Report on the Quality of Marine Surface Observations

Report Number 42

July to December 2009

REPORT ON THE QUALITY OF MARINE SURFACE OBSERVATIONS:

JULY TO DECEMBER 2009

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1. INTRODUCTION

In 1985, the WMO 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 42nd report and covers the period July to December 2009. For each observing platform identified as suspect, values are supplied for the number of observations received at the Met Office, the number of these observations with gross errors, the observations' mean differences from the background values used by the 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 nearby observations. However, such quality checks are unable to identify errors on all occasions and it is recognised that the numerical data assimilation systems in use today can provide global reference values applicable in observation monitoring. The short-term forecast from the previous numerical analysis, commonly known as the first-guess or background field, provides perhaps the most useful information on observation quality, as it represents an accurate and spatially consistent estimate of the observed value which is independent of the observation itself. Observation-minus-background (hereafter referred to as O-B) differences are at the core of all monitoring work by GDPS centres. Due to the thermal-inertia of the oceans and the slowly varying nature of SST, the background SST is in fact the previous analysis (daily analyses are produced at the Met Office from an assimilation of both surface and satellite observations).

Taking all marine surface observations together, the values of O-B have distinct characteristics. The vast majority of the observations show quite small departures from background and the distribution of O-B is nearly Gaussian, with little or no bias. 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). 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 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 2009, 4307461 observations of pressure were monitored at Exeter from 2577 manual ships, 859 drifting buoys, and 495 automatic ships. The number of reports received from individual ships varies greatly as Table 1 demonstrates: 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 41 shows little change. Since most marine observations are located in the northern hemisphere, there is inevitably some seasonal variation in the number of vessels reporting, especially in the case of buoys, since new or replacement buoys are generally deployed in better weather conditions. Considering the general trends over previous reports, the decline in the number of manual ships seems to have stopped, with a small increase, and the recent large decrease in automatic ships has also stopped, but there has been a drop in the number of buoys reporting.

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 has decreased slightly over the last two reports; while the number of observations from automatic ships has increased again, after a decline in numbers in the first half of 2009. Reports from drifting buoys now account for 57.4% of the total, while those from manual ships make up just 10.5% of the total, and those from automatic ships account for the remaining 32.1%. 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, which has only recently levelled-off.

A histogram of O-B differences for all ship pressure reports in the period July to December 2009 is shown in Figure 2a, together with the Gaussian distribution with the same mean and standard deviation. Although almost all values fall within the range +5 to -5 hPa, a small number of much larger values, presumably resulting from erroneous observations, contribute to the large standard deviation of the population. The distribution for all those observations which fail the automatic quality-control checks is broad (Figure 2b). The remaining 93.9% of the observations that pass the quality checks show a distribution of O-B which is very close to Gaussian (Figure 2c) with mean O-B of -0.1hPa and standard deviation of 1.3hPa. The principal contribution to the standard deviation is assumed to be from background errors.

A global estimate of the background error, such as that provided above, can conceal large spatial variations. Background values will be more accurate in data-rich areas (e.g. in the North Sea or Mediterranean) or where the meteorological variability is low (e.g. the tropics). 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 1.0 hPa, the exceptions being generally where the sample size is small. The standard deviation is generally in the range 1.0 to 1.5 hPa, but is less than 1.0 hPa in some areas of the north Atlantic, the north-west Pacific and the tropics. The number of ship pressure reports that passed the quality control checks are shown in Figure 5.

Table 3 contains a list of those ships and drifting buoys considered to have produced suspect observations of pressure in the period July to December 2009. Values over the six-month period are given for the number of observations of pressure available for Met Office global model runs, the number of observations differing from the model background value by more than 15 hPa (gross errors), and the mean and standard deviation of the model O-B. The number of times the identifier has appeared on the monthly suspect lists from the five monitoring centres is also given. In order to give a detailed picture of the frequency of reporting and any changes in the observation accuracy, 6-month time-series of O-B differences are given at the end of the report for each of the identifiers listed.

An interesting characteristic of the errors identified here, which soon becomes obvious on inspection of the time-series charts at the end of this report, is that most can be attributed to a bias in the observed pressure. In many cases, the bias is constant over the whole monitoring period; although some values depart greatly from the sample mean, presumably due to some gross error in the observation, these are generally isolated instances. In only a few cases are there regular large random departures from background. Those observing platforms listed in Table 3 which appeared in report number 41 (January to June 2009) have been indicated with an asterisk. A comparison of the statistics given here with those in the report number 40 (July to December 2008), clearly indicates that the bias in the pressure observations from a few ships has hardly changed for more than a year.

Statistics for those marine observing platforms listed in report number 41 and which do not appear in Table 3b, are given in Table 4 along with comments on the quality of their pressure observations. Time-series of the pressure observations from these platforms are not given. Less than 40 reports were received in the 6-month period for many of these platforms, but 62% of platforms on the list do show some improvement in the quality of their observations.

3.2   Wind

Monitoring observations of wind is more problematical than pressure. On most observing platforms, wind is measured using anemometers; the reported speed depends upon the averaging period and instrument height above sea level, which varies a great deal between platforms. Since large structures distort wind flow, the anemometer position relative to the wind bearing and platform structure does affect the measurement. (These factors do not apply to those ship observations where wind speed is based on visual estimates of the sea state e.g. the UK 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 2009, 1921040 wind observations were available for monitoring at Exeter, from 2598 manual ships, 40 drifting buoys, and 538 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. As stated for pressure observations, the large increase in the number of monitored wind observations seen in report 19 was largely due to the inclusion of all 'automatic ship' data, instead of just one report in each six hour period.

Histograms of O-B differences for ship observations of wind speed are presented in Figures 2d, 2e and 2f and of wind direction in Figures 2g, 2h and 2i. As with observations of pressure, those wind observations that fail the quality-control checks differ most from background, some by as much as 50 ms^{-1}, and they make a large contribution to the variance of O-B. The distributions of O-B wind speed and direction for the remaining 93% of the observations are nearly Gaussian. There is a speed bias of 1.1 ms^{-1} relative to background, with a direction bias of just -0.8°.

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 2-3 ms^{-1} in middle latitudes and around 1.5 ms^{-1} in the tropics. The bias is generally around +1 ms^{-1}, but exceeds +2 ms^{-1} in a few places, whereas it 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 in the tropics. The standard deviation is generally between 20 and 30 degrees globally, but in some data-sparse areas and near some coasts it is as large as 40-50 degrees. The numbers of reports of wind direction used to generate these statistics are presented in Figure 11.

Figures 6-11 provide reference values against which to compare the O-B characteristics for different marine observing platforms. Table 5 contains a list of those ships and drifting buoys considered to have produced suspect observations of wind speed in the period July to December 2009, and in Table 7 a similar list is provided for wind direction. Values are given for the number of observations of wind received at the Met Office, the number of observations having a vector difference from background of more than 25ms^{-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 2009, a total of 6816958 observations of SST were monitored at the Met Office, from 2230 manual ships, 1893 drifting buoys and 351 automatic ships. Of the total, 394531 were from manual ships, 5304003 from drifting buoys and 1118424 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, although the number of buoys has increased by 7% for this reporting period and the number of manual ships has gone down by 7%. 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% 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 standard deviation of 1.1°C and no bias relative to the background.

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

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

4.   SUMMARY

There are 79 marine observing platforms listed as producing suspect observations of pressure over the period July to December 2009, 88 as producing suspect wind observations and 60 as producing suspect SST observations. The first report issued by RSMC Bracknell, for the period January to June 1989, listed 150 marine platforms producing suspect observations of pressure. With the selection criteria remaining unchanged, an initial reduction in the number of platforms listed as suspect was followed by a series of reports listing similar numbers of suspects, around 80. There was an increase in suspect numbers during 1999 and 2000 and since then the numbers have fluctuated, mostly between 100 and 160, although over the past two years there has been a downward trend, with a decrease of 35% over the previous year. Considering the fluctuations in numbers of platforms reporting and observations monitored, there seems to be little overall trend in observation quality.

For wind observations, over the years up to 2002 there was a tendency for a small increase in the number of wind observing platforms listed as suspect, but since then the numbers have fluctuated, mostly between 100 and 150, except for the last two report periods which have been well below 100. The number of SST observing platforms listed as being suspect has been fairly constant over the last two years, following a decrease in numbers from a high value of 225 four years ago.

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 2009.

Number of reports	Number of manual ships reporting			Number of drifting buoys reporting			Number of automatic ships reporting		
	Press.	Wind	SST	Press.	Wind	SST	Press.	Wind	SST*
1	259	267	182	9	10	5	13	15	3
2-10	257	268	321	6	3	12	15	17	2
11-20	176	175	184	4	1	9	4	4	3
21-40	236	242	249	4	0	8	11	11	0
41-100	563	562	478	11	0	31	15	13	5
101-200	534	534	428	16	2	28	16	18	2
201-500	414	414	233	72	1	148	24	26	12
501-1000	60	59	59	82	2	187	38	43	19
1001-1500	34	34	42	57	8	147	27	44	19
1500+	44	43	54	598	13	1318	332	347	286
Total	2577	2598	2230	859	40	1893	495	538	351
(Report 41)	(2633)	(2645)	(2400)	(832)	(65)	(1772)	(495)	(534)	(344)

* numbers are for automatic (fixed) buoys only

TABLE 2: NUMBER OF OBSERVATIONS OF PRESSURE RECEIVED AT EXETER ON THE GTS FOR EACH OF THE SIX-MONTH PERIODS COVERED BY THE WMO REPORTS ON THE QUALITY OF MARINE OBSERVATIONS.

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

TABLE 3: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT PRESSURE OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2009.

Column   1   Call sign or identifier.

Column   2   Number of pressure observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.

Column   3   Number of pressure observations differing by more than 15 hPa from background (gross error).

Column   4   Standard deviation of observation-minus-background differences excluding cases of gross error.

Column   5   Mean of observation-minus-background differences (bias) excluding cases of gross error.

Columns   6-10   Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.

Column   11   Comments on quality of pressure observations.

Notes: 1.   Units are hPa.
            2.   Observing platforms marked with an asterisk were listed in the previous report January to June 2009)

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
17653	338	111	5.4	-7.1	1	1	1	1	1	Bias
17666	2106	46	3.9	-3.1	1	0	0	1	0	Bias
21954	330	31	6.1	-3.9	2	2	2	1	2	Bias & SD
33632	1151	144	5.1	-0.4	1	1	1	1	1	SD
33647	3741	112	3.0	0.0	1	1	1	1	1	SD in November
33946	292	0	0.9	-3.3	0	0	0	0	0	Bias
33962	442	39	5.5	-1.2	0	0	0	0	0	SD
46609	185	117	4.9	4.7	1	1	1	1	1	GE & SD
46610	188	44	7.6	2.1	1	1	1	1	1	SD & GE
47538	435	423	7.9	4.0	2	2	2	1	2	GE
47554	387	118	4.3	-9.1	1	1	1	1	1	Bias & GE
48691	132	56	4.8	4.6	2	1	2	0	2	Bias
48692	104	74	1.8	-12.8	2	1	2	0	2	Bias & GE
48694	802	117	5.5	3.0	1	0	0	0	0	SD
48696	234	61	6.9	5.0	1	1	1	1	1	Bias & SD
48697	75	0	4.8	-1.5	0	0	0	0	0	SD
51682	421	173	2.9	-0.9	1	1	1	1	1	GE
55629	42	19	3.7	-9.3	1	1	1	0	1	GE
55962	42	30	2.5	-12.0	1	1	1	0	1	GE
63552	73	0	3.7	4.2	1	1	1	0	1	Bias
71607	457	55	6.8	3.9	1	1	1	1	1	SD
71614	463	3	5.2	0.3	0	0	0	0	0	SD
71615	686	451	5.0	-6.4	1	1	1	1	1	Bias & GE
73651	407	138	8.8	-0.5	1	1	1	1	1	SD & GE
74542	1138	86	5.0	-1.0	1	1	1	1	1	SD

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
23997	3342	1	0.7	4.0	3	0	2	2	1	Bias
44641	696	191	3.0	-0.5	1	0	1	1	2	Gross Errors

Table 3b: Platforms reporting in SHIP code

Identifier		N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
8PPK	*	244	27	5.5	2.9	3	1	3	0	2	SD
9HRJ9		452	15	5.9	-2.0	4	0	3	0	4	SD
9MBW7		149	2	3.1	-5.3	3	3	4	0	4	Bias
A8ET7	*	145	0	3.3	4.1	3	3	4	0	4	Bias
A8FB9		103	0	3.4	-5.5	1	1	1	0	1	Bias
A8GI7		95	15	0.9	13.8	3	3	3	0	3	Bias
A8JJ8		77	0	2.2	3.9	1	1	1	0	1	Bias reduced
A8NA3		98	0	2.2	-3.8	2	0	1	0	0	Bias
AUBE		62	0	4.1	4.9	1	1	1	0	1	Bias
AUBL	*	48	2	2.4	10.9	0	0	0	0	0	Bias
C6PZ3		92	0	3.9	5.0	1	2	2	0	4	Bias
C6SE8	*	78	1	2.3	-4.7	1	0	1	0	1	Bias
CG2960	*	945	353	4.6	-7.7	6	2	6	0	6	Biases
CG2992		2420	984	3.4	-8.9	5	4	5	0	5	Biases
CGDS	*	970	156	2.9	-7.8	5	1	5	0	5	Bias
CYBJ		73	1	3.0	6.8	1	0	1	0	1	Bias
DQVG		182	0	1.7	-4.7	4	2	5	1	5	Bias
HPHV		58	0	1.9	4.1	1	0	1	0	1	Bias
IBCF		42	0	1.1	-6.2	1	0	1	0	2	Bias
MICH		56	1	1.8	5.2	1	0	1	0	1	Bias
MRWF2	*	124	0	3.4	3.2	2	2	2	0	2	Biases
ONAI		78	0	1.4	-3.5	0	0	0	0	0	Bias
ONCA		78	1	5.2	8.1	1	0	1	0	1	Bias
ONEQ		44	0	4.8	4.6	1	0	1	0	1	Biases & SD
OUJS2		42	1	1.1	7.8	1	1	1	0	1	Bias
OXOS2		139	0	1.3	4.4	2	0	2	0	2	Bias
OZBY2		87	1	4.5	1.6	2	0	1	0	2	SD & biases
S6CG		86	1	2.3	-7.9	2	0	2	0	2	Bias
UBHE9	*	73	0	2.7	6.5	1	1	1	0	1	Bias
UCAB		108	0	2.2	3.5	1	1	1	0	1	Bias
UCJE		75	5	3.6	4.8	1	1	1	0	1	Bias
UCKA		66	5	6.2	-0.7	1	1	1	0	1	SD
UCUF	*	170	0	4.2	-0.1	0	0	0	0	0	SD
UGOU		51	1	2.9	-6.5	1	1	1	0	1	Bias
UITP		216	5	2.5	3.5	3	3	3	0	3	Bias
UITR	*	192	27	3.7	-7.2	4	4	4	1	4	Bias
V7JM2	*	136	0	0.6	-6.8	2	1	2	0	2	Bias
V7JX6		84	0	2.0	3.5	1	0	1	0	2	Bias
VC6750		1290	182	3.5	-1.3	1	1	2	0	2	Bias & SD
VGSS		51	3	3.8	-3.7	0	0	0	0	0	Bias

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
VOPM	196	142	3.9	-4.8	2	1	2	0	2	Bias
VRCQ2	148	9	6.5	-3.3	2	2	2	0	2	SD
VRWE7 *	73	0	3.2	5.0	0	1	0	0	2	Bias
VRZK8	131	0	2.2	3.4	0	0	1	0	1	Bias
WBN598: *	58	0	3.1	-2.9	0	0	0	0	0	Bias
WCZ653: *	68	0	5.1	2.1	0	0	0	0	1	SD
WDE8265	91	1	2.9	-4.4	1	1	0	0	1	Bias
WED228 *	70	1	2.3	-8.0	2	0	0	0	2	Bias
WL3108	80	26	6.0	-1.4	1	0	0	0	1	SD
WQZ7791	240	78	4.5	-3.4	3	0	1	0	3	SD & GE
WQZ9670	241	65	4.0	-0.9	2	0	2	0	2	GE
ZCDL9	74	0	2.8	6.4	1	0	1	0	2	Bias

TABLE 4: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 3 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2009.

Column 1 Call sign or identifier.

Column 2 Number of pressure observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.

Column 3 Number of pressure observations differing by more than 15 hPa from background (gross error).

Column 4 Standard deviation of observation-minus-background differences excluding cases of gross error.

Column 5 Mean of observation-minus-background differences (bias) excluding cases of gross error.

Column 6 Comments on quality of pressure observations.

Notes: 1. Units are hPa

Identifier	N Obs.	NGE	SD	Bias	Comments
2AJl3	1	0	0.0	12.0	Less than 40 reports
62138	205	1	1.8	-1.9	Bias & SD reduced
9VDN3	282	1	2.2	-2.6	Bias reduced in December
9VKQ3	211	11	6.2	7.3	Bias reduced in December
A8AT8	5	0	0.9	4.1	Less than 40 reports
A8IQ2	18	0	0.8	5.2	Less than 40 reports
A8IT6	13	0	1.0	-1.8	Less than 40 reports
A8JR5	48	0	1.2	0.5	Bias reduced
A8LC5	13	0	1.1	-3.5	Less than 40 reports
A8MG8	22	0	0.8	-5.6	Less than 40 reports
A8PQ8	233	0	3.0	4.9	Bias reduced
ATSJ	12	1	1.9	3.9	Less than 40 reports
AUFI	26	0	0.9	4.5	Less than 40 reports
AVOSTEST	1	0	0.0	0.9	Less than 40 reports
C6FV8	30	19	1.9	-12.5	Less than 40 reports
C6FY5	278	0	2.0	-0.4	Reduced bias
C6LU3	230	0	2.7	2.7	Reduced bias
C6QF6	180	0	2.3	1.3	Bias reduced
C6TX6	91	1	2.5	0.3	Reduced SD
C6VF3	263	0	1.8	1.5	Reduced bias
DNFA	35	0	2.2	4.0	Less than 40 reports
HPYE	428	0	1.7	-0.1	Reduced biases
HRRF	25	0	0.5	-8.9	Less than 40 reports
HZZD	72	0	2.1	-0.7	Reduced bias
ONCF	128	0	3.9	2.0	Reduced bias & GEs
ONEV	153	0	2.9	-3.7	Reduced bias
OUOW2	5	1	6.5	4.1	Less than 40 reports
OYAU2	19	0	2.2	7.3	Less than 40 reports
PBAD	508	36	4.4	-1.5	Reduced bias from September
PBCJ	144	0	2.1	-1.4	Reduced bias from October
PHFV	258	1	2.5	-2.8	Reduced bias from November
UFCK	46	1	2.6	-2.8	Reduced bias
UGWJ	210	3	2.7	2.8	Reduced bias
UHWZ	2	0	0.5	-2.2	Less than 40 reports
UISD	17	0	3.3	-5.6	Less than 40 reports
V7BW6	246	6	4.6	-4.2	Reduced bias
V7BW8	369	0	2.5	3.6	Reduced bias from November
V7DI8	225	0	2.8	8.1	Reduced bias from November
V7HP2	34	25	4.6	0.6	Less than 40 reports
VRBW4	136	1	1.7	-0.6	Reduced bias
VRDN3	90	1	3.0	-3.4	Reduced bias from November
VTXG	131	1	2.1	2.1	Reduced bias
VWSZ	86	2	2.3	-3.1	Reduced bias
WDA3359	16	0	2.5	-0.6	Less than 40 reports
WDC8307	200	4	4.3	3.2	Reduced bias in December
WDD4207	116	0	0.7	-0.2	Reduced bias

TABLE 5: LIST OF MARINE OBSERVING PLATFORMS REPORTING SUSPECT WIND SPEED OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2009.

Column	1	Call sign or identifier.
Column	2	Number of wind speed observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column	3	Number of wind observations with vector difference from background of more than $25ms^{-1}$ (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 2009)

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

*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
23171	*	56	0	1.0	-7.9	1	1	1	1	1	Bias
3EKU3		98	0	4.7	9.2	3	3	3	0	3	Bias
9VBA		76	1	5.9	3.2	0	1	1	0	0	SD
A8CP8		113	1	4.3	5.8	2	2	1	0	2	Bias
A8KO3		173	16	6.9	11.2	4	3	3	0	4	SD
ELTG9		56	2	5.9	7.6	1	0	1	0	1	Bias
KS000		59	2	4.0	6.6	1	1	1	0	1	Bias
KS078	*	474	55	6.3	2.0	1	1	1	0	1	SD
PCHM		1491	1	3.5	3.8	0	0	0	0	0	Bias
VEP717	*	1257	0	4.5	5.7	5	2	1	0	2	Bias
ZCDF8		798	0	3.3	3.8	0	0	0	0	0	Bias
ZCDP2		42	1	4.7	6.7	1	1	1	0	1	Bias

TABLE 6: **LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 5 BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2009.**

Column   1   Call sign or identifier.

Column   2   Number of wind speed observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.

Column   3   Number of wind observations with vector difference from background of more than $25ms^{-1}$ (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
A8MG8	22	0	3.5	2.9	Less than 40 reports
A8PQ6	344	3	3.9	3.6	Reduced bias
C6KD5	253	0	3.4	3.2	Reduced SD
VWSZ	86	1	4.9	4.1	Reduced bias
WBN5982	59	0	2.6	1.6	Reduced bias

TABLE 7: LIST OF MARINE OBSERVING PLATFORMS PRODUCING SUSPECT WIND DIRECTION OBSERVATIONS OVER THE PERIOD JULY TO DECEMBER 2009.

Column	1	Call sign or identifier.
Column	2	Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column	3	Number of wind observations with vector difference from background of more than 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 2009)

Table 7a: Platforms reporting in BUOY code

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

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
42902	2828	0	37.5	38.8	1	1	0	2	3	Bias

*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	*	2487	142	89.4	3.1	2	0	2	1	1	SD
23170	*	211	0	26.8	51.5	1	1	1	1	0	Bias
23491	*	64	0	9.7	147.8	1	0	1	0	1	Bias
23494	*	172	0	51.8	-14.9	0	0	0	0	1	SD
3EBL5		171	0	72.6	-14.0	0	0	0	0	2	SD
3FCA9	*	73	1	60.2	-30.4	0	0	0	0	1	SD
3FPQ9		319	0	69.8	-6.4	0	0	0	0	1	SD
3FPS9		463	5	69.0	-17.1	0	1	0	0	1	SD
42364		2384	0	40.3	70.8	2	1	2	1	2	Bias
46022		4222	0	47.3	37.8	0	0	0	0	5	Bias
46081	*	4125	0	40.8	-37.3	0	0	3	5	6	Bias
46094		2404	0	82.0	33.4	1	0	0	0	1	SD + bias
61010		559	0	56.1	82.5	3	3	6	2	0	Bias
62081		383	4	93.7	17.6	1	0	2	0	1	SD
62128	*	3420	5	47.9	28.8	0	0	0	0	0	Bias
9HOM8		310	0	63.9	4.5	0	0	0	0	3	SD
9VAY4	*	114	0	75.1	1.0	0	2	2	0	2	SD
9VDN3	*	285	0	58.7	-21.2	1	0	0	0	5	SD
9VVD6		92	1	73.5	-18.8	1	0	0	0	1	SD
A3BN5		82	0	69.5	24.5	0	0	0	0	0	SD
A8CJ9		93	0	69.6	-16.7	0	0	0	0	1	SD
A8FS8		61	0	73.3	-4.6	1	1	1	1	2	SD
A8FW3		119	0	66.1	-3.6	0	0	1	0	1	SD
A8GX4		119	0	63.6	-26.9	0	1	1	0	1	SD
A8IH2	*	206	4	92.6	-2.7	3	3	3	0	3	SD
A8JM3		104	0	63.7	-20.9	0	0	0	0	0	SD
A8ME4	*	78	0	74.6	7.8	0	0	0	0	1	SD
A8PQ4		348	0	73.2	-15.8	2	1	2	0	4	SD
A8PQ8		230	0	60.9	-11.6	0	0	0	0	0	SD
ATMG		69	1	67.3	6.7	0	0	0	0	0	SD
ATVX	*	115	0	50.3	-6.6	0	0	0	0	1	SD
C6HS4		72	0	63.6	16.0	1	0	1	0	2	SD
C6JT		124	0	70.8	-6.1	0	0	0	0	3	SD
C6KD5	*	253	0	73.5	-8.2	3	3	3	0	4	SD
C6XE5		99	1	73.3	-2.4	0	0	1	0	3	SD
DAQZ		133	0	36.7	-44.0	2	1	2	0	2	Bias
DCPC2		94	0	60.9	-12.9	0	0	0	0	0	SD
DDVK2		248	5	79.0	28.2	1	1	1	0	1	SD + bias
DGOS		183	4	80.1	-17.4	0	1	2	0	4	SD
DICB		95	2	70.0	-5.8	0	0	1	0	1	SD

Identifier		N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
FHQB		370	0	89.1	-19.6	2	4	4	0	4	SD
IBCE	§	97	3	67.4	2.4	0	0	0	0	1	SD
J8AZ3		179	0	53.2	-39.1	0	0	0	0	1	Bias
J8NW	*	193	0	59.4	-2.7	0	0	0	0	2	SD
JNCJ	*	78	0	56.0	9.8	0	0	0	0	0	SD
KF001		174	0	62.8	5.9	0	0	0	0	2	SD
KS034	*	78	0	51.1	6.1	0	0	0	0	2	SD
KS078	*§	474	55	110.7	-22.3	4	2	4	0	4	SD
MGSM5		71	0	42.7	45.3	1	1	1	0	1	Bias
MHNO6		63	0	54.8	-32.2	0	0	0	0	0	Bias
MVQP8		120	0	67.3	13.8	0	0	0	0	2	SD
NWS001	*§	1033	2	40.0	6.6	0	0	0	0	1	SD
OVYQ2		100	0	77.7	-4.8	0	0	0	0	0	SD
PEBP		154	1	64.8	-22.6	0	0	0	0	0	SD
S6TB		66	0	61.8	7.7	0	0	0	0	0	SD
TBWUK1	*	121	0	60.9	-17.8	0	0	0	0	1	SD
UASP		126	1	72.4	8.3	0	0	0	0	0	SD
UCAD		100	2	77.7	-6.4	0	0	0	0	1	SD
UCJE		75	1	69.3	37.0	1	1	1	0	1	SD
UCKA		62	0	65.5	-3.9	0	0	0	0	2	SD
UCUF		169	1	67.1	9.3	0	0	0	0	1	SD
UCUO		146	4	77.1	-10.3	1	1	1	0	1	SD
V2AC6		77	0	72.7	-7.2	0	0	0	0	1	SD
V2BM5	*	102	0	57.3	8.2	0	0	0	0	1	SD
V2NA1	*	72	0	56.4	-0.3	0	0	0	0	0	SD
VRCQ2		153	0	90.5	31.8	2	2	2	0	3	SD + bias
VRDT7		187	2	63.6	-11.0	0	0	0	0	2	SD
VRFS2		81	2	75.2	-5.4	0	0	0	0	2	SD
VRXK4		786	0	88.4	5.4	2	2	1	0	5	SD
WBP321(	*	1938	18	91.2	1.3	2	2	2	0	2	SD
WBS5272		93	0	63.0	-5.9	0	0	0	0	0	SD
WCF3990		90	0	63.5	0.8	0	0	0	0	0	SD
WCX4608		69	0	67.6	-19.4	0	0	0	0	1	SD
WCX744	*	3080	8	79.6	1.9	2	3	2	0	2	SD
WDD9281		591	0	66.9	-18.9	0	0	0	0	1	SD
WWU8	*	86	0	66.2	24.6	0	0	0	0	1	SD
ZCBP6		75	1	72.3	-10.9	0	0	0	0	0	SD

TABLE 8: LIST OF PLATFORMS REPORTING IN SHIP CODE NOT APPEARING IN TABLE 7
BUT LISTED AS SUSPECT OVER THE PERIOD JANUARY TO JUNE 2009.

Column	1	Call sign or identifier.
Column	2	Number of wind direction observations available for monitoring over the 6-month period, excluding duplicates, but including any observations with gross errors.
Column	3	Number of wind observations with vector difference from background of more than 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
23102	610	0	30.8	20.8	Reduced bias
9VJC5	77	0	53.5	18.7	Reduced SD
9VVN8	156	1	42.7	-12.9	Reduced SD
A8AL3	8	0	5.9	11.7	Less than 40 reports
A8EH3	20	0	77.0	-23.9	Less than 40 reports
A8KM9	26	0	55.5	12.7	Less than 40 reports
A8LL9	79	0	26.9	-6.4	Reduced SD
A8NH4	77	0	52.5	-22.3	Reduced SD
C6JD4	74	0	37.1	-20.0	Reduced bias
DDAL2	112	0	53.4	-15.3	Reduced SD
DGVZ	64	0	48.5	-12.7	Reduced SD
ELVB3	37	0	49.8	0.8	Less than 40 reports
KS073	17	0	126.0	-60.6	Less than 40 reports
LAVD4	112	0	43.1	-11.9	Reduced SD
PCBU	333	0	88.0	-15.1	SD
TBWGR00	9	0	27.8	-6.9	Less than 40 reports
UCUC	32	0	55.8	4.7	Less than 40 reports
UDYG	147	0	13.8	-2.0	Reduced bias
UGPK	105	0	53.4	-7.9	Reduced SD
V2FN	68	0	45.6	-31.1	SD
V2OW1	5	0	100.3	16.7	Less than 40 reports
VQBW2	94	0	56.0	0.0	Reduced SD
WBN8467	94	0	52.2	-47.9	Reduced bias
WCX9106	163	0	50.7	-28.7	Reduced SD
ZCDH7	68	0	39.1	-8.0	Reduced SD
ZCDJ6	116	0	43.2	5.7	Reduced SD

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

Column   1   Call sign or identifier.

Column   2   Number of sea-surface temperature observations available for monitoring over the six-month period, excluding duplicates, but including any observations with gross errors.

Column   3   Number of sea surface temperature observations differing by more than 10 °C from background (gross error).

Column   4   Standard deviation of observation-minus-background differences excluding cases of gross error.

Column   5   Mean of observation-minus-background differences excluding cases of gross error.

Columns 6-10 Number of times observing platform has appeared on suspect lists. B=Exeter, E=ECMWF, F=MétéoFrance, T=Tokyo, W=Washington.

Column   11   Comments on quality of sea surface temperature observations.

Notes: 1.   Units are °C

           2.   Observing platforms marked with an asterisk were listed in the previous report (January to June 2009)

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
13925	151	139	0.2	9.7	1	-	0	-	1	Bias
15944	136	136	---	---	1	-	0	-	1	GE
15945	306	0	1.9	4.3	1	-	1	-	1	Bias
16960	359	206	0.2	-0.2	1	-	0	-	1	GE
21943	854	275	0.6	9.0	1	-	1	-	1	Bias
31733	1435	962	5.7	0.2	3	-	3	-	3	SD
31776	661	96	3.9	-3.7	2	-	1	-	1	Bias & SD
32624	119	0	3.1	3.4	1	-	1	-	0	Bias
32648	176	72	2.7	-4.6	1	-	1	-	0	Bias
41907	435	0	2.6	5.8	1	-	1	-	1	Bias
44503	266	0	1.2	-4.4	1	-	1	-	1	Bias
48511	327	327	---	---	2	-	2	-	2	GE
48526	429	429	---	---	2	-	0	-	2	GE
48596	444	444	---	---	1	-	0	-	1	GE
54549	1365	0	1.4	3.3	2	-	0	-	1	Bias
55902	451	0	0.7	5.8	1	-	0	-	1	Bias
56522	484	188	0.2	-0.4	1	-	0	-	1	GE
56531	646	250	4.4	-3.0	1	-	2	-	2	Bias
63529	11794	50	2.9	-0.8	1	-	0	-	2	Bias in Dec
63657	376	82	0.1	-9.6	1	-	1	-	1	Bias
63669	397	76	4.3	-5.2	1	-	1	-	1	Bias
63935	630	353	3.3	-1.0	1	-	1	-	1	GE
63943	2551	394	1.9	0.1	0	-	0	-	0	GE
63994	67	0	1.5	-8.1	1	-	0	-	1	Bias

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

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

Table9b: Platforms reporting in SHIP code

Identifier	N Obs.	NGE	SD	Bias	B	E	F	T	W	Comments
3FJY6	55	1	1.2	-4.5	1	-	1	-	1	Bias
64071	690	0	2.6	-3.1	1	-	0	-	0	Bias
9HJB9 *	1286	696	2.8	-1.5	5	-	5	-	5	Bias + GE
9HOB8	372	24	2.6	-4.9	4	-	5	-	3	Bias
9V7954	47	1	2.5	-3.2	0	-	0	-	0	Bias
9V8258	57	53	3.1	-3.3	0	-	0	-	0	Bias + GE
9VAY4	108	6	1.9	-5.5	3	-	3	-	3	Bias
A81V4	89	5	2.6	-5.2	1	-	1	-	1	Bias
A8CS3	45	1	3.8	-4.8	1	-	1	-	1	Bias
A8GA8	127	0	1.4	6.5	2	-	3	-	3	Bias
A8HF6 *	153	5	3.6	-1.8	1	-	0	-	0	SD
A8IN8	117	0	2.5	4.5	3	-	4	-	3	Bias
B2M1297	54	0	1.9	3.3	0	-	0	-	0	Bias
CGDP	274	174	3.3	3.2	1	-	1	-	1	Bias
DANV	43	0	0.9	-3.2	0	-	0	-	0	Bias
DEAL *	80	0	0.8	-3.4	1	-	2	-	0	Bias
DGTX *	144	0	1.3	2.6	1	-	2	-	1	Bias
DIBZ *	53	0	0.7	-3.5	1	-	1	-	0	Bias
DPCK	76	0	1.5	-3.0	1	-	1	-	0	Bias
J8PD	73	0	1.0	-6.9	1	-	1	-	1	Bias
KHRC *	42	0	0.8	-3.7	1	-	1	-	0	Bias
KS034 *	97	0	0.5	3.4	3	-	3	-	2	Bias
KS063 *	145	145	---	---	1	-	0	-	1	GE
KS078 *	79	0	0.4	-5.7	1	-	2	-	2	Bias
KS080 *	96	50	0.5	9.4	2	-	0	-	2	Bias
ONAN *	119	1	3.1	-3.5	2	-	1	-	2	Bias
ONEQ	44	0	1.3	-3.2	1	-	0	-	0	Bias
PDWZ	87	0	0.9	4.1	3	-	4	-	2	Bias
PFQE	58	0	1.8	3.0	0	-	0	-	1	Bias
PHAL	139	0	0.9	-3.4	2	-	2	-	0	Bias
SAMARIA	59	0	2.1	-5.7	1	-	1	-	2	Bias
SGBA *	44	0	0.6	2.5	0	-	0	-	0	Bias
SIWN	212	1	2.0	3.3	2	-	2	-	2	Bias
VRXK4	770	0	2.0	-3.5	4	-	3	-	1	Bias
ZCBP6	58	0	2.5	5.0	0	-	0	-	0	Bias
ZDGR8 *	138	1	2.6	2.2	1	-	3	-	1	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 2009.

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
9KKS	175	0	2.3	-1.2	Reduced bias from October
9VAH	41	4	4.8	4.8	Reduced bias in Dec
A8IX8	79	0	0.6	-2.7	Reduced bias
DAJL	13	0	0.4	3.2	Less than 40 reports
KS066	25	0	1.4	4.7	Less than 40 reports
KS087	28	28	---	---	Less than 40 reports
KS088	26	16	0.5	-9.3	Less than 40 reports
KS089	11	11	---	---	Less than 40 reports
PDUJ	1	0	0.0	0.1	Less than 40 reports
UCJL	148	0	1.1	2.2	Reduced bias
UHWZ	7	1	1.0	3.5	Less than 40 reports
V7DI7	170	0	0.5	2.4	Reduced bias
VRWE7	65	4	1.0	0.0	Reduced bias
VRXK9	9	8	0.0	3.4	Less than 40 reports
WZZF	264	0	1.6	0.3	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

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

Mean O-B = -0.3   SD O-B = 2.9
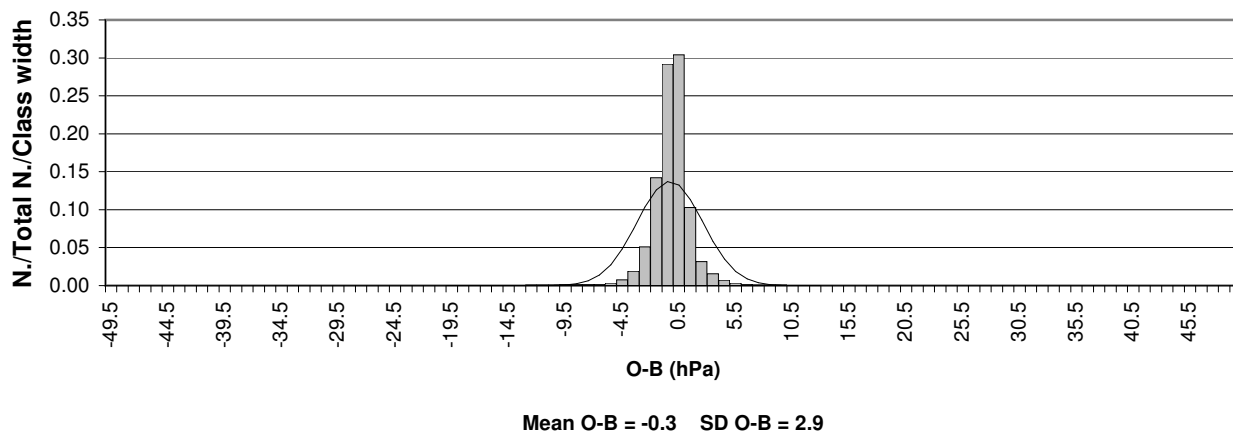
Figure 2b: Distribution of ship O-B pressure (hPa)
Period of data: JUL-DEC 2009   Data used: Flagged observations

Mean O-B = -1.2   SD O-B = 7.6
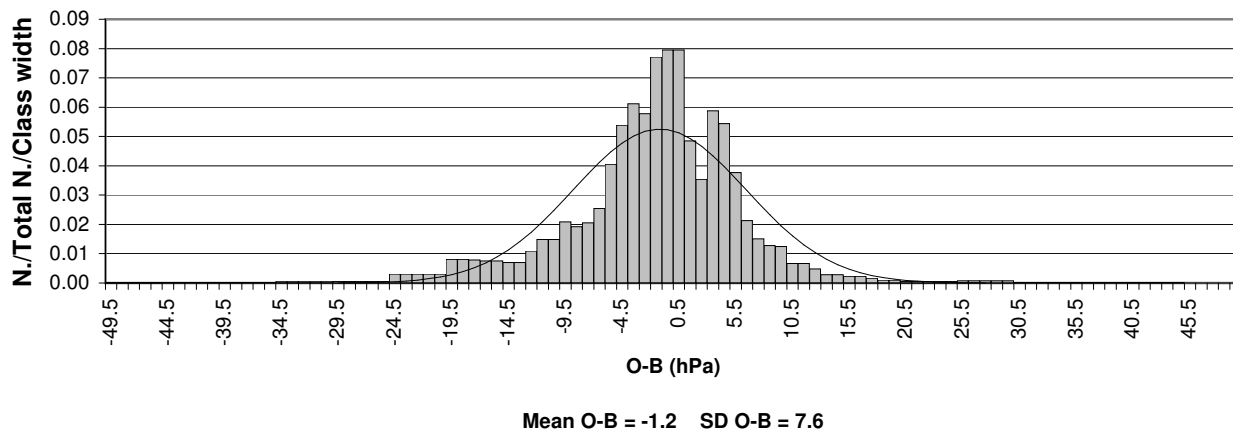
Figure 2c: Distribution of ship O-B pressure (hPa)
Period of data: JUL-DEC 2009   Data used: Unflagged observations

Mean O-B = -0.1   SD O-B = 1.3
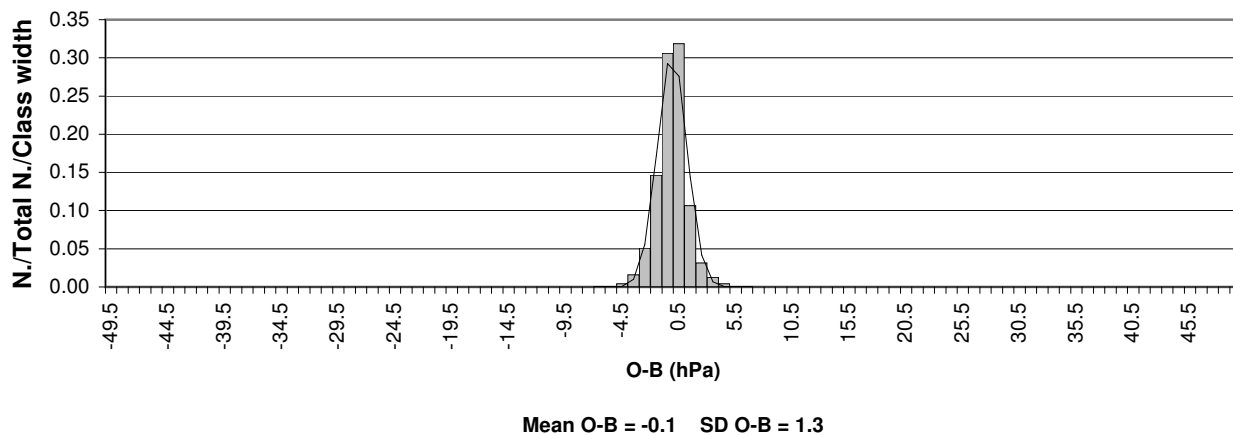
Figure 2d: Distribution of ship O-B wind speed (ms⁻¹)
Period of data: JUL-DEC 2009   Data used: All observations

Mean O-B = 1.2   SD O-B = 3.2
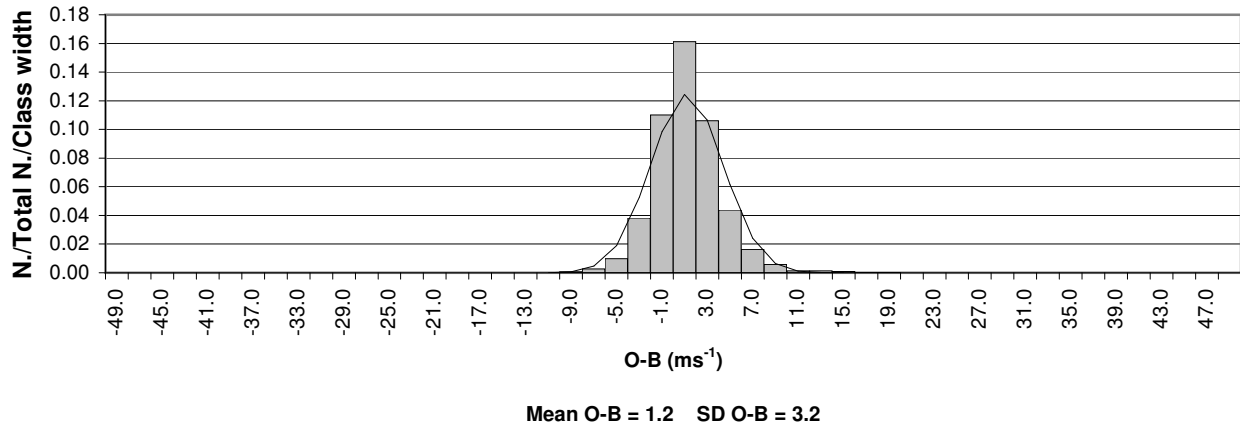
Figure 2e: Distribution of ship O-B wind speed (ms⁻¹)
Period of data: JUL-DEC 2009   Data used: Flagged observations

Mean O-B = 1.8   SD O-B = 6.1
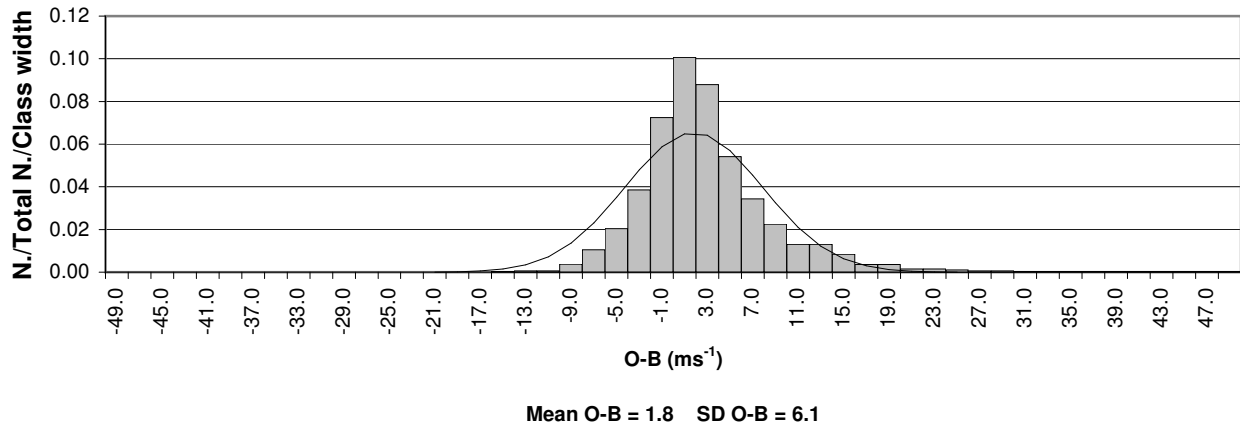
Figure 2f: Distribution of ship O-B wind speed (ms⁻¹)
Period of data: JUL-DEC 2009   Data used: Unflagged observations

Mean O-B = 1.1   SD O-B = 2.6
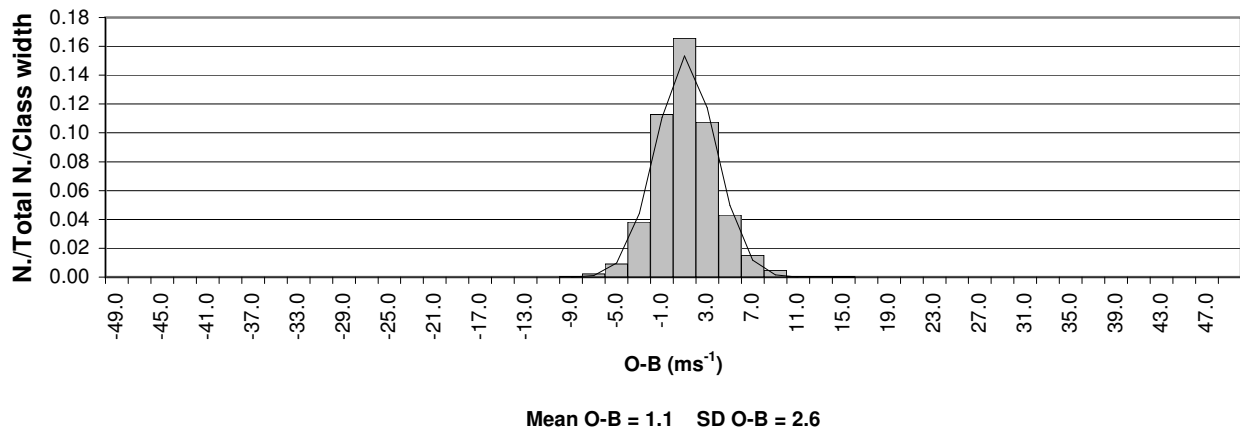
Figure 2g: Distribution of ship O-B wind direction (degrees)
Period of data: JUL-DEC 2009   Data used: All observations

Mean O-B = -0.8   SD O-B = 36.4
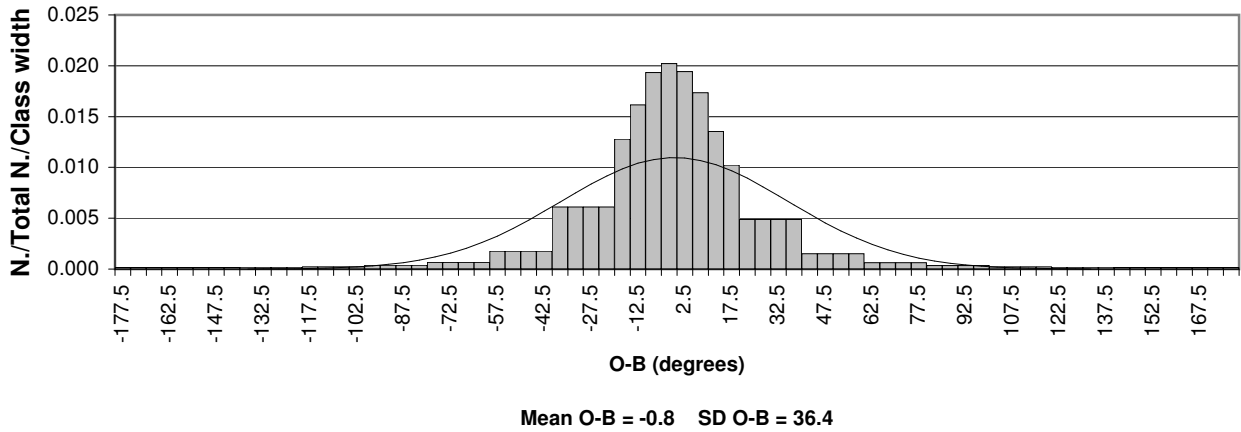
Figure 2h: Distribution of ship O-B wind direction (degrees)
Period of data: JUL-DEC 2009   Data used: Flagged observations

Mean O-B = -0.6   SD O-B = 64.2
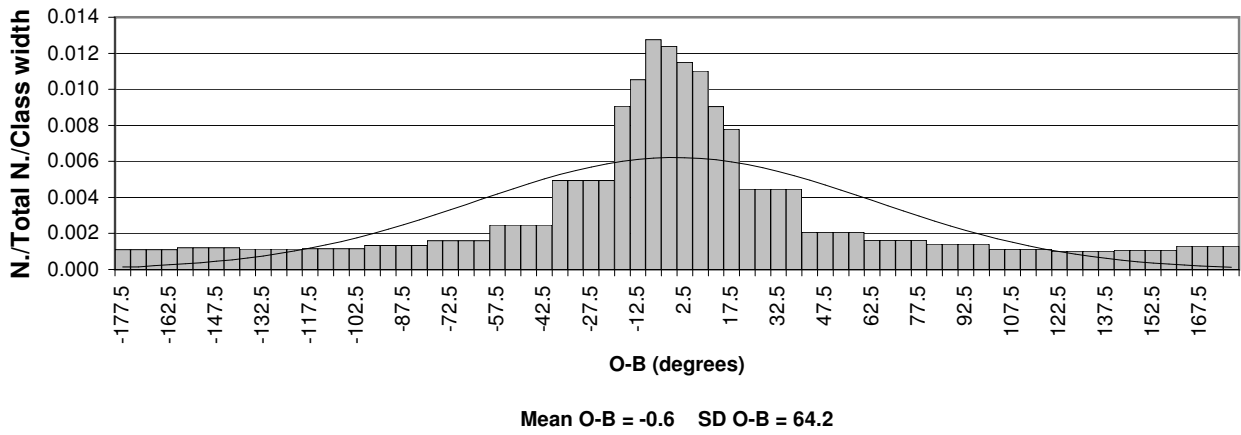
Figure 2i: Distribution of ship O-B wind direction (degrees)
Period of data: JUL-DEC 2009   Data used: Unflagged observations

Mean O-B = -0.8   SD O-B = 30.7
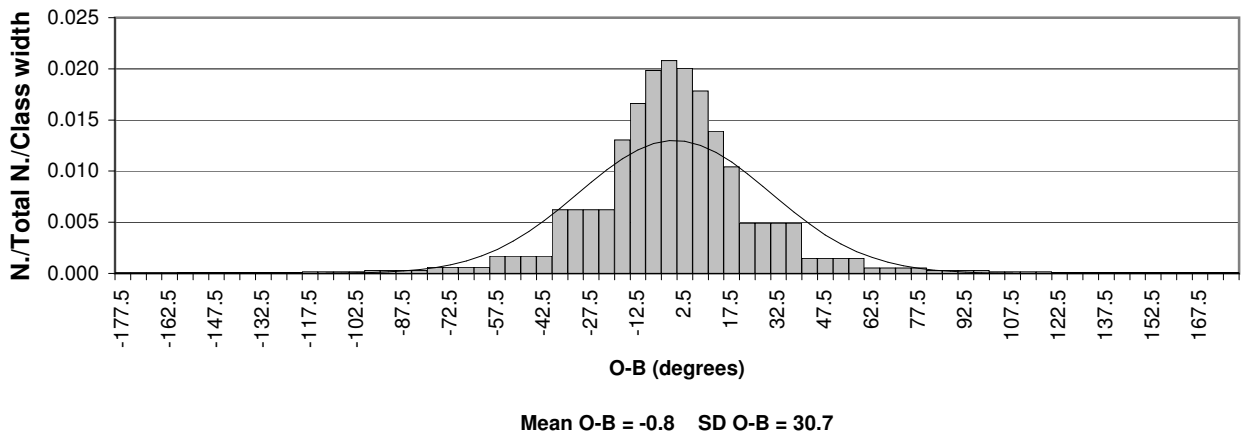
Figure 2j: Distribution of ship O-B SST (℃)
Period of data: JUL-DEC 2009   Data used: All observations

Mean O-B = 0.0   SD O-B = 2.2
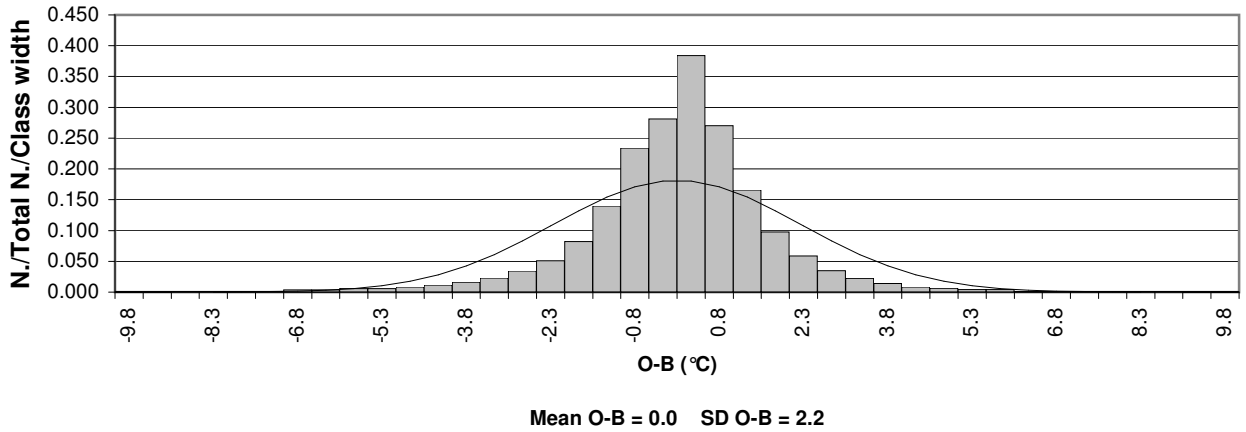
Figure 2k: Distribution of ship O-B SST (℃)
Period of data: JUL-DEC 2009   Data used: Flagged observations

Mean O-B = -0.8   SD O-B = 6.7
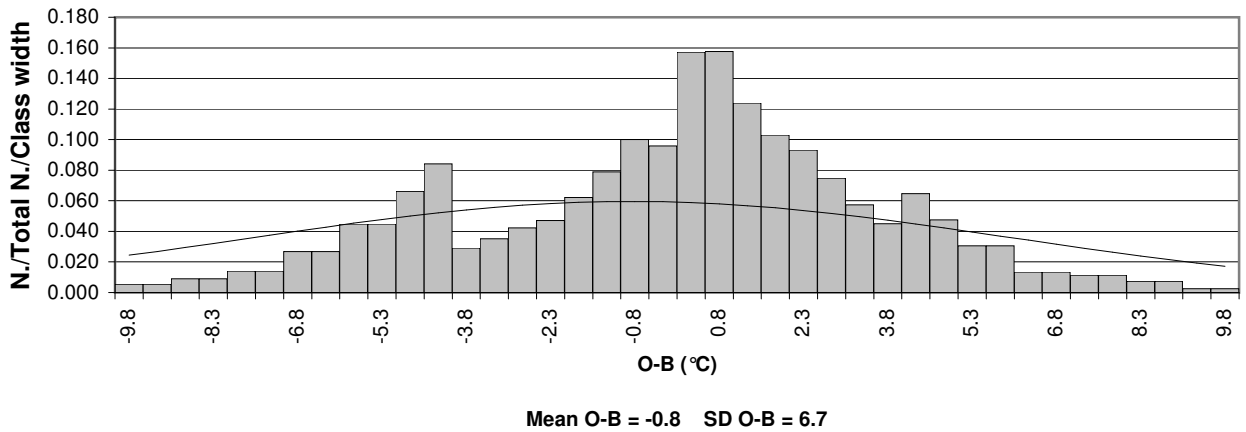
Figure 2l: Distribution of ship O-B SST (℃)
Period of data: JUL-DEC 2009   Data used: Unflagged observations

Mean O-B = 0.0   SD O-B = 1.1

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

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

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

```
10    84   352   259   103   114    45     1     1    16    45   301     4     3    88   127    27    33    29   140    13     1     2     4     6           5     1     1           1     1     2    10           2

17   183   593   526  2310   757   267    20  1341  1361   624   407    30                50   158   141  1009  3018  1508  1027   162    88   151   102    86   285   120    86    99    43    36    40    73    22

584  1161   293 15740  1798   529  4356   409   758   779   960  2265  2863  1470   834  1176  1206 11088 66278  2940   364   773   428   101    29     2                 1           1     1    13   107

11963 7526 11991 24430 39322 18794          8920    57   102  1427  2449  1704  2152  2007 23880 68999 14038 22953 1373    89           1                 1     1     2   318   251   639  6386

985  1011  1024  1145 10238 63608     1          2416 52966 68217 65336 34948  8265  3537  4094 10507 39348 23655  1909   901   292    25     1                       1     2  1142  2205  1803  1170  1009

635   662   713  1011  1458 49699 18208     1    30 16257 51626  6581  5536  2472  3901  3492  4248  8469  7124  4667  4962  4414     2                 1     1         101 23983  8742  2862   910   644   565

719  8887  8252  1211   827   635  2045  1070 40583 44406 20218 11162  7020  2229   999   989  3250     2     1     2     1  1752    35  1363   990    38   116     4    11  1895  4173  2350   828   368   283   280

98  4400  3650   128   229   158   221  1080  1307 10928  7431 17062 10004  4747  2126  3618  1884     2     3     4     3   329  2263  1968  2014  1684  1118  1810   555  3069  1443  1308   605   198   133  1663

18    70    97   749  1002    17    12   414   353  1684  1119    14  1140  1028   679  1514  1323  1156  2364     2           2    20    55   451  2435  4470  2724  3851  1108   989  8590  5340  6395  2120    17

1840   55    85    75   302   149   246   326   260   493    44     1    14   773  2266  2343   122  2691   750   200          18    98   204  1124  1036  1352   146   910  1087   594   307  3064  7538   180    44

342   244   907  1644   438   223   211   128    20   228   284     1     1        1333   359   306   302   759   337         102  1662   755  2651   384   142   329   553   737   480   397  2567  1166   325   370

230   221   164   174   429    99    24    21    35    74   394           2  6057   974   474   300   391   570  1487     1  1272  1763  1637   169    66    60    66   307   982           3    93  2864   956   615

268   123    43    26     8     3     2     4    36    22   299     9   567  3927   143    69   157   236   357  1518  1355   836   332   432    95   223    29    28    42  2003  1290  1797  5099  2821   723  8981

216     1     8    10    11    11     7     4           3   329   134   235    59     8    18    64     8    27    51    32    40   141   215   116   203                       5    29  4546   128   566  7622

            23     6    27    21    39    25    48    17  2522  1228   479   101   173     7          18    22    15    29     4     5     5    34           6     8     8    20    27     9   179    11   198   312

            30     7           9                 7   663   373    85                 1    10    21    53    26           1     3    34    48    12     6    20               277   459

                                                       7     8    15
```

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

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

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

| 10 | 81 | 353 | 261 | 105 | 114 | 46 | 1 | 1 | 16 | 45 | 305 | 4 | 3 | 88 | 127 | 27 | 33 | 29 | 140 | 12 | 1 | 2 | 4 | 8 | 1 | 5 | 1 | 1 | | 1 | 1 | 2 | 10 | | 2 |

17 172 598 529 2322 833 320 20 1342 1357 624 404 30 51 159 147 955 3006 1466 1082 176 88 93 74 54 137 104 26 3 11 14 17 13 15

374 1278 532 14306 3021 2686 6006 523 811 774 961 2258 1733 982 521 729 758 9237 65438 2593 358 463 434 155 29 2 1 20 104

8559 5476 9595 22972 39360 18600 8939 57 101 1428 2413 1180 1506 1305 18725 49564 15780 22243 1336 60 2 3 2 1 3 363 279 683 5712

1014 1047 1052 1188 6766 59361 1 2611 60124 66908 66152 32205 5794 2419 3145 9466 37283 21128 1993 884 227 12 3 3 3 6 1248 2273 1843 1192 1032

646 660 713 1031 1465 52641 17532 1 37 19336 66049 6423 5371 2320 3522 3026 3687 7350 6269 4723 4650 3566 3 1 1 1 103 24442 8517 4805 886 648 563

711 8885 8263 1233 838 651 1952 661 33329 40054 19895 11054 6764 1972 2692 2786 3269 5 2 5 2 1759 40 1532 1025 24 126 2 11 1843 4170 2479 735 386 287 273

75 4398 2993 112 202 156 220 1096 1328 10691 6712 16649 9924 4742 4059 3399 1876 2 4 7 10 331 2240 2006 2505 1708 1502 1838 570 3176 1580 1369 536 195 139 238

10815 2212 8393 4955 2294 4523 3207 2214 2542 1386 749 14 634 952 4501 2271 1311 1586 2689 8 6 4 20 56 473 2259 5482 3275 3751 1363 1159 6101 5242 5701 7944 23

11902 383 6300 2143 2436 6688 4158 523 3983 370 49 14 275 3783 2257 2150 2779 624 203 1 19 100 2352 2508 918 3117 172 507 681 625 294 2992 5380 6320 336

190 125 817 1665 366 118 100 76 19 102 279 1 1 5354 247 326 319 643 344 101 1663 2937 2471 369 154 333 442 610 407 253 2748 1011 318 215

208 196 112 121 352 59 23 21 35 55 294 2 2729 953 389 301 410 592 1404 2 1191 1646 1459 176 71 57 64 287 763 2 1 96 2147 832 619

185 80 43 29 6 3 2 4 35 23 273 8 579 3925 43 60 159 241 372 1460 1268 748 330 393 94 221 29 28 39 1381 1033 1562 4451 2295 520 2569

215 1 8 9 11 11 7 4 2 254 121 136 12 11 18 64 8 22 53 32 43 141 215 110 203 5 29 4523 118 396 2112

1 23 6 27 21 39 25 48 17 1001 471 88 51 34 7 18 22 15 29 4 5 5 33 6 8 8 20 25 9 178 11 200 313

30 7 9 7 344 71 4 1 11 21 53 26 1 3 33 50 12 6 20 273 441

7 8 19

4

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

Figure 10: Standard Deviation of Ship O-B Wind Direction (degrees). Date:- July - December 2009
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 40 degrees

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

```
6    30   66   83   35   61   22            15   43   199  1    2    14   21   17   13   15   76   7         1         3         3                                  2         1
5    105  393  228  1000 477  274  5    947  1155 424  274  24             32   60   74   394  2003 883  778  137  64   53   41   30   84   73   15   2    5    5    13   7    13
269  960  516  5814 2727 2671 2913 385  698  671  820  1847 981  699  350  485  548  5876 47701 2263 271  420  245  109  25   1                                  20   70
6754 4264 6792 13845 25686 9475      3564 5    79   1225 1892 955  1215 1042 14719 37043 84345 19205 970  60        2              3              2    1    3    218  190  447  3608
702  752  785  865  4628 23420 1        758  26455 28563 36448 22662 4509 1827 2366 7357 27652 10273 1047 864  213  4    3    3                   3    5    719  1446 1216 825  717
448  500  495  615  824  21052 4734 1    23   7870 28910 4004 2487 1371 1993 1735 2224 4641 3472 2264 2781 1907 3         1    1    1              60   10894 4234 2817 662  458  407
410  6411 5953 820  542  371  995  180  15754 16016 10580 6002 3881 1084 1894 2102 2225 5    2    5    2    968  23   708  508  19   96        6    1139 2759 1654 470  246  171  166
57   3097 2505 86   173  134  118  311  399  6552 5537 10172 7158 3515 2814 1826 797  1    4    7    10   118  1217 1137 1613 956  906  1060 405  1967 960  844  327  104  121  52
4511 819  4435 3379 1364 2906 2282 1539 1457 359  513  4    359  601  2644 1468 424  735  1397 8    6    4    15   47   226  1122 2440 1268 2636 633  463  2307 1166 1196 1696 8
5708 227  4136 1793 2046 5901 3822 489  3038 250  31        14   265  3377 1609 1865 2304 194  92   1    14   67   1657 1553 574  1405 117  269  297  190  158  1017 1137 1736 116
157  95   468  989  263  93   72   62   12   81   167  1    1         3766 219  235  224  441  206       87   713  2466 2151 318  124  305  326  312  126  141  1922 808  268  170
134  132  67   62   181  30   15   16   11   31   193       2    1776 682  235  158  196  407  1118 2    905  1218 880  143  59   39   39   211  519  2    1    72   1642 585  427
122  41   28   22   5    1         2    24   19   197  7    398  2733 32   35   106  152  242  1158 938  578  241  285  48   143  14   20   20   1199 796  1237 4092 1881 358  2196
200  1    3    8    6    7    5    4         2    230  87   102  7    8    18   52   8    18   50   31   40   104  184  96   187                 2    10   4385 103  363  1824
1         19   5    22   21   37   25   48   15   1000 392  76   44   29   6         18   20   15   22   4    5    4    31             4    7    8    12   6    172  6    180  268
          25   6         9              3    178  58   2              1    2    7                   1         12   7    2    2    8              73   254
                                                              3    9
                                                                                                                                    4
```
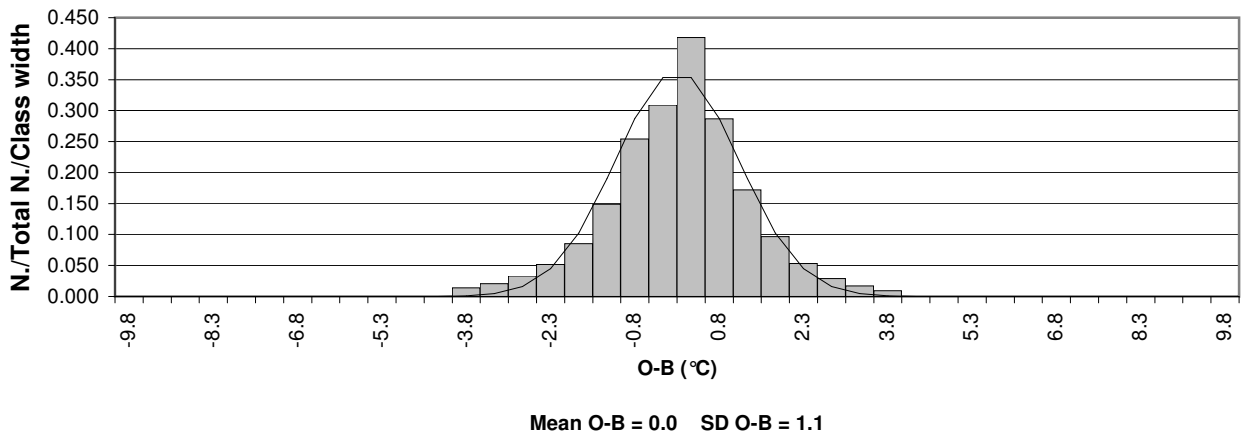
Figure 12: Bias of Ship O-B SST (degrees C). Date:- July - December 2009
Only observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
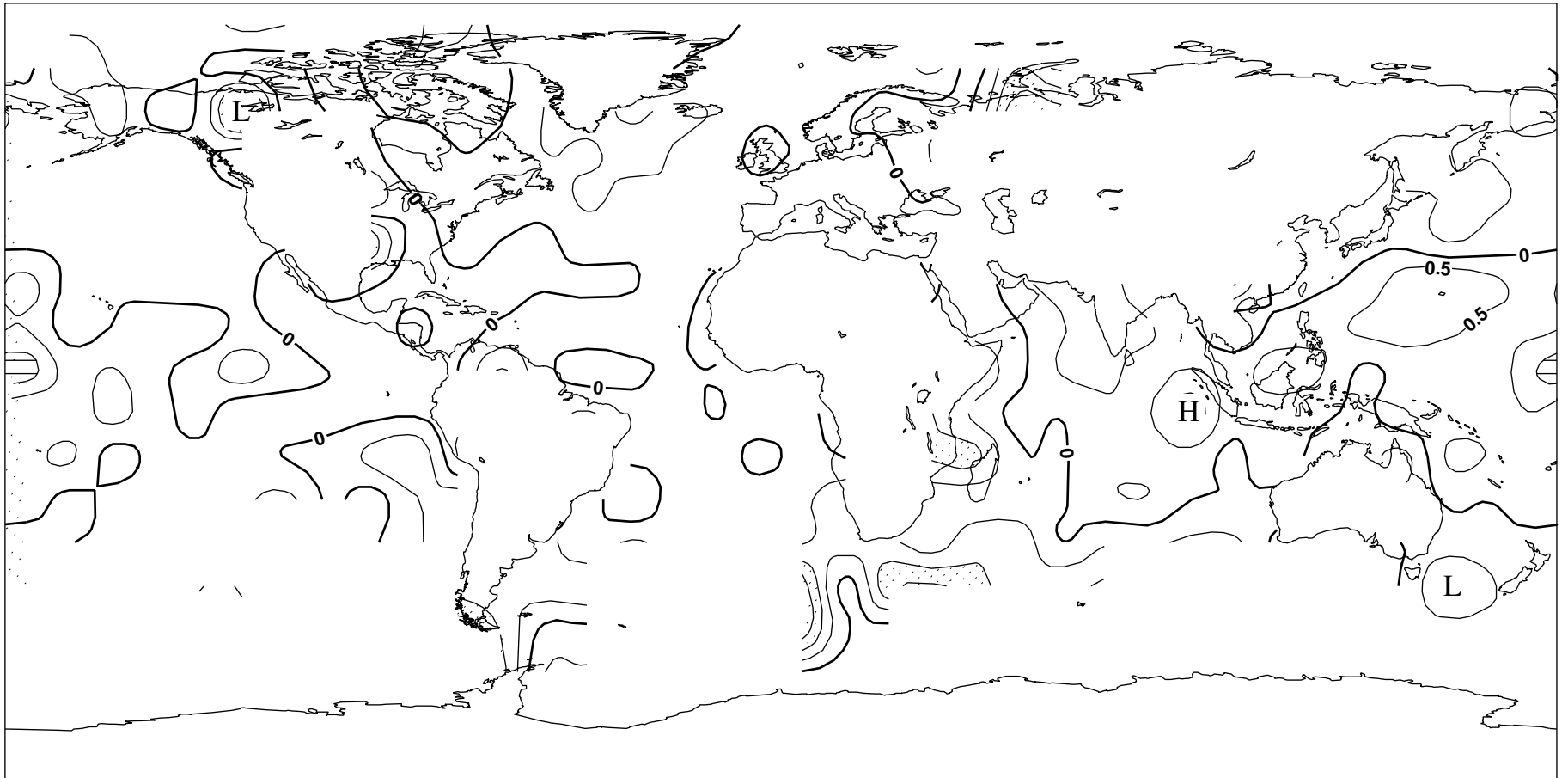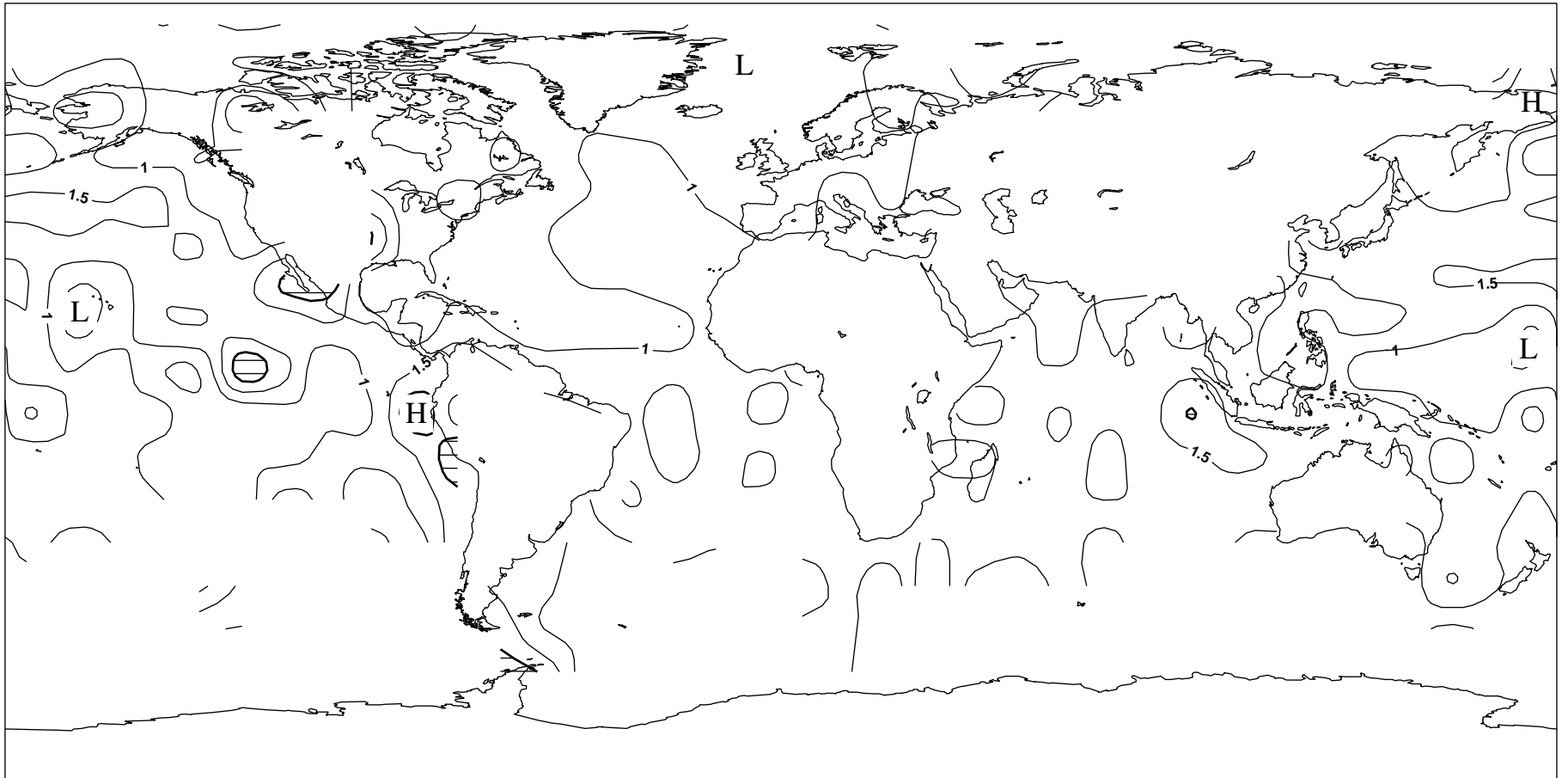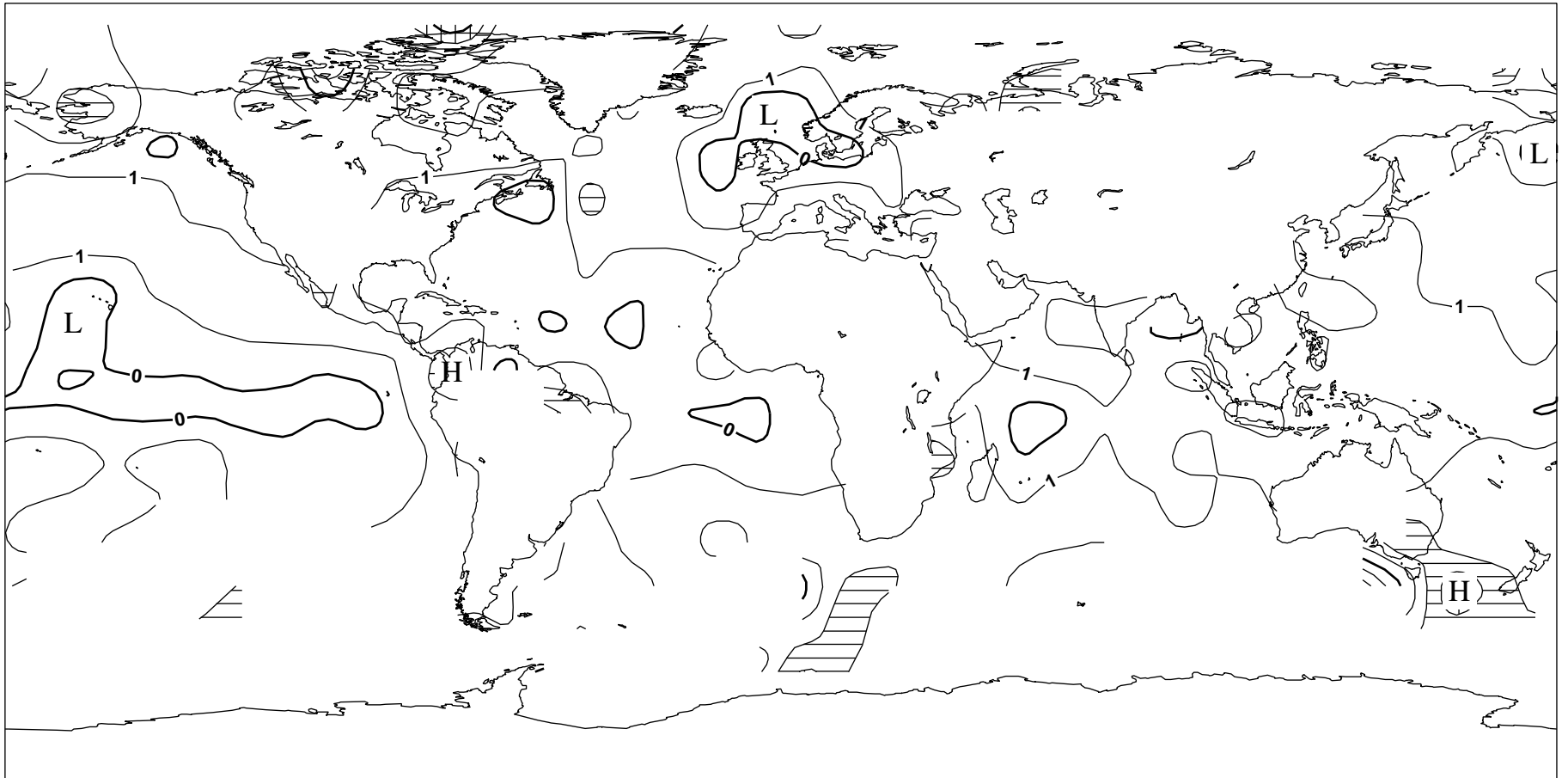**Shaded areas have a bias of magnitude greater than 1.0 degree C**

Figure 13: Standard Deviation of Ship O-B SST (degrees C). Date:- July - December 2009
Only Observations passing quality control used in statistics
Contours drawn to 10 degree boxes, if the number of observations is greater than 10
Shaded areas have a standard deviation of greater than 2.0 degrees C
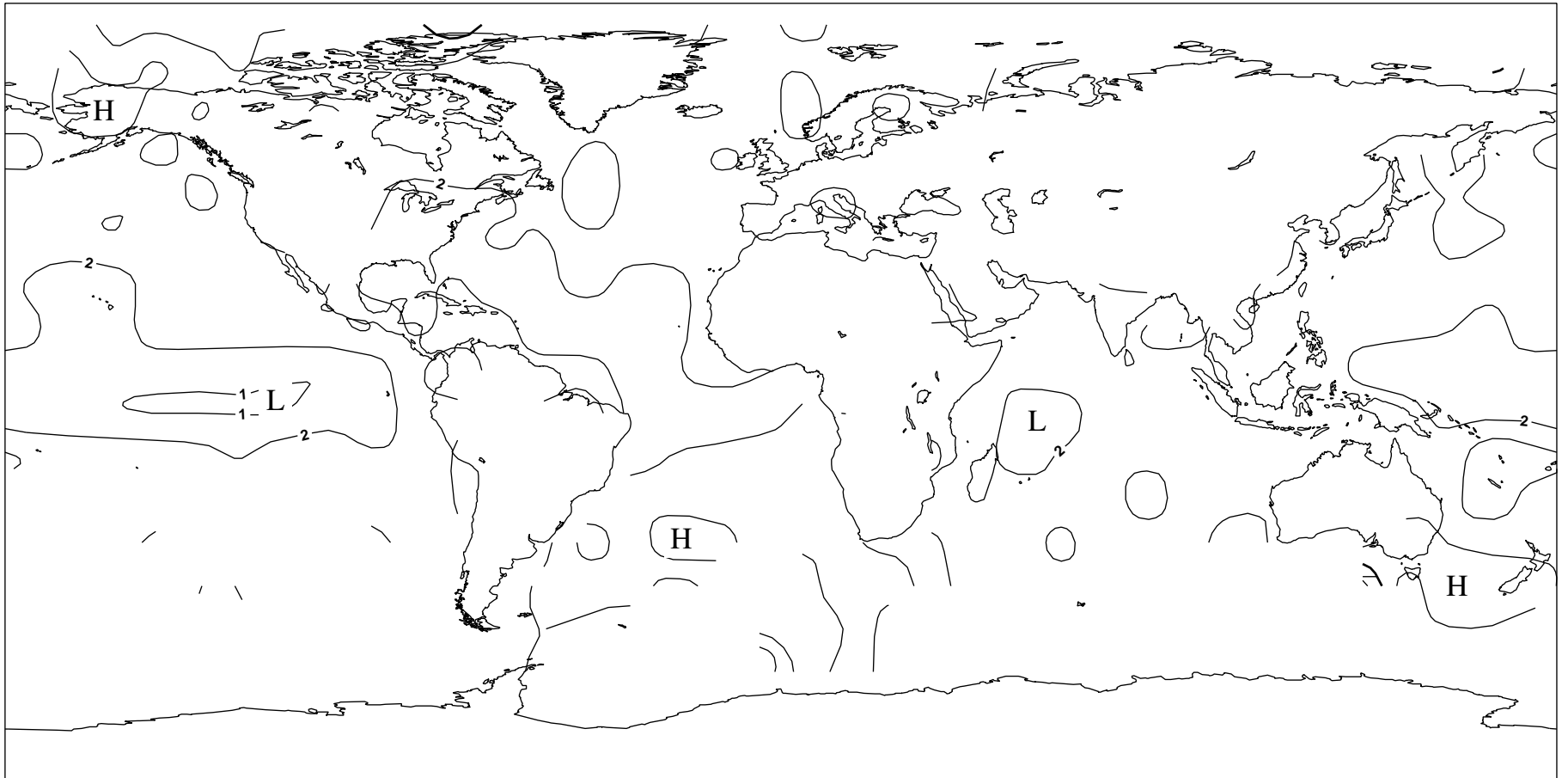
Figure 14:
Plot of the Number of Ship SST Observations. Date:- July - December 2009
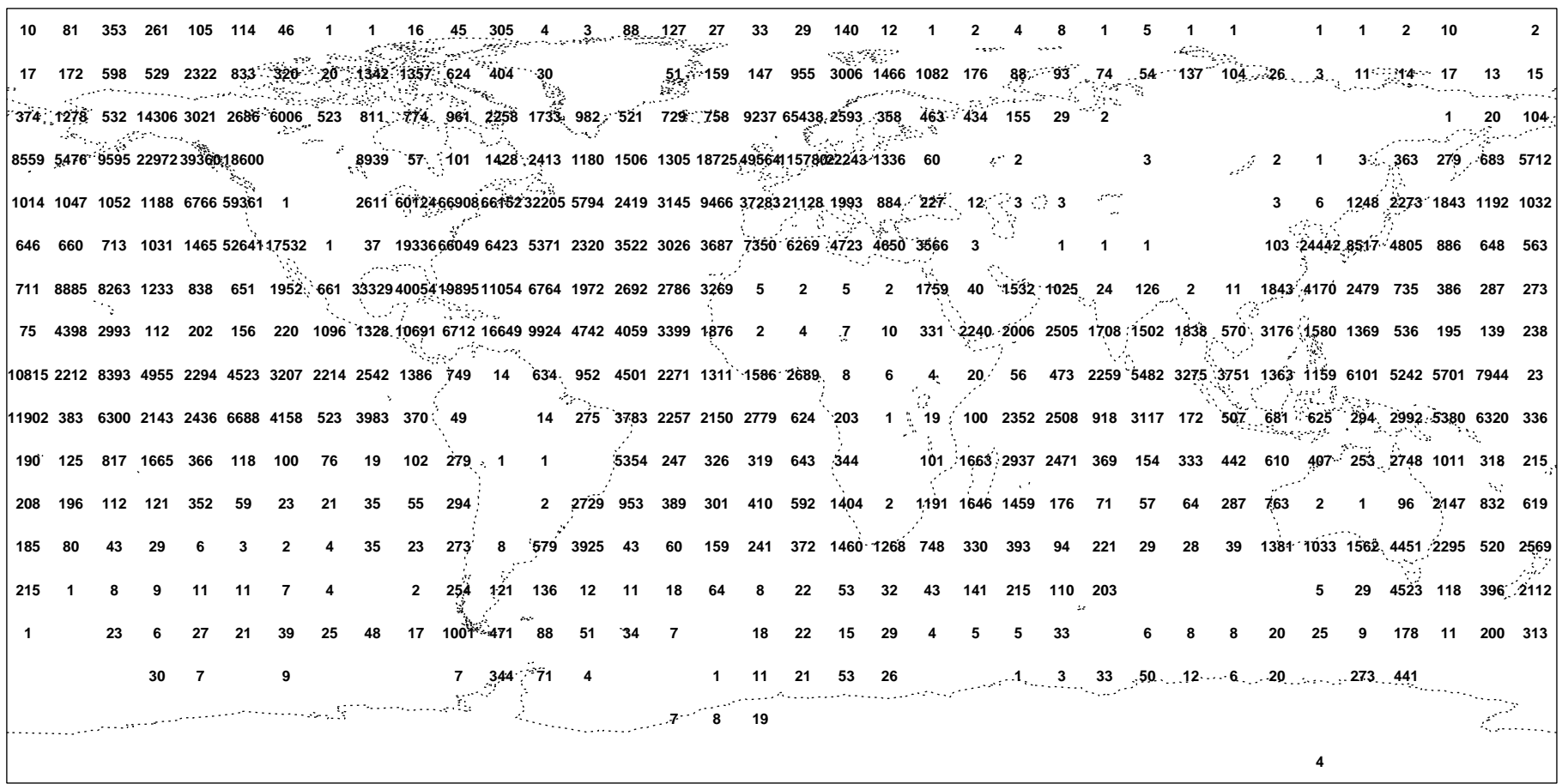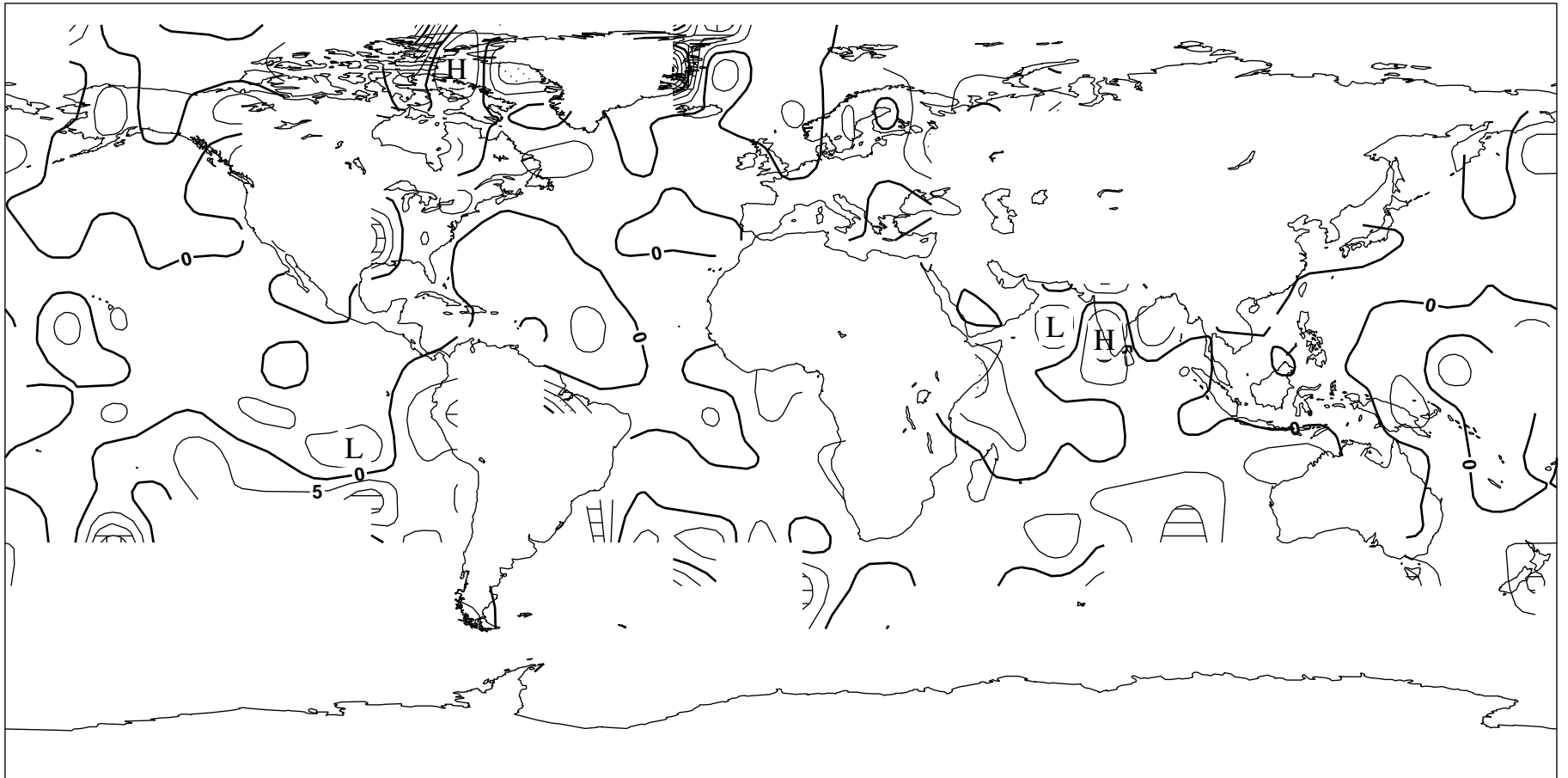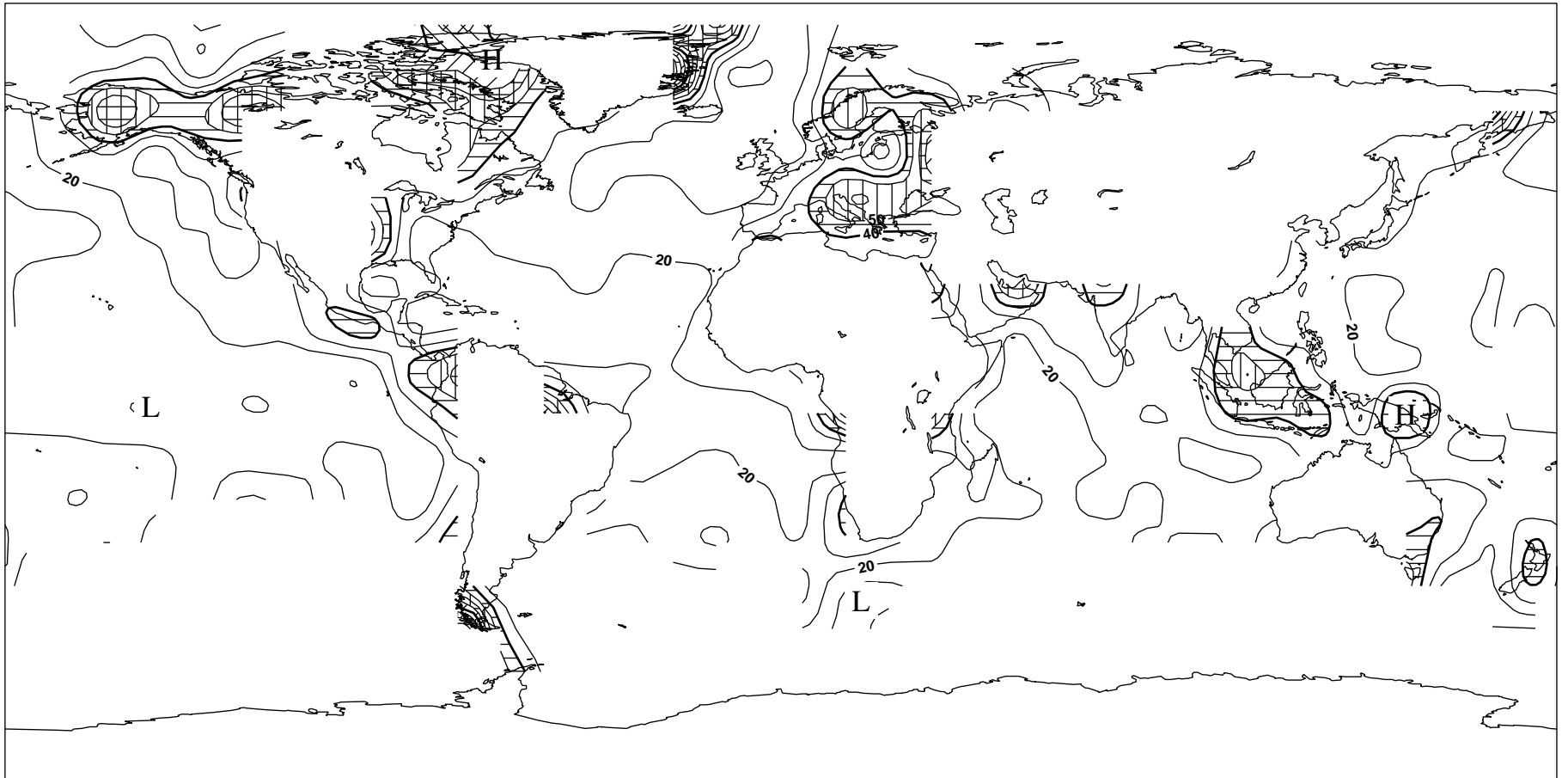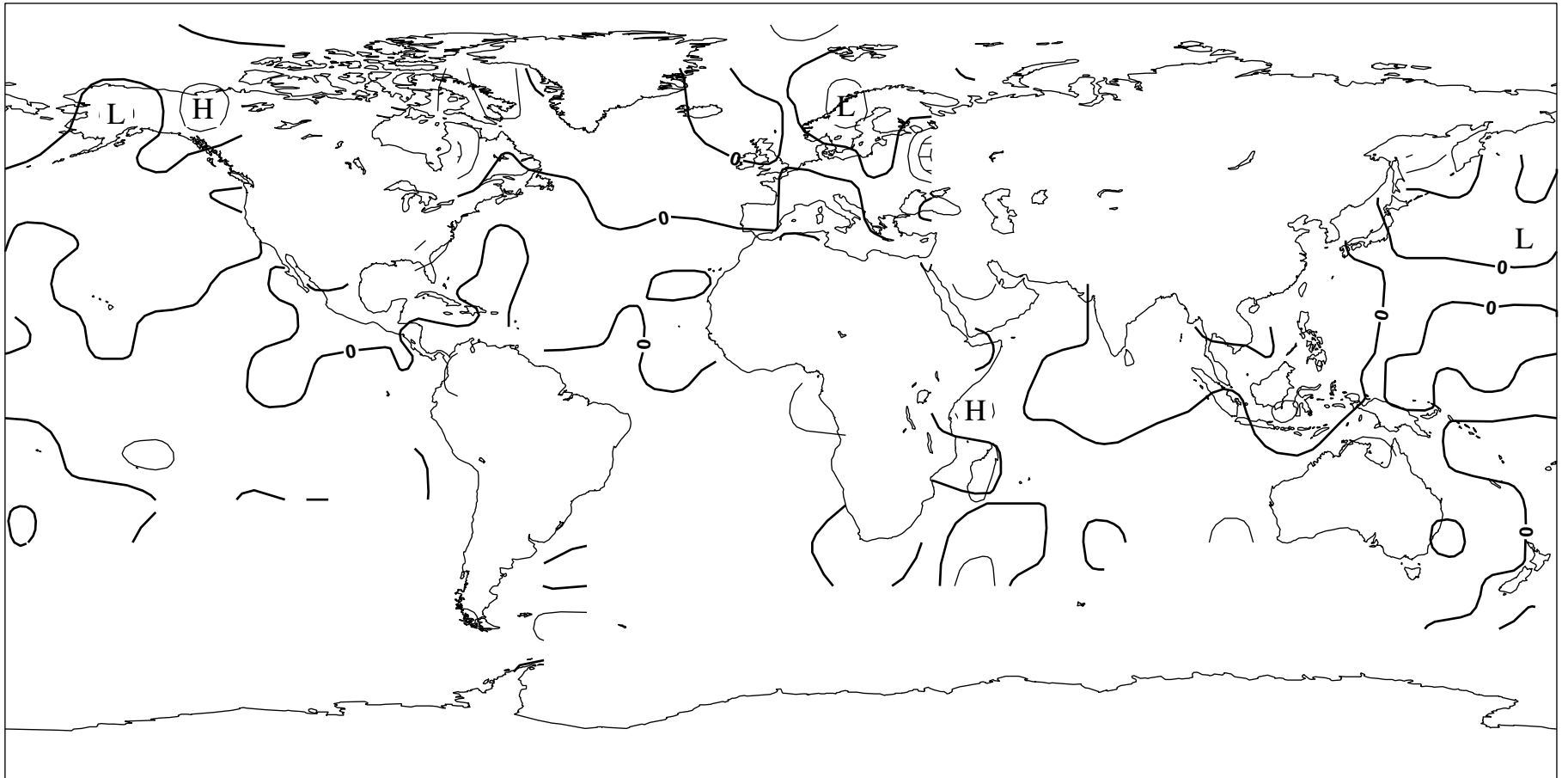**Only observations passing quality control included**

6		74	78	32	66	27	1		14	5	52	3	1	1	1	9	19	24	88	5			3						
81	400	741	470	1426	300	48	8	153	207	190	82	22		11	110	99	643	2157	1039	556	109	21	22	30	25	59	15	1	1	2	2	1		13
418	419	294	11911	120	28	49	217	350	234	324	558	660	357	334	498	355	4795	8331	2195	321	190	46	1	5								2	5	88
8090	10400	9682	19360	31804	15213		1	64	617	1025	825	1011	894	19677	27567	41796	16255	1127	35								1	340	241	502	5110
643	699	688	772	9393	85328		69011	44271	21499	5244	1811	2161	7796	31683	16399	1354	810	204	3					1	987	1544	1267	804	714
475	501	579	771	1083	90958	101473		17431	86178	6690	4290	1509	2604	2207	2546	4569	5316	3627	3607	3129			35	20426	6370	5104	749	532	440
2407	8699	30310	849	581	442	2633	554	54558	82209	20452	9370	5496	1561	2456	2592	2172			1508	29	1476	682	27	69	3	7	1221	3528	2177	665	318	257	249
149	3922	3808	195	228	126	173	851	936	9057	6408	24919	8610	4089	4169	3135	1003			289	1882	1668	1416	790	1387	1727	309	2494	1272	973	7835	178	121	1067
12133	2438	8093	4991	1182	4699	2378	2869	2609	1169	4709	5	512	772	4595	3085	922	2577	1232		20	53	348	1445	7085	3302	2142	1126	1000	9348	5768	8745	7552	96
12967	414	7094	2174	3382	6054	5956	848	3911	389	29		4	217	3526	2362	1699	3407	398	102	14	69	460	2884	640	5241	1830	385	785	435	192	2800	8334	5579	240
156	74	804	1628	314	107	115	66	8	166	238		5004	172	270	273	498	212		39	1424	369	1137	267	131	269	277	455	191	155	585	744	103	141
153	104	59	75	214	37	17	18	29	40	257		3595	825	259	222	277	402	1118		938	1229	1222	148	46	46	49	240	514		57	1187	388	396
92	52	42	25	10	5		1	17	9	257	8	492	3369	35	45	138	199	290	1137	913	582	309	408	91	223	29	34	40	986	758	1153	2152	1378	260	1107
213	2	1	1	5	4	3	1	1	1	329	148	137	12	7	18	64	7	27	15	34	42	145	201	93	107			5	28	1693	92	359	1759
2	5	24	6	27	21	39	25	47	16	676	1020	100	49	39	7		18	23	7	7	4	5	4	33		6	8	8	19	27	10	196	11	168	315
1		37	8		9			7	585	397	4		1	13	9	7			1	3	37	48	12	6	20		8	432
								11	9	20