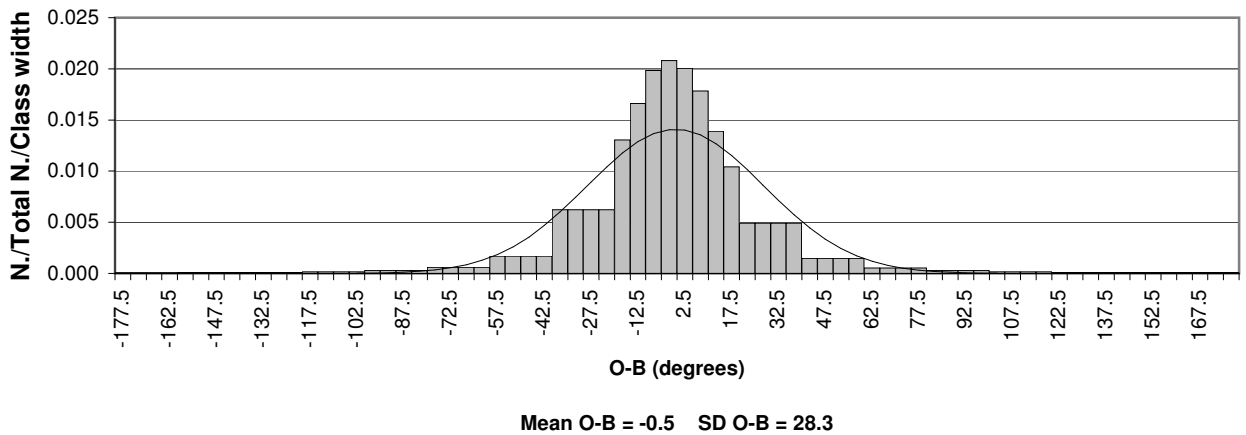


Figure 2j: Distribution of ship O-B SST (°C)
Period of data: JAN-JUN 2011 Data used: All observations

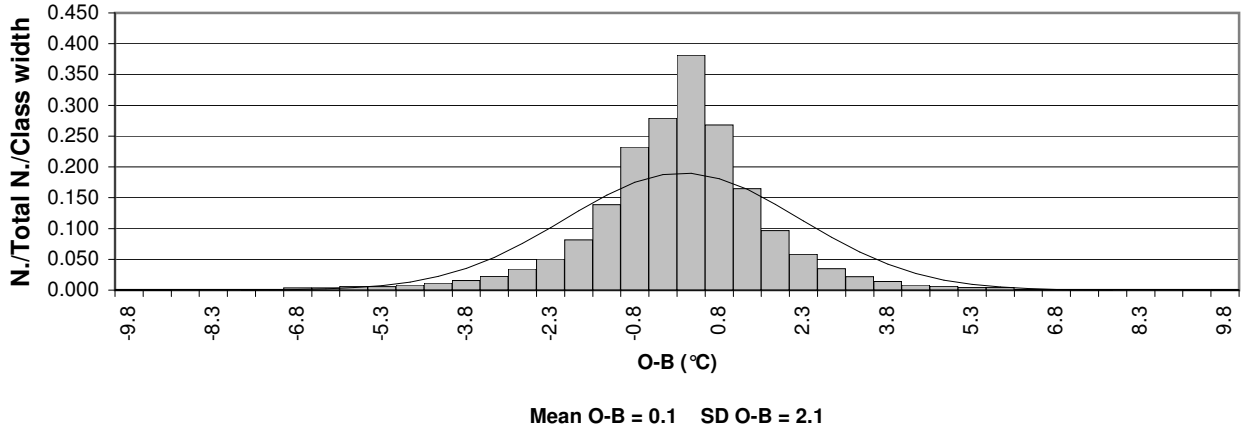


Figure 2k: Distribution of ship O-B SST (°C)
Period of data: JAN-JUN 2011 Data used: Flagged observations

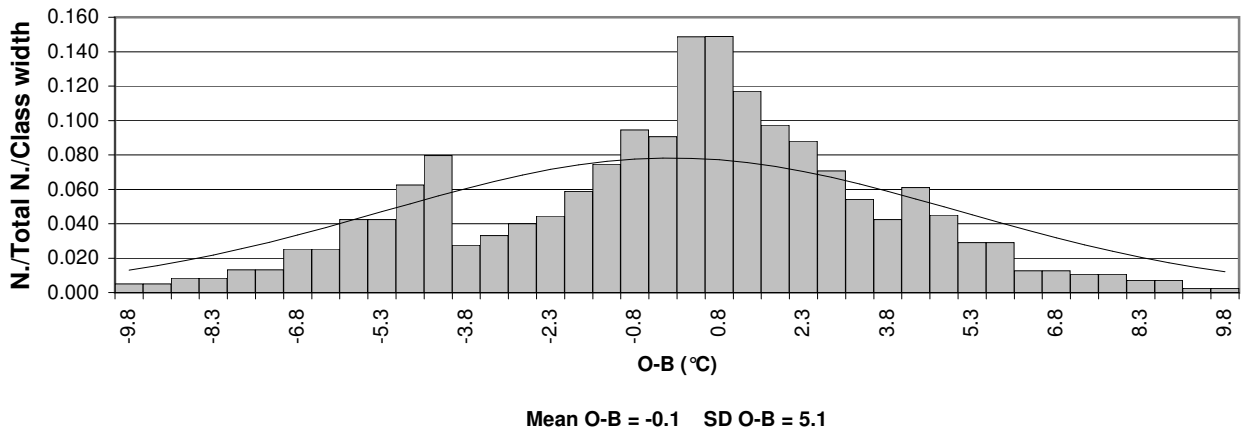


Figure 2l: Distribution of ship O-B SST (°C)
Period of data: JAN-JUN 2011 Data used: Unflagged observations

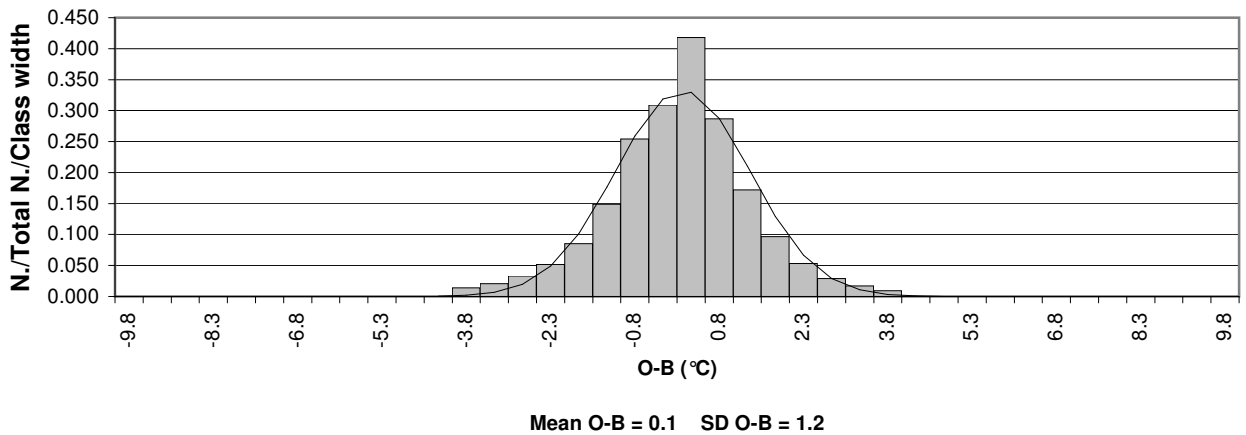


Figure 3: Bias of Ship O-B Pressure (hPa). Date:- January - June 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 1.0 hPa

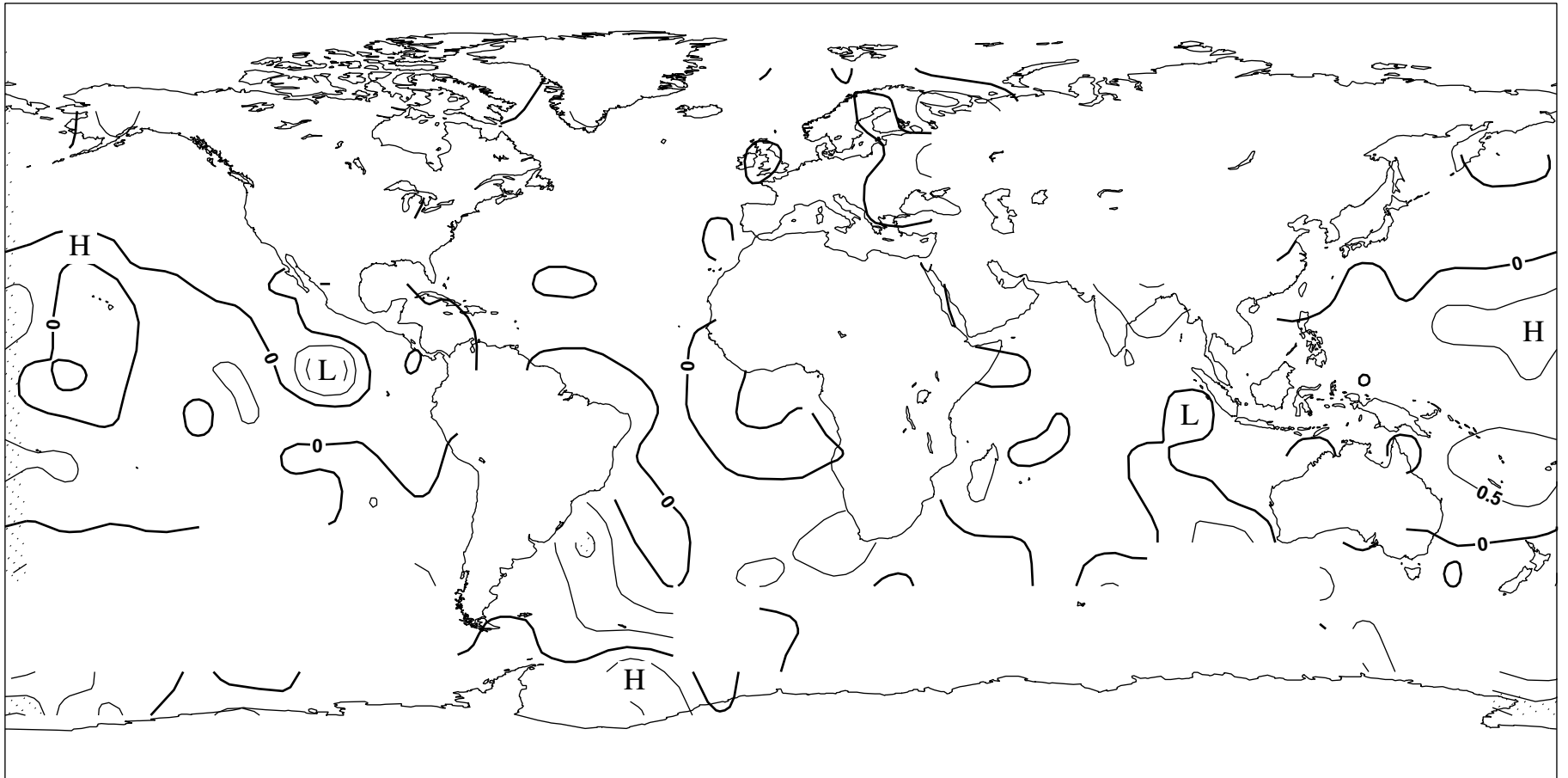


Figure 4: Standard Deviation of Ship O-B Pressure (hPa). Date:- January - June 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 2.0 hPa

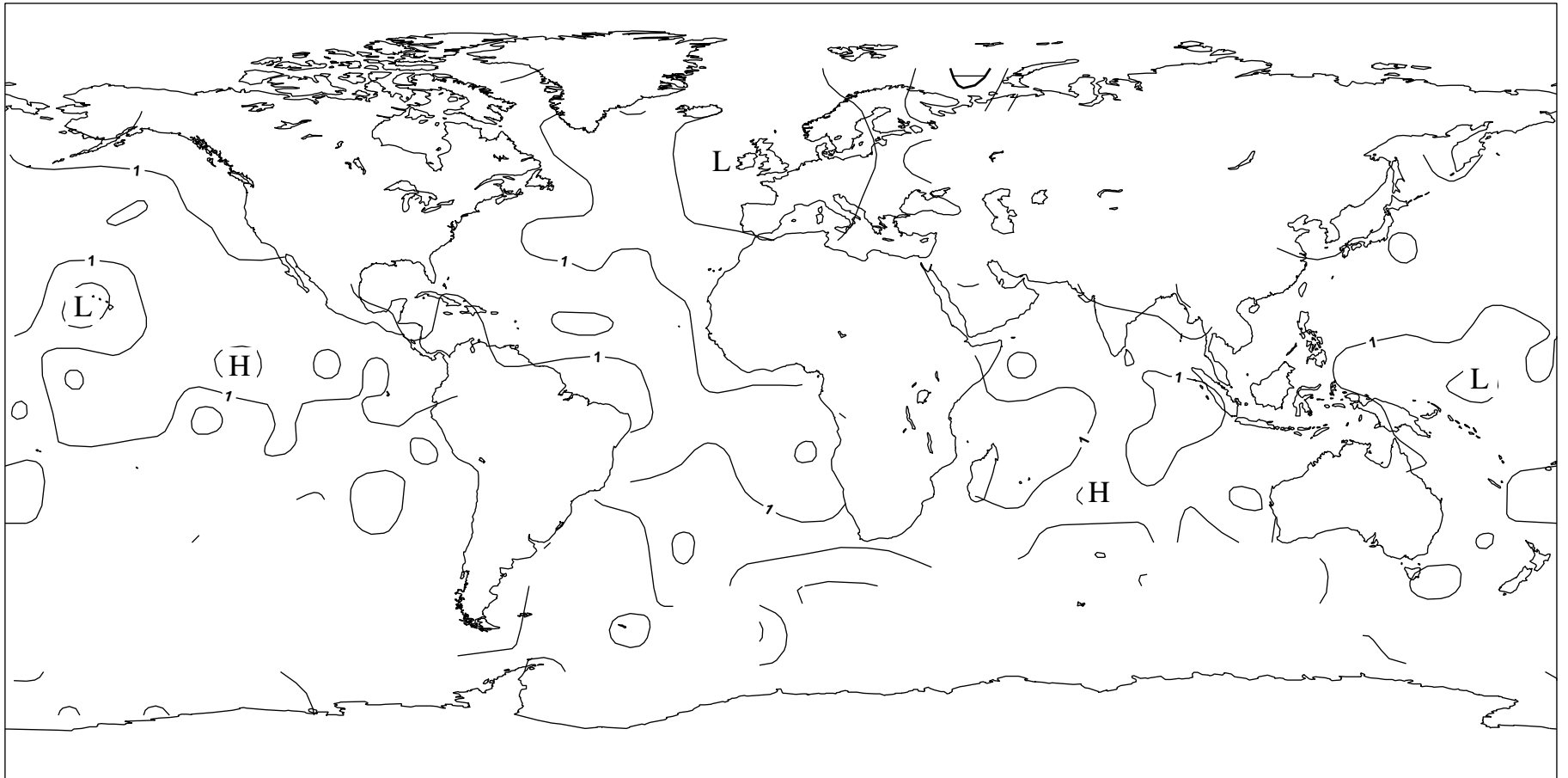


Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- January - June 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 2.0 ms-1

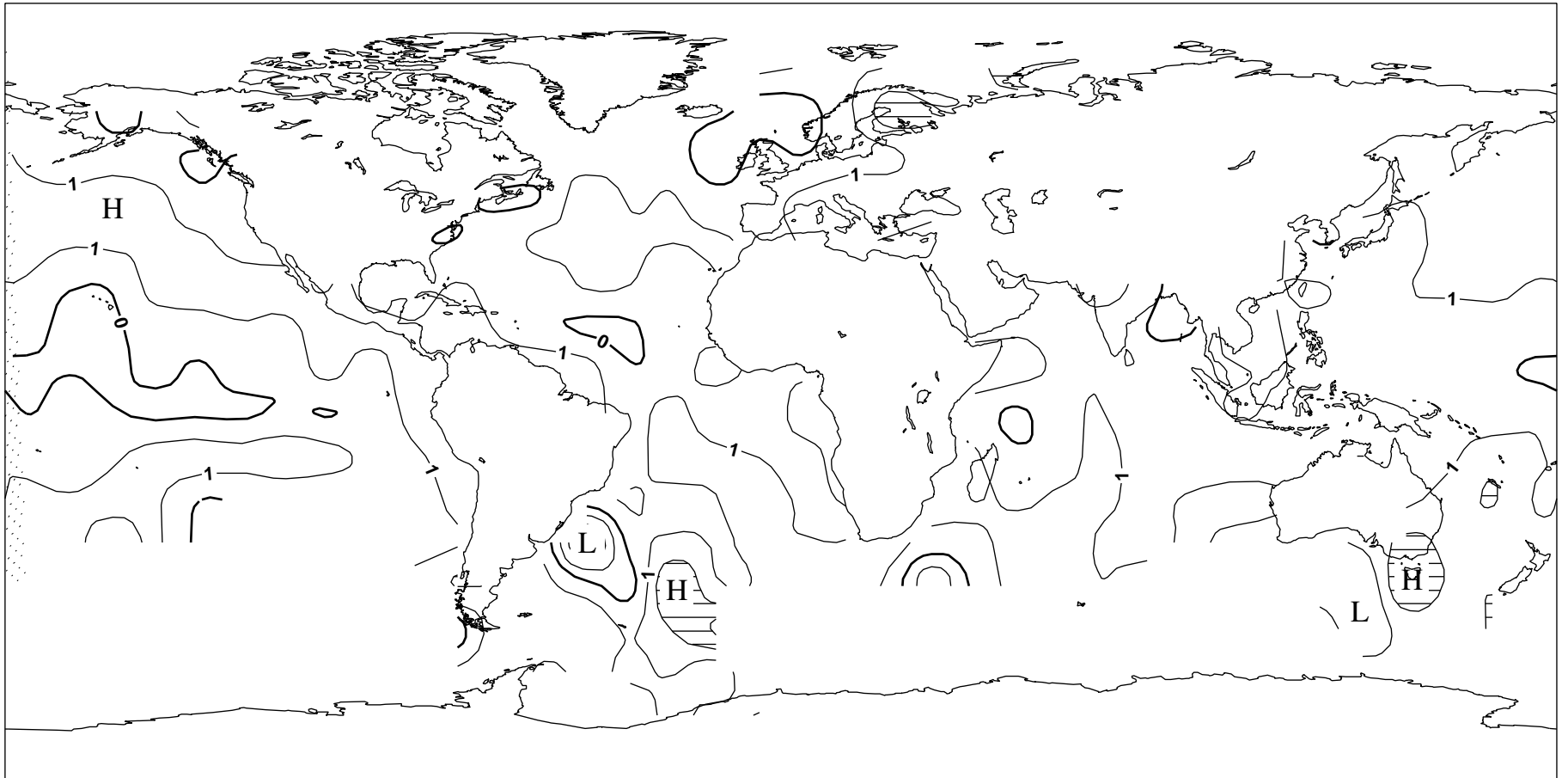


Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- January - June 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 4.0 ms-1

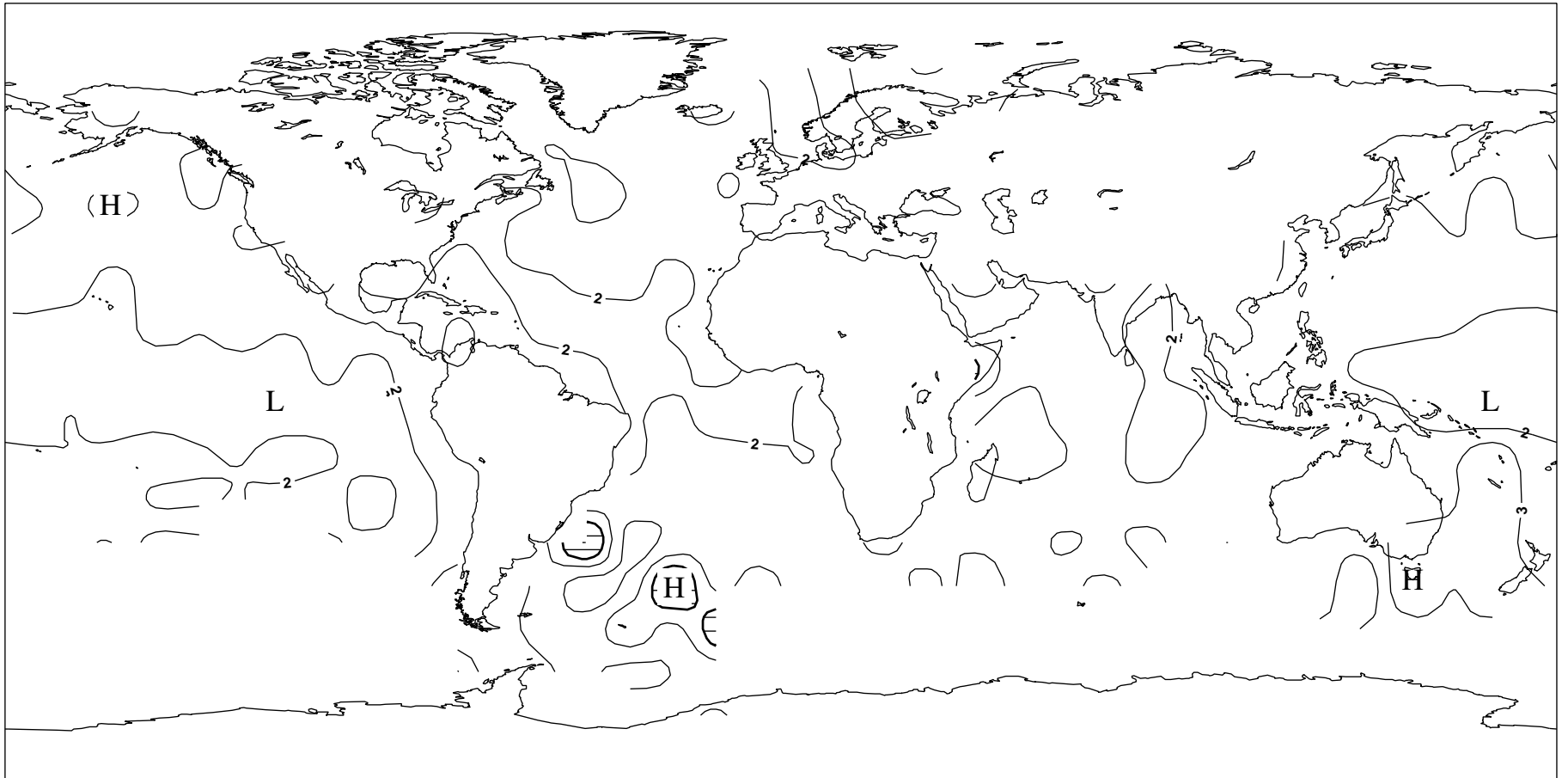


Figure 8:
Plot of the Number of Ship Wind Speed Observations. Date:- January - June 2011
Only observations passing quality control included

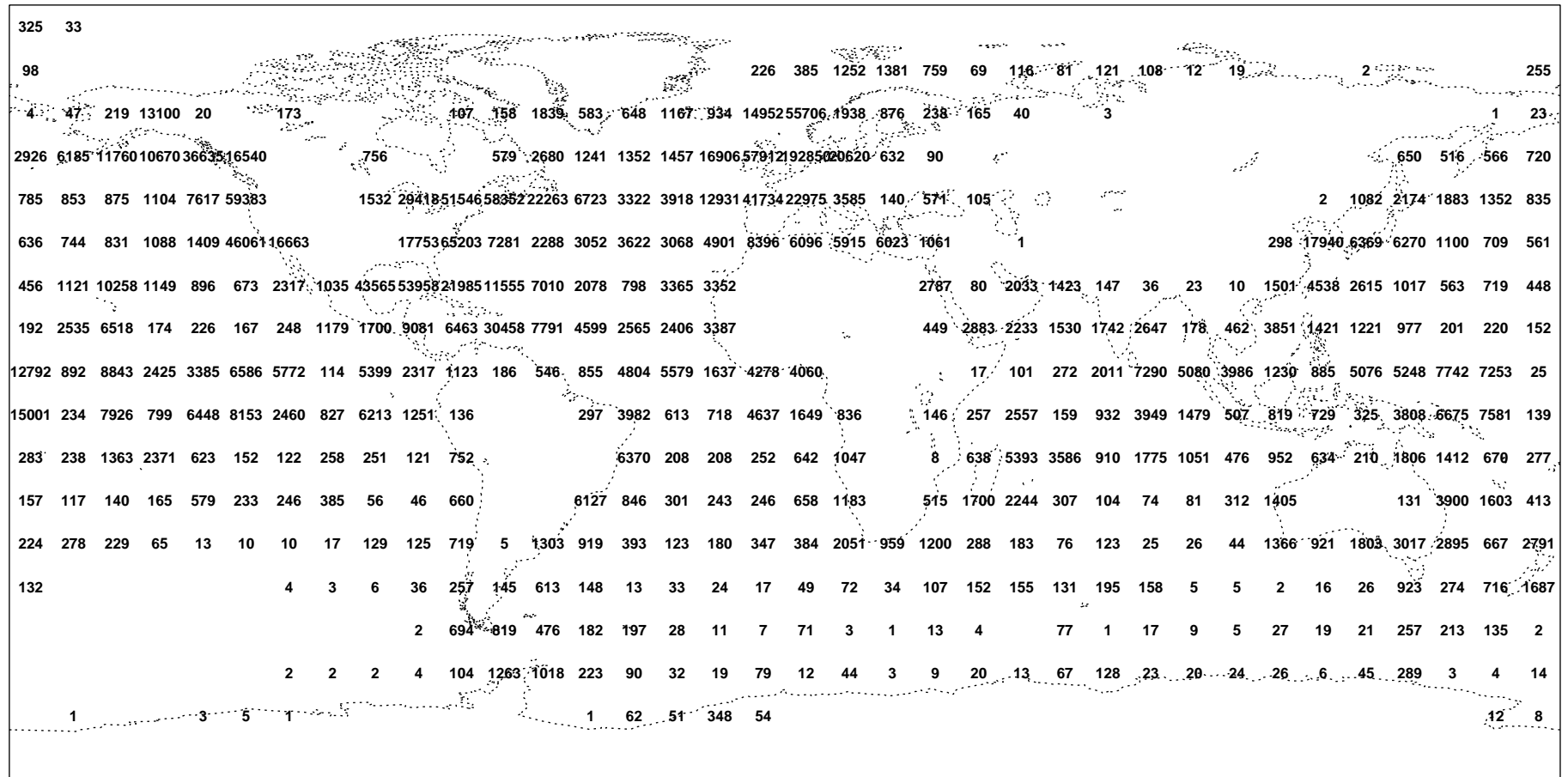


Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- January - June 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 10 degrees

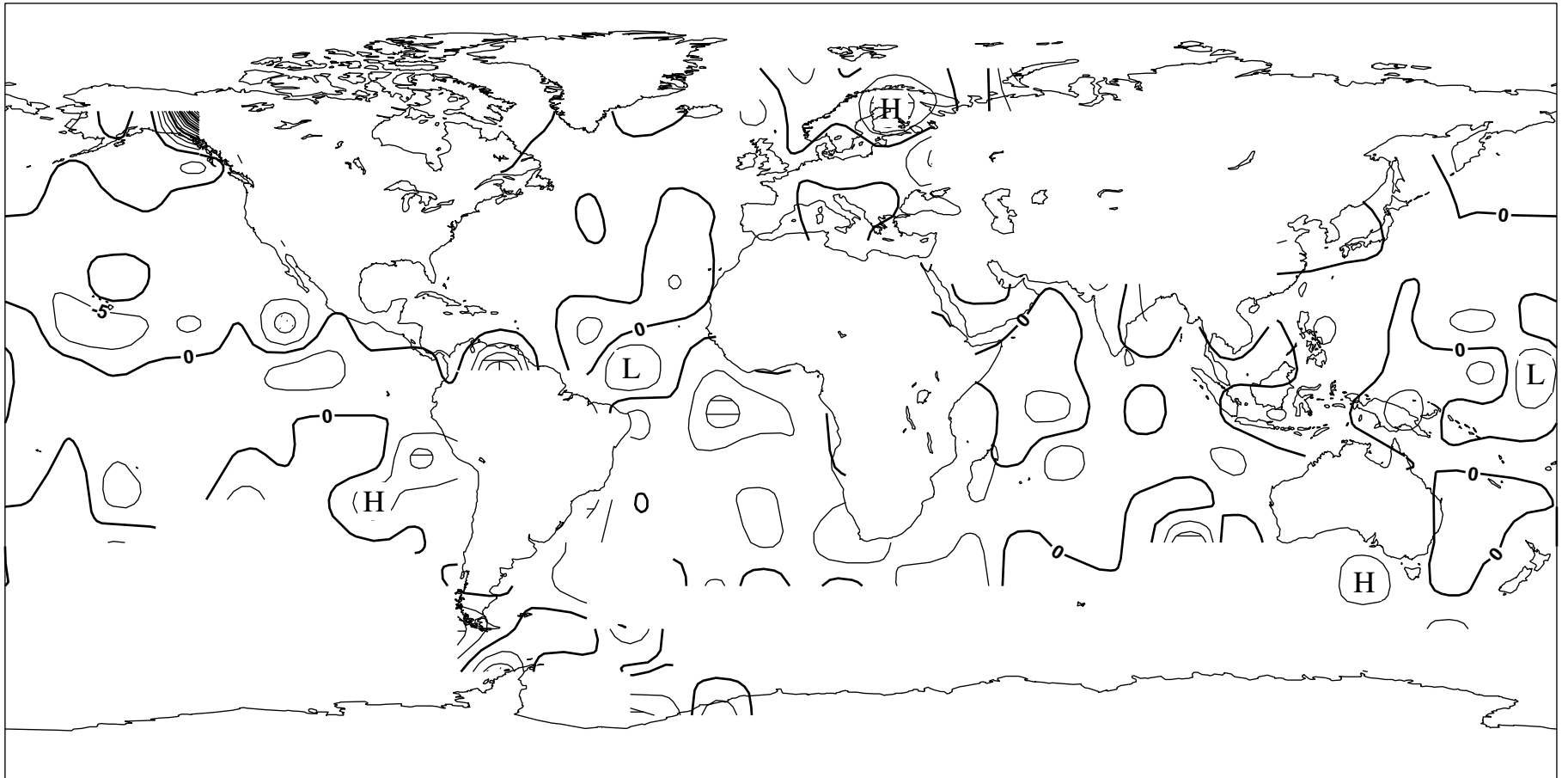


Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- January - June 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 40 degrees

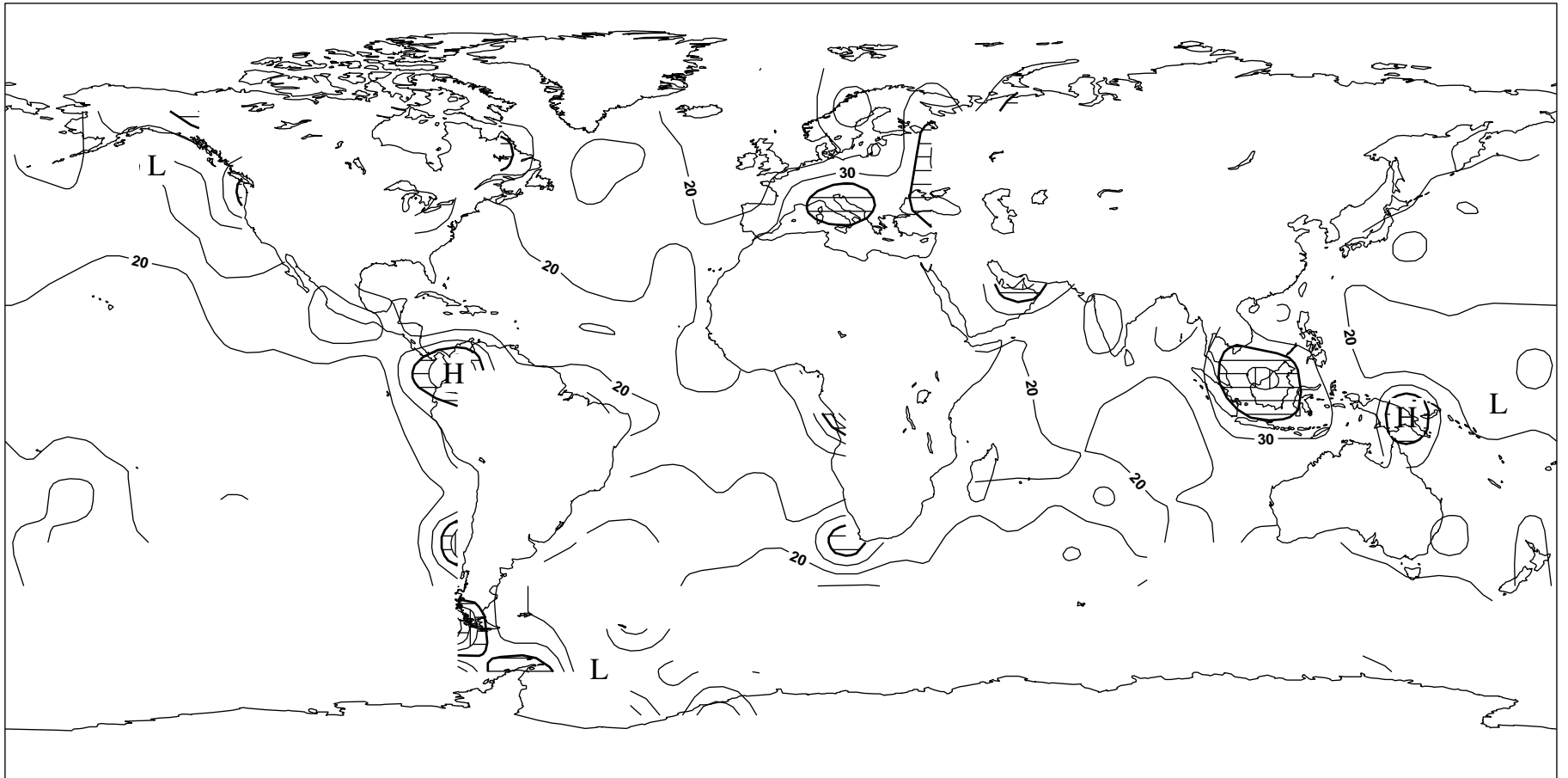


Figure 12: Bias of Ship O-B SST (degrees C). Date:- January - June 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 1.0 degree C



Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- January - June 2011
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

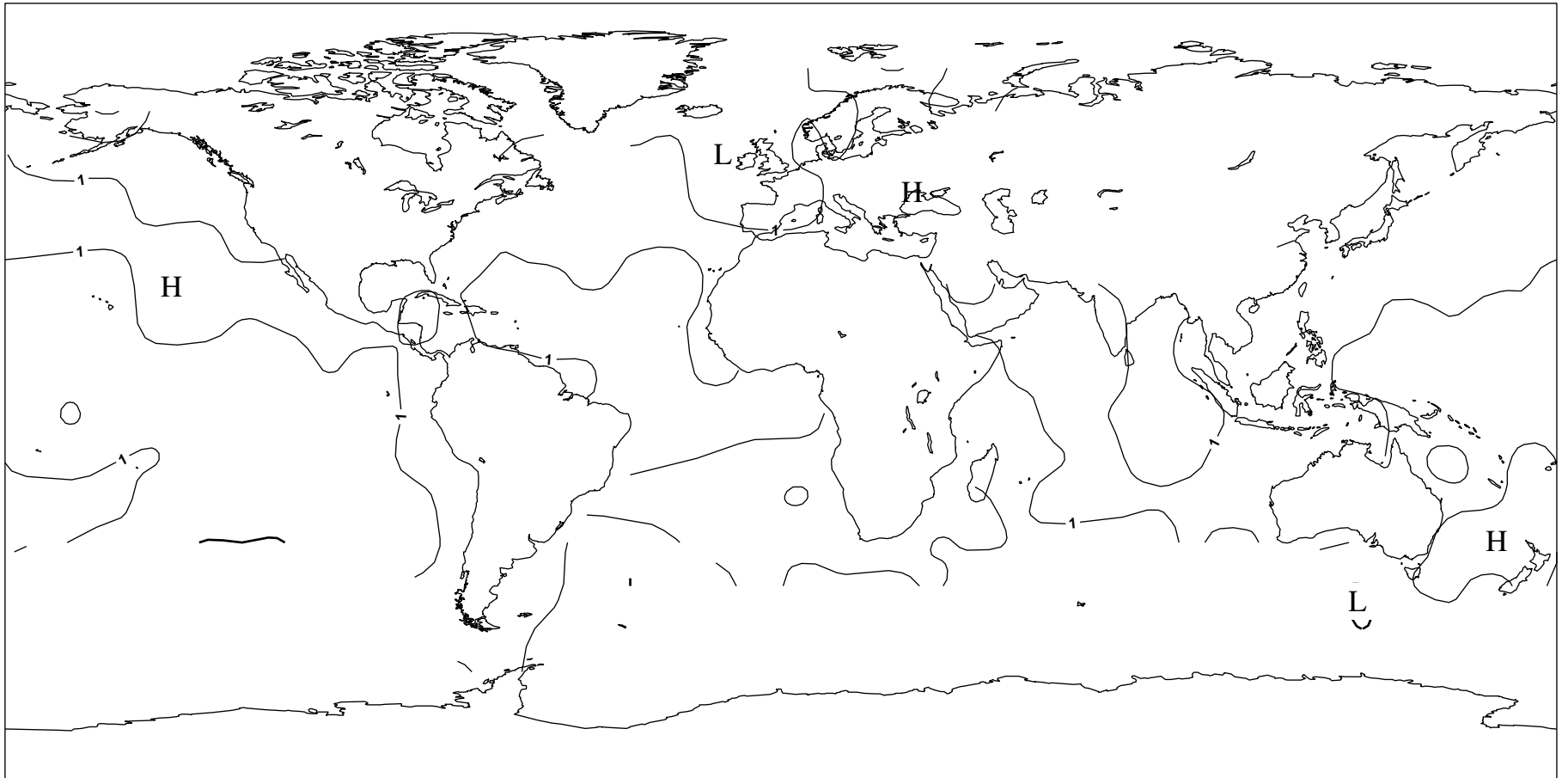


Figure 14:
Plot of the Number of Ship SST Observations. Date:- January - June 2011
Only observations passing quality control included

