Report on the Quality of Marine Surface Observations

Report Number 46

July to December 2011

Met Office Data Assimilation

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2011

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REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2011

CONTENTS

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2011

LIST OF TABLES

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2011

LIST OF FIGURES

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 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 report number 46 and covers the period July to December 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 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 |	≥4.0 hPa
2.	standard deviation of O-B	≥6.0 hPa
3.	percentage of gross errors	≥25

Wind

1.	| mean of O-B |	≥5.0ms^{-1}	(Speed)
		≥30°	(Direction)
2.	standard deviation of O-B	≥80°	(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) or 10°C (SST). 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 |	≥5.0ms^{-1}	(Speed)
		≥30°	(Direction)
2.	standard deviation of O-B	≥6.0ms^{-1}	(Speed)
		≥60°	(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, July to December 2011, 5086288 observations of pressure were monitored at Exeter from 2687 manual ships, 1022 drifting buoys, and 651 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 45 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 number of manual ships reporting pressure seems to be fairly constant, while the number of automatic ships continues to increase steadily, and the number of drifting buoys reporting pressure is fairly constant, following an increase in 2009/2010.

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 seems to have peaked in the second half of 2008 and remained reasonably constant since then. Reports from drifting buoys now account for 52% of the total, while those from manual ships make up just 11 % of the total, and those from automatic ships account for the remaining 37%. 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 July to December 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 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 0.0hPa and standard deviation 1.0hPa. 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 1.5hPa, being less than 1.0hPa over much of the north Atlantic and the tropics. The number of ship pressure reports that passed the quality control checks are shown in Figure 5.

Table 3 contains a list of those ships and drifting buoys considered to have produced suspect observations of pressure in the period July to December 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 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 45 (January to June 2011) have been indicated with an asterisk (14 ships and one moored buoy). A comparison of the statistics given here with those in report number 44 (July to December 2010), 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 45 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 14 platforms on the list have definitely shown some improvement in the quality of their observations.

3.2 Wind

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

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

In the period July to December 2011, 2449902 wind observations were available for monitoring at the UK Met Office, from 2730 manual ships, 26 drifting buoys, and 666 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 +0.4ms^{-1} relative to the background and a direction bias of just -0.4°.

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 2ms^{-1} in middle latitudes and around 1.5ms^{-1} in the tropics. The |bias| is generally less than 1ms^{-1}, but exceeds 2ms^{-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 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 July to December 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 July to December 2011, a total of 7670430 observations of SST were monitored at the Met Office, from 2332 manual ships, 1830 drifting buoys and 503 automatic ships. Of the total, 514567 were from manual ships, 5676633 from drifting buoys and 1479230 from automatic ships. (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 has been little change in the numbers of ships and drifters reporting SST over the last 2 years, but there has been an increase of ~40% in the number of 'automatic ships' (moored buoys) reporting SST, with the largest increase being for this report 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 7% 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 +0.1°C relative to the background and a standard deviation of 1.1°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 between 0.5°C and 1.5°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 74 marine observing platforms listed as producing suspect observations of pressure over the period July to December 2011, 71 as producing suspect wind observations and 66 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 numbers dropped slightly, to be averaging about 75 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. There was a slight decrease in the number of suspect wind platforms up to 2010 and since then the number has levelled-off at around 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, JULY TO DECEMBER 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	321	353	247	2	0	2	35	32	23
2-10	312	324	296	5	2	17	33	36	16
11-20	166	166	151	2	1	7	5	5	9
21-40	250	256	267	4	0	9	13	17	6
41-100	537	537	446	9	3	12	17	17	7
101-200	511	512	423	19	0	34	15	13	2
201-500	427	426	307	75	2	119	27	30	26
501-1000	64	65	71	82	4	151	37	31	22
1001-1500	26	21	34	105	1	151	35	38	44
1500+	73	70	90	719	13	1328	434	447	348
Total	2687	2730	2332	1022	26	1830	651	666	503
(Report 45)	(2667)	(2690)	(2326)	(1029)	(29)	(1938)	(613)	(632)	(411)

* 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

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

Notes:
1. Units are hPa.
2. Observing platforms marked with an asterisk were listed in the previous report January to June 2011)

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
16962	1105	179	5.2	-2.0	1	1	1	1	1	SD
17524	662	0	3.2	-4.7	2	2	2	1	2	Bias
17667	897	219	6.4	-8.1	2	2	2	2	2	Bias
17674	112	0	0.9	-8.3	2	2	2	0	2	Bias
17680	144	0	0.8	-5.2	1	1	1	1	1	Bias
17902	875	64	4.4	7.0	2	2	2	2	2	Bias
17928	2027	417	5.1	-1.2	1	1	1	1	1	SD
21902	904	298	5.9	5.1	1	1	1	1	1	Bias
21985	95	7	1.6	12.9	1	1	1	1	1	Bias
21994	397	133	1.3	12.8	1	1	1	1	1	Bias
25618	138	53	5.1	-2.3	1	1	1	1	1	GE
25619	225	57	4.8	-0.4	1	1	1	1	1	GE
32542	711	3	6.0	4.3	1	1	1	1	1	Bias
32730	867	793	8.9	-4.1	2	2	2	1	2	SD
32925	972	563	1.6	0.0	1	1	1	1	1	GE
33509	2123	965	3.5	2.1	2	2	2	1	2	Bias
33586	1040	474	8.5	-1.2	2	2	2	2	2	SD + GE
33660	1160	34	3.5	4.1	2	2	2	2	2	Bias
33706	3647	1108	5.1	0.1	2	2	2	2	2	Bias + SD
34545	2235	324	6.5	0.9	4	4	3	4	4	SD
41554	608	444	4.7	-1.5	2	1	2	1	2	SD
42543	349	298	2.6	-5.9	2	2	0	1	2	Bias
44637	66	64	0.7	-8.0	1	0	0	0	1	GE
48509	1269	760	5.3	-2.8	2	2	2	2	2	GE
48656	349	349	---	---	2	2	2	0	2	GE
48660	323	322	0.0	7.5	1	1	1	0	1	GE
54946	2677	1170	0.5	0.1	2	2	2	1	2	GE
66864	158	158	---	---	1	1	0	0	1	GE
71572	288	153	6.3	6.6	1	1	1	1	1	GE + SD
71616	3799	367	4.5	1.2	3	3	2	2	2	SD
71627	1566	468	6.6	4.0	3	3	2	3	3	SD + GE
71666	292	36	4.8	4.3	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
17684	410	375	4.6	5.7	1	1	1	1	1	GE
23598	2653	2221	2.6	-12.0	6	4	6	6	6	Bias
33677	1947	174	5.2	-2.2	2	1	1	2	2	Bias
56919	576	214	0.8	0.7	1	1	1	1	1	GE

Table 3b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
45023 *	742	742	---	---	1	1	1	0	1	Bias + GE
9HJI9	500	60	7.2	-0.9	1	0	1	0	1	SD
A8AT8	73	0	3.1	3.7	1	1	1	0	1	Bias
A8DE3	206	0	5.3	1.8	1	0	0	0	0	SD
A8VN7 *	134	0	3.0	-4.2	3	3	3	0	4	Bias
AUYN *	47	3	5.3	5.4	0	0	0	0	0	Bias + SD
AUYR	46	1	3.0	5.7	0	0	0	0	0	Bias
CFK9796	46	41	2.5	-11.5	0	0	0	0	3	Bias + GE
CFN4309 *	53	41	5.1	-8.8	1	0	0	0	2	Bias + GE
CG2522 *	624	298	1.4	-0.2	4	2	4	0	4	GE
CG2992	389	341	0.6	-0.2	1	1	1	0	1	GE
CGDS *	739	321	1.1	0.2	0	0	0	0	0	GE
CYGR *	56	28	4.1	-9.4	2	0	0	0	2	Bias
CZ3695	912	687	0.5	0.0	1	1	1	0	1	Bias + GE
CZ9742 *	2560	1167	0.9	-0.3	1	1	1	0	1	GE
KS086	286	4	4.2	5.8	2	2	2	0	2	Bias
ONFN *	111	0	5.4	0.1	0	0	0	0	1	SD
OZWA2	91	0	6.6	-4.6	1	1	1	0	1	SD
S6CH5	41	0	4.5	8.7	1	0	0	0	1	Bias
SBPQ	247	10	5.3	1.3	1	0	0	0	0	SD
TBWUK09	186	0	4.6	-0.6	2	0	2	0	3	Bias
UCUQ	65	0	1.1	-4.8	0	0	0	0	0	Bias
UFCK	41	2	1.7	-3.9	0	0	0	0	0	Bias
V7DI7	66	0	1.1	-3.9	0	0	0	0	0	Bias
V7QK3	127	2	5.5	2.3	4	0	4	0	4	SD
V7SY6	252	20	6.0	2.3	2	1	2	0	2	SD
VDFP *	113	62	4.6	-9.6	2	0	2	0	2	Bias + GE
VDRV *	58	17	3.0	-10.8	0	0	0	0	4	Bias + GE
VRIO2	58	0	6.2	-5.0	1	1	1	0	1	SD + Bias
VVKS	170	32	6.8	10.0	2	2	2	0	2	Bias
VYNG *	131	108	4.3	-9.1	2	0	2	0	3	Bias + GE
WAV4647	61	7	5.3	-3.0	0	0	0	0	0	SD
WBN6510	65	0	3.1	-4.2	1	1	1	0	1	Bias
WCX744 *	2710	575	6.3	-3.7	6	5	6	0	6	SD + Bias
WDC664 *	323	0	5.3	-0.2	2	1	2	0	2	SD
WQZ779 *	136	62	7.7	-6.5	5	0	2	0	5	Bias + SD
WUW2120	82	26	3.0	-0.4	1	0	0	0	1	GE
ZCDL9	153	0	5.6	0.9	2	0	2	0	2	SD

TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 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.
Column 6 Comments on quality of pressure observations.

Notes: 1. Units are hPa

Identifier	N Obs.	NGE	SD	Bias	Comments
9MEU4	183	2	5.6	-0.5	Reduced bias
A8PC7	25	0	2.6	2.4	Less than 40 reports
A8SI4	89	0	5.7	3.4	Reduced bias
A8UA9	323	1	2.1	-0.4	Reduced bias
A8VL5	119	0	2.2	1.1	Reduced bias
AUFH	15	0	2.4	2.4	Less than 40 reports
C6FM8	154	0	2.1	0.3	Reduced bias
CG2350	3371	572	0.8	0.2	Reduced bias
KS089	10	6	7.9	-1.1	Less than 40 reports
NWS0010	684	0	2.6	-1.1	Reduced bias
OUJN2	66	0	3.3	3.4	Reduced bias
UAST	79	1	3.6	0.6	Reduced SD
UCUF	119	21	1.7	-0.3	Reduced bias
UFJN	142	1	4.2	-0.2	Reduced bias
WDF2728	476	0	1.7	0.2	Reduced bias
WDF7994	469	43	3.8	-0.9	Reduced SD
WXQ4511	288	17	4.8	-4.0	Reduced bias
WYT8569	6	0	0.3	-0.5	Less than 40 reports

TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 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 (January to June 2011)

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
44637	45	4	0.8	9.7	1	1	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

Table 5b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
31375 *	59	0	2.8	-8.9	1	1	1	0	1	Bias
44064	166	0	6.8	-2.7	0	0	1	0	0	SD
KS078	359	15	4.5	6.9	3	1	4	0	4	Bias
VRGI7	88	0	6.2	3.7	0	1	0	0	0	SD
WQZ7791	136	0	3.5	-5.7	2	0	2	0	3	Bias

TABLE 6: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 5 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 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 Comments on quality of wind speed observations.

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

Identifier	N Obs.	NGE	SD	Bias	Comments
9VVN	132	0	2.4	-0.3	SD and bias reduced
A8HI8	33	0	3.3	-0.4	Less than 40 reports
A8KO3	96	1	5.7	5.1	Bias and SD reduced
UCUD	8	0	2.9	-2.0	Less than 40 reports

TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 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 (°).
2. Observing platforms marked § had a significant speed bias at some time within the period and the statistics and their plots refer to direction reports associated with background wind speeds greater than 5 ms^{-1} . If no significant speed bias was present, the statistics and plots refer to direction reports with an observed speed greater than 5 ms^{-1}.
3. Observing platforms marked with an asterisk were listed in the previous report (January to June 2011)

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
48631 §	600	2	138.7	-60.5	3	0	0	0	6	Bias + SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments

Table 7b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
21210 *	1937	10	76.4	10.6	2	0	5	3	1	SD
23173	865	10	63.4	132.8	4	1	5	4	5	Bias
2AKI4 *	82	0	73.9	-17.1	1	1	1	0	2	SD
31260	451	0	53.7	43.4	0	1	3	0	3	SD
3EBL5 *	159	0	63.7	-4.1	0	0	0	0	1	SD
3EUS *	281	0	67.9	-7.2	0	0	0	0	0	SD
42370	3133	0	56.2	-44.6	2	2	3	1	2	Bias
45023 *	3768	0	50.2	-46.2	3	1	3	2	3	Bias + SD
46015	3411	0	47.5	30.7	0	0	0	0	3	Bias
46053	4225	0	43.5	-36.6	0	0	0	0	3	Bias
46081 *	3619	0	40.7	-28.1	0	0	0	2	5	Bias
46091	2848	0	59.0	-41.9	0	0	0	0	4	Bias + SD
51307	468	0	147.4	-56.1	2	1	2	1	2	Bias + SD
53057 *	2644	18	148.2	11.9	6	5	6	6	6	SD
8PNQ	296	7	67.8	-0.1	0	0	0	0	1	SD
A8CH2	134	6	68.0	-1.6	0	1	1	0	3	SD
A8CQ5	165	0	71.0	-6.6	0	0	0	0	0	SD
A8PQ3	286	0	71.7	-8.5	0	0	0	0	3	SD
AGRF *	59	0	35.6	-30.8	0	0	0	0	0	Bias
BAREU63	376	0	62.5	20.4	0	0	1	0	1	SD
BATFR45	136	0	87.6	40.2	1	1	1	0	1	Bias + SD
C6FM5	221	1	66.1	-7.4	1	0	0	0	2	SD
C6T2062	105	0	51.2	-44.7	0	0	0	0	0	Bias
CBGR *	76	0	60.2	-35.0	0	0	0	0	0	Bias + SD
CGBR	2972	8	75.5	-33.3	3	0	4	0	4	Bias + SD
CZ3695 *	1515	0	44.0	24.2	1	2	3	0	3	Bias
DDIG2	111	0	61.3	2.9	0	0	0	0	0	SD
DGPT2	153	0	81.5	-5.7	1	0	2	0	3	SD
DGSE	249	0	61.3	-23.9	2	1	1	0	2	SD
DPKZ	149	0	68.7	-10.1	0	0	0	0	1	SD
ELWG7	83	0	91.9	5.3	0	1	0	0	2	SD
ELWZ5 *	72	0	55.4	0.0	0	0	0	0	0	SD
J8NW *	232	2	101.8	-51.8	2	3	5	0	5	Bias + SD
KS073 *	497	0	51.4	37.1	0	0	0	0	0	SD
KS078 *§	359	15	132.9	-1.7	3	1	4	0	4	SD
KS098	447	0	103.9	41.6	1	0	1	0	1	SD + Bias
LEQZ3	137	1	65.3	11.3	0	0	1	0	1	SD
MCUV3	222	0	66.2	7.0	0	1	2	0	2	SD
MGRL8	159	0	65.8	-5.3	0	1	0	0	3	SD
MTFH5	133	1	65.2	2.0	1	1	2	0	1	SD

Continued >

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
MYSU5	247	8	71.4	-15.2	1	1	2	0	4	SD
NWS0006	293	0	60.4	14.5	0	0	0	0	2	SD
PCBZ	94	0	68.4	4.3	0	0	1	0	1	SD
S6MJ	126	0	76.9	25.4	0	0	0	0	2	SD
TBWUK1 *	48	0	75.5	3.2	0	0	0	0	1	SD
TBWUK16	95	0	82.3	-4.2	1	0	1	0	2	SD
UCAD	188	1	66.4	5.3	0	2	1	0	4	SD
UCTS	110	0	70.3	-3.2	0	0	0	0	0	SD
UDYG	143	0	55.1	36.0	0	0	0	0	1	Bias
V2OH6	136	0	65.3	-3.2	0	0	0	0	0	SD
V2OT9	88	1	70.8	-15.8	0	0	0	0	0	SD
V7EM3 *	174	0	73.7	-3.3	1	0	2	0	2	SD
V7OX3 *	163	0	64.7	19.1	0	0	0	0	2	SD
VC6750	2117	0	78.8	64.7	4	3	3	0	4	Bias
VRFO7	78	0	68.9	-12.1	0	0	0	0	1	SD
WBN4113	95	0	56.3	-46.2	0	0	0	0	0	Bias
WCX744 *	2703	2	88.1	26.5	3	3	4	0	5	SD
WCX910 *	659	0	48.8	-23.3	0	1	2	0	4	Bias + SD
WDA335 *	58	0	76.3	-26.5	0	0	0	0	1	SD
YJZC5	73	0	61.0	-20.3	0	0	0	0	2	SD
ZCBE7	58	2	68.4	-6.6	0	0	0	0	0	SD
ZCDN9	190	3	83.6	5.4	2	0	3	0	3	SD
ZCDY2 *	841	11	115.5	28.0	5	1	6	0	6	SD
ZM7552	230	0	50.0	-36.7	1	1	1	0	2	Bias
ZMENA *	920	27	90.2	6.6	3	3	4	0	4	SD

TABLE 8: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 7 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 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 Comments on quality of wind direction observations.

Notes: 1. Units are degrees (°)

Identifier	N Obs.	NGE	SD	Bias	Comments
13001	1915	0	19.1	-1.0	Bias reduced
42058	4383	0	39.8	-19.3	Reduced bias
A8FA5	34	0	21.4	1.7	Less than 40 reports
A8GU7	62	0	52.0	-26.8	SD reduced
A8HI8	33	0	44.4	0.0	Less than 40 reports
A8ME3	70	0	29.6	0.9	SD reduced
A8NQ7	42	0	69.0	-8.6	SD
A8QJ7	306	4	81.6	5.5	SD reduced
AUYL	137	0	32.5	1.4	Reduced SD
DDJG2	83	0	34.4	1.5	Reduced SD
DYLD	92	0	42.3	6.6	Reduced SD & Bias
H9UY	175	0	30.7	-4.8	Reduced SD
J8AZ2	42	0	58.4	-23.2	Reduced bias
J8NY	64	0	50.1	2.4	Reduced SD & Bias
MCLJ8	174	1	43.3	-1.7	Reduced SD
ONAN	127	0	45.6	-3.9	Reduced SD
PCUI	29	0	33.7	0.3	Less than 40 reports
UBLH	73	0	49.7	0.8	Reduced SD
UERK	4	0	0.0	81.7	Less than 40 reports
UGPK	76	0	49.0	4.2	Reduced SD
V2BE4	194	0	52.1	1.0	Reduced SD
V7QX2	466	0	47.2	-0.1	Reduced SD
VQBW2	129	1	52.7	4.9	Reduced SD
VRDC6	22	0	72.2	-32.9	Less than 40 reports
VRZQ9	33	0	27.8	-7.6	Less than 40 reports
WBN3013	10	0	12.5	-2.8	Less than 40 reports
WBP3210	3061	15	69.4	0.6	Reduced SD

TABLE 9: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT SEA SURFACE TEMPERATURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 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 (January to June 2011)

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
16525	335	39	3.6	-2.6	0	-	0	-	1	Bias
16558	297	274	0.2	-5.5	2	-	2	-	2	GE
16948	316	159	0.6	-2.2	1	-	1	-	1	GE
21528	3653	3652	0.0	-8.1	5	-	5	-	5	GE
21991	427	1	2.7	5.3	1	-	2	-	1	Bias
23978	687	687	---	---	2	-	2	-	2	Bias + GE
23984	130	9	4.4	3.3	1	-	0	-	0	Bias
25619	2634	1240	3.3	-2.6	2	-	0	-	4	Bias + GE
32551	926	926	---	---	2	-	2	-	2	Bias + GE
41554	1066	443	1.4	0.7	2	-	0	-	2	GE
41577	519	0	2.1	-3.7	1	-	1	-	1	Bias
41978	189	0	0.1	6.7	1	-	0	-	1	Bias
44882	263	0	1.4	5.4	1	-	1	-	1	Bias
46712	2421	401	3.4	2.4	0	-	0	-	1	GE + Bias
46919	339	0	0.8	-6.3	2	-	2	-	2	Bias
46925	281	0	0.9	-5.8	1	-	1	-	1	Bias
47505	1473	200	2.5	3.5	2	-	1	-	2	Bias
47546	1606	196	2.7	3.2	1	-	1	-	1	Bias
48518	2611	2610	0.0	-2.8	5	-	5	-	5	GE
48519	2618	2617	0.0	-3.2	5	-	5	-	5	GE + Bias
48520	2620	2620	---	---	5	-	5	-	5	GE
48531	1954	1954	---	---	4	-	4	-	4	GE + Bias
51639	255	0	0.9	4.0	1	-	0	-	1	Bias
51673	236	131	2.9	1.7	1	-	1	-	1	GE
51711	397	141	2.0	0.2	1	-	1	-	1	GE
51923	398	261	4.2	-2.9	2	-	2	-	2	GE
51929	394	131	0.5	0.0	1	-	1	-	1	GE + Bias
51933	347	66	2.9	6.5	1	-	1	-	1	Bias
55962	3898	1926	0.3	0.1	3	-	3	-	3	GE + Bias

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
17908	374	374	---	---	1	-	0	-	1	GE
25615	2171	242	3.8	-4.7	2	-	2	-	4	Bias
48511	297	297	---	---	1	-	1	-	1	GE
54554	2621	24	4.7	5.2	2	-	0	-	2	Bias

Table9b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
2AUO5	46	0	1.3	-4.3	1	-	1	-	1	Bias
53056	3383	973	0.2	0.0	5	-	5	-	0	GE
7JGT	67	0	1.1	3.4	0	-	0	-	0	Bias
7JHI	48	0	0.7	-3.2	1	-	1	-	0	Bias
7JHY	56	0	1.3	3.6	2	-	2	-	0	Bias
9V8739	114	0	2.0	3.1	2	-	2	-	1	Bias
9VBM6	586	1	0.9	3.1	4	-	1	-	0	Bias
A8CI8	67	0	2.2	-4.1	2	-	1	-	2	Bias
A8IX8 *	105	0	0.8	-2.8	0	-	0	-	0	Bias
A8KW3 *	189	0	1.2	2.9	4	-	3	-	0	Bias
A8LP6	254	0	0.8	-4.3	6	-	6	-	6	Bias
A8SZ3	58	0	2.3	-4.5	1	-	1	-	1	Bias
A8TG2	83	2	3.1	-5.3	2	-	2	-	2	Bias
A8WC8 *	161	4	0.6	-7.1	4	-	4	-	4	Bias
C6CN4	105	0	1.7	-4.1	2	-	2	-	1	Bias
C6QM8	347	1	4.2	2.6	3	-	1	-	3	Bias
C6YT4	97	0	1.7	4.2	2	-	2	-	1	Bias
CG2992	63	35	2.3	4.4	2	-	2	-	3	GE + Bias
CGDR *	1739	0	1.2	2.6	1	-	3	-	2	Bias
DNDD	60	0	2.3	3.1	0	-	0	-	0	Bias
ELNY2	169	1	2.7	-4.2	3	-	3	-	3	Bias
ELWZ5 *	60	0	1.6	3.8	1	-	1	-	0	Bias
KS098	315	0	0.3	-9.4	1	-	1	-	1	Bias
KS099	756	722	5.2	6.6	2	-	0	-	2	Bias + GE
LEQZ3 *	135	6	3.1	3.7	2	-	1	-	1	Bias
MGSH7	41	0	3.7	-3.7	1	-	1	-	0	Bias
MRWF2	122	43	0.7	1.2	1	-	1	-	1	GE
PBHZ	116	0	1.1	3.3	3	-	3	-	0	Bias
V7MP5	40	11	2.7	-4.5	1	-	0	-	1	GE + Bias
VMGO	80	0	1.4	-3.3	0	-	0	-	0	Bias
WCX8884	195	69	3.2	-5.2	5	-	5	-	5	Bias + GE
WSLH *	137	0	1.8	-3.4	3	-	2	-	0	Bias
ZCDQ5	67	0	1.7	-4.8	2	-	2	-	2	Bias

TABLE 10: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 9 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2011.

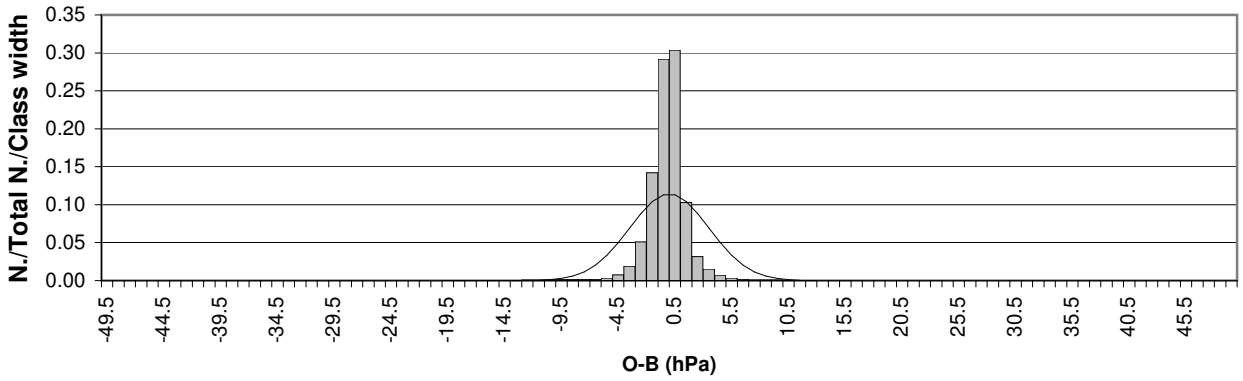
Column 1 Call sign or identifier
Column 2 Number of sea-surface temperature observations available for monitoring over the 6-month period, including any observations with gross errors.
Column 3 Number of sea surface temperature observations differing by more than 10 °C from the background (gross error).
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
2ALD3	240	1	2.7	2.0	Reduced bias
44041	3280	0	1.4	0.8	Reduced bias
44057	3335	0	1.8	-1.1	Reduced bias
44140	2299	0	1.2	0.4	Reduced bias
9V8072	40	0	2.4	0.4	Reduced bias
9V8798	23	0	1.0	4.2	Less than 40 reports
A8CS2	86	0	2.6	-1.5	Reduced bias
A8IV4	29	2	3.2	-4.0	Less than 40 reports
A8MW8	37	0	0.7	3.3	Less than 40 reports
DGTX	332	0	1.3	2.5	Reduced bias
DIBZ	2	0	1.3	0.2	Less than 40 reports
J8AZ3	183	1	3.6	-2.5	Reduced bias
J8NW	234	1	2.7	-1.5	Reduced bias
KRPP	5	0	0.4	-0.1	Less than 40 reports
KS077	1221	0	3.4	1.6	Reduced bias
MGSG6	138	1	2.4	0.5	Reduced bias
PCKU	92	1	1.6	-0.8	Reduced bias
PDIB	26	1	1.3	-1.1	Less than 40 reports
TBWUK11	39	0	2.4	2.6	Less than 40 reports
UCDN	113	4	3.9	2.0	Reduced bias
UCJX	17	0	2.9	-1.1	Less than 40 reports
UFLC	228	0	1.6	1.4	Bias
VRCV5	1	0	0.0	1.9	Less than 40 reports
VREX8	1	0	0.0	2.1	Less than 40 reports
ZDGR8	86	0	0.7	-0.2	Reduced bias
ZDJT6	84	0	3.0	-3.5	Reduced bias

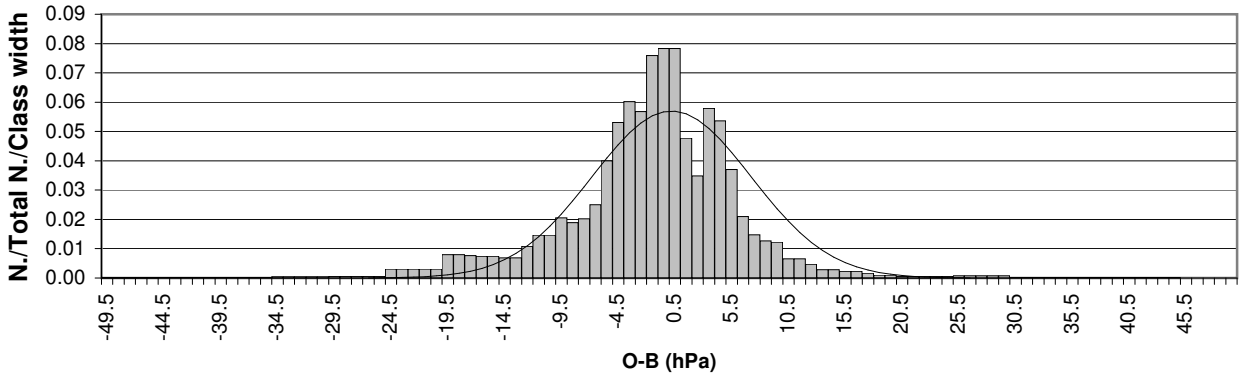
Period	WMO report number	Number of Observations			
		Manual ships	Drifting buoys	Automatic ships	Total
Jan - Jun 1989	1	424087	174971	40082	639140
Jul - Dec 1989	2	421315	151972	58016	631303
Jan - Jun 1990	3	424335	177927	63847	666109
Jul - Dec 1990	4	412430	205488	71146	689064
Jan - Jun 1991	5	364760	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

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



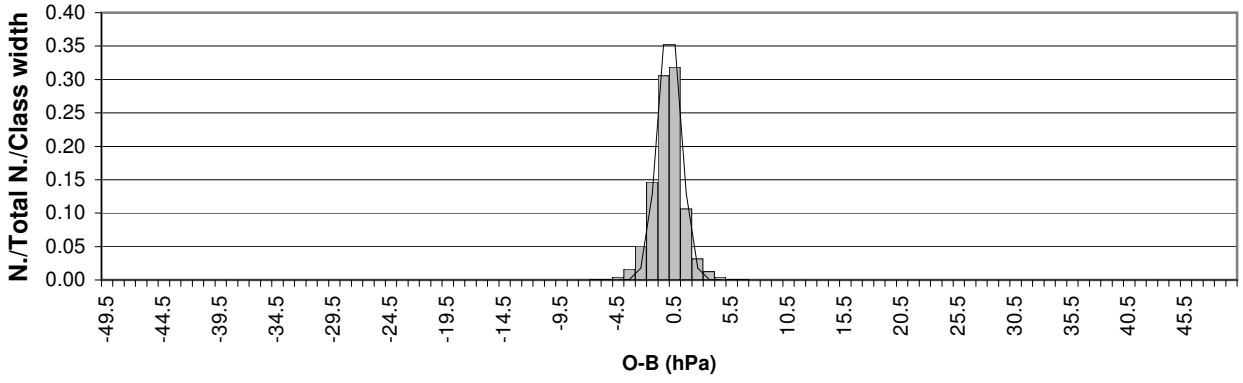
Mean O-B = 0.0 SD O-B = 3.5

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



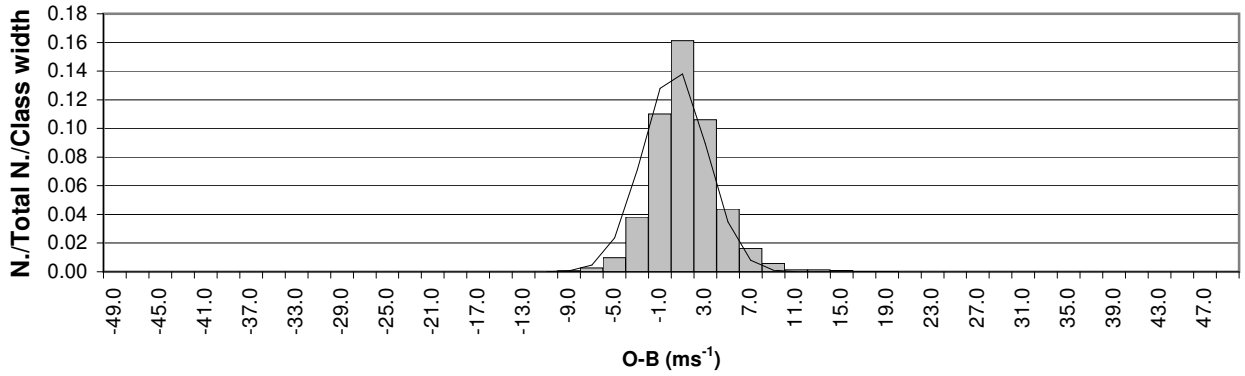
Mean O-B = 0.2 SD O-B = 7.0

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



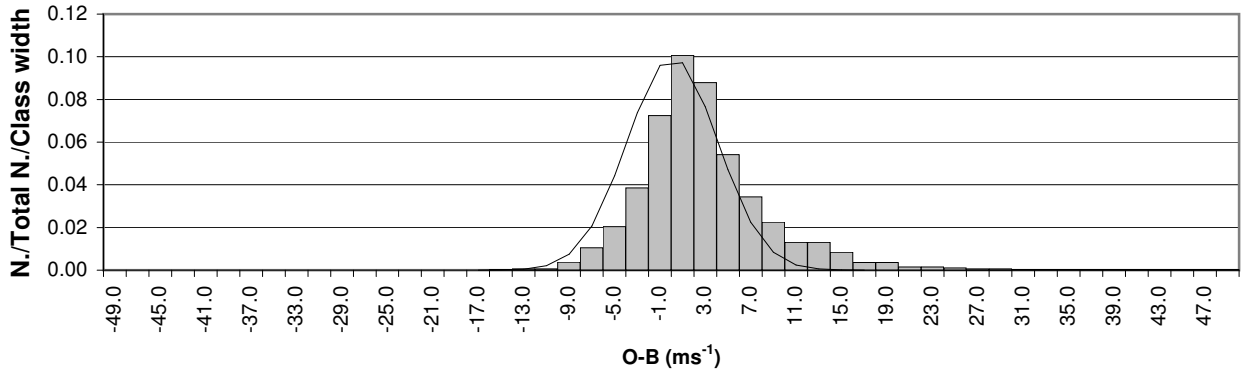
Mean O-B = 0.0 SD O-B = 1.0

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



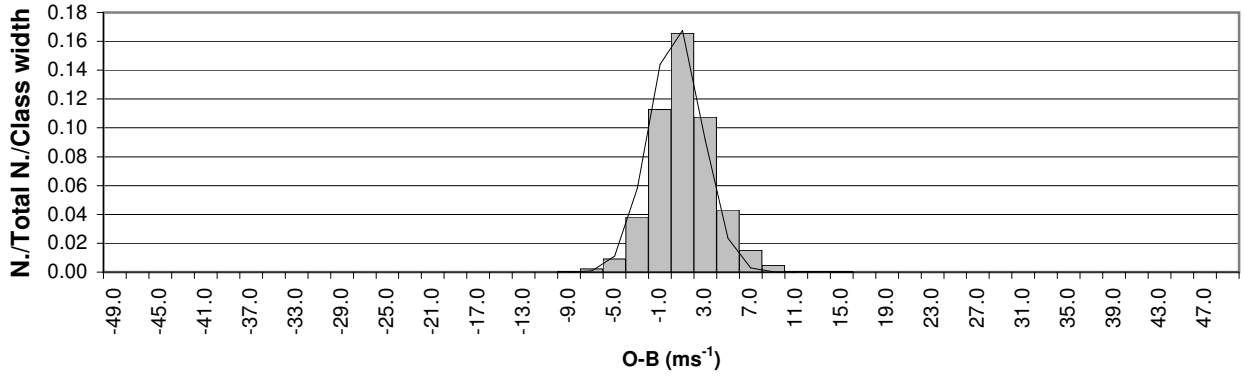
Mean O-B = 0.3 SD O-B = 2.8

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



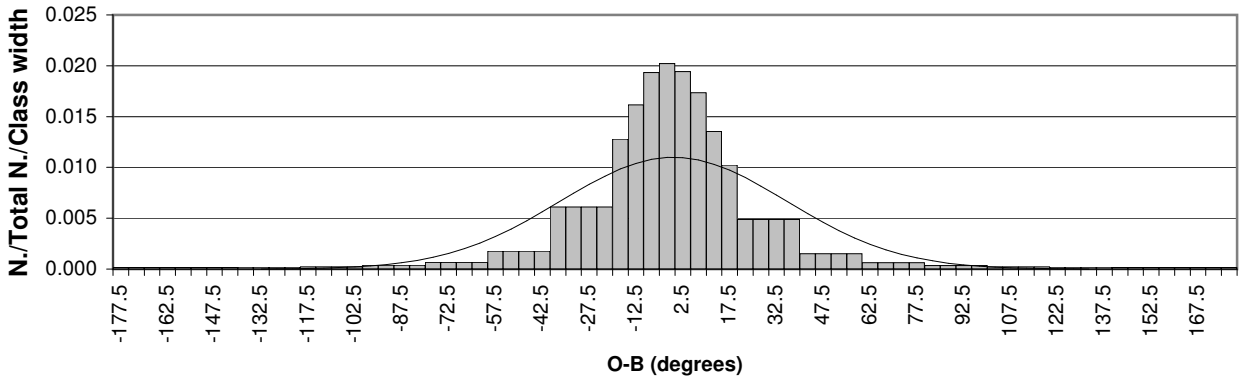
Mean O-B = 0.1 SD O-B = 4.0

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



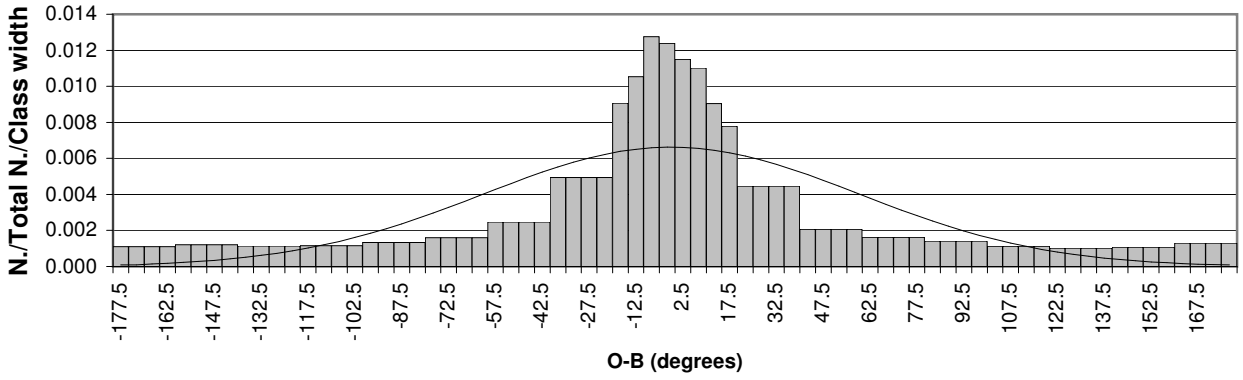
Mean O-B = 0.4 SD O-B = 2.3

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



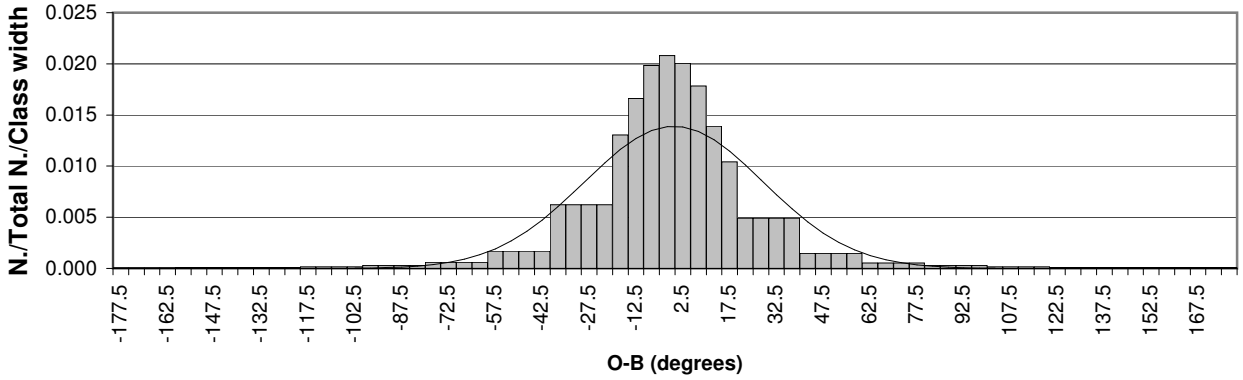
Mean O-B = -0.5 SD O-B = 36.3

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



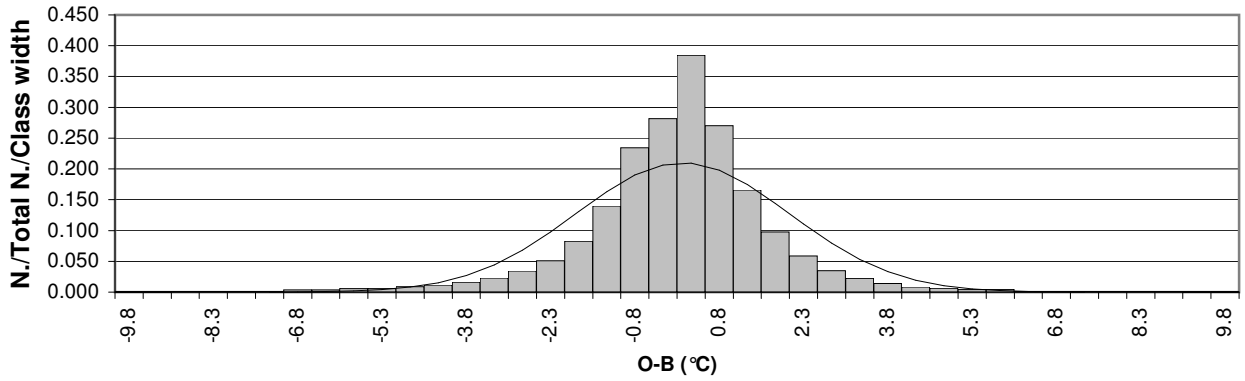
Mean O-B = -1.2 SD O-B = 60.2

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



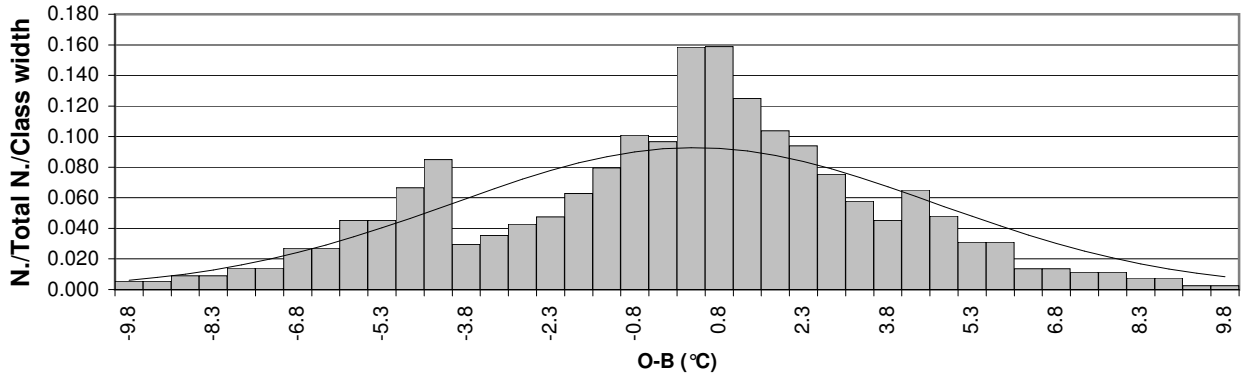
Mean O-B = -0.4 SD O-B = 28.7

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



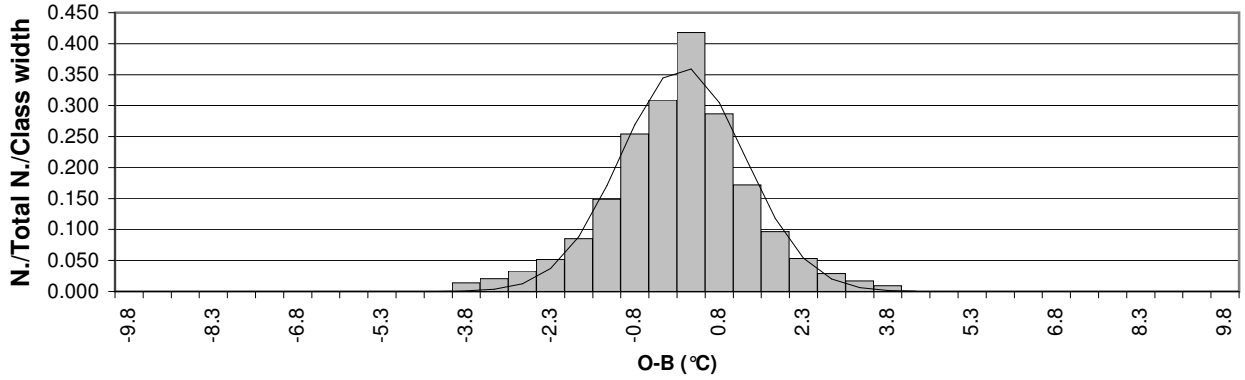
Mean O-B = 0.1 SD O-B = 1.9

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



Mean O-B = 0.3 SD O-B = 4.3

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



Mean O-B = 0.1 SD O-B = 1.1

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

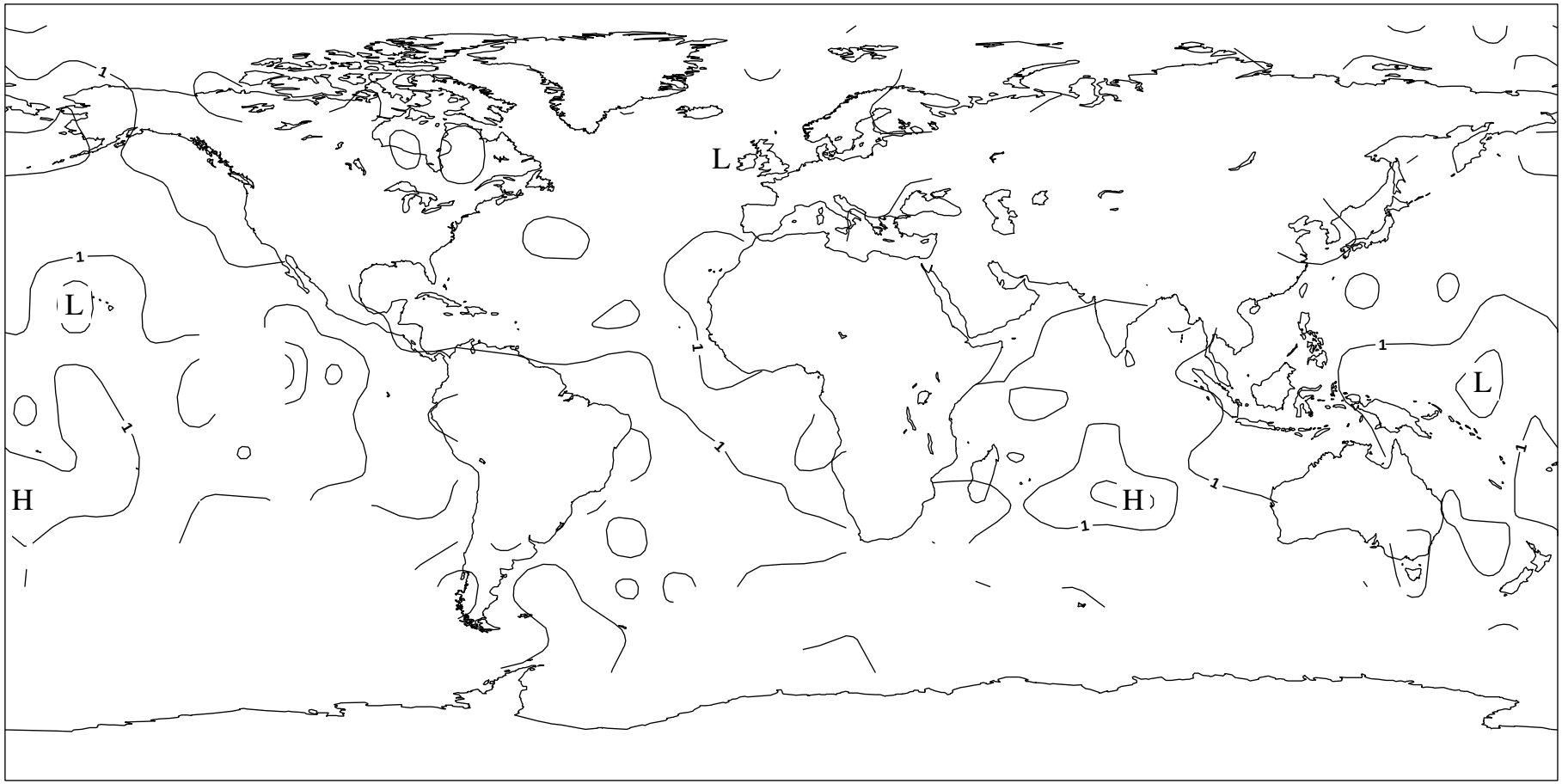


Figure 5:
Plot of the Number of Ship Pressure Observations. Date:- July - December 2011
Only observations passing quality control included

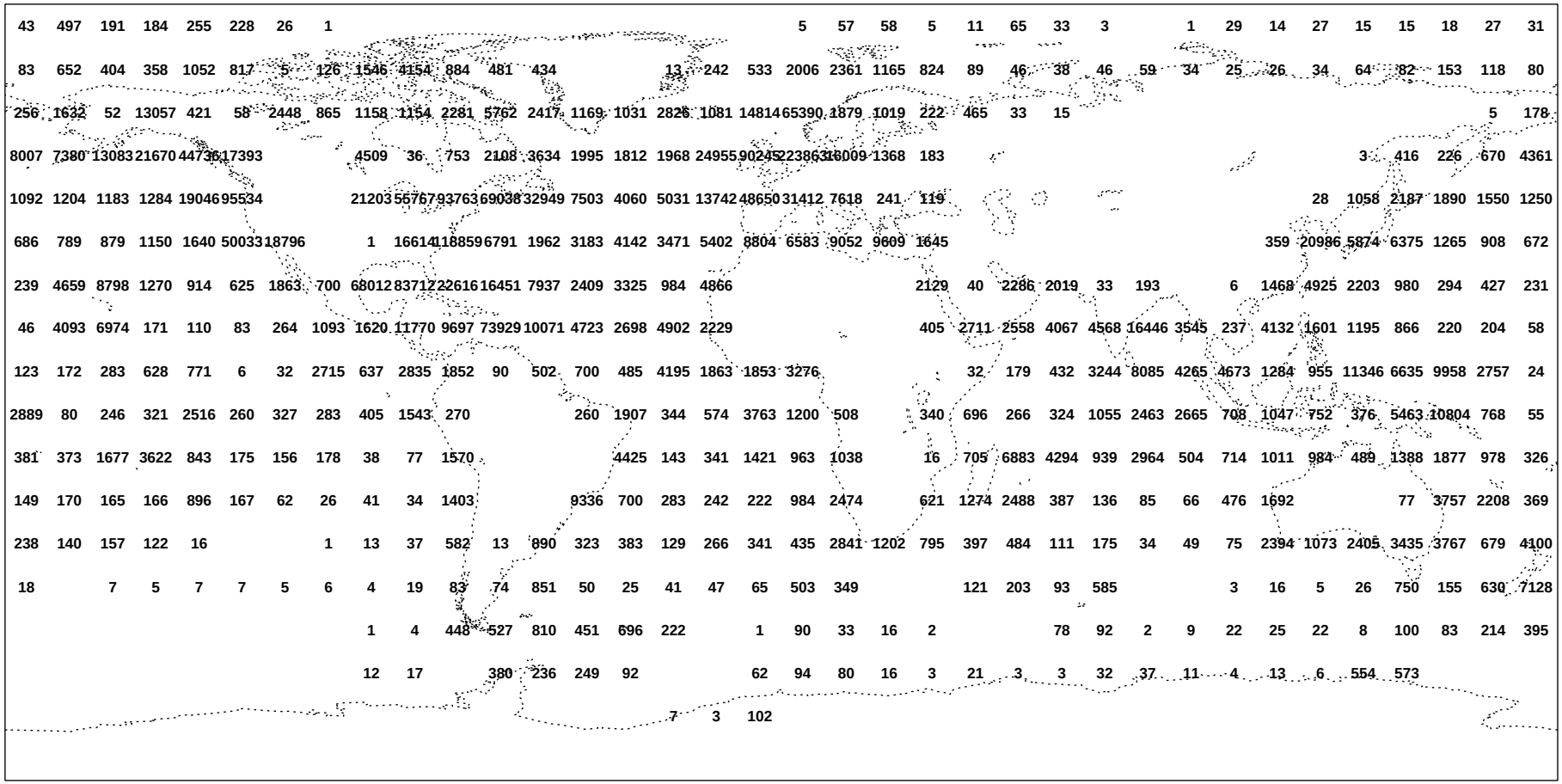


Figure 6: Bias of Ship O-B Wind Speed (ms-1). Date:- July - December 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 2.0 ms-1

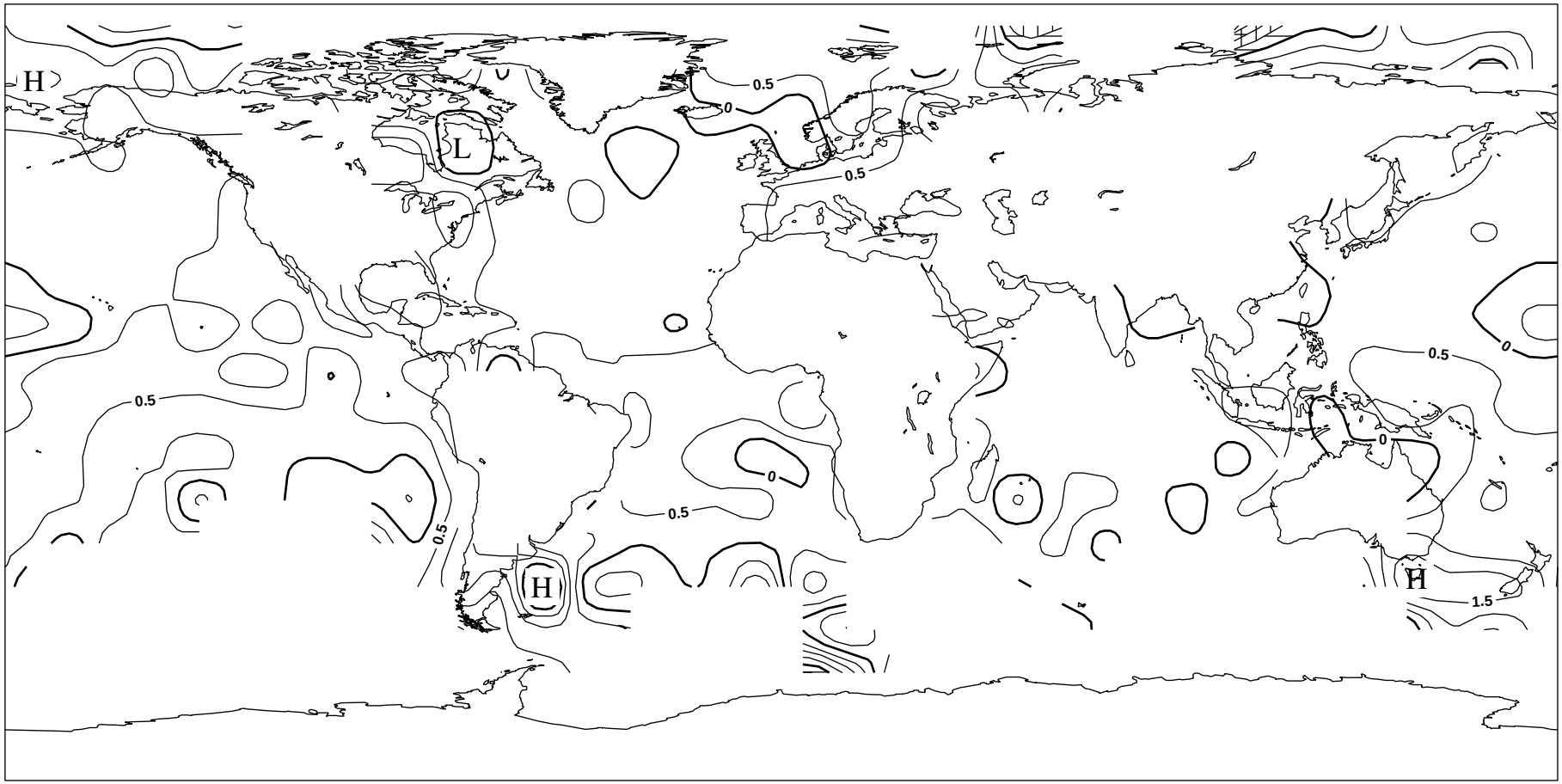


Figure 7: Standard Deviation of Ship O-B Wind Speed (ms-1). Date:- July - December 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 4.0 ms-1

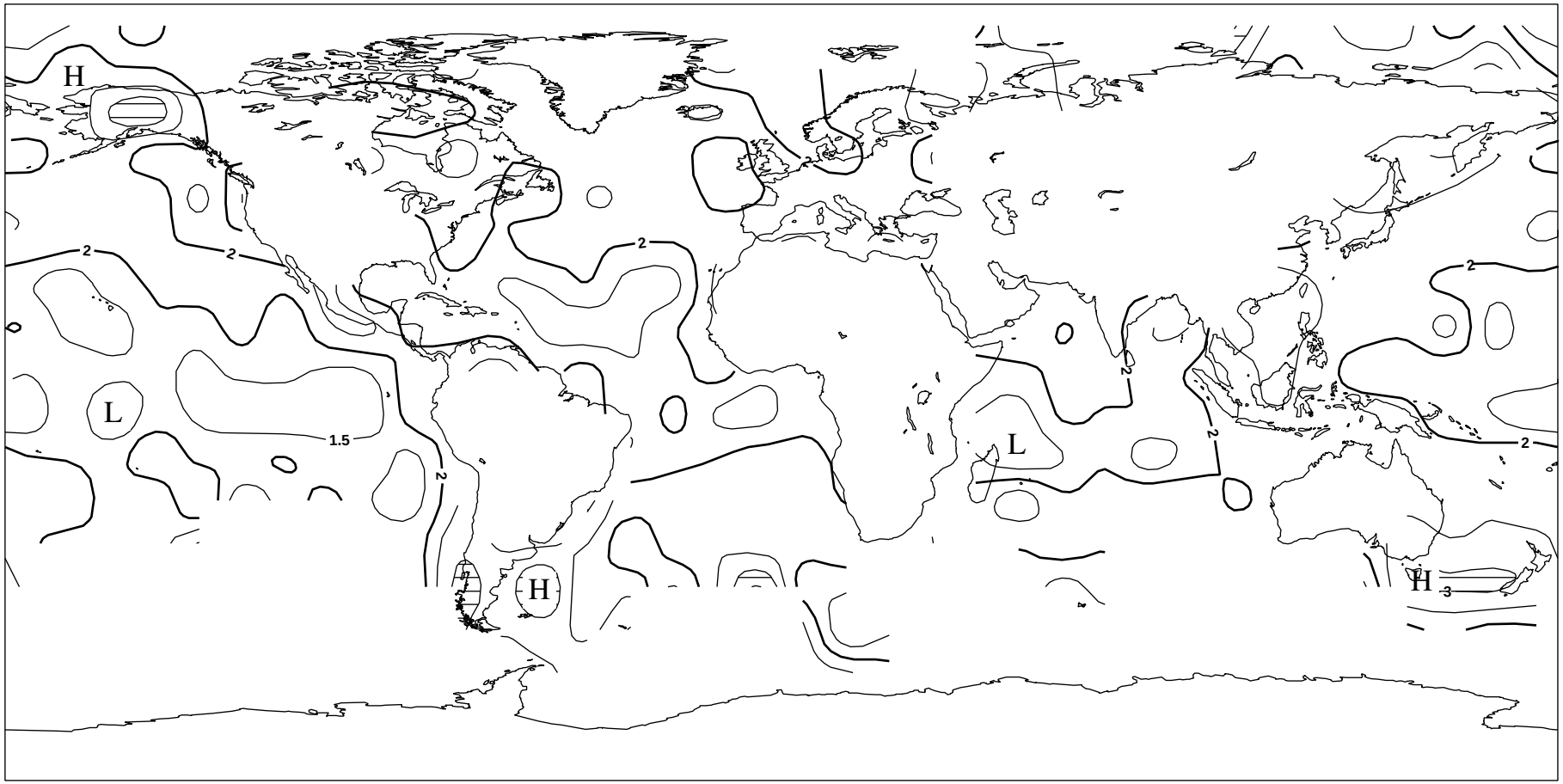


Figure 8:
Plot of the Number of Ship Wind Speed Observations. Date:- July - December 2011
Only observations passing quality control included

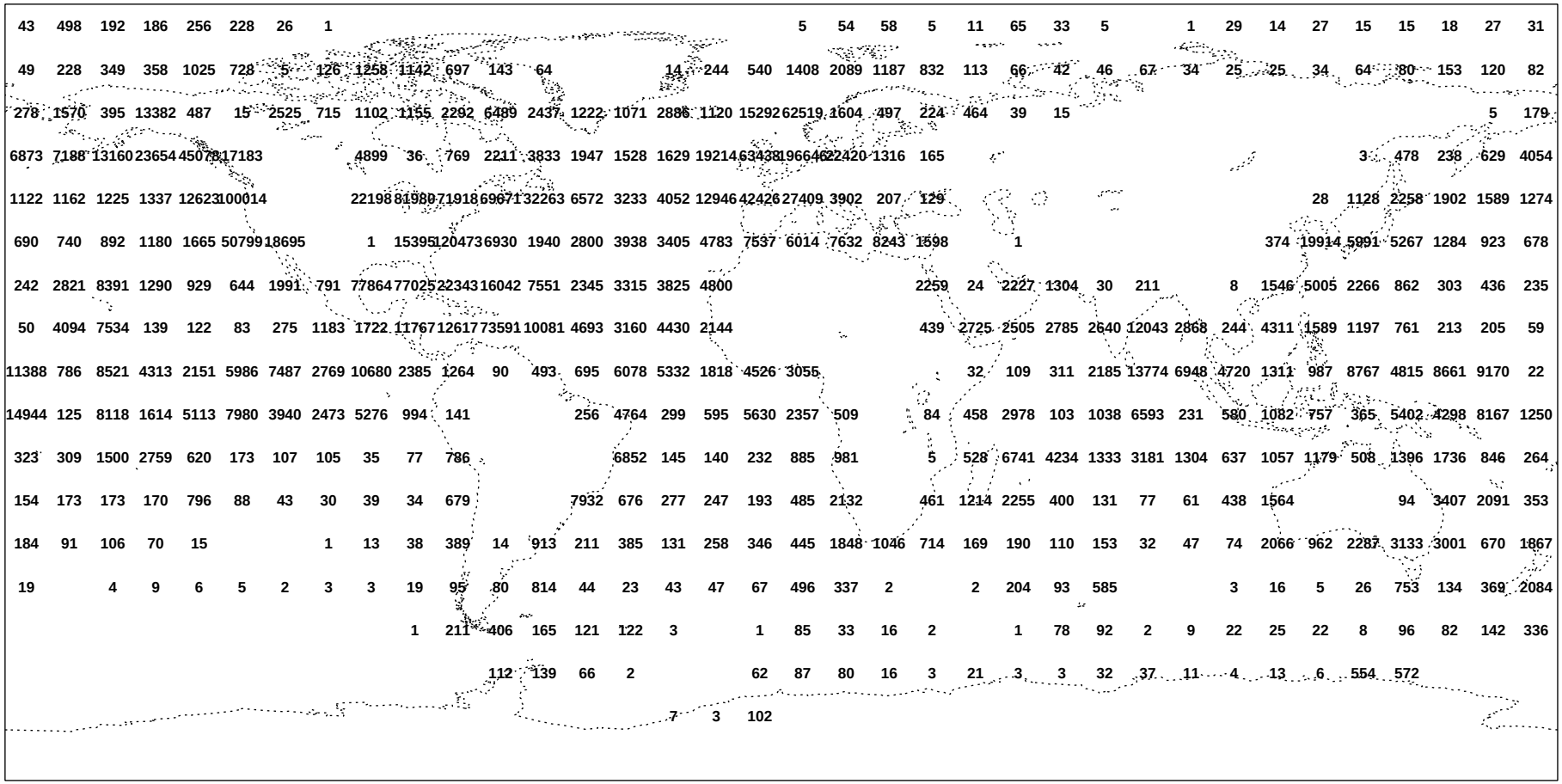


Figure 9: Bias of Ship O-B Wind Direction (degrees). Date:- July - December 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 10 degrees

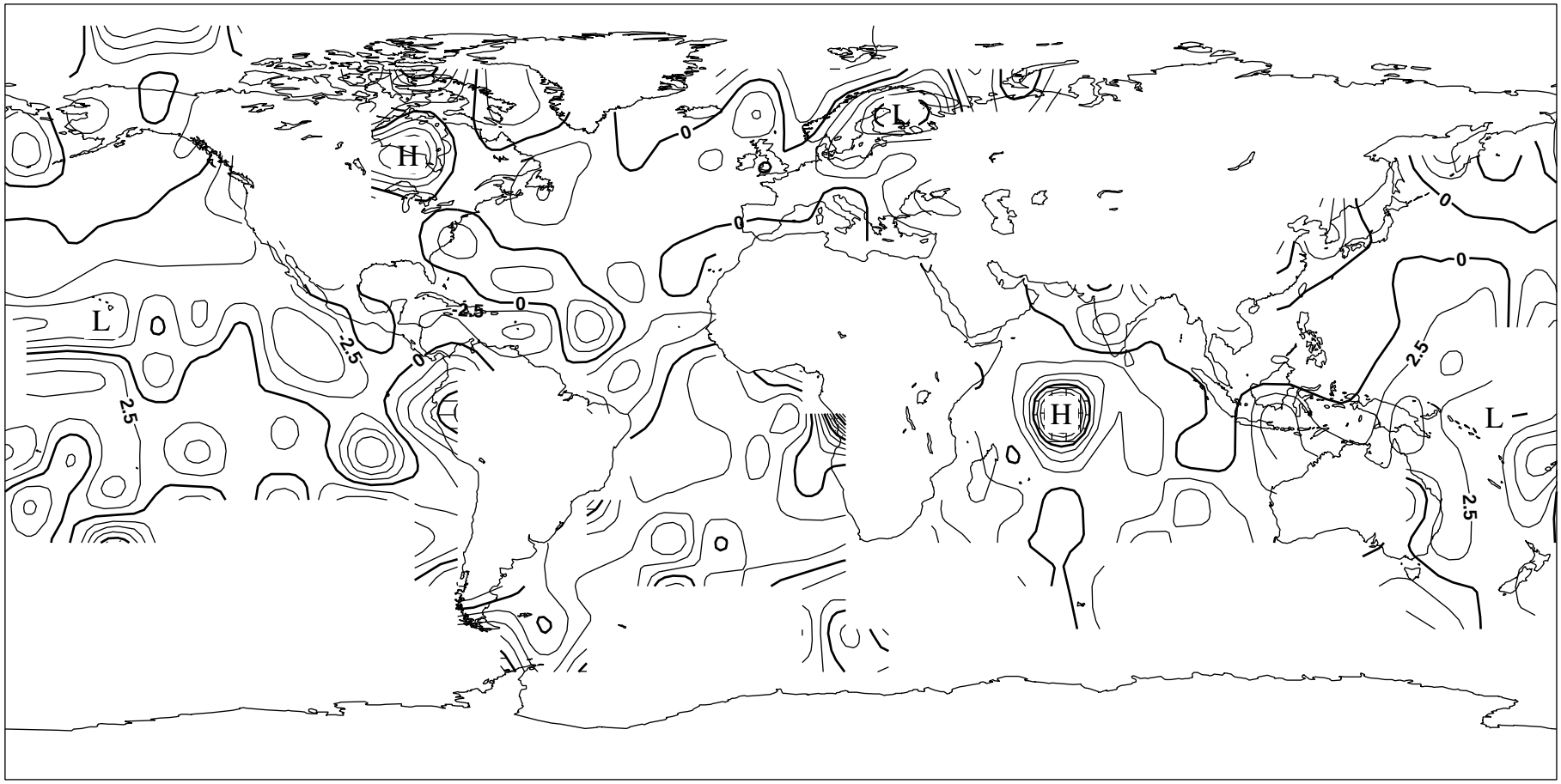


Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- July - December 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 40 degrees

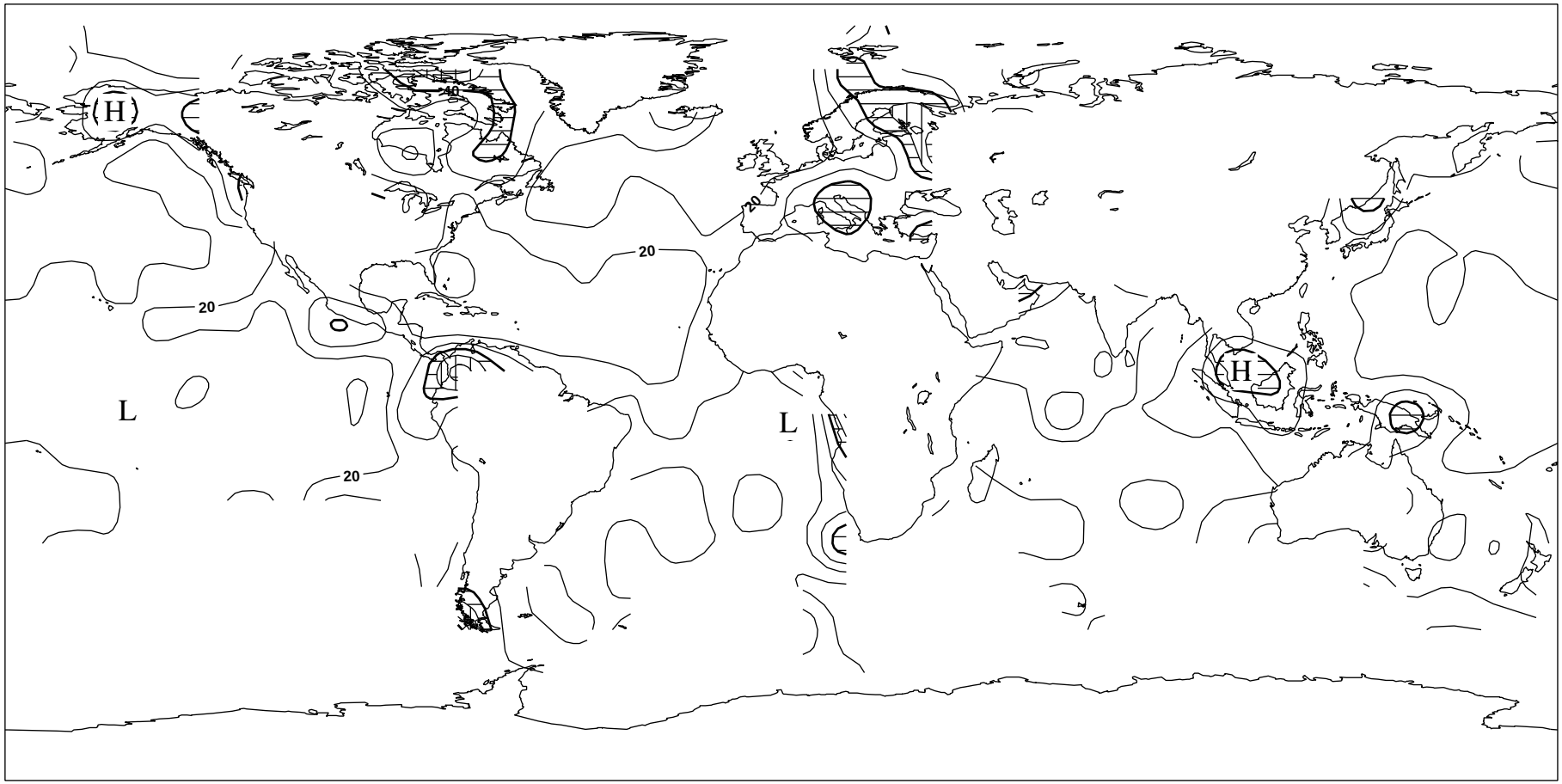


Figure 11:
Plot of the Number of Ship Wind Direction Observations. Date:- July - December 2011
Only observations passing quality control included

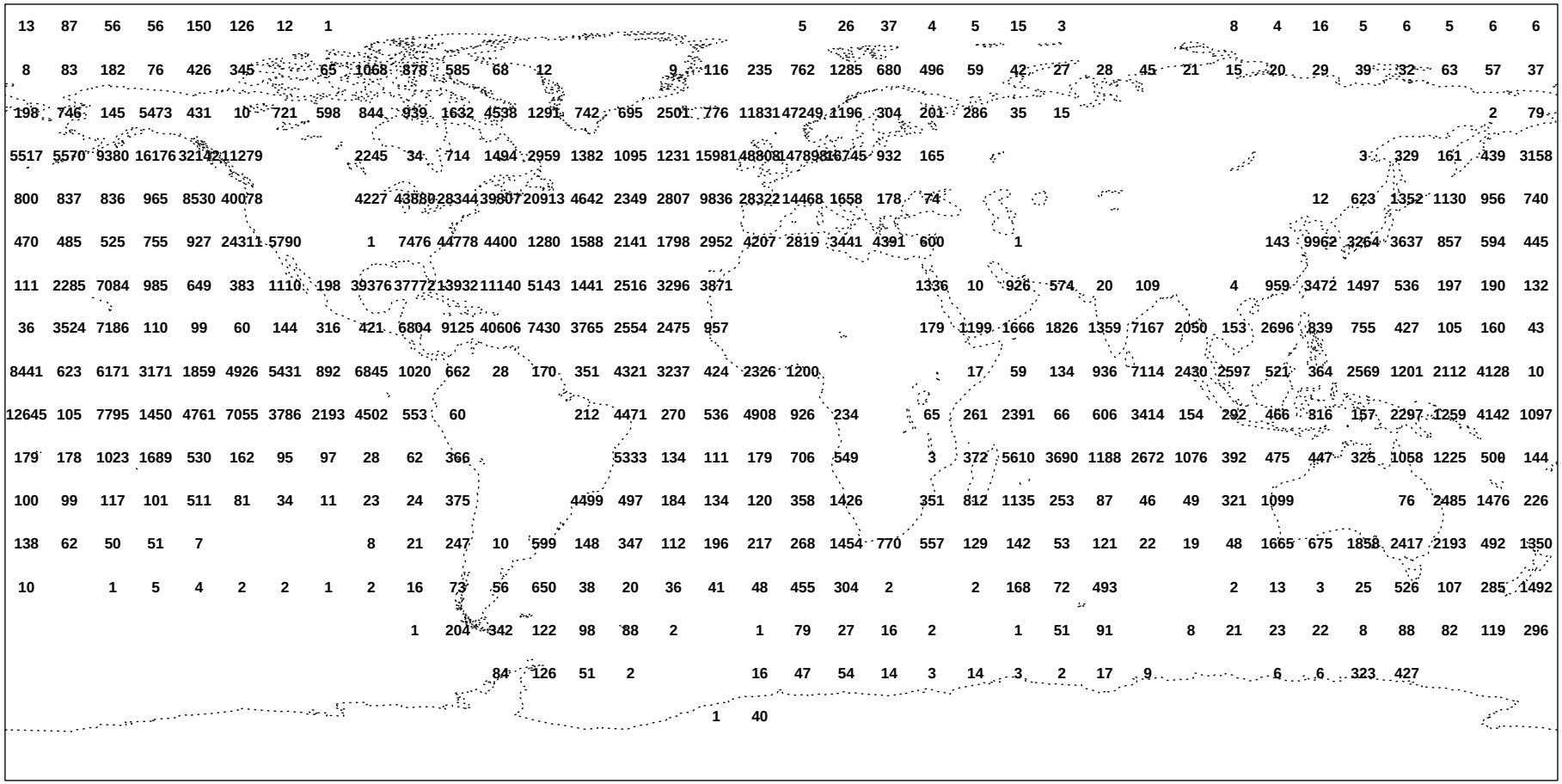


Figure 12: Bias of Ship O-B SST (degrees C). Date:- July - December 2011
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a bias of magnitude greater than 1.0 degree C

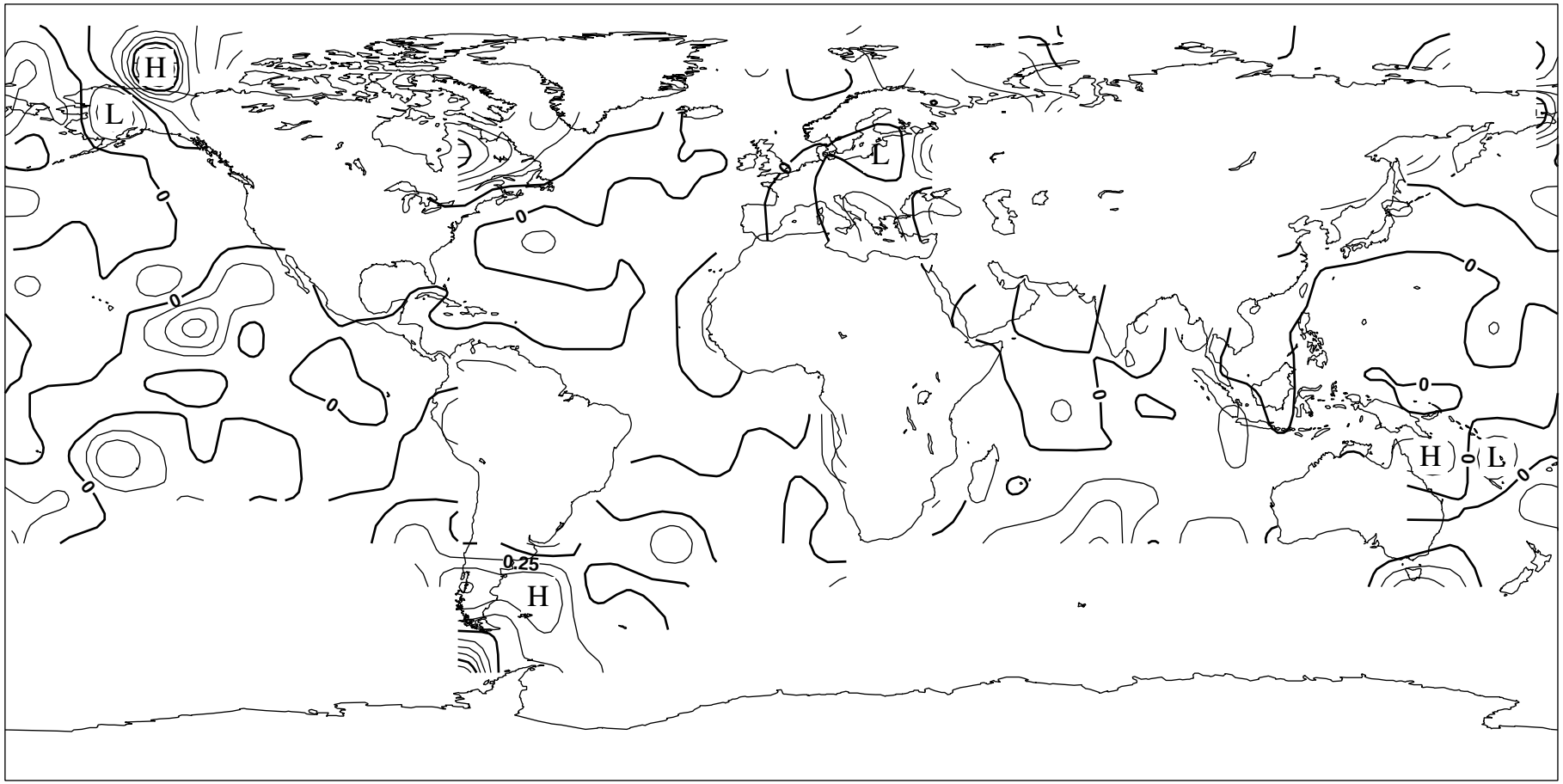


Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- July - December 2011
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 2.0 degrees C

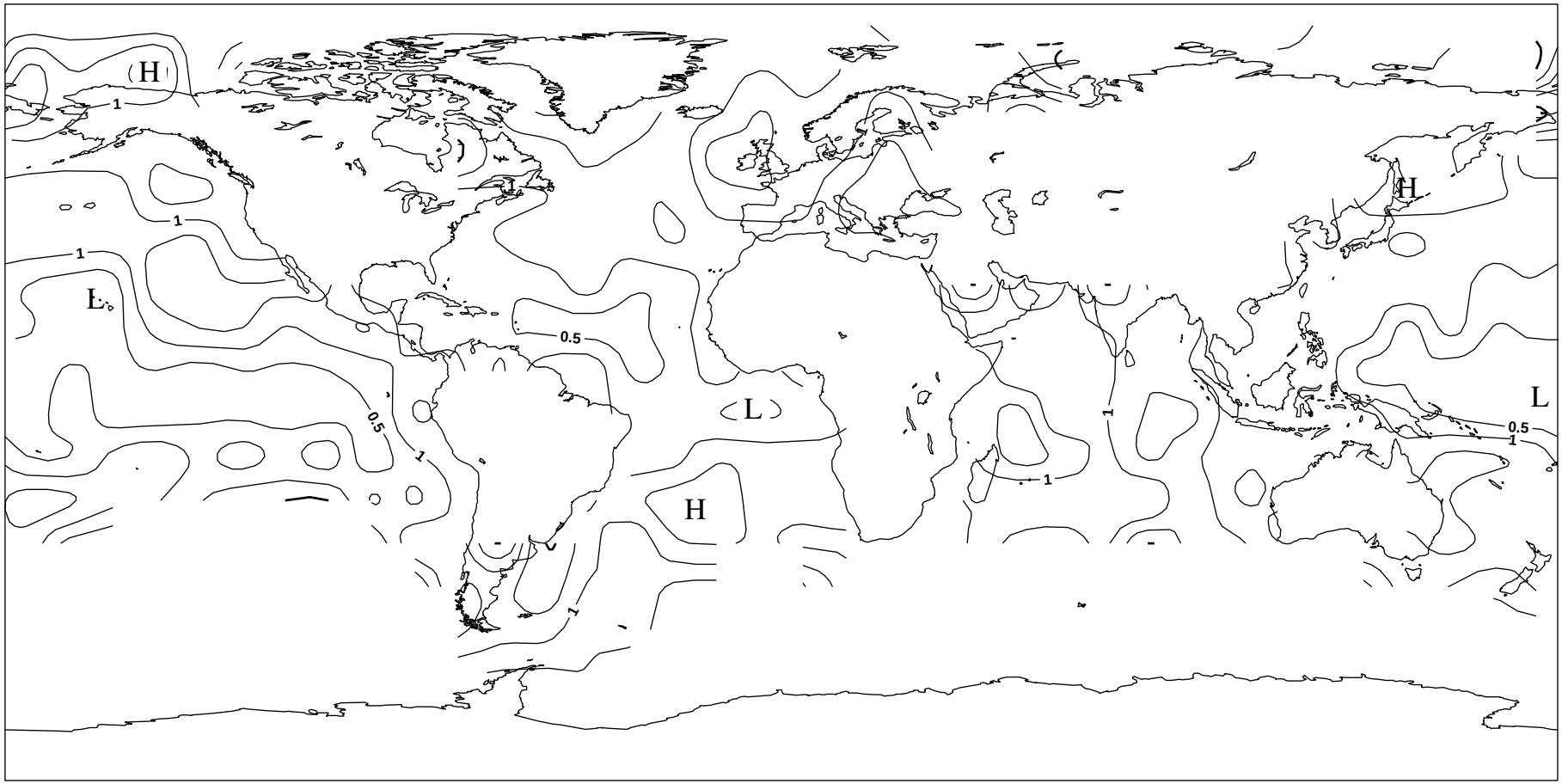


Figure 14:
Plot of the Number of Ship SST Observations. Date:- July - December 2011
Only observations passing quality control included