

North American Tungsten Corporation Ltd.

MACTUNG PROJECT 2008 HYDROMETEOROLOGICAL SURVEY

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North American Tungsten Corporation Ltd.

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2008 HYDROMETEOROLOGICAL SURVEY

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EXECUTIVE SUMMARY

North American Tungsten Corp. Ltd. is conducting baseline environmental studies at its Mactung project site to assist in developing a new mine in the area. In 2005, EBA Engineering Consultants Limited was retained by North American Tungsten Corp. Ltd. to execute the necessary baseline environmental study program to update and build on previous studies conducted for AMAX in the 1970's.

This report is a continuation of the hydrometeorological baseline studies conducted by Hay & Company Consultants, a division of EBA Engineering Consultants Ltd, and consists of a summary of all the hydrometeorological data collected at the Mactung project site since July 2005. Included in this report is a summary of the meteorological data collected by Meteorological Services of Canada (MSC) at their weather station at Macmillan Pass, approximately seven kilometres southeast of the Mactung site.

The hydrology component involved the determination of a discharge hydrograph and a time history of water temperatures for Tributary A, Tributary C and for a newly installed station on the South Tributary of the Hess River. Dale Creek was dropped from the program at the request of North American Tungsten Corporation, as it was no longer considered relevant to the project and hence no data is presented for this creek.

The data indicate that Tributary A had a base summer flow of 3 to 4 m³/s, with short term increases of up to 3.0 m³/s, due to precipitation events. The peak flow measurement was 8.1 m³/s and it occurred on June 23, 2008. By September, typical discharges were in the order of 2.0 m³/s.

The data indicate that Tributary C had a base summer flow of 0.8 m³/s, with short term increases of up to 0.8 m³/s, due to precipitation events. The peak flow measurement was 2.5 m³/s and it occurred on June 23, 2008. By September, the typical discharge was 0.5 m³/s.

The data collected in 2008 indicate that the South Tributary of the Hess River had a base summer flow near 10.0 m³/s, with short term increases of up to 15.0 m³/s, due to precipitation events. The peak flow measurement was 30.9 m³/s and it occurred on July 13, 2008. By September, discharges were near 5.0 m³/s.

Creek water temperatures were measured at both hydrometric stations and exhibited a diurnal variation of approximately $\pm 1.5^{\circ}\text{C}$, about a mean summer temperature of 6.0°C for Tributary A and 8.0°C for the Hess River South Tributary. In early September, creek water temperatures began to decrease to a mean average daily temperature of 3°C for Tributary A and 4°C for the Hess River South Tributary.

The objective of the meteorological component of the study was to continuously record weather conditions at the Mactung property site. In July 2005, a meteorological station was

installed at the Mactung site. It has been operating continuously since the installation, recording the weather parameters of wind speed and direction, air temperature, relative humidity and solar incident radiation. Typical maximum daily wind gusts are in the range of 6 m/s, but wind speeds as large as 22.9 m/s have been recorded by the station. Air temperatures were typically 5 to 10°C during the summer with maximums of 20°C. Typical winter temperatures are -15°C but have been recorded as low as -36°C. Relative humidity is typically near 90%, but frequently can drop as low as 30% for periods of up to a day. Peak solar incident radiation during the summer is in the vicinity of 850 W/m² while during the winter period (Dec to Jan) the maximum radiation is near 50 W/m².

Similar meteorological data are presented for the MSC meteorological station located at Macmillan Pass.



TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	i
1.0 INTRODUCTION.....	1
2.0 HYDROLOGY	2
2.1 Method.....	2
2.2 Tributary A	3
2.2.1 Tributary A Stage Measurements	3
2.2.2 Tributary A Discharge Measurements	3
2.2.3 Tributary A Stage-Discharge Relationship.....	3
2.2.4 Tributary A Discharge Hydrograph	4
2.2.5 Time History of Tributary A Water Temperatures	5
2.2.6 Tributary C Discharge Hydrograph	5
2.3 Hess River South tributary.....	6
2.3.1 Hess River South Tributary Stage Measurements.....	6
2.3.2 Hess River South Tributary Discharge Measurements	6
2.3.3 Hess River South Tributary Stage-Discharge Relationship.....	7
2.3.4 Hess River South Tributary Discharge Hydrograph.....	7
2.3.5 Time History of Creek Water Temperatures	7
3.0 METEOROLOGY.....	8
3.1 Mactung Meteorological Station.....	8
3.1.1 Winds.....	8
3.1.1.1 Maximum Wind Speed	9
3.1.1.2 Wind Speed and Direction Stick Plots.....	9
3.1.1.3 Wind Roses.....	9
3.1.2 Air Temperature.....	10
3.1.2.1 Daily Extremes for Air Temperature	10
3.1.2.2 Hourly Air Temperatures	11
3.1.3 Relative Humidity.....	11
3.1.3.1 Daily Extremes for Relative Humidity	11
3.1.3.2 Hourly Relative Humidity.....	12
3.1.4 Solar Incident Radiation.....	12
3.1.4.1 Daily Extremes for Incident Solar Radiation.....	12

TABLE OF CONTENTS

	PAGE
3.1.4.2 Hourly Incident Solar Radiation.....	12
3.2 Macmillan Pass Station (Meteorological Service of Canada).....	13
3.2.1 Winds.....	13
3.2.1.1 Maximum Wind Speed.....	13
3.2.1.2 Wind Speed and Direction Stick Plots.....	14
3.2.1.3 Wind Roses.....	14
3.2.2 Air Temperature.....	15
3.2.2.1 Daily Extremes for Air Temperature.....	15
3.2.2.2 Hourly Air Temperatures.....	16
3.2.3 Relative Humidity.....	16
3.2.3.1 Daily Extremes for Relative Humidity.....	16
3.2.3.2 Hourly Relative Humidity.....	17
3.2.4 Barometric Pressure.....	17
3.2.4.1 Daily Extremes for Barometric Pressure.....	17
3.2.4.2 Hourly Barometric Pressure.....	17
3.2.5 Precipitation.....	18
4.0 RECOMMENDATIONS.....	18
5.0 LIMITATIONS OF REPORT.....	19
6.0 CLOSURE.....	19
REFERENCES.....	20

TABLES

Table 1.1	2008 Hydrometeorological Survey Station Geographic Coordinates
Table 2.1	Summary of Collected Discharge Measurements for Tributary A
Table 2.2	Summary of Collected Discharge Measurements for Tributary C
Table 2.3	Summary of Collected Discharge Measurements for Hess River South Tributary

TABLE OF CONTENTS

FIGURES

- Figure 1.1 Project Location Map
- Figure 1.2 Hydrometeorological Site Location Map
- Figure 2.1 Site 1 – Tributary A Hydrometric Station
- Figure 2.2 Tributary A 2006-2008 Creek Stages
- Figure 2.3 Site 1 – Tributary A 2006-2008 Stage-Discharge Relationship
- Figure 2.4 Tributary A 2006-2008 Discharge Hydrograph
- Figure 2.5 Tributary A 2006-2008 Water Temperatures
- Figure 2.6 Comparative Discharges Tributary C vs. Tributary A
- Figure 2.7 Tributary C 2006-2008 Discharge Hydrograph
- Figure 2.8 Hess River South Tributary 2008 Creek Stages
- Figure 2.9 Hess River South Tributary 2008 Stage-Discharge Relationship
- Figure 2.10 Hess River South Tributary 2008 Hydrograph
- Figure 2.11 Hess River South Tributary 2008 Creek Temperatures
- Figure 3.1 Mactung Station Daily Maximum Wind Speed
- Figure 3.2 Mactung Station Wind Data – July 2008
- Figure 3.3 Mactung Station Wind Rose – July 14, 2005 – August 27, 2008
- Figure 3.4 Mactung Station Daily Maximum, Mean and Minimum Air Temperatures
- Figure 3.5 Mactung Station Weather Parameters – July 2008
- Figure 3.6 Mactung Station Daily Maximum, Mean and Minimum Relative Humidity
- Figure 3.7 Mactung Station Daily Maximum Incident Solar Radiation
- Figure 3.8 Macmillan Pass Maximum Daily Wind Speeds and Wind Gusts
- Figure 3.9 Macmillan Pass Wind Data – February 2008
- Figure 3.10 Macmillan Pass Wind Rose – July 2005 – August 2008
- Figure 3.11 Macmillan Pass Daily Maximum, Mean and Minimum Air Temperatures
- Figure 3.12 Macmillan Pass & Mactung Mean Daily Air Temperature Comparison
- Figure 3.13 Macmillan Pass Parameters – February 2008



TABLE OF CONTENTS

FIGURES

- Figure 3.14 Macmillan Pass Daily Maximum, Mean and Minimum Relative Humidity
- Figure 3.15 Macmillan Pass and Mactung Mean Daily Relative Humidity Comparison
- Figure 3.16 Macmillan Pass Daily Maximum, Mean and Minimum Barometric Pressure
- Figure 3.17 Macmillan Pass Average Monthly Precipitation 1998-2005

APPENDICES

- Appendix A Hydrometeorological Site Descriptions
- Appendix B Monthly Mactung Station Wind Summaries – July 2005 to August 2008
- Appendix C Monthly Mactung Station Wind Roses – July 2005 to August 2008
- Appendix D Monthly Mactung Station Weather Summaries August 2005 to August 2008
- Appendix E Monthly Macmillan Pass Wind Data – July 2005 to August 2008
- Appendix F Monthly Macmillan Pass Wind Roses – July 2005 to August 2008
- Appendix G Monthly Macmillan Pass Weather Parameters – July 2005 to August 2008
- Appendix H EBA's General Conditions

1.0 INTRODUCTION

North American Tungsten Corp. Ltd. is conducting baseline environmental studies at its Mactung project site to assist in the development of a new mine in the area. In 2005, EBA Engineering Consultants Limited was retained by North American Tungsten Corp. Ltd. to undertake the necessary baseline environmental study program. The project is located on the boundary between the Yukon and Northwest Territories, shown in Figure 1.1.

This report summarizes the hydrometeorological data collected at the Mactung Project site from July 2005 to August 2008, and is a continuation of the Hay & Company Consultants report published in 2007 entitled “Mactung Project 2007 Hydrometeorological Survey”.

During the period from June 2008 to September 2008, Hay & Company Consultants conducted the hydrology and meteorology components of the overall study program for the Mactung project.

The objective of the hydrology component was to determine the discharge hydrographs and time histories of water temperature for three of the creeks flowing off or near the Mactung property. The meteorological component of the study was to continuously record weather conditions at the Mactung property site and summarize the meteorological data collected at Macmillan Pass, a nearby meteorological station operated by Meteorological Services of Canada.

Dale Creek was dropped from the program at the request of North American Tungsten Corporation as it was no longer considered relevant to the project.

A new hydrometric station located on the South Tributary of the Hess River was added to the program as this creek is the proposed water source for the operation of the mine.

The hydrology portion of this year’s study began with a site visit on June 18, 2008 to re-install the pressure transducer/data logger within the instrument housing for Tributary A. During this field trip the South Tributary of the Hess River hydrometric station was installed and instrumented. The pressure transducer/datalogger records creek stage and water temperature four times per hour. A staff gauge was also installed at each site for the manual measurement of creek stages. During this initial visit, stage-discharge information was collected on the three selected creeks using a Swiffer meter to measure creek velocities.

Second and third site visits were conducted on July 15 and September 3, 2008, for the purpose of collecting further stage-discharge data and to inspect and download stage and temperature data from the hydrometric stations. During the latter visit the instrumentation was removed from the housings and put into storage to prevent damage to the sensitive pressure transducer diaphragm due to freezing conditions.

The hydrometric and meteorological stations discussed in this report are listed below, with the main objective for each station. Figure 1.2 is a site location map showing a portion of a 1:250,000 scale National Topographic Series (NTS) map of the area, on which the sites are indicated. Table 1.1 lists the GPS positions for the following hydrometeorological sites near or on the Mactung project site.

- TRIB A - Tributary A, collect stage, stage-discharge, flow and water temperature data.
- DALE - Dale Creek, dropped from the program.
- HESS ST - Hess River South Tributary, collect stage, stage-discharge, flow and water temperature data.
- MET - Mactung Meteorological Station, record site meteorological parameters.
- MACPAS - Macmillan Pass Meteorological Station, Meteorological Service of Canada (MSC), long-term data record and data comparison.

Further detailed information on these sites is provided in the site description documents included in Appendix A.

Section 2 of this report presents the hydrological component of the baseline study program. Section 3 discusses the meteorological component and Section 4 contains recommendations.

2.0 HYDROLOGY

2.1 METHOD

To gain an understanding of the hydrological conditions in the Mactung project study area, hydrometric stations were installed at the two sites identified on Figure 1.2 as TRIB A and HESS ST. For each hydrometric station, a standard method was employed to determine a discharge hydrograph for the creek. First an appropriate hydrometric site was chosen, which represented all the flow from the drainage basin of interest. A staff gauge was installed to enable the manual recording of water surface elevations. The pressure transducer/data logger instrumentation and protective housing were also installed in the creek. Each time hydrology personnel were at site, the data loggers were downloaded and creek velocity data were recorded to enable the development of a stage-discharge relationship for each site.

To develop a stage-discharge relationship, the most common and precise practice is to measure creek discharge and stage simultaneously. The method used to determine creek discharge requires the measurement of no less than 10 sets of water velocities along a transect spanning the creek width. The measured velocities are multiplied by a representative flow area determined from the creek depth at the location of the velocity measurement and the horizontal distance to the flanking velocity measurements.

The stage and discharge data collected are plotted on a graph relating discharge to creek stage. The stage-discharge function is developed as the best-fit curve through the plotted stage-discharge data points. The stages recorded by the data logger are then used in the stage-discharge relationship to determine the creek discharge hydrograph.

2.2 TRIBUTARY A

The hydrometric station is located in a well-defined channel on Tributary A, approximately 50 meters downstream of the confluence of Tributary C. Tributary A flows northwest to the South Tributary of the Hess River, the Hess River, and eventually to the Stewart River in the Yukon Territory. Tributary A drainage basin, including Tributary B and Tributary C, (Figure 1.2), is approximately 10 km by 11 km and has a catchment area of 80.2 km². The elevation of the hydrometric station is 1133 m above sea level (asl). The highest basin elevation is 1951 m (asl). Inflows to Tributary A, at the location of the hydrometric station, consist of flows from Tributary A as well as from two smaller creeks, Tributary B to the southwest and Tributary C to the east.

Figure 2.1, Photo 1, shows the reach of Tributary A where the monitoring station is installed, as well as the confluence of Tributary C with Tributary A. Photo 2 shows details of the hydrometric station.

2.2.1 Tributary A Stage Measurements

Creek stage data were recorded every 15 minutes by the hydrometric station instrumentation from June 18 to September 3, 2008. The hydrographs of recorded stage measurements for all three years of data collection are presented in Figure 2.2. Whenever site visits occurred, staff gauge readings were manually recorded and used as a check on the stage monitoring instrumentation accuracy.

2.2.2 Tributary A Discharge Measurements

A total of 10 discrete discharge measurements were collected for Tributary A between May 8 and September 3, 2008. These data have been summarized in Table 2.1 along with the data collected from the previous years.

All the data collected on Tributary A over the three year monitoring period were used to develop a stage-discharge relationship for this site, which enables the determination of the creek discharge hydrograph, using the creek stage data recorded by the logger.

2.2.3 Tributary A Stage-Discharge Relationship

Figure 2.3 shows the stage-discharge relationship for the hydrometric station on Tributary A. This data consists of the manually measured discharges and the corresponding creek stage as recorded by the data logger. The data were fitted using an exponential function that best fit the data set. The regression coefficient (R^2) was 0.9138.

To calculate the discharge from the stage records, the regression equation is:

$$y = 0.3085e^{9.122x}$$

where y = creek discharge (m^3/s)
 x = recorded water depth over transducer (m)
 e = base of Napierian logarithms (2.71828)

2.2.4 Tributary A Discharge Hydrograph

The discharge hydrographs for the three years of collected data since 2006 for Tributary A at the location of the hydrometric station are shown in Figure 2.4. The circles of a similar colour to the lines represent the discharges that were determined in the field by velocity measurements. This same data is summarized in Table 2.1.

Based on Figure 2.4, discharge hydrographs for Tributary A for the summers of 2006 - 2008, the following observations were made:

- The discharge hydrographs are similar for all three years and range from $8 m^3/s$ during the spring thaw to under $2 m^3/s$ in the early fall just before freeze up.
- In 2008 the hydrometric station was activated on June 18, almost a month earlier than the previous two years. The station recorded most of the spring freshet discharges for 2008 and the records indicate that peak freshet discharges were in the order of $8 m^3/s$.
- As indicated in the notes section of Figure 2.4 a single discharge measurement of $0.2 m^3/s$ was made on May 8, 2008, indicating that the freshet had not yet started.
- The freshet had concluded by the last week of June, 2008 as indicated by the creek discharge rapidly dropping below $4.0 m^3/s$.
- The typical summer discharges for Tributary A are of the order of $3.5 m^3/s$. The hydrographs in Figure 2.4 indicate a slight downward trend in the flow as the summer advances.
- Storm events create the flow peaks during the summer period. During large precipitation events creek discharges can increase by up to $3.0 m^3/s$, this represents nearly 50% increase in discharge over the base flow.
- By the last week in August the creek discharges begin to drop at a higher rate than over the summer period due to the onset of cooler temperatures.

2.2.5 Time History of Tributary A Water Temperatures

During the period of discharge measurement on Tributary A, creek water temperatures were recorded using the temperature instrumentation contained within the pressure transducer. The creek temperature data for all three years of recorded data is presented in Figure 2.5. Each year is represented by a different coloured line as indicated on the figure legend.

The data indicate that creek water temperatures for all three years are very similar. Mean daily creek water temperatures are near 4.0°C during the spring freshet, increase to 6.0°C during midsummer and drop to 3.0°C by mid-September.

There is a strong diurnal temperature cycle with maximum water temperatures occurring at about 5:30 PM and minimum temperatures occurring near 8:00 AM. The typical daily temperature variation is approximately $\pm 1.5^\circ\text{C}$ from the daily mean. The highest water temperature recorded over the three year record was 10.8°C, which occurred on July 29, 2006 and the lowest, 0.9°C, occurred on September 14, 2006.

2.2.6 Tributary C Discharge Hydrograph

The eastern tributary of Tributary A, called Tributary C, which originates close to the territorial border and within the Mactung property, is the basin of interest for this study.

Tributary C basin is approximately five kilometres by five kilometres and has a catchment of 24.2 km². There was no suitable reach along Tributary C for the installation of a hydrometric station so the station was installed on Tributary A. The discharge hydrograph for Tributary C must be deduced from concurrent discharge data obtained from measured Tributary A and Tributary C discharges.

During the 2008 survey period, ten discrete discharge measurements were made on both tributaries at similar times. Table 2.2 summarizes all discharge measurements collected for Tributary C since the beginning of the program in 2006. The ratio of the discharge data collected on Tributary A to similar data collected on Tributary C was used to generate a discharge hydrograph for Tributary C. Figure 2.6 shows the concurrent discharge measurements and a best fit line equation through the data. The equation allows the estimation of Tributary C flows from the measured Tributary A discharges. The results indicate that Tributary C discharges are approximately one third of those in Tributary A. Using this correlation, the Tributary C discharge hydrograph was generated, as shown in Figure 2.7. The ratio of the Tributary C to Tributary A flows is 0.3384, according to Figure 2.6. The ratio of the catchment areas is 0.302, providing a further check on the methodology.

The estimated Tributary C monthly average discharges for July and August are 1.0 m³/s and 0.8 m³/s, respectively. The two large flow events in July correspond to peak flows of just over 1.7 m³/s for July 17 and July 25, 2007. During August the estimated flows dropped to 0.7 m³/s by early September.

Based on Figure 2.7, discharge hydrograph for Tributary A for the summers of 2006 to 2008, the following observations were made:

- The discharge hydrographs are similar for all three years and range from 2.5 m³/s during the spring thaw to under 0.4 m³/s in the early fall just before freeze up.
- In 2008 the hydrometric station on Tributary A was activated on June 18, almost a month earlier than the previous two years. This in turn extended the record for Tributary C. The data indicate that typical peak freshet discharges for this creek are in the order of 2.5 m³/s.
- As indicated in the notes section of Figure 2.7 a single discharge measurement of 0.11 m³/s was made on May 9, 2008, indicating that the freshet had not yet started.
- The freshet had concluded by the last week of June, 2008 as indicated by the creek discharge dropping below 1.2 m³/s.
- Typical summer discharges for Tributary A are of the order of 0.8 m³/s. The hydrographs in Figure 2.7 indicate a slight downward trend as the summer advances.
- Storm events create the flow peaks during the summer period. During large precipitation events creek discharges can increase by up to 1.0 m³/s, which represents nearly 50% increase in discharge over the typical summer discharge.
- By the last week in August the creek discharges begin to drop at a higher rate than over the summer period due to the onset of lower temperatures.

2.3 HESS RIVER SOUTH TRIBUTARY

2.3.1 Hess River South Tributary Stage Measurements

From June 18 to September 3, 2008, creek stage data were recorded at the hydrometric station every 15 minutes. The stage hydrograph is presented in Figure 2.8. Creek stages read from the staff gauge were manually recorded during site visits. Creek stages varied by ± 0.09 m from the typical summer stage of 0.45 m.

2.3.2 Hess River South Tributary Discharge Measurements

A total of 10 discharge measurements were manually recorded in 2008 over the duration of the summer. The time, date, stage and discharge for each measurement are summarized in Table 2.3. The data collected on the Hess River South Tributary was used to develop a stage-discharge relationship.

A site visit was conducted on March 28, 2008, to measure the winter discharge. Velocities were measured under the ice cover and the discharge was determined to be 0.14 m³/s. This data point is included in Table 2.3, but was not used in the development

of the stage discharge relationship as the site was not instrumented at this time and therefore no stage data was recorded.

2.3.3 Hess River South Tributary Stage-Discharge Relationship

The stage-discharge relationship for Hess River South Tributary is shown in Figure 2.9. This figure shows the measured creek discharges plotted against creek stages recorded by the data logger and the power function that was fitted to the data set. The regression coefficient (R^2) was 0.9585. The regression relationship is as follows:

$$y = 58.024x^{2.1711}$$

where y = creek discharge (m^3/s)

and x = recorded water depth over transducer (m).

Note that a different functional equation was used from the equation for the Tributary A data, as a number of fitting functions was considered, and the one that provided the maximum R^2 was used.

2.3.4 Hess River South Tributary Discharge Hydrograph

The discharge hydrograph for the Hess River South Tributary is shown in Figure 2.10. This figure also shows the discharges that were determined in the field by measuring velocities.

Based on the Hess River South Tributary discharge hydrograph for the summer of 2008, the following observations were made:

- The peak flow was $31.5 m^3/s$ on July 13, 2008. This was likely the result of a storm event.
- The summer discharge was typically 10 to $15 m^3/s$.
- Precipitation events increased creek flows by up to $15 m^3/s$ above the base flow. This represents a 100% increase in discharge due to storm events. This is evidenced by the two large peaks in the hydrograph that are greater than $25 m^3/s$.
- From the last week in August to the end of the record in early September flows dropped to about $5.0 m^3/s$.

2.3.5 Time History of Creek Water Temperatures

During the period of stage measurement on Hess River South Tributary, creek water temperatures were recorded by the temperature instrumentation contained within the pressure transducer. The creek temperature data are presented in Figure 2.11.

These data indicate a diurnal temperature cycle with maximum daily water temperatures occurring each evening from 5:00 to 6:00 PM and minimum temperatures occurring from 7:30 to 9:00 AM. The typical daily maximum to minimum temperature variation is approximately 3°C. The highest water temperature, 11.9°C, occurred on the evening of August 9, 2008, and the lowest, 2.4°C, occurred on the morning of August 31, 2008.

3.0 METEOROLOGY

On July 14, 2005, Hay & Company installed a meteorological station at the Mactung project site, near the camp. The NAD 27 GPS coordinates for this station are provided in Table 1.1.

There is also a Meteorological Services of Canada station located at Macmillan Pass, seven kilometres southwest of the project site, at an elevation of 1379 m. The NAD 27 GPS coordinates for this station are also provided in Table 1.1. As this station is relatively far from the site, at a much lower elevation and on the other side of the divide, the weather parameters measured may not be representative of true meteorological conditions at the project site; however, it provides a longer record of meteorological conditions and precipitation data. This station was installed on February 1, 1998. Specifications and descriptions of the instruments installed on this station are contained in the site descriptions included in Appendix A. To enable easy comparisons of the data collected by each station, the data from this station is reported in the same format and for same time period, July 2005 to August 2008, as the data presented for the Mactung meteorological station.

Monthly plots for wind speed and direction, wind roses, and other meteorological parameters for both stations are included in Appendices B to G. These Appendices are not included in hard copy, but are in digital form as PDF files on the DVD on the inside back cover of this report. Appendices B to D contain the data for the Mactung station and Appendices E to G contain the data for the Macmillan Pass station.

3.1 MACTUNG METEOROLOGICAL STATION

The Mactung station measures wind speed and direction, relative humidity, air temperature and incident solar radiation, which are saved to a logger at 15-minute intervals. At midnight, the logger produces a daily summary. The data is retrieved by downloading, at convenient times, with a laptop computer or by exchanging the memory storage module at site and subsequently downloading the data at a later date. The storage module enables Mactung staff to download the data without the need for a portable computer or training.

3.1.1 Winds

Wind data at the Mactung site has been collected since the installation of the meteorological station on July 14, 2005. The entire data set for the period of record from July 2005 to August 2008 has been summarized and presented in three different forms, as described below.

3.1.1.1 Maximum Wind Speed

The maximum gust wind speed for the day is recorded by the meteorological station at midnight in the 24 hour data array. This data is displayed in Figure 3.1.

The maximum wind gust of 22.9 m/s was recorded on November 23, 2005. The average maximum daily gust is approximately 6.0 m/s. On a relatively calm day, maximum daily wind gusts are in the order of 4.0 m/s, whereas on a windy day the maximum daily gusts are in the order of 10.0 m/s.

3.1.1.2 Wind Speed and Direction Stick Plots

Figure 3.2 is a sample of the 38 wind speed and direction figures presented in Appendix B. Each figure in Appendix B represents one month of wind data over the survey period from July 2005 to August 2008. Each figure consists of three panels.

The upper panel is a stick plot that displays the hourly wind vector. Direction is indicated by the angle of each hourly stick with true north towards the top of the page. Using this convention, a wind vector pointing due north indicates a wind blowing to the north, which is considered a south wind using the standard meteorological convention. The wind speed is indicated by the length of the stick and is determined using the scale in m/s given at the left and right of the plot. For example, in Figure 3.2, on February 12, 2008, winds were blowing from the north at a speed of about 3.0 m/s. A shift in the winds is evident during the evening and through the next day, with winds changing from blowing from the north to blowing from the southwest with an increase in speed to 6 m/s.

The central panel indicates the average hourly wind speed in metres per second. Viewing the central panel on Figure 3.2 for February 12, winds were 3 m/s. During the evening of February 12 and through the next day, the winds increased in speed to 6 m/s. These higher winds persisted till February 18, 2008.

The lower panel in Figure 3.2 shows the direction from which the wind was blowing on an hourly basis. A shift in the wind direction is evident on the evening of February 12 when the wind direction changes from the north to the southwest. The winds continued blowing from the southwest until late on February 18, 2008.

3.1.1.3 Wind Roses

A wind rose is a useful tool that displays an entire period of recorded wind data on a single graph. The total duration of wind occurring within a specified speed range and compass direction is determined as a percentage of the total period of record. Average hourly wind speeds are grouped into ranges from 0 to 1 m/s (calm), 1 to 3 m/s, 3 to 6 m/s etc., in 3 m/s ranges, to 18+ m/s. The wind direction is grouped into 16 compass direction ranges of 22.5 degrees starting at north. This data is summarized in the wind speed and direction frequency distribution table, which is located in the lower right of the figure. The wind rose is a visual display of the data contained within the table.

The length of the line indicates the frequency of winds from each compass direction over the period. The colour and thickness of the line indicate the percentage of the time that winds of a particular speed range were blowing from a particular direction. Figure 3.3 is a wind rose for the entire period of record from July 14, 2005 to August 27, 2008, excluding the 81 days when no data was recorded, as indicated in the notes section in the bottom left corner of the figure. The figure indicates that there are two predominant wind directions; 14.35% of the time the wind blows from the north northeast (NNE) and 13.87% from the west (W). Looking in detail at the winds from the NNE, the thin black portion of the line closest to the centre is representative of the 7.59% of the time winds were blowing from this direction at a speed between 1 and 3 m/s. The light blue portion represents the 5.55% of the time winds were blowing at a speed between 3 and 6 m/s. The dark blue line indicates that for 0.54% of the period of record, winds from the north northeast (NNE) were blowing at a speed between 6 and 9 m/s. The remaining line types in this wind direction indicate that winds are 9-12 m/s, 12-15 m/s, 15-18 m/s and 18+ m/s, 0.33%, 0.12%, 0.11% and 0.11% respectively of the period of record.

It is also possible to determine the percentage of time the wind was blowing at a specific speed by viewing the “total (%)” row at the bottom of the frequency distribution table. At the Mactung site, for the period from July 2005 to August 2008, the wind was considered calm (wind speeds less than 1 m/s) 14.72% of the time, wind speeds were between 1 and 3 m/s 37.77% of the time, between 3 and 6 m/s 38.54% of the time, between 6 and 9 m/s 6.96% of the time and between 9 and 12 m/s 1.54% of the time. Wind speeds in excess of 12 m/s occurred 0.48% of the time during the record period.

Appendix C contains the 38 wind rose/frequency distribution figures for each month for the period of record. Viewing each individual monthly wind rose yields seasonal information on the two prevailing wind directions. The winds generally blow slightly more frequently from the north northeast and the northeast during the winter months, whereas during the summer, winds blow slightly more frequently from the west and southwest.

3.1.2 Air Temperature

Air temperatures are presented in terms of daily extreme temperatures and means as well as hourly averages, as recorded at the Mactung station.

3.1.2.1 Daily Extremes for Air Temperature

The daily maximum, minimum and mean air temperatures are recorded by the meteorological station at midnight. Figure 3.4 summarizes the daily recorded air temperatures for the period of record from July 14, 2005 to August 27, 2008. The mean temperature for the day is plotted as a thick red line bounded by the daily maximum and minimum temperatures which are indicated by thin black lines. Generally, the daily variance in air temperature is $\pm 5^{\circ}\text{C}$ from the mean daily air temperature.

A pattern is evident in the year-long data record. The warmest period is from June to the end of August with a mean daily temperature of approximately 7.0°C . During summer,

temperatures can fluctuate between a high of 20°C and a low of 0°C. The maximum recorded daily temperature for the period of record was 20.1°C which occurred on June 12, 2006.

The coldest period at the site occurs between November and the end of April. During this period the mean daily temperature is -15°C. During the winter period, temperatures can fluctuate between a high of -7°C and a low of -30°C, however temperatures can drop as low as -36°C. The minimum recorded daily temperature for the period of record was -37.2 °C, which occurred on January 26, 2008. Air temperatures begin to rise in April.

3.1.2.2 Hourly Air Temperatures

Figure 3.5 is an example of the 38 monthly weather parameter figures contained in Appendix D. The upper panel in Figure 3.5 and in the figures in Appendix D show on a monthly basis the average hourly air temperatures recorded by the station for each day of the month. These figures are useful for viewing diurnal temperature patterns for a short period of time, such as during a storm. For example, viewing the upper panel of Figure 3.5, temperatures just prior to the evening of February 9, 2008 were fluctuating around -30°C. There was an increase in temperature over the next two days, reaching -10°C on February 12, 2008. This warming was accompanied by the shift in wind direction, as discussed in Section 3.1.1.2, and is evidence of a new weather system moving into the area.

3.1.3 Relative Humidity

Relative humidity is presented in terms of daily extremes and means as well as hourly averages as recorded by the Mactung station.

3.1.3.1 Daily Extremes for Relative Humidity

The daily maximum, minimum and mean relative humidity were recorded by the meteorological station at midnight. Figure 3.6 summarizes this data for the period of record. The daily mean relative humidity is plotted as a thick blue line bounded by the recorded maximum and minimum relative humidity indicated by thin black lines.

Over the period of record the relative humidity varied from short duration lows of less than 20% to a high of 99%, which can occur at any time of the year. During the summer months there is generally a slightly larger daily variation in relative humidity than during the winter months. Maximum relative humidity in the winter months is approximately 5% lower than in the summer. During the warmer summer months, the daily range of relative humidity is typically from 40% to 99% or $\pm 30\%$ from the daily mean, whereas during the winter, the daily range of relative humidity is typically from 70% to 94% or $\pm 12\%$ from the daily mean. The highest daily recorded relative humidity was 99.2% on August 28, 2006. The lowest was 10.4% on November 28, 2007.

3.1.3.2 Hourly Relative Humidity

Figure 3.5 is an example of the monthly weather parameter figures contained in Appendix D. The middle panel in Figure 3.5 and in the figures in Appendix D show the average hourly relative humidity, recorded by the station for each day in the month. For example viewing the center panel of Figure 3.5, late in the day on February 8, 2008 the relative humidity dropped sharply from 70% to 50%, stayed at 50 % till the early hours of February 10, when it rose sharply back to 70%. By February 11 the relative humidity was over 80%, temperatures had warmed to -10°C . This was as a result of the change in winds from the north to the southwest pushing a warmer wet air mass onto the site.

3.1.4 Solar Incident Radiation

Solar incident radiation is presented in terms of daily extremes as well as hourly averages as recorded by the Mactung station.

3.1.4.1 Daily Extremes for Incident Solar Radiation

At the conclusion of each day, the station records the maximum daily incident solar radiation (insolation) in Watts per square metre (W/m^2). The minimum daily incident solar radiation will be zero throughout the year, as at this latitude, it gets dark for at least a short time each night. Figure 3.7 shows the recorded maximum daily incident solar radiation plotted from July 14, 2005 to August 27, 2008.

There is a strong yearly cycle. Over the winter period, from mid-November to mid-January, the sun is lowest in the sky and solar radiation is at a minimum, typically less than $50 \text{ W}/\text{m}^2$. During this winter period daily variations up to the maximum incident solar radiation are less than $30 \text{ W}/\text{m}^2$.

During the summer period, from April to July, solar radiation is at its highest, with a typical maximum radiation of $850 \text{ W}/\text{m}^2$ for the day. The highest recorded incident solar radiation of $1164 \text{ W}/\text{m}^2$ occurred on May 5, 2006. During the summer months, there are large variations in the daily maximums due to cloud cover. This cloud cover can reduce the maximum daily insolation from an average of $850 \text{ W}/\text{m}^2$ to under $600 \text{ W}/\text{m}^2$ for the day.

3.1.4.2 Hourly Incident Solar Radiation

The lower panel in Figure 3.5 and the figures in Appendix D show the average hourly solar incident radiation recorded by the station for each month over the period of record.

Peaks typically occur at midday, when the sun is at its highest. Insolation drops to zero during the night. The data can be used to determine the number of daylight hours at site for any day of the year, or to determine the incident solar radiation at any point in time. It can also be used to identify periods of cloud cover. In Figure 3.5, from February 22 to 26, the insolation peaks are 300 to $400 \text{ W}/\text{m}^2$, which for February at this latitude is a clear sunny day with little to no cloud cover. For the first half of February 2008, the daily insolation peaks are less than $100 \text{ W}/\text{m}^2$, indicating cloud cover.

3.2 MACMILLAN PASS STATION (METEOROLOGICAL SERVICE OF CANADA)

The Meteorological Service of Canada station at Macmillan Pass records meteorological parameters at hourly intervals. A daily summary is also recorded. Further details on this station can be obtained from the site description included in Appendix A. The station is currently active and has an existing data record of hourly observations since June 29, 1998. Monthly data exists back to February 1998.

This station is 7 km from the Mactung site, at a lower elevation, and on the opposite side of the divide, therefore the parameters measured may not be representative of the meteorological conditions at the Mactung site. This data is used in conjunction with the data recorded at the Mactung meteorological station, to further understand the meteorology of the area. This station records barometric pressure and precipitation data, two parameters that are not recorded at the Mactung station, and therefore, these measured parameters provide an estimate of conditions at the Mactung site.

Periods of data are missing throughout the Macmillan Pass record. These periods are noted in the sections outlining the various recorded meteorological parameters. During the data analysis it was evident that the precipitation data collected by the station after Oct 12, 2007 were suspect and therefore have been removed from the data set.

3.2.1 Winds

The Macmillan Pass station records wind data on an hourly and a daily basis. Wind data for the period from August 2006 to August 2007 have been summarized and presented in three different forms, and described below.

3.2.1.1 Maximum Wind Speed

Figure 3.8 shows the maximum average hourly wind speed recorded at the Macmillan Pass station for the period from July 14, 2005 to Aug 27, 2008 as a blue line. The red diamonds indicate the maximum wind gust speed for the day recorded by the meteorological station if the speed is greater than 31 km/h (8.6 m/s). If the maximum gust is less than this value it is denoted by Environment Canada as < 31. Therefore no maximum daily wind gust data is available for days when the maximum wind gust is less than 8.6 m/s. The gust data is missing for the entire months of November 2006 and February, April and June 2007. The maximum recorded wind gust of 23.1 m/s occurred on August 26, 2008. Wind gusts over 15 m/s were recorded on 21 occasions, as indicated in Figure 3.8.

Figure 3.8 indicates that the typical daily maximum wind gust is about twice the daily maximum average hourly wind speed.

Comparing the maximum daily average hourly wind speed data from both stations (Figures 3.1 and 3.8), it is noted that the sites typically have similar daily maximum average hourly wind speeds of 5 to 6 m/s. However the Mactung station records higher maximum daily average hourly winds. For example the Macmillan station recorded only one day where the maximum daily average hourly wind speed was as high as 15 m/s, whereas over

the same time period, the Mactung station recorded 17 days where daily maximum average hourly wind speed was greater than 15 m/s.

3.2.1.2 Wind Speed and Direction Stick Plots

Figure 3.9 is a sample of the 38 wind speed and direction figures, presented in Appendix E, which were produced from data recorded at the Macmillan Pass meteorological station for the same period as the Mactung data presented in Figure 3.2.

Similarities and differences between winds, measured at the two stations can be observed by comparing the monthly figures in Appendix B (Mactung data) to those in Appendix E (Macmillan Pass data).

For example the change of weather observed by the Mactung meteorological station on February 12, 2008 and discussed in Section 3.1.1.2 is also evident in the data collected from the Macmillan Pass station for the same period.

Viewing the upper panel of Figure 3.9, it is observed that on February 12 for example, the winds were blowing predominantly from the northeast at approximately 2.0 m/s, about 1.0 m/s slower than at the Mactung station. At midnight on the evening of February 12, the wind shifted from the northeast to the southwest with a speed of over 5 m/s, similar to that at Mactung station. Viewing the remaining figures in Appendix B and E it is evident that during some months there are no wind pattern similarities between the two stations. The most likely reason for the lack of consistency is the topographical differences between the two stations.

The central panel indicates the average hourly wind speed in m/s. A period of relative calm can be seen for the period prior to February 12, 2008, when the winds were blowing at 2 m/s or less. This lasted until midnight on February 12, when the wind speed increased to over 5 m/s. These higher winds lasted for most of the day, then dropped to less than 1.0 m/s overnight, but then increased rapidly to over 10 m/s on the morning of February 13. Winds greater than 5.0 m/s persisted for the next few days.

The lower panel in Figure 3.9 shows the bearing from which the wind was blowing on an hourly basis. During the evening of February 12, 2008 a shift in the wind direction from the northeast (bearing 25 to 50 degrees) to the southwest (bearing 230 degrees) is evident.

In general, the two stations agree with respect to the occurrence and timing of storm events, as well as the wind speed during these events. However, the Mactung site generally recorded greater wind speeds and greater directional variability during the calmer periods than did the Macmillan Pass station.

3.2.1.3 Wind Roses

Figure 3.10 is a wind rose for the entire period of record from July 2006 to August 2008 for Macmillan Pass. It is similar to the Mactung wind rose in Figure 3.3, except that the Macmillan Pass northeast prevailing winds are more diffuse in that there is a similar

occurrence for the NNE, NE, ENE directions, whereas the Mactung Pass wind is predominantly from the NNE direction. Also the winds at the Macmillan Pass station are primarily from the SW, whereas the comparable Mactung winds tend to be from the W, or WSW directions.

Winds at Macmillan Pass blew from a south-westerly direction (including SSW, SW and WSW) 34.2 % of the time and from a north-easterly direction (NNE, NE, and ENE) 32.9 % of the time.

In general, winds at the Macmillan Pass site are slower than at the Mactung station, as can be readily seen by comparing the 'Total %' of the speed and direction tables in Figures 3.3 and 3.10. The Macmillan Pass station recorded wind speeds in excess of 6 m/s 6% of the time whereas the Mactung station recorded that 9% of the time winds were greater than 6.0 m/s. Also the Mactung station recorded winds greater than 15.0 m/s 0.23 % of the time whereas the Macmillan Pass station recorded no wind greater than 15.0 m/s.

Using hourly averaged wind speeds over the period of record, the winds at Macmillan Pass were considered calm (wind speeds less than 1 m/s) 7.85% of the time. Wind speeds were between 1 and 3 m/s 55.83%, between 3 and 6 m/s 30.51%, between 6 and 9 m/s 5.12%, between 9 and 12 m/s 0.78%, and between 12 and 15 m/s 0.10% of the time.

The 38 wind rose/frequency distribution figures for each month for the period of record are contained in Appendix F.

3.2.2 Air Temperature

Air temperature is presented in terms of daily extreme temperatures and means as well as hourly averages as recorded by the Macmillan Pass station.

3.2.2.1 Daily Extremes for Air Temperature

The maximum, minimum and mean air temperatures for the day are recorded at Macmillan Pass. The mean air temperature for the day is plotted as a thick red line bounded by the maximum and minimum temperatures, indicated by thin black lines in Figure 3.11. There are numerous days of missing data with the largest data gap from December 11, 2007 to January 31, 2008. The daily variation in air temperature is $\pm 5^{\circ}\text{C}$ from the mean daily air temperature.

During the summer, temperatures at Macmillan Pass fluctuated between 4°C and 17°C , with a mean temperature of approximately 10°C . The maximum recorded daily temperature for the period of record was 26.9°C on June 12, 2006. This is also the day on which the highest maximum temperature of 20.05°C was recorded at the Mactung station.

During the winter, temperatures at Macmillan Pass fluctuated between a high of -5°C and a low of less than -30°C with a mean of -20°C , however temperatures can drop to the -40°C range for short periods. The minimum recorded daily temperature for the period of record

was -41°C on February 8 and 9, 2008. This occurred two weeks after the lowest recorded temperature of -37.2°C at the Mactung station.

To compare temperatures at Mactung and Macmillan Pass, daily mean air temperatures for the period of record are plotted in Figure 3.12. A very similar yearly pattern is evident for the two stations.

Mean air temperatures at Macmillan Pass are generally 2 to 5°C lower than those recorded at Mactung during the winter. During the summer, mean temperatures at Macmillan Pass tend to be 2° to 3°C warmer.

3.2.2.2 Hourly Air Temperatures

Figure 3.13 is an example of the 38 monthly weather parameter figures contained in Appendix G. The top panel in Figure 3.13 and in the figures in Appendix D shows the average hourly air temperatures as recorded by the Macmillan Pass station. The horizontal axis indicates days. This panel shows that temperatures were below -30°C until the morning of February 10. The temperature began to rise over the next few days until it reached about -8°C on February 14. This is a similar trend to that observed at the Mactung station, except that the temperature rise occurred more slowly at the Macmillan station.

3.2.3 Relative Humidity

Relative humidity is presented in terms of daily extremes and means as well as hourly averages as recorded by the Macmillan Pass station.

3.2.3.1 Daily Extremes for Relative Humidity

The daily maximum, minimum and mean relative humidity are recorded by the Macmillan Pass meteorological station. Figure 3.14 is a graph showing the mean daily relative humidity plotted as a thick blue line bounded by the maximum and minimum relative humidity indicated by thin black lines.

Over the period of record, the relative humidity varied from short duration lows of slightly less than 20% to a high of 99%, which can occur at any time of the year. During the summer months there is a much larger daily variation in relative humidity. The daily range in the summer is 40% to 99% or $\pm 30\%$ from the daily mean, whereas during the winter the daily range of relative humidity is 70% to 94% or $\pm 12\%$ from the daily mean. The lowest recorded relative humidity was 13% on June 13, 2006.

The daily mean relative humidities for Macmillan Pass and Mactung are shown in Figure 3.15 and indicate similar daily fluctuations for the two stations. However, during the winter period, on days with a low mean relative humidity, the Mactung station recorded values 30 to 35% lower than those recorded at the Macmillan Pass Station.

3.2.3.2 Hourly Relative Humidity

Figure 3.13 is an example of the 38 monthly weather parameter figures contained in Appendix G. The second panel from the top in Figure 3.13 and in the figures in Appendix G shows the average hourly relative humidity. This panel shows that the relative humidity was about 60% at the beginning of February. As the winds changed from north to southwest and the temperature increased, the relative humidity rose to over 90%. By February 11 it was over 80%, temperatures had risen to -10°C indicating that a warm wet air mass was being pushed onto the site by the southwest winds.

Comparing the second panel in Figure 3.5 (Mactung) and the second panel of Figure 3.13 (Macmillan Pass), it is evident by the larger fluctuations in relative humidity at the Mactung site, that weather systems affect relative humidity more at this station.

3.2.4 Barometric Pressure

The Macmillan Pass barometric pressure is presented in terms of daily extremes as well as hourly averages. A barometric pressure sensor was not installed at the Mactung station, therefore the barometric pressure data recorded at Macmillan Pass must be used to estimate conditions at Mactung. This is accomplished by subtracting 49.3 hPa from the Macmillan Pass data to account for the 481 m elevation difference between the two stations.

3.2.4.1 Daily Extremes for Barometric Pressure

The maximum, minimum and mean relative humidity for the day are recorded by the Macmillan Pass station and saved to a daily summary data array. This data is presented in Figure 3.16. The daily mean barometric pressure is plotted as a thick green line bounded by the maximum and minimum barometric pressures indicated by thin black lines. The reported barometric pressure is in terms of on site pressure and has not been corrected to sea level equivalent pressure.

There is a seasonal variation in barometric pressure at Macmillan Pass over the period of record. The mean barometric pressure in summer is 857 hPa, while during winter it is 847 hPa. During the warmer summer months, the daily variations of barometric pressure are small, typically from 865 hPa to 850 hPa or ± 7.5 hPa from the daily mean. During the winter, barometric pressure fluctuates more, typically from 865 hPa to 830 hPa or ± 17.5 hPa from the daily mean. The lowest recorded barometric pressure was 821 hPa on December 18, 2006. The highest was 876 hPa on February 16, 2006. Four out of five of the highest recorded barometric pressures occurred during the winter, even though this is time of the year when the lowest pressures have been recorded.

3.2.4.2 Hourly Barometric Pressure

The third panel from the top in Figure 3.13 and in the figures in Appendix G shows the average hourly barometric pressure recorded by the Macmillan Pass station.

During the spring and summer months, there is little variation in barometric pressure. Slight rises and falls due to the movement of air masses can be seen, but fluctuations are gradual, and in the range of 5 to 10 hPa over three to four days. During the winter months, fluctuations are more prominent, in the range of 40 hPa.

3.2.5 Precipitation

The Macmillan Pass meteorological station has recorded daily precipitation since June 1998. During the analysis of the precipitation data, it was observed that the precipitation records were incorrect post December 2005. This was discovered because the recorded rainfall and water equivalent snowfall for each day did not add up to the total precipitation recorded for that day. The MSC has stated that there has been a problem since March 2005. However, inspection of the data from March 2005 to the end of the year indicated that during this period the error was very small. Therefore only data from 1998 to 2005 has been included in this report.

Average monthly precipitation based on available monthly data from 1998 to 2005 is shown as a histogram in Figure 3.17. The figure indicates the total average amount of precipitation as well as the average amount of snow or rain that fell for each month. August has the highest average monthly precipitation with an average of 77.8 mm for the month. All the precipitation recorded for August fell as rain. March ranks as the second highest month for precipitation with an average rate of 75.5 mm for the month, all of it falling as snow.

A yearly average precipitation of 672.2 mm was determined from the precipitation data collected from 1998 to 2005 from the Macmillan Pass meteorological station.

4.0 RECOMMENDATIONS

It is recommended that the Mactung hydrometric stations be re-installed in the spring of 2009. This will enable a more accurate assessment of the year to year variability of discharge and water temperature. A fourth season of discharge data for Tributaries A and C and a second year of data on the Hess River South Tributary is advised to improve the confidence level for the determination of various hydrological parameters.

The Mactung meteorological station should remain in operation through 2009 for similar reasons with respect to weather parameters.

Precipitation data recorded at the Environment Canada's Macmillan Pass meteorological station provides only a rough estimate of conditions at the Mactung site. The difference of nearly half a kilometre in elevation between the two sites can lead to erroneous assumptions, especially in mountainous terrain. Furthermore, numerous months of precipitation data are missing from the record and MSC has stated that the precipitation gauge is not functioning correctly and that no time frame has been set for repair or replacement. Therefore it is recommended that an all-weather precipitation gauge be installed in the vicinity of the existing meteorological station at Mactung, to obtain accurate precipitation data for the site.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of North American Tungsten Corporation Ltd. and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than North American Tungsten Corporation Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions provided in Appendix H of this report.

6.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact one of the undersigned at your convenience.

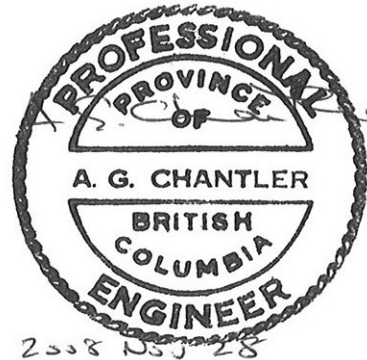
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TABLES



TABLE 1.1: 2008 HYDROMETEOROLOGICAL SURVEY STATION GEOGRAPHIC COORDINATES							
Station	Longitude			Latitude			Station El. (m) SL
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds	
TRIB A - Tributary A Hydrometric Station	130	17	19.0	63	17	22.6	1133
HESS ST - Hess River South Tributary Hydrometric Station	130	19	38.5	63	18	44.9	1090
MET - MacTung Meteorological Station	130	8	50.3	63	16	50.2	1860
MACPAS - MSC MacMillan Pass Meteorological Station	130	2	7.1	63	14	36.9	1379

Note: GPS coordinates datum is NAD27

TABLE 2.1: SUMMARY OF COLLECTED DISCHARGE MEASUREMENTS FOR TRIBUTARY A			
Date/time PDST	Staff Gauge Reading m	Logger stage m	Discharge m ³ /s
2006			
Jul 10/06 16:41	0.450	0.299	4.56
Jul 10/06 17:25	0.450	0.298	4.55
Aug 04/06 13:12	0.398	0.266	3.45
Aug 04/06 13:46	0.398	0.263	3.51
Aug 05/06 09:39	0.385	0.242	3.26
Aug 05/06 10:18	0.385	0.241	3.20
Aug 05/06 11:30	0.385	0.240	3.18
Aug 06/06 09:47	0.373	0.227	2.96
Aug 06/06 10:24	0.370	0.227	2.93
Sep 19/06 11:27	0.334	0.186	2.23
Sep 19/06 12:23	0.335	0.189	2.26
Sep 19/06 13:10	0.334	0.190	1.92
Sep 19/06 13:46	0.334	0.194	2.22
Sep 20/06 15:19	0.329	0.173	2.17
Sep 20/06 15:49	0.329	0.175	2.10
2007			
Jul 10/07 13:51	0.450	0.266	5.1
Jul 10/07 14:21	0.447	0.265	4.7
Jul 11/07 12:54	0.429	0.260	4.8
Jul 11/07 13:30	0.431	0.260	5.0
Sep 04/07 13:04	0.322	0.182	1.5
Sep 04/07 13:54	0.324	0.182	1.7
Sep 05/07 14:38	0.328	0.183	1.8
Sep 05/07 15:20	0.328	0.182	1.8
2008			
May 08/08 14:00			0.2
Jun 18/08 09:10	0.455		4.1
Jun 18/08 09:32	0.455		4.1
Jun 18/08 10:07	0.455		4.4
Jun 18/08 20:55	0.530	0.339	6.9
Jun 18/08 21:17	0.530	0.337	7.8
Jul 15/08 18:22	0.452	0.277	4.3
Jul 15/08 19:05	0.455	0.277	4.3
Sep 03/08 14:42	0.389	0.231	2.9
Sep 03/08 15:19	0.389	0.231	2.9

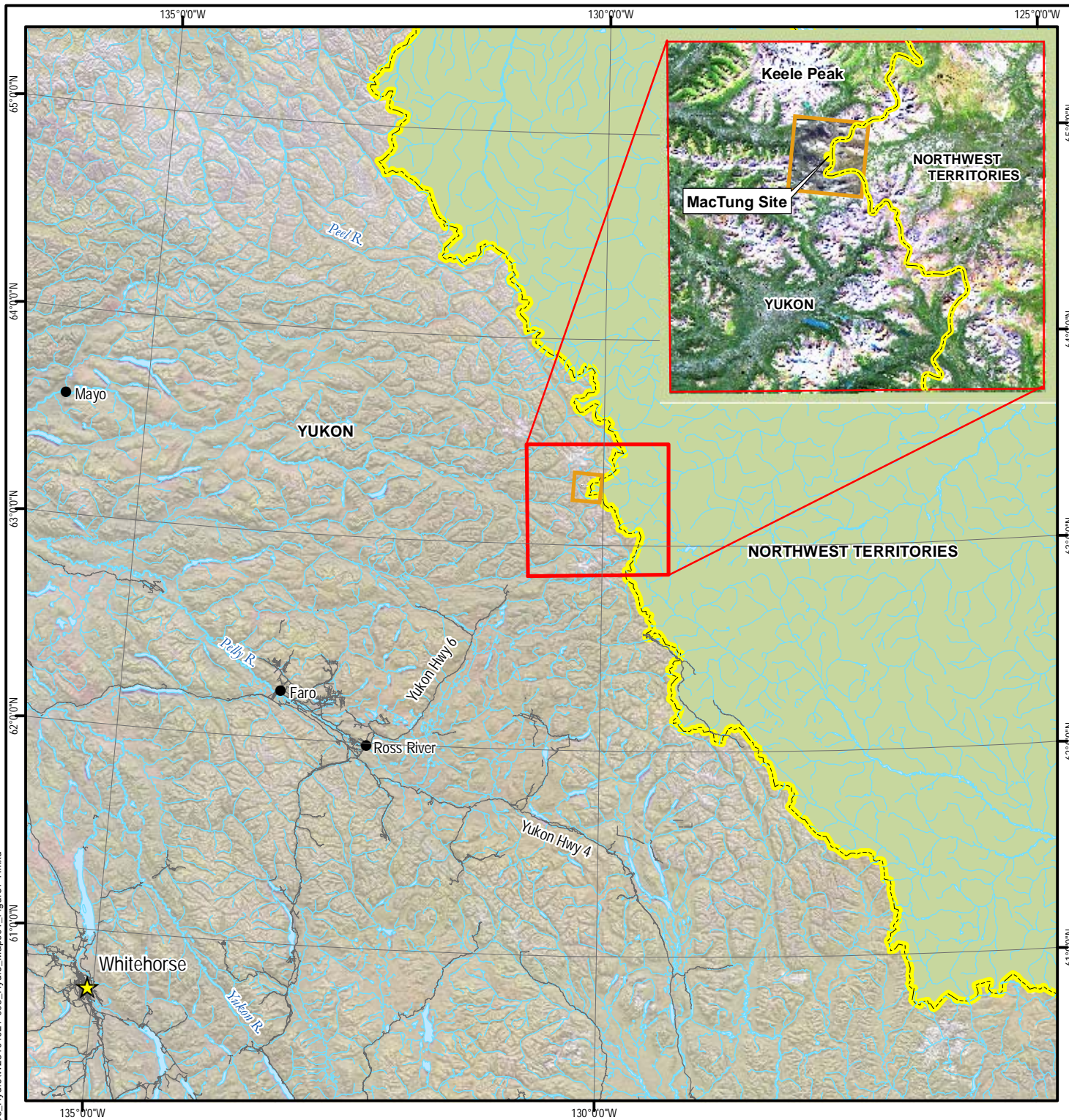
TABLE 2.2: SUMMARY OF COLLECTED DISCHARGE MEASUREMENTS FOR TRIBUTARY C			
Date/time PDST	Staff Gauge Reading m	Logger Stage m	Discharge m ³ /s
2006			
Aug 06/06 11:22	no staff	no logger	0.78
Aug 06/06 11:43	no staff	no logger	0.78
Sep 19/06 14:30	no staff	no logger	0.57
Sep 19/06 14:51	no staff	no logger	0.53
Sep 20/06 16:24	no staff	no logger	0.45
2007			
Jul 11/07 14:26	no staff	no logger	1.43
Jul 11/07 14:47	no staff	no logger	1.37
Jul 11/07 15:17	no staff	no logger	1.32
Sep 04/07 14:43	no staff	no logger	0.43
Sep 04/07 15:12	no staff	no logger	0.44
2008			
May 09/08 14:00	no staff	no logger	0.11
Jun 18/08 11:12	no staff	no logger	1.37
Jun 18/08 11:27	no staff	no logger	1.29
Jun 18/08 11:37	no staff	no logger	1.54
Jun 18/08 22:22	no staff	no logger	2.35
Jun 18/08 22:37	no staff	no logger	2.21
Jul 15/08 19:55	no staff	no logger	1.24
Jul 15/08 20:19	no staff	no logger	1.23
Sep 03/08 15:59	no staff	no logger	0.60
Sep 03/08 16:29	no staff	no logger	0.66

TABLE 2.3: SUMMARY OF COLLECTED DISCHARGE MEASUREMENTS FOR HESS RIVER SOUTH TRIBUTARY			
Date/time PDST	Staff Gauge Reading m	Logger Stage m	Discharge m ³ /s
2006			
Mar 28/08 12:00			0.14
Jun 18/08 16:00	0.385	0.499	14.62
Jun 18/08 16:50	0.390	0.503	14.84
Jun 18/08 17:15	0.390	0.507	12.51
Jun 19/08 08:10	0.455	0.578	17.11
Jun 19/08 08:35	0.460	0.577	18.94
Jun 19/08 09:01	0.460	0.572	16.10
Jul 15/08 15:15	0.465	0.563	15.36
Jul 15/08 16:28	0.460	0.556	15.75
Sep 03/08 11:16	0.227	0.368	5.92
Sep 03/08 12:19	0.227	0.335	5.65








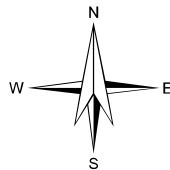
FIGURES





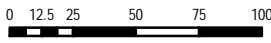
LEGEND

-  Territorial Boundary
-  Local Study Area
-  Watercourse
-  Waterbody
-  Roads



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

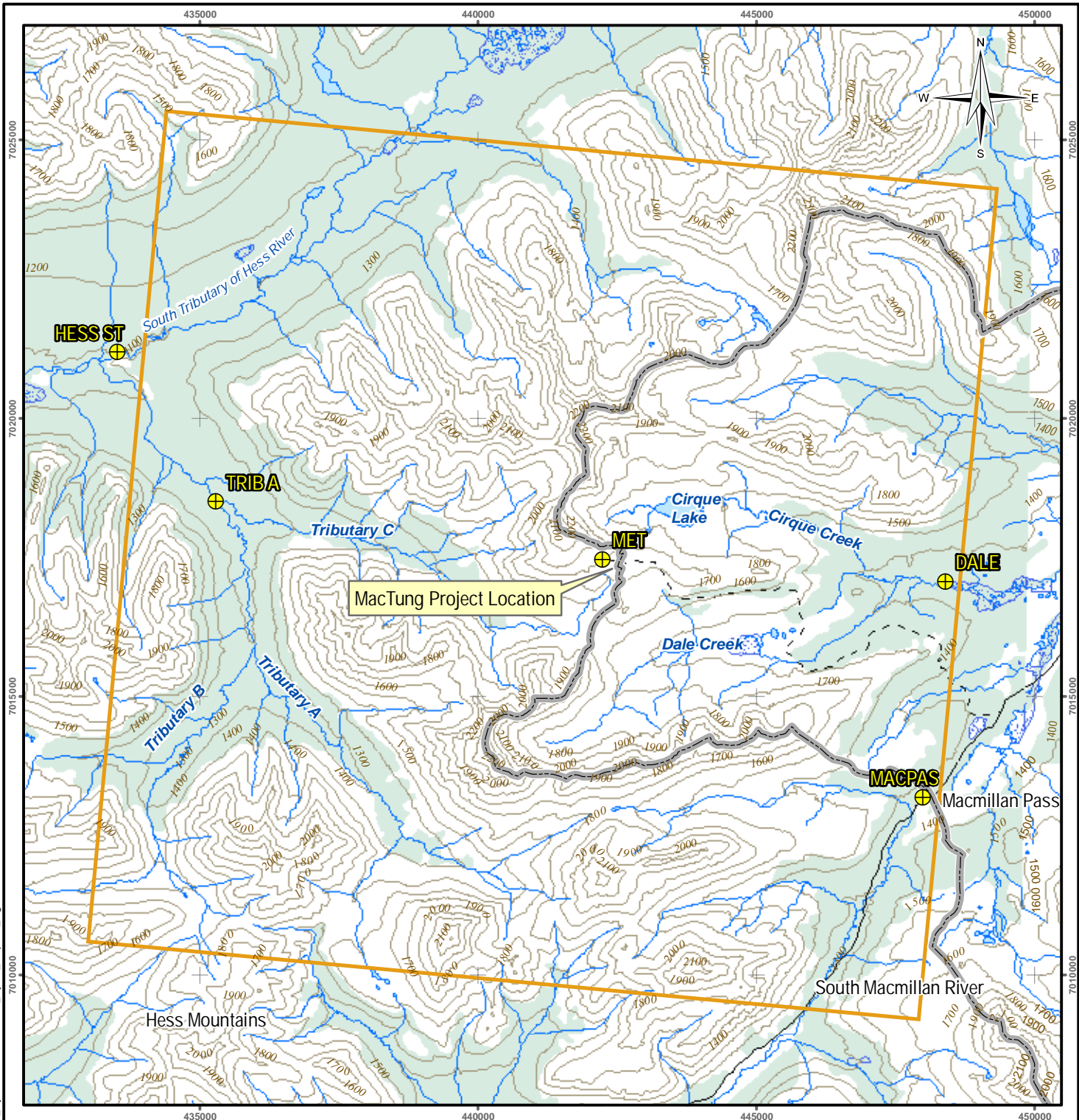
Project Location Map

PROJECTION UTM Zone 9		DATUM NAD83	
Scale: 1:3,000,000			
			
FILE NO. W23101021-013_Hydro_Map001_Figure1-1.mxd			
PROJECT NO. W23101021.013	DWN MEZ	CKD BD	REV 0
OFFICE EBA-VANC	DATE November 6, 2008		

EBA Engineering
Consultants Ltd. 

Figure 1.1

NOTES Landsat TM imagery Earthsat acquired Sept.17, 1995
Bands 432 enhanced



G:\Vancouver\GIS\ENVIRONMENTAL\W231\W23101021-013_Hydro_Map002_Figure1-2.mxd

LEGEND

- Hydrometric Station
- NWT - Yukon Border
- Local Study Area
- Road
- Trail
- Watercourse
- Contour (100m interval)
- Waterbody
- Wetland
- Vegetation

- TRIBA** Tributary A Hydrometric Station
- DALE** Dale Creek Hydrometric Station (Dropped from Hydrometric Program)
- MET** MacTung Camp Meteorological Station
- MACPAS** MSC Macmillan Pass Meteorological Station
- HESS ST** Hess River South Tributary

NOTES Base data source:
NTS 1:50,000

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Hydrometeorological Site
Location Map**

PROJECTION UTM Zone 9		DATUM NAD83	
Scale: 1:100,000			
FILE NO. W23101021-013_Hydro_Map002_Figure1-2.mxd			
PROJECT NO. W23101021.013	DWN MEZ	CKD BD	REV 0
OFFICE EBA-VANC	DATE November 6, 2008		

EBA Engineering Consultants Ltd.

Figure 1.2

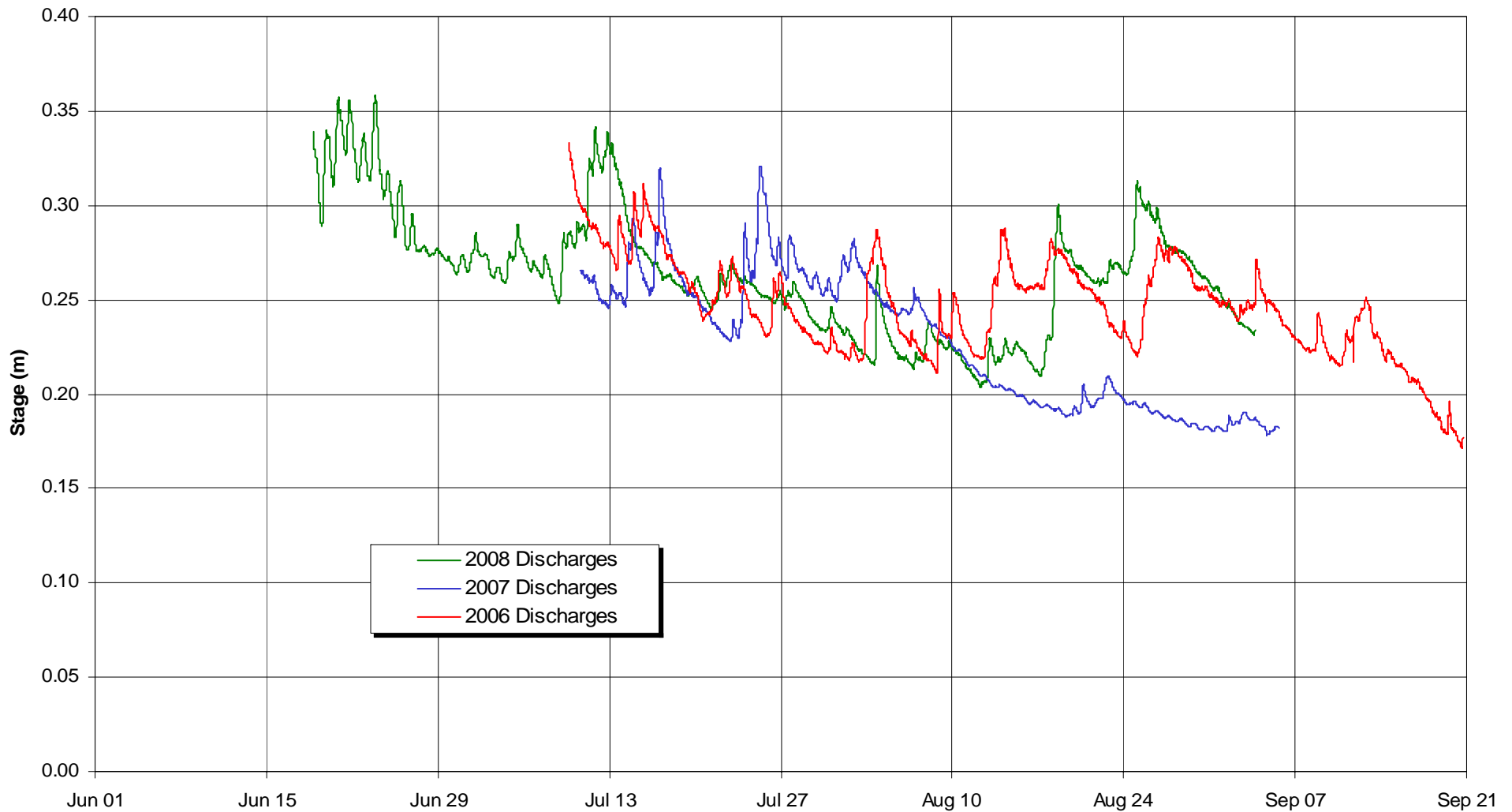


Photo 1 - Aerial View of Site 1 Tributary A Hydrometric Station July 2007



Photo 2 - View Upstream of Site 1 Tributary A Hydrometric Station July 2007

<p>CLIENT</p>  <p>NORTH AMERICAN TUNGSTEN CORPORATION LTD</p>		<p>MACTUNG PROJECT 2008 HYDROMETEOROLOGICAL SURVEY</p>			
		<p>Site 1 Tributary A Hydrometric Station</p>			
<p>EBA Engineering Consultants Ltd.</p>  <p>eba</p>	<p>PROJECT NO. W23101021</p>	<p>DWN RED</p>	<p>CHK JAS</p>	<p>REV n</p>	<p>Figure 2.1</p>
	<p>OFFICE FRA-VANC.</p>	<p>DATE November, 2008</p>			



NOTES

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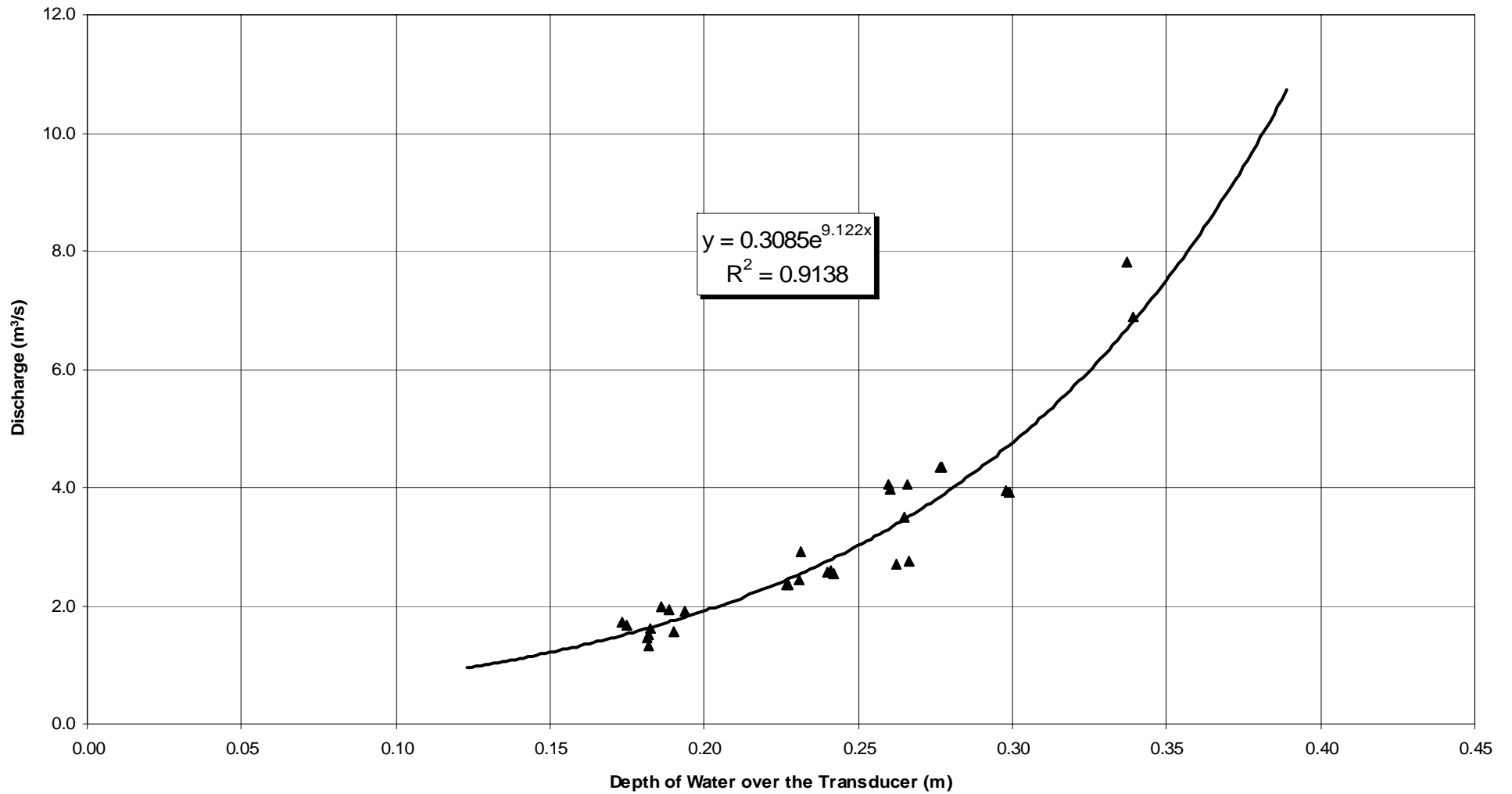
MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Tributary A
2006-2008
Creek Stages

PROJECT NO.
W23101021
OFFICE
EBA-VANC

DWN	CKD	REV
RFD	JAS	0
DATE October, 2008		

Figure 2.2



NOTES

This stage-discharge relationship include all data collected at the hydrometric station from July 10, 2005 to september 3, 2008

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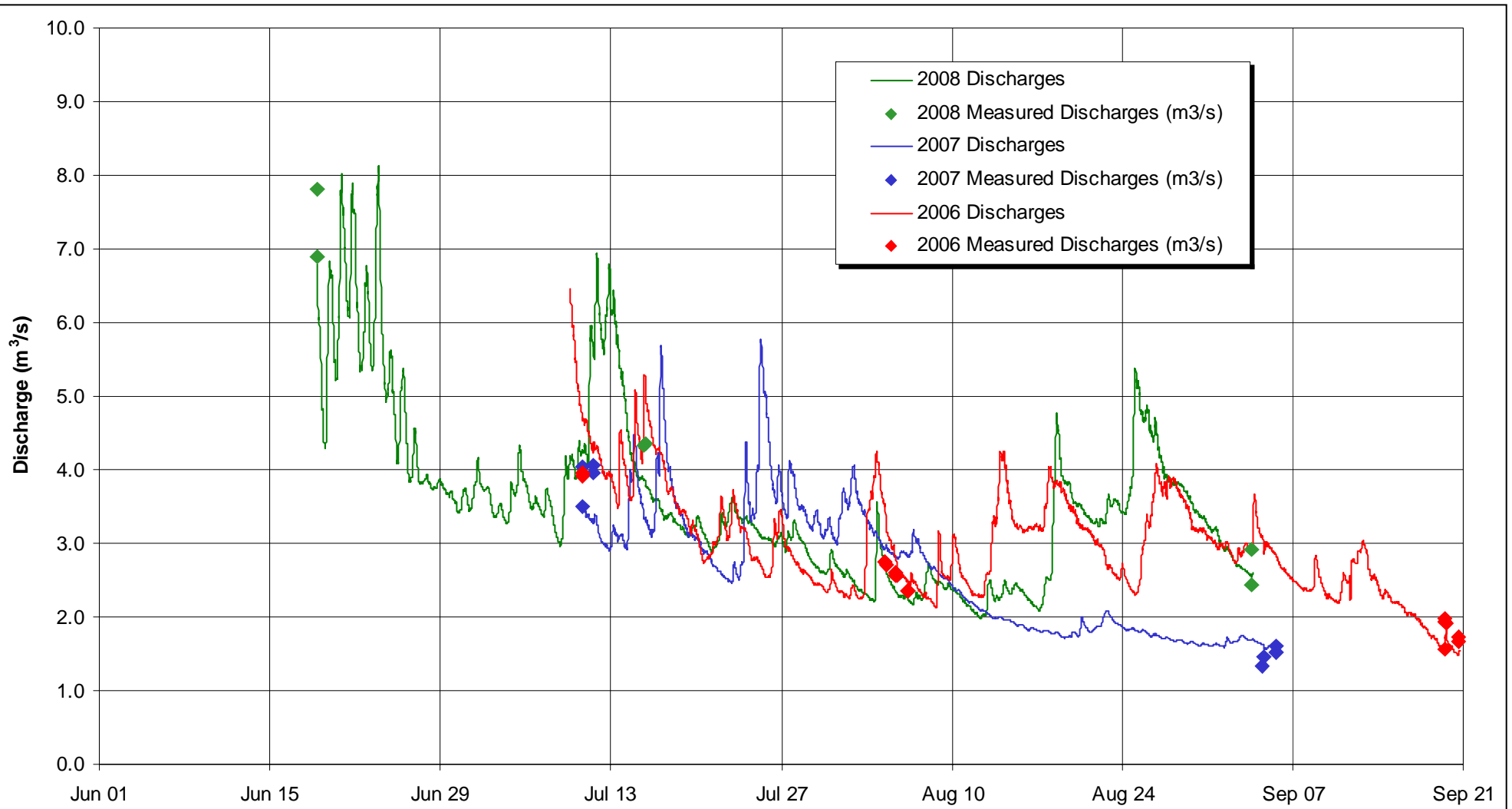
MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Tributary A
2006 - 2008

Stage-Discharge Relationship

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.3



NOTES

A discharge of 0.23 m³/s was measured on May 8, 2008 @ 14:00 hours.

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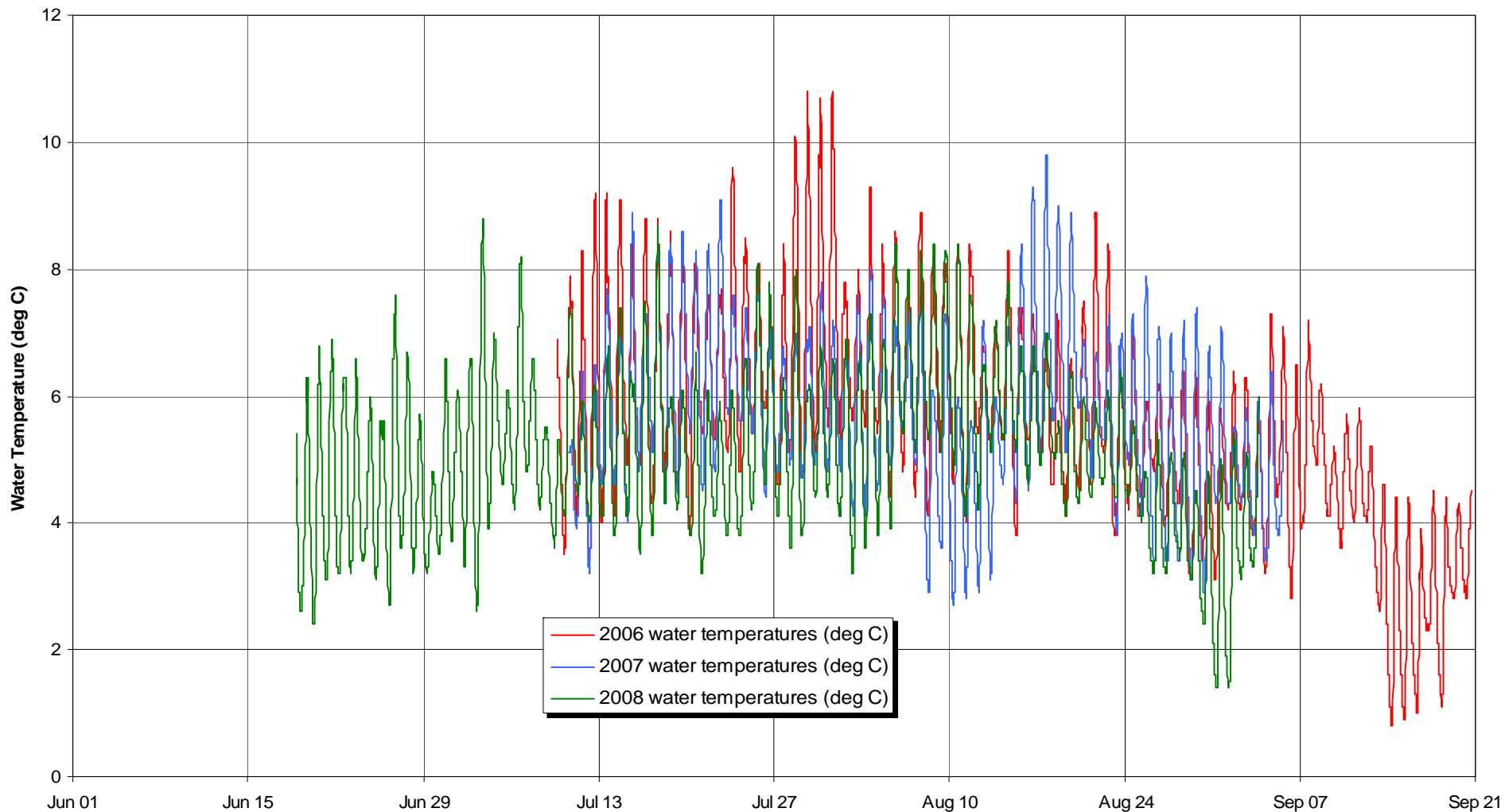
MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Tributary A
2006-2008

Discharge Hydrograph

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE October, 2008		

Figure 2.4



NOTES

Water Temperatures collected at the same depth as the transducer.

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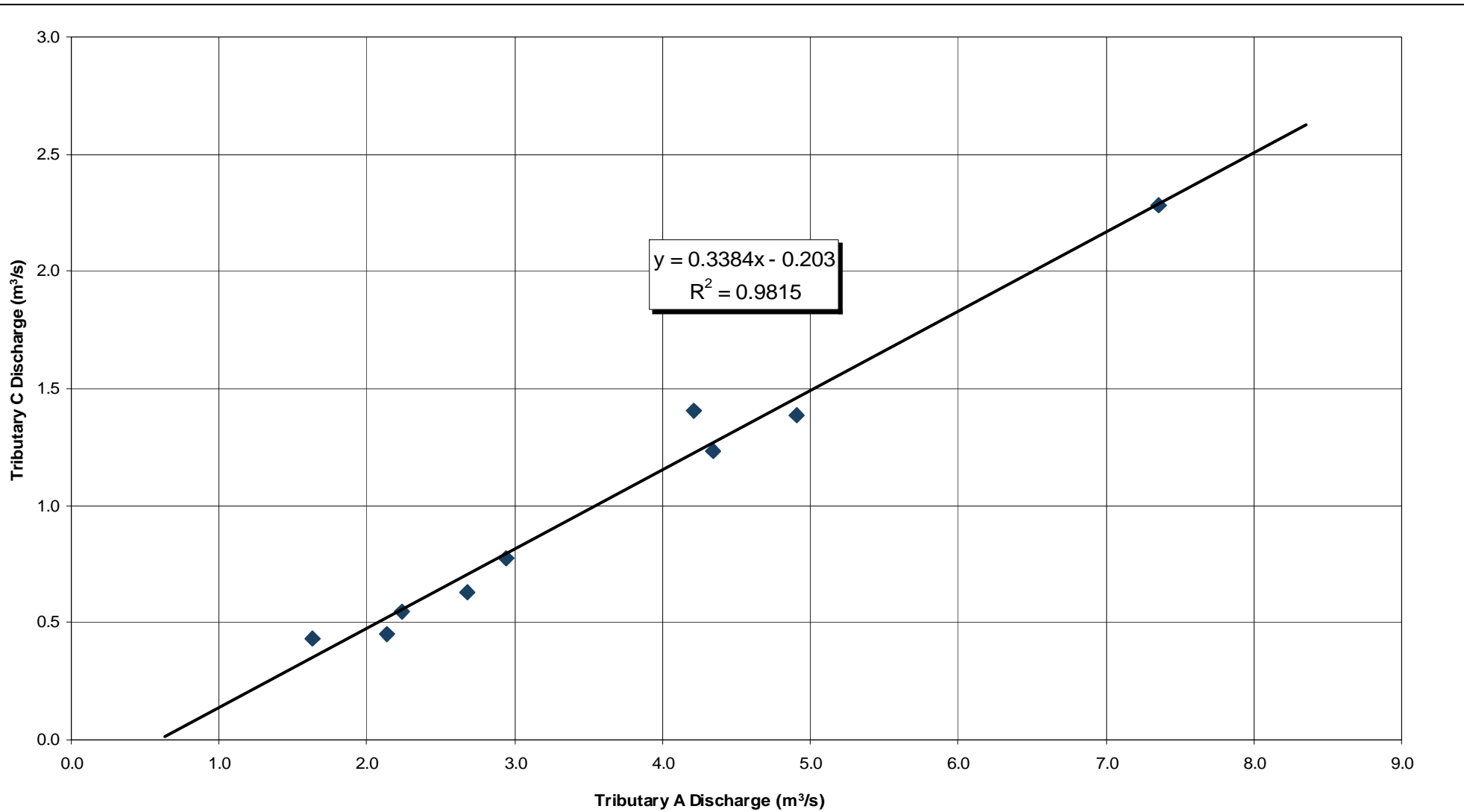
MACTUNG PROPERTY
 2008 HYDROMETEOROLOGICAL SURVEY

Tributary A
 2006 - 2008

Water Temperatures

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE October, 2008		

Figure 2.5



NOTES

Based on data collected from 2006 to 2008

CLIENT



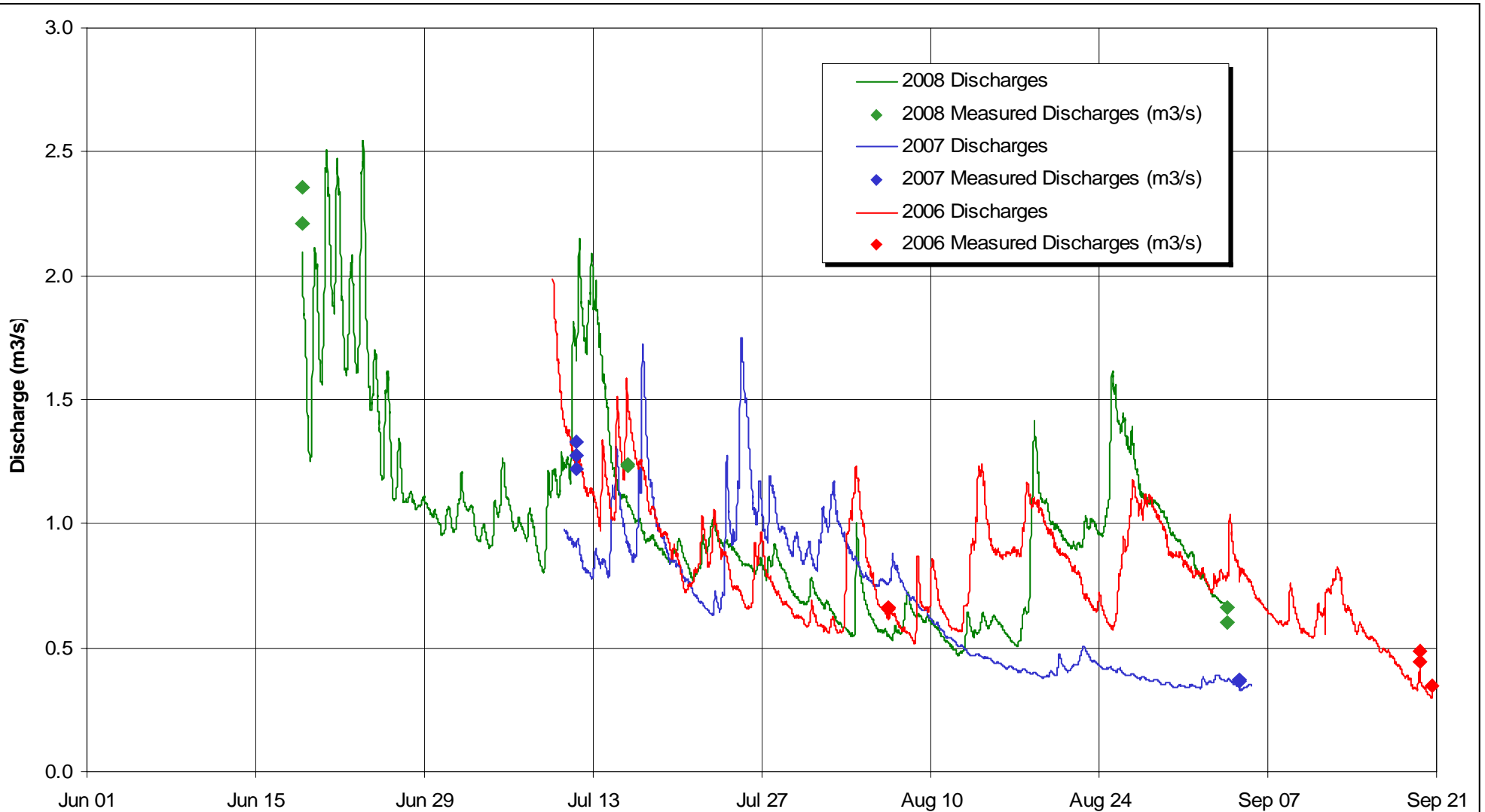
EBA Engineering
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MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Comparative
Discharges
Tributary C vs Tributary A

PROJECT NO. W23101021	DWN RFD	CKD JAS0	REV
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.6



NOTES

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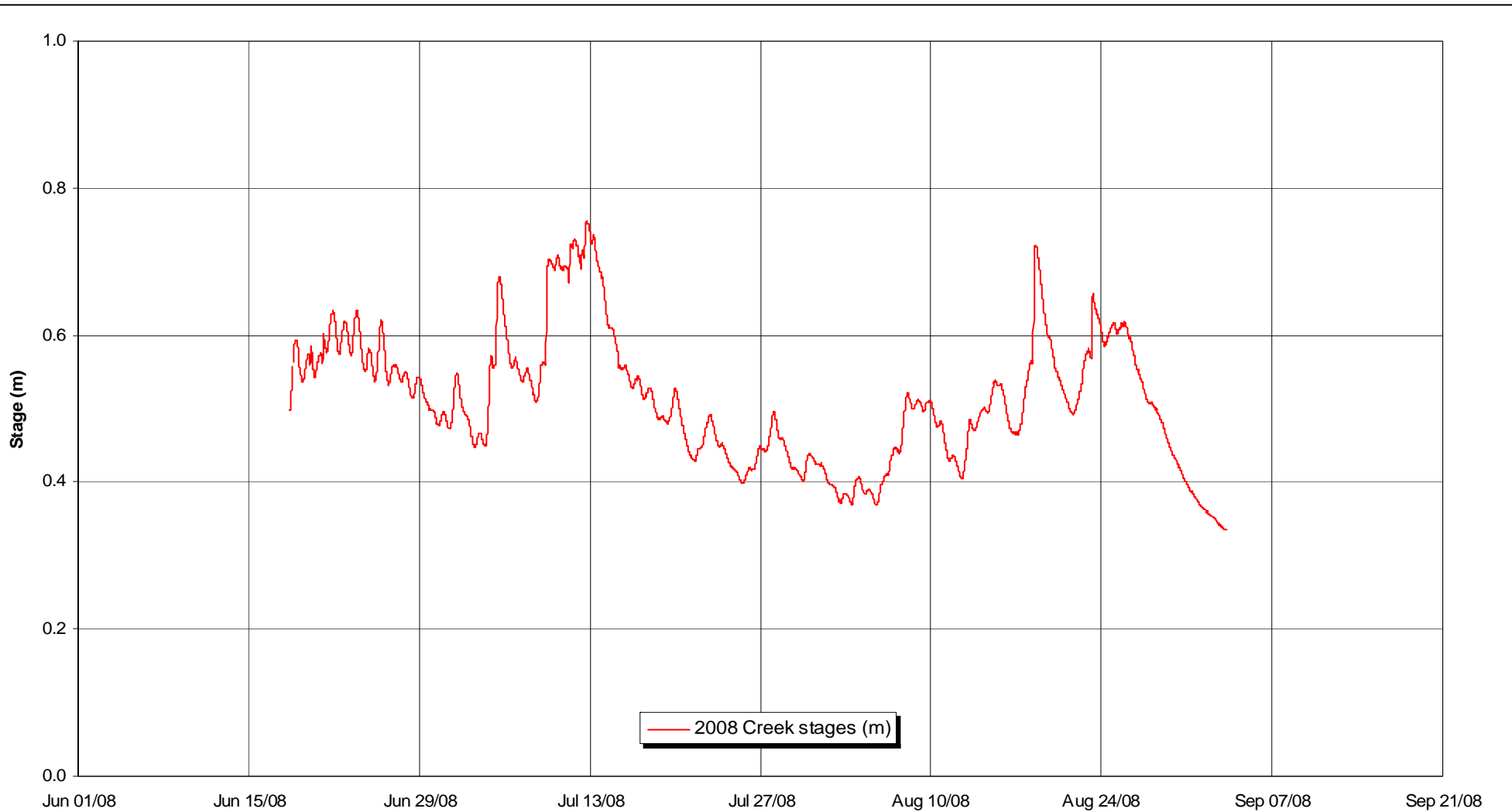
MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Tributary C
2006-2008

Discharge Hydrograph

PROJECT NO. W23101021	DWN RFD	CKD JASO	REV
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.7



— 2008 Creek stages (m)

NOTES

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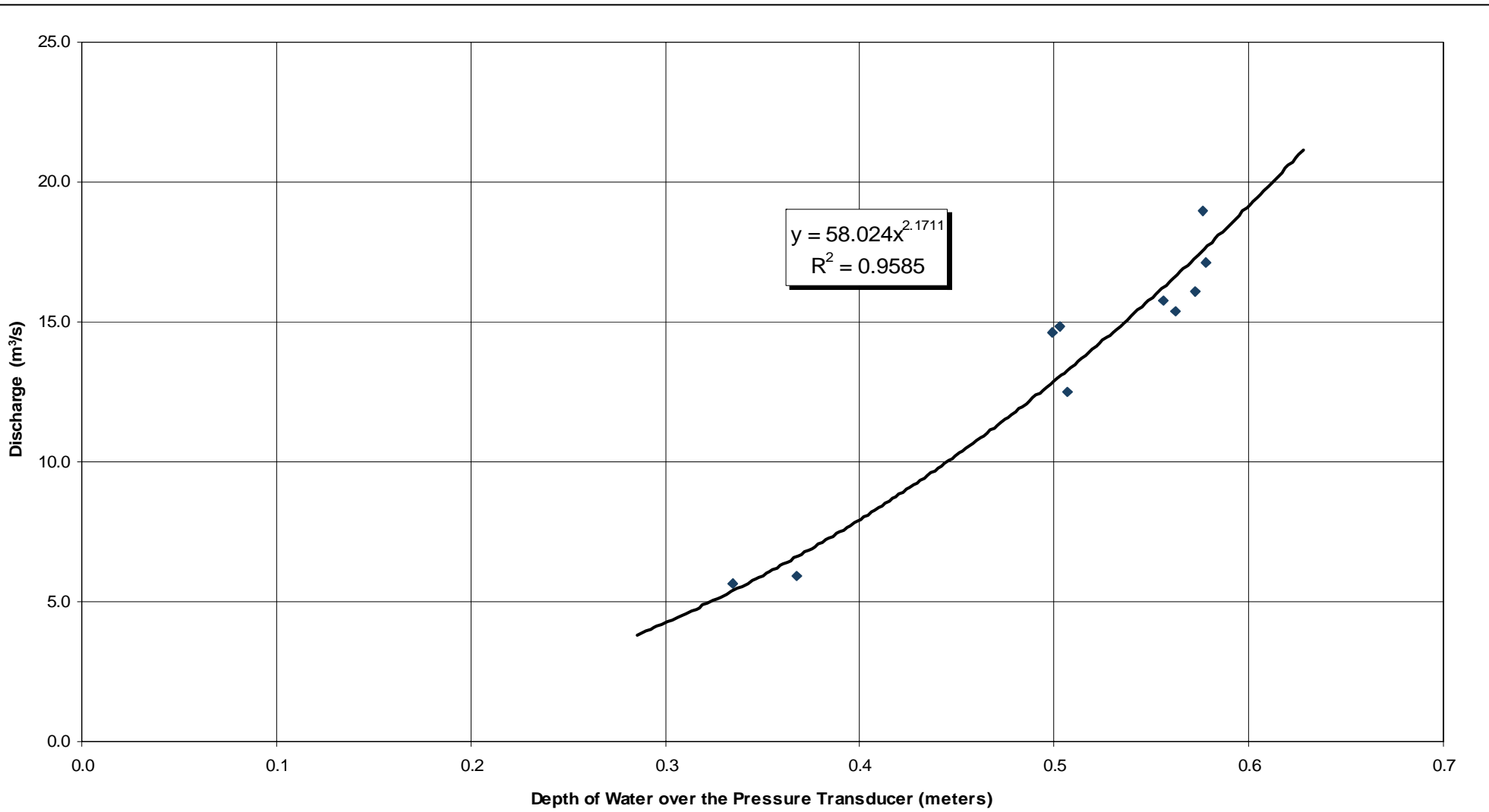
EBA Engineering
Consultants Ltd.



MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY
Hess River South Tributary
2008
Creek Stages

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.8



NOTES

CLIENT



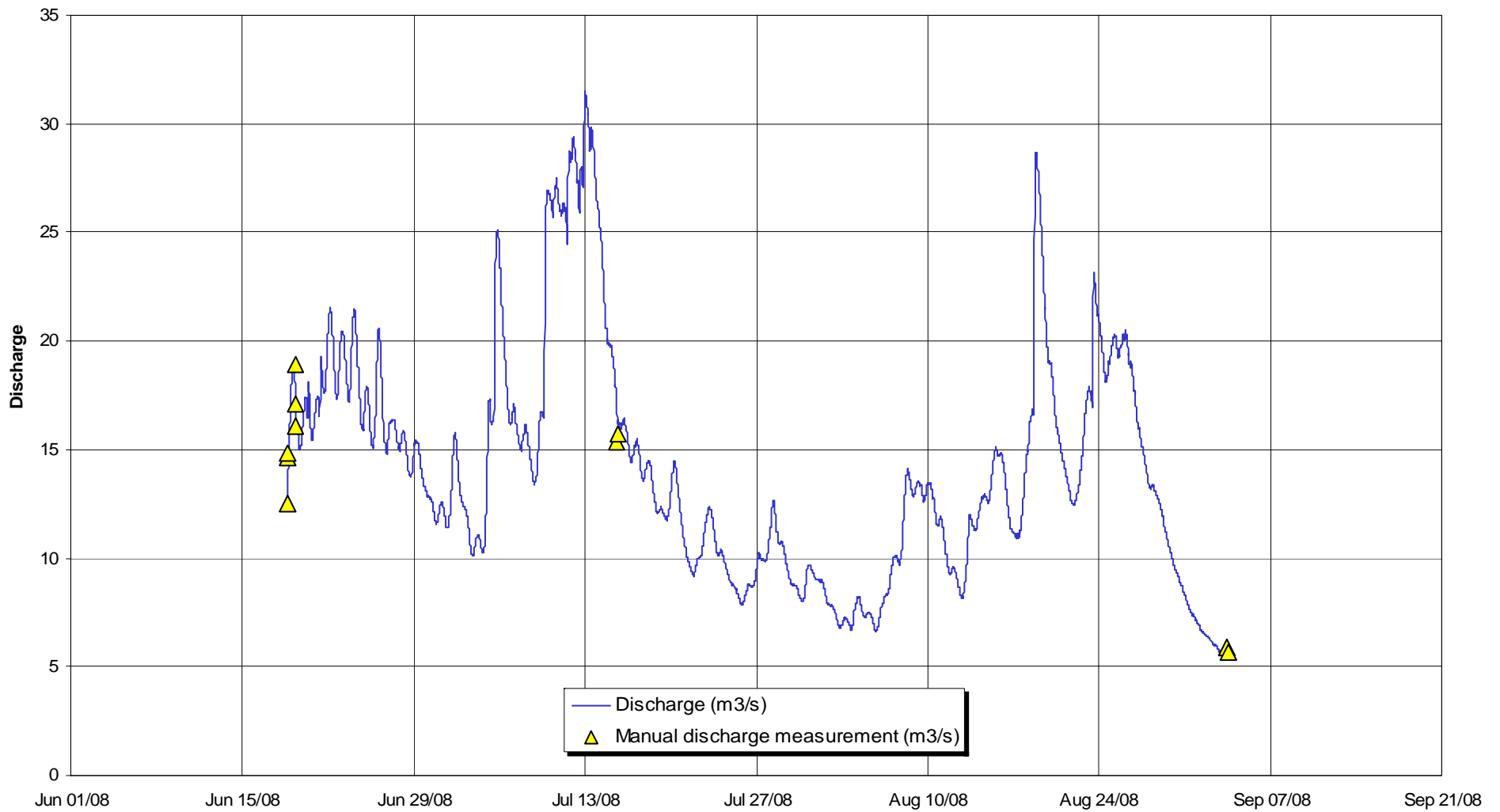
MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY
 Hess River South Tributary
 2008
 Stage-Discharge Relationship

EBA Engineering
 Consultants Ltd.



PROJECT NO.	DWN	CKD	REV
W23101021	RFD	JAS	0
OFFICE	DATE		
EBA-VANC	November, 2008		

Figure 2.9



NOTES

Not included in this hydrograph is a single under the ice discharge measurement of 0.14 m³/s collected on March 28, 2008 @ 12:00 hours.

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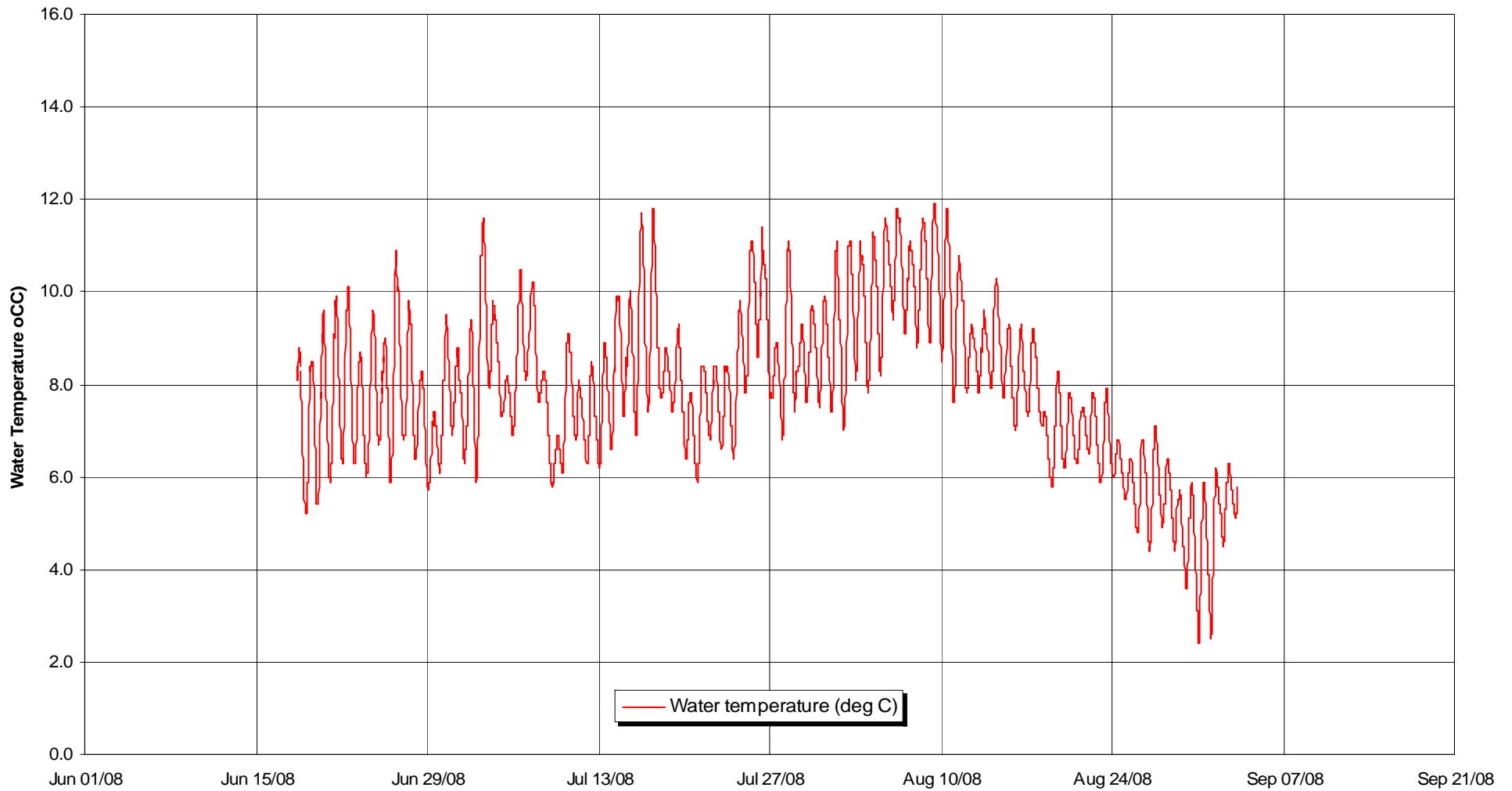
MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Hess River South Tributary
2008

Hydrograph

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.10



NOTES

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MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

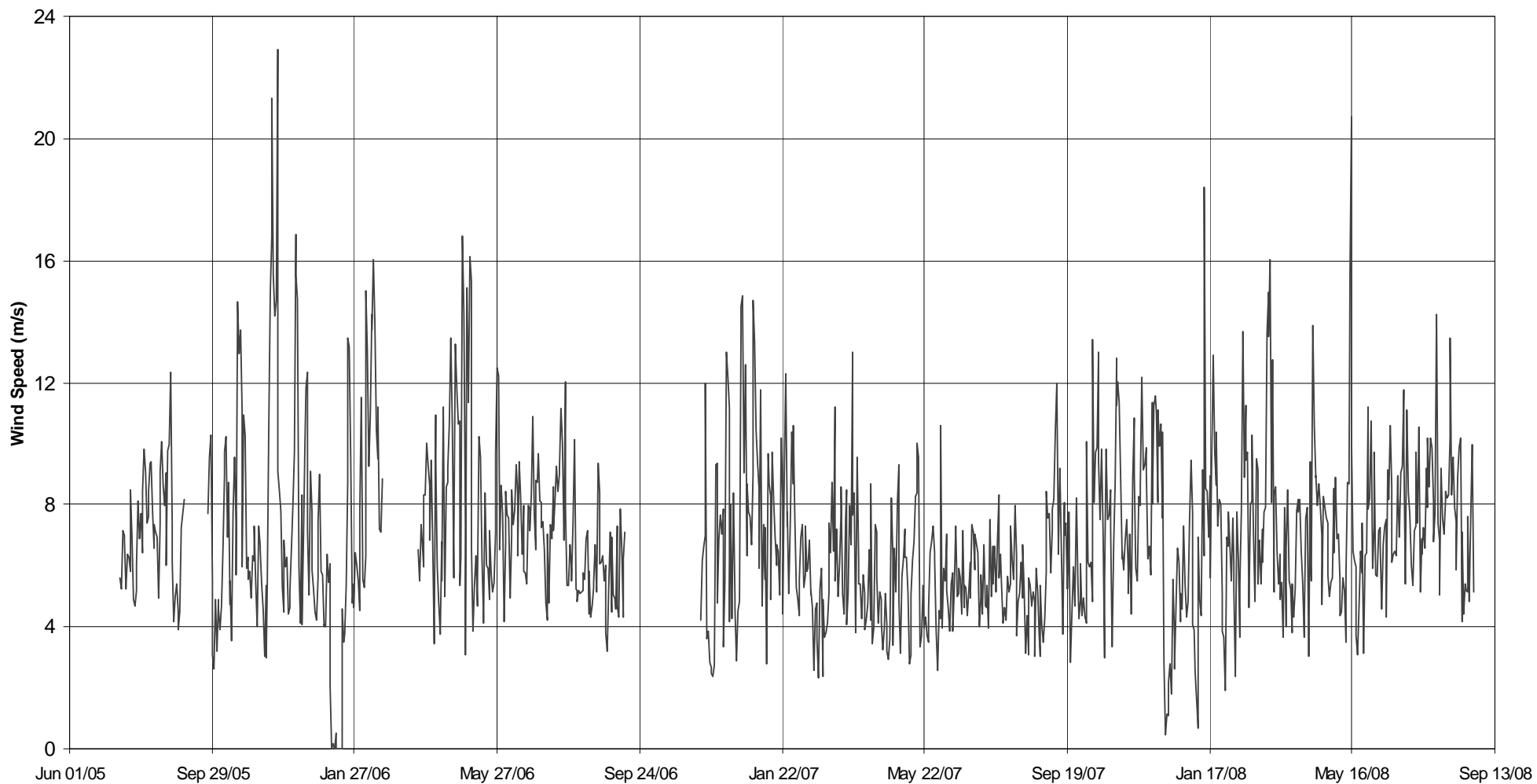
Hess River South Tributary

2008

Creek Temperatures

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 2.11




NOTES

No data recorded for the following periods:

- September 6 - 26, 2005
- January 7 - 17, 2006
- February 20 - March 21, 2006
- September 12 - November 15, 2006

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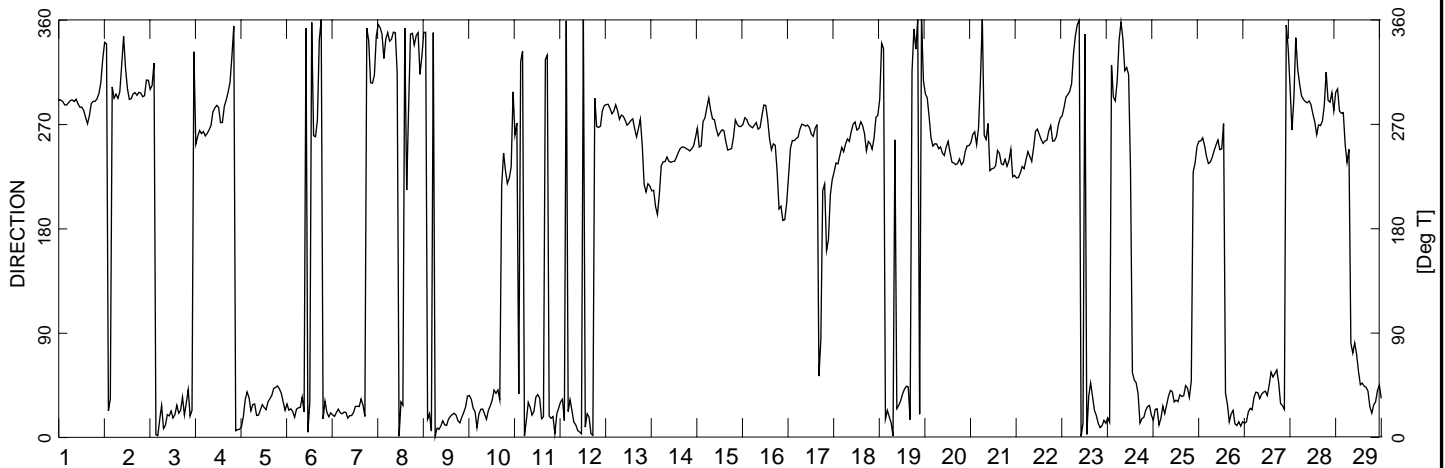
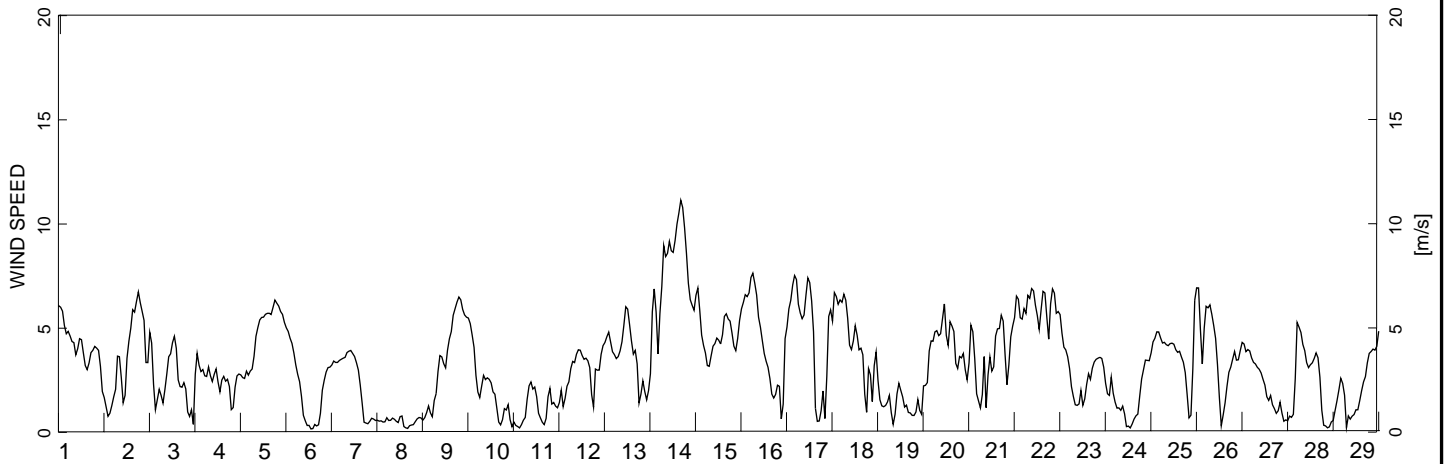
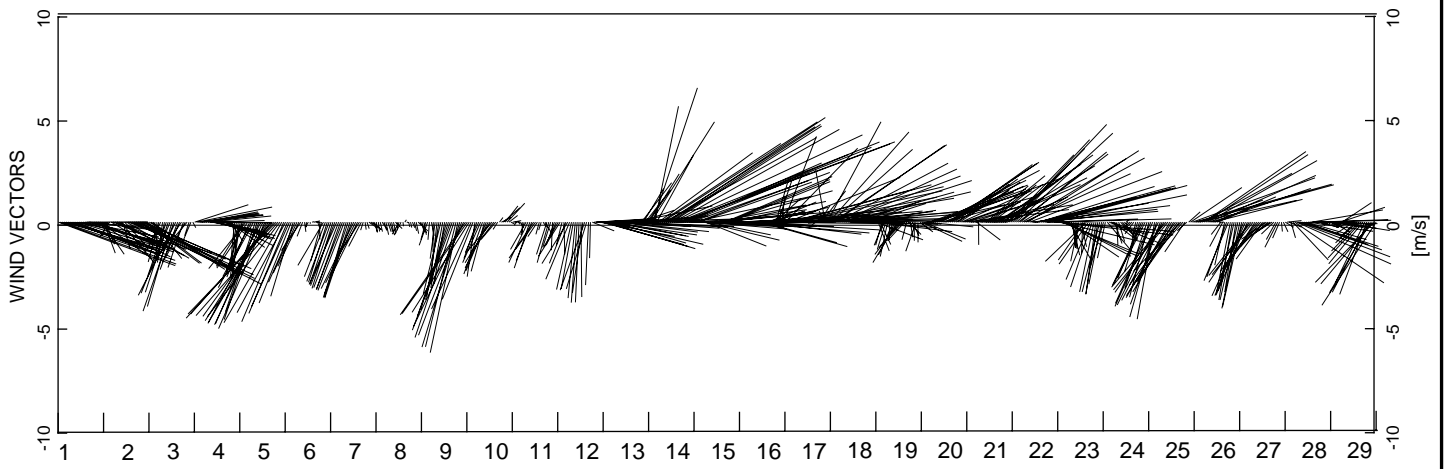
EBA Engineering
Consultants Ltd. 

MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Mactung Station
Daily Maximum
Wind Speed

PROJECT NO. W23101023	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.1



NOTES

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**MACTUNG PROJECT 2008
HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
February 2008**

PROJECT NO.
W23101021

DWN
RED

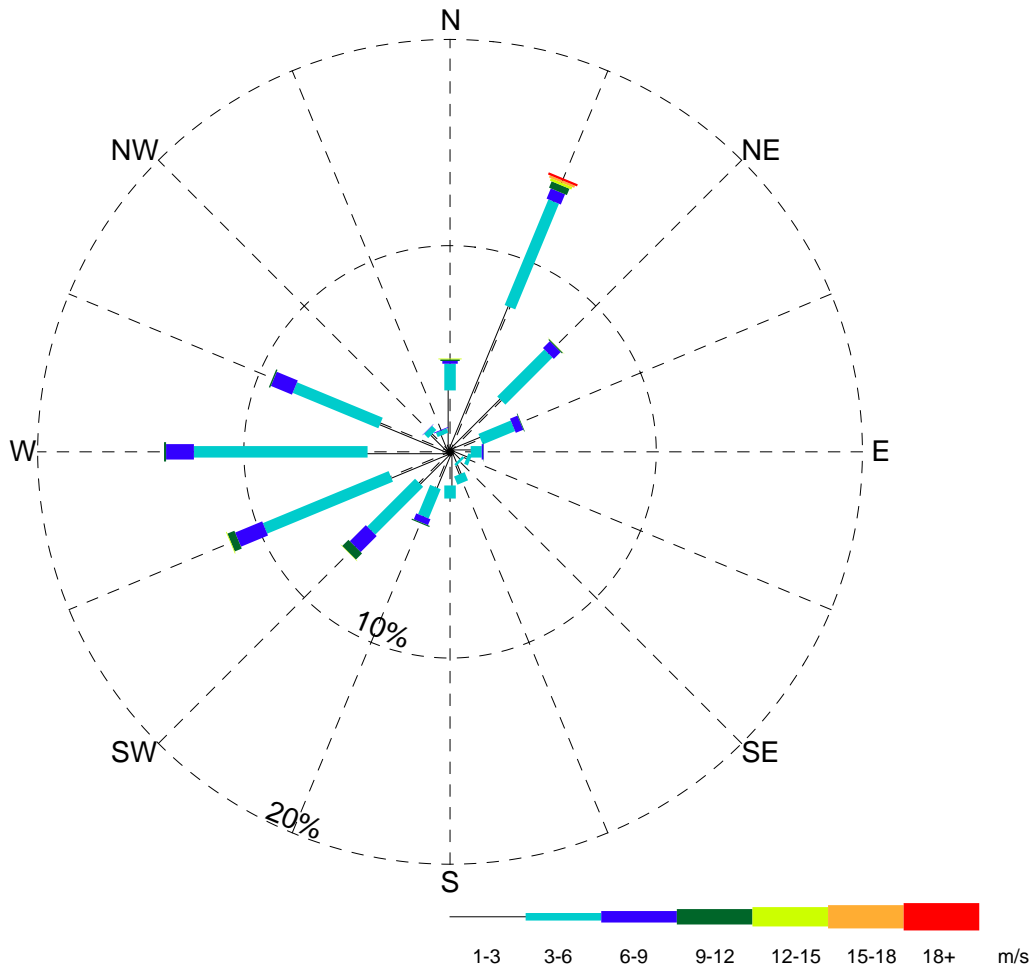
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure 3.2



Wind Speed & Direction Frequency Distribution Table

Station Name: Mactung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 1059 of 1140 days
 Start Date: July 14, 2005
 End Date: August 27, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.60	1.70	0.39	0.04	-	-	-	3.73
NE	-	3.52	3.23	0.47	0.06	0.01	-	-	7.28
NNE	-	7.59	5.55	0.54	0.33	0.12	0.11	0.11	14.35
N	-	2.98	1.29	0.13	0.08	0.04	-	-	4.53
NNW	-	0.89	0.22	0.04	-	-	-	-	1.16
NW	-	1.22	0.29	0.02	-	-	-	-	1.52
WNW	-	3.65	4.50	1.11	0.07	-	-	-	9.32
W	-	4.00	8.42	1.35	0.10	-	-	-	13.87
WSW	-	3.11	6.60	1.42	0.37	0.04	-	-	11.53
SW	-	2.12	3.28	1.10	0.42	0.02	-	-	6.94
SSW	-	1.85	1.53	0.31	0.06	-	-	-	3.76
S	-	1.63	0.63	-	-	-	-	-	2.27
SSE	-	1.18	0.43	-	-	-	-	-	1.61
SE	-	0.57	0.12	-	-	-	-	-	0.70
ESE	-	0.85	0.20	-	-	-	-	-	1.05
E	-	1.00	0.54	0.09	0.02	-	-	-	1.64
Calm	14.72	-	-	-	-	-	-	-	14.72
Total (%)	14.72	37.77	38.54	6.96	1.54	0.25	0.12	0.11	100.00

NOTES

No data for the following periods
 Sep. 6 - Sep. 26, 2005
 Jan. 7 - Jan. 17, 2006
 Feb. 20 - Mar. 21, 2006
 Sep. 12 - Nov. 15, 2006

CLIENT



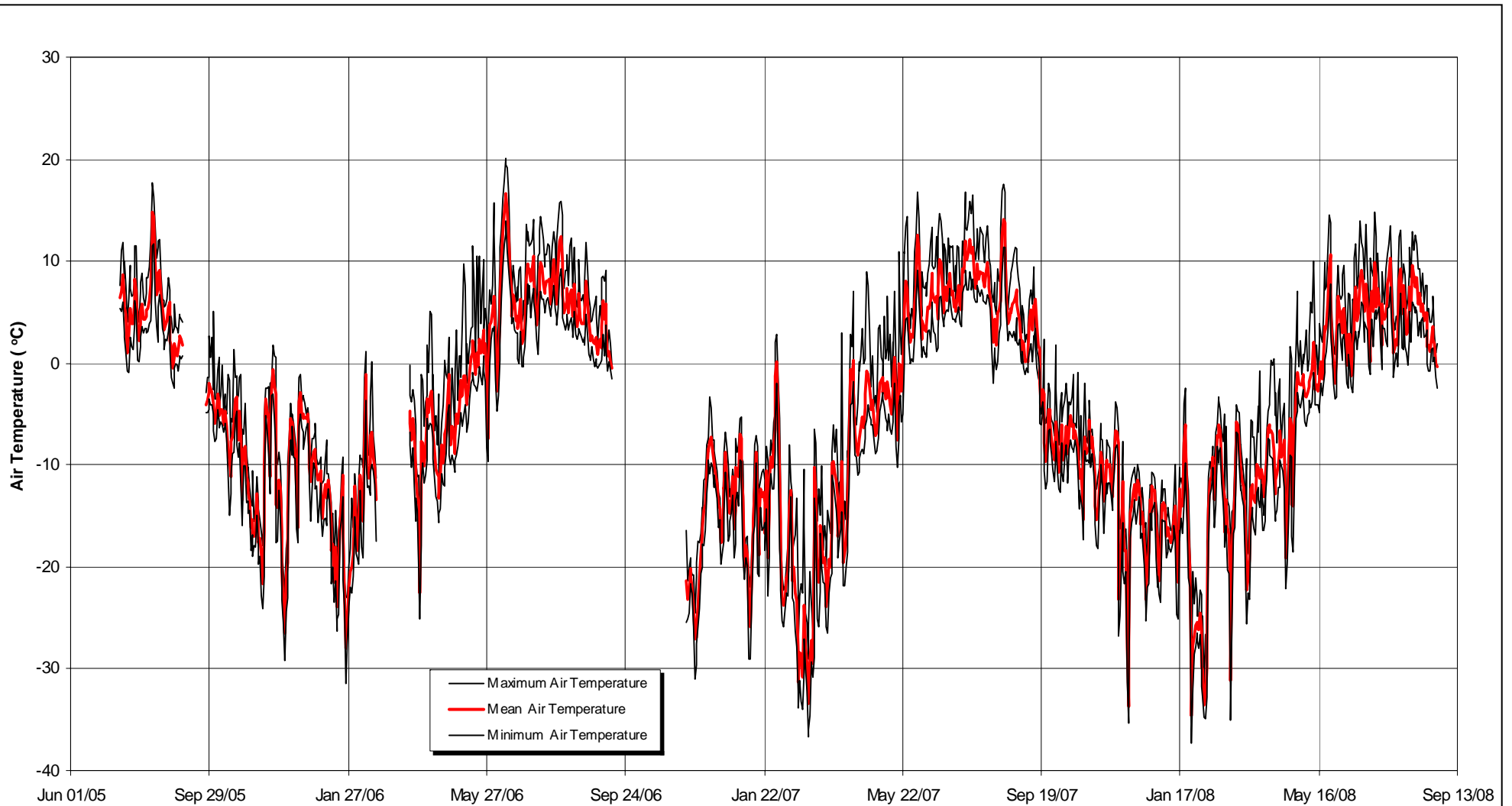
EBA Engineering Consultants Ltd.

**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Wind Rose
 July 14, 2005 - August 27, 2008**

PROJECT NO. W23101021	DWN RED	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure 3.3



NOTES

No data recorded for the following periods:

- September 6 - 26, 2005
- January 7 - 17, 2006
- February 20 - March 21, 2006
- September 12 - November 15, 2006

CLIENT

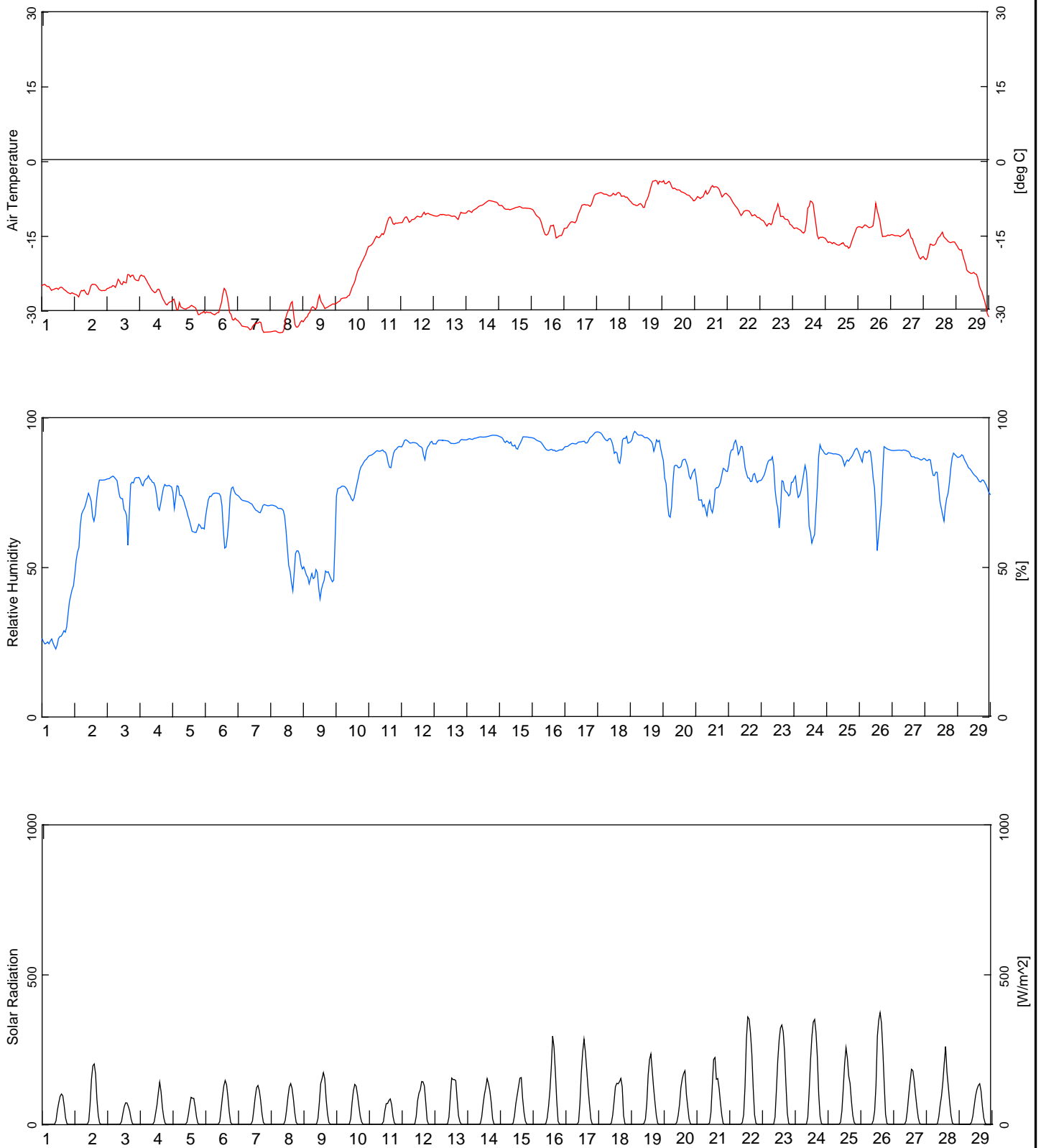


**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Daily Maximum, Mean & Minimum
Air Temperatures**

PROJECT NO. W23101023	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.4



NOTES

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**MACTUNG PROJECT 2008
HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
February 2008**

PROJECT NO.
W23101021

DWN
RED

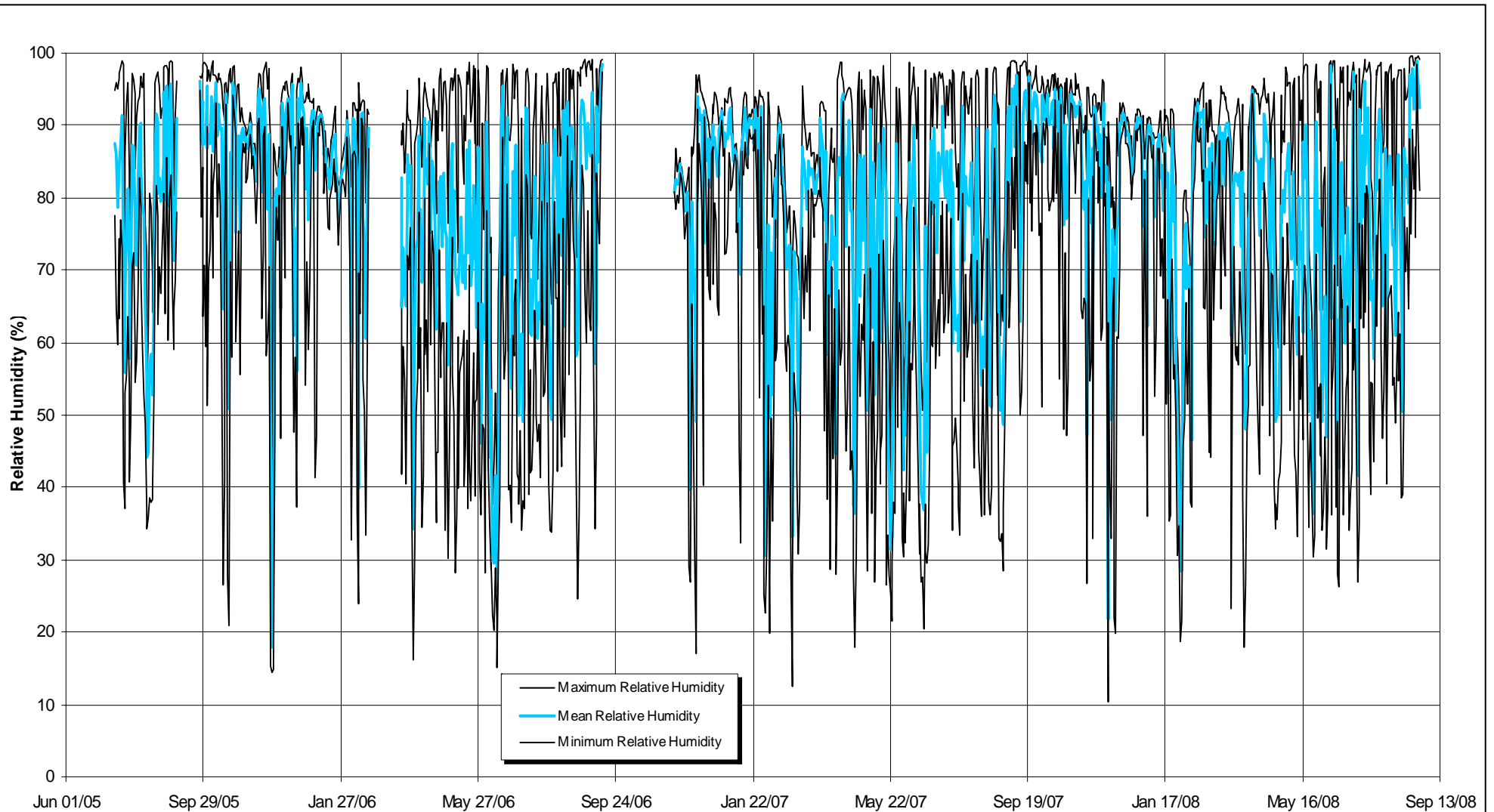
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure 3.5



NOTES

No data recorded for the following periods:

- September 6 - 26, 2005
- January 7 - 17, 2006
- February 20 - March 21, 2006
- September 12 - November 15, 2006

CLIENT



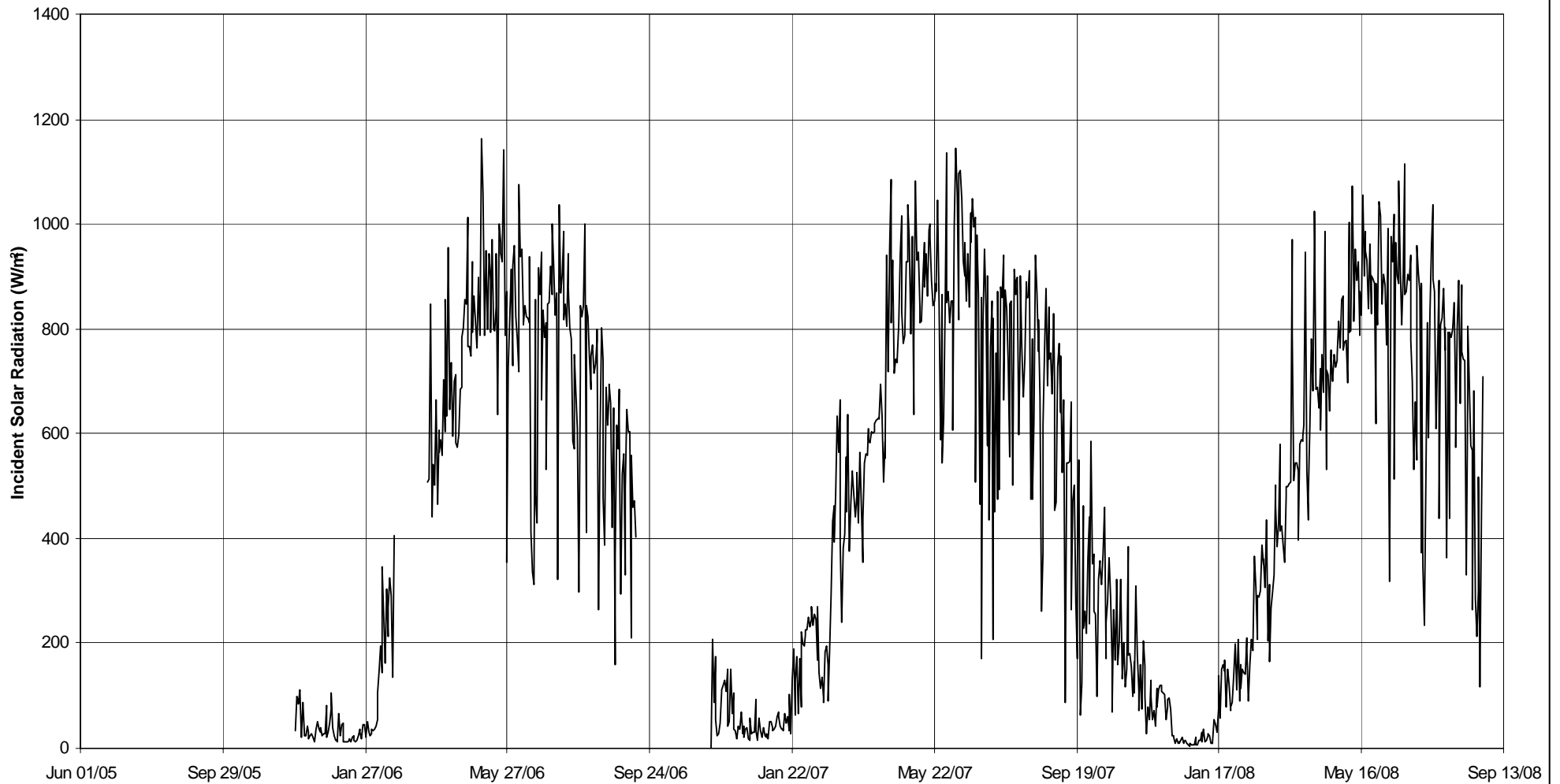
EBA Engineering Consultants Ltd. 

MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Mactung Station
Daily Maximum, Mean & Minimum
Relative Humidity

PROJECT NO. W23101023	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.6



NOTES

No data recorded for the following periods:

- July 14 - September 28, 2005
- January 7 - 17, 2006
- February 20 - March 21, 2006
- September 12 - November 15, 2006

CLIENT



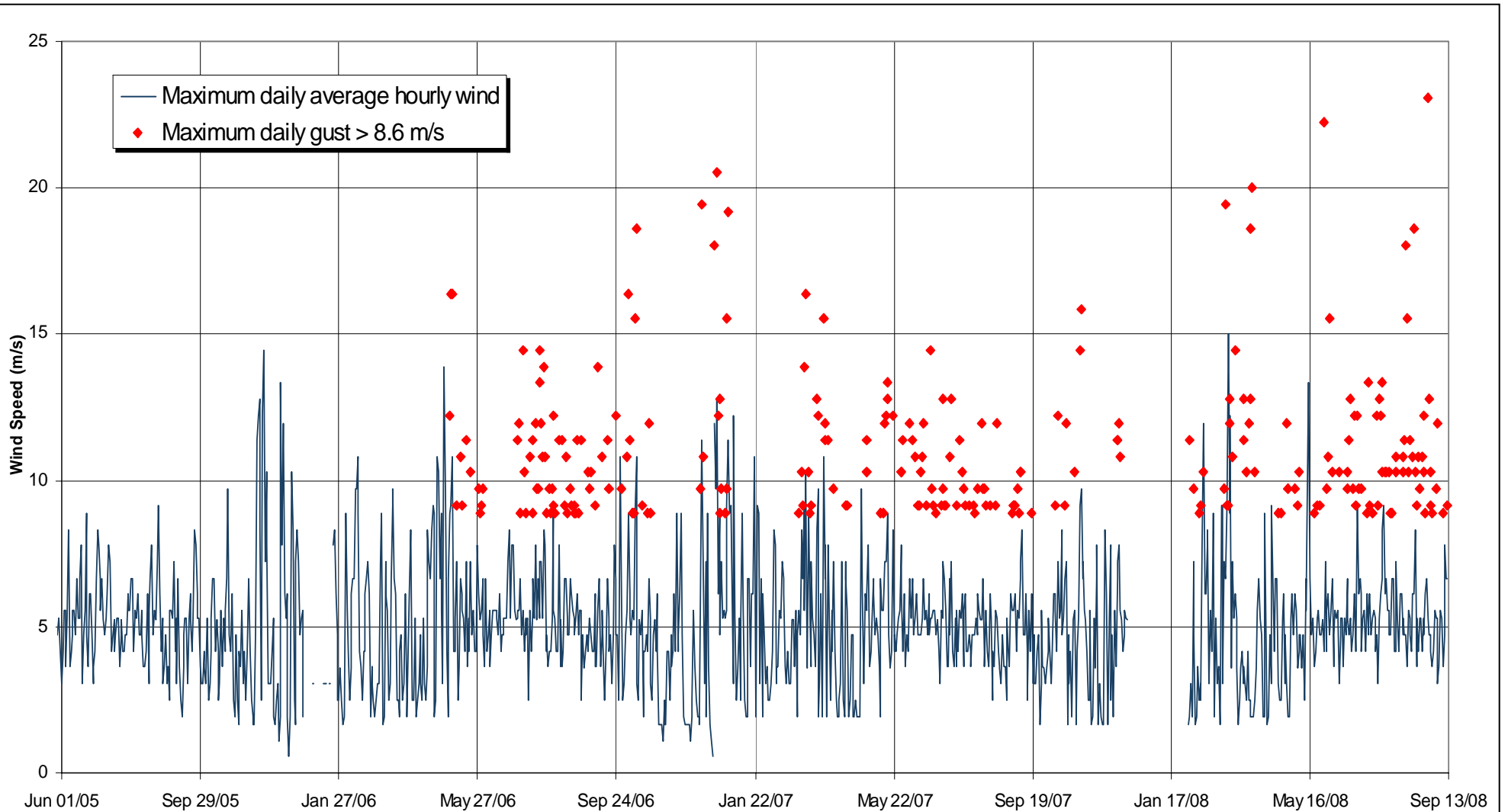
EBA Engineering Consultants Ltd. 

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Daily Maximum
Incident Solar Radiation**

PROJECT NO. W23101023	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.7




NOTES

The lowest maximum wind gust recorded by the Meteorological Service of Canada for MacMillan Pass is 8.6 m/s. To augment this data the maximum daily average hourly wind speed is also plotted on this figure. A total of 120 days of data is missing from this record. The missing periods are November, February, April and June, 2007.

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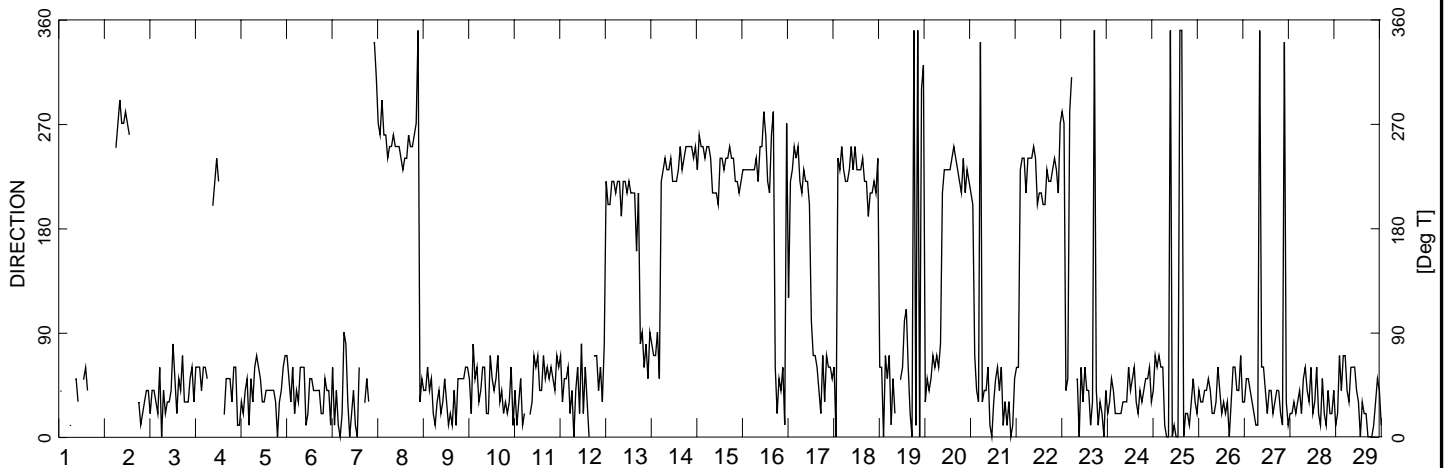
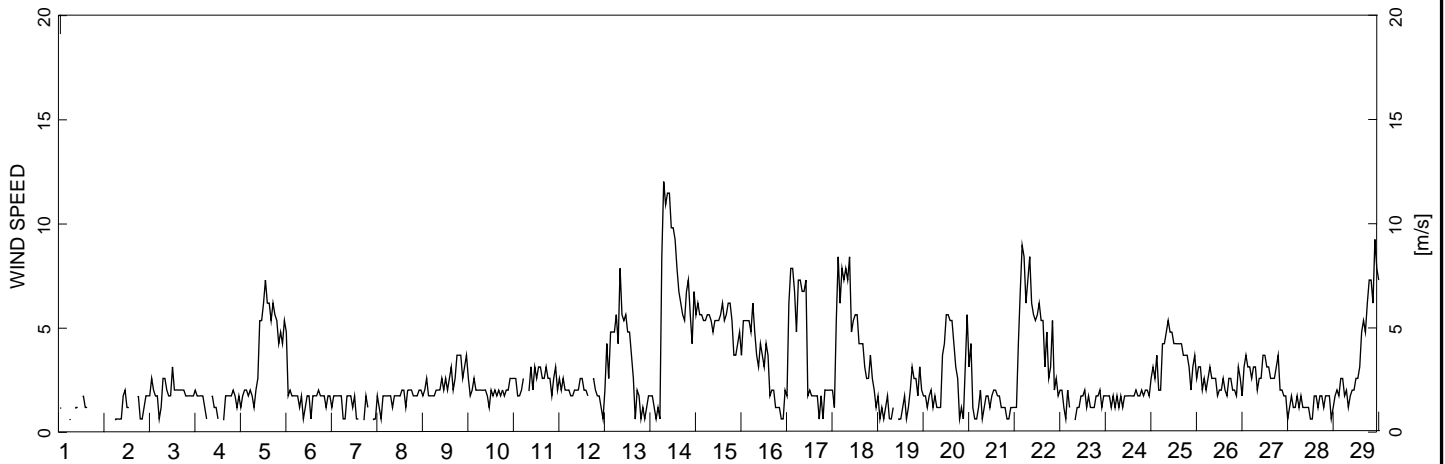
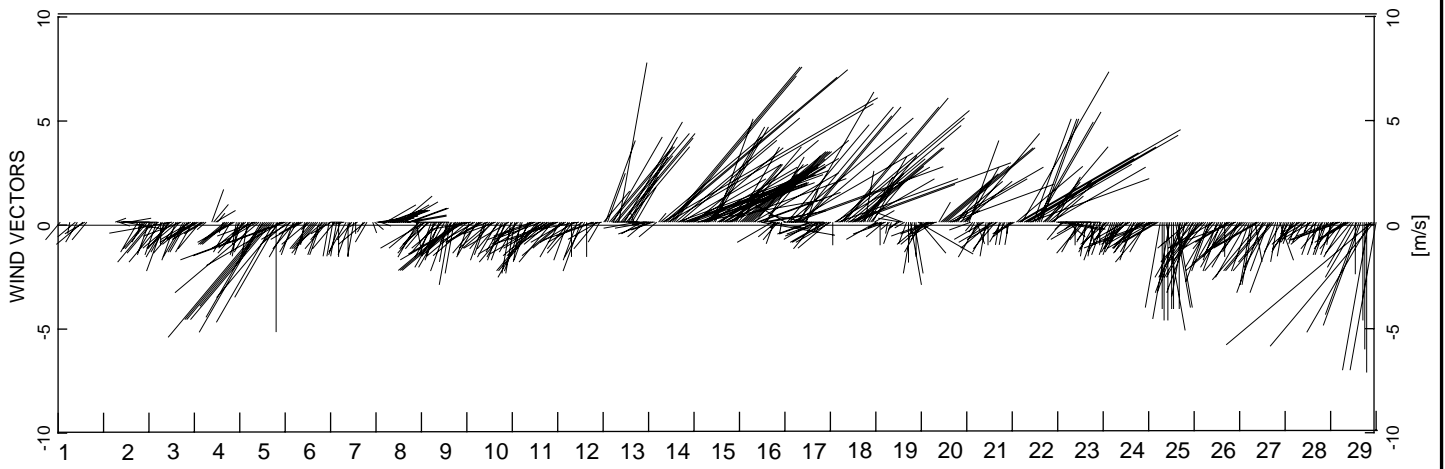
EBA Engineering Consultants Ltd. 

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Maximum Daily Wind Speeds
and Wind Gusts**

PROJECT NO. W23101021	DWN JR	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.8



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
February 2008**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

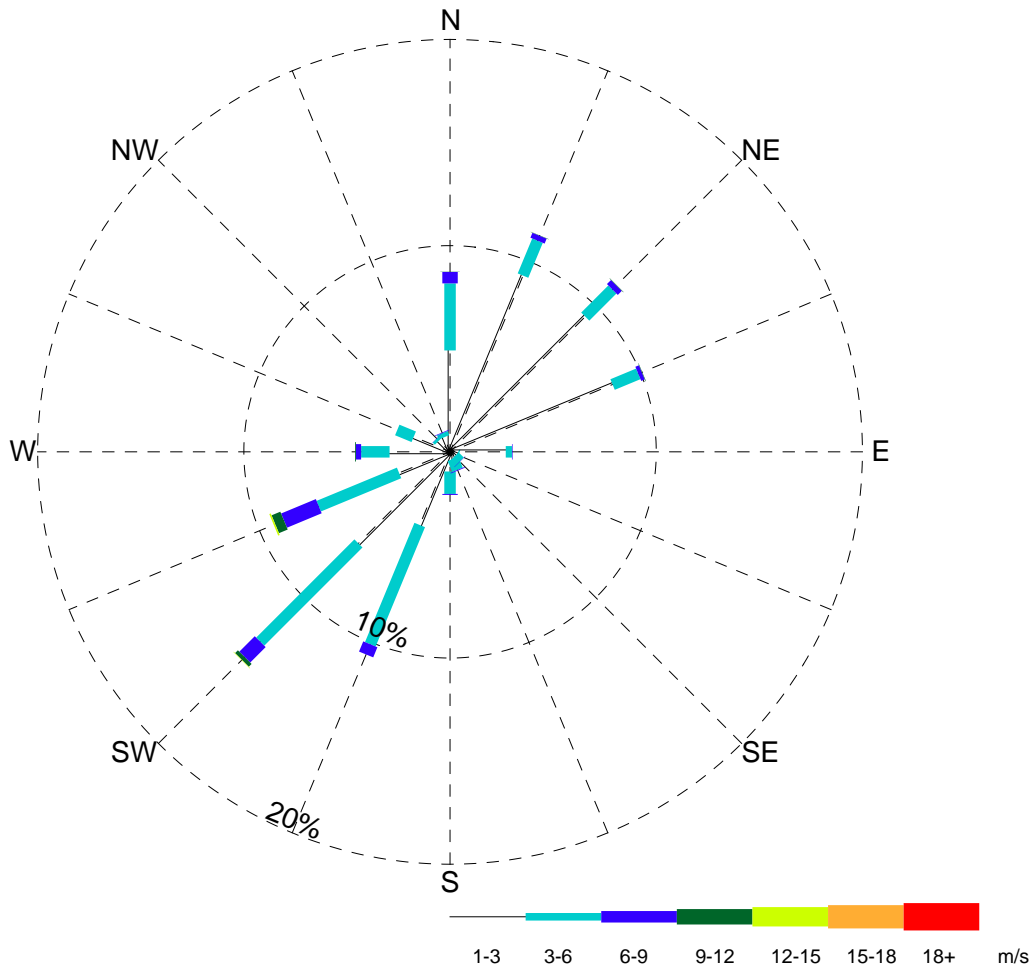
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure 3.9



Wind Speed & Direction Frequency Distribution Table

Station Name: MACMILLAN PASS
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 958 days
 Start Date: July 1, 2005
 End Date: August 31, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	8.53	1.35	0.19	0.02	-	-	-	10.09
NE	-	9.27	1.86	0.28	0.02	-	-	-	11.43
NNE	-	9.25	1.84	0.26	0.02	-	-	-	11.36
N	-	4.92	3.25	0.55	0.01	-	-	-	8.74
NNW	-	0.76	0.22	0.03	-	-	-	-	1.01
NW	-	0.76	0.15	0.01	-	-	-	-	0.92
WNW	-	1.91	0.86	-	-	-	-	-	2.77
W	-	2.93	1.38	0.25	0.04	-	-	-	4.60
WSW	-	2.67	4.22	1.82	0.46	0.08	-	-	9.25
SW	-	6.28	6.74	1.06	0.19	0.02	-	-	14.29
SSW	-	3.84	6.26	0.53	-	-	-	-	10.65
S	-	0.95	1.09	0.05	-	-	-	-	2.10
SSE	-	0.37	0.58	0.04	-	-	-	-	0.99
SE	-	0.31	0.36	0.02	-	-	-	-	0.68
ESE	-	0.37	0.06	-	-	-	-	-	0.43
E	-	2.70	0.30	0.03	-	-	-	-	3.03
Calm	7.65	-	-	-	-	-	-	-	7.65
Total (%)	7.65	55.83	30.51	5.12	0.78	0.10	-	-	100.00

NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
July 2005 - August 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
JR

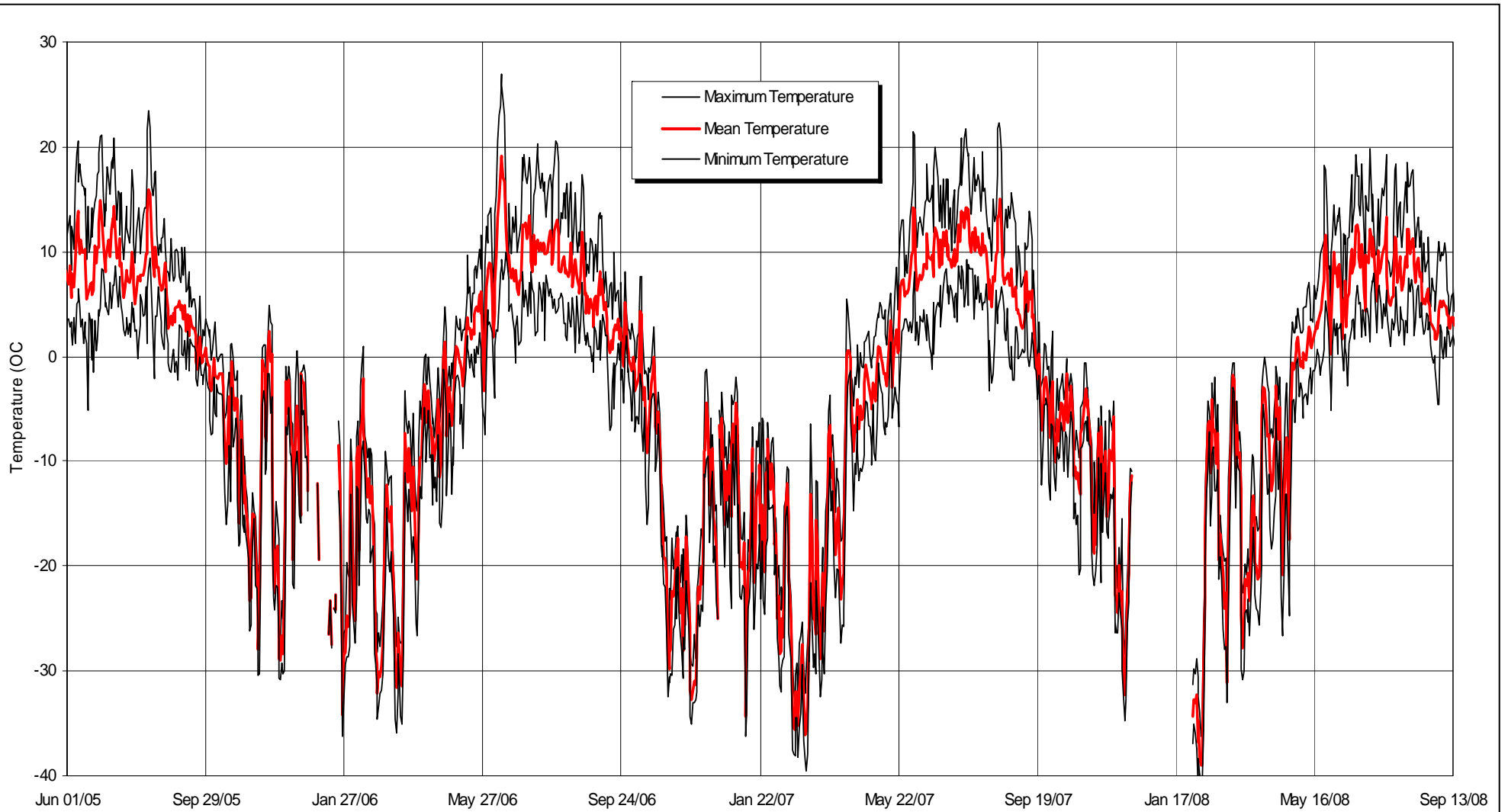
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure 3.10



NOTES

Macmillan Pass data is missing for the period of December 11, 2007 to January 31, 2008.

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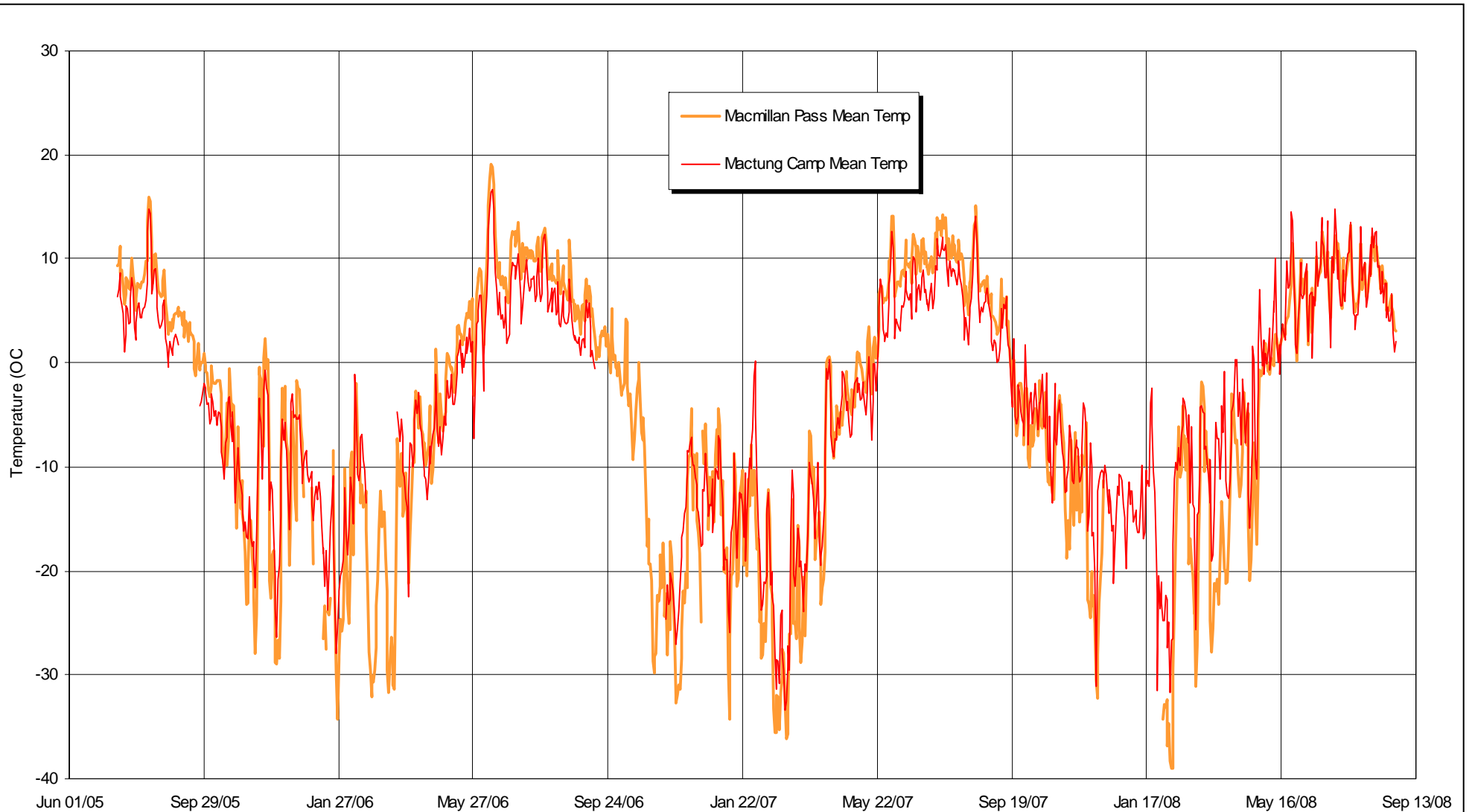


MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Macmillan Pass
Daily Maximum, Mean & Minimum
Air Temperatures

PROJECT NO. W23101021	DWN JR	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.11



NOTES

MacTung Camp data is missing for the period of September 13, 2006 to November 15, 2006.
 Macmillan Pass data is missing for the period of December 11, 2007 to January 31, 2008.

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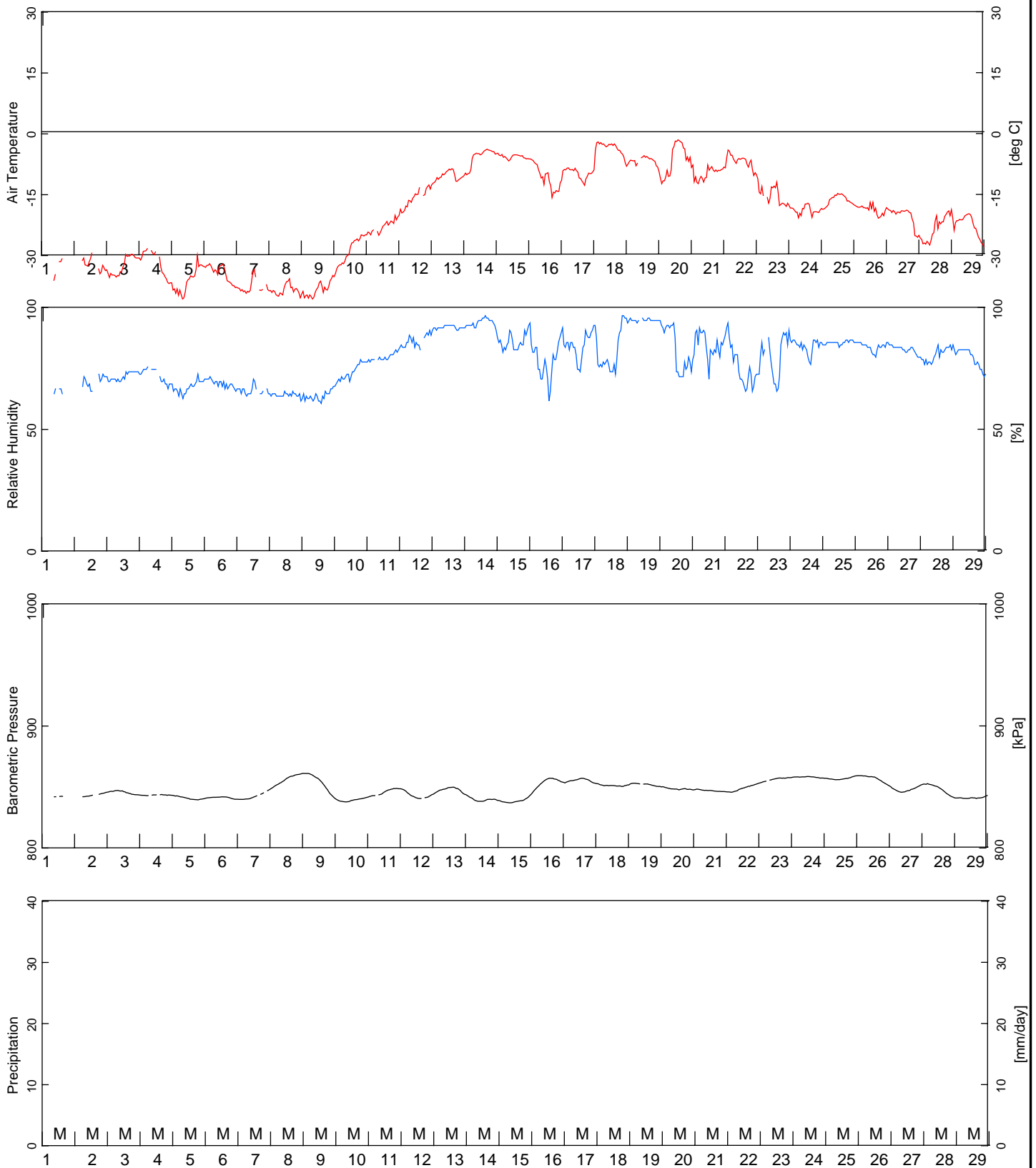


MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY

MacMillan Pass & MacTung
 Mean Daily Air Temperature
 Comparison

PROJECT NO. W23101021	DWN JR	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.12



NOTES

"M" denotes missing precipitation data

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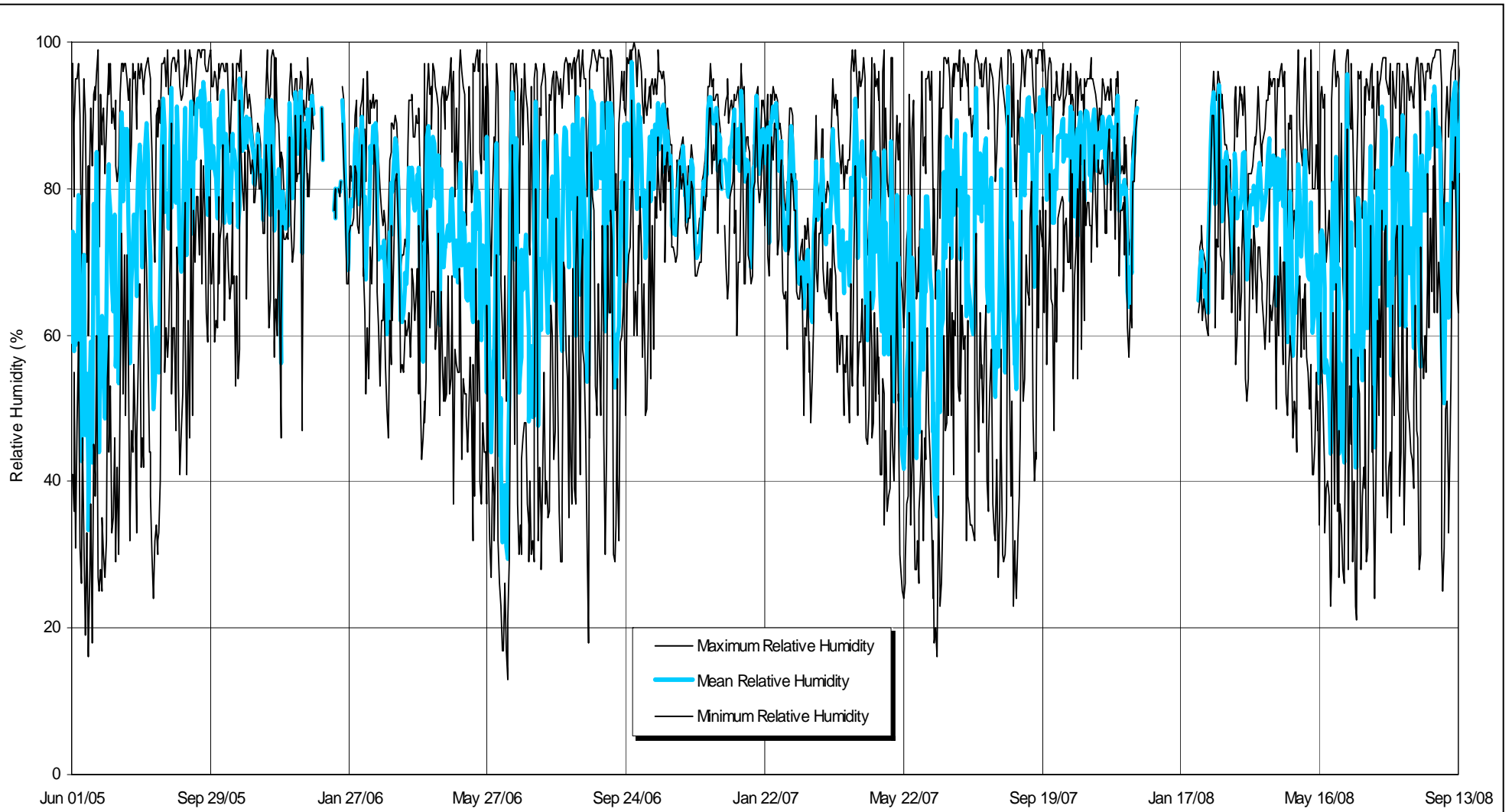
EBA Engineering Consultants Ltd.

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
February 2008**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure 3.13



NOTES

Macmillan Pass data is missing for the period of December 11, 2007 to January 31, 2008.

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MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Macmillan Pass
Daily Maximum, Mean & Minimum
Relative Humidity

PROJECT NO.
W23101021

DWN
JR

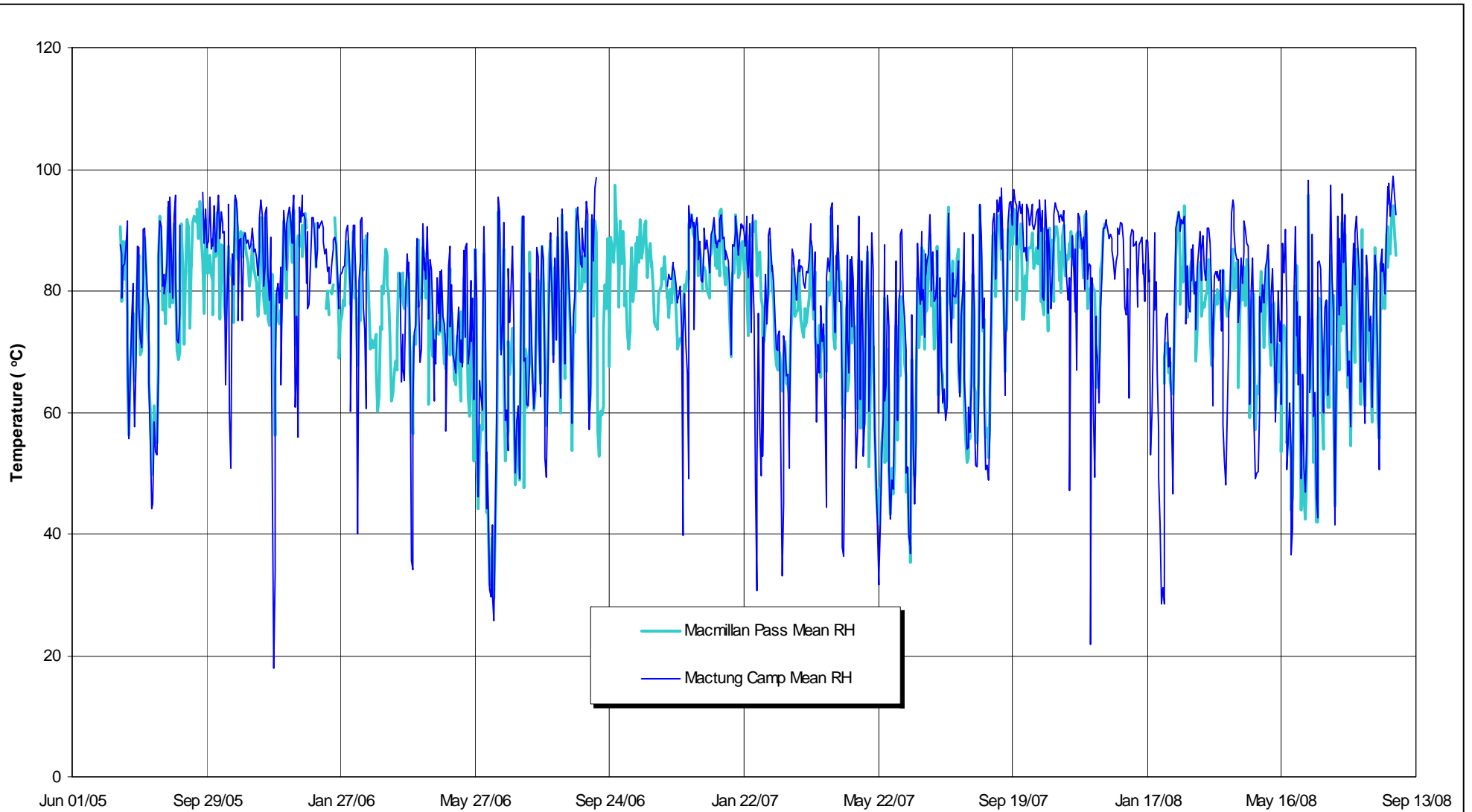
CKD
JAS

REV
0

OFFICE
EBA-VANC

DATE
November, 2008

Figure 3.14



NOTES

MacTung Camp data is missing for the period of September 13, 2006 to November 15, 2006.
 Macmillan Pass data is missing for the period of December 11, 2007 to January 31, 2008.

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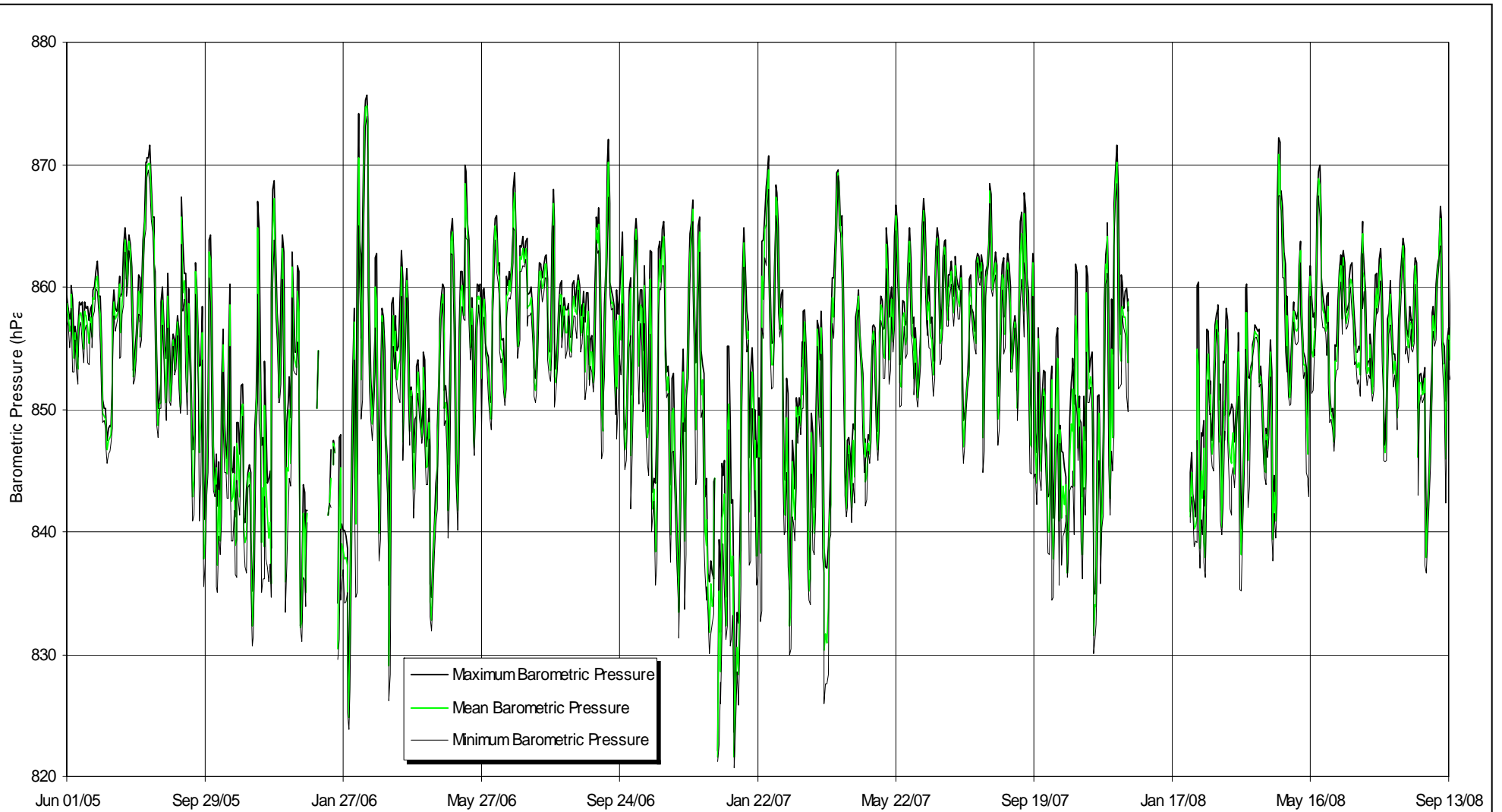
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MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY

Macmillan Pass & Mactung
 Mean Daily Relative Humidity
 Comparison

PROJECT NO. W23101021	DWN JR	CKD JAS	REV 0
OFFICE EBA-VANC	DATE November, 2008		

Figure 3.15



NOTES

Macmillan Pass data is missing for the period of December 11, 2007 to January 31, 2008.

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MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY

Macmillan Pass
Daily Maximum, Mean & Minimum
Barometric Pressure

PROJECT NO.
W23101021

DWN
JR

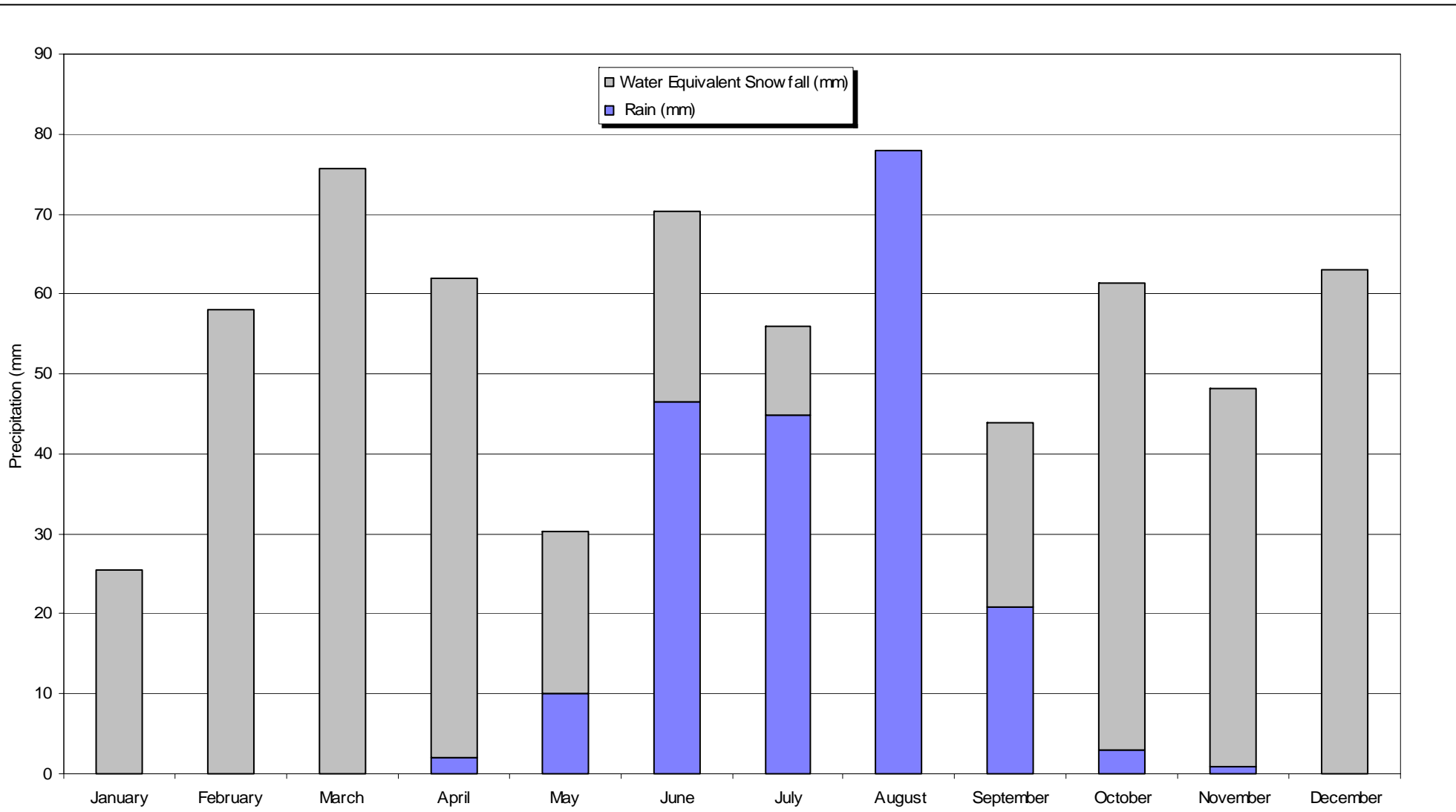
CKD
JAS

REV
0

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DATE
November, 2008

Figure 3.16



NOTES

MSC data for this station is suspect post December 2005 and therefore has not been used in this analysis.

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MACTUNG PROPERTY
2008 HYDROMETEOROLOGICAL SURVEY

Macmillan Pass

Average Monthly Precipitation

1998 - 2005

PROJECT NO. W23101021	DWN RFD	CKD JAS	REV 0
OFFICE EBA-VANC	DATE October, 2008		

Figure 3.17



APPENDIX A

APPENDIX A HYDROMETEOROLOGICAL SITE DESCRIPTIONS

Site Identification: Site: #1 GPS Waypoint: TRIB A Name: Tributary A

Site GPS Coordinates (NAD27): 130° 17' 19.0" Longitude 63° 17' 22.6" Latitude

Site Location:

Site 1, installed on July 8, 2006, is located on Tributary A approximately five km due west of the Mactung camp. The hydrometric station is located on the south-west side of the creek near the left bank approximately 50 m downstream of the junction of Tributary C with Tributary A. Tributary C drains the western portion of the Mactung property and is the discharge of interest for this project. The approximate site elevation is 1133 m above sea level.

Description:

Tributary A is a fast flowing creek with a moderate water surface slope. The reach selected for Site 1 flows to the northwest. The creek is wide (12 m) but shallow (0.4 m maximum depth) at the location of the hydrometric station. The creek bed consists of coarse gravel and rock with boulders up to 2 metres in diameter.

Instrumentation:

The hydrometric station consists of a PT2X stage recorded with a 5 PSI pressure transducer and a data logger which is housed in a .05 metre by 2.5 metres long galvanized steel pipe bolted to a large boulder. The data logger collects both depth of water over the pressure transducer and water temperature at 15-minute intervals. A Water Survey of Canada type staff gauge is mounted less than 1 metre away from the pressure transducer near the bank. The flow gauging station is located about 15 metres upstream from the hydrometric station in an area of the creek where there are no large boulders impeding the flow.

Specifics on Measurements:

1133.000 m sea level, benchmark elevation at the site (approximate)

1132.148 m sea level, elevation of zero reading on staff gauge

1132.300 m sea level, elevation of zero reading on pressure transducer

0.852 m difference in elevation from staff gauge zero reading to BM

0.700 m difference in elevation from pressure transducer to BM

0.152 m difference from staff gauge zero to transducer elevation

2620031 Serial number of the pressure transducer / data logger



Photo A: Aerial view of the Tributary A hydrometric station.

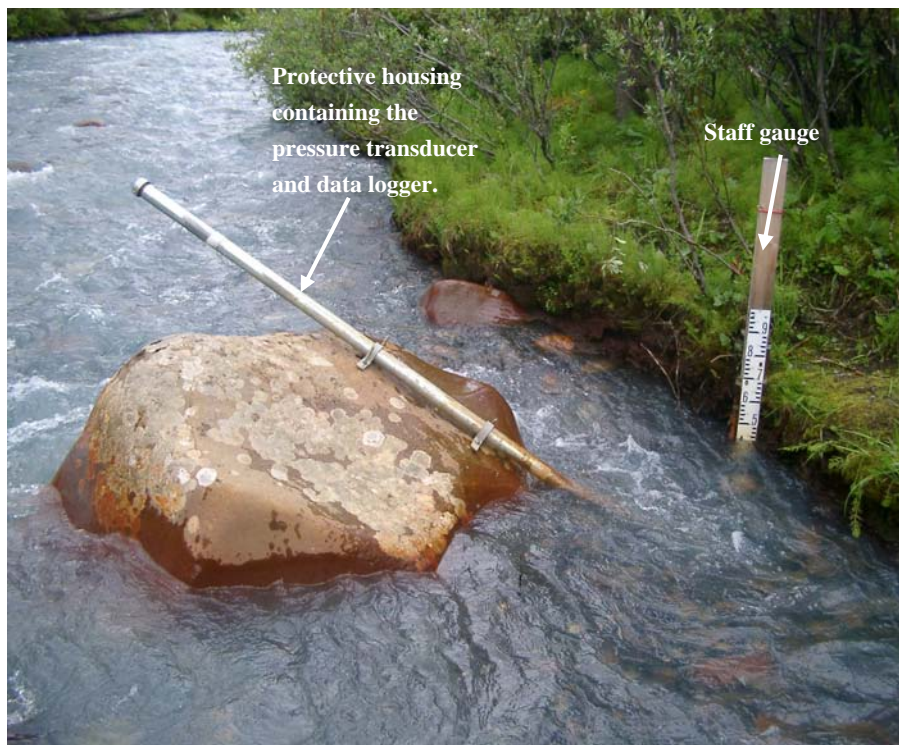


Photo B: View looking upstream at the Tributary A hydrometric station.

Site Identification: Site: #4 GPS Waypoint: Hess ST Name: Hess River South Tributary

Site GPS Coordinates (NAD27): 130° 19' 31.2" Longitude 63° 18' 45.4" Latitude

Site Location:

Site 4, installed on June 18, 2008, is located on the south tributary of the Hess River approximately 150 m upstream of the confluence of Tributary A. The hydrometric station is located on the south side (left bank) of the River. The south tributary of the Hess River drains a 340 km² basin located northeast of the Mactung property. The approximate site elevation is 1090 m above sea level. Discharges in this river are of interest, as it is near the proposed site for the water intake for the mine.

Description:

Hess River South Tributary is a fast flowing creek with a moderate water surface slope (0.5 to 1%). The reach of the river selected for the hydrometric station flows to the west and is approximately 26 m wide and up to 0.7 m maximum depth. The creek bed consists of coarse gravel with some cobbles.

Instrumentation:

The hydrometric station consists of a PT2X stage recorded with a 5 PSI pressure transducer and a data logger which is housed in a .05 metre by 2.7 metres long ABS pipe bolted to a large boulder. The data logger collects both depth of water over the pressure transducer and water temperature at 15-minute intervals. A Water Survey of Canada type staff gauge is mounted near the station. The flow gauging station is located about 200 metres upstream from the hydrometric station in an area of the creek where there are no large boulders impeding the flow.

Specifics on Measurements:

- 1090.000 m sea level, benchmark elevation at the site (approximate)
- 1088.584 m sea level, elevation of the pressure transducer sensing element
- 1088.716 m sea level, elevation of the zero reading on staff gauge
 - 1.284 m difference in elevation from BM to staff gauge zero reading
 - 1.416 m difference in elevation from BM to pressure transducer
 - 0.132 m difference from staff gauge zero to transducer elevation
- 2740009 Serial number of the pressure transducer / data logger

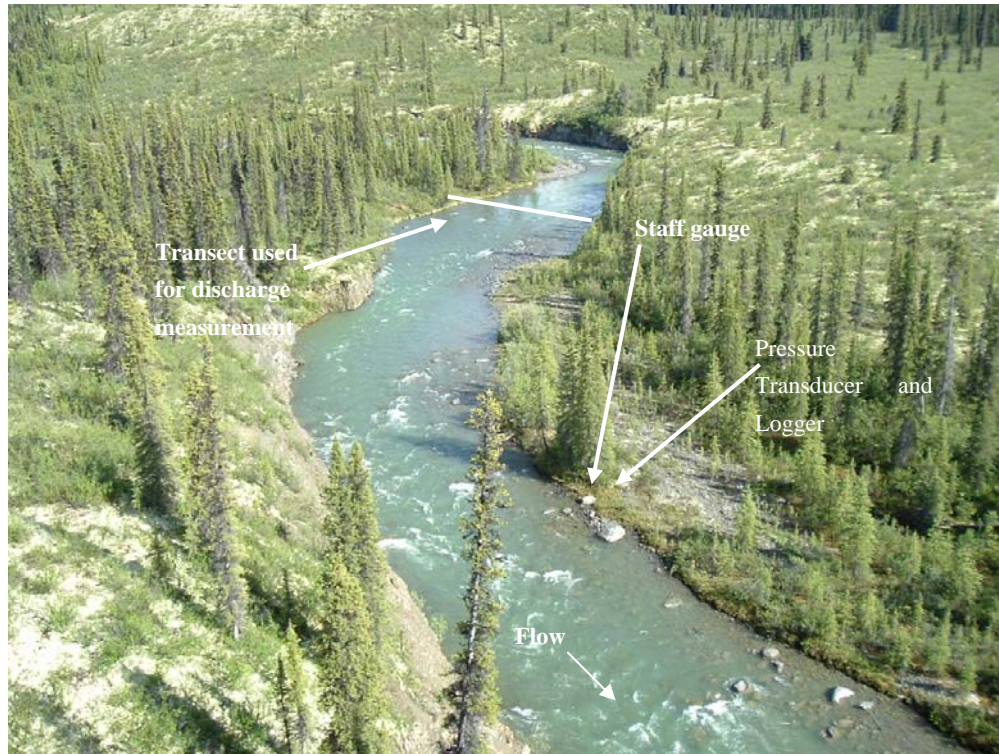


Photo A: Aerial view of the South Tributary of the Hess R. hydrometric station



Photo B: View looking at the hydrometric station on the South Tributary of the Hess R.

Station Name: Mactung Station

Date of Installation: July 15, 2005

Station Coordinates (NAD27): North 63° 16' 50.2"
West 130° 8' 50.3"

Tower Height: 3 m
Site elevation above sea level: 1860 m

Magnetic Deviation: 26.47° or TN=333.53° mag.

North alignment pole set 333.53° mag.

Site Description:

This weather station consists of a standard three meter meteorological tower with instrumentation to measure wind speed and direction, air temperature, relative humidity, and a pyranometer for incident solar radiation. The station is powered by a 12 Vdc 8.5 Ahr battery with a 20-watt solar panel for charging. Data is recorded to a Campbell Scientific CR10X data logger. The data collection cycle is 5 seconds and the data is averaged over the 15 minute archiving period and saved to the logger memory. Station memory capacity exceeds one year of data at the current sampling rate.

Site Location:

The station is located on the Mactung property in a clearing overlooking Macmillan Pass. It is approximately 50 metres south of the Mactung camp site.

Installation Notes:

The tripod tower was fixed to the ground by stakes and then large boulders were placed on each of the tripod legs to further secure the tower. There are no wind obstructions within 50 metres of the station.

Recorded Data:

The two tables below show examples of the data array collected every 15 minutes as well as a 24-hour summary of the day's maximums and minimums.

15 Minute Record

Date	Time (hhmm)	Wind Speed (m/s)	Wind Direction (degrees)	SD Wind Direction (degrees)	Air Temp (°C)	Relative Humidity (%)	Pyranometer W/m ²	Soil Temp (°C)
Aug 21/07	900	1.093	81.5	28.42	3.33	95.8	83.60	6.092
Aug 21/07	915	0.603	78.6	31.56	2.78	96.7	97.48	6.071
Aug 21/07	930	0.343	138.5	26.88	3.34	94.7	103.66	6.057

Daily Summary

Date	Time (hhmm)	Wind Speed (m/s)	Maximum Logger Box Temperature (°C)	Minimum Logger Box Temperature (°C)	Minimum Battery Voltage (Vdc)	Station ID
Aug 21/07	2400	8.383	13.64	4.509	12.65	1
Aug 22/07	2400	6.082	11.51	3.469	12.64	1
Aug 23/07	2400	6.092	6.77	1.210	12.65	1

Station Instrumentation:

Brief descriptions of the Mactung station instrumentation, based on material provided by the manufacturers, are provided below.

Meteorological Station Instrumentation Parameters

Instrument	Model	Measuring Range	Sensitivity/Accuracy
Wind Monitor	05103-10 R.M. Young	0 to 60 m/s	Accuracy ± 0.3 m/s
		0 to 100 m/s gusts	Threshold wind = 1.0 m/s
		0 to 355 degrees	$\pm 1.4^\circ$
Relative Humidity /Air Temperature Probe	CS500-U Vaisala	Relative Humidity 0.0 to 100	Accuracy at 20°C $\pm 3\%$ RH (10-90% RH) $\pm 6\%$ RH (90-100% RH)
		Air Temperature -40° to +60°C	Accuracy at 20°C $\pm 0.4^\circ\text{C}$
Pyranometer	LI200S LI-COR	Spectral Waveband. 400-1100 nm	1.0% Linearity (at 3000 W/m ²) 2.0% Non stability (% change/year)

Wind Speed and Direction Monitor:

Model 05103-10 Wind Speed and Direction Monitor is manufactured by R.M. Young. It is composed of a four-blade propeller mounted on a torpedo-shaped wind vane. Rotation of the propeller produces an alternating current with a frequency that is directly proportional to the wind speed. Wind direction is sensed by a potentiometer that is excited by an applied voltage. The potentiometer outputs a voltage that is directly proportional to the azimuth angle. Wind data is collected every five seconds and the mean wind vector magnitude and direction are calculated and stored at 15 minute intervals. The standard deviation of wind direction is also determined and indicates the variability of wind direction over the archiving period.

Temperature and Relative Humidity Probe:

The CS500-U relative humidity and air temperature probe measures relative humidity (RH) using a laser-trimmed INTERCAP capacitive chip. Temperature is measured with a 1000 ohm platinum resistance thermometer (PRT). Both sensors are enclosed in a 6-plate gill radiation shield designed to shield the sensors from precipitation and solar radiation.

Pyranometer:

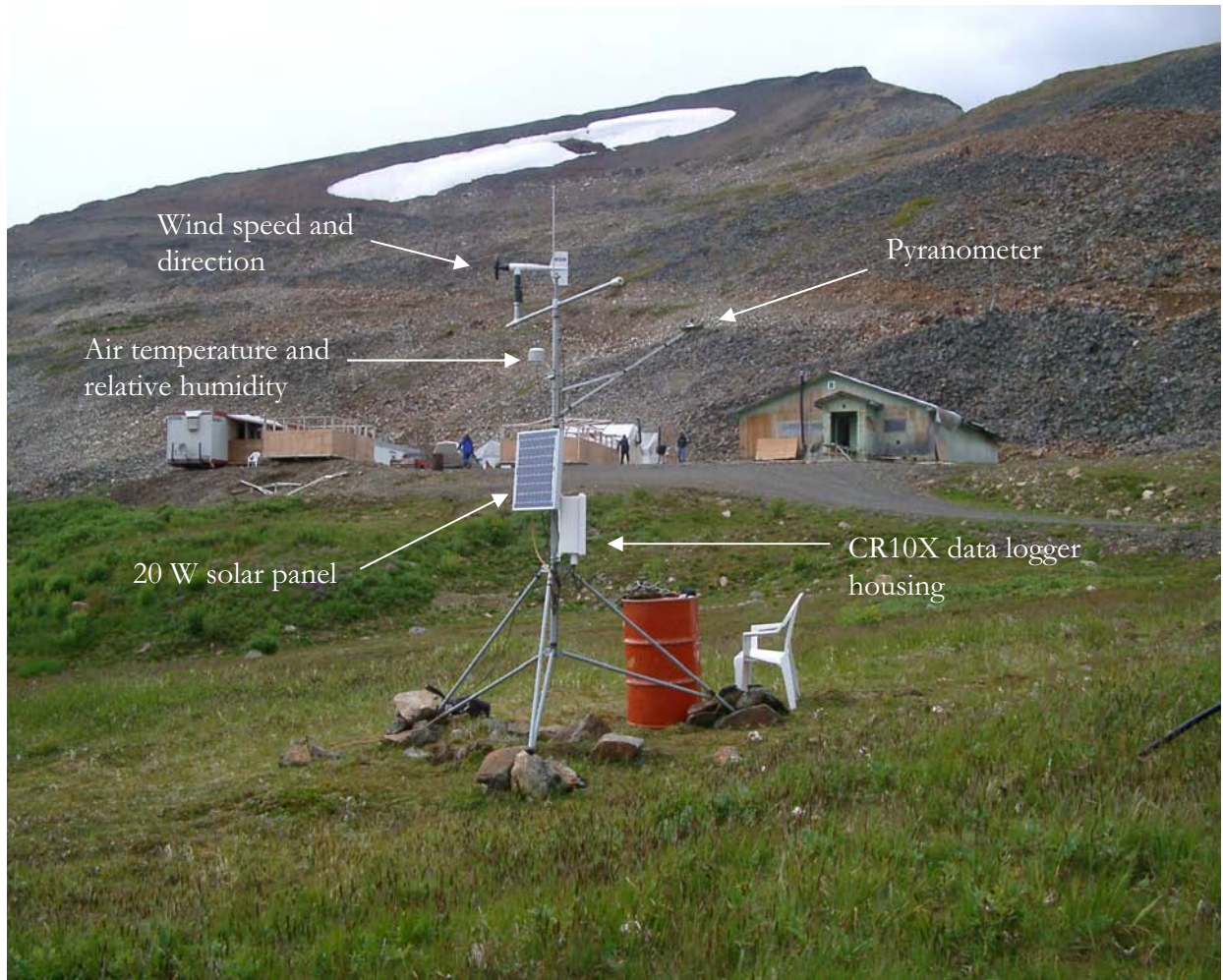
A pyranometer is a device used to measure incident solar radiation. The LI-COR LI-200S pyranometer consists of a high stability silicon photovoltaic detector (blue enhanced), which converts incident solar radiation to an electrical signal proportional to the received solar radiation. The photodiode is housed in a weatherproof anodized aluminum case with an acrylic diffuser. It has a spectral sensitivity between 400 and 1100 nm.

Data Storage:

Data is recorded to a Campbell Scientific CR10X data logger. The archiving interval for all parameters is 15 minutes. At a 15-minute sample frequency, the station will log more than a year of data before filling the memory module. Meteorological data on all instruments is collected at 5-second intervals, then averaged over the archiving period and saved to the logger memory every 15 minutes. At the conclusion of each 24-hour period, a daily summary is saved to the logger memory. Variables that are indicative of the status of the meteorological station, such as battery power and internal logger temperatures, are saved in this 24-hour data array

Station Power:

The meteorological station is powered by a 12-V DC battery, a 20-watt solar panel and a charge regulator, all of which are attached to the three meter tripod. With this power configuration the station can operate unattended for more than a year.



Photograph of the Mactung Meteorological Station

Station Name: Macmillan Pass

Date of Installation: February 1, 1998

Station Coordinates (NAD27): North 63° 14' 36.9" Tower Height: 10 m
West 130° 2' 7.1" Site elevation above sea level: 1379 m

Site Description:

This weather station is operated by the Meteorological Services of Canada (MSC). It consists of a ten metre meteorological tower with instrumentation to measure hourly values for wind speed and direction, air temperature, relative humidity, barometric pressure and dew point temperature. Other instrumentation mounted at ground level record daily totals for rainfall, snowfall, total precipitation and snow depth. The station is powered by 12 V DC batteries and uses a solar panel for charging augmented by a 12 V DC wind powered generator.

Site Location:

The station is located in Macmillan pass about 7 kilometres southwest from the Mactung camp site. It is in the Northwest Territories near the border between the Yukon and Northwest Territories. The station is approximately 25 metres north of the access road that connects Mactung Camp to the Macmillan Pass Airstrip.

Installation Notes:

The station is located in a clear area with no nearby trees. The ground cover consists of squat bushes and lichens. The base of the tower is mounted to a concrete base and the top of the tower is further secured by guy wires. The remaining meteorological instruments, not mounted on the tower, are located within a 15 metre radius of the tower.

Recorded Data:

The two tables below show examples of the hourly collected data and the 24 hour summary:

15 Minute Record

Date	Time (hhmm)	Air Temp (°C)	Dew Point Temp (degrees)	Relative Humidity (%)	Wind Dir Direction (10's deg)	Wind Speed (km/h)	Standard Pressure hPa
Aug 02/07	10:00	7.9	6.6	91	20	11	85.73
Aug 02/07	11:00	9.5	7.3	86	20	11	85.73
Aug 02/07	12:00	9.3	6.1	80	20	13	85.74

Daily Summary

Date	Maximum Air Temperature (°C)	Minimum Air Temperature (°C)	Mean Air Temperature (°C)	Heat Degree Days (°C)	Cool Degree Days (°C)	Total Precip (mm)	Total Snow (cm)	Snow on Ground (cm)	Direction of Max Wind Gust (10's deg)	Speed Of Max Wind Gust (10's deg)
Oct 21/07	2.0	-3.6	-0.8	18.8	0	0	7	6	19	32
Oct 22/07	3.7	-3.5	0.1	17.9	0	0	1	11	23	43
Oct 23/07	-1.5	-5.3	-3.4	21.4	0	0	1	13	23	32

Station Instrumentation:

Brief descriptions of these instruments, based on material provided by the manufacturers, are provided below.

Meteorological Station Instrumentation Parameters

Instrument	Model	Measuring Range	Sensitivity/Accuracy
Wind Monitor (Two units installed for the station)	05103-10 R.M. Young	0 to 60 m/s 0 to 100 m/s gusts	0 to 100 m/s gusts Threshold wind = 1.0 m/s
		0 to 355 degrees	±1.4°
Relative Humidity /Air Temperature Probe	HMP45C Vaisala	Relative Humidity 0.0 to 100	Accuracy at 20°C ±2% RH (10-90% RH) ±3% RH (90-100% RH)
		Air Temperature -40° to +60°C	Accuracy at 20°C ± 0.4°C
Barometric Pressure Sensor	SBP270 Setra	800 – 1100 hPa	± 0.2 hPa accuracy ±0.1% long term stability
Tipping Bucket Rain Gauge	TB3 Hydrological Services Pty.	0 to 700 mm/hr	± 3% accuracy (25-500 mm/hr) 0.25 mm resolution
All-weather precipitation gauge	Ott Pluvio	0 to 250 mm then needs to be drained	0.25 mm resolution 0.04 mm accuracy
Snow depth sensor	SR50-45 Sonic Ranger 50KHz	0.5 to 10 metres	±1.0 cm accuracy or ± 0.4% of distance to target (whichever is greater)
Soil temperature	107B	-35° to +50°C	Less than ±0.5°C

Wind Speed and Direction Monitor:

The Model 05103-10 Wind Speed and Direction Monitor is manufactured by R.M. Young. It is composed of a four-blade propeller mounted on a torpedo-shaped wind vane. Rotation of the propeller produces an alternating current with a frequency that is directly proportional to the wind speed. Wind direction is sensed by a potentiometer that is excited by an applied voltage. The potentiometer outputs a voltage that is directly proportional to the azimuth angle.

Temperature and Relative Humidity Probe:

The Vaisala HMP45C relative humidity and air temperature probe measures relative humidity (RH) using a HUMICAP capacitive polymer H chip. Temperature is measured with a 1000 ohm platinum resistance thermometer (PRT). Both sensors are enclosed in a radiation shield designed to shield the sensors from precipitation and solar radiation.

Barometric Pressure Sensor:

The station uses a SBP270 Setra Barometric Pressure Sensor to measure barometric pressure conditions at the site consisting of a SETRACERAM capacitive sensor and an IC analog circuit.

Tipping Bucket Rain Gauge:

The TB3 Hydrological Services Pty. Tipping rain gauge measures water equivalent precipitation. The unit consists of a 200 mm diameter collector funnel, a stainless steel filter and a tipping bucket mechanism. The bucket tips when precipitation of 0.2 mm has been collected. Each tip is marked by a reed switch closure and stored on the Data Logger.

All-Weather Precipitation Gauge:

The Ott Pluvio all-weather precipitation gauge allows for the continuous and automatic recording of precipitation volume and intensity. An electronic weighing cell measures the weight of precipitation in the collection container. The gauge is equipped with an integrated multi-channel data logger and an RS-232C interface for downloading or linking to a remote data-transmission system. Hardware and software filters are included to minimize the distortion of the precipitation signal that may be influenced by wind, temperature, and/or evaporation. The gage has an aerodynamic protective housing made of stainless steel.

Snow Depth Sensor:

The SR50-45 Sonic Ranger is based on an electronic transducer that determines the distance to a target by sending out ultrasonic pulses and measuring the time it takes for the echoes to return.

Soil Temperature:

The 107B soil temperature sensor consists of a thermistor encapsulated in a cylindrical aluminum housing.

Data Storage:

Data is recorded to a data logger. The archiving interval for all parameters is 1 hour. At the conclusion of each 24-hour period, a daily summary is saved to the logger memory.

Station Power:

The meteorological station is powered by a 12 V DC battery and a 20-watt solar panel which are attached to the 10 metre tower. A Rutland 910 Series wind generator is attached to a four metre tower, and augments power supplied to the station.



Photograph of the MSC Macmillan Pass Meteorological Station



APPENDIX B

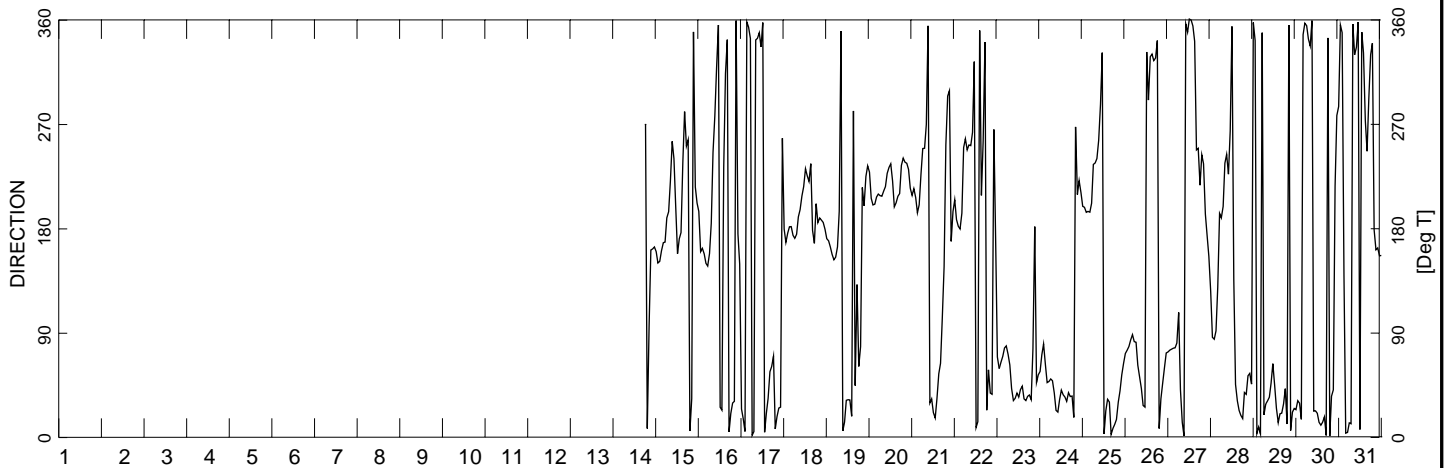
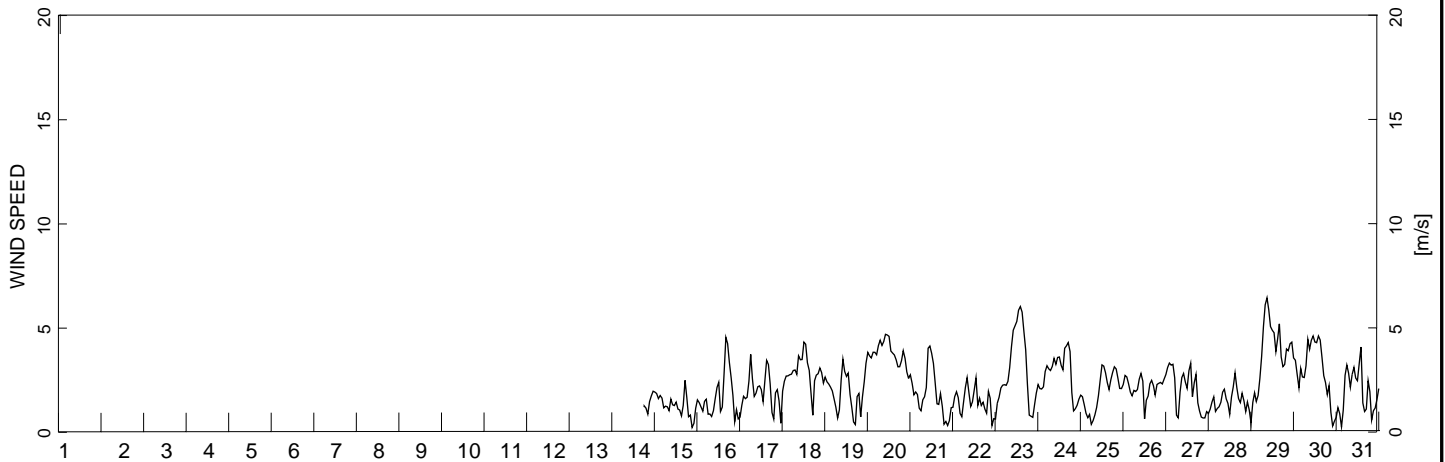
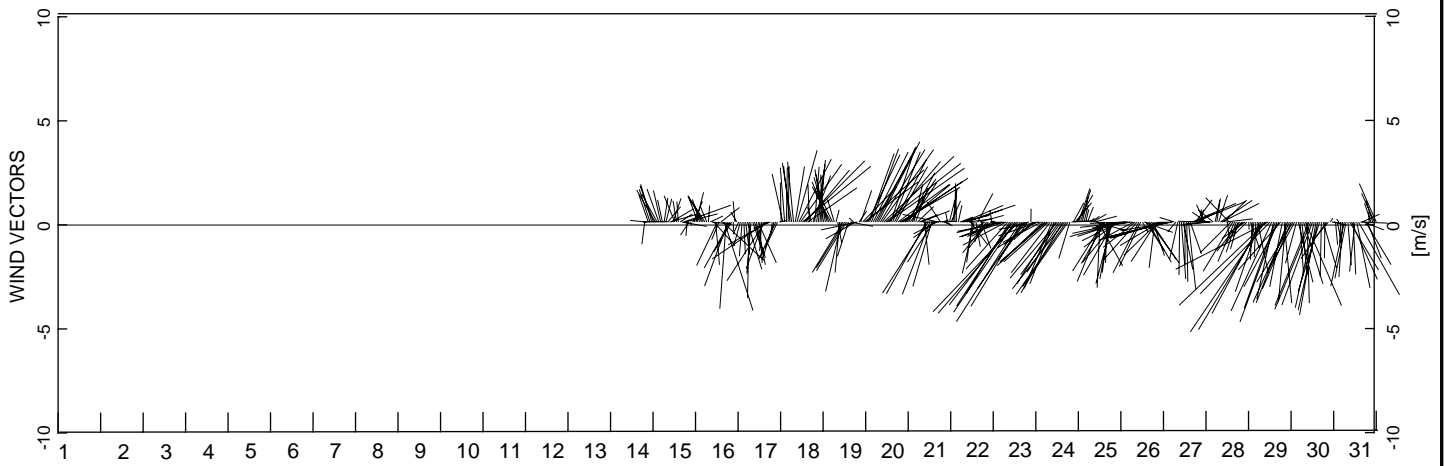
APPENDIX B MONTHLY MACTUNG STATION WIND SUMMARIES – JULY 2005 TO AUGUST 2008

APPENDIX B

Monthly Mactung Station Wind Summaries July 2005 – August 2008

- B-01 Mactung Station Wind Data – July 2005
- B-02 Mactung Station Wind Data – August 2005
- B-03 Mactung Station Wind Data – September 2005
- B-04 Mactung Station Wind Data – October 2005
- B-05 Mactung Station Wind Data – November 2005
- B-06 Mactung Station Wind Data – December 2005
- B-07 Mactung Station Wind Data – January 2006
- B-08 Mactung Station Wind Data – February 2006
- B-09 Mactung Station Wind Data – March 2006
- B-10 Mactung Station Wind Data – April 2006
- B-11 Mactung Station Wind Data – May 2006
- B-12 Mactung Station Wind Data – June 2006
- B-13 Mactung Station Wind Data – July 2006
- B-14 Mactung Station Wind Data – August 2006
- B-15 Mactung Station Wind Data – September 2006
- B-16 Mactung Station Wind Data – October 2006
- B-17 Mactung Station Wind Data – November 2006
- B-18 Mactung Station Wind Data – December 2006
- B-19 Mactung Station Wind Data – January 2007
- B-20 Mactung Station Wind Data – February 2007
- B-21 Mactung Station Wind Data – March 2007
- B-22 Mactung Station Wind Data – April 2007
- B-23 Mactung Station Wind Data – May 2007

- B-24 Mactung Station Wind Data – June 2007
- B-25 Mactung Station Wind Data – July 2007
- B-26 Mactung Station Wind Data – August 2007
- B-27 Mactung Station Wind Data – September 2007
- B-28 Mactung Station Wind Data – October 2007
- B-29 Mactung Station Wind Data – November 2007
- B-30 Mactung Station Wind Data – December 2007
- B-31 Mactung Station Wind Data – January 2008
- B-32 Mactung Station Wind Data – February 2008
- B-33 Mactung Station Wind Data – March 2008
- B-34 Mactung Station Wind Data – April 2008
- B-35 Mactung Station Wind Data – May 2008
- B-36 Mactung Station Wind Data – June 2008
- B-37 Mactung Station Wind Data – July 2008
- B-38 Mactung Station Wind Data – August 2008



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
July 2005**

PROJECT NO.
W23101021

DWN
RED

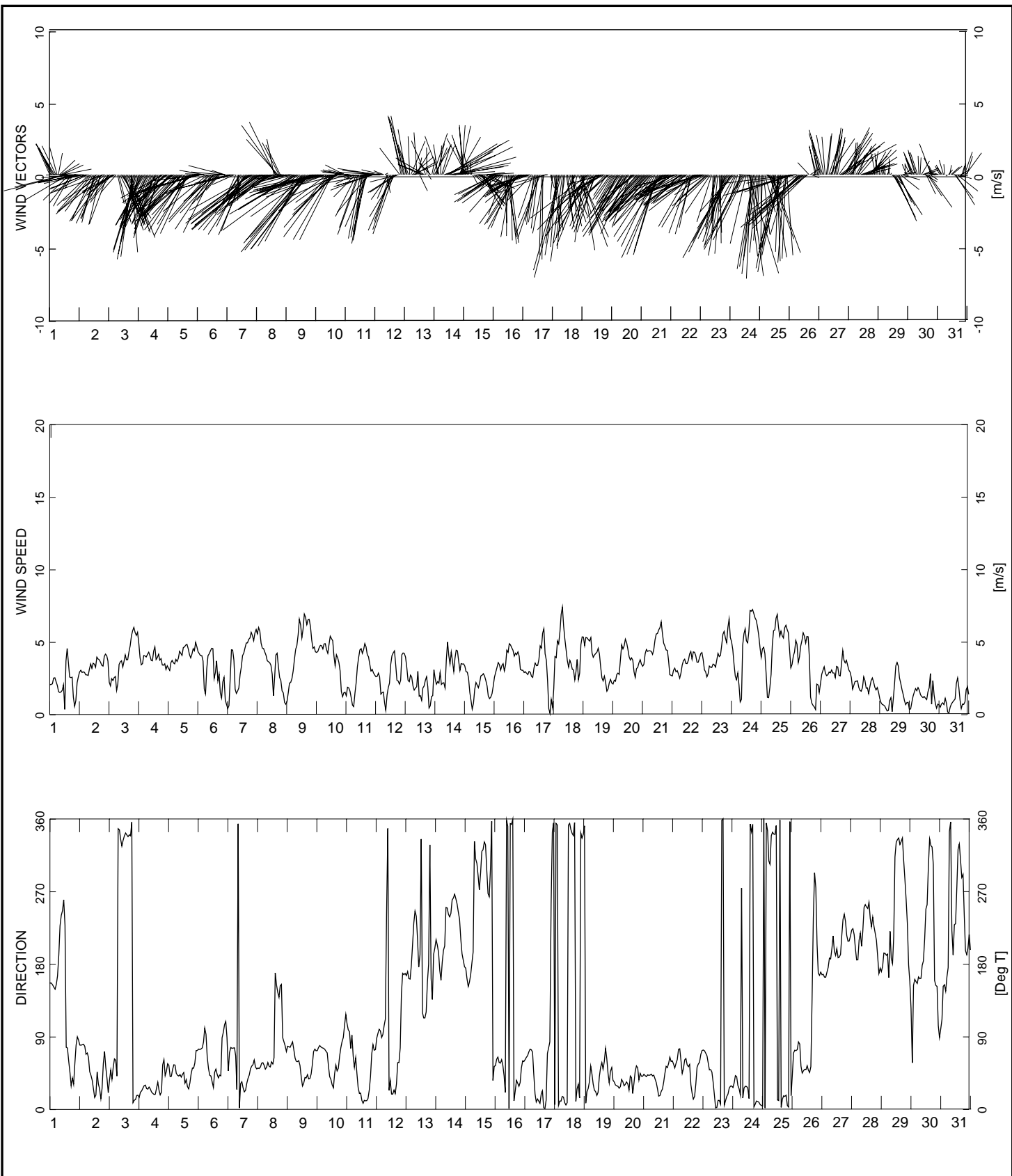
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Figure B-01



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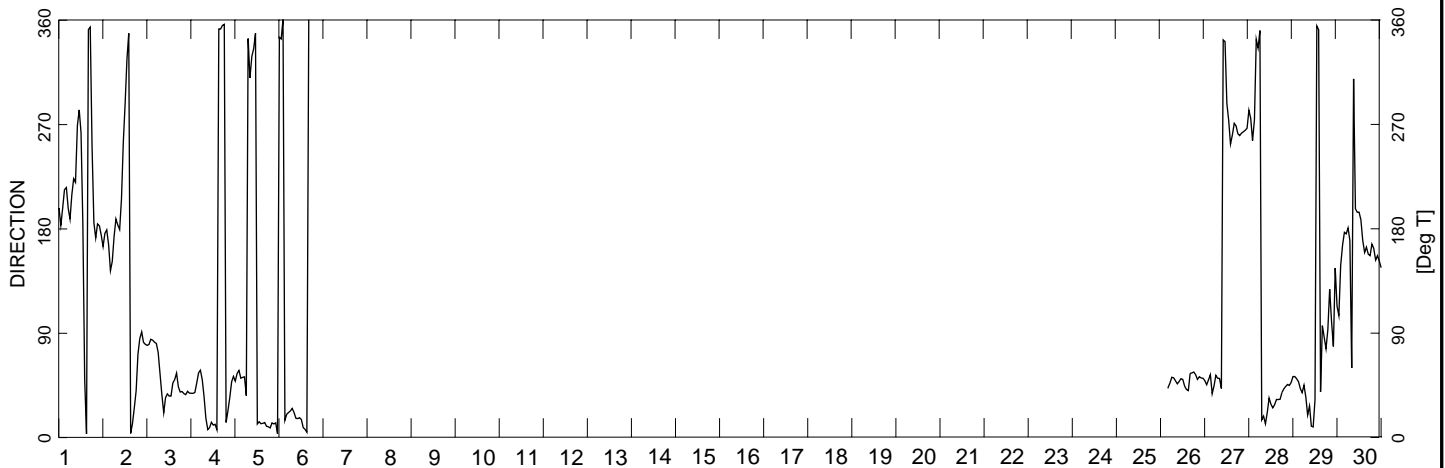
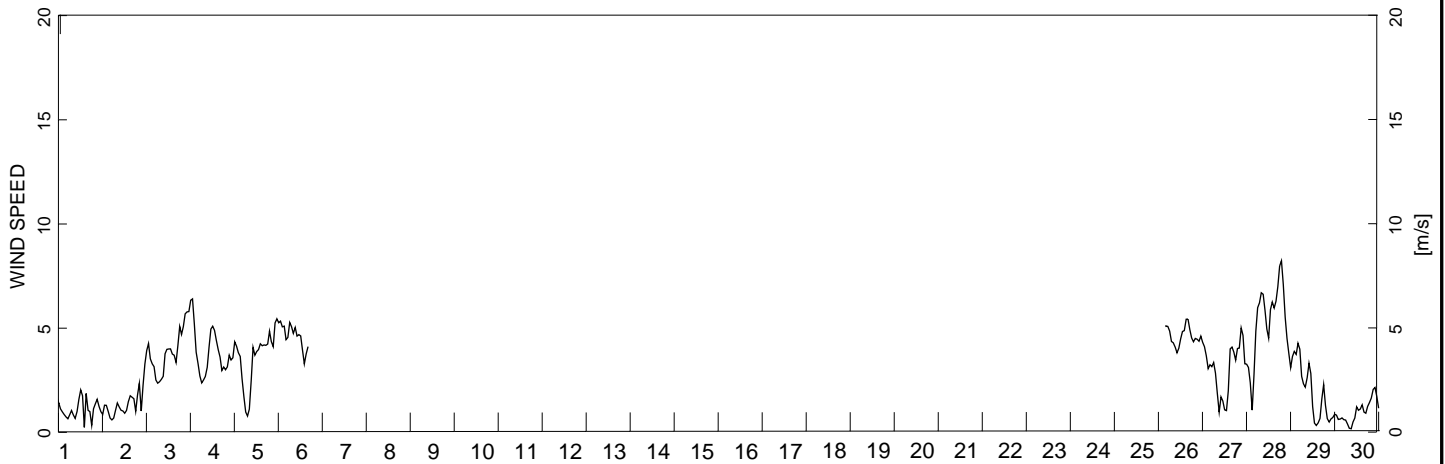
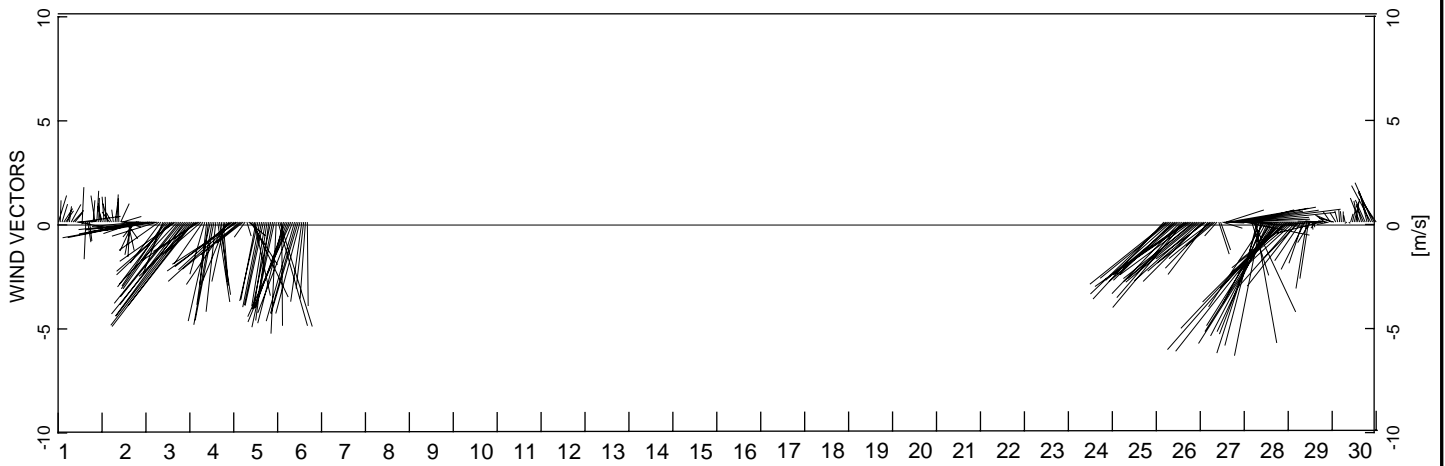


**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
August 2005**

PROJECT NO. W23101021	DWN RED	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure B-02



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
September 2005**

PROJECT NO.
W23101021

DWN
RED

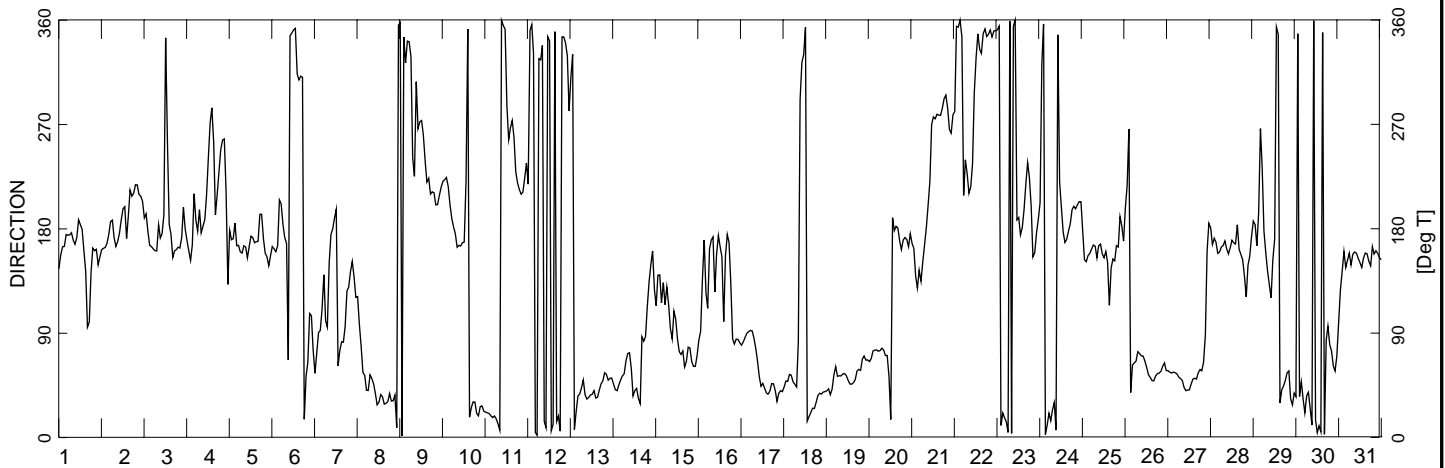
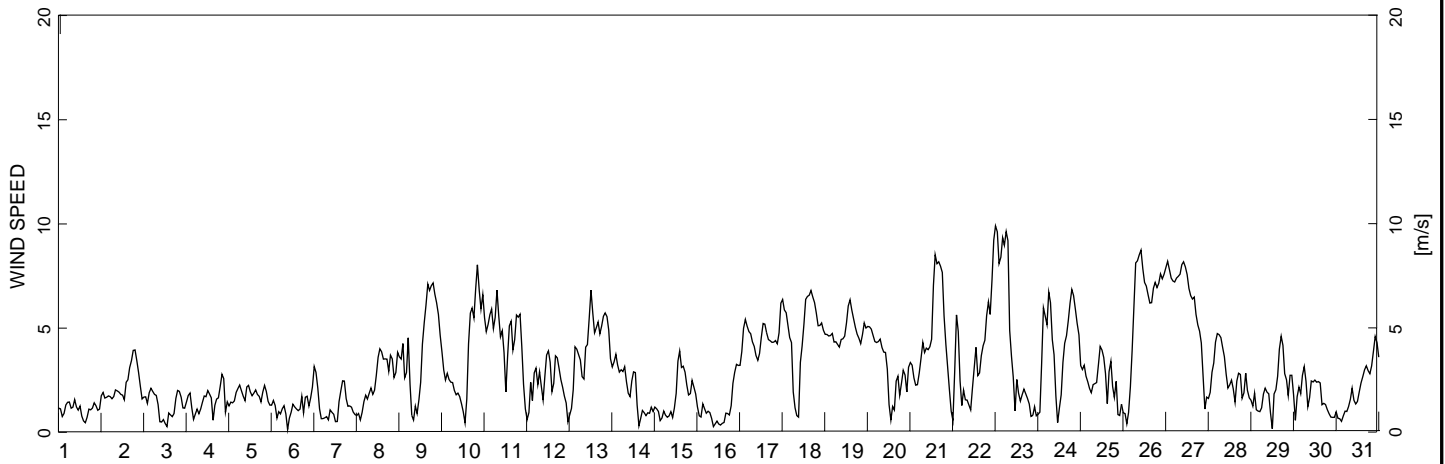
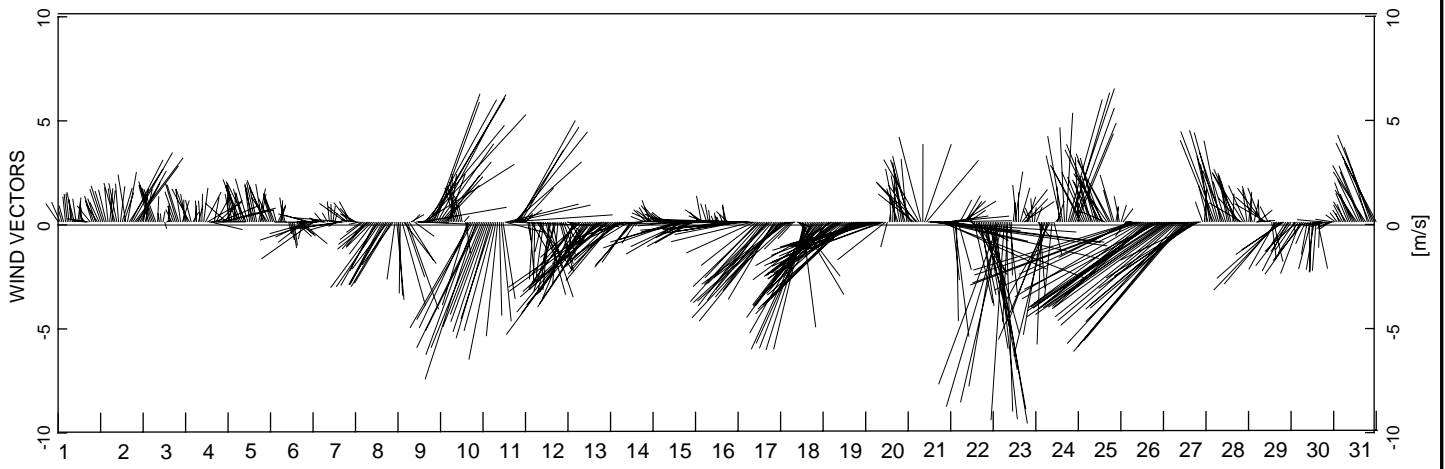
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Figure B-03



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
October 2005**

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W23101021

DWN
RED

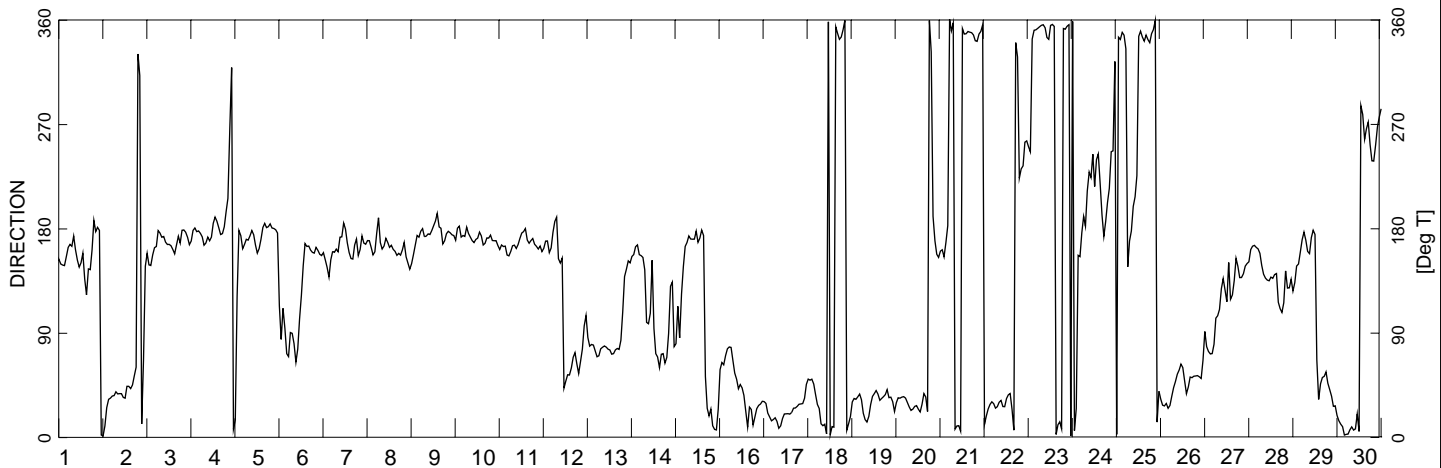
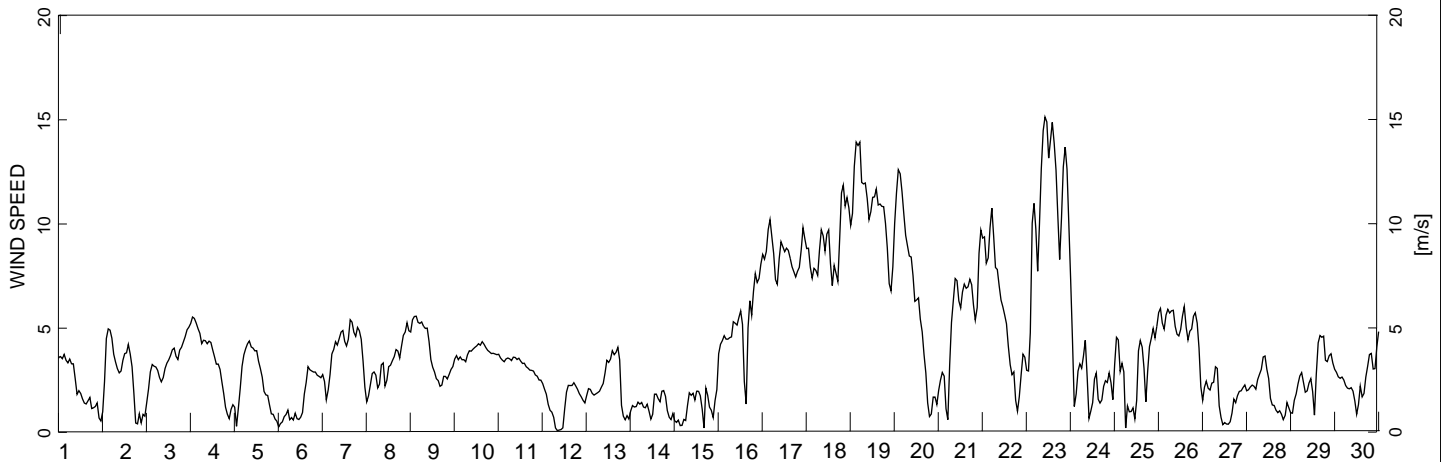
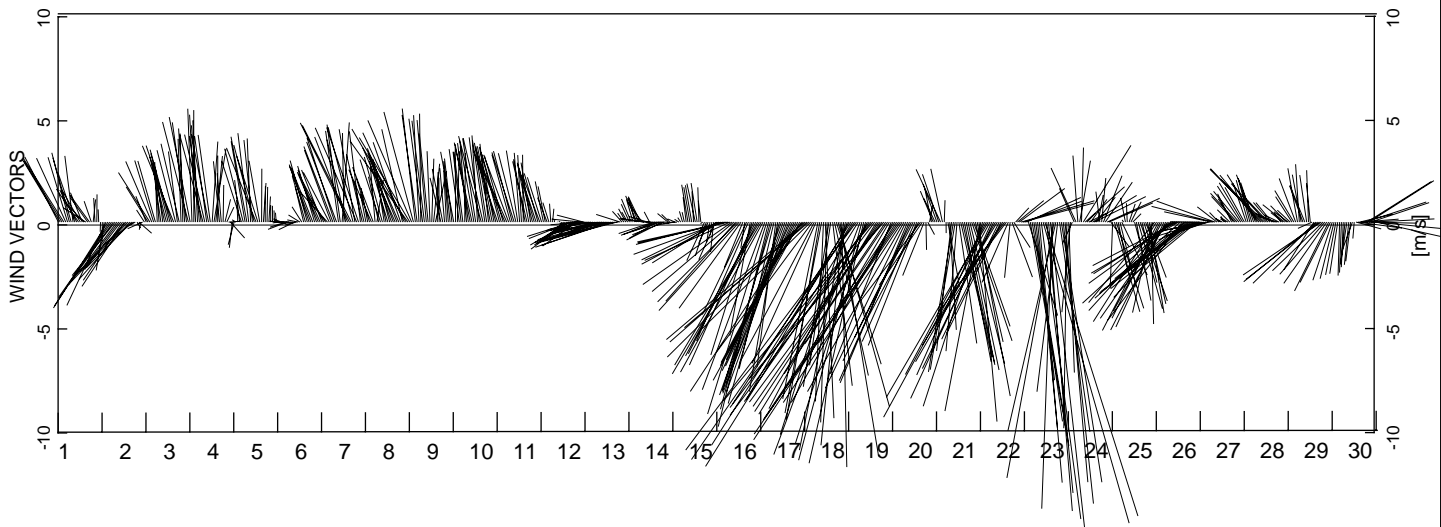
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Figure B-04



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
November 2005**

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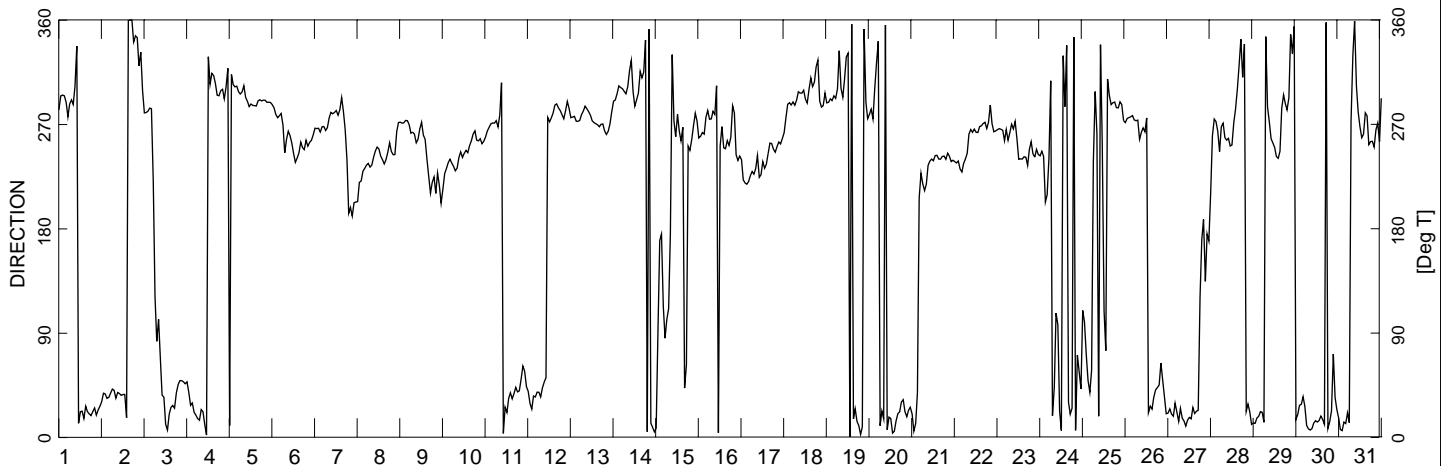
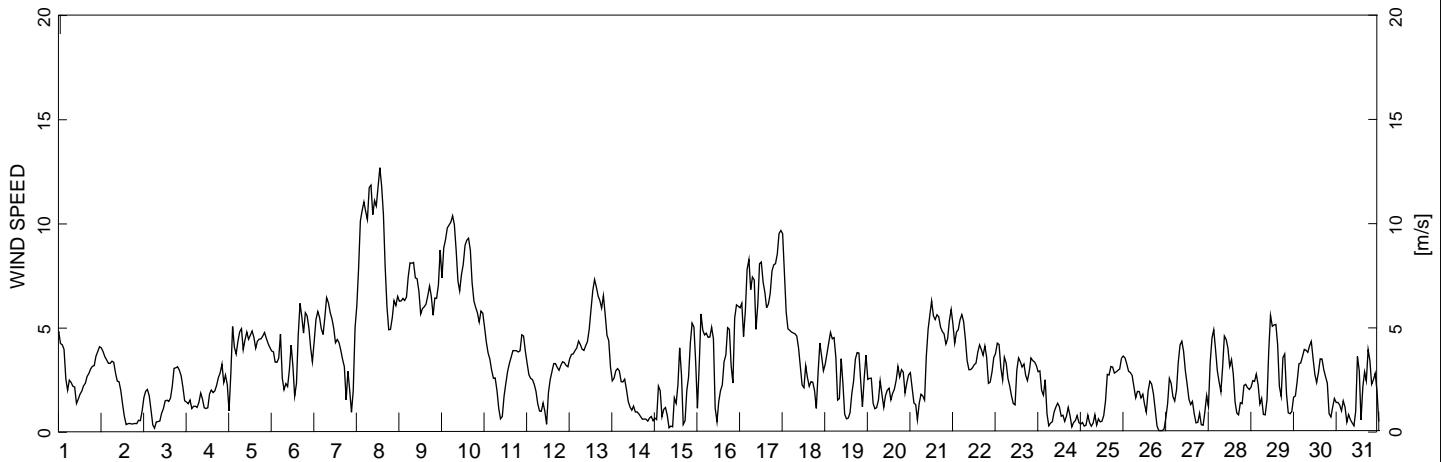
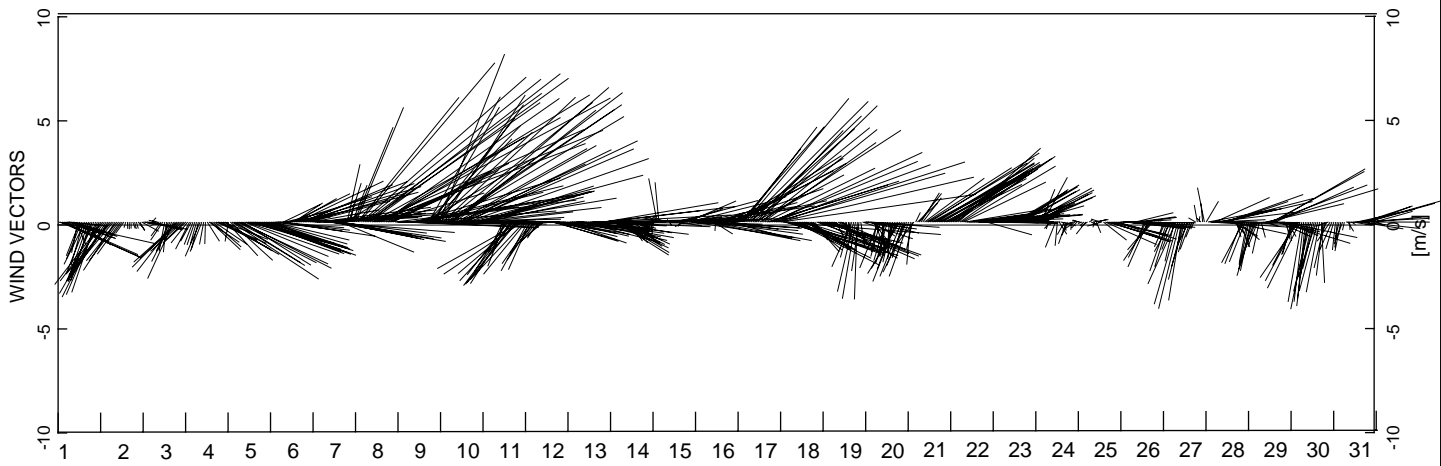
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EBA-VANC

DATE

November 2008

Figure B-05



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
December 2005**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
RED

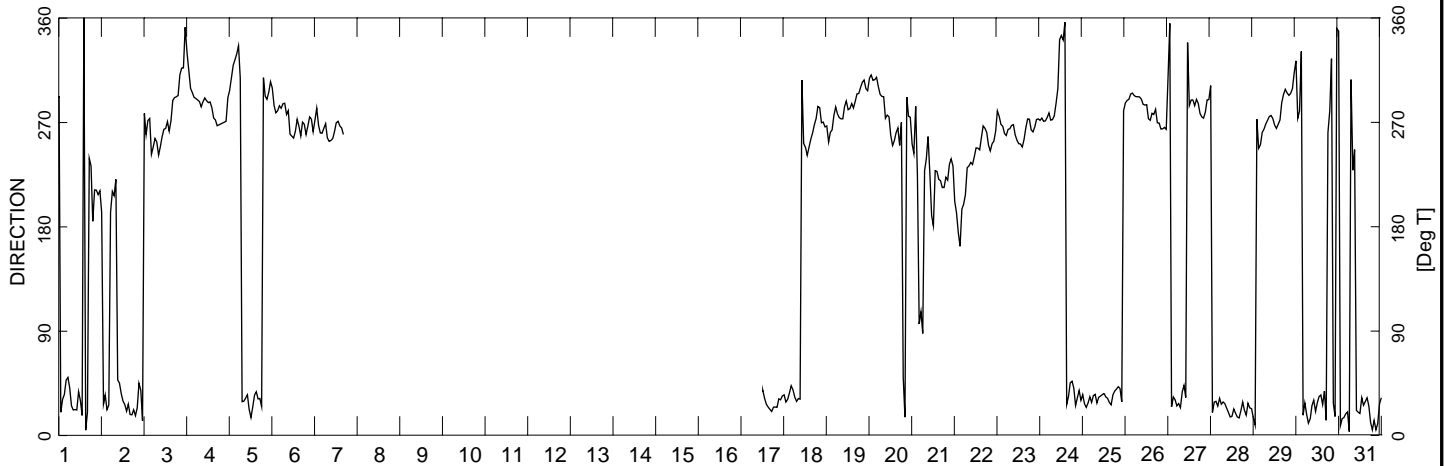
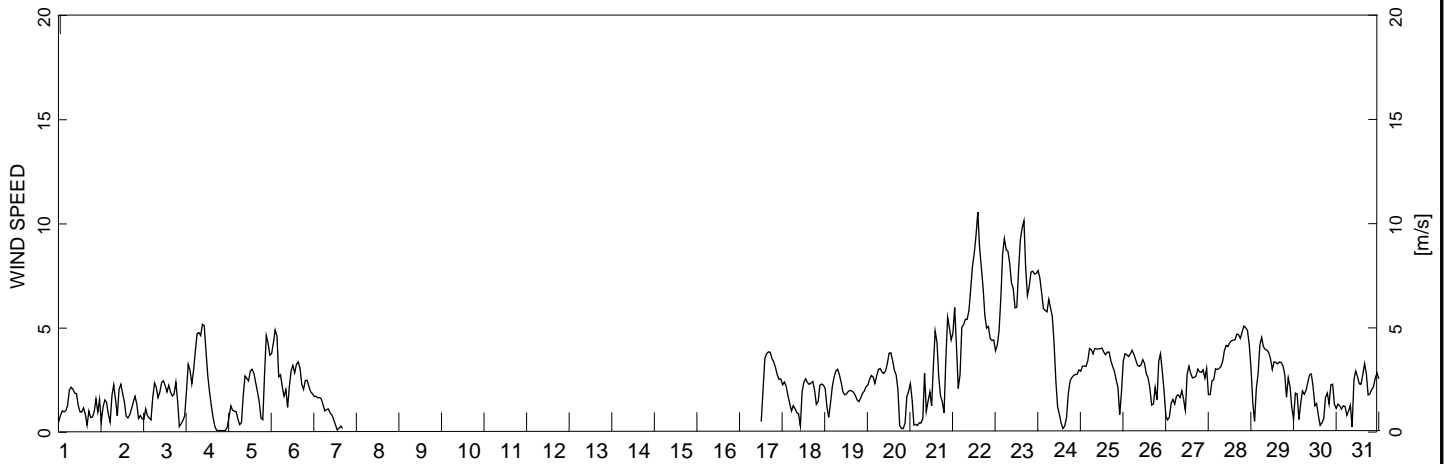
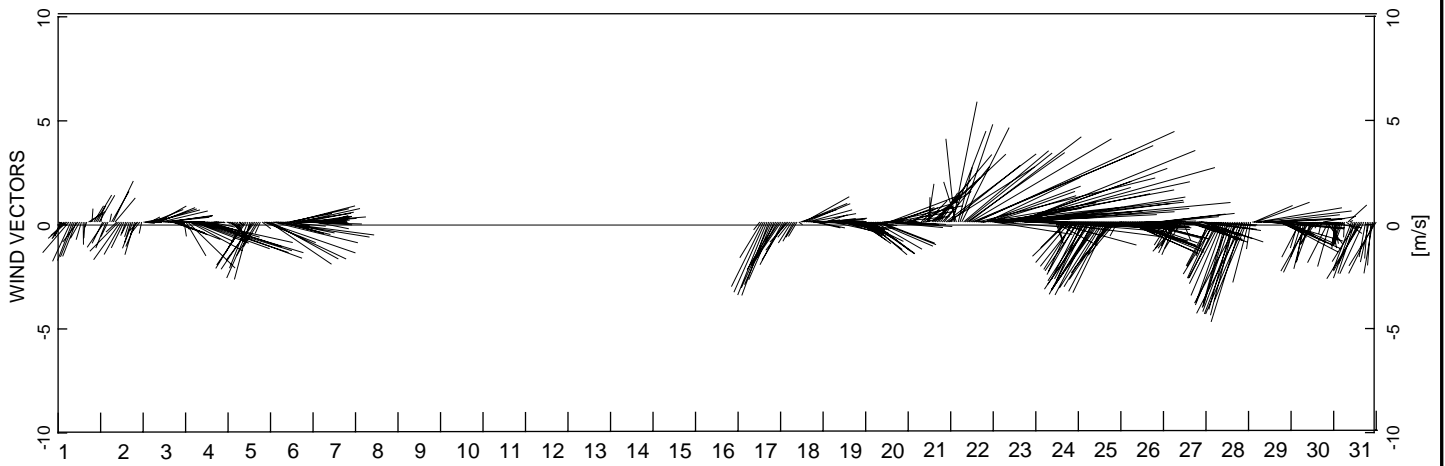
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November 2008

Figure B-06



NOTES

Anemometer propellor is not turning from January 7 to 16, 2006
Likely due to ice formation on the propellor.

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
January 2006**



PROJECT NO.
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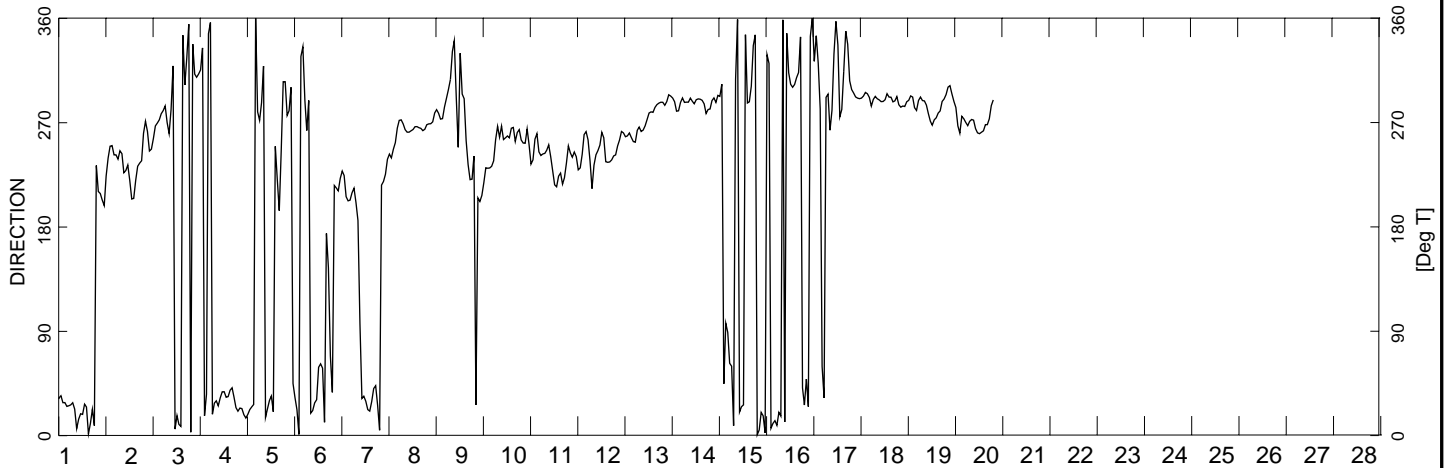
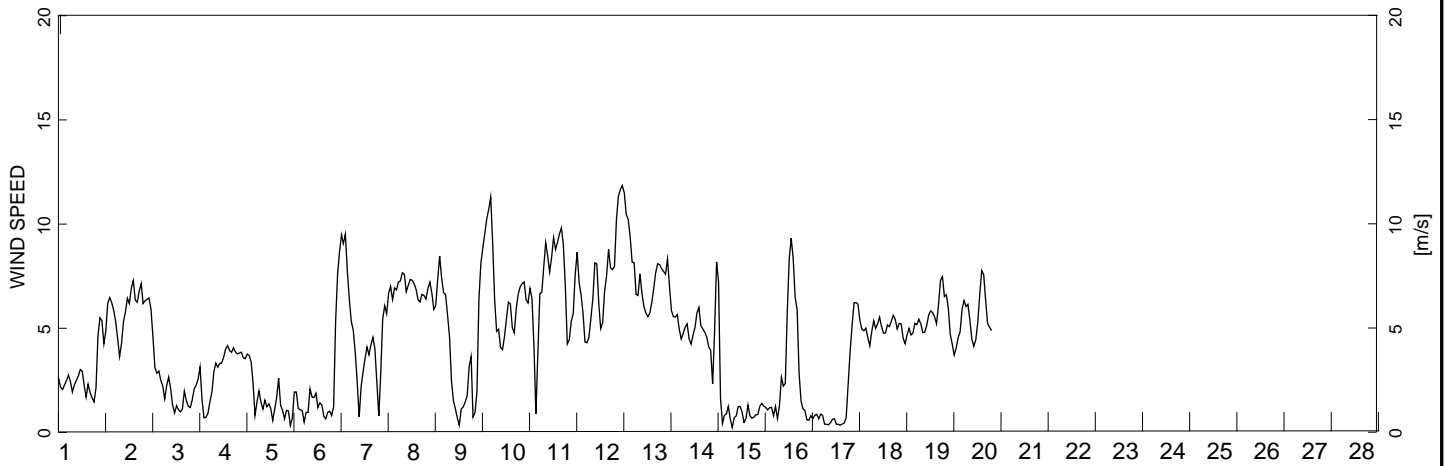
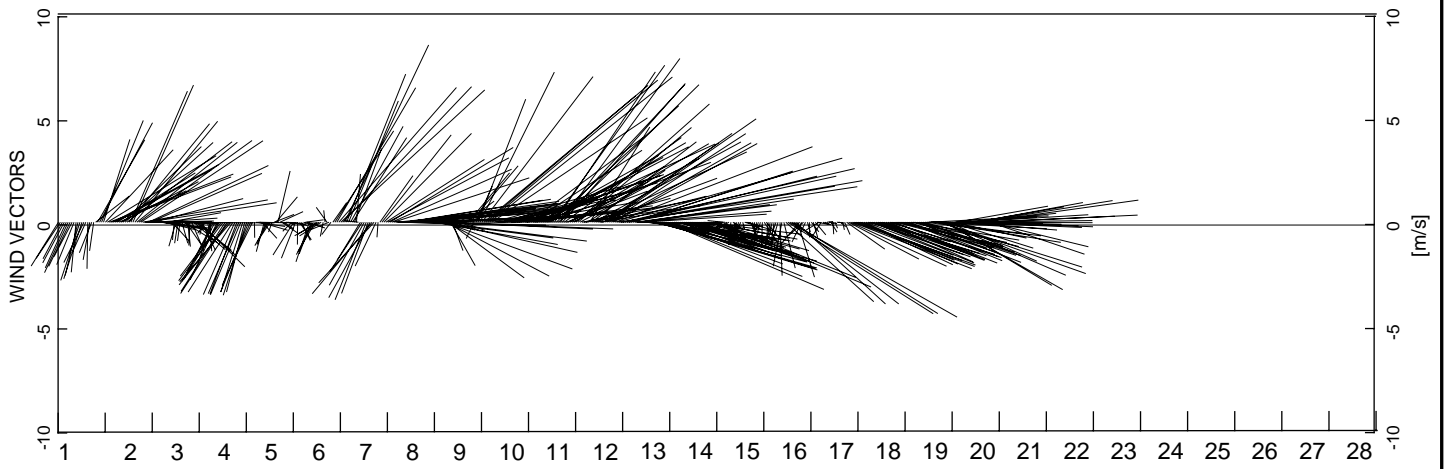
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Figure B-07



NOTES

No data available from
February 16 to 28, 2006

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
February 2006**

**EBA Engineering
Consultants Ltd.**



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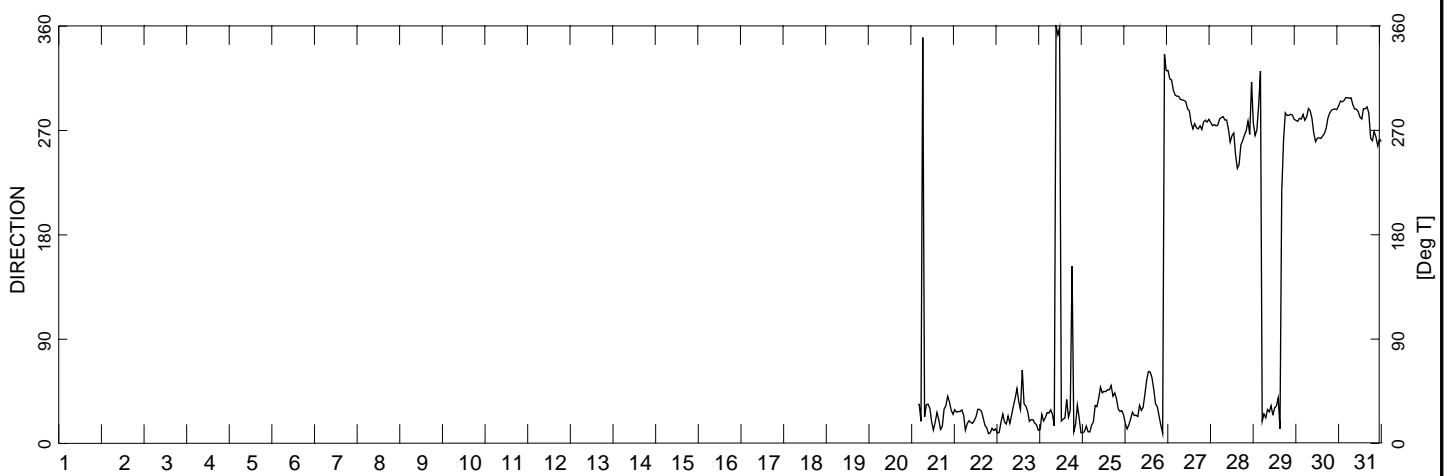
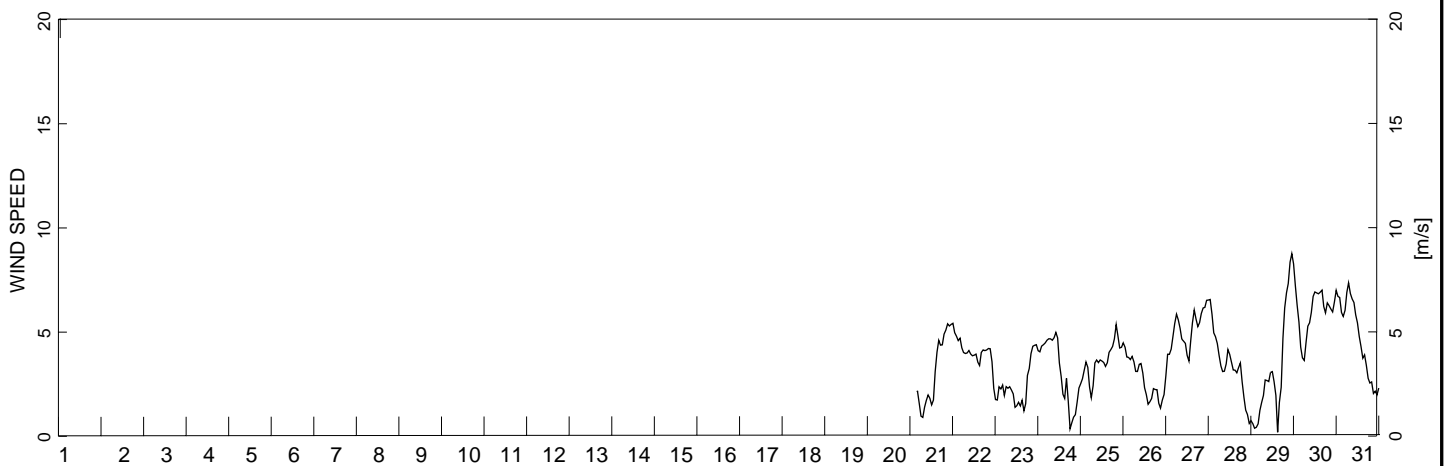
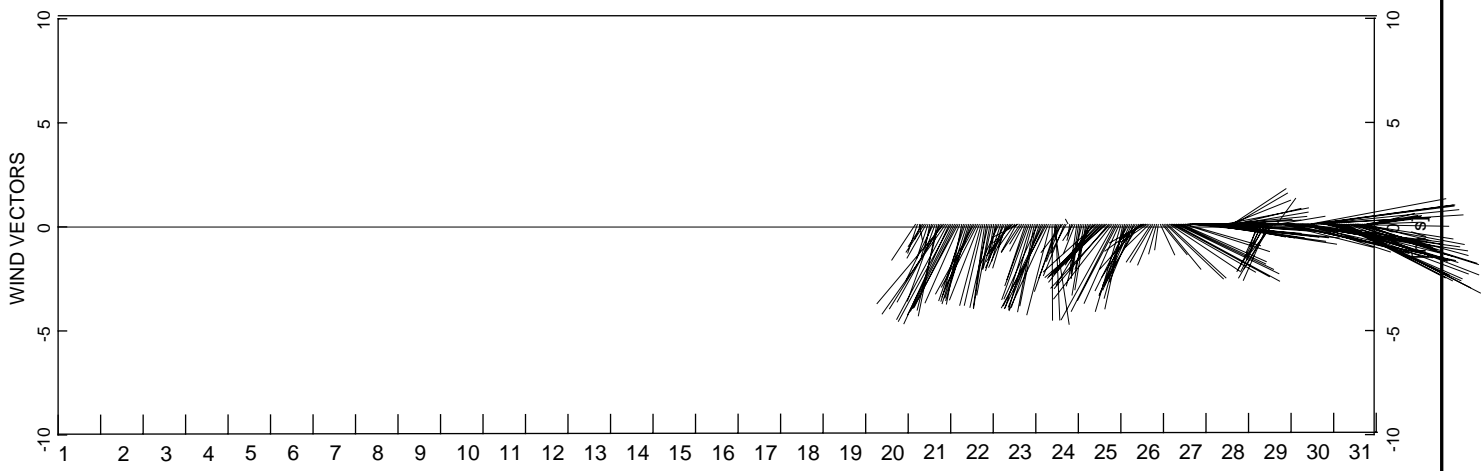
CHK
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Figure B-08



NOTES
 No data available from
 March 1 - 20, 2006

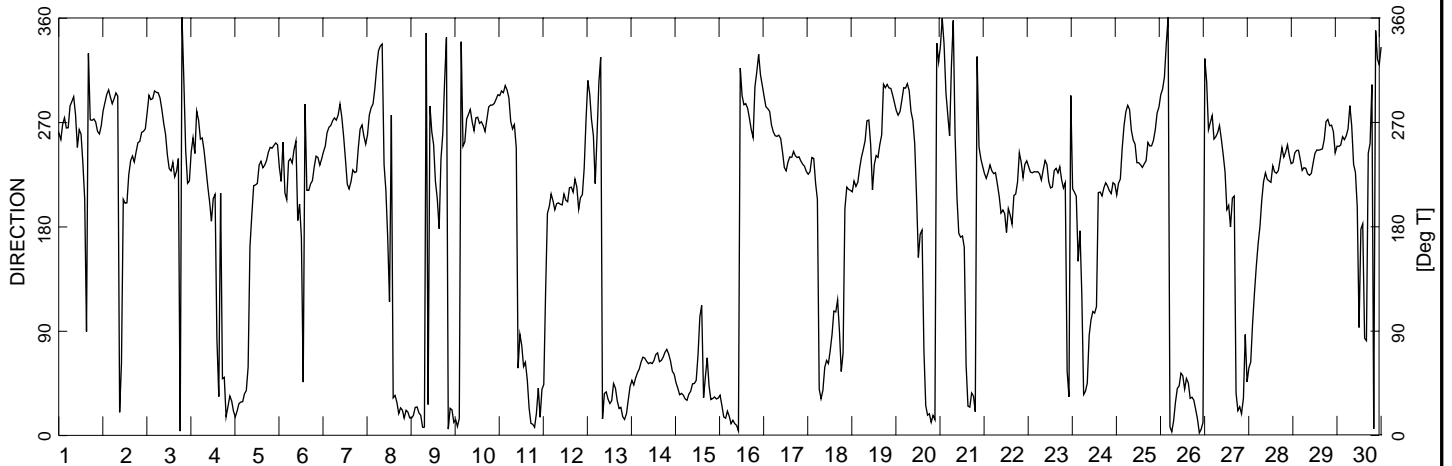
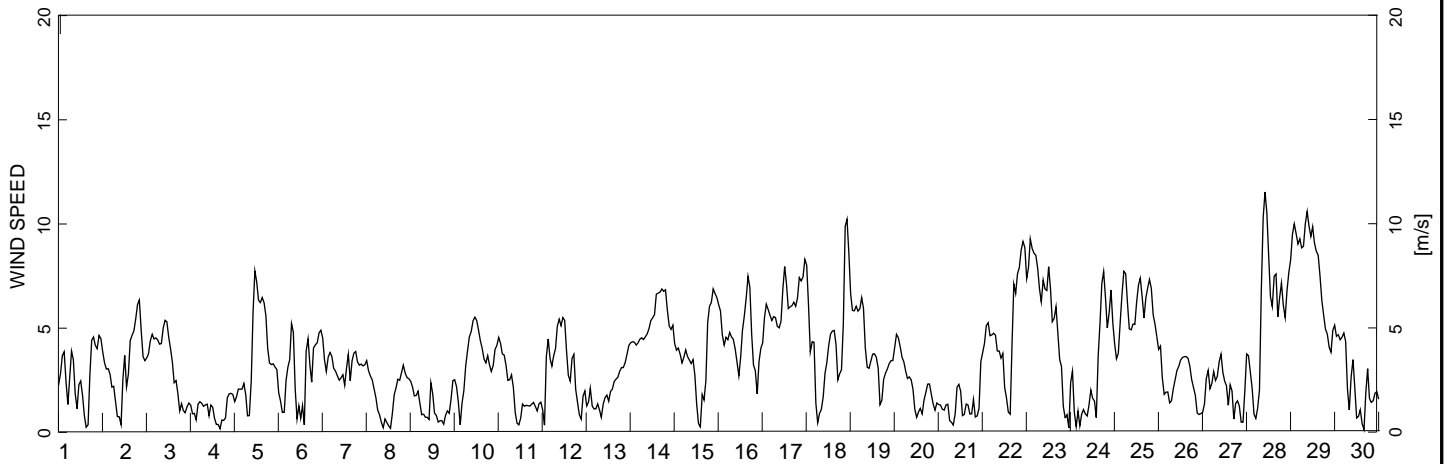
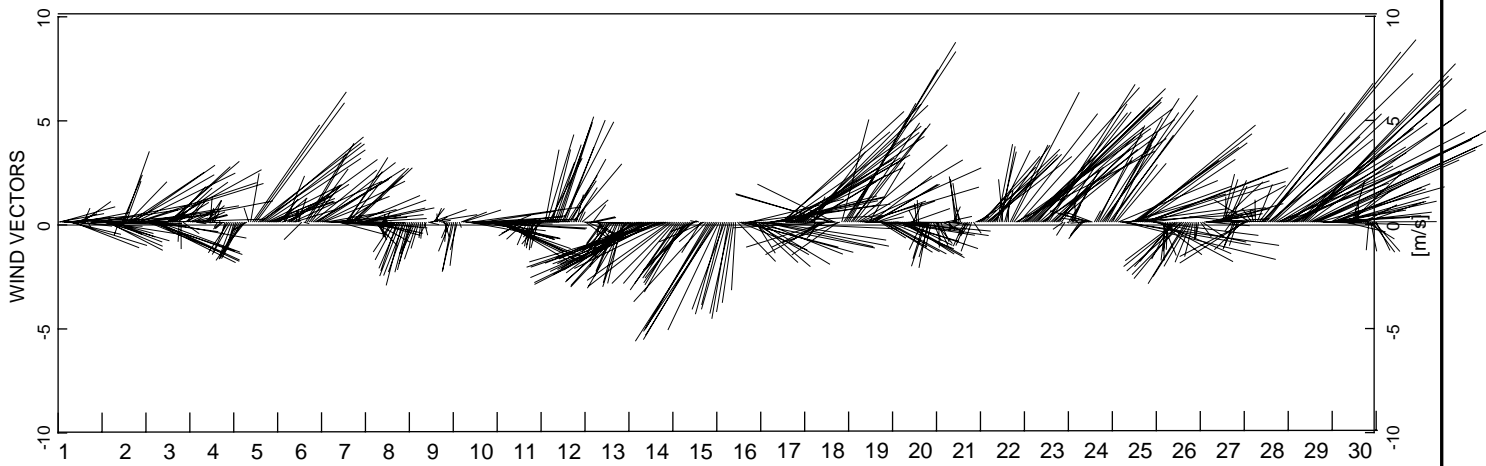
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MACTUNG PROJECT 2008 HYDROMETEOROLOGICAL SURVEY			
Mactung Station Wind Data March 2006			
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Figure B-09



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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
April 2006**

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PROJECT NO.
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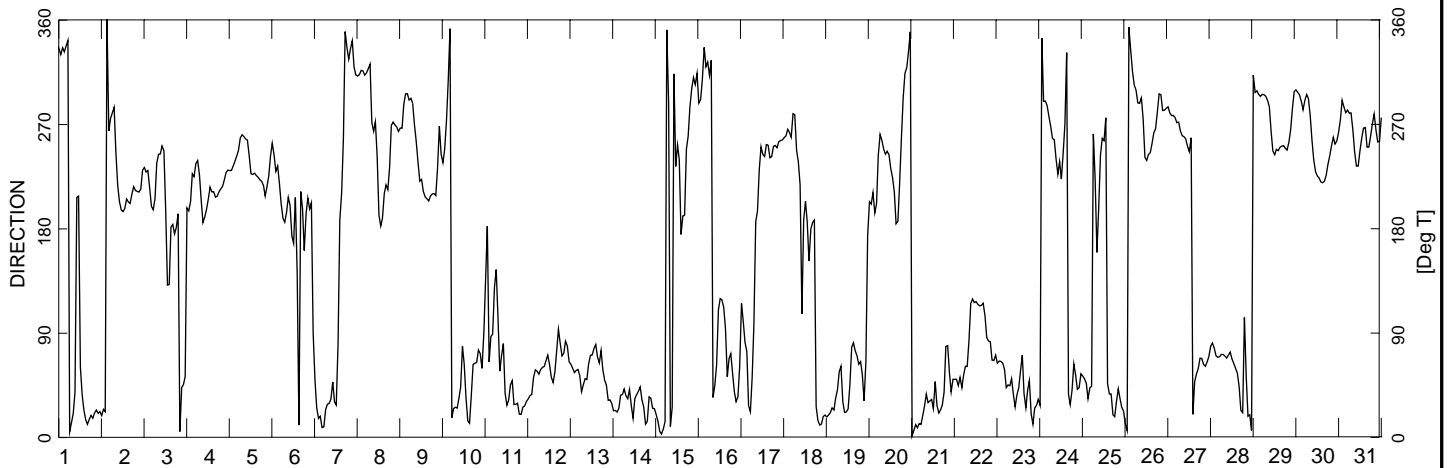
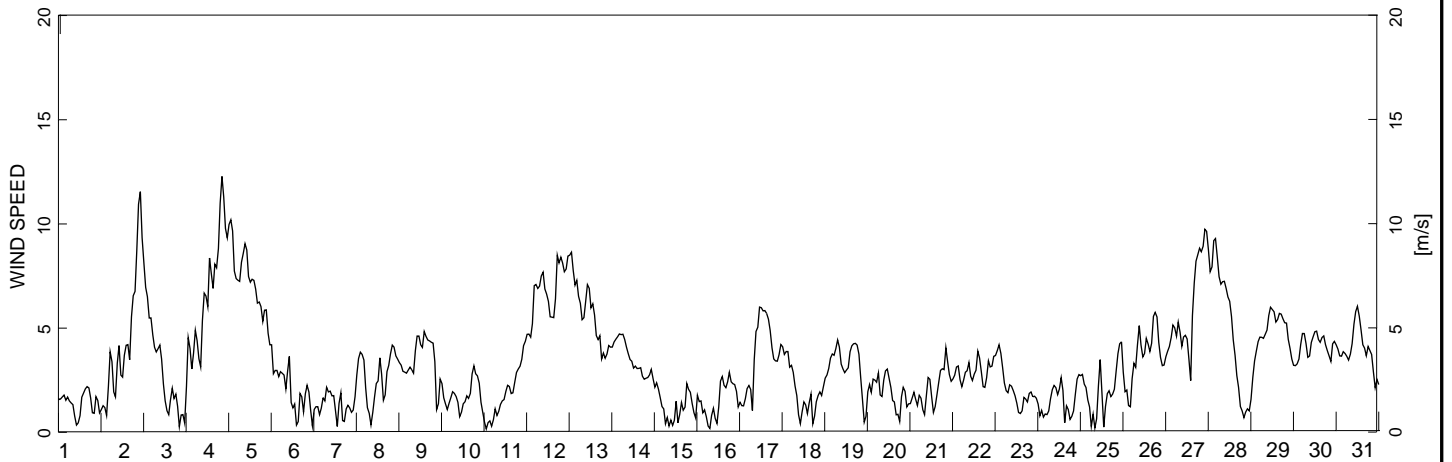
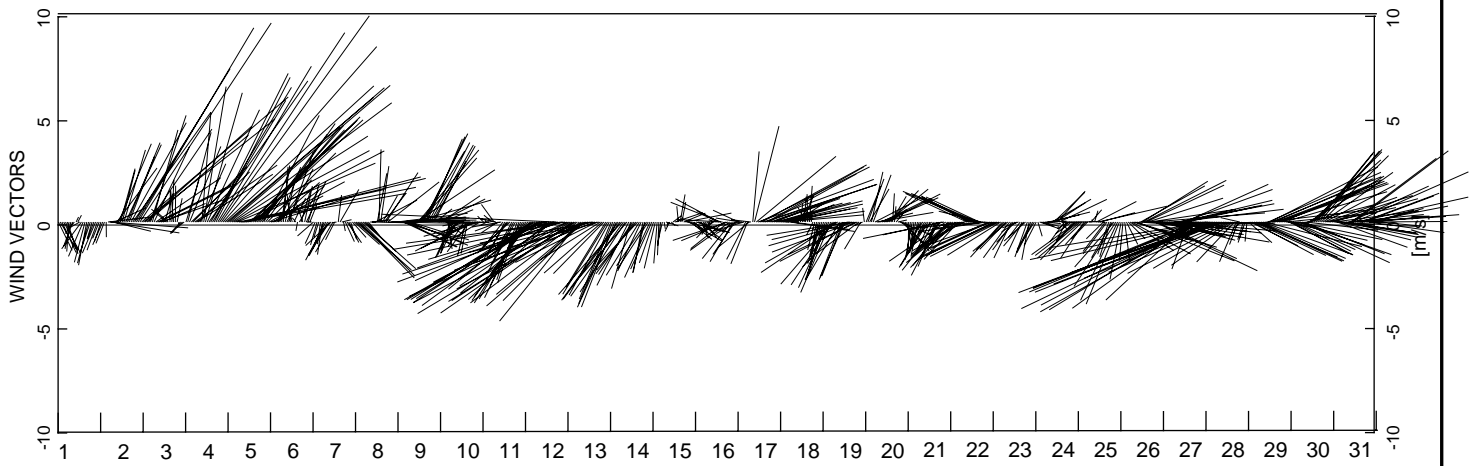
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DATE
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Figure B-10



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
May 2006**

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PROJECT NO.
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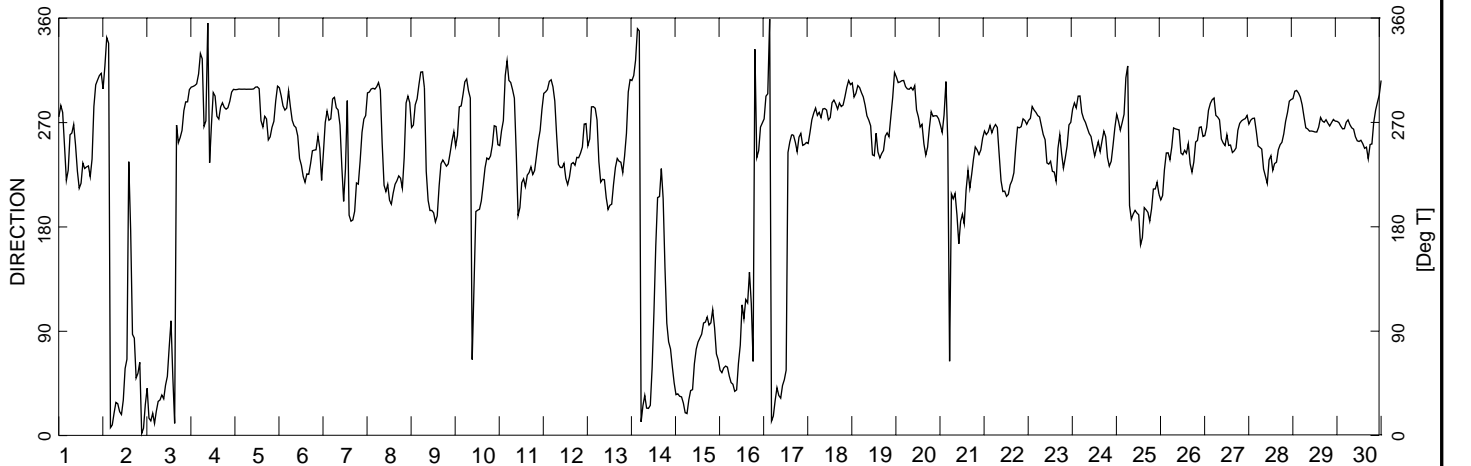
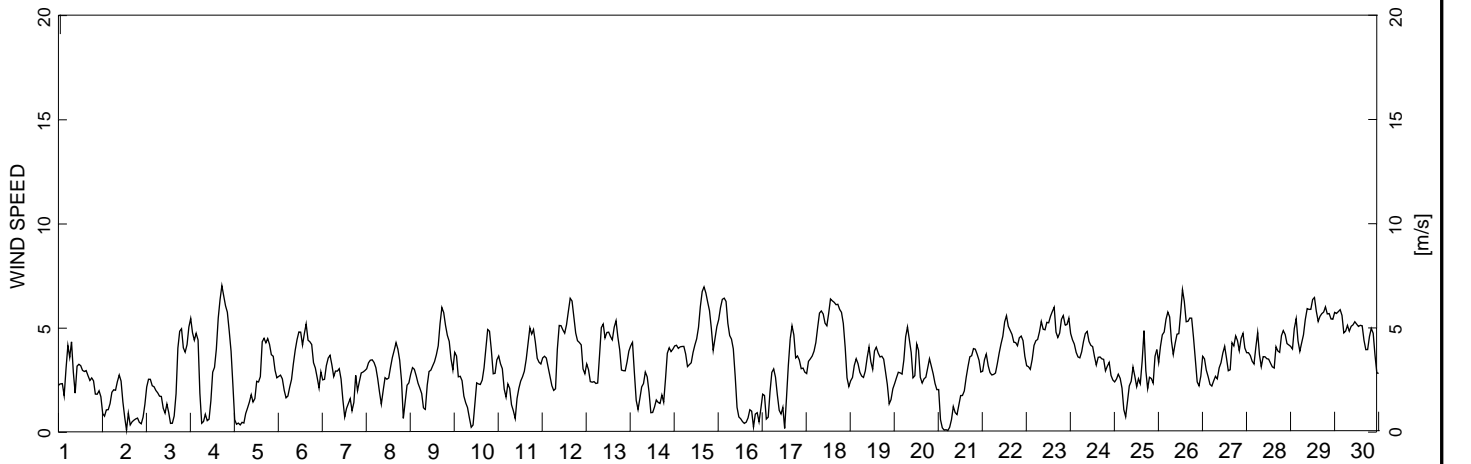
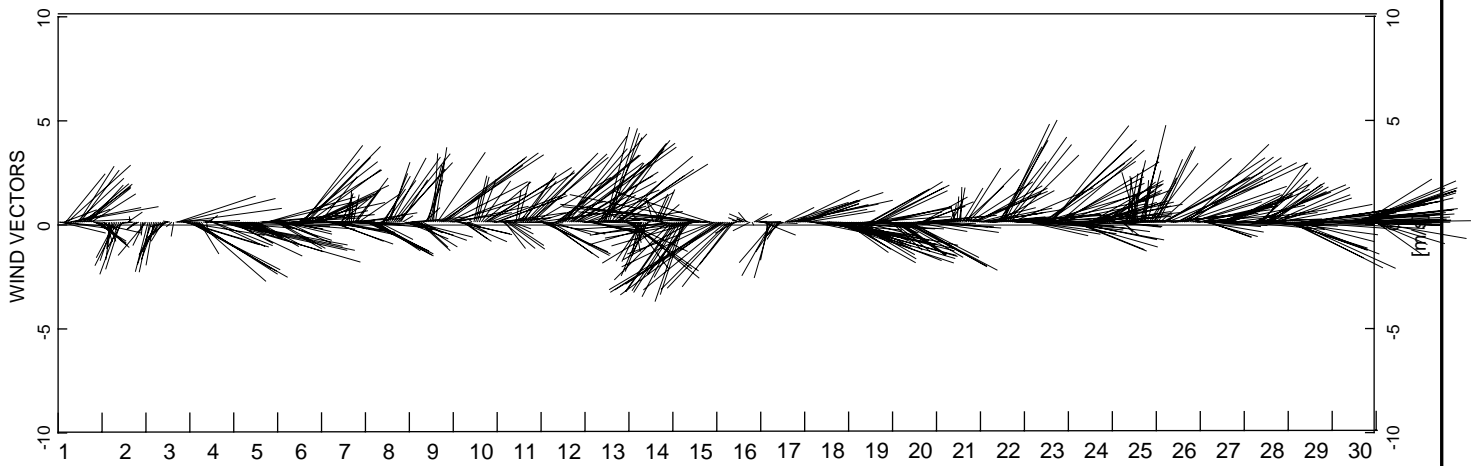
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DATE
November 2008

Figure B-11



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
June 2006**

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PROJECT NO.
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DWN
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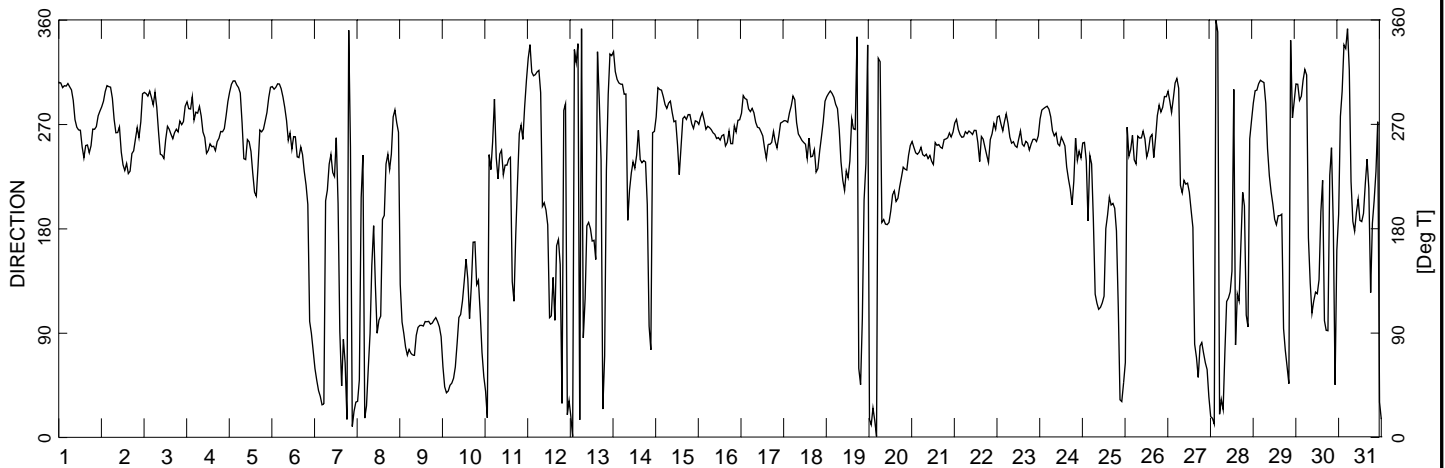
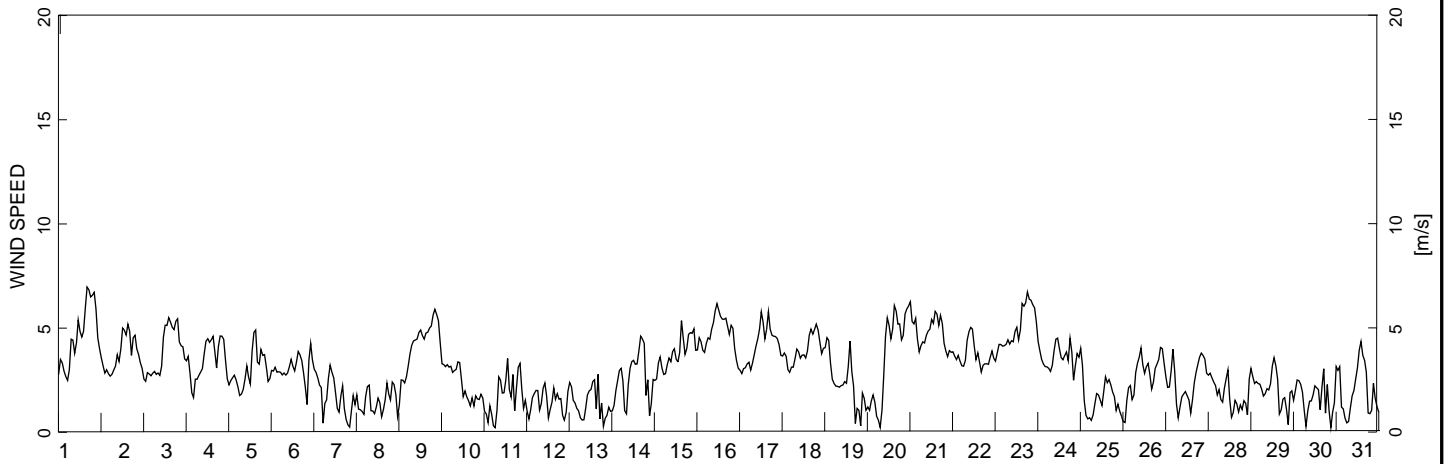
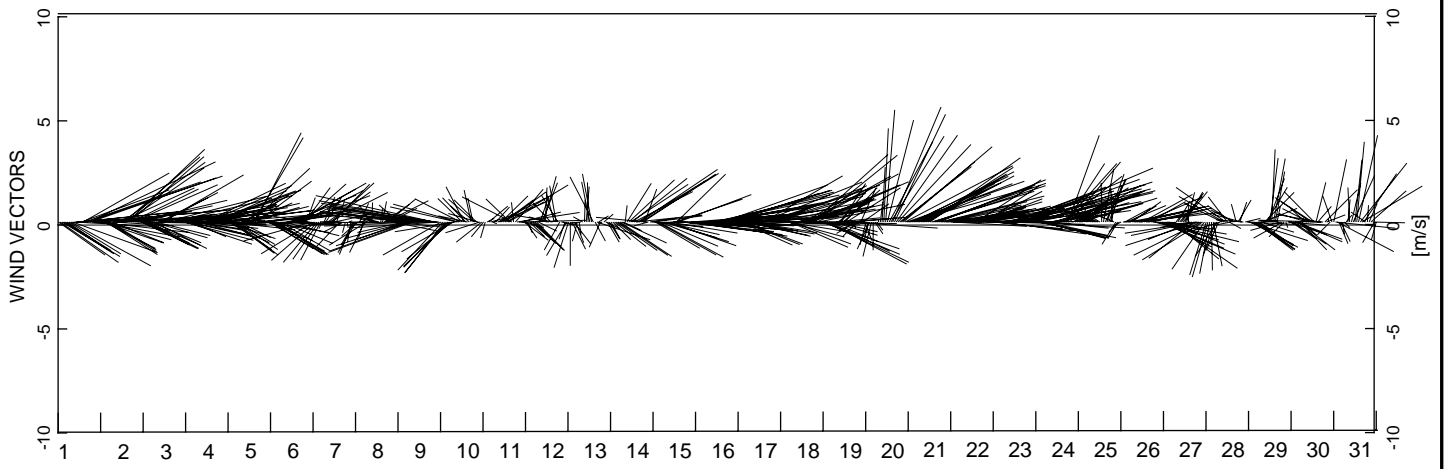
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DATE
November 2008

Figure B-12



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
July 2006**

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PROJECT NO.
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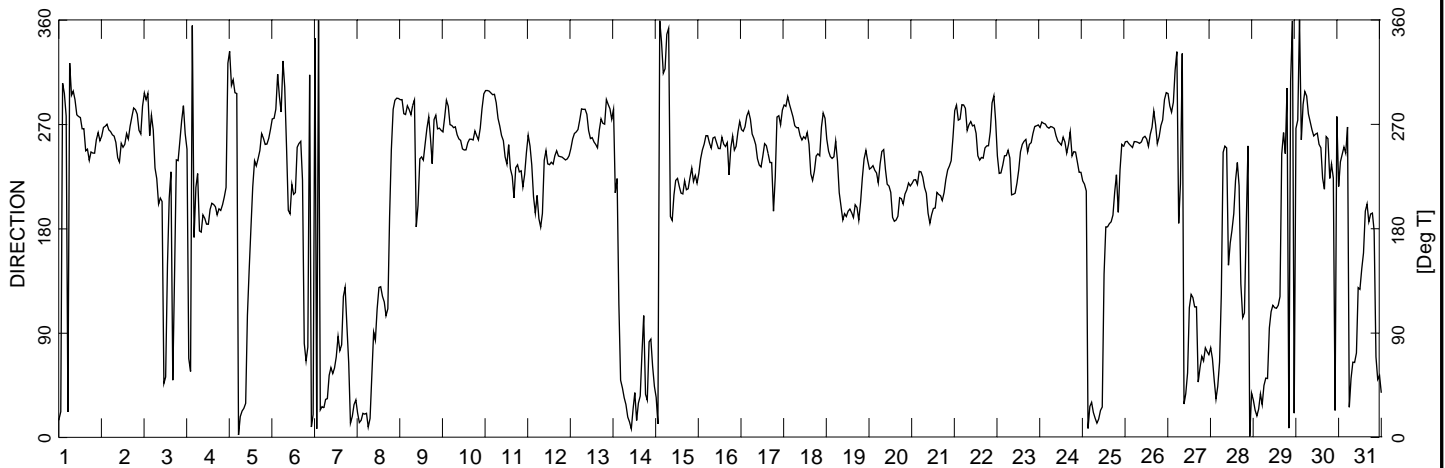
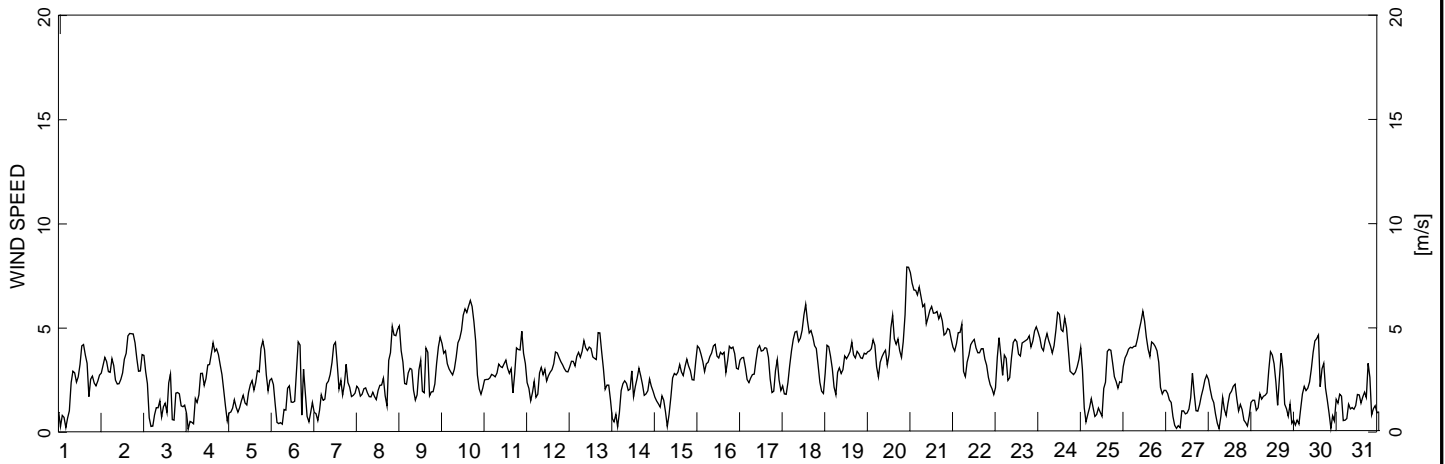
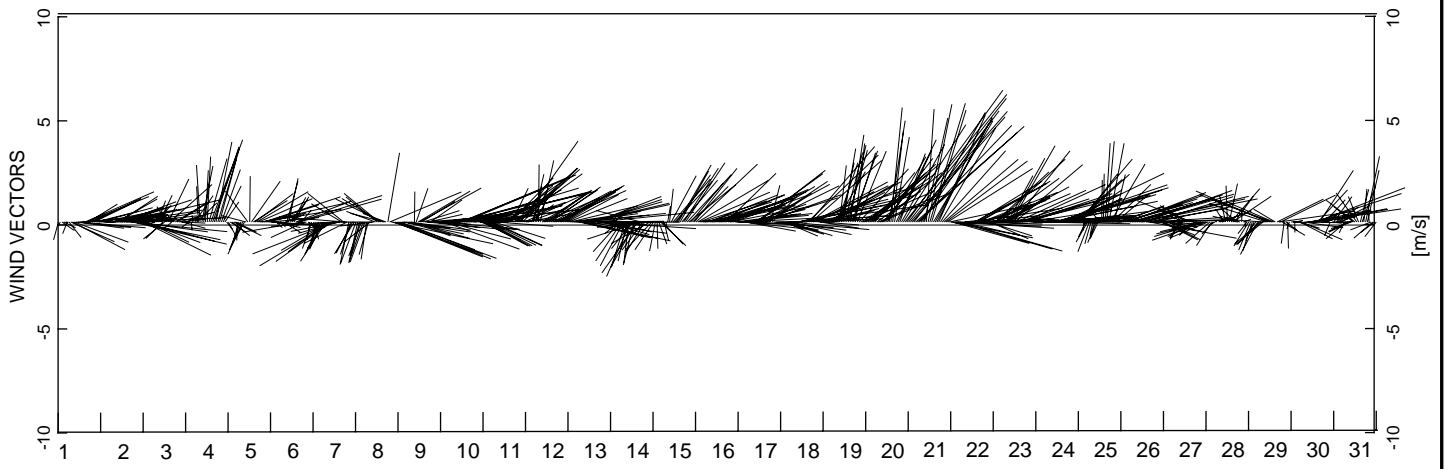
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DATE
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Figure B-13



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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
August 2006**

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PROJECT NO.
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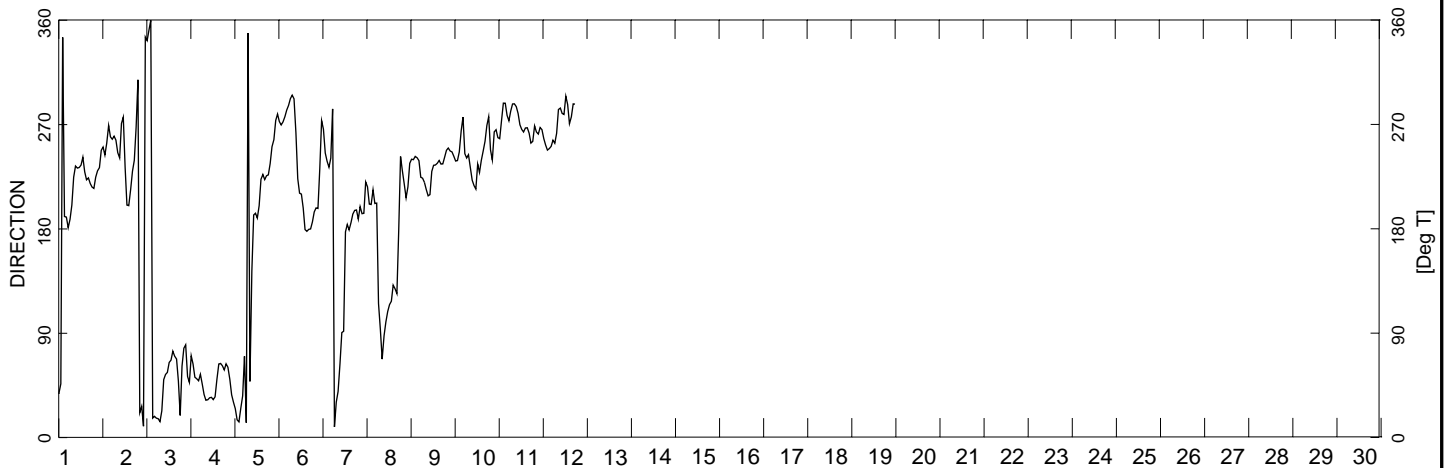
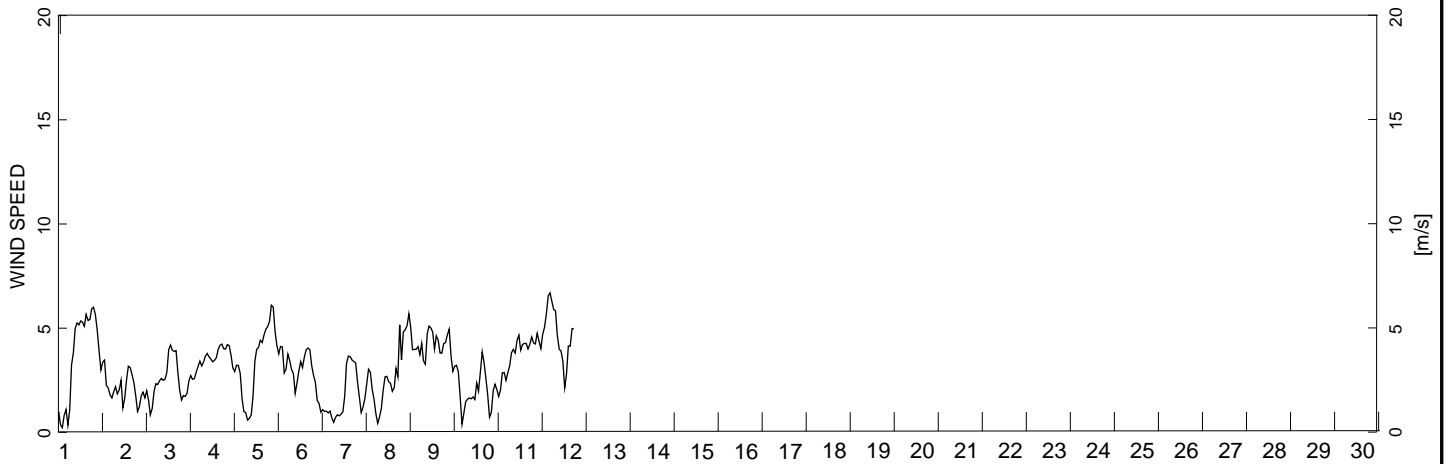
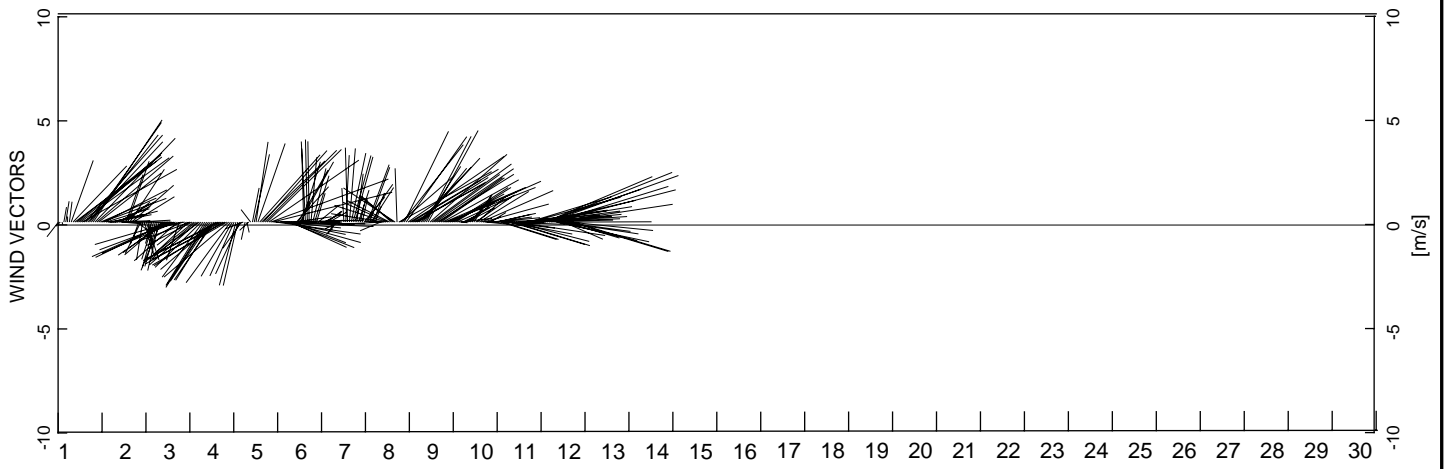
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DATE
November 2008

Figure B-14



NOTES

No data available from
September 13 to 30, 2006

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
September 2006**

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PROJECT NO.
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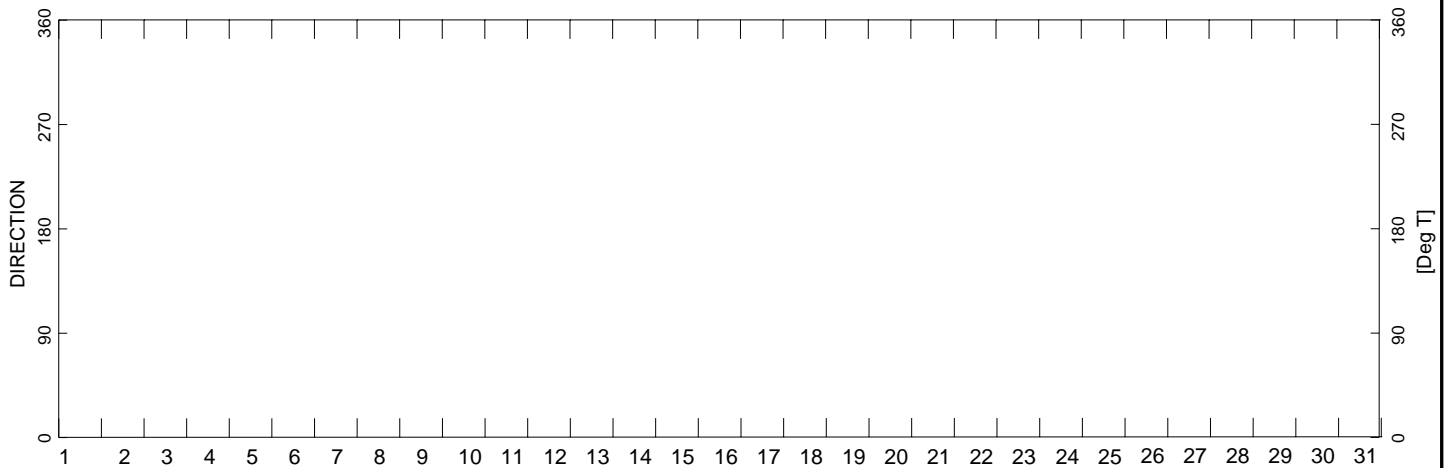
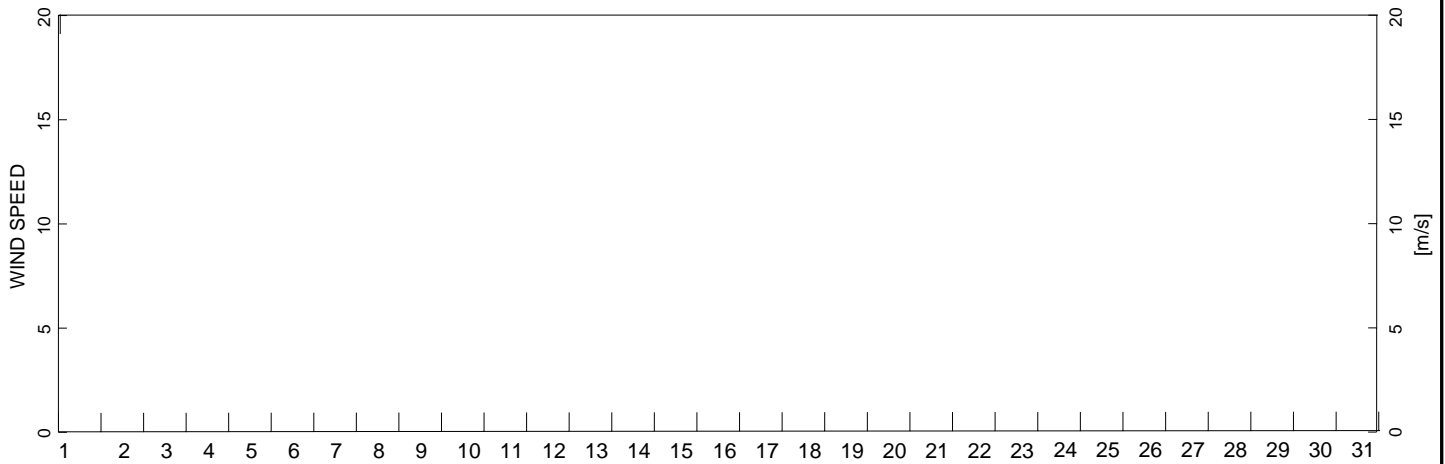
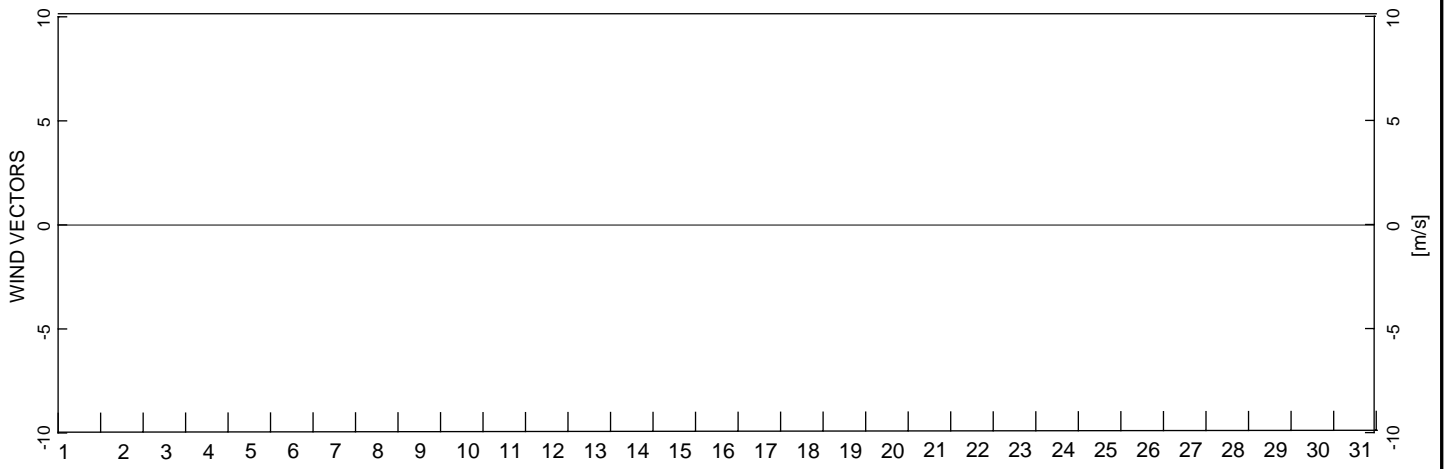
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DATE
November 2008

Figure B-15



NOTES

No data available from
October 1 to 31, 2006

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
October 2006**

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PROJECT NO.
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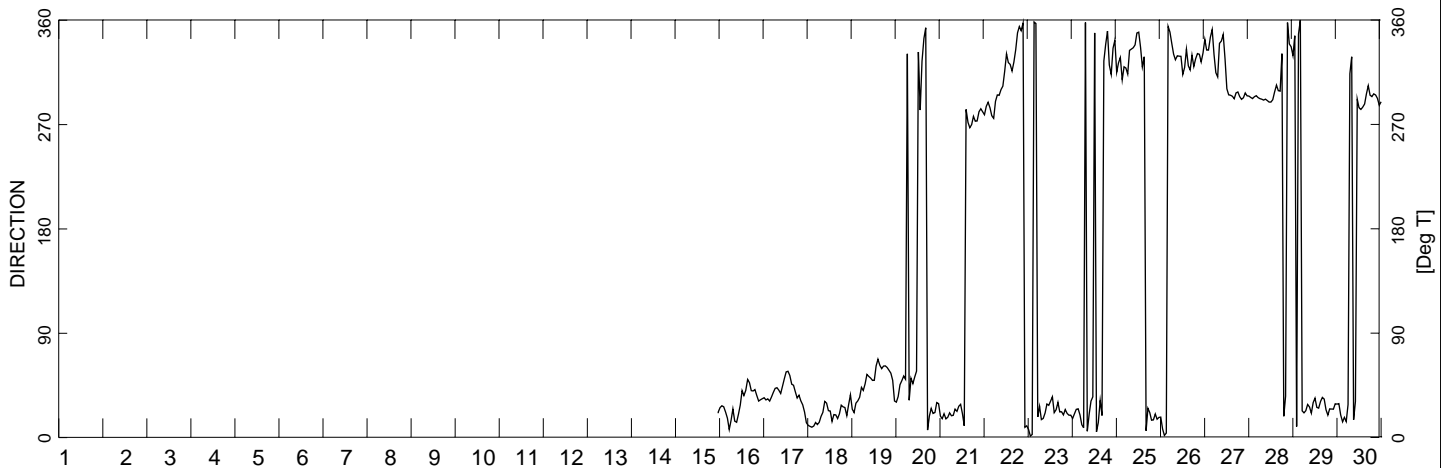
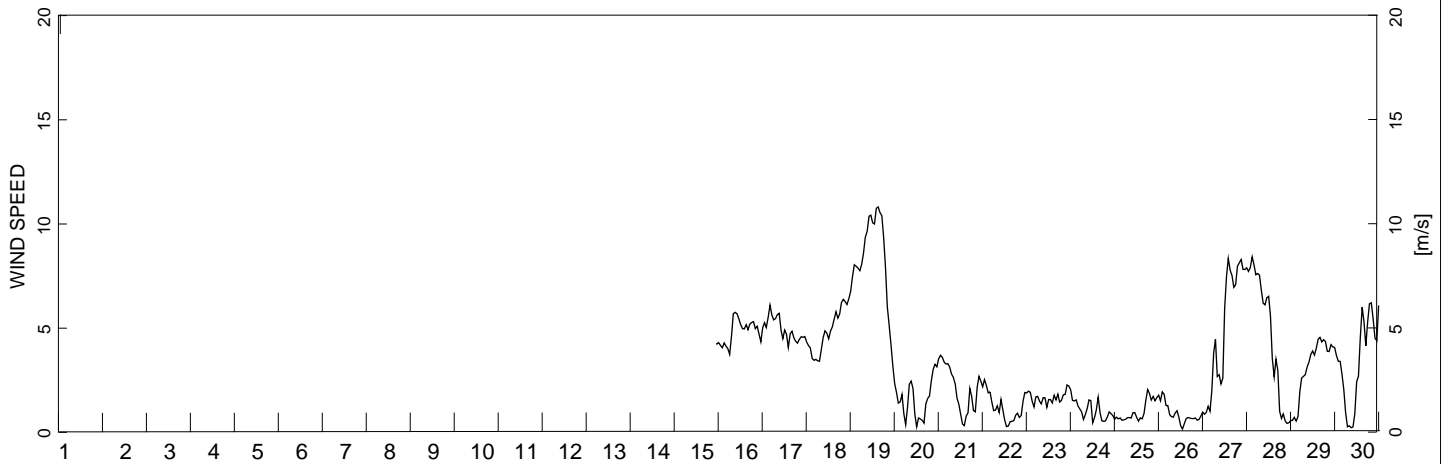
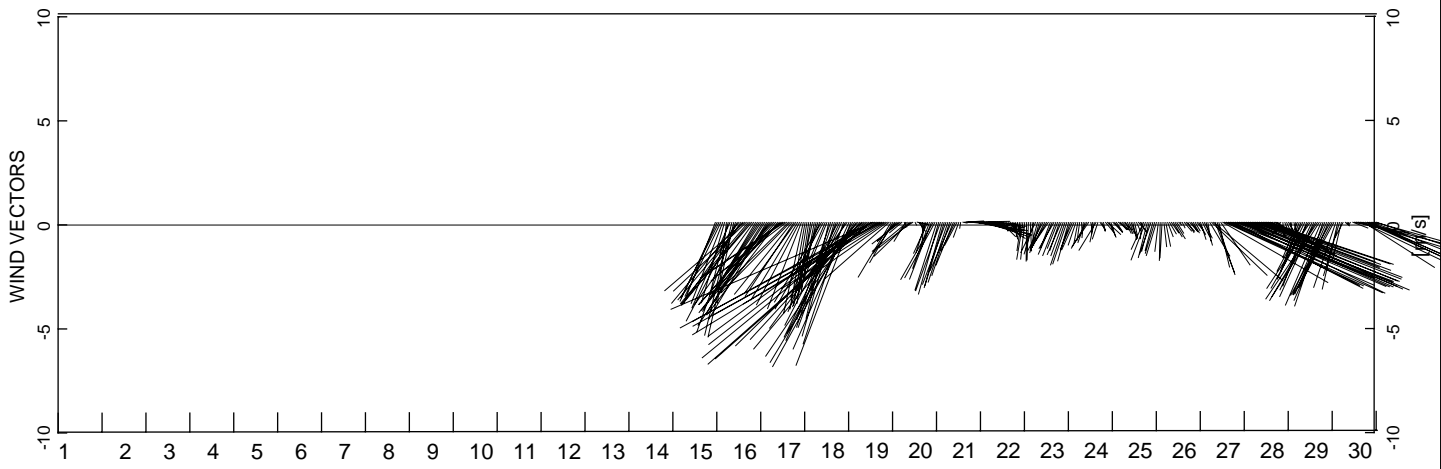
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DATE
November 2008

Figure B-16



NOTES

No data available from
November 1 to 15, 2006

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
November 2006**



PROJECT NO.
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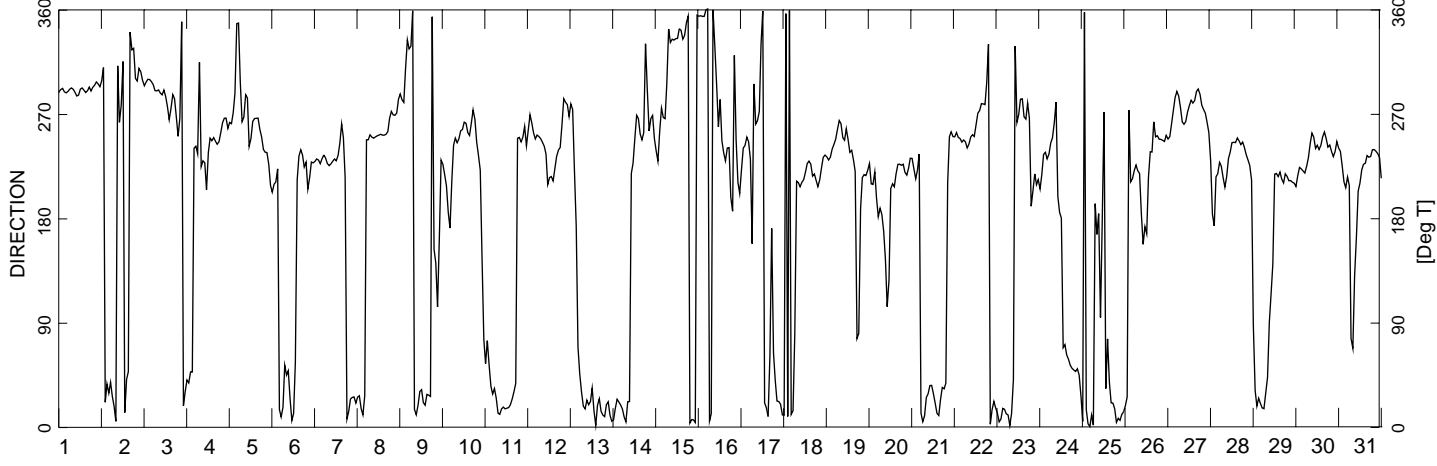
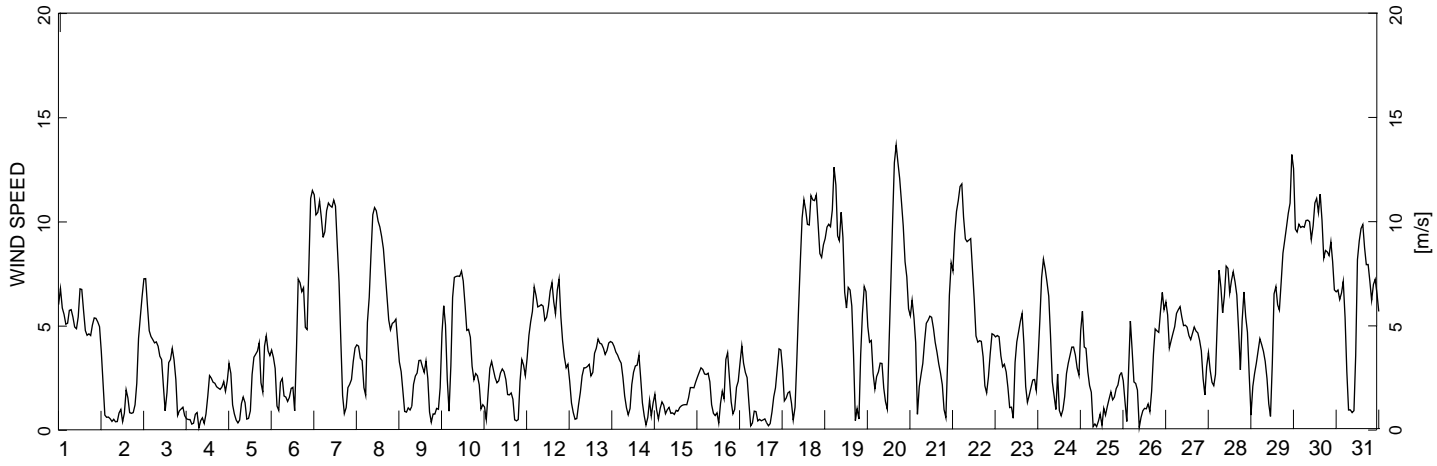
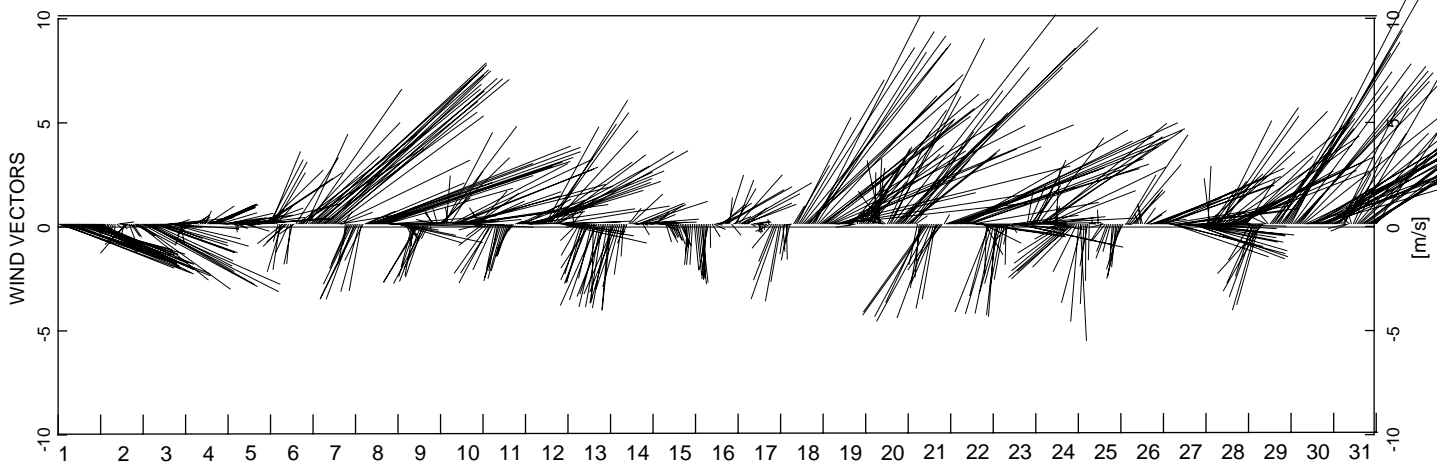
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DATE
November 2008

Figure B-17



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
December 2006**

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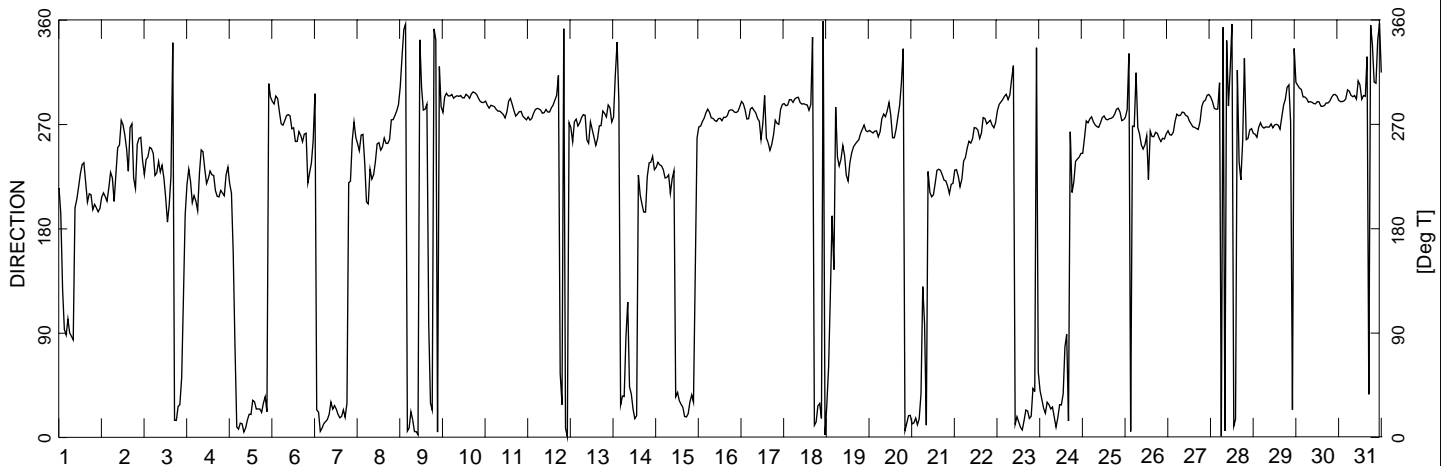
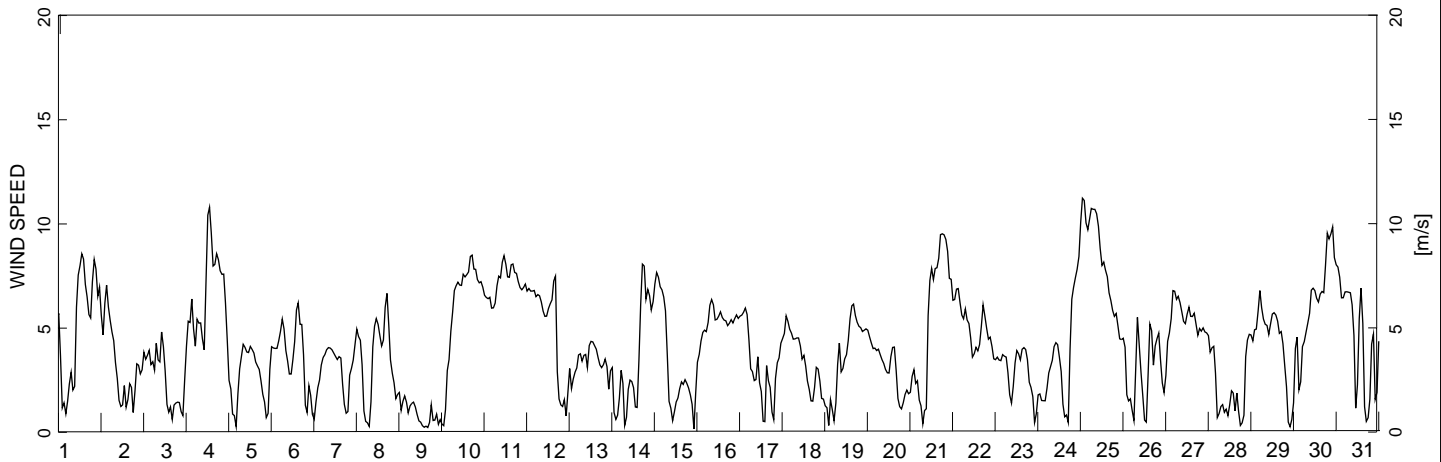
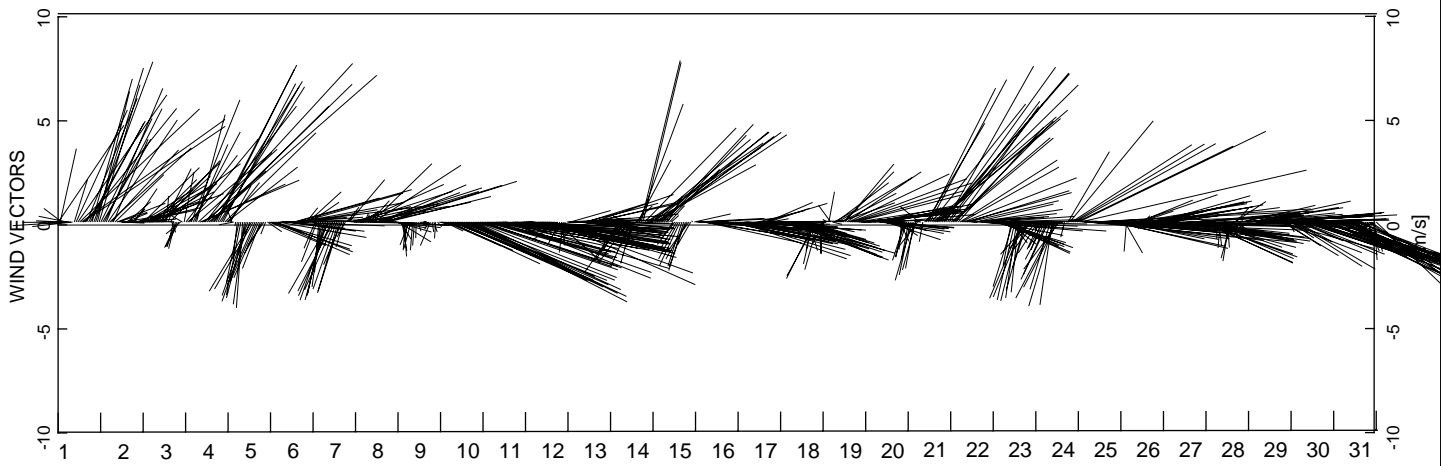
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DATE
November 2008

Figure B-18



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
January 2007**

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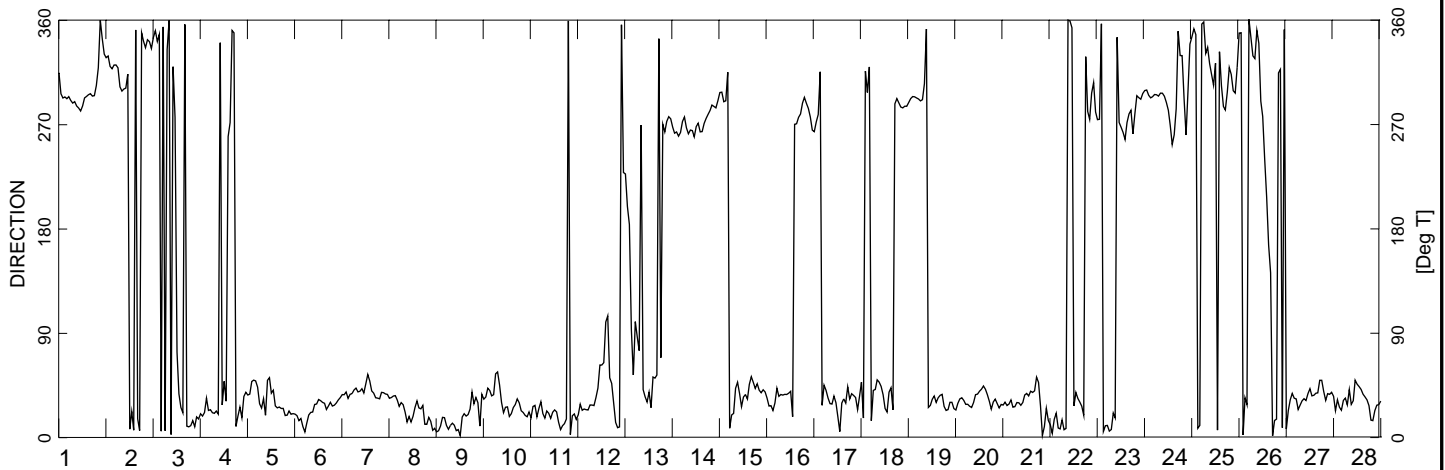
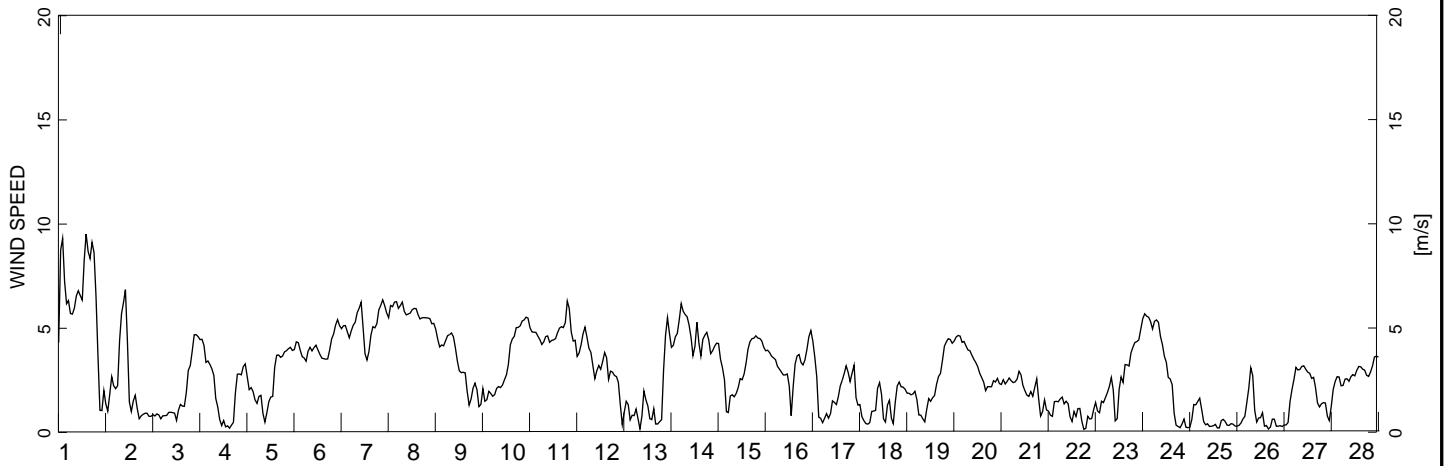
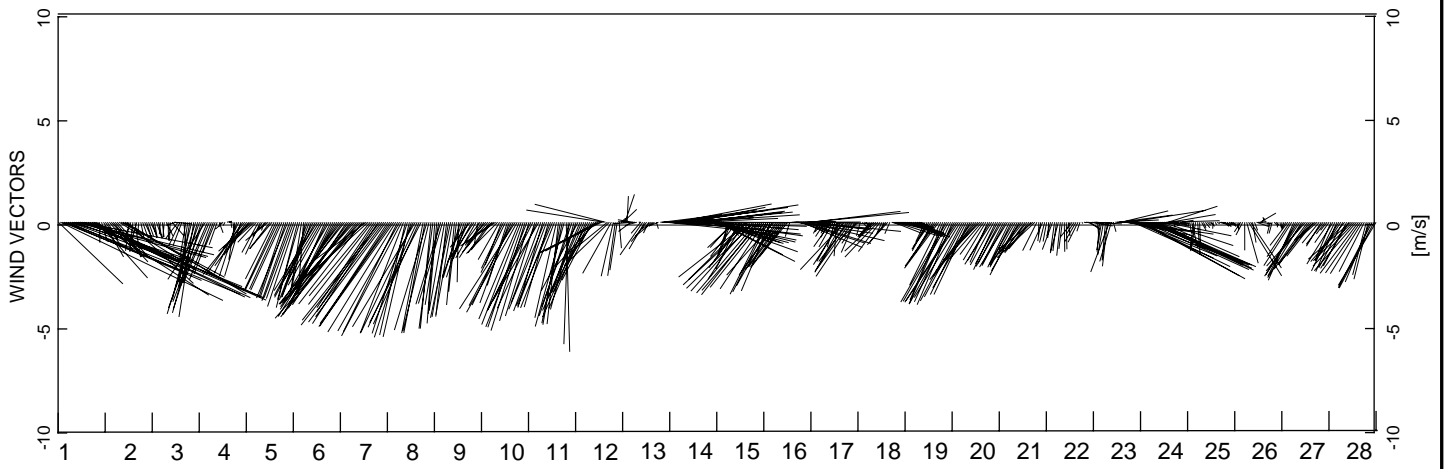
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EBA-VANC

DATE
November 2008

Figure B-19



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
February 2007**

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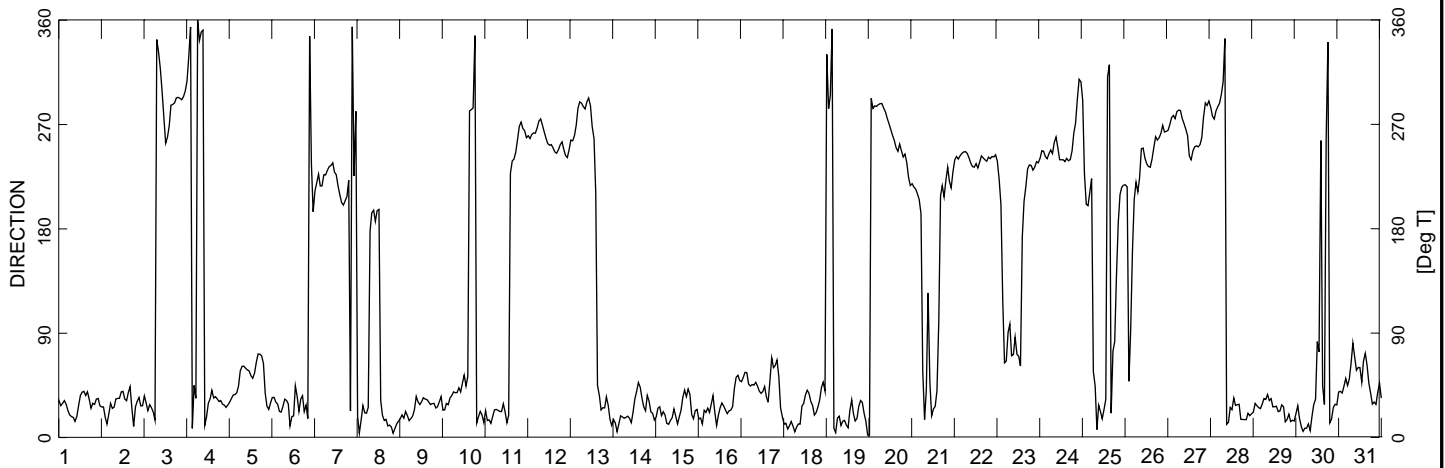
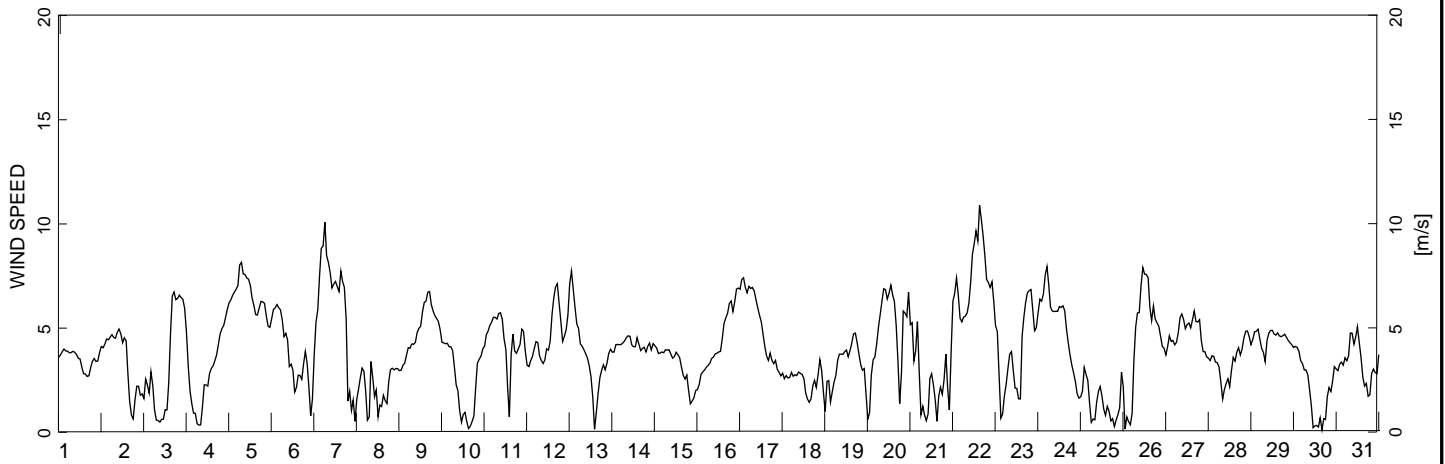
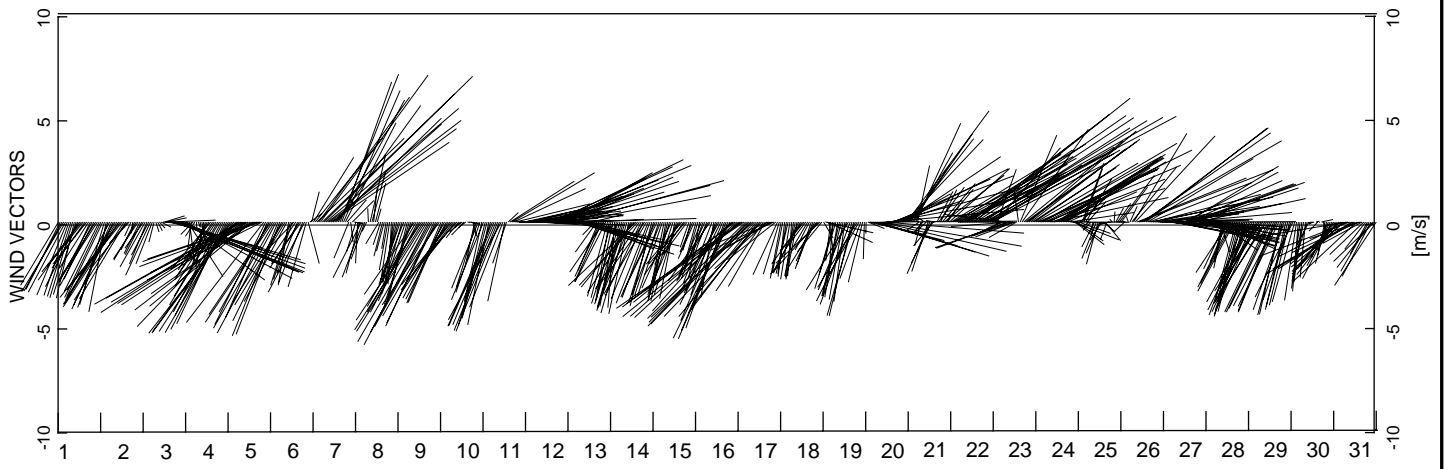
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DATE
November 2008

Figure B-20



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
March 2007**

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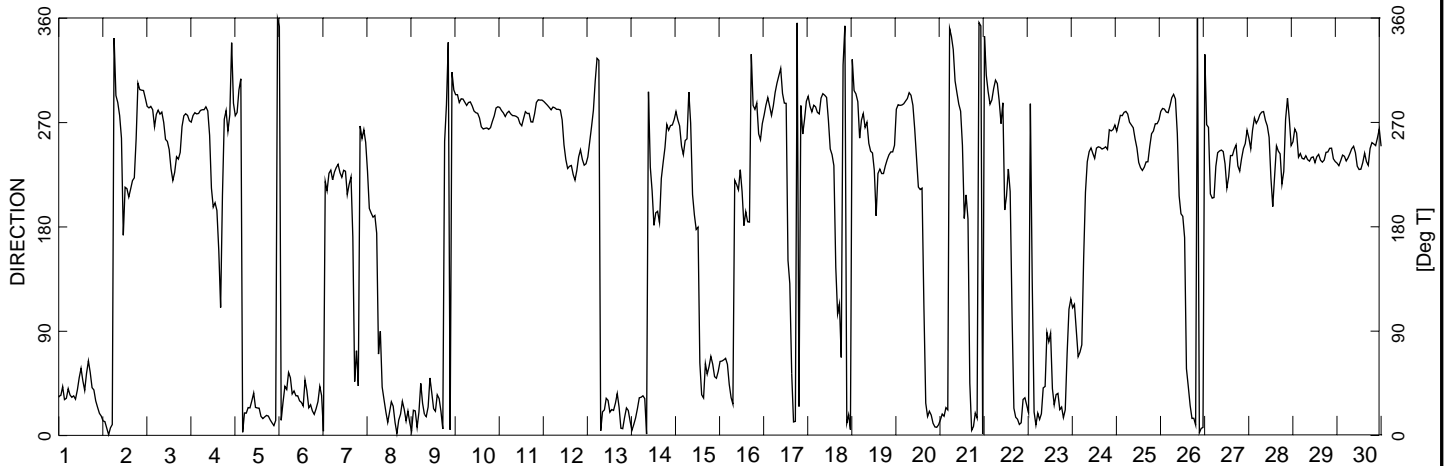
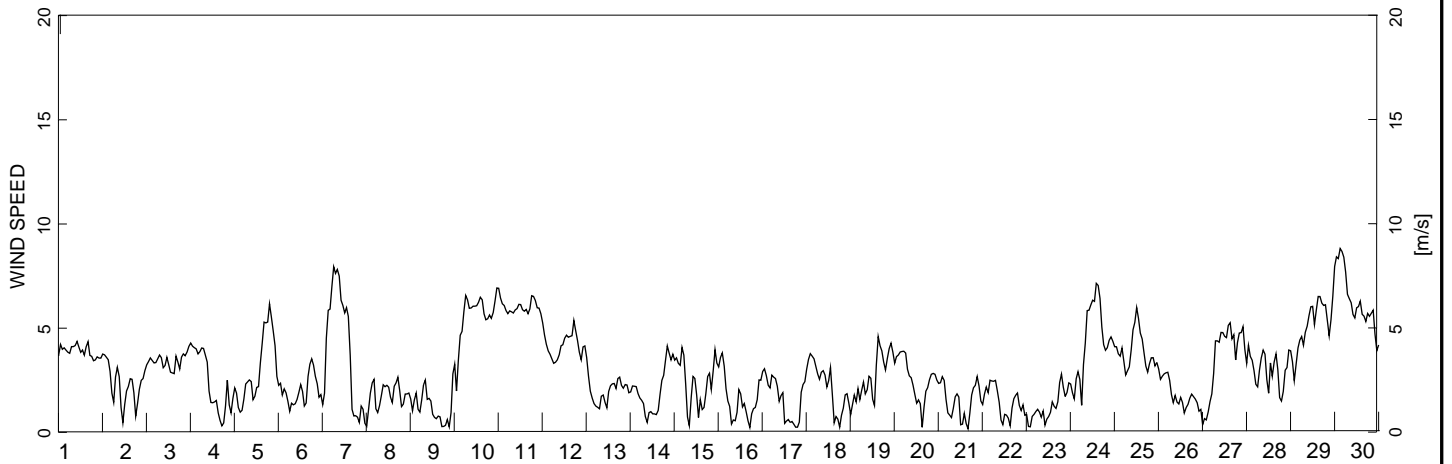
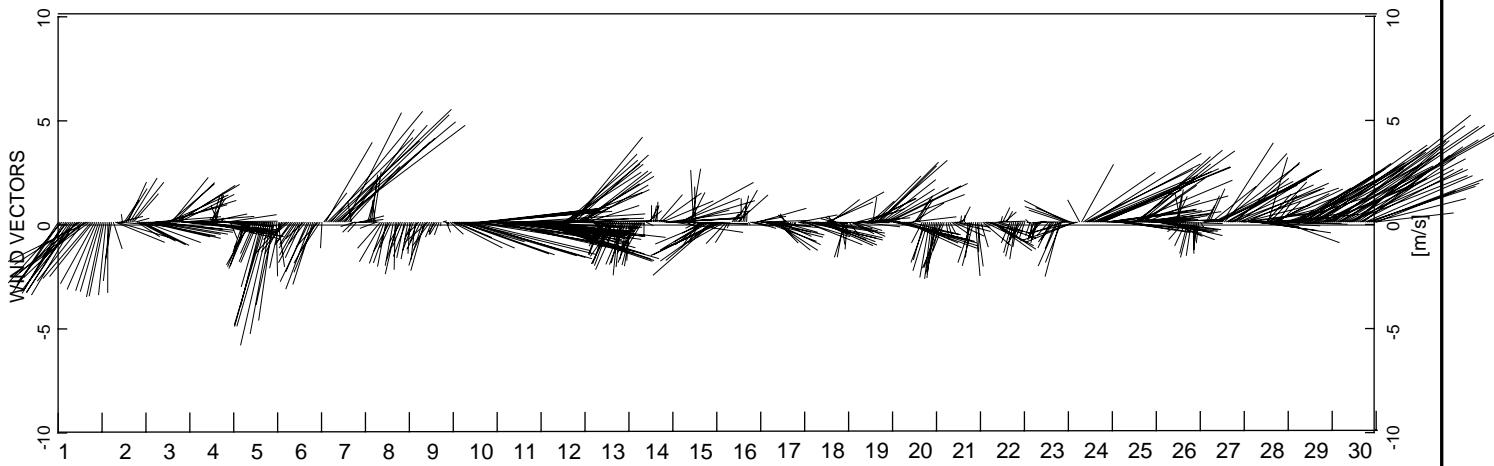
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OFFICE
EBA-VANC

DATE
November 2008

Figure B-21



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
April 2007**

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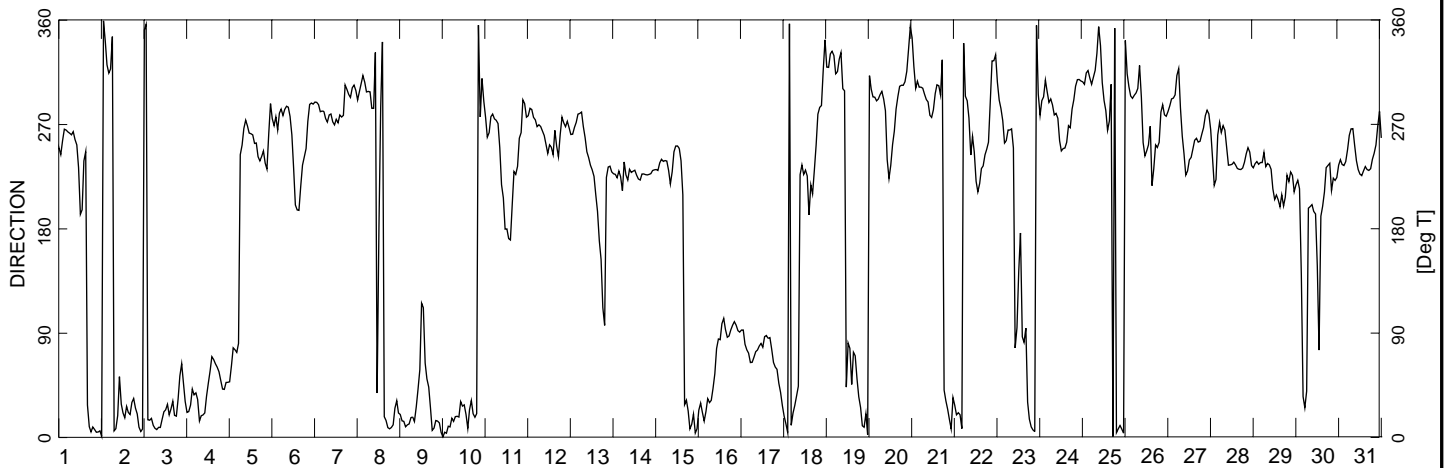
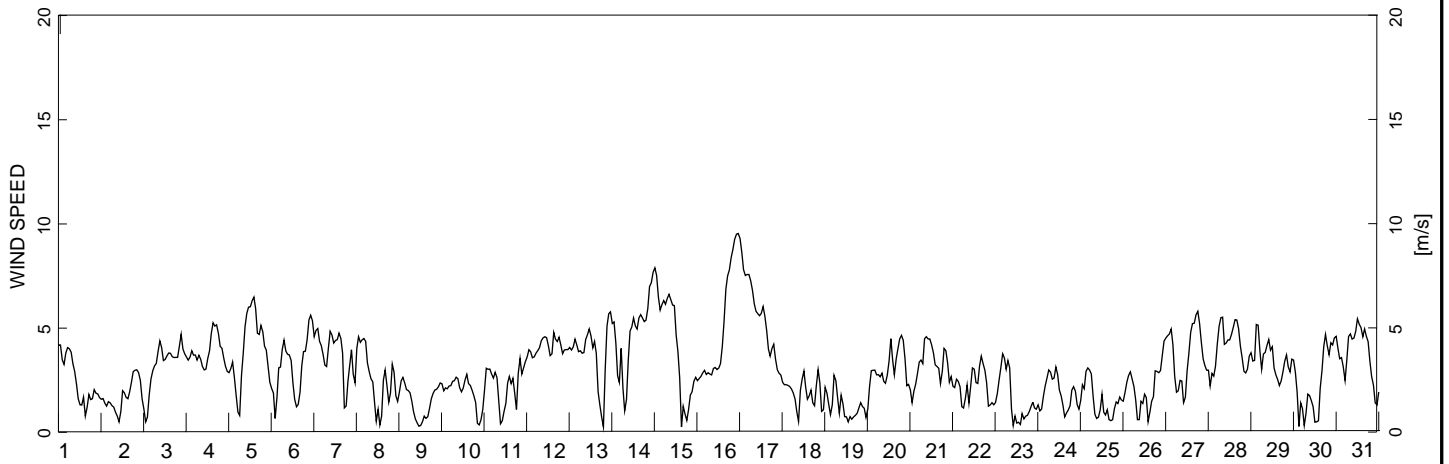
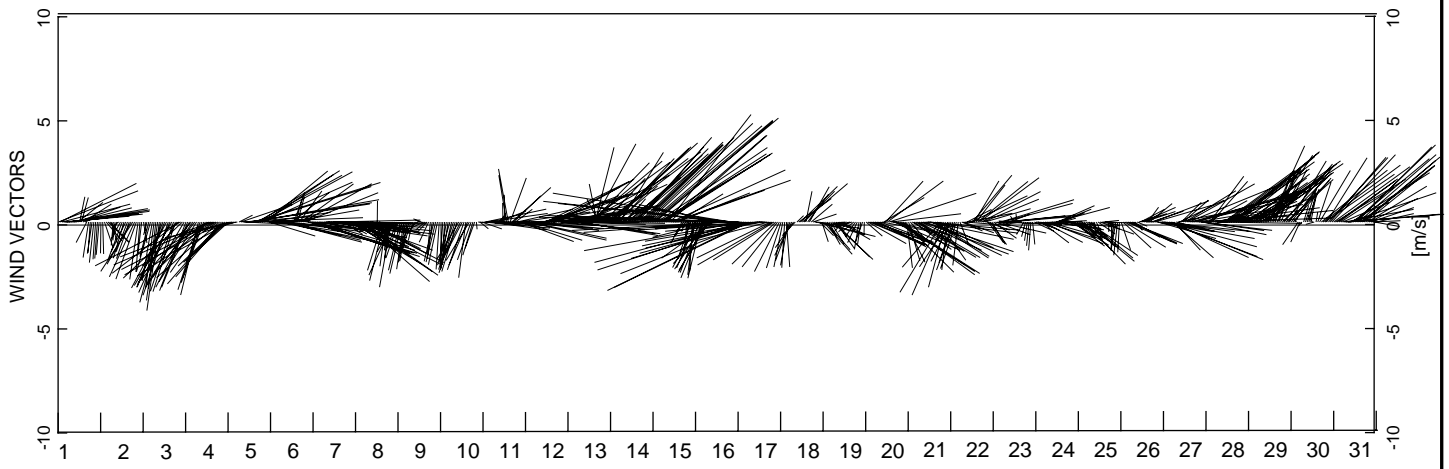
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DATE
November 2008

Figure B-22



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2008 HYDROMETEOROLOGICAL SURVEY**

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Wind Data
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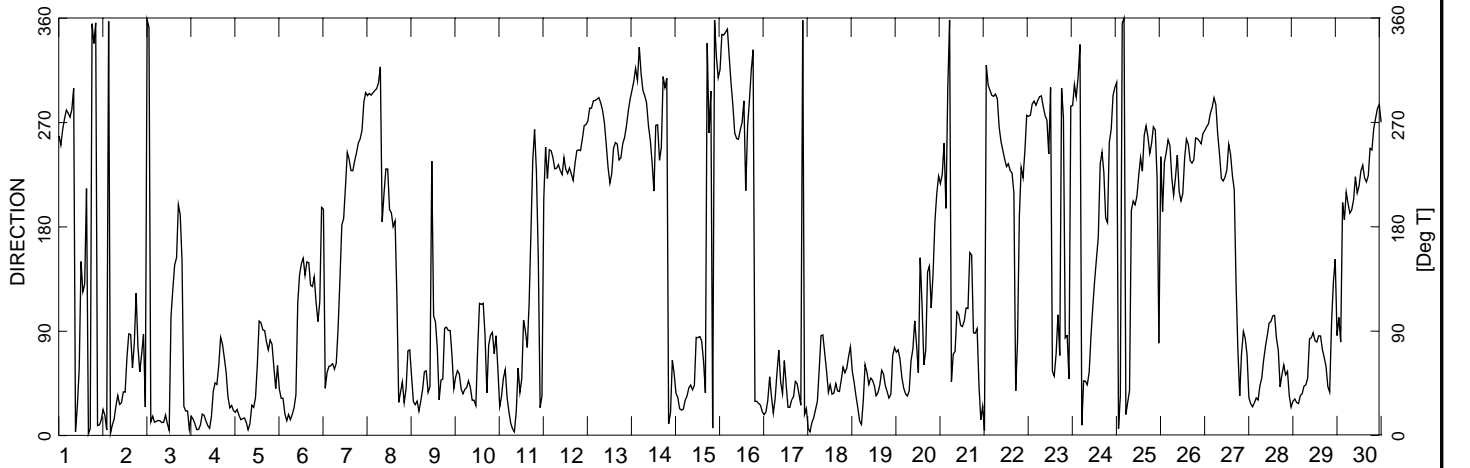
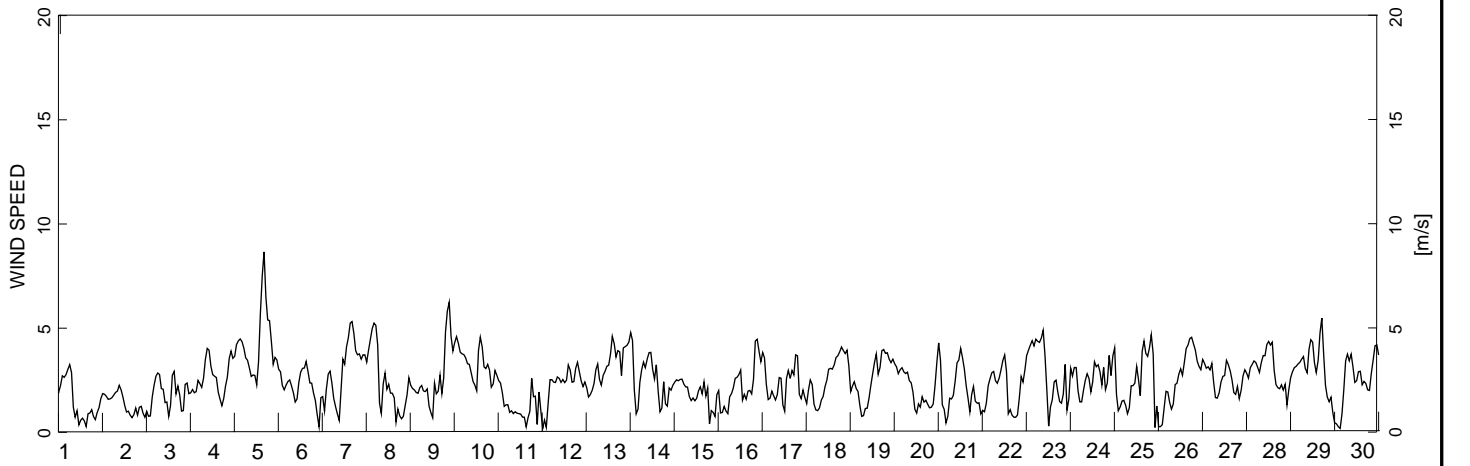
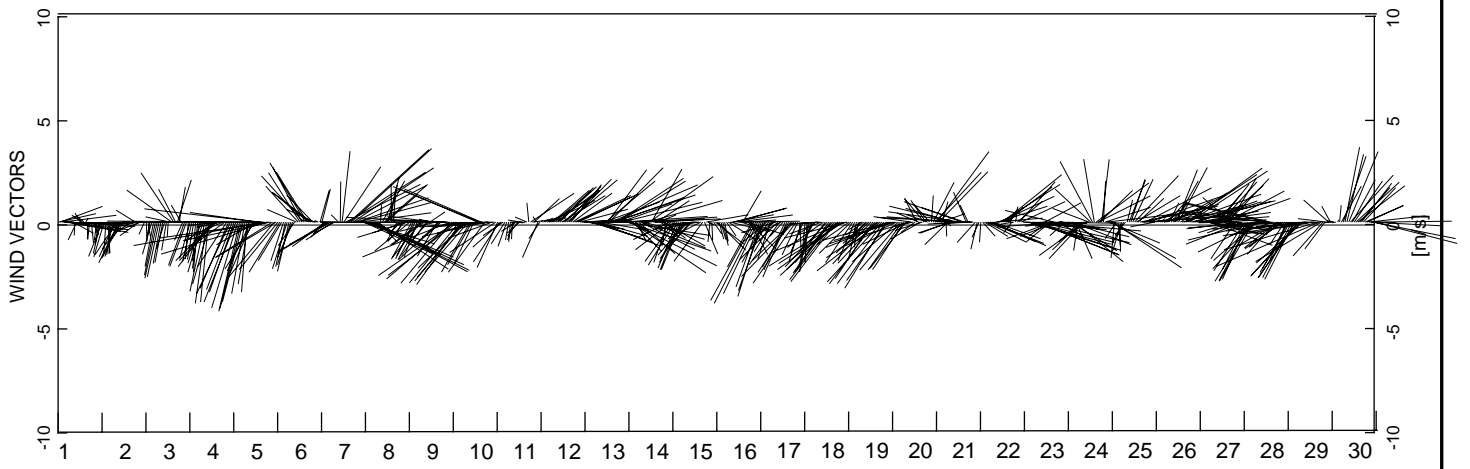
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DATE
November 2008

Figure B-23



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2008 HYDROMETEOROLOGICAL SURVEY**

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Wind Data
June 2007**

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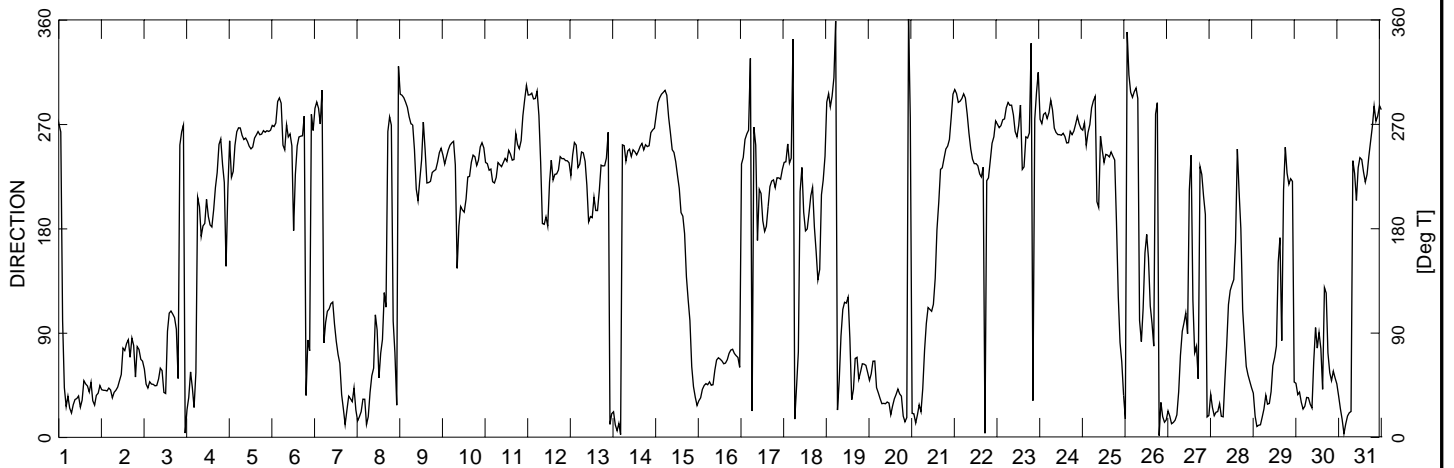
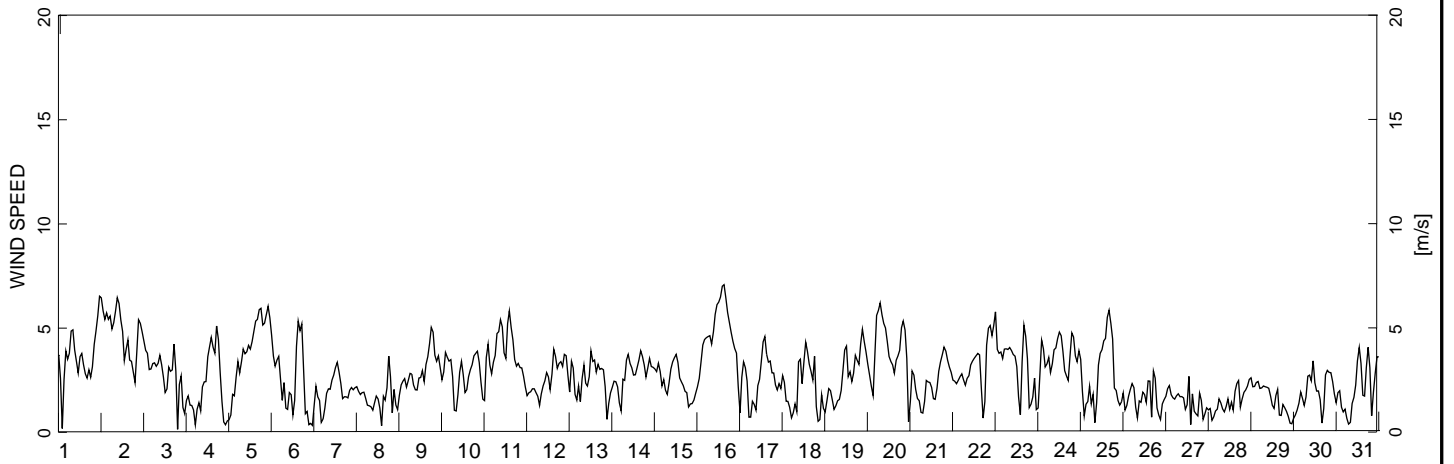
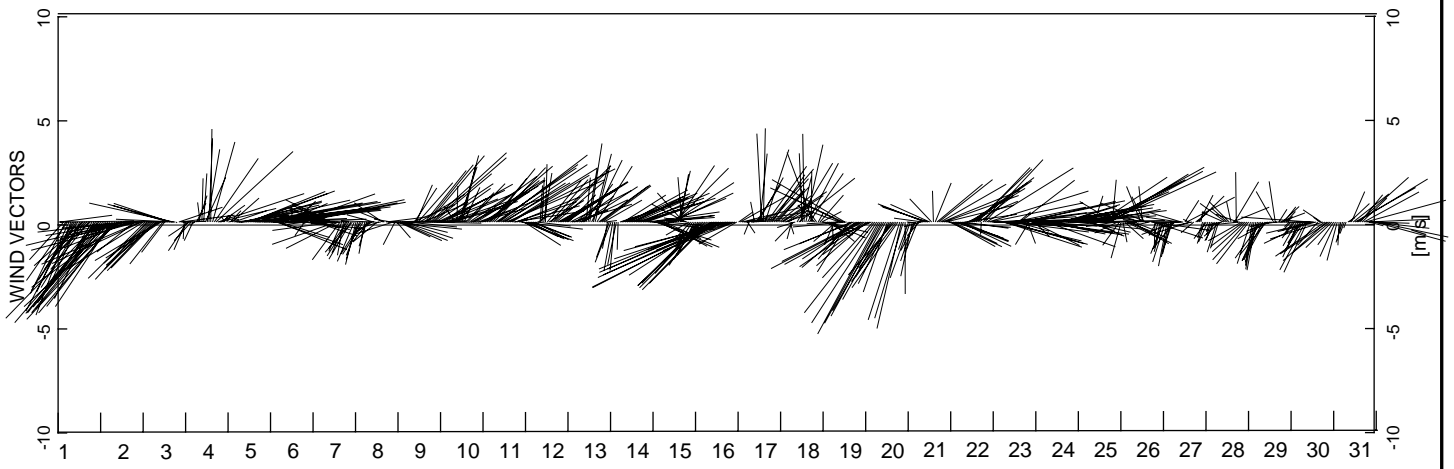
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Figure B-24



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

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Wind Data
July 2007**

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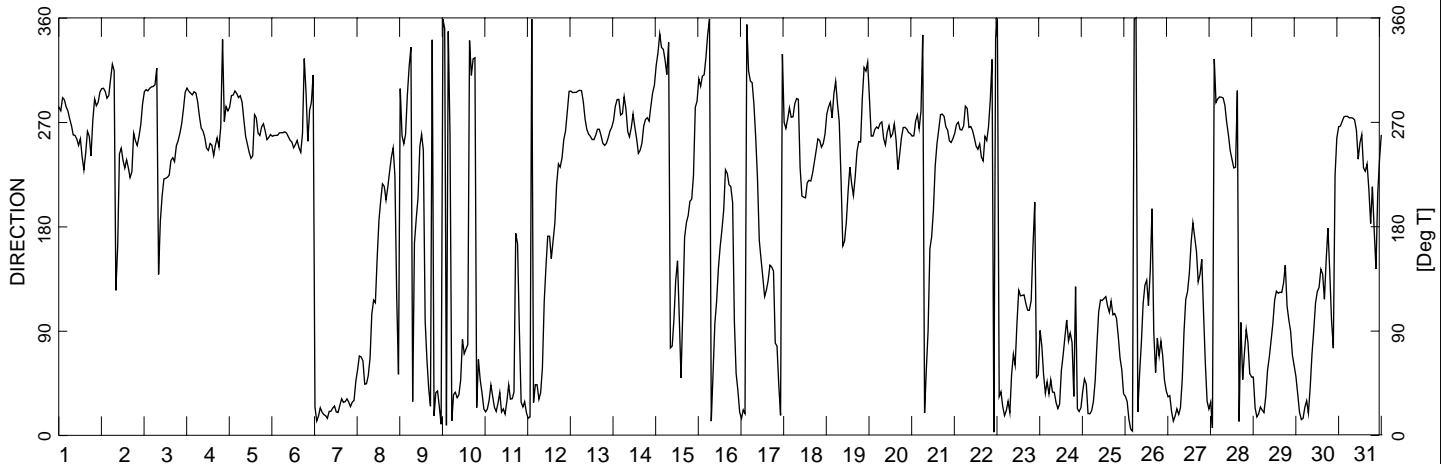
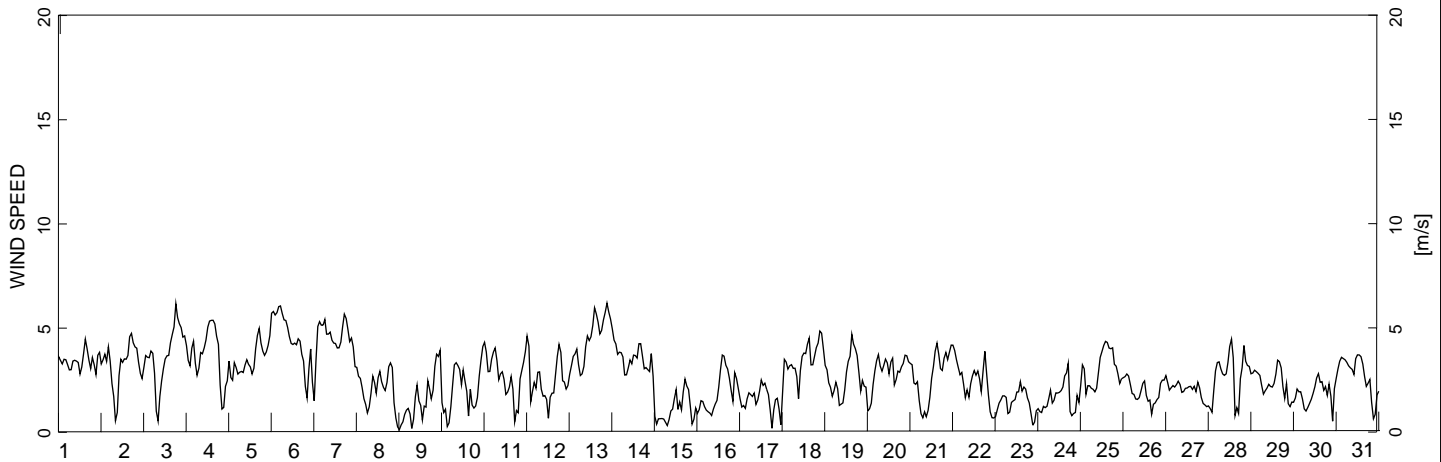
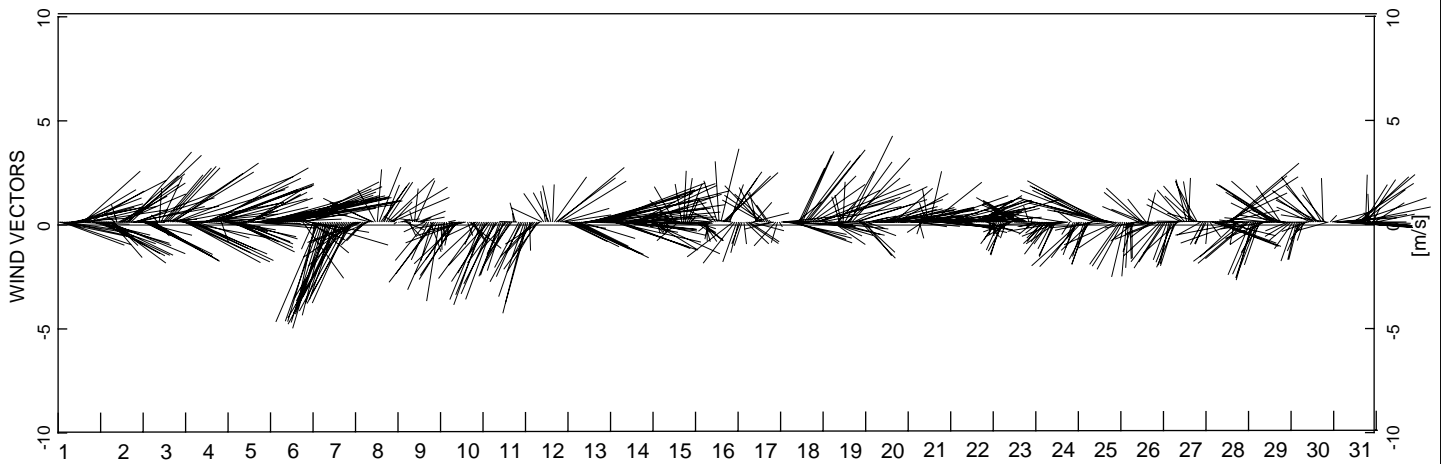
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DATE
November 2008

Figure B-25



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
August 2007**

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Consultants Ltd.**



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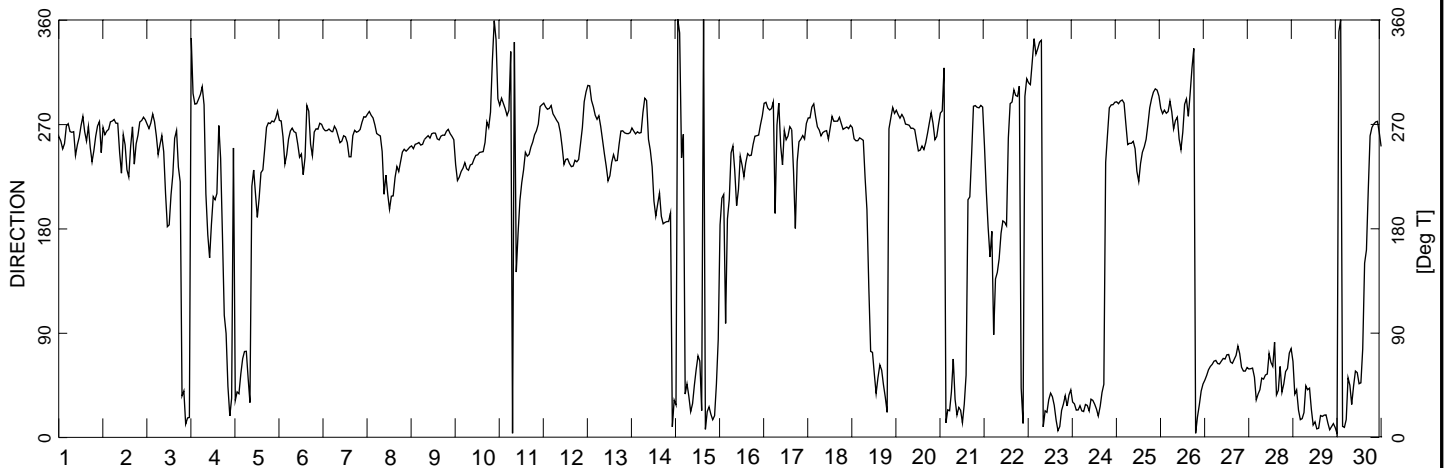
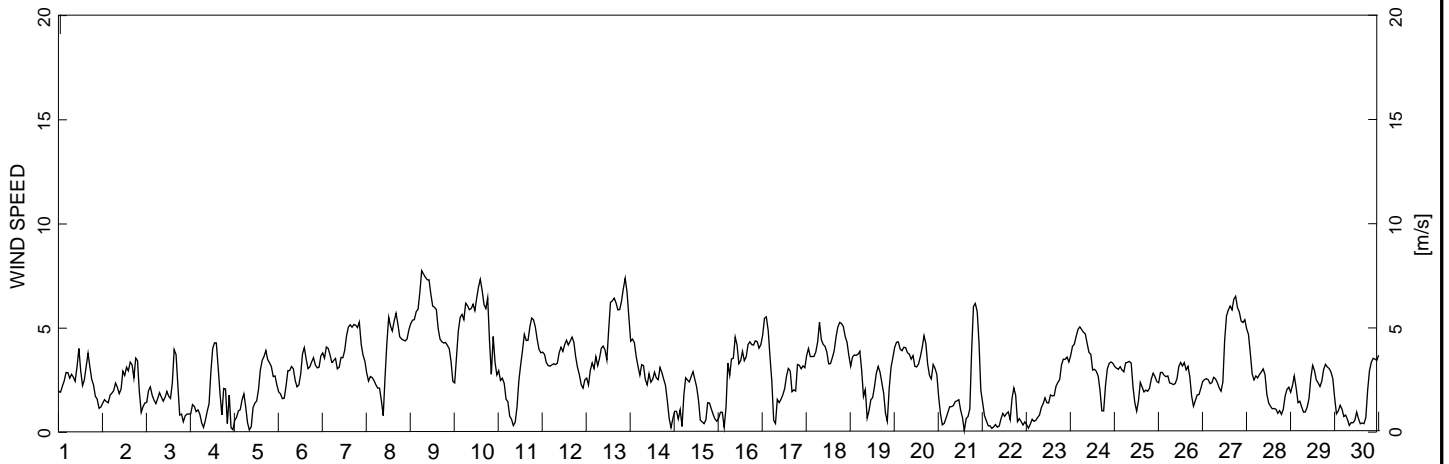
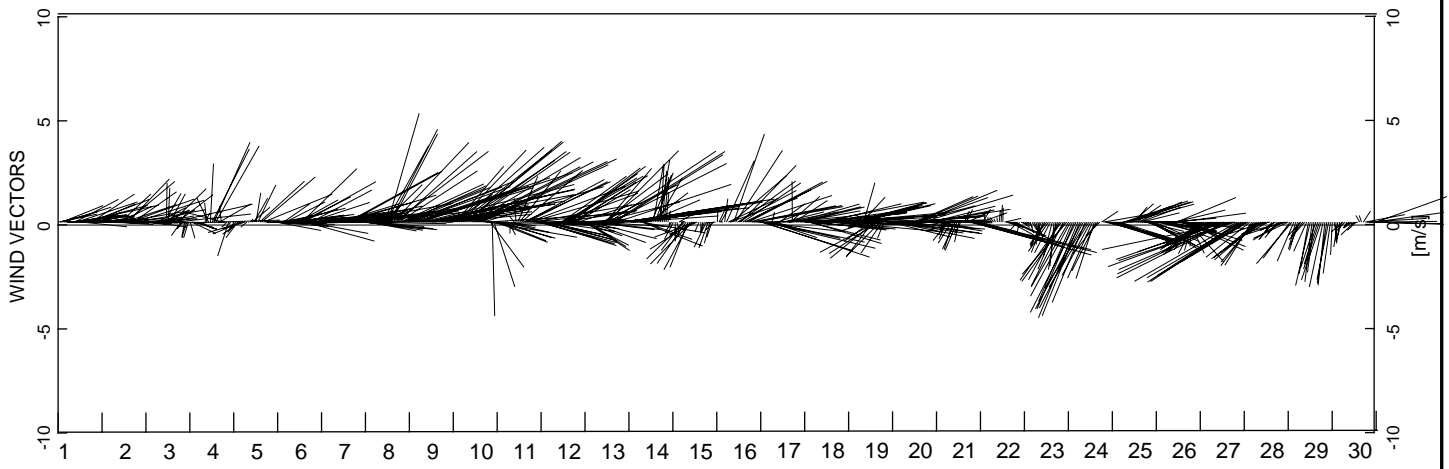
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DATE
November 2008

Figure B-26



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
September 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
RED

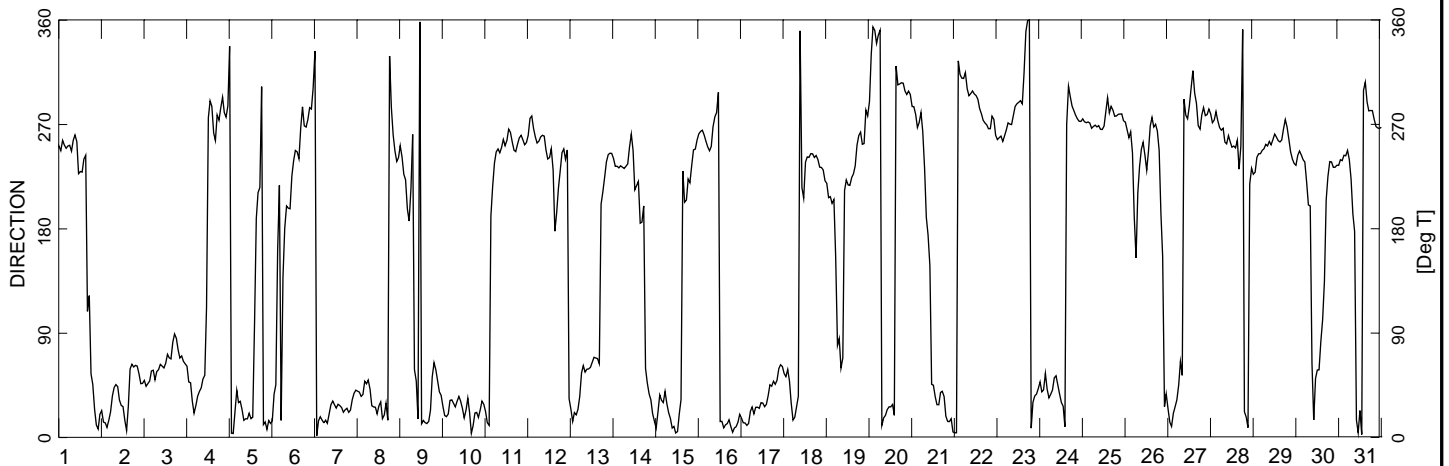
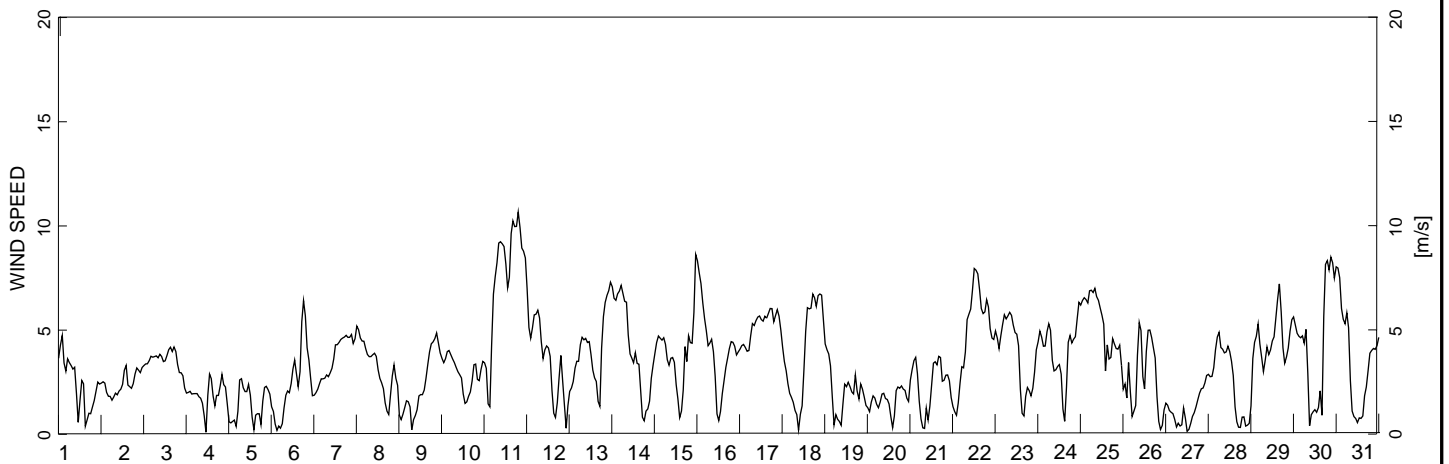
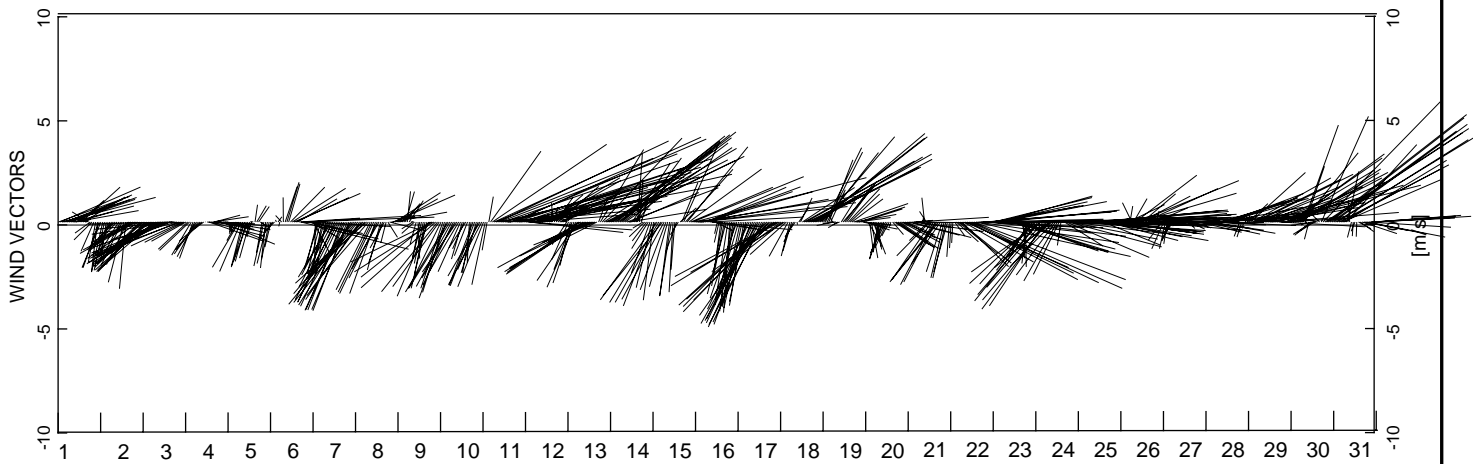
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OFFICE
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DATE
November 2008

Figure B-27



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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
October 2007**

**EBA Engineering
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DWN
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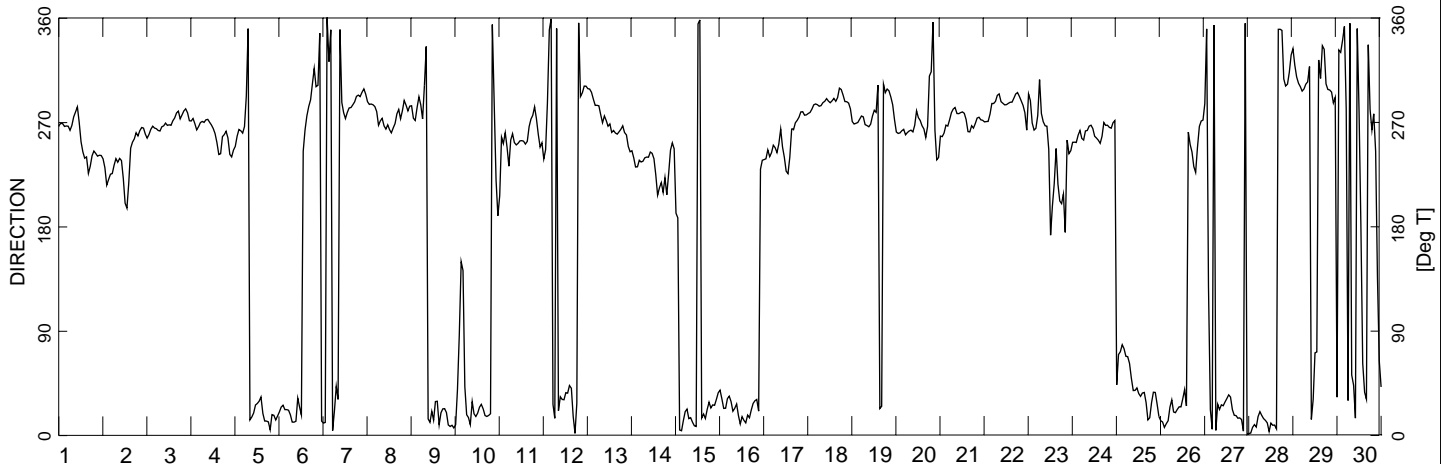
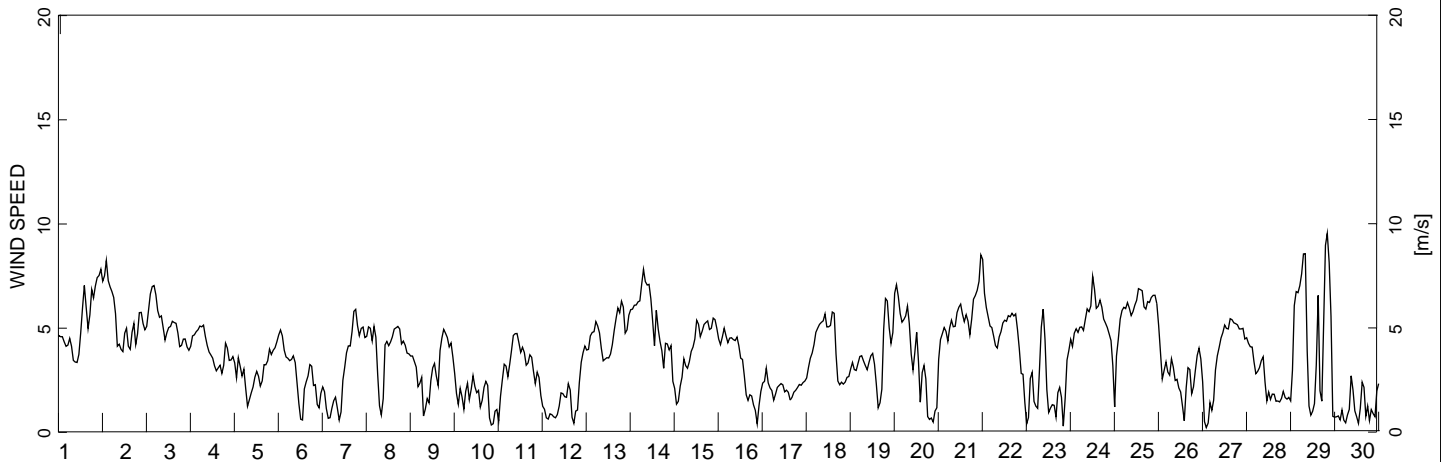
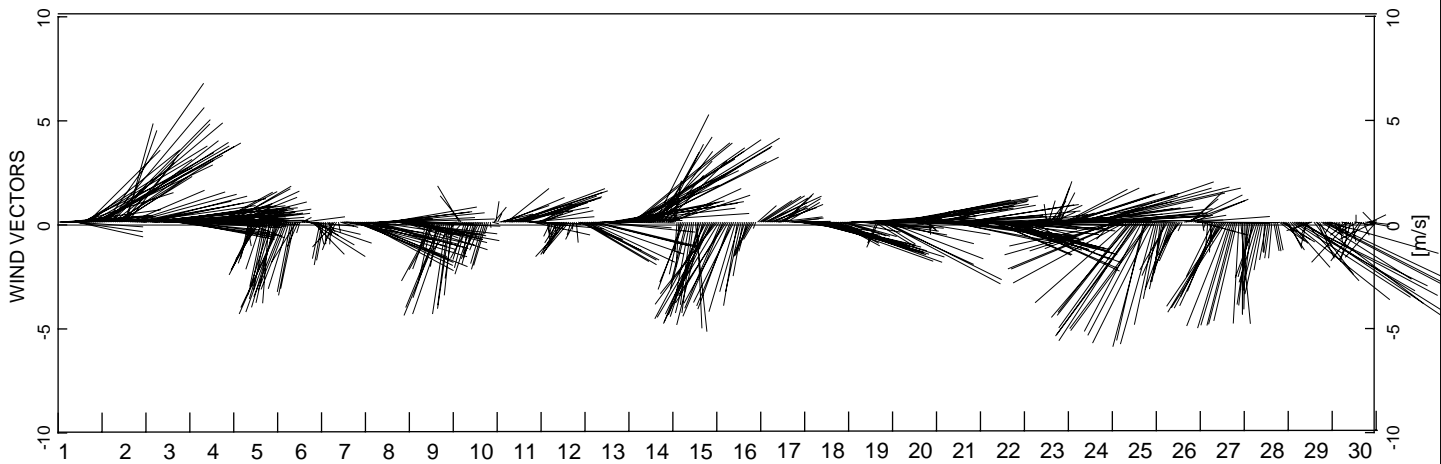
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November 2008

Figure B-28



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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
November 2007**

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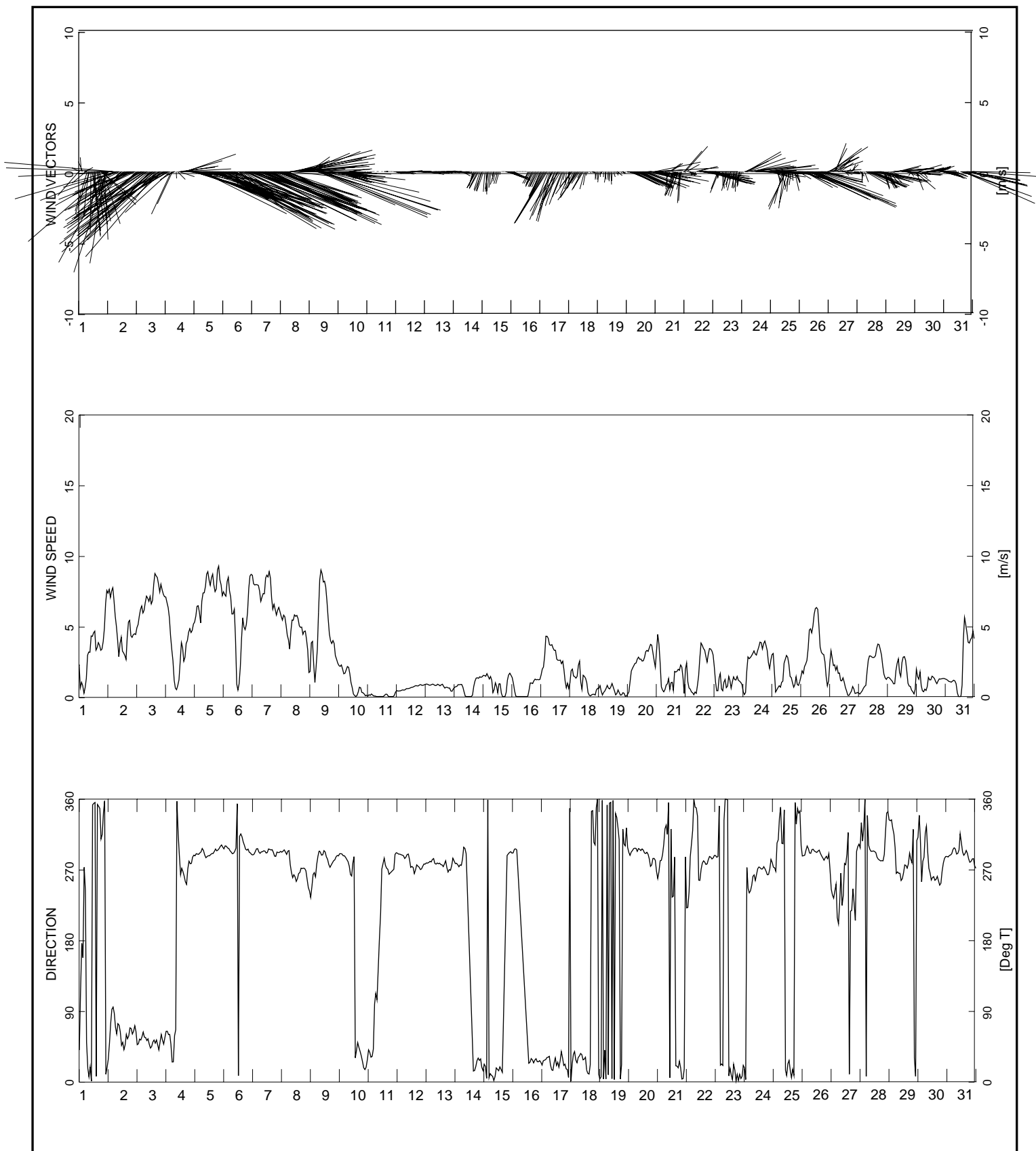
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Figure B-29



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
December 2007**

**EBA Engineering
Consultants Ltd.**



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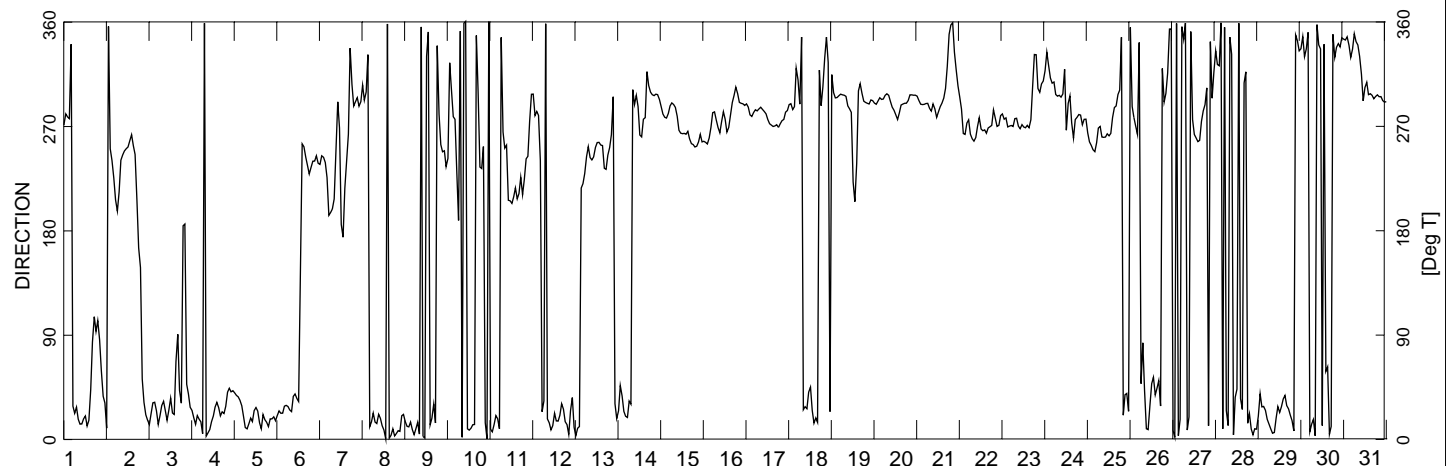
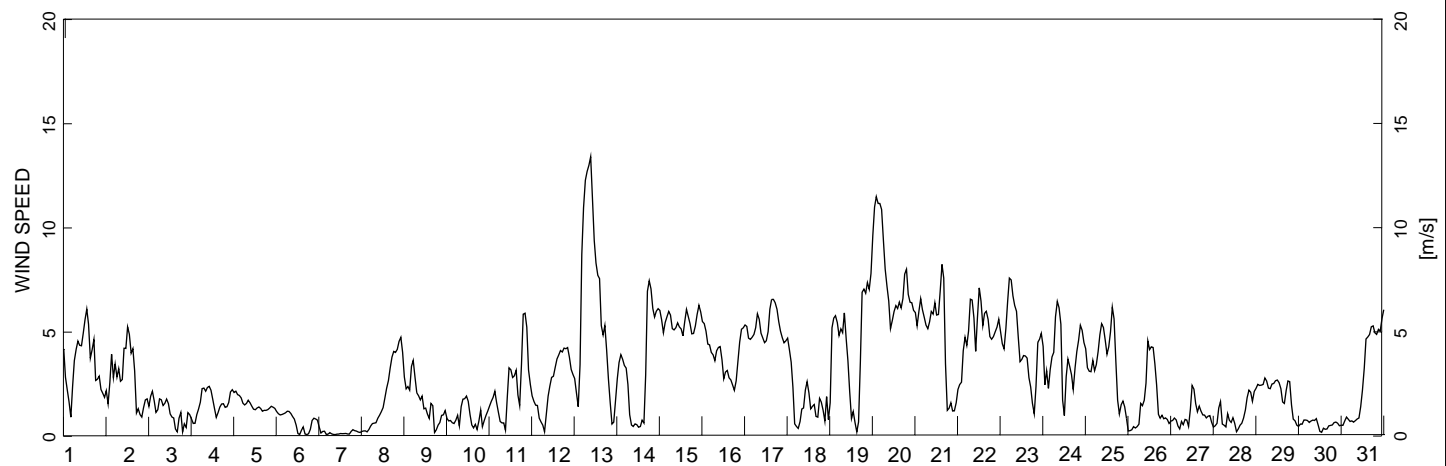
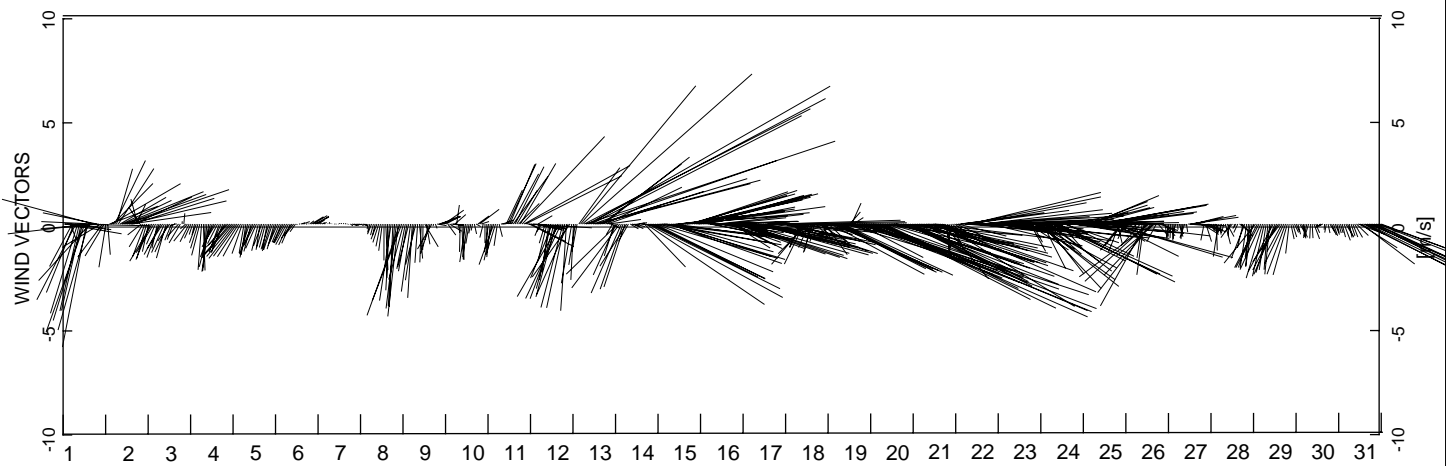
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Figure B-30



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
January 2008**

**EBA Engineering
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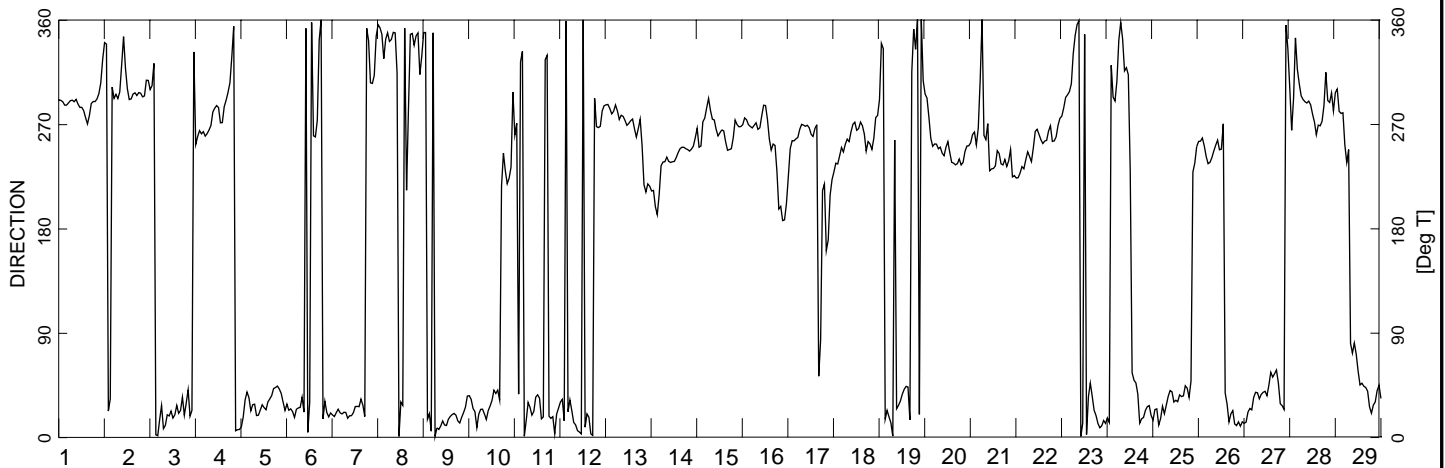
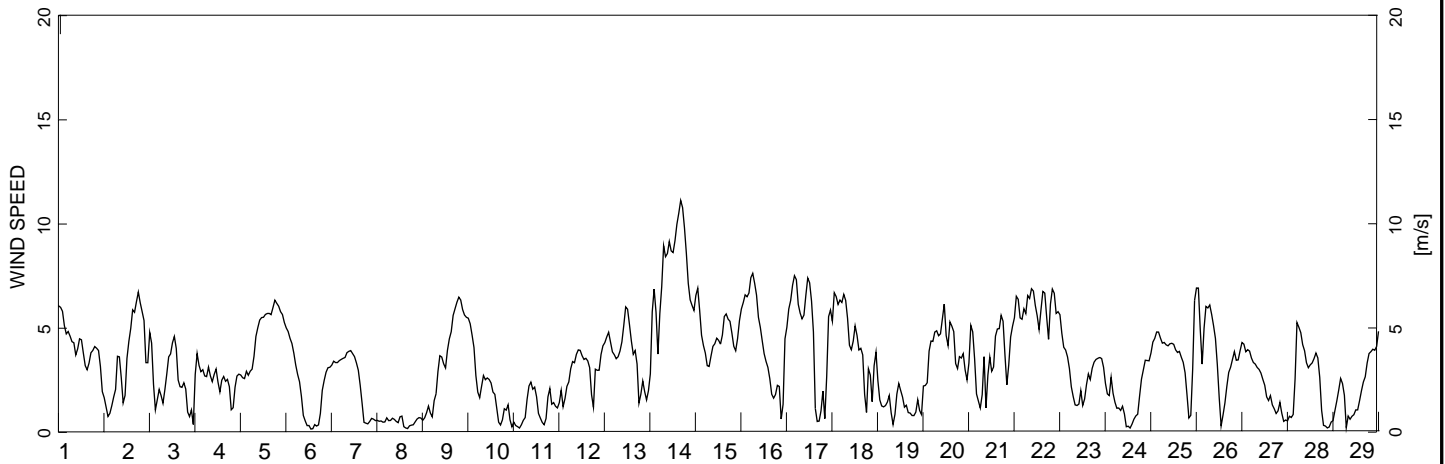
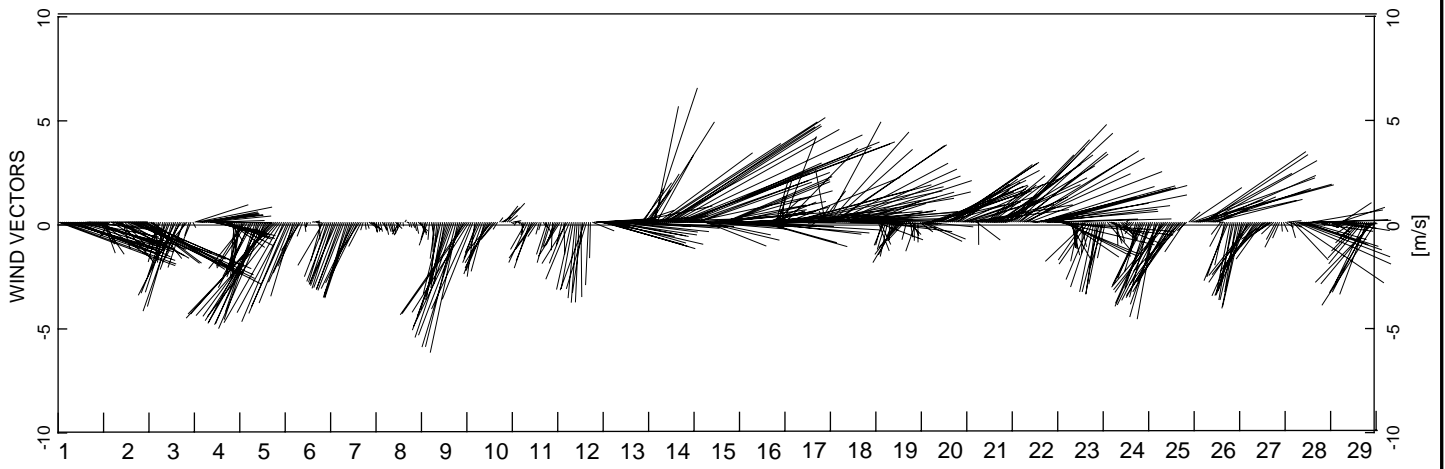
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Figure B-31



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
February 2008**

**EBA Engineering
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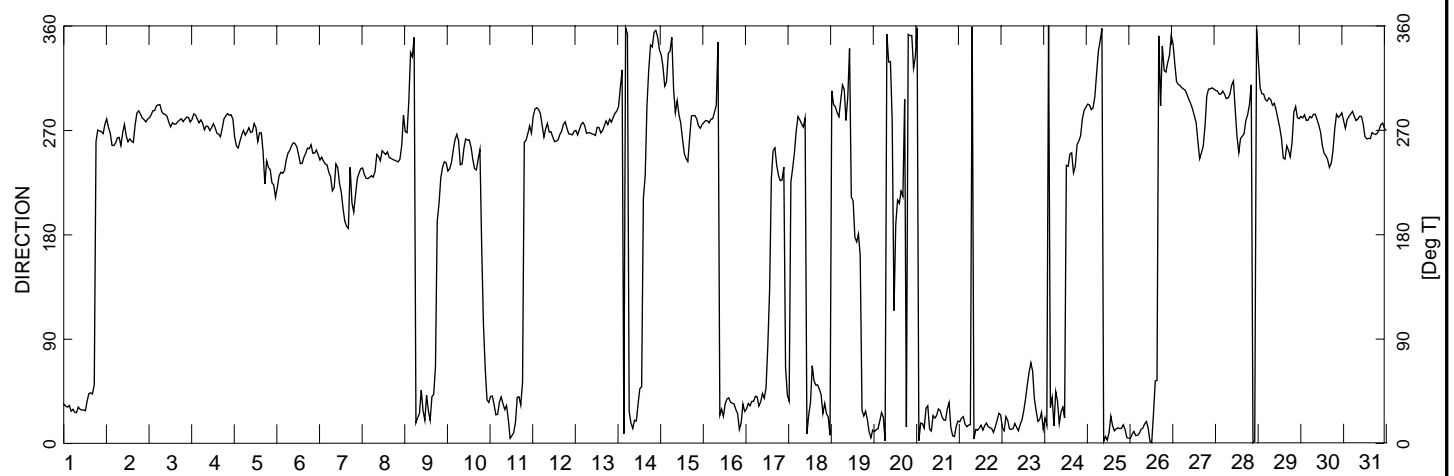
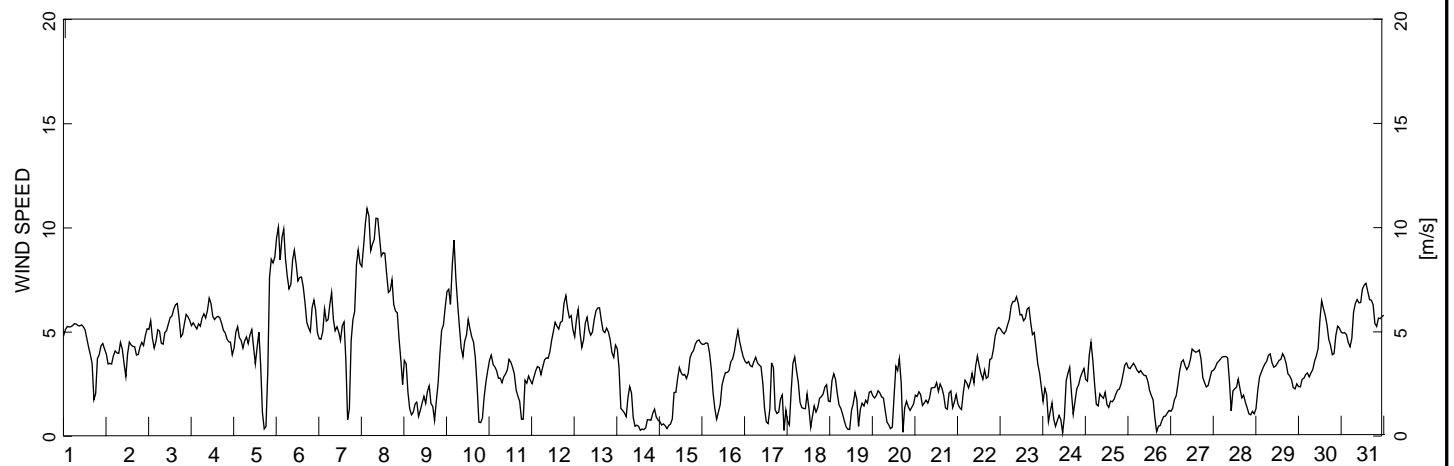
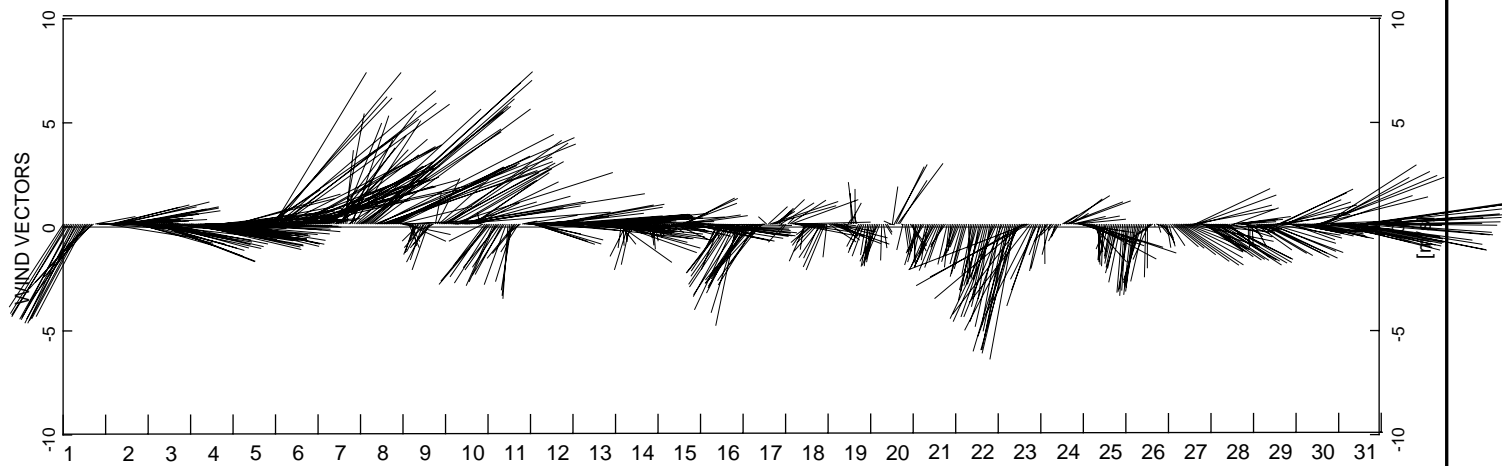
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DATE
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Figure B-32



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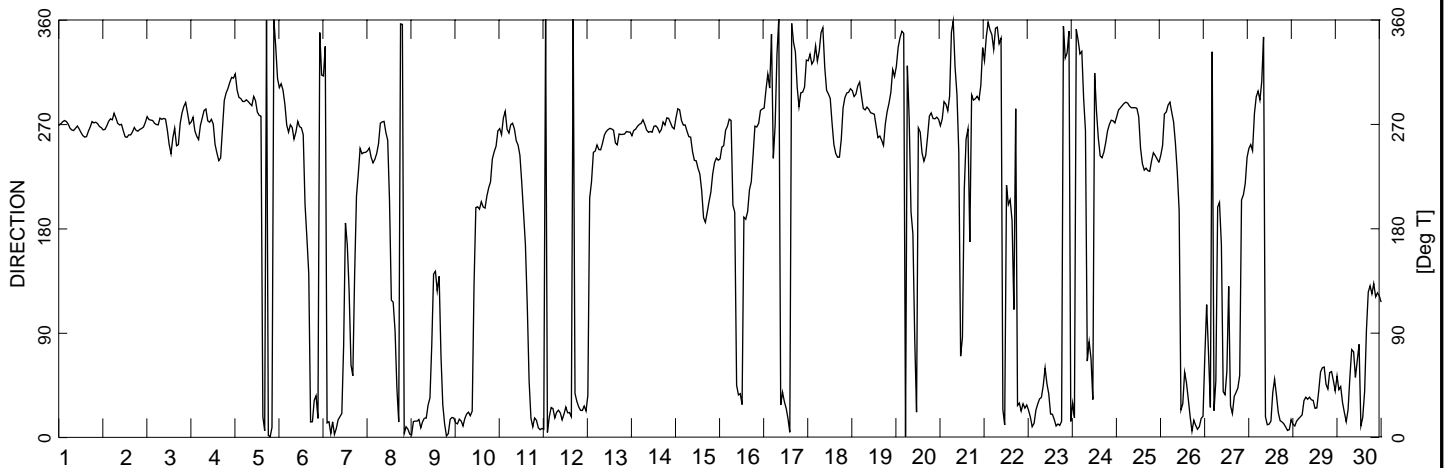
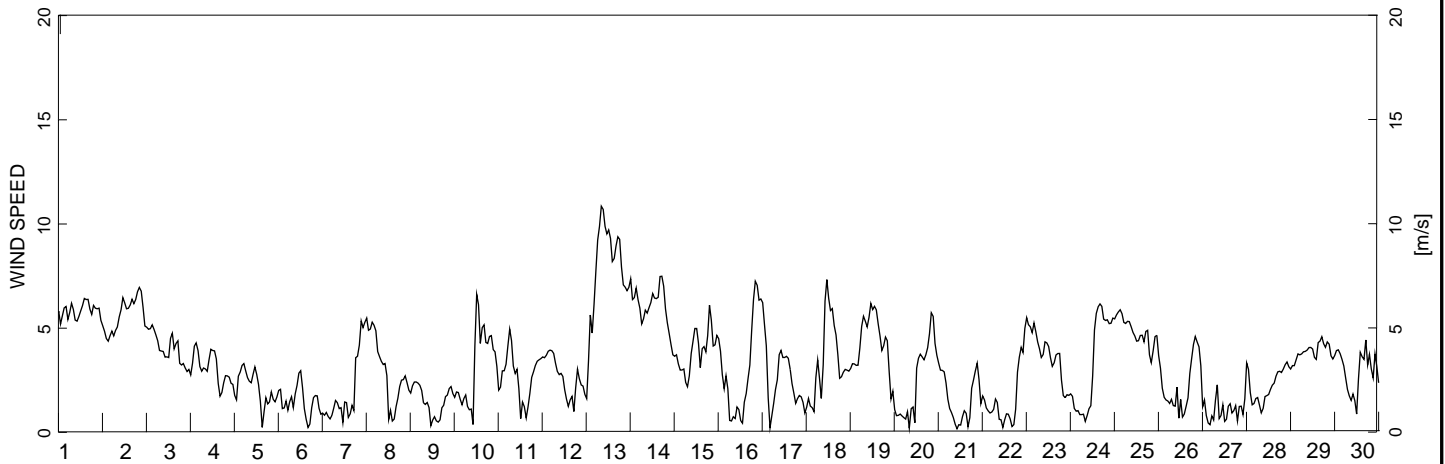
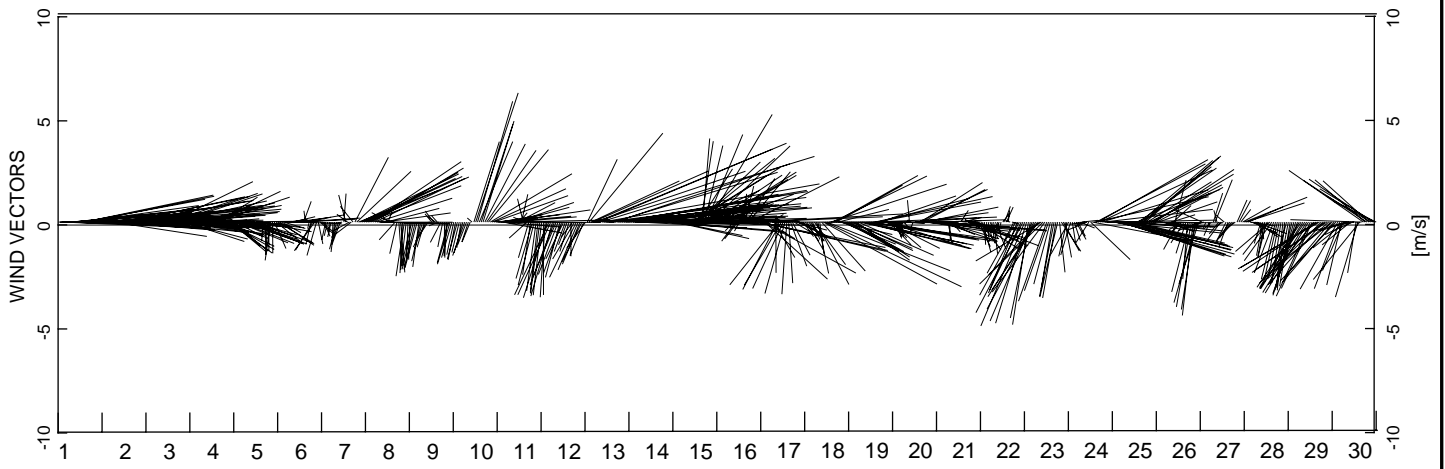
**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
March 2008**



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Figure B-33



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**Mactung Station
Wind Data
April 2008**

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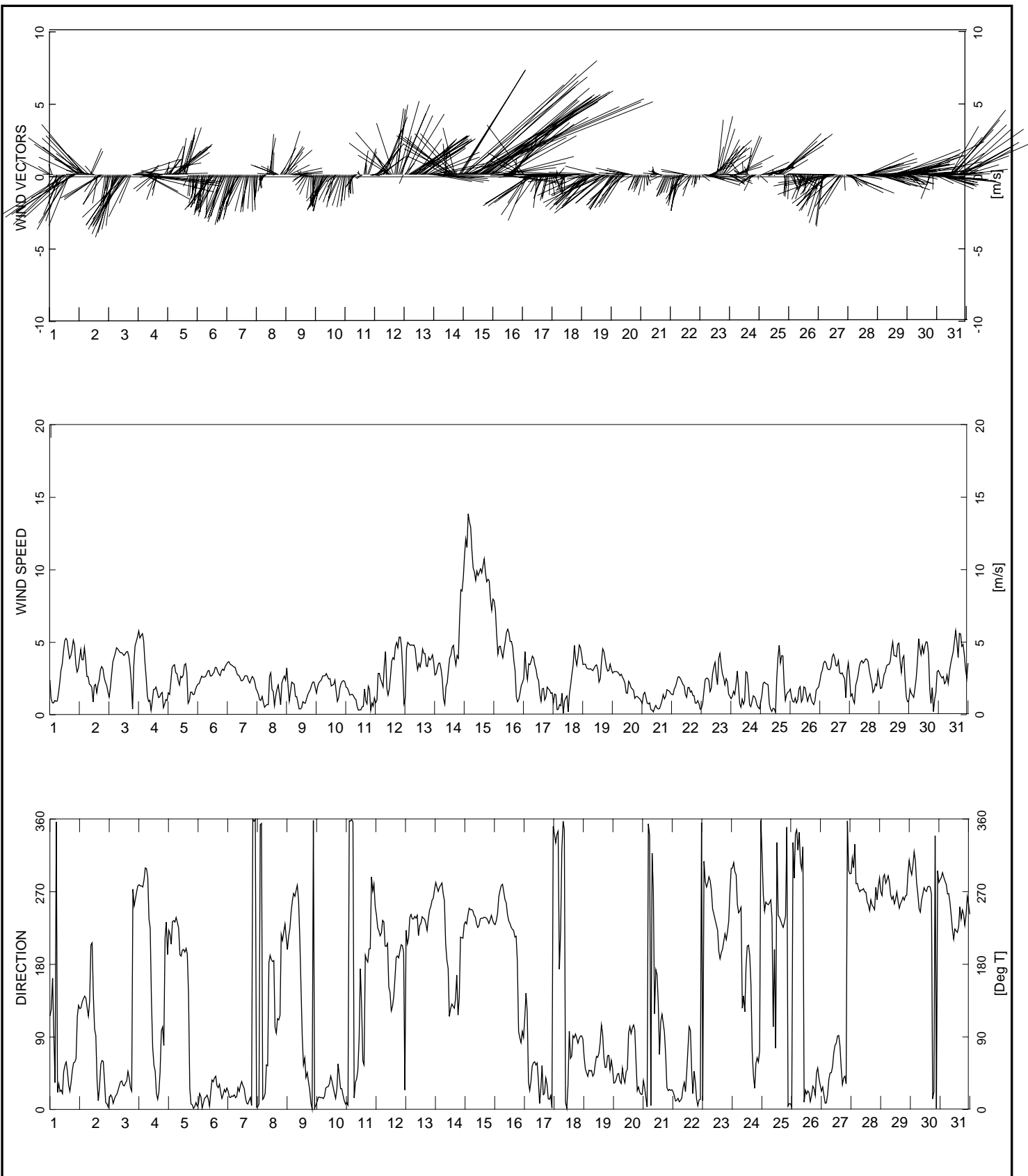
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November 2008

Figure B-34



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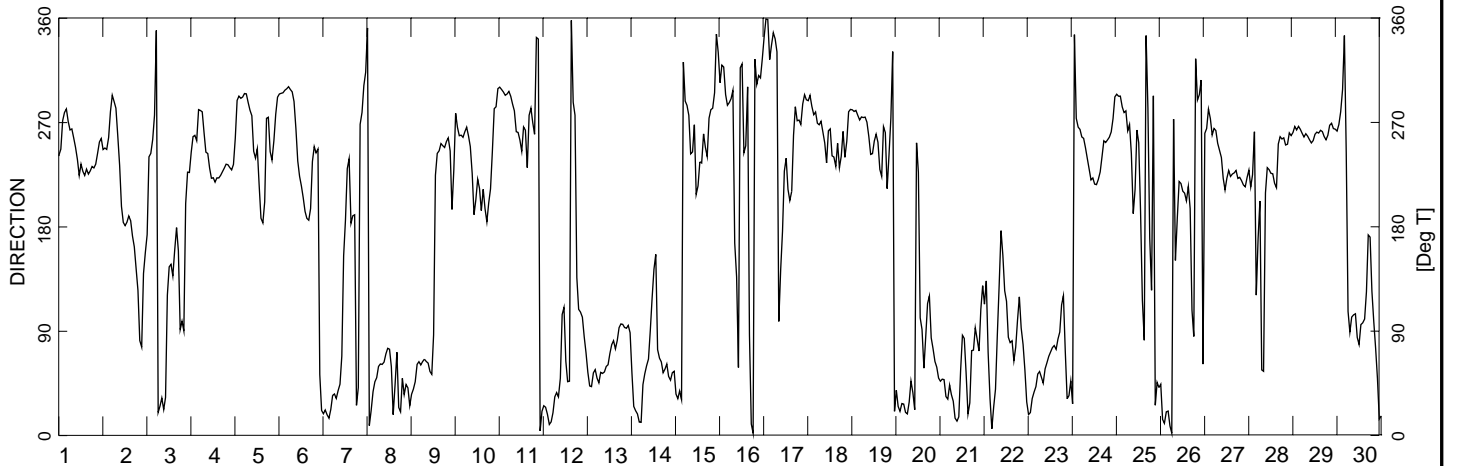
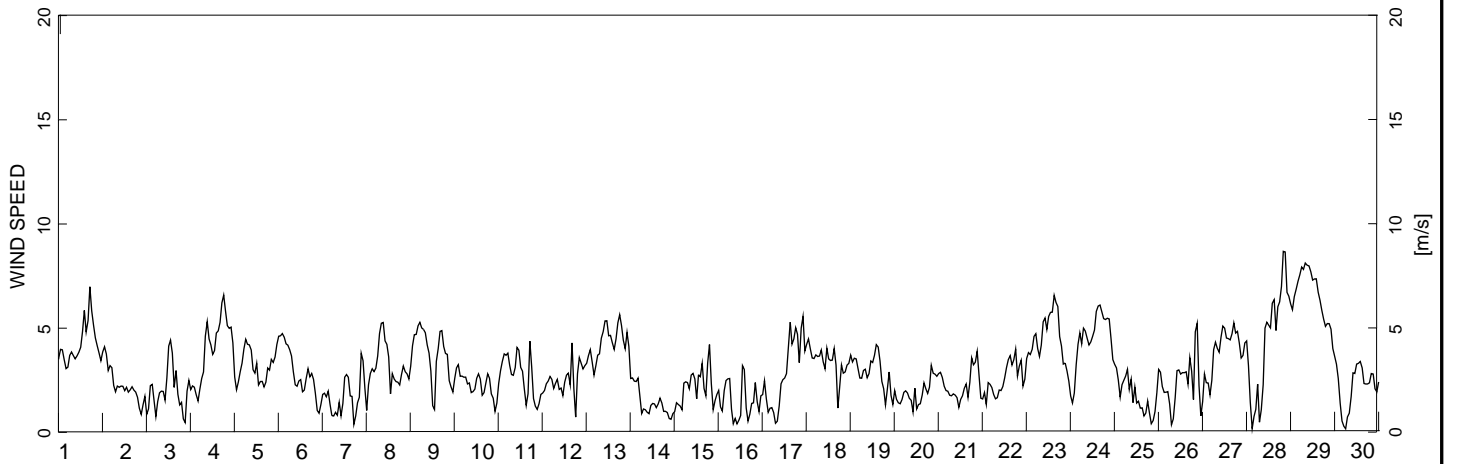
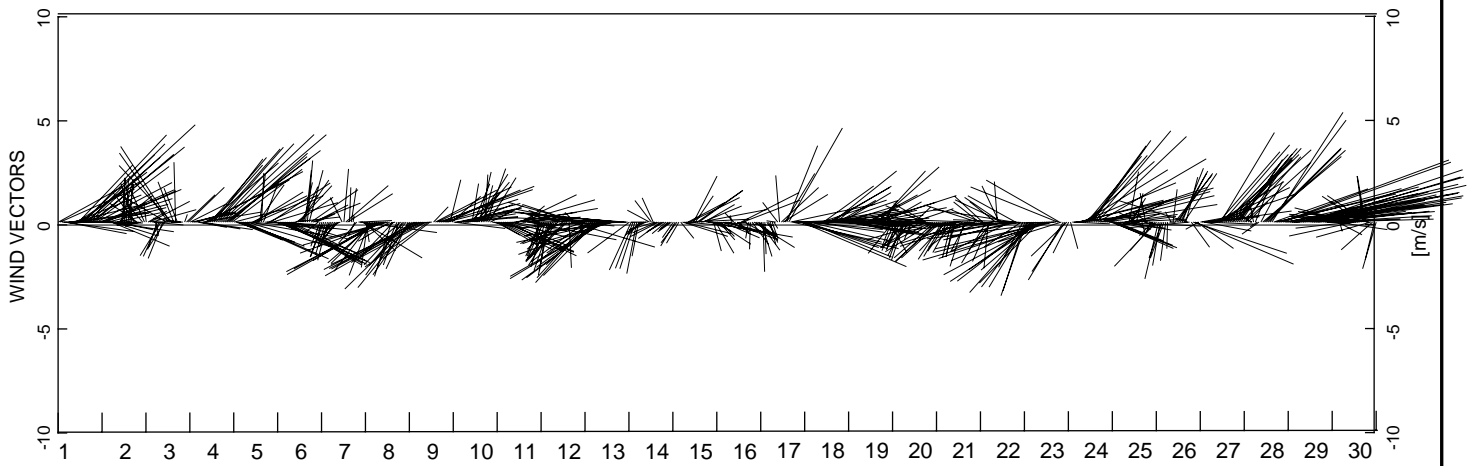
**MACTUNG PROJECT
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**Mactung Station
Wind Data
May 2008**



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Figure B-35



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
June 2008**

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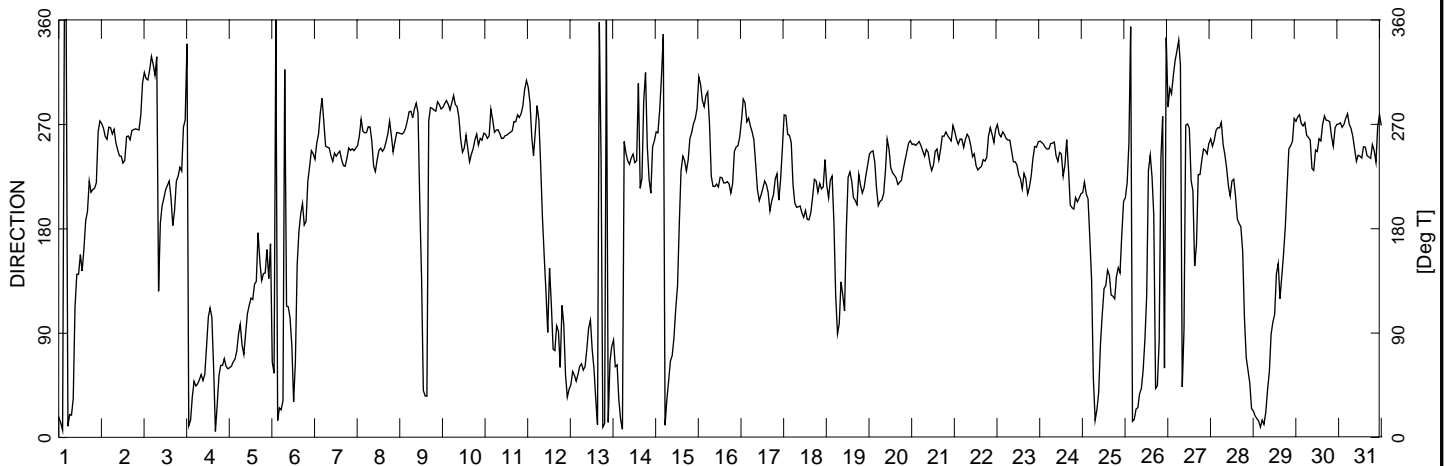
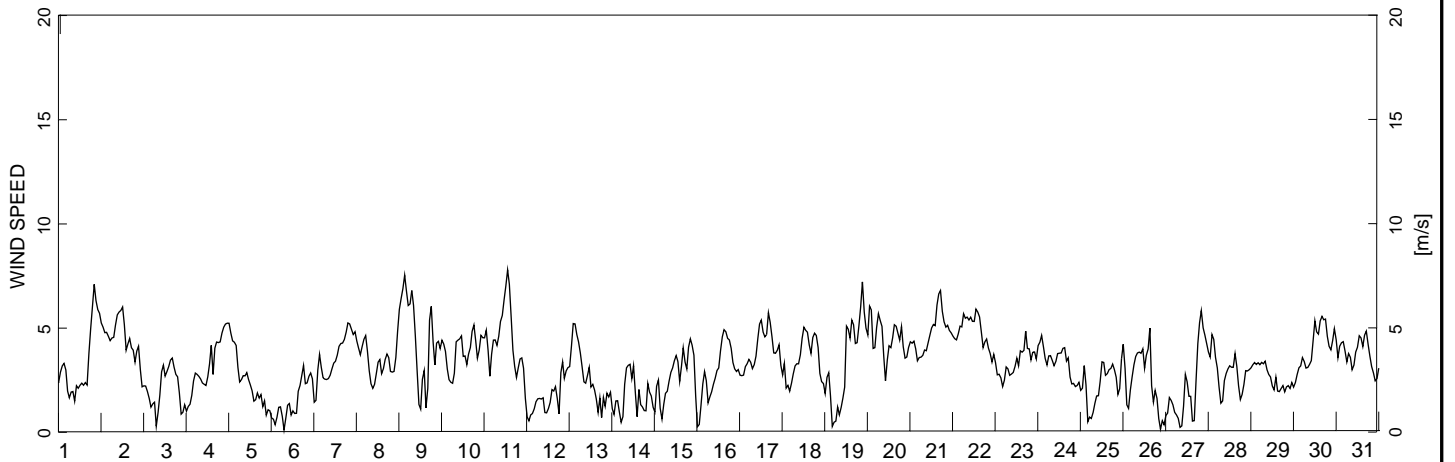
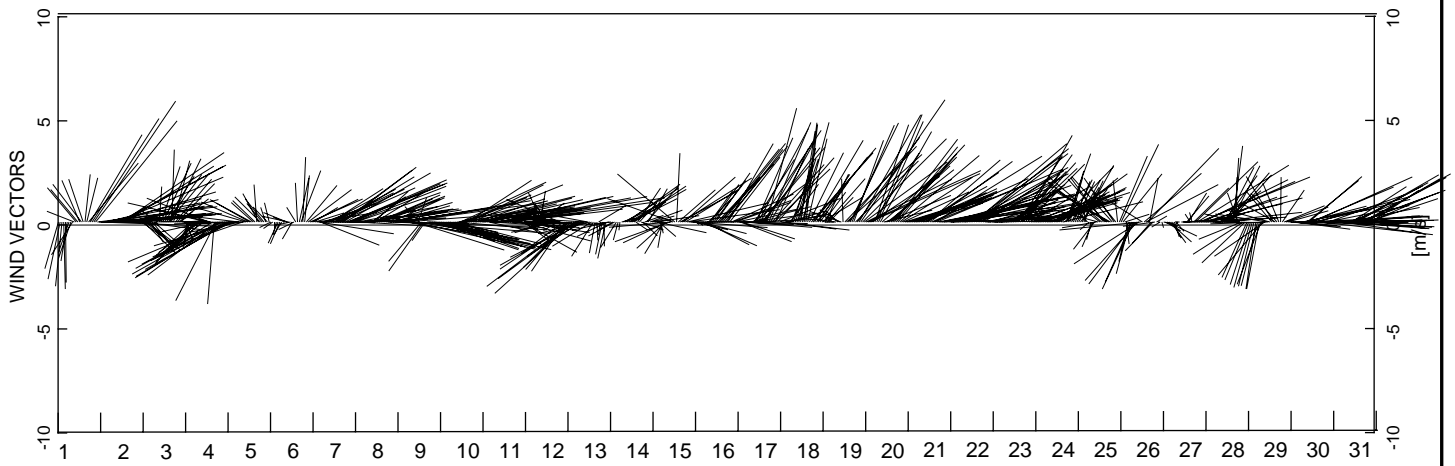
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Figure B-36



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
July 2008**

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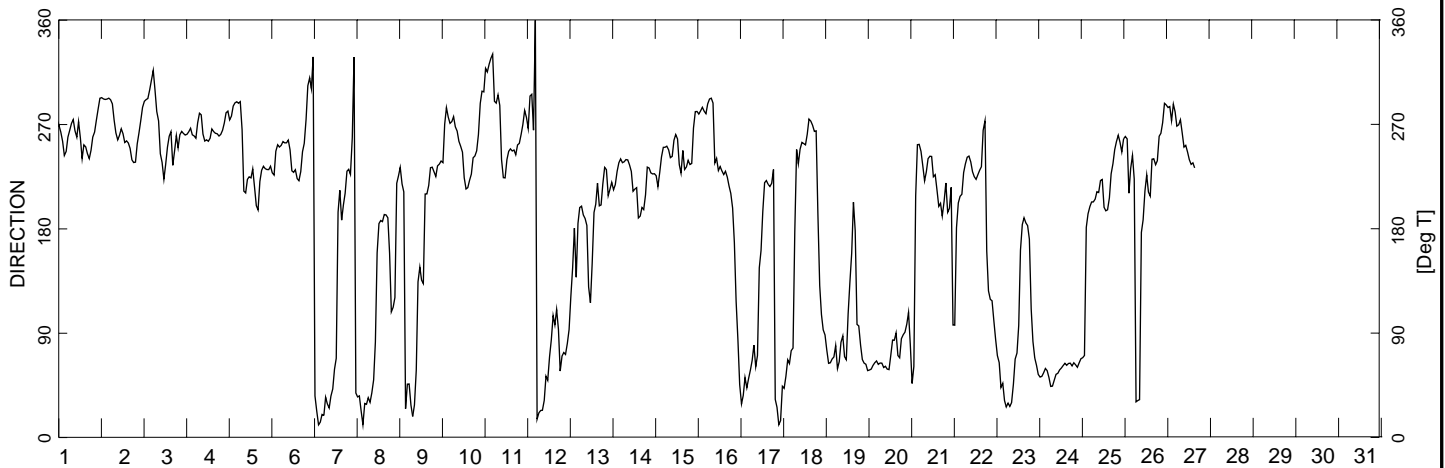
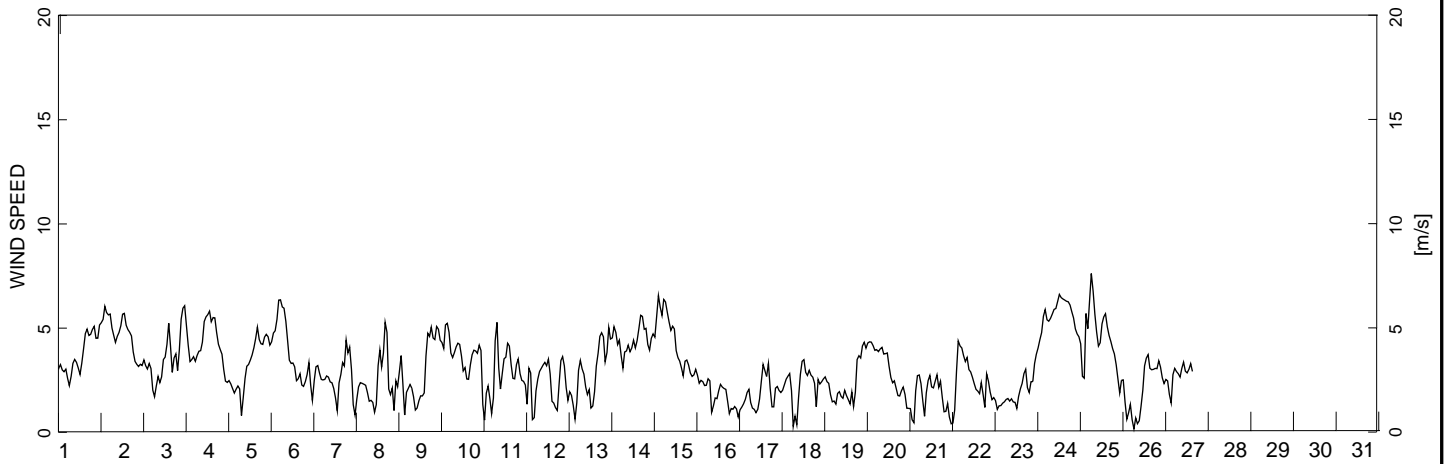
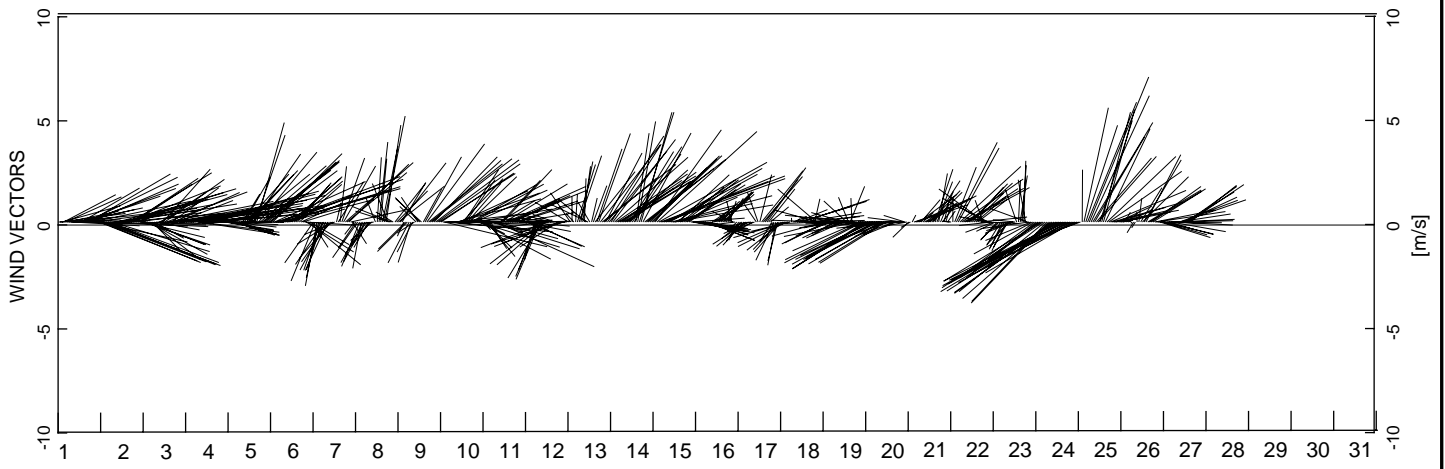
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Figure B-37



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Data
August 2008**

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DATE
November 2008

Figure B-38



APPENDIX C

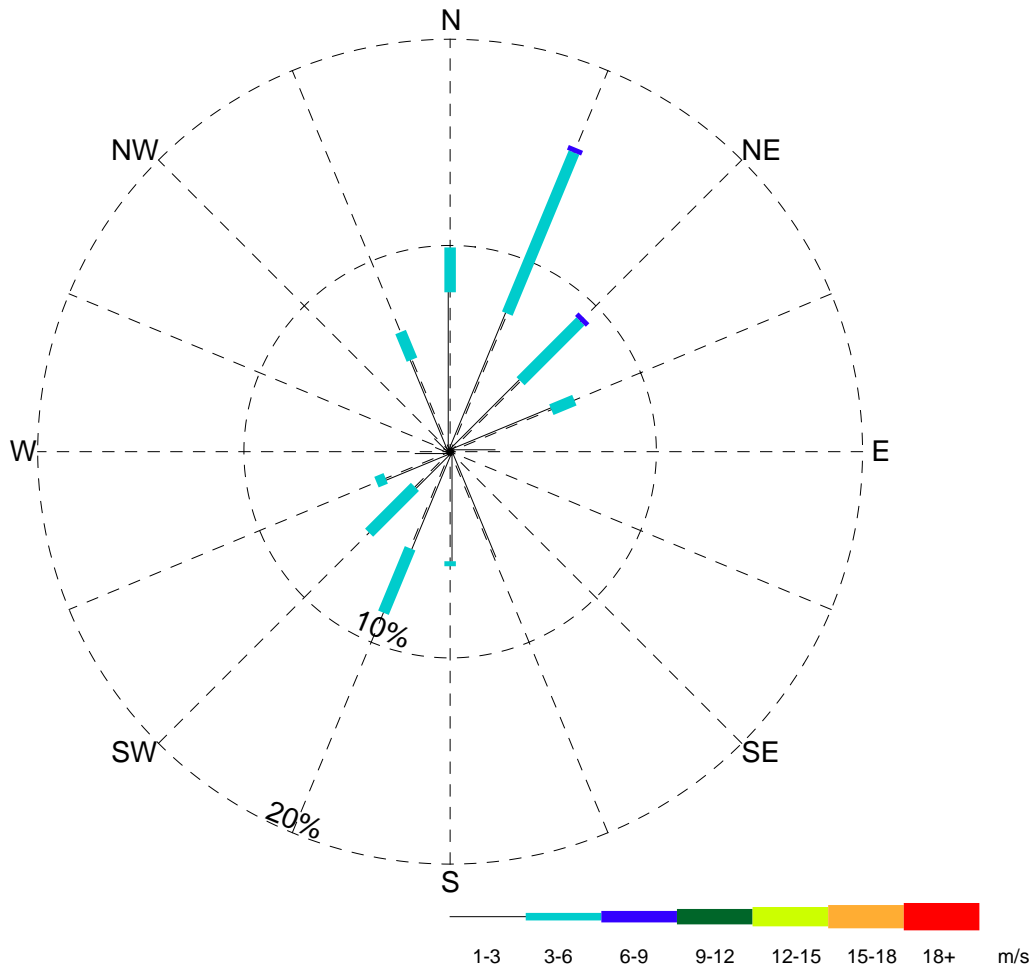
APPENDIX C MONTHLY MACTUNG STATION WIND ROSES – JULY 2005 TO AUGUST 2008

APPENDIX C

Monthly Mactung Station Wind Roses July 2005 – August 2008

- C-01 Mactung Station Wind Rose – July 2005
- C-02 Mactung Station Wind Rose – August 2005
- C-03 Mactung Station Wind Rose – September 2005
- C-04 Mactung Station Wind Rose – October 2005
- C-05 Mactung Station Wind Rose – November 2005
- C-06 Mactung Station Wind Rose – December 2005
- C-07 Mactung Station Wind Rose – January 2006
- C-08 Mactung Station Wind Rose – February 2006
- C-09 Mactung Station Wind Rose – March 2006
- C-10 Mactung Station Wind Rose – April 2006
- C-11 Mactung Station Wind Rose – May 2006
- C-12 Mactung Station Wind Rose – June 2006
- C-13 Mactung Station Wind Rose – July 2006
- C-14 Mactung Station Wind Rose – August 2006
- C-15 Mactung Station Wind Rose – September 2006
- C-16 Mactung Station Wind Rose – October 2006
- C-17 Mactung Station Wind Rose – November 2006
- C-18 Mactung Station Wind Rose – December 2006
- C-19 Mactung Station Wind Rose – January 2007
- C-20 Mactung Station Wind Rose – February 2007
- C-21 Mactung Station Wind Rose – March 2007
- C-22 Mactung Station Wind Rose – April 2007
- C-23 Mactung Station Wind Rose – May 2007

- C-24 Mactung Station Wind Rose – June 2007
- C-25 Mactung Station Wind Rose – July 2007
- C-26 Mactung Station Wind Rose – August 2007
- C-27 Mactung Station Wind Rose – September 2007
- C-28 Mactung Station Wind Rose – October 2007
- C-29 Mactung Station Wind Rose – November 2007
- C-30 Mactung Station Wind Rose – December 2007
- C-31 Mactung Station Wind Rose – January 2008
- C-32 Mactung Station Wind Rose – February 2008
- C-33 Mactung Station Wind Rose – March 2008
- C-34 Mactung Station Wind Rose – April 2008
- C-35 Mactung Station Wind Rose – May 2008
- C-36 Mactung Station Wind Rose – June 2008
- C-37 Mactung Station Wind Rose – July 2008
- C-38 Mactung Station Wind Rose – August 2008



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	5.31	1.21	-	-	-	-	-	6.52
NE	-	4.83	4.11	0.24	-	-	-	-	9.18
NNE	-	7.25	8.45	0.24	-	-	-	-	15.94
N	-	7.73	2.17	-	-	-	-	-	9.90
NNW	-	4.83	1.45	-	-	-	-	-	6.28
NW	-	0.97	-	-	-	-	-	-	0.97
WNW	-	0.73	-	-	-	-	-	-	0.73
W	-	1.69	-	-	-	-	-	-	1.69
WSW	-	3.38	0.48	-	-	-	-	-	3.87
SW	-	2.41	3.14	-	-	-	-	-	5.56
SSW	-	5.07	3.38	-	-	-	-	-	8.45
S	-	5.31	0.24	-	-	-	-	-	5.56
SSE	-	5.56	-	-	-	-	-	-	5.56
SE	-	0.24	-	-	-	-	-	-	0.24
ESE	-	0.24	-	-	-	-	-	-	0.24
E	-	2.17	-	-	-	-	-	-	2.17
Calm	17.15	-	-	-	-	-	-	-	17.15
Total (%)	17.15	57.73	24.64	0.48	-	-	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 18 days
 Start Date: July 14, 2005
 End Date: July 31, 2005

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
July 2005**

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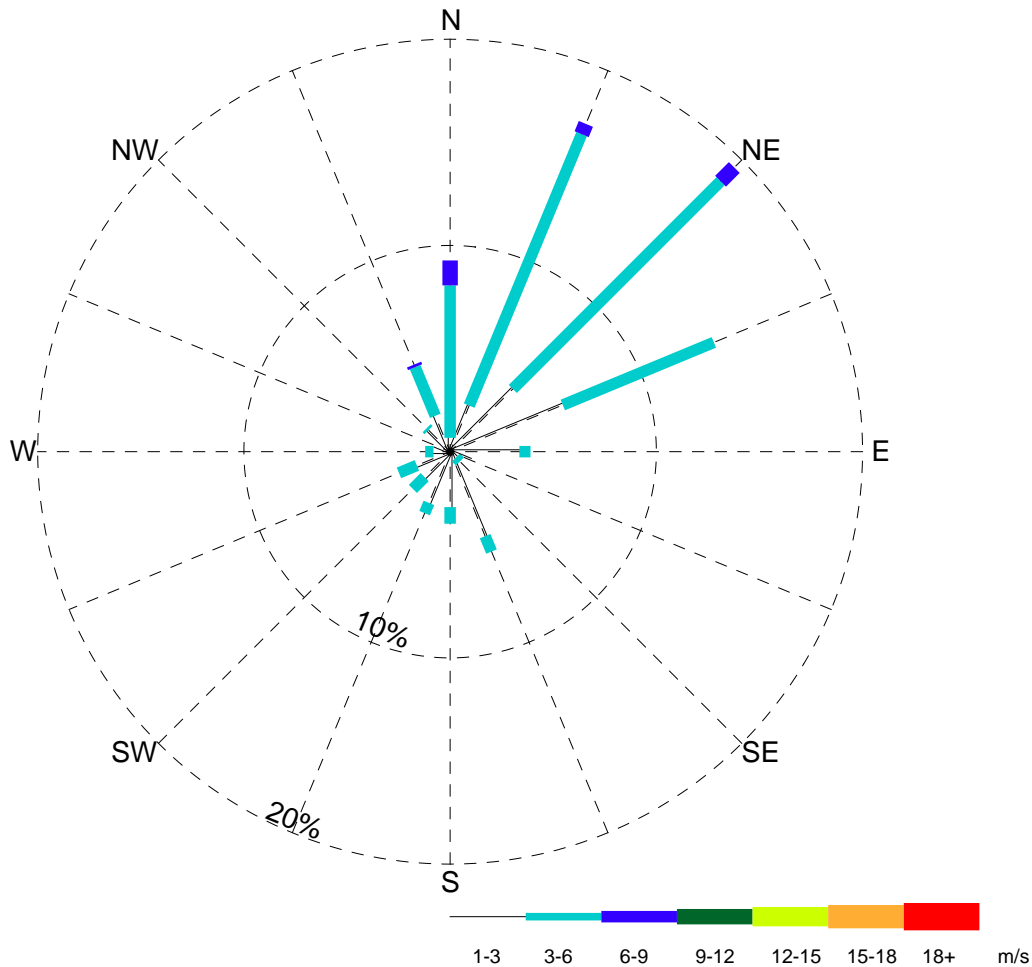
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DATE
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Figure C-01



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: August 1, 2005
 End Date: August 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	5.91	7.93	-	-	-	-	-	13.84
NE	-	4.30	14.25	0.94	-	-	-	-	19.49
NNE	-	2.42	14.25	0.54	-	-	-	-	17.20
N	-	0.67	7.39	1.21	-	-	-	-	9.27
NNW	-	1.88	2.55	0.13	-	-	-	-	4.57
NW	-	1.48	0.13	-	-	-	-	-	1.61
WNW	-	0.81	-	-	-	-	-	-	0.81
W	-	0.81	0.40	-	-	-	-	-	1.21
WSW	-	1.75	0.94	-	-	-	-	-	2.69
SW	-	1.75	0.81	-	-	-	-	-	2.55
SSW	-	2.69	0.54	-	-	-	-	-	3.23
S	-	2.69	0.81	-	-	-	-	-	3.49
SSE	-	4.43	0.81	-	-	-	-	-	5.24
SE	-	0.40	0.27	-	-	-	-	-	0.67
ESE	-	1.08	-	-	-	-	-	-	1.08
E	-	3.36	0.54	-	-	-	-	-	3.90
Calm	9.14	-	-	-	-	-	-	-	9.14
Total (%)	9.14	36.42	51.61	2.82	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
August 2005**

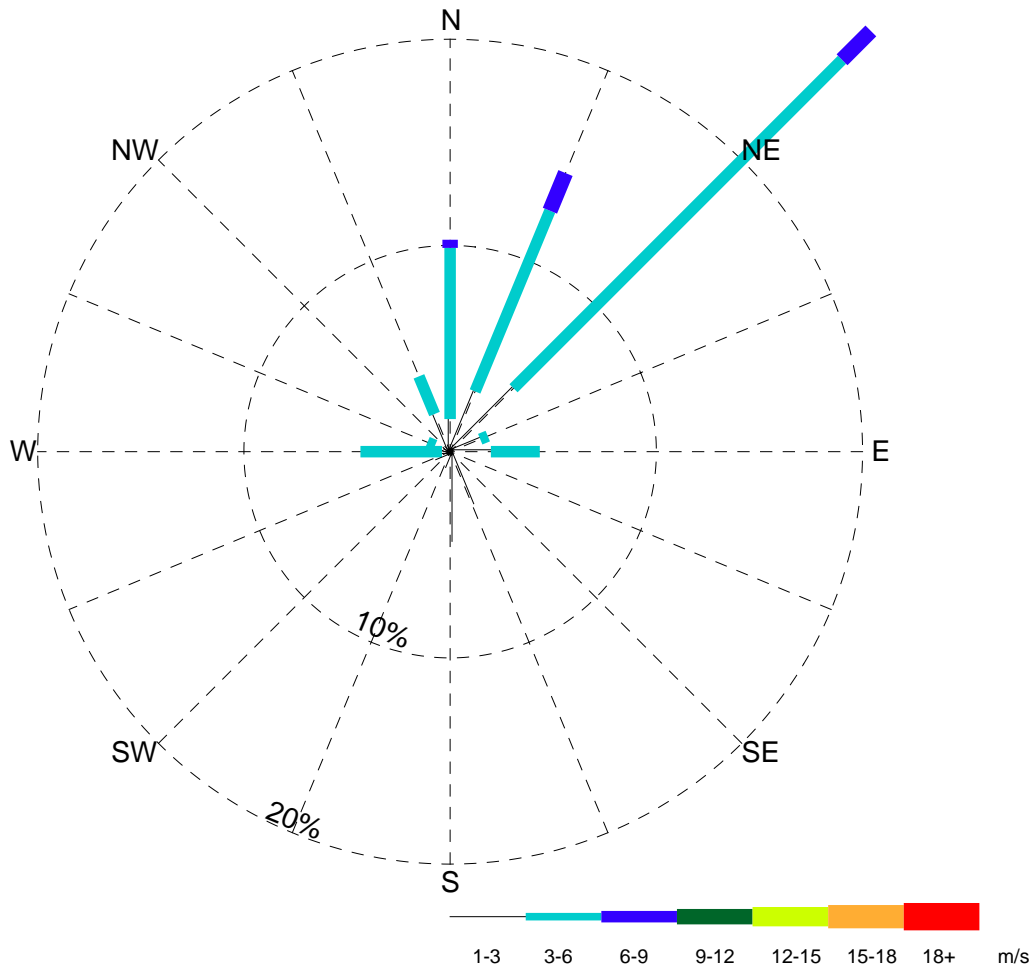
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0
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November 2008

Figure C-02



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 11 days
 Start Date: September 1, 2005
 End Date: September 30, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.58	0.40	-	-	-	-	-	1.98
NE	-	4.35	22.53	1.98	-	-	-	-	28.85
NNE	-	3.16	9.49	1.98	-	-	-	-	14.62
N	-	1.58	8.30	0.40	-	-	-	-	10.28
NNW	-	1.98	1.98	-	-	-	-	-	3.95
NW	-	0.40	-	-	-	-	-	-	0.40
WNW	-	0.79	0.40	-	-	-	-	-	1.19
W	-	0.40	3.95	-	-	-	-	-	4.35
WSW	-	0.79	-	-	-	-	-	-	0.79
SW	-	-	-	-	-	-	-	-	-
SSW	-	0.79	-	-	-	-	-	-	0.79
S	-	4.35	-	-	-	-	-	-	4.35
SSE	-	2.77	-	-	-	-	-	-	2.77
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	1.98	2.37	-	-	-	-	-	4.35
Calm	21.34	-	-	-	-	-	-	-	21.34
Total (%)	21.34	24.90	49.41	4.35	-	-	-	-	100.00

NOTES

Data not available from
 Sep 7 to 25, 2005

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Wind Rose
 September 2005**

EBA Engineering
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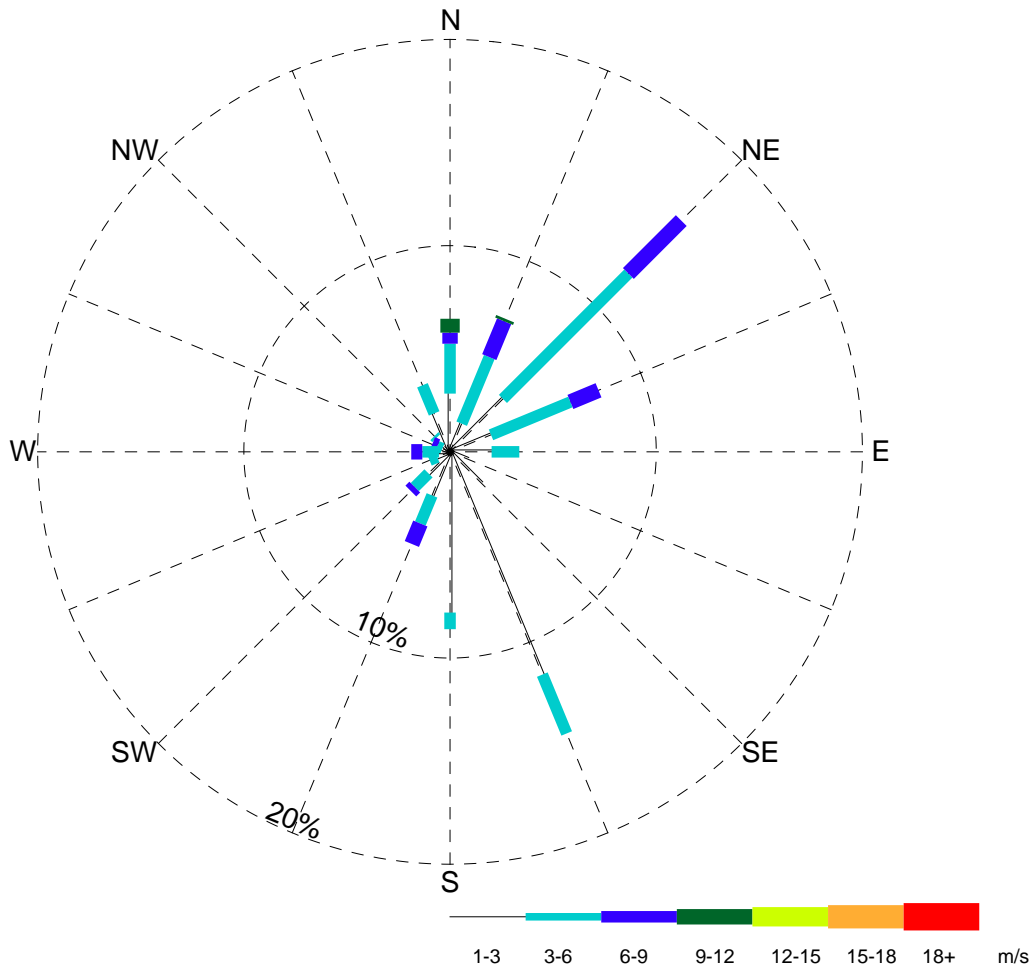


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Figure C-03



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: October 1, 2005
 End Date: October 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.15	4.17	1.48	-	-	-	-	7.80
NE	-	3.63	8.60	3.63	-	-	-	-	15.86
NNE	-	1.48	3.49	1.88	0.13	-	-	-	6.99
N	-	2.82	2.42	0.54	0.67	-	-	-	6.45
NNW	-	2.02	1.48	-	-	-	-	-	3.49
NW	-	0.94	0.13	-	-	-	-	-	1.08
WNW	-	0.40	0.27	0.27	-	-	-	-	0.94
W	-	0.54	0.81	0.54	-	-	-	-	1.88
WSW	-	0.67	0.40	-	-	-	-	-	1.08
SW	-	1.48	0.94	0.27	-	-	-	-	2.69
SSW	-	2.29	1.48	1.08	-	-	-	-	4.84
S	-	7.80	0.81	-	-	-	-	-	8.60
SSE	-	11.69	3.09	-	-	-	-	-	14.78
SE	-	2.15	-	-	-	-	-	-	2.15
ESE	-	0.94	-	-	-	-	-	-	0.94
E	-	2.02	1.34	-	-	-	-	-	3.36
Calm	17.07	-	-	-	-	-	-	-	17.07
Total (%)	17.07	43.01	29.43	9.68	0.81	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
October 2005**

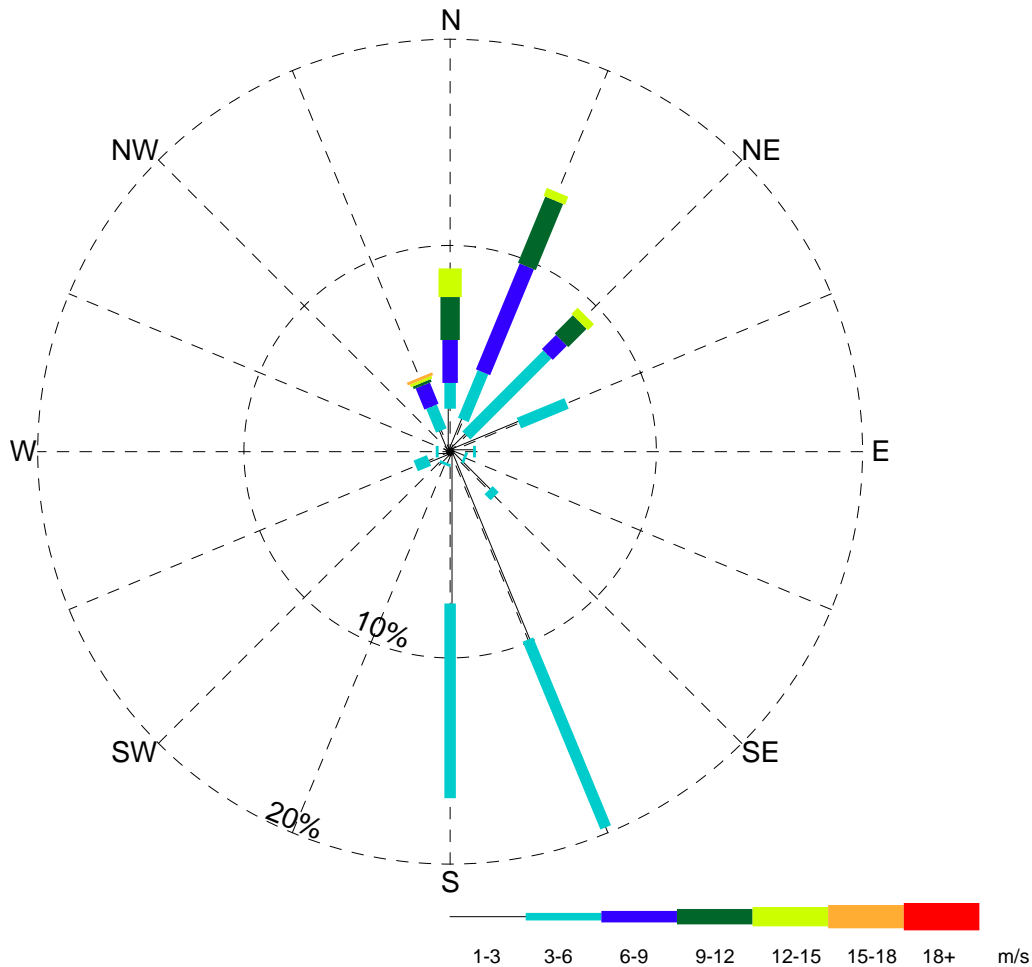
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Figure C-04



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: November 1, 2005
 End Date: November 30, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.61	2.50	-	-	-	-	-	6.11
NE	-	1.11	5.56	0.97	1.25	0.42	-	-	9.31
NNE	-	1.67	2.50	5.56	3.47	0.42	-	-	13.61
N	-	2.08	1.25	2.08	2.08	1.39	-	-	8.89
NNW	-	1.11	1.25	1.11	0.14	0.14	0.14	-	3.89
NW	-	0.28	-	-	-	-	-	-	0.28
WNW	-	0.14	-	-	-	-	-	-	0.14
W	-	0.56	0.14	-	-	-	-	-	0.69
WSW	-	1.11	0.69	-	-	-	-	-	1.81
SW	-	0.83	-	-	-	-	-	-	0.83
SSW	-	0.56	0.14	-	-	-	-	-	0.69
S	-	7.36	9.44	-	-	-	-	-	16.81
SSE	-	9.86	9.86	-	-	-	-	-	19.72
SE	-	2.64	0.42	-	-	-	-	-	3.06
ESE	-	0.69	0.14	-	-	-	-	-	0.83
E	-	1.11	0.14	-	-	-	-	-	1.25
Calm	12.08	-	-	-	-	-	-	-	12.08
Total (%)	12.08	34.72	34.03	9.72	6.94	2.36	0.14	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
November 2005**

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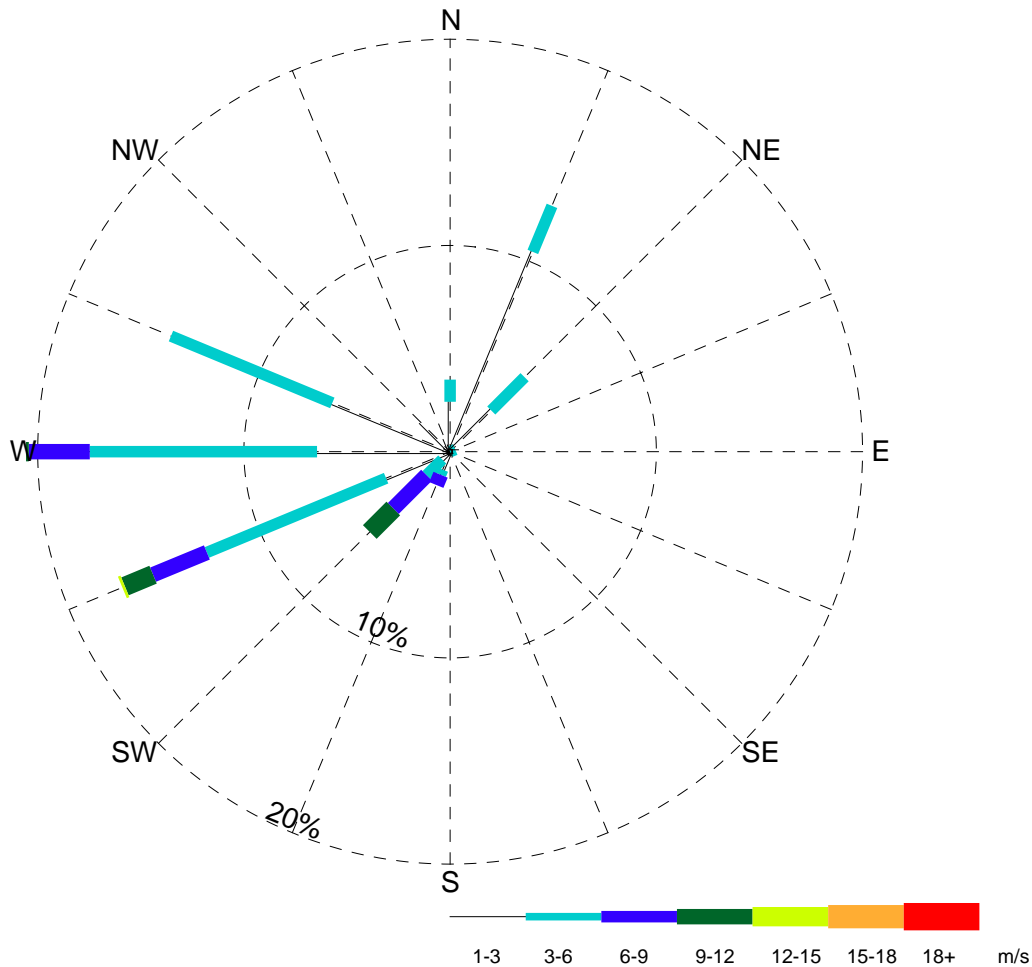


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Figure C-05



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: December 1, 2005
 End Date: December 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	-	0.27	-	-	-	-	-	0.27
NE	-	2.82	2.29	-	-	-	-	-	5.11
NNE	-	10.48	2.42	-	-	-	-	-	12.90
N	-	2.42	1.08	-	-	-	-	-	3.49
NNW	-	0.67	-	-	-	-	-	-	0.67
NW	-	2.02	-	-	-	-	-	-	2.02
WNW	-	6.18	8.47	-	-	-	-	-	14.65
W	-	6.45	11.02	2.96	0.13	-	-	-	20.57
WSW	-	3.36	9.41	2.82	1.48	0.13	-	-	17.20
SW	-	0.54	1.08	2.29	1.61	-	-	-	5.51
SSW	-	0.94	0.27	0.54	-	-	-	-	1.75
S	-	0.27	-	-	-	-	-	-	0.27
SSE	-	0.13	-	-	-	-	-	-	0.13
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	0.40	-	-	-	-	-	-	0.40
Calm	15.05	-	-	-	-	-	-	-	15.05
Total (%)	15.05	36.69	36.29	8.60	3.23	0.13	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
December 2005**

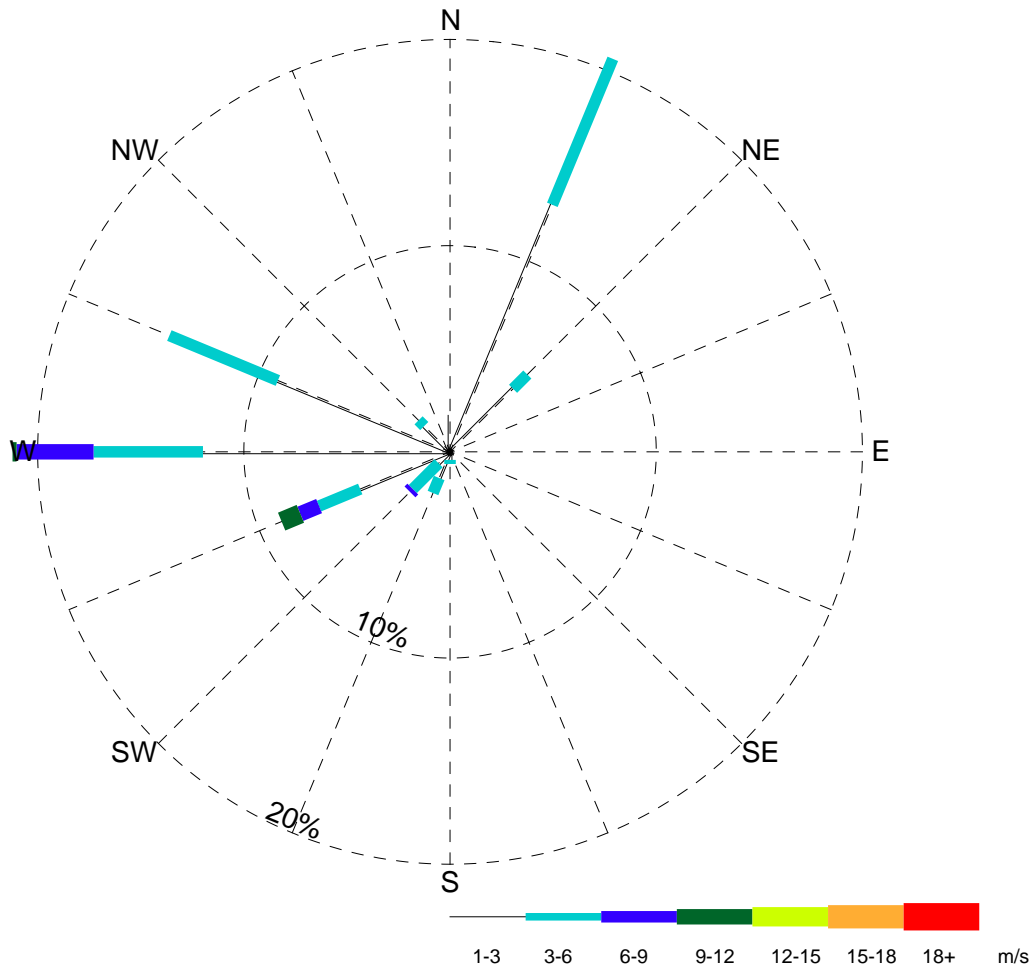
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Figure C-06



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 22 days
 Start Date: January 1, 2006
 End Date: January 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	-	-	-	-	-	-	-	-
NE	-	4.32	0.98	-	-	-	-	-	5.30
NNE	-	12.97	7.66	-	-	-	-	-	20.63
N	-	1.77	-	-	-	-	-	-	1.77
NNW	-	0.59	-	-	-	-	-	-	0.59
NW	-	1.77	0.39	-	-	-	-	-	2.16
WNW	-	9.04	5.70	-	-	-	-	-	14.73
W	-	11.98	5.30	3.73	0.20	-	-	-	21.22
WSW	-	4.72	2.16	0.98	0.98	-	-	-	8.84
SW	-	0.79	1.77	0.20	-	-	-	-	2.75
SSW	-	1.38	0.79	-	-	-	-	-	2.16
S	-	0.39	0.20	-	-	-	-	-	0.59
SSE	-	0.20	-	-	-	-	-	-	0.20
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	19.06	-	-	-	-	-	-	-	19.06
Total (%)	19.06	49.90	24.95	4.91	1.18	-	-	-	100.00

NOTES

Data not available from
 January 8 to 16, 2006

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 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Wind Rose
 January 2006**

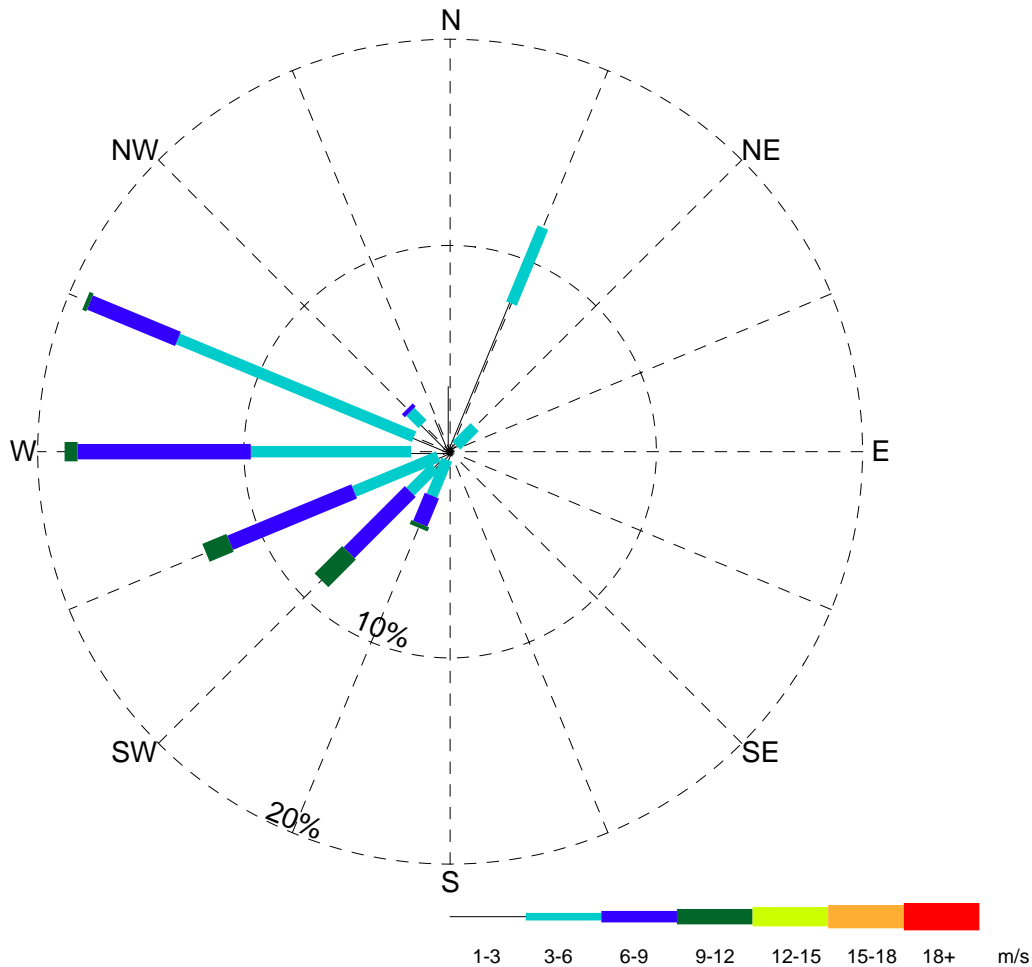
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Figure C-07



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 20 days
 Start Date: February 1, 2006
 End Date: February 28, 2006

Direction	Percent Occurrence (%)								
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	Total (%)
ENE	-	0.84	-	-	-	-	-	-	0.84
NE	-	0.42	1.26	-	-	-	-	-	1.68
NNE	-	7.77	3.99	-	-	-	-	-	11.77
N	-	3.15	-	-	-	-	-	-	3.15
NNW	-	1.68	-	-	-	-	-	-	1.68
NW	-	1.89	0.84	0.21	-	-	-	-	2.94
WNW	-	1.89	12.40	4.62	0.21	-	-	-	19.12
W	-	1.89	7.77	8.40	0.63	-	-	-	18.70
WSW	-	0.63	4.41	6.51	1.26	-	-	-	12.81
SW	-	1.05	1.68	4.20	1.89	-	-	-	8.82
SSW	-	0.42	1.89	1.47	0.21	-	-	-	3.99
S	-	0.21	-	-	-	-	-	-	0.21
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	14.29	-	-	-	-	-	-	-	14.29
Total (%)	14.29	21.85	34.24	25.42	4.20	-	-	-	100.00

NOTES

Data not available from
 February 20 to 28, 2006

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**Mactung Station
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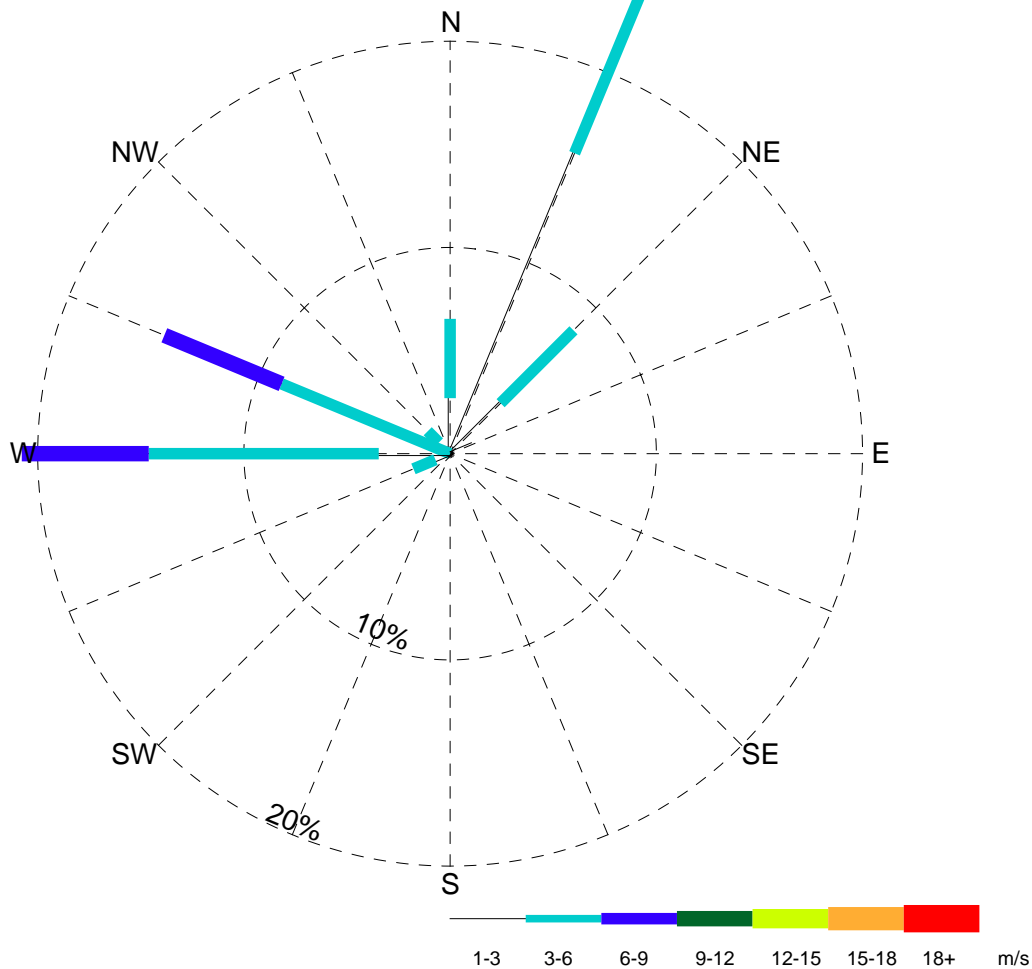


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Figure C-08



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 11 days
 Start Date: March 1, 2006
 End Date: March 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.15	-	-	-	-	-	-	1.15
NE	-	3.46	5.00	-	-	-	-	-	8.46
NNE	-	15.77	22.69	-	-	-	-	-	38.46
N	-	2.69	3.85	-	-	-	-	-	6.54
NNW	-	0.38	-	-	-	-	-	-	0.38
NW	-	0.77	0.77	-	-	-	-	-	1.54
WNW	-	-	8.85	6.15	-	-	-	-	15.00
W	-	3.46	11.15	6.15	-	-	-	-	20.77
WSW	-	0.77	1.15	-	-	-	-	-	1.92
SW	-	0.38	-	-	-	-	-	-	0.38
SSW	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	5.39	-	-	-	-	-	-	-	5.39
Total (%)	5.39	28.85	53.46	12.31	-	-	-	-	100.00

NOTES

Data not available from
 March 1 to 20, 2006

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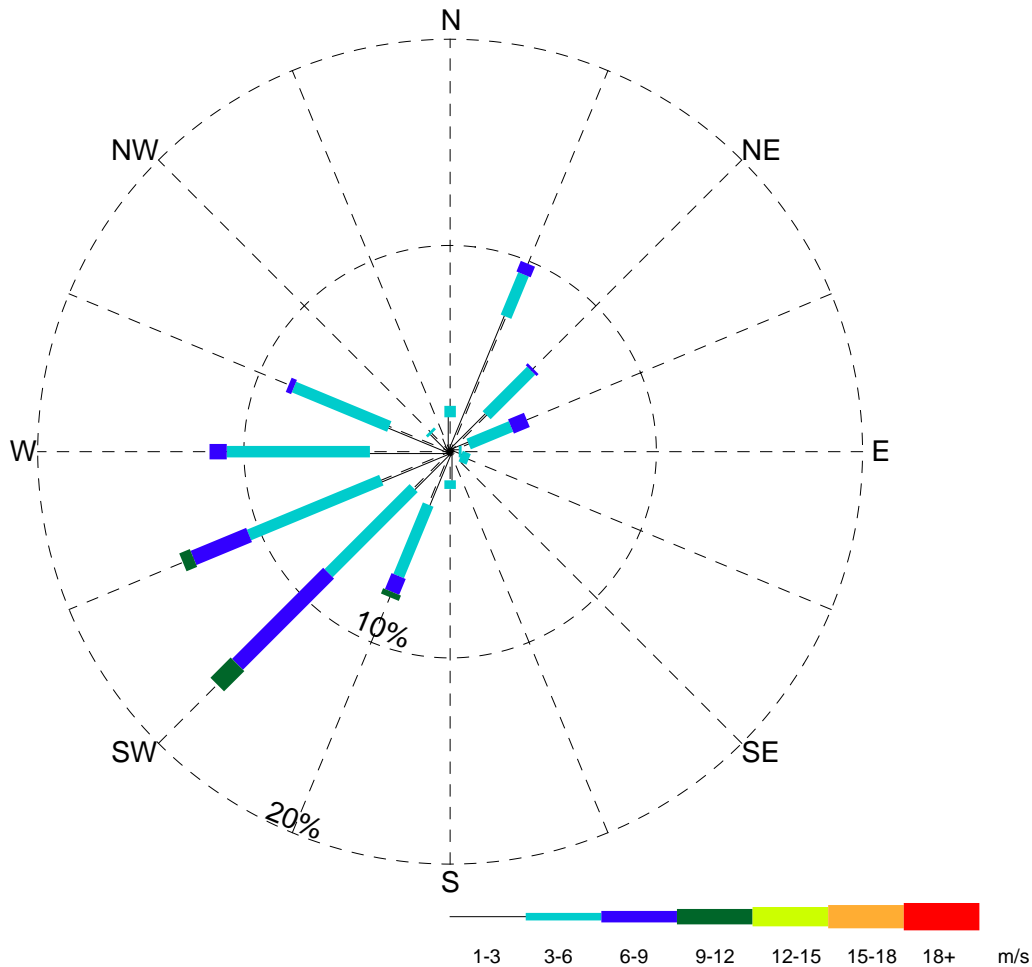
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Figure C-09



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: April 1, 2006
 End Date: April 30, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.97	2.22	0.83	-	-	-	-	4.03
NE	-	2.50	3.06	0.14	-	-	-	-	5.69
NNE	-	7.08	2.22	0.56	-	-	-	-	9.86
N	-	1.67	0.56	-	-	-	-	-	2.22
NNW	-	0.69	-	-	-	-	-	-	0.69
NW	-	1.25	0.14	-	-	-	-	-	1.39
WNW	-	3.19	5.00	0.28	-	-	-	-	8.47
W	-	3.89	6.94	0.83	-	-	-	-	11.67
WSW	-	3.61	6.94	2.92	0.56	-	-	-	14.03
SW	-	2.50	5.83	6.25	1.39	-	-	-	15.97
SSW	-	2.78	3.75	0.83	0.28	-	-	-	7.64
S	-	1.39	0.42	-	-	-	-	-	1.81
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.56	0.42	-	-	-	-	-	0.97
E	-	0.42	0.14	-	-	-	-	-	0.56
Calm	15.00	-	-	-	-	-	-	-	15.00
Total (%)	15.00	32.50	37.64	12.64	2.22	-	-	-	100.00

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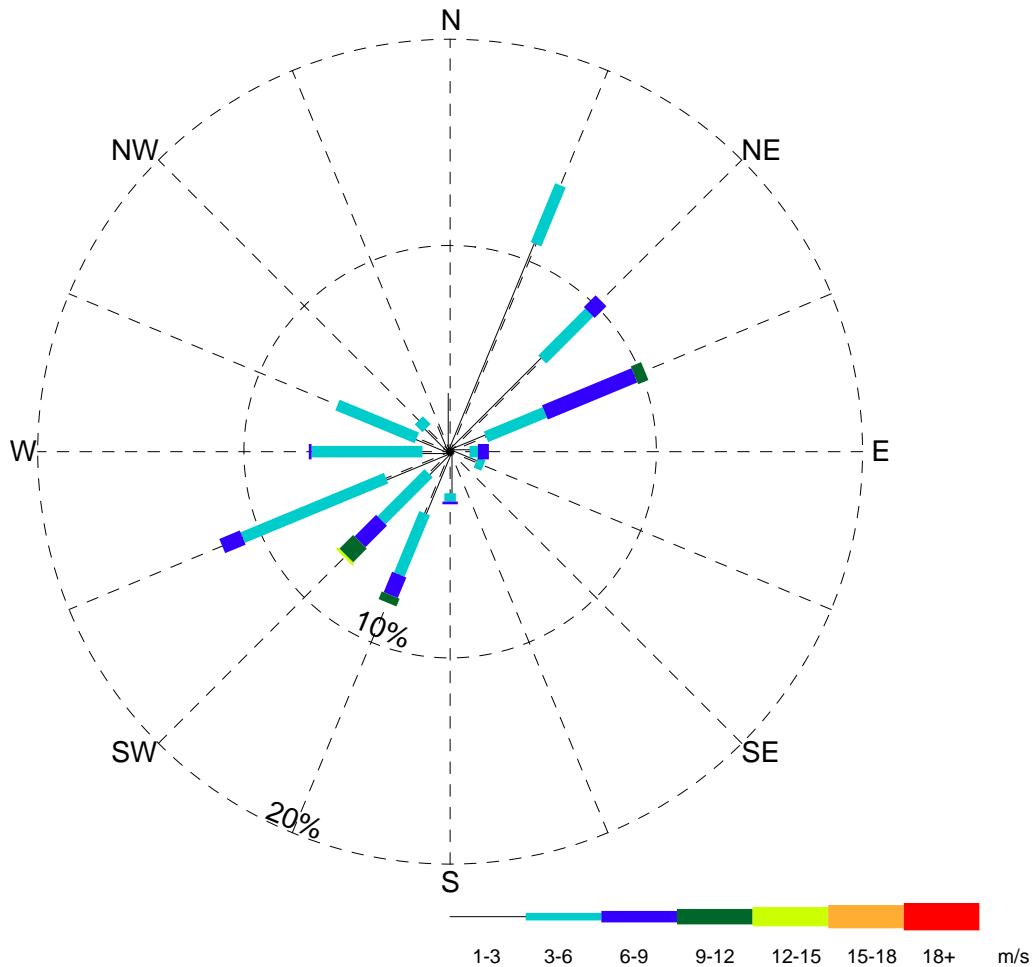
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Figure C-10



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: May 1, 2006
 End Date: May 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.88	3.09	4.70	0.54	-	-	-	10.22
NE	-	6.32	3.23	0.81	-	-	-	-	10.35
NNE	-	10.89	3.09	-	-	-	-	-	13.98
N	-	2.82	-	-	-	-	-	-	2.82
NNW	-	1.34	-	-	-	-	-	-	1.34
NW	-	1.61	0.54	-	-	-	-	-	2.15
WNW	-	1.75	4.17	-	-	-	-	-	5.91
W	-	1.34	5.38	0.13	-	-	-	-	6.86
WSW	-	3.36	7.53	1.08	-	-	-	-	11.96
SW	-	1.48	3.23	1.48	0.94	0.13	-	-	7.26
SSW	-	3.23	3.23	1.08	0.40	-	-	-	7.93
S	-	2.02	0.40	0.13	-	-	-	-	2.55
SSE	-	0.13	-	-	-	-	-	-	0.13
SE	-	0.13	-	-	-	-	-	-	0.13
ESE	-	1.34	0.40	-	-	-	-	-	1.75
E	-	0.94	0.40	0.54	-	-	-	-	1.88
Calm	12.77	-	-	-	-	-	-	-	12.77
Total (%)	12.77	40.59	34.68	9.95	1.88	0.13	-	-	100.00

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
May 2006**

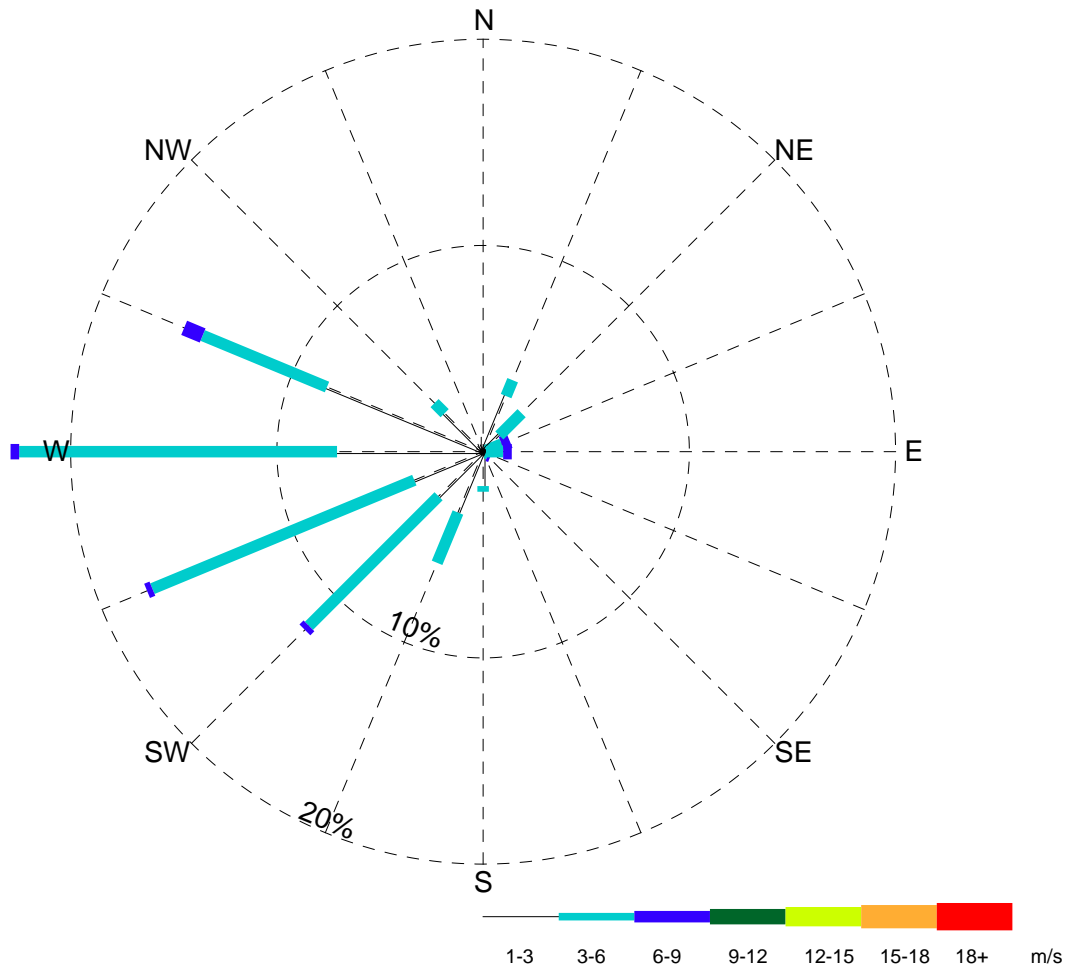
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Figure C-11



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: June 1, 2006
 End Date: June 30, 2006

Direction	Percent Occurrence (%)							Total (%)	
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s		18+ m/s
ENE	-	0.14	0.83	0.42	-	-	-	-	1.39
NE	-	1.11	1.53	-	-	-	-	-	2.64
NNE	-	2.92	0.83	-	-	-	-	-	3.75
N	-	0.69	-	-	-	-	-	-	0.69
NNW	-	0.42	-	-	-	-	-	-	0.42
NW	-	2.64	0.69	-	-	-	-	-	3.33
WNW	-	8.19	6.53	0.97	-	-	-	-	15.69
W	-	7.08	15.42	0.42	-	-	-	-	22.92
WSW	-	3.61	13.75	0.28	-	-	-	-	17.64
SW	-	3.06	8.89	0.28	-	-	-	-	12.22
SSW	-	3.19	2.64	-	-	-	-	-	5.83
S	-	1.67	0.28	-	-	-	-	-	1.94
SSE	-	0.28	-	-	-	-	-	-	0.28
SE	-	0.14	-	-	-	-	-	-	0.14
ESE	-	0.14	0.14	0.14	-	-	-	-	0.42
E	-	0.14	0.83	0.42	-	-	-	-	1.39
Calm	9.31	-	-	-	-	-	-	-	9.31
Total (%)	9.31	35.42	52.36	2.92	-	-	-	-	100.00

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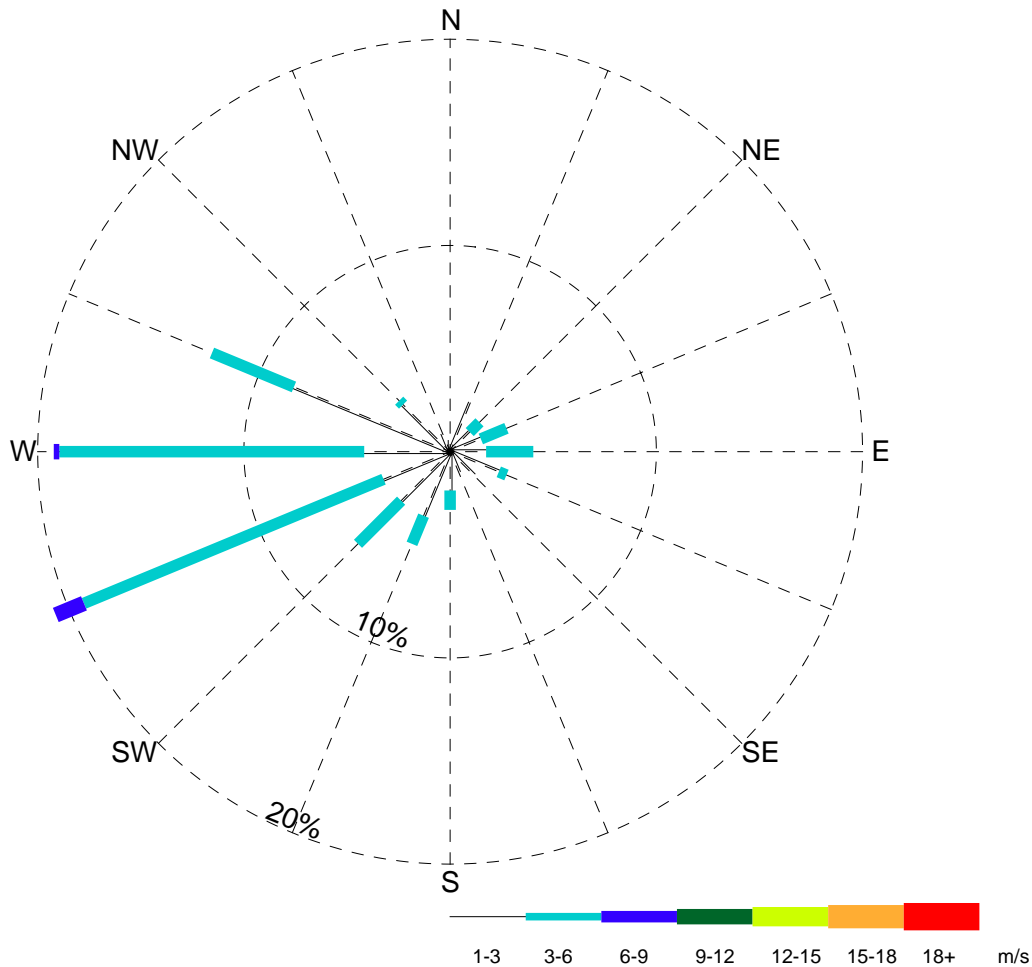
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Figure C-12



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: July 1, 2006
 End Date: July 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.61	1.34	-	-	-	-	-	2.96
NE	-	1.34	0.67	-	-	-	-	-	2.02
NNE	-	2.55	-	-	-	-	-	-	2.55
N	-	0.54	-	-	-	-	-	-	0.54
NNW	-	0.94	-	-	-	-	-	-	0.94
NW	-	3.23	0.27	-	-	-	-	-	3.49
WNW	-	8.20	4.30	-	-	-	-	-	12.50
W	-	4.17	14.78	0.27	-	-	-	-	19.22
WSW	-	3.49	15.73	1.48	-	-	-	-	20.70
SW	-	3.36	2.96	-	-	-	-	-	6.32
SSW	-	3.36	1.48	-	-	-	-	-	4.84
S	-	1.88	0.94	-	-	-	-	-	2.82
SSE	-	1.08	-	-	-	-	-	-	1.08
SE	-	1.61	-	-	-	-	-	-	1.61
ESE	-	2.55	0.40	-	-	-	-	-	2.96
E	-	1.75	2.29	-	-	-	-	-	4.03
Calm	11.43	-	-	-	-	-	-	-	11.43
Total (%)	11.43	41.67	45.16	1.75	-	-	-	-	100.00

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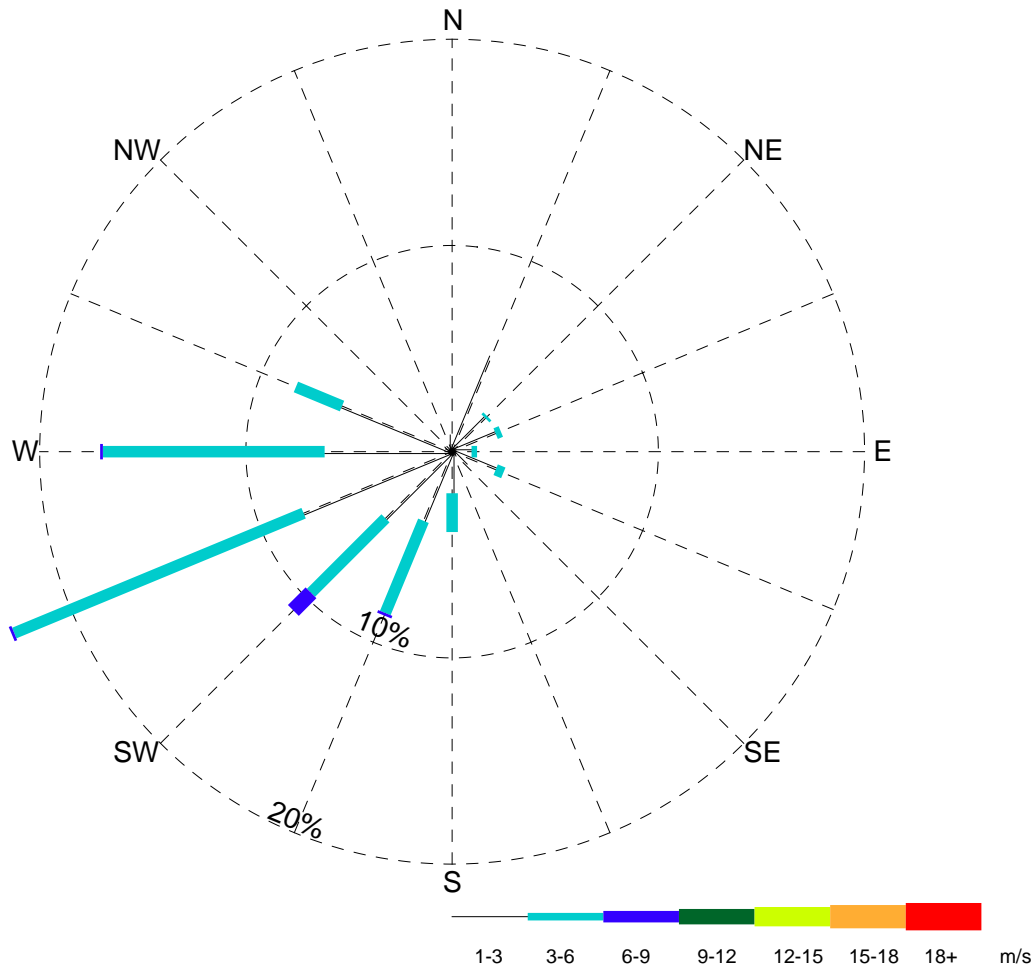
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Figure C-13



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: August 1, 2006
 End Date: August 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.29	0.27	-	-	-	-	-	2.55
NE	-	2.29	0.13	-	-	-	-	-	2.42
NNE	-	4.97	-	-	-	-	-	-	4.97
N	-	0.81	-	-	-	-	-	-	0.81
NNW	-	0.13	-	-	-	-	-	-	0.13
NW	-	0.40	-	-	-	-	-	-	0.40
WNW	-	5.78	2.42	-	-	-	-	-	8.20
W	-	6.18	10.75	0.13	-	-	-	-	17.07
WSW	-	7.80	15.19	0.13	-	-	-	-	23.12
SW	-	4.57	5.11	1.21	-	-	-	-	10.89
SSW	-	3.63	4.84	0.13	-	-	-	-	8.60
S	-	2.02	1.88	-	-	-	-	-	3.90
SSE	-	0.27	-	-	-	-	-	-	0.27
SE	-	0.94	-	-	-	-	-	-	0.94
ESE	-	2.29	0.40	-	-	-	-	-	2.69
E	-	0.94	0.27	-	-	-	-	-	1.21
Calm	11.83	-	-	-	-	-	-	-	11.83
Total (%)	11.83	45.30	41.26	1.61	-	-	-	-	100.00

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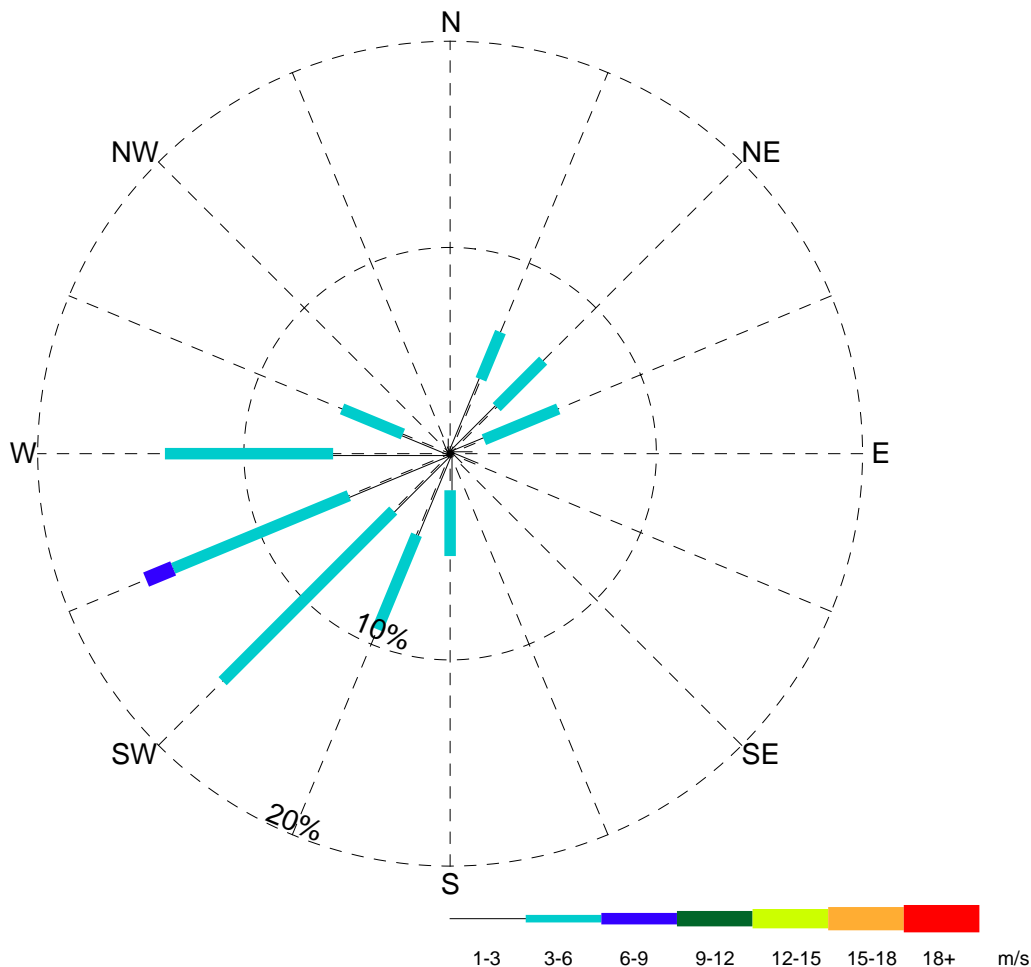
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Figure C-14



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.77	3.90	-	-	-	-	-	5.67
NE	-	3.19	3.19	-	-	-	-	-	6.38
NNE	-	3.90	2.48	-	-	-	-	-	6.38
N	-	0.71	-	-	-	-	-	-	0.71
NNW	-	0.71	-	-	-	-	-	-	0.71
NW	-	-	-	-	-	-	-	-	-
WNW	-	2.48	3.19	-	-	-	-	-	5.67
W	-	5.67	8.16	-	-	-	-	-	13.83
WSW	-	5.32	9.22	1.42	-	-	-	-	15.96
SW	-	3.90	11.70	-	-	-	-	-	15.60
SSW	-	4.26	4.97	-	-	-	-	-	9.22
S	-	1.77	3.19	-	-	-	-	-	4.97
SSE	-	-	-	-	-	-	-	-	-
SE	-	0.71	-	-	-	-	-	-	0.71
ESE	-	1.42	-	-	-	-	-	-	1.42
E	-	1.06	-	-	-	-	-	-	1.06
Calm	11.70	-	-	-	-	-	-	-	11.70
Total (%)	11.70	36.88	50.00	1.42	-	-	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 12 days
 Start Date: September 1, 2006
 End Date: September 30, 2006

NOTES

Data not available from
 September 13 to 30, 2006

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 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Wind Rose
 September 2006**

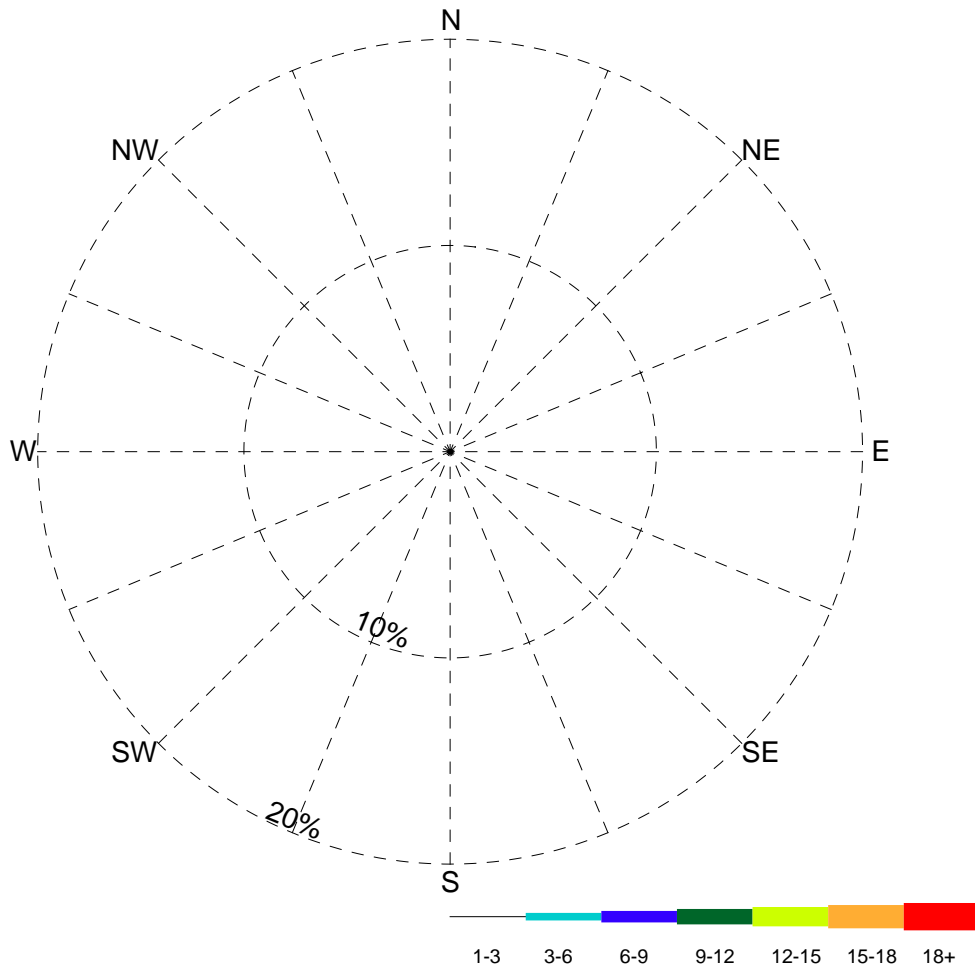
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Figure C-15



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 0 days
 Start Date: October 1, 2006
 End Date: October 31, 2006

Direction	Percent Occurrence (%)							Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	
ENE	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-
N	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-
Calm	-	-	-	-	-	-	-	-
Total (%)	-	-	-	-	-	-	-	-

NOTES

Data not available from
 October 1 to 31, 2006

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**Mactung Station
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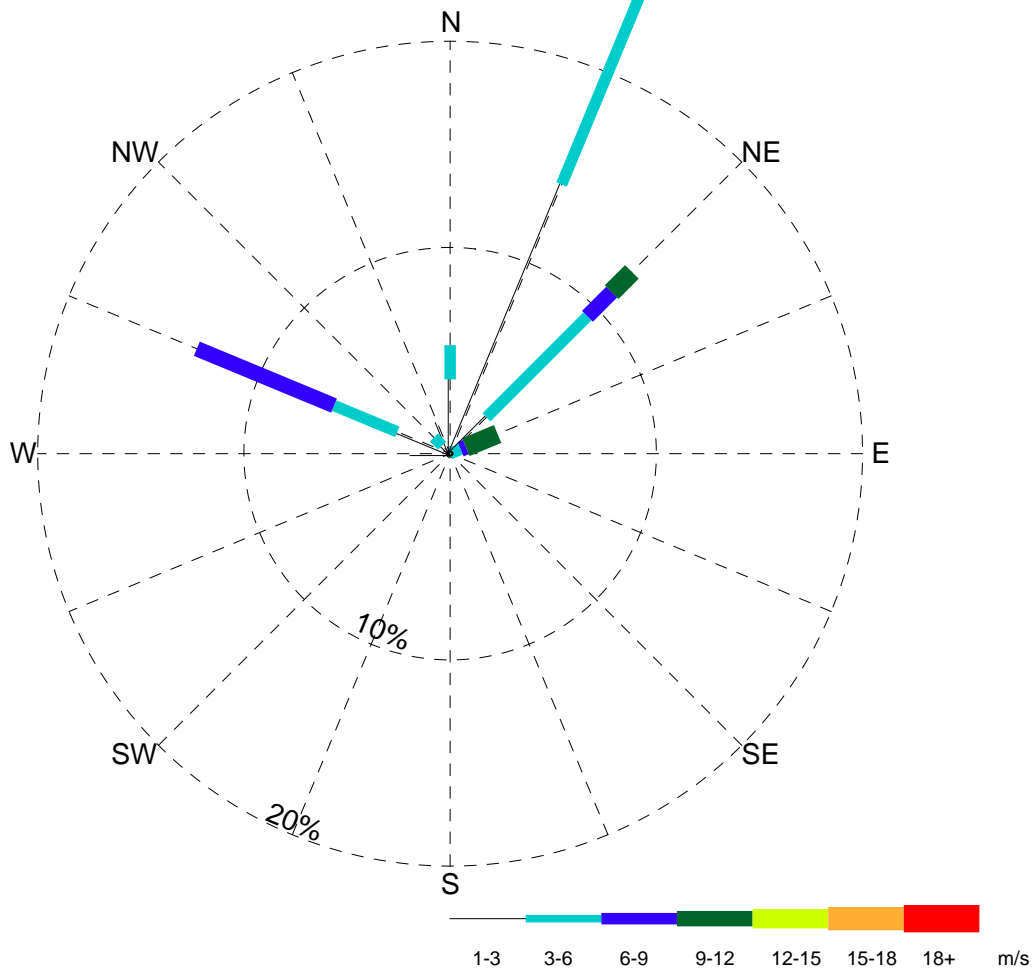


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Figure C-16



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	-	0.55	0.28	1.66	-	-	-	2.49
NE	-	2.49	6.93	1.66	1.38	-	-	-	12.47
NNE	-	14.13	18.28	2.22	-	-	-	-	34.63
N	-	3.60	1.66	-	-	-	-	-	5.26
NNW	-	1.66	-	-	-	-	-	-	1.66
NW	-	0.55	0.55	-	-	-	-	-	1.11
WNW	-	2.77	3.32	7.20	-	-	-	-	13.30
W	-	1.94	-	-	-	-	-	-	1.94
WSW	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	27.15	-	-	-	-	-	-	-	27.15
Total (%)	27.15	27.15	31.30	11.36	3.05	-	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 15 days
 Start Date: November 1, 2006
 End Date: November 30, 2006

NOTES

Data not available from
 November 1 to 15, 2006

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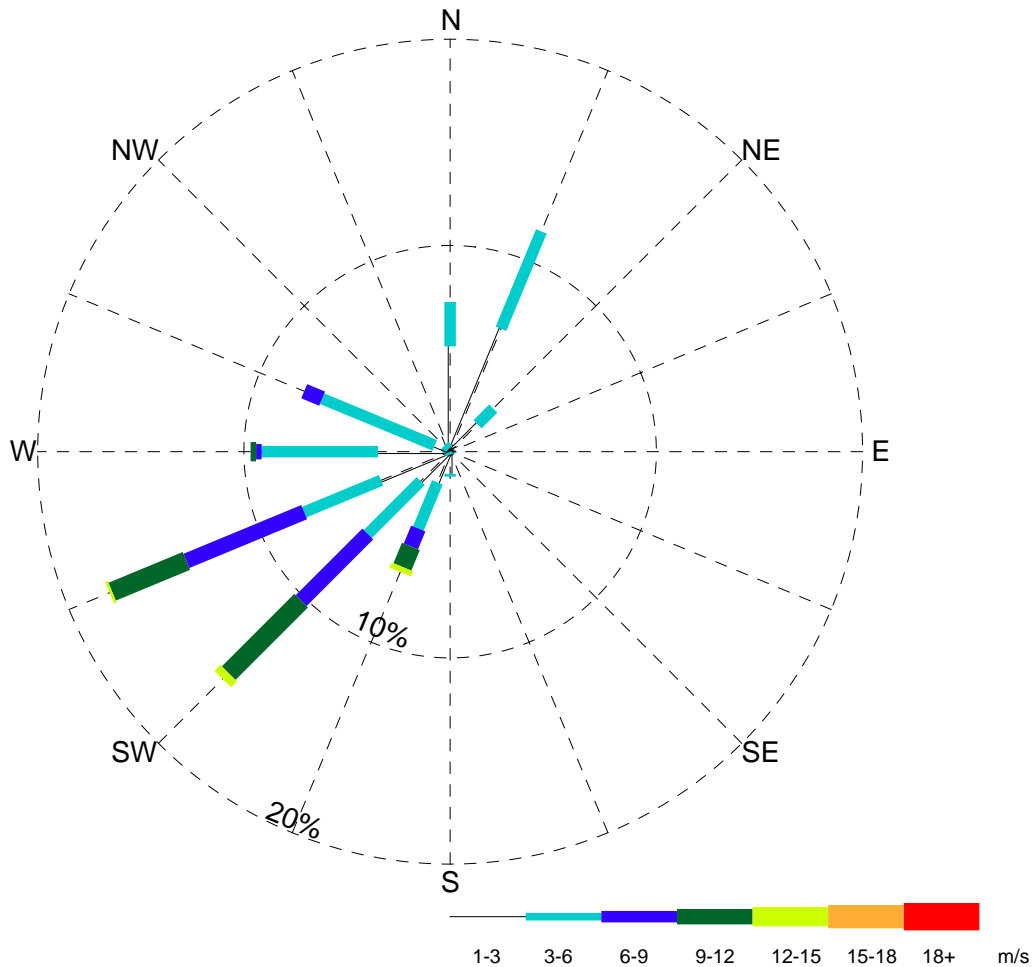
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Figure C-17



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: December 1, 2006
 End Date: December 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.40	-	-	-	-	-	-	0.40
NE	-	1.88	1.08	-	-	-	-	-	2.96
NNE	-	6.45	5.11	-	-	-	-	-	11.56
N	-	5.11	2.15	-	-	-	-	-	7.26
NNW	-	0.81	-	-	-	-	-	-	0.81
NW	-	0.13	0.27	-	-	-	-	-	0.40
WNW	-	0.81	5.91	0.94	-	-	-	-	7.66
W	-	3.49	5.64	0.27	0.27	-	-	-	9.68
WSW	-	3.63	4.03	6.18	3.90	0.13	-	-	17.88
SW	-	2.02	3.63	4.57	4.97	0.40	-	-	15.59
SSW	-	1.61	2.42	0.94	1.08	0.27	-	-	6.32
S	-	1.08	0.13	-	-	-	-	-	1.21
SSE	-	-	0.13	-	-	-	-	-	0.13
SE	-	0.13	-	-	-	-	-	-	0.13
ESE	-	0.27	-	-	-	-	-	-	0.27
E	-	0.13	-	-	-	-	-	-	0.13
Calm	17.61	-	-	-	-	-	-	-	17.61
Total (%)	17.61	27.96	30.51	12.90	10.22	0.81	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
December 2006**

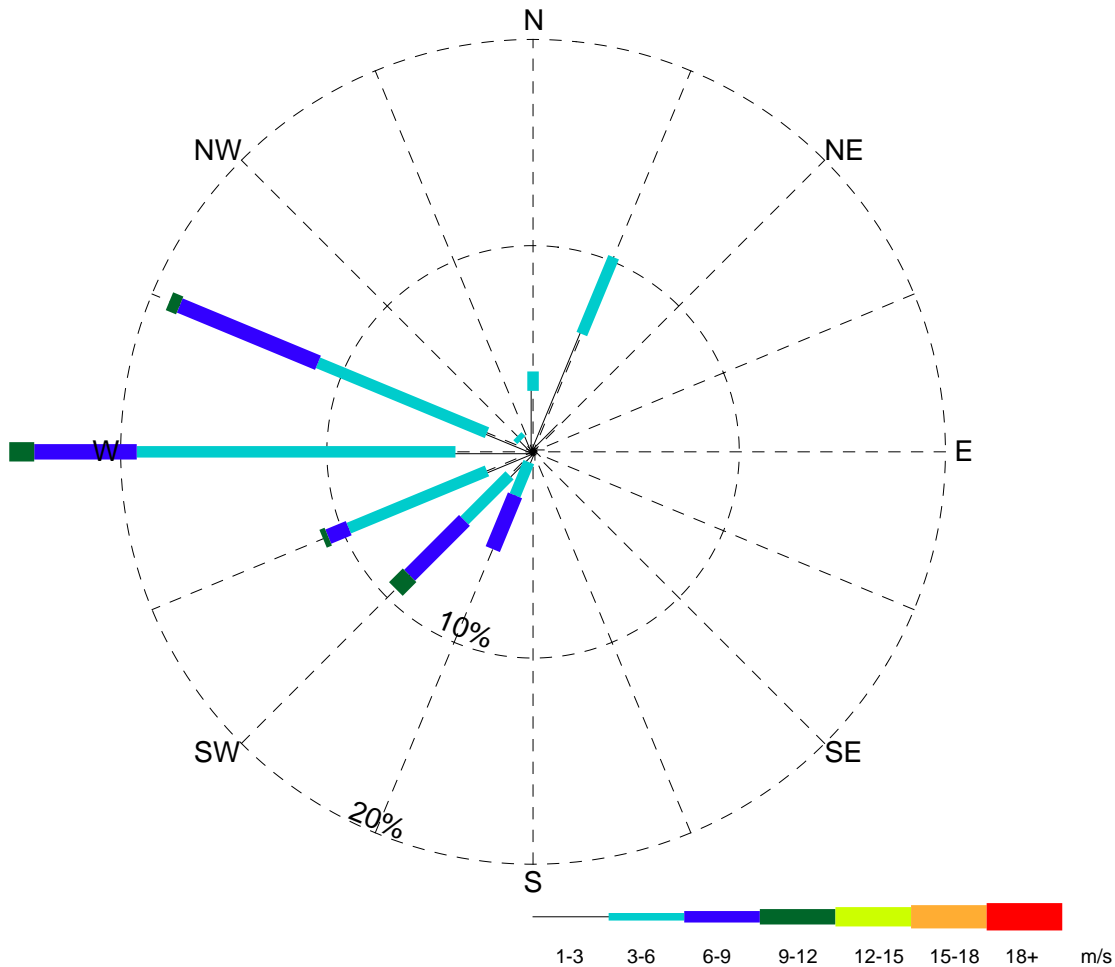
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Figure C-18



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: January 1, 2007
 End Date: January 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.27	-	-	-	-	-	-	0.27
NE	-	1.75	-	-	-	-	-	-	1.75
NNE	-	6.18	4.03	-	-	-	-	-	10.22
N	-	2.96	0.94	-	-	-	-	-	3.90
NNW	-	0.81	-	-	-	-	-	-	0.81
NW	-	0.81	0.27	-	-	-	-	-	1.08
WNW	-	2.42	8.87	7.26	0.54	-	-	-	19.09
W	-	3.76	15.46	4.97	1.21	-	-	-	25.40
WSW	-	2.42	7.26	1.08	0.27	-	-	-	11.02
SW	-	1.61	3.09	3.76	0.94	-	-	-	9.41
SSW	-	0.54	1.75	2.82	-	-	-	-	5.11
S	-	0.40	-	-	-	-	-	-	0.40
SSE	-	-	-	-	-	-	-	-	-
SE	-	0.40	-	-	-	-	-	-	0.40
ESE	-	0.13	-	-	-	-	-	-	0.13
E	-	0.54	-	-	-	-	-	-	0.54
Calm	10.48	-	-	-	-	-	-	-	10.48
Total (%)	10.48	25.00	41.67	19.89	2.96	-	-	-	100.00

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January 2007**

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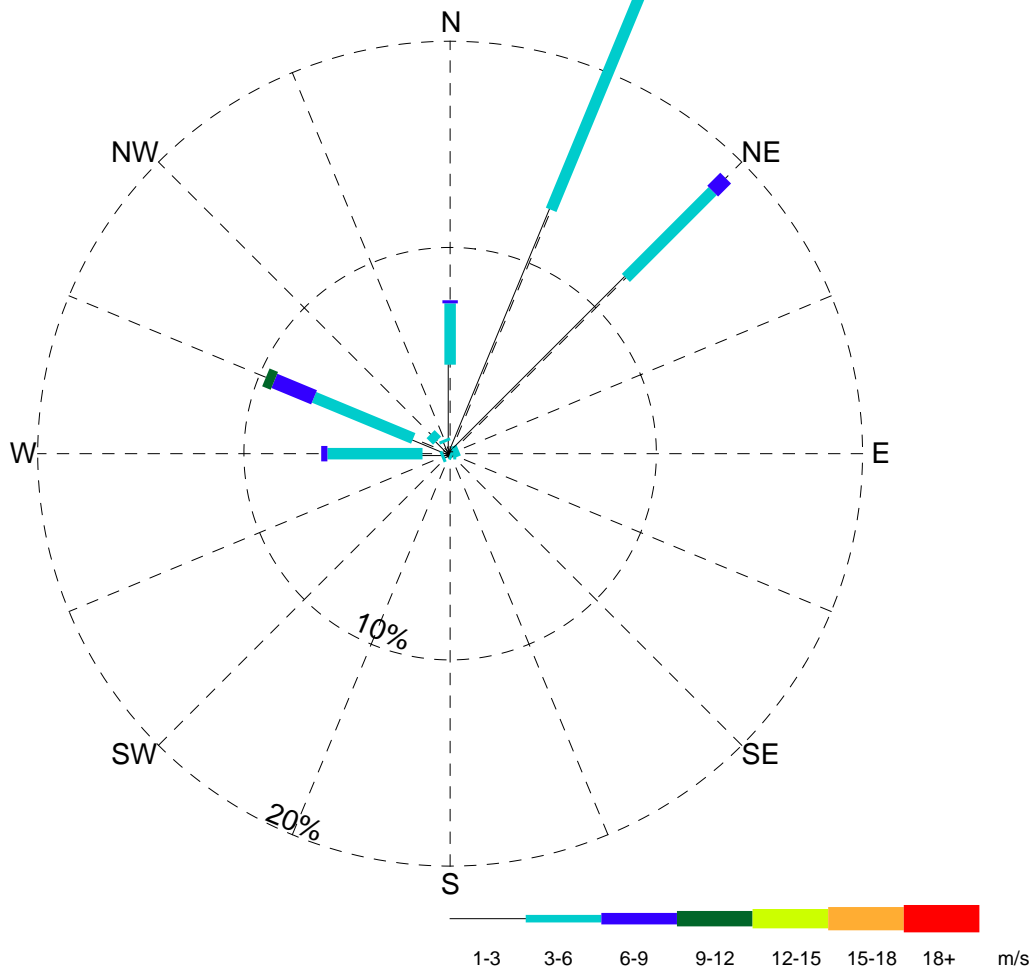


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Figure C-19



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.15	0.30	-	-	-	-	-	0.45
NE	-	12.05	5.95	0.89	-	-	-	-	18.90
NNE	-	12.80	18.90	0.45	-	-	-	-	32.14
N	-	4.32	2.98	0.15	-	-	-	-	7.44
NNW	-	0.60	0.15	-	-	-	-	-	0.74
NW	-	0.89	0.45	-	-	-	-	-	1.34
WNW	-	1.93	5.21	2.08	0.45	-	-	-	9.67
W	-	1.34	4.61	0.30	-	-	-	-	6.25
WSW	-	0.30	0.15	-	-	-	-	-	0.45
SW	-	-	-	-	-	-	-	-	-
SSW	-	0.15	-	-	-	-	-	-	0.15
S	-	0.15	-	-	-	-	-	-	0.15
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	0.15	-	-	-	-	-	0.15
E	-	0.15	0.15	-	-	-	-	-	0.30
Calm	21.88	-	-	-	-	-	-	-	21.88
Total (%)	21.88	34.82	38.99	3.87	0.45	-	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 28 days
 Start Date: February 1, 2007
 End Date: February 28, 2007

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
February 2007**

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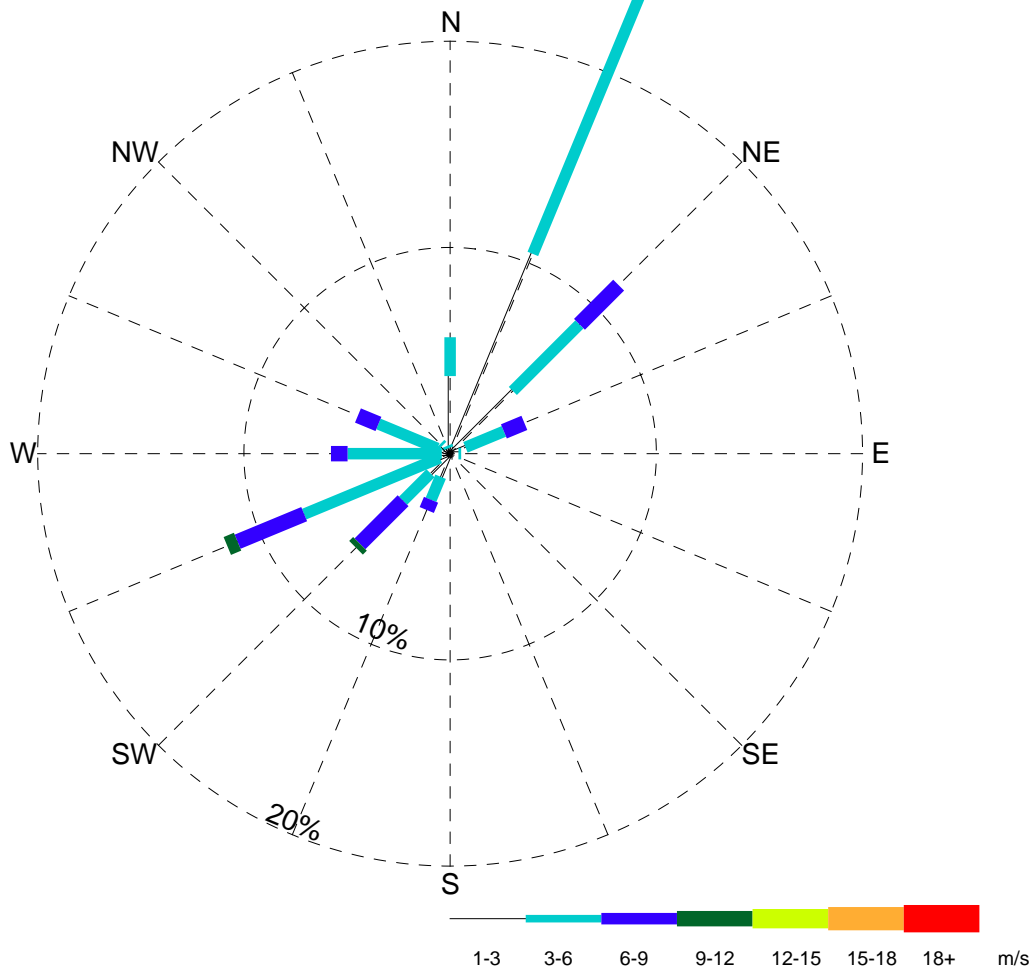


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Figure C-20



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: March 1, 2007
 End Date: March 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.81	2.02	1.08	-	-	-	-	3.90
NE	-	4.30	4.57	2.69	-	-	-	-	11.56
NNE	-	10.48	24.60	1.34	-	-	-	-	36.42
N	-	3.76	1.88	-	-	-	-	-	5.64
NNW	-	0.27	0.13	-	-	-	-	-	0.40
NW	-	0.54	0.13	-	-	-	-	-	0.67
WNW	-	0.67	3.09	1.08	-	-	-	-	4.84
W	-	0.40	4.57	0.81	-	-	-	-	5.78
WSW	-	0.54	7.12	3.49	0.54	-	-	-	11.69
SW	-	1.34	1.88	2.96	0.27	-	-	-	6.45
SSW	-	1.21	1.21	0.54	-	-	-	-	2.96
S	-	0.27	-	-	-	-	-	-	0.27
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	0.40	0.13	-	-	-	-	-	0.54
Calm	8.87	-	-	-	-	-	-	-	8.87
Total (%)	8.87	25.00	51.34	13.98	0.81	-	-	-	100.00

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**MACTUNG PROJECT
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**Mactung Station
Wind Rose
March 2007**

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PROJECT NO.

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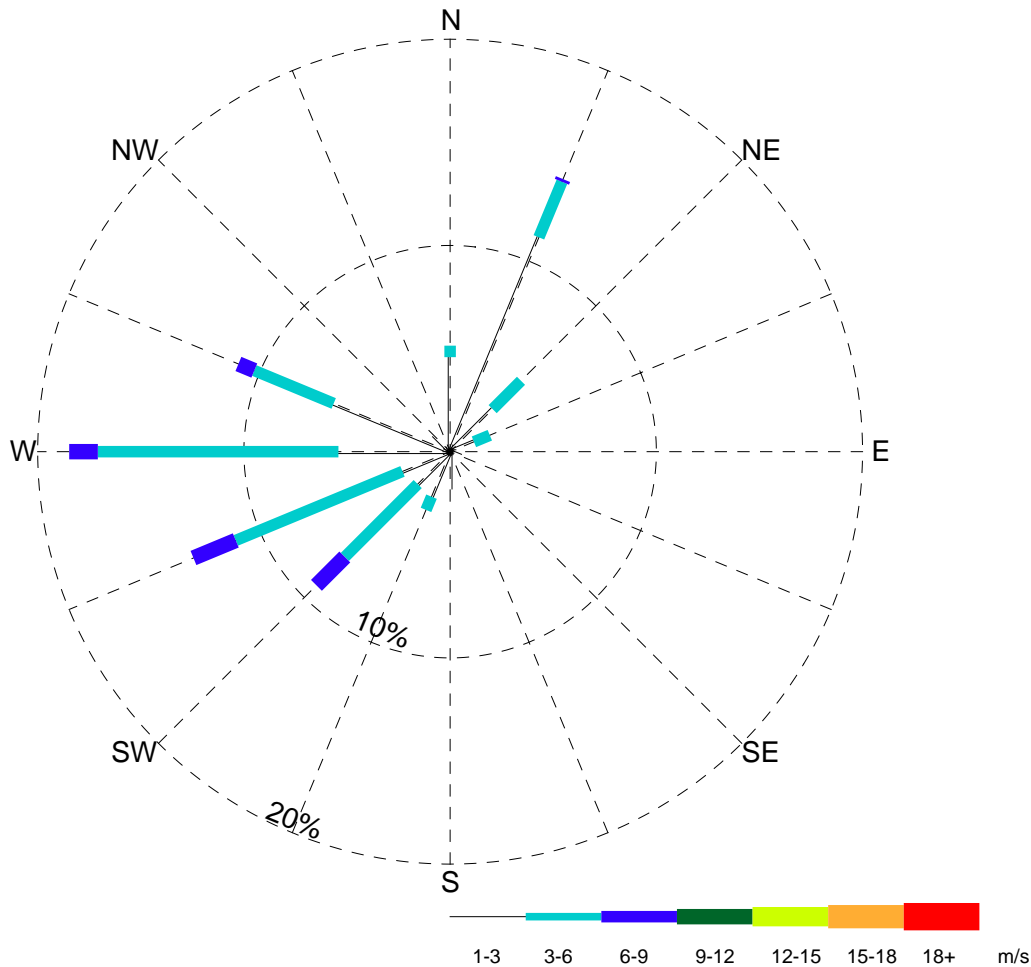
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Figure C-21



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: April 1, 2007
 End Date: April 30, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.25	0.83	-	-	-	-	-	2.08
NE	-	2.92	1.94	-	-	-	-	-	4.86
NNE	-	11.25	2.92	0.14	-	-	-	-	14.31
N	-	4.58	0.56	-	-	-	-	-	5.14
NNW	-	0.28	-	-	-	-	-	-	0.28
NW	-	1.11	-	-	-	-	-	-	1.11
WNW	-	6.11	4.17	0.83	-	-	-	-	11.11
W	-	5.42	11.67	1.39	-	-	-	-	18.47
WSW	-	2.50	8.75	2.22	-	-	-	-	13.47
SW	-	2.22	5.00	1.94	-	-	-	-	9.17
SSW	-	2.36	0.69	-	-	-	-	-	3.06
S	-	1.81	-	-	-	-	-	-	1.81
SSE	-	0.14	-	-	-	-	-	-	0.14
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.56	-	-	-	-	-	-	0.56
E	-	0.28	-	-	-	-	-	-	0.28
Calm	14.17	-	-	-	-	-	-	-	14.17
Total (%)	14.17	42.78	36.53	6.53	-	-	-	-	100.00

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**MACTUNG PROJECT
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**Mactung Station
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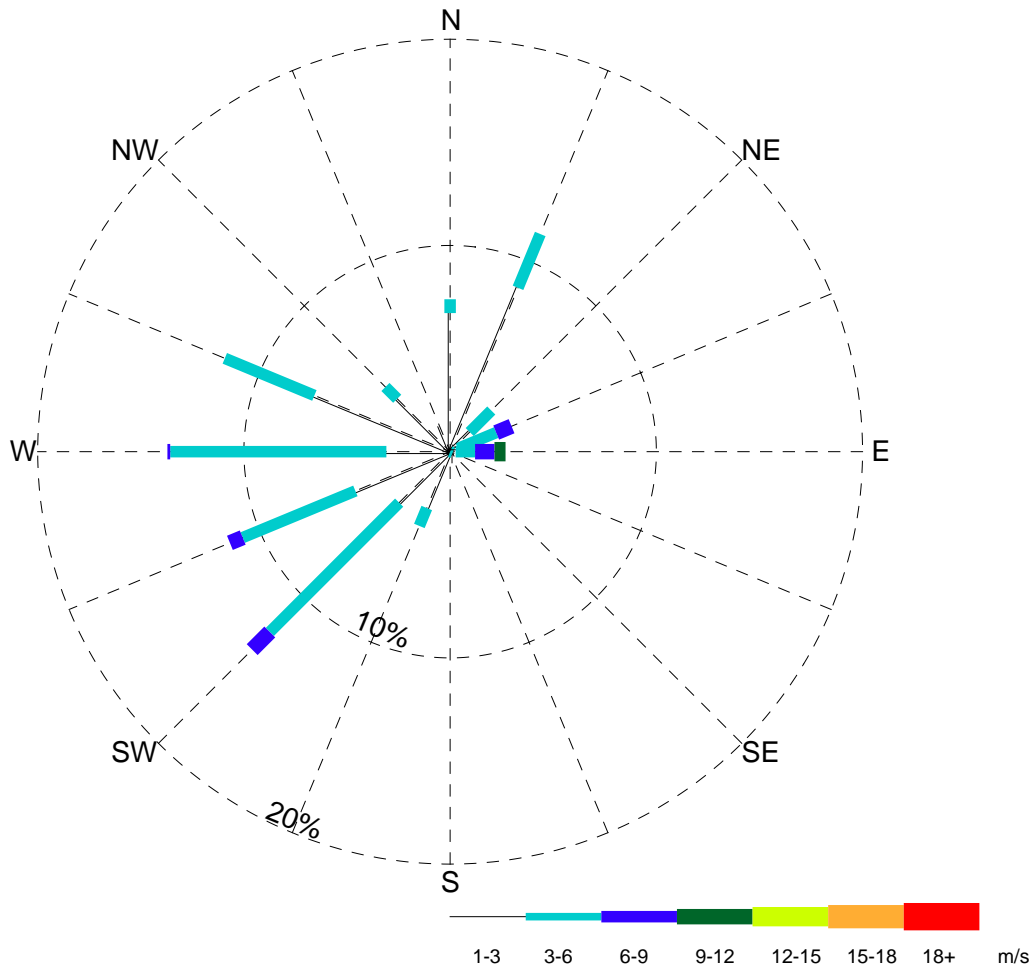


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Figure C-22



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: May 1, 2007
 End Date: May 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.40	2.02	0.81	-	-	-	-	3.23
NE	-	1.34	1.48	-	-	-	-	-	2.82
NNE	-	8.60	2.82	-	-	-	-	-	11.43
N	-	6.72	0.67	-	-	-	-	-	7.39
NNW	-	1.34	-	-	-	-	-	-	1.34
NW	-	3.63	0.81	-	-	-	-	-	4.43
WNW	-	7.12	4.70	-	-	-	-	-	11.83
W	-	3.09	10.48	0.13	-	-	-	-	13.71
WSW	-	4.97	5.91	0.67	-	-	-	-	11.56
SW	-	3.49	8.87	1.21	-	-	-	-	13.57
SSW	-	2.96	0.94	-	-	-	-	-	3.90
S	-	0.54	-	-	-	-	-	-	0.54
SSE	-	0.27	-	-	-	-	-	-	0.27
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	0.13	-	-	-	-	-	0.13
E	-	0.27	0.94	0.94	0.54	-	-	-	2.69
Calm	11.16	-	-	-	-	-	-	-	11.16
Total (%)	11.16	44.76	39.78	3.76	0.54	-	-	-	100.00

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
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May 2007**

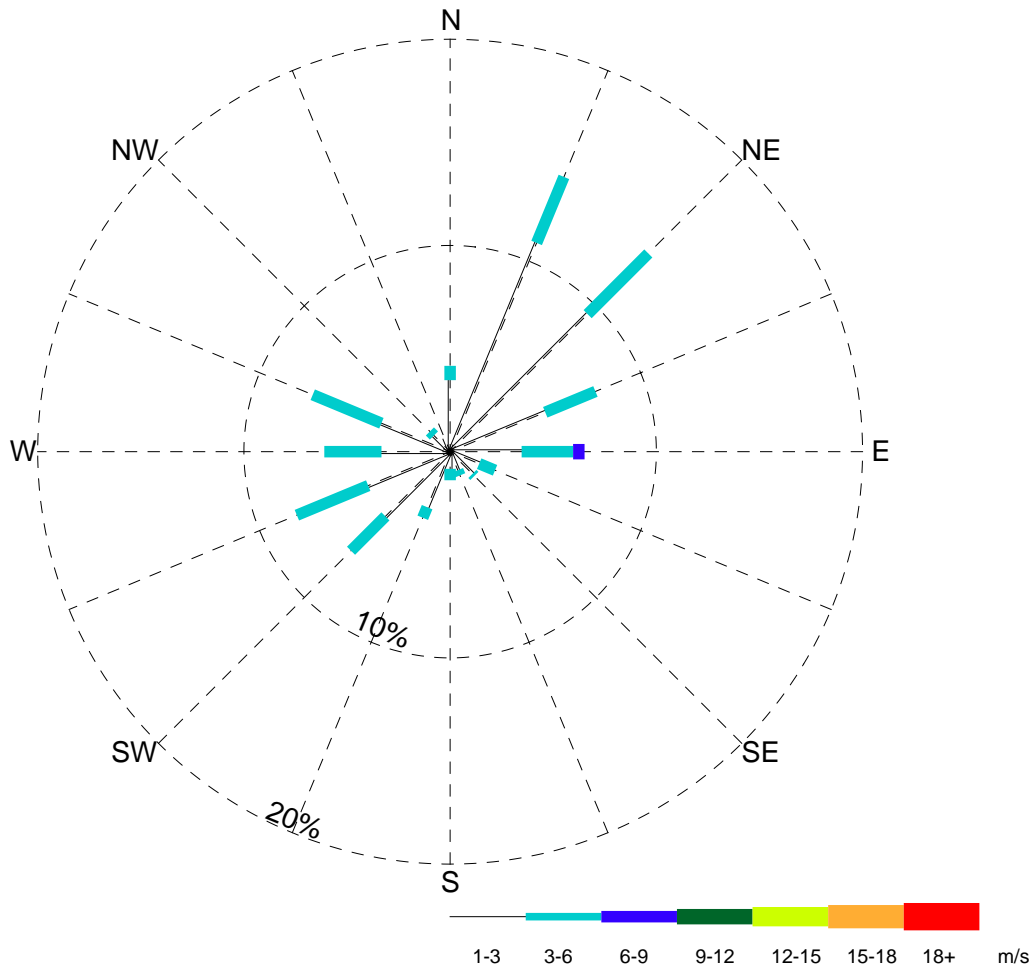
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Figure C-23



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: June 1, 2007
 End Date: June 30, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.99	2.63	-	-	-	-	-	7.63
NE	-	9.43	4.16	-	-	-	-	-	13.59
NNE	-	10.96	3.47	-	-	-	-	-	14.42
N	-	3.47	0.69	-	-	-	-	-	4.16
NNW	-	0.69	-	-	-	-	-	-	0.69
NW	-	1.11	0.28	-	-	-	-	-	1.39
WNW	-	3.61	3.61	-	-	-	-	-	7.21
W	-	3.33	2.77	-	-	-	-	-	6.10
WSW	-	4.30	3.74	-	-	-	-	-	8.04
SW	-	4.44	2.36	-	-	-	-	-	6.80
SSW	-	2.91	0.56	-	-	-	-	-	3.47
S	-	0.83	0.56	-	-	-	-	-	1.39
SSE	-	0.97	0.28	-	-	-	-	-	1.25
SE	-	1.53	0.14	-	-	-	-	-	1.66
ESE	-	1.53	0.83	-	-	-	-	-	2.36
E	-	3.47	2.50	0.56	-	-	-	-	6.52
Calm	13.31	-	-	-	-	-	-	-	13.31
Total (%)	13.31	57.56	28.57	0.56	-	-	-	-	100.00

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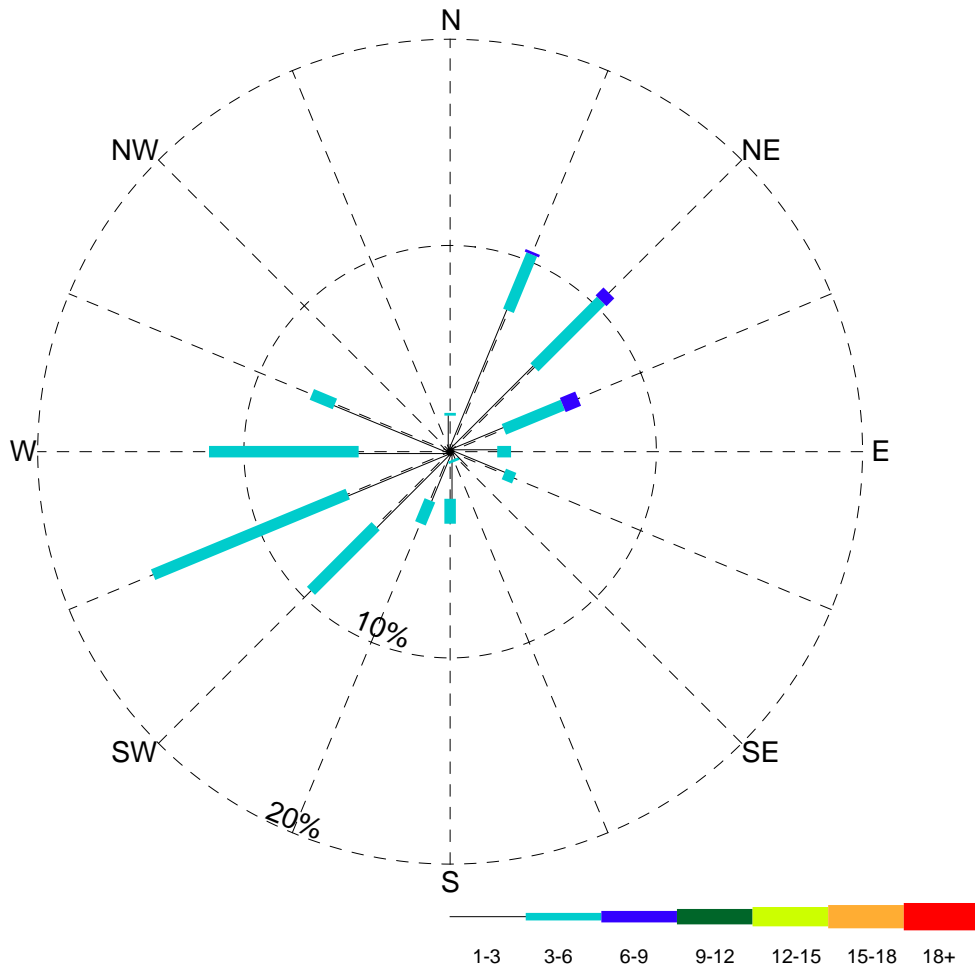
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Figure C-24



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: July 1, 2007
 End Date: July 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.82	3.09	0.81	-	-	-	-	6.72
NE	-	5.78	4.57	0.54	-	-	-	-	10.89
NNE	-	7.39	2.96	0.13	-	-	-	-	10.48
N	-	1.75	0.13	-	-	-	-	-	1.88
NNW	-	0.13	-	-	-	-	-	-	0.13
NW	-	0.54	-	-	-	-	-	-	0.54
WNW	-	6.05	1.21	-	-	-	-	-	7.26
W	-	4.43	7.26	-	-	-	-	-	11.69
WSW	-	5.38	10.22	-	-	-	-	-	15.59
SW	-	5.11	4.43	-	-	-	-	-	9.54
SSW	-	2.55	1.21	-	-	-	-	-	3.76
S	-	2.29	1.21	-	-	-	-	-	3.49
SSE	-	0.40	0.13	-	-	-	-	-	0.54
SE	-	1.08	-	-	-	-	-	-	1.08
ESE	-	2.82	0.54	-	-	-	-	-	3.36
E	-	2.29	0.67	-	-	-	-	-	2.96
Calm	10.08	-	-	-	-	-	-	-	10.08
Total (%)	10.08	50.81	37.63	1.48	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
July 2007**

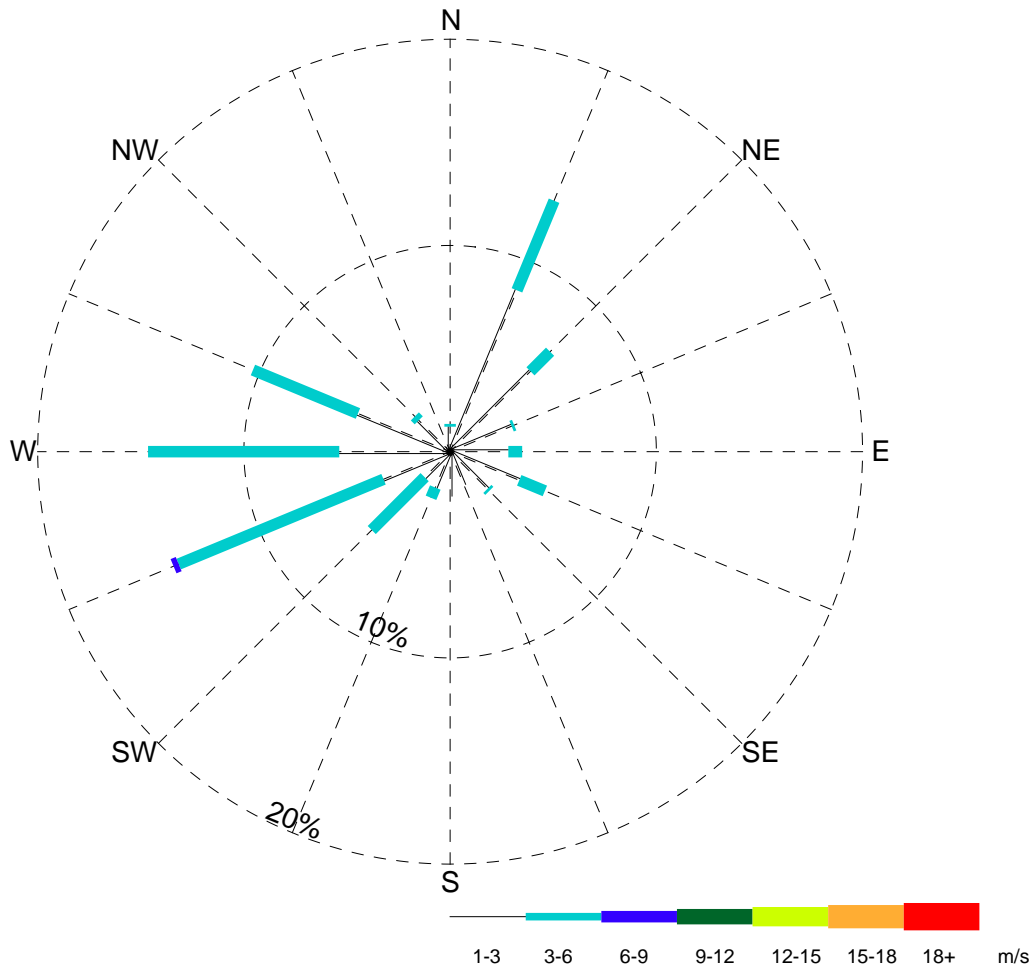
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Figure C-25



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: August 1, 2007
 End Date: August 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.23	0.13	-	-	-	-	-	3.36
NE	-	5.51	1.34	-	-	-	-	-	6.86
NNE	-	8.47	4.70	-	-	-	-	-	13.17
N	-	1.21	0.13	-	-	-	-	-	1.34
NNW	-	0.27	-	-	-	-	-	-	0.27
NW	-	2.15	0.27	-	-	-	-	-	2.42
WNW	-	4.84	5.51	-	-	-	-	-	10.35
W	-	5.38	9.27	-	-	-	-	-	14.65
WSW	-	3.49	10.75	0.27	-	-	-	-	14.52
SW	-	1.75	3.63	-	-	-	-	-	5.38
SSW	-	1.88	0.54	-	-	-	-	-	2.42
S	-	2.15	-	-	-	-	-	-	2.15
SSE	-	1.75	-	-	-	-	-	-	1.75
SE	-	2.55	0.13	-	-	-	-	-	2.69
ESE	-	3.63	1.34	-	-	-	-	-	4.97
E	-	2.82	0.67	-	-	-	-	-	3.49
Calm	10.22	-	-	-	-	-	-	-	10.22
Total (%)	10.22	51.08	38.44	0.27	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
August 2007**

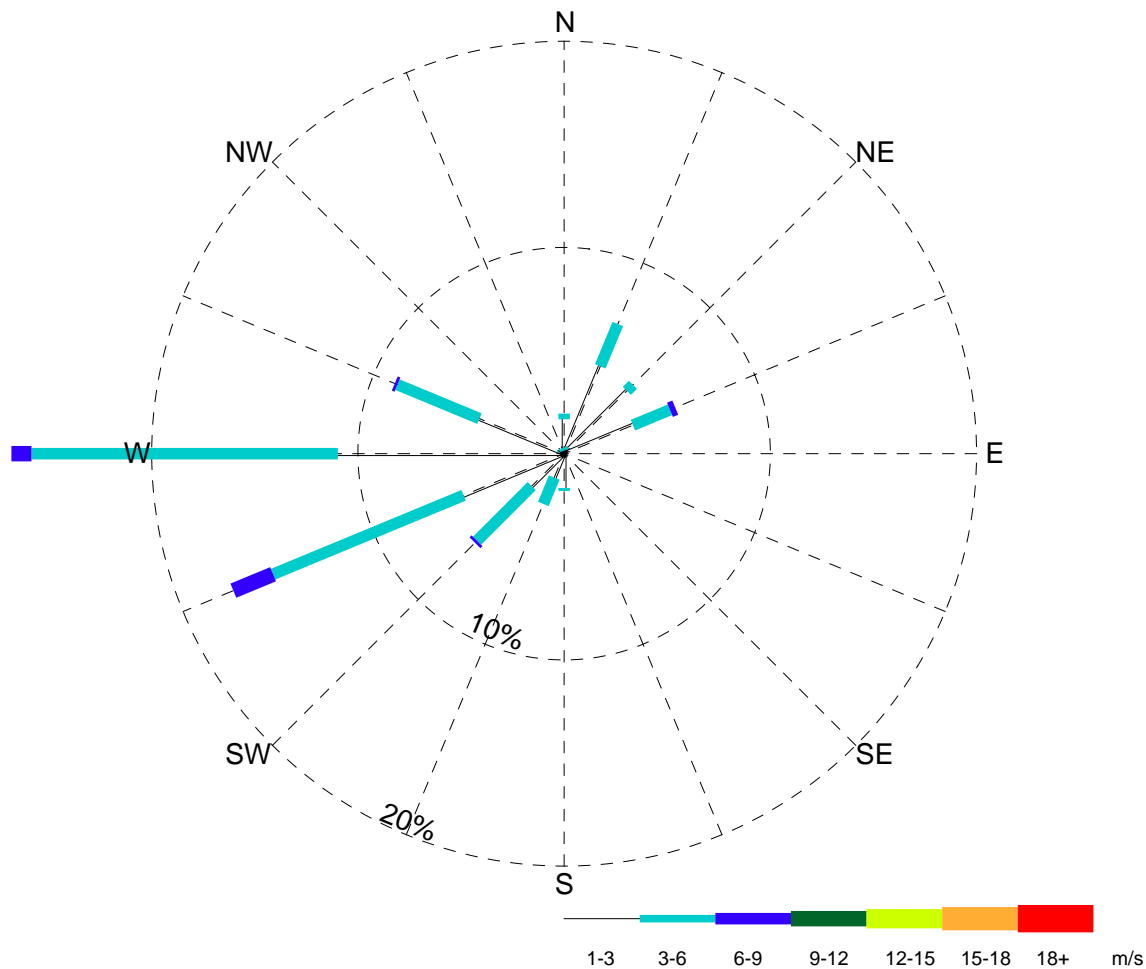
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Figure C-26



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: September 1, 2007
 End Date: September 30, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.61	1.94	0.28	-	-	-	-	5.83
NE	-	4.31	0.42	-	-	-	-	-	4.72
NNE	-	4.58	2.22	-	-	-	-	-	6.81
N	-	1.67	0.28	-	-	-	-	-	1.94
NNW	-	0.14	0.14	-	-	-	-	-	0.28
NW	-	0.28	-	-	-	-	-	-	0.28
WNW	-	4.44	4.31	0.14	-	-	-	-	8.89
W	-	10.97	14.86	0.97	-	-	-	-	26.81
WSW	-	5.28	10.00	2.08	-	-	-	-	17.36
SW	-	2.22	3.75	0.14	-	-	-	-	6.11
SSW	-	1.25	1.39	-	-	-	-	-	2.64
S	-	1.67	0.14	-	-	-	-	-	1.81
SSE	-	0.14	-	-	-	-	-	-	0.14
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.14	-	-	-	-	-	-	0.14
E	-	0.28	-	-	-	-	-	-	0.28
Calm	15.97	-	-	-	-	-	-	-	15.97
Total (%)	15.97	40.97	39.44	3.61	-	-	-	-	100.00

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
September 2007**

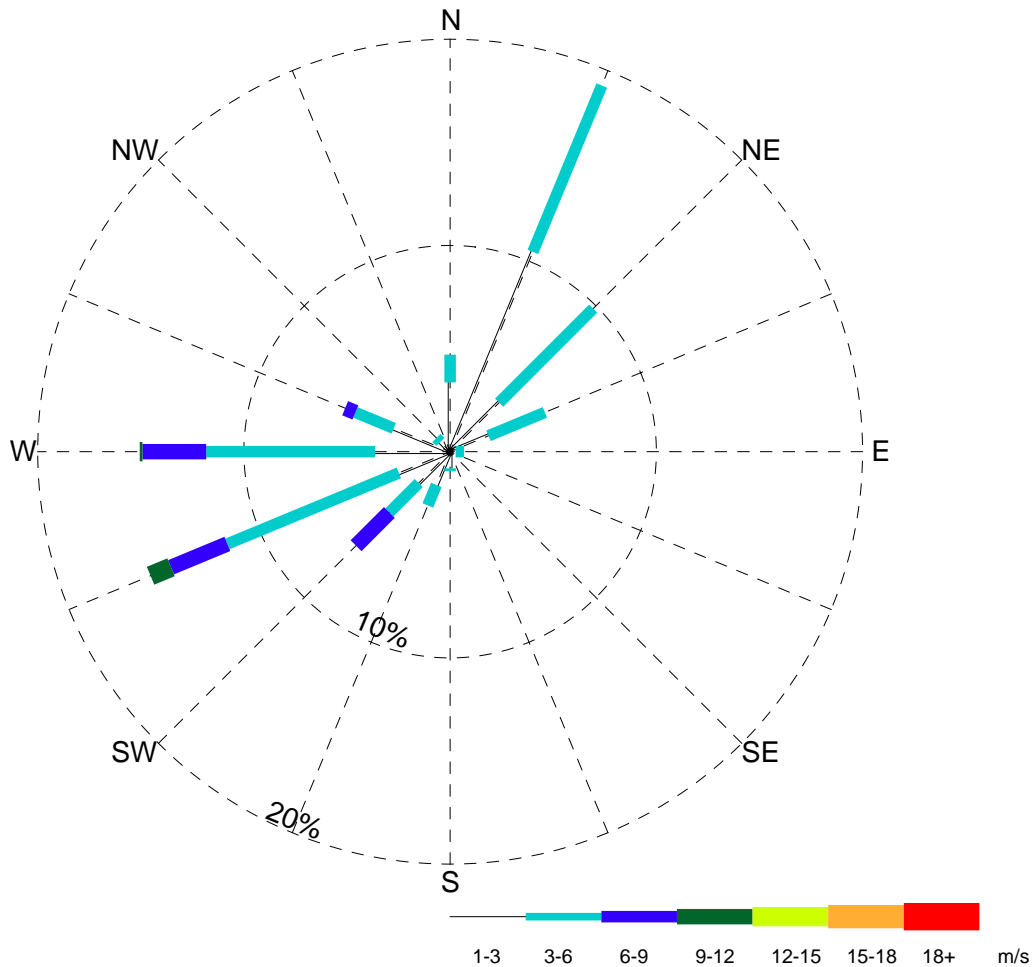
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Figure C-27



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.02	2.96	-	-	-	-	-	4.97
NE	-	3.36	6.45	-	-	-	-	-	9.81
NNE	-	10.48	8.74	-	-	-	-	-	19.22
N	-	3.36	1.34	-	-	-	-	-	4.70
NNW	-	0.54	-	-	-	-	-	-	0.54
NW	-	0.67	0.27	-	-	-	-	-	0.94
WNW	-	2.96	2.02	0.54	-	-	-	-	5.51
W	-	3.63	8.20	3.09	0.13	-	-	-	15.05
WSW	-	2.69	9.01	2.96	1.08	-	-	-	15.73
SW	-	2.15	2.02	2.29	-	-	-	-	6.45
SSW	-	1.75	1.08	-	-	-	-	-	2.82
S	-	0.81	0.13	-	-	-	-	-	0.94
SSE	-	0.13	-	-	-	-	-	-	0.13
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	0.27	0.40	-	-	-	-	-	0.67
Calm	12.50	-	-	-	-	-	-	-	12.50
Total (%)	12.50	34.81	42.61	8.87	1.21	-	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: October 1, 2007
 End Date: October 31, 2007

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
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October 2007**

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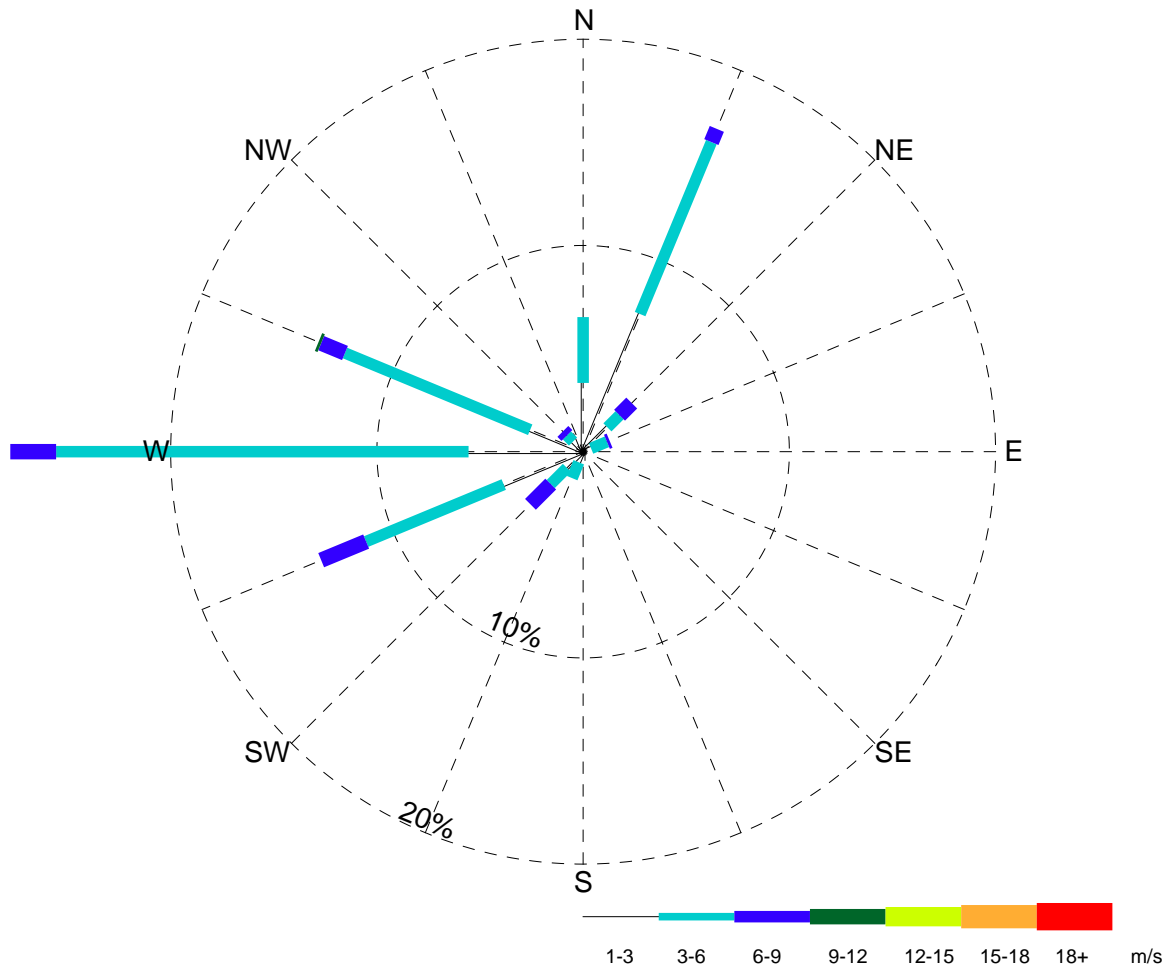
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Figure C-28



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: November 1, 2007
 End Date: November 30, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.42	0.83	0.14	-	-	-	-	1.39
NE	-	1.67	0.83	0.83	-	-	-	-	3.33
NNE	-	7.22	9.03	0.69	-	-	-	-	16.94
N	-	3.33	3.19	-	-	-	-	-	6.53
NNW	-	0.97	-	-	-	-	-	-	0.97
NW	-	0.69	0.42	0.28	-	-	-	-	1.39
WNW	-	2.78	9.72	1.25	0.14	-	-	-	13.89
W	-	5.56	20.00	2.22	-	-	-	-	27.78
WSW	-	4.17	7.22	2.36	-	-	-	-	13.75
SW	-	1.11	1.11	1.39	-	-	-	-	3.61
SSW	-	0.56	0.83	-	-	-	-	-	1.39
S	-	0.42	-	-	-	-	-	-	0.42
SSE	-	0.14	-	-	-	-	-	-	0.14
SE	-	0.14	-	-	-	-	-	-	0.14
ESE	-	-	-	-	-	-	-	-	-
E	-	0.14	-	-	-	-	-	-	0.14
Calm	8.19	-	-	-	-	-	-	-	8.19
Total (%)	8.19	29.31	53.19	9.17	0.14	-	-	-	100.00

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
November 2007**

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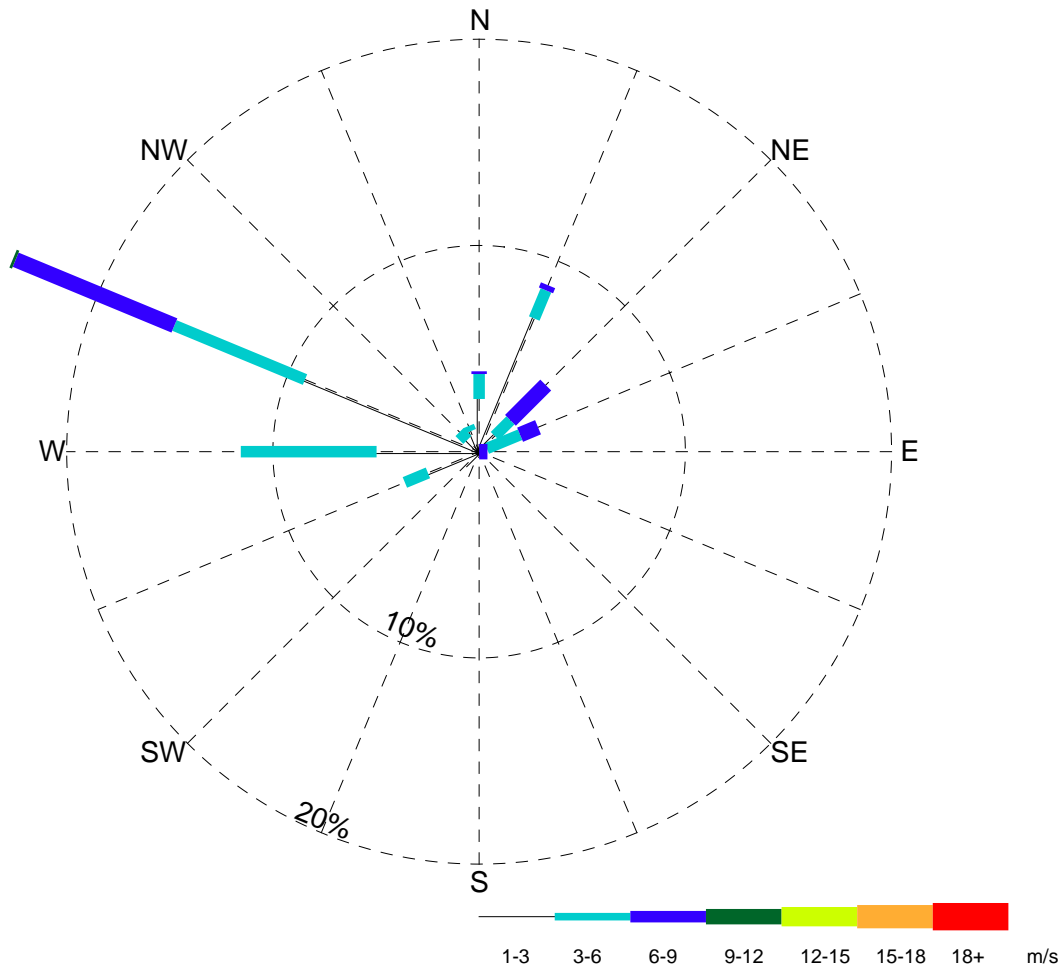
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Figure C-29



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: December 1, 2007
 End Date: December 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.40	1.75	0.94	-	-	-	-	3.09
NE	-	1.08	1.08	2.42	-	-	-	-	4.57
NNE	-	6.99	1.48	0.27	-	-	-	-	8.74
N	-	2.55	1.21	0.13	-	-	-	-	3.90
NNW	-	1.08	0.27	-	-	-	-	-	1.34
NW	-	0.81	0.54	-	-	-	-	-	1.34
WNW	-	9.14	6.86	8.33	0.13	-	-	-	24.46
W	-	4.97	6.59	-	-	-	-	-	11.56
WSW	-	2.69	1.21	-	-	-	-	-	3.90
SW	-	0.94	-	-	-	-	-	-	0.94
SSW	-	0.27	-	-	-	-	-	-	0.27
S	-	0.13	-	-	-	-	-	-	0.13
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	0.40	-	-	-	-	0.40
Calm	35.35	-	-	-	-	-	-	-	35.35
Total (%)	35.35	31.05	20.97	12.50	0.13	-	-	-	100.00

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**Mactung Station
Wind Rose
December 2007**

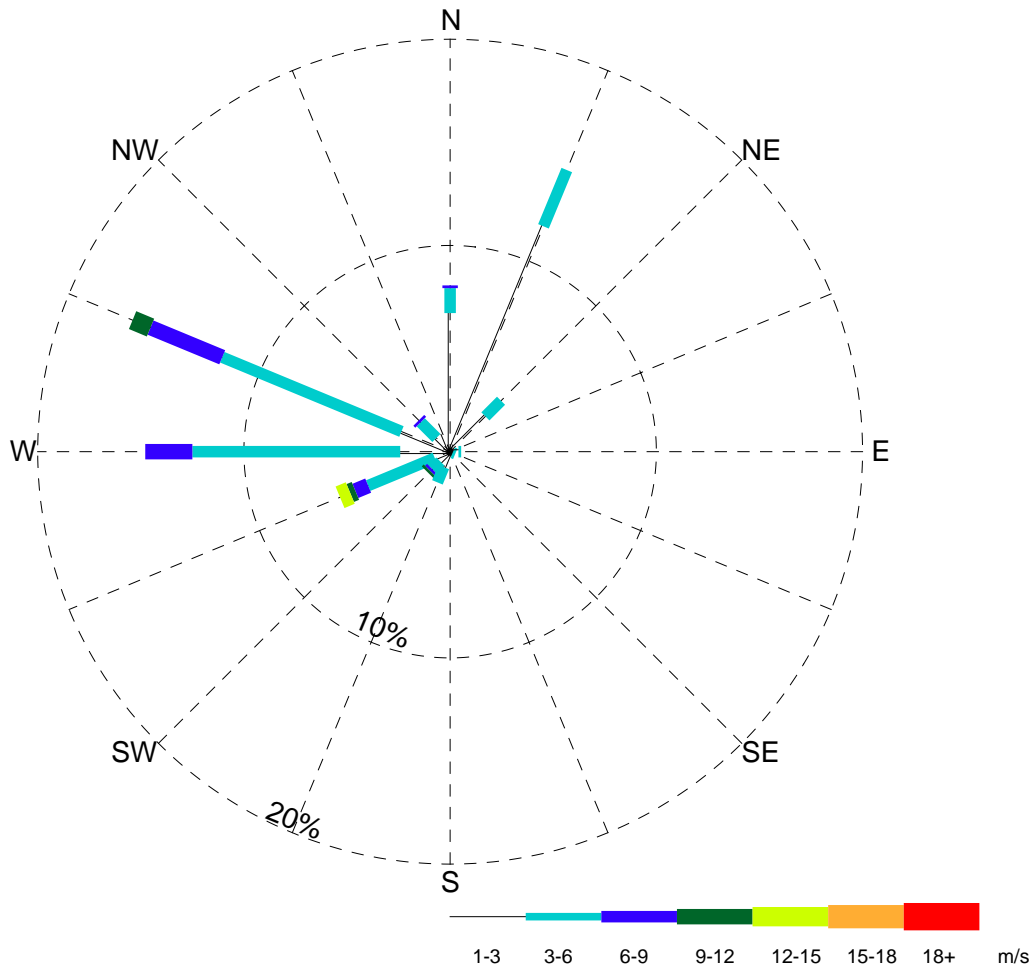
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Figure C-30



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.13	-	-	-	-	-	-	0.13
NE	-	2.42	1.08	-	-	-	-	-	3.49
NNE	-	11.83	2.96	-	-	-	-	-	14.78
N	-	6.72	1.21	0.13	-	-	-	-	8.06
NNW	-	0.94	-	-	-	-	-	-	0.94
NW	-	0.94	1.08	0.13	-	-	-	-	2.15
WNW	-	2.55	9.41	3.76	0.94	-	-	-	16.67
W	-	2.42	10.08	2.29	-	-	-	-	14.78
WSW	-	0.81	3.49	0.67	0.27	0.54	-	-	5.78
SW	-	0.67	0.54	0.13	0.13	-	-	-	1.48
SSW	-	0.81	0.81	-	-	-	-	-	1.61
S	-	-	-	-	-	-	-	-	-
SSE	-	0.13	-	-	-	-	-	-	0.13
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.13	0.13	-	-	-	-	-	0.27
E	-	0.40	0.13	-	-	-	-	-	0.54
Calm	29.17	-	-	-	-	-	-	-	29.17
Total (%)	29.17	30.91	30.91	7.12	1.34	0.54	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: January 1, 2008
 End Date: January 31, 2008

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**Mactung Station
Wind Rose
January 2008**

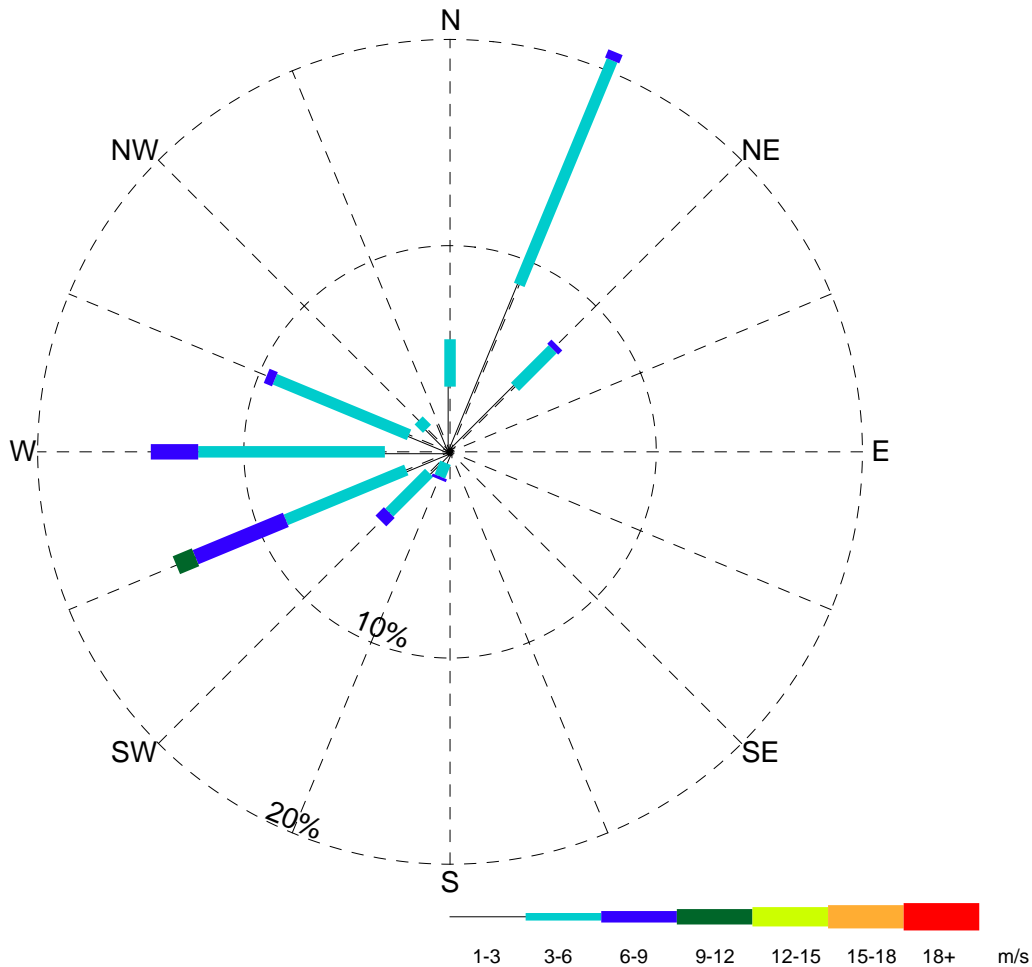
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Figure C-31



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 28 days
 Start Date: February 1, 2008
 End Date: February 28, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.29	-	-	-	-	-	-	0.29
NE	-	4.45	2.59	0.29	-	-	-	-	7.33
NNE	-	8.76	11.78	0.43	-	-	-	-	20.98
N	-	3.16	2.30	-	-	-	-	-	5.46
NNW	-	1.44	-	-	-	-	-	-	1.44
NW	-	1.58	0.57	-	-	-	-	-	2.15
WNW	-	2.15	7.04	0.43	-	-	-	-	9.63
W	-	3.16	9.05	2.30	-	-	-	-	14.51
WSW	-	2.30	6.32	4.74	1.01	-	-	-	14.37
SW	-	1.44	2.73	0.57	-	-	-	-	4.74
SSW	-	0.57	0.72	0.14	-	-	-	-	1.44
S	-	0.29	-	-	-	-	-	-	0.29
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	17.39	-	-	-	-	-	-	-	17.39
Total (%)	17.39	29.60	43.10	8.91	1.01	-	-	-	100.00

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**Mactung Station
Wind Rose
February 2008**

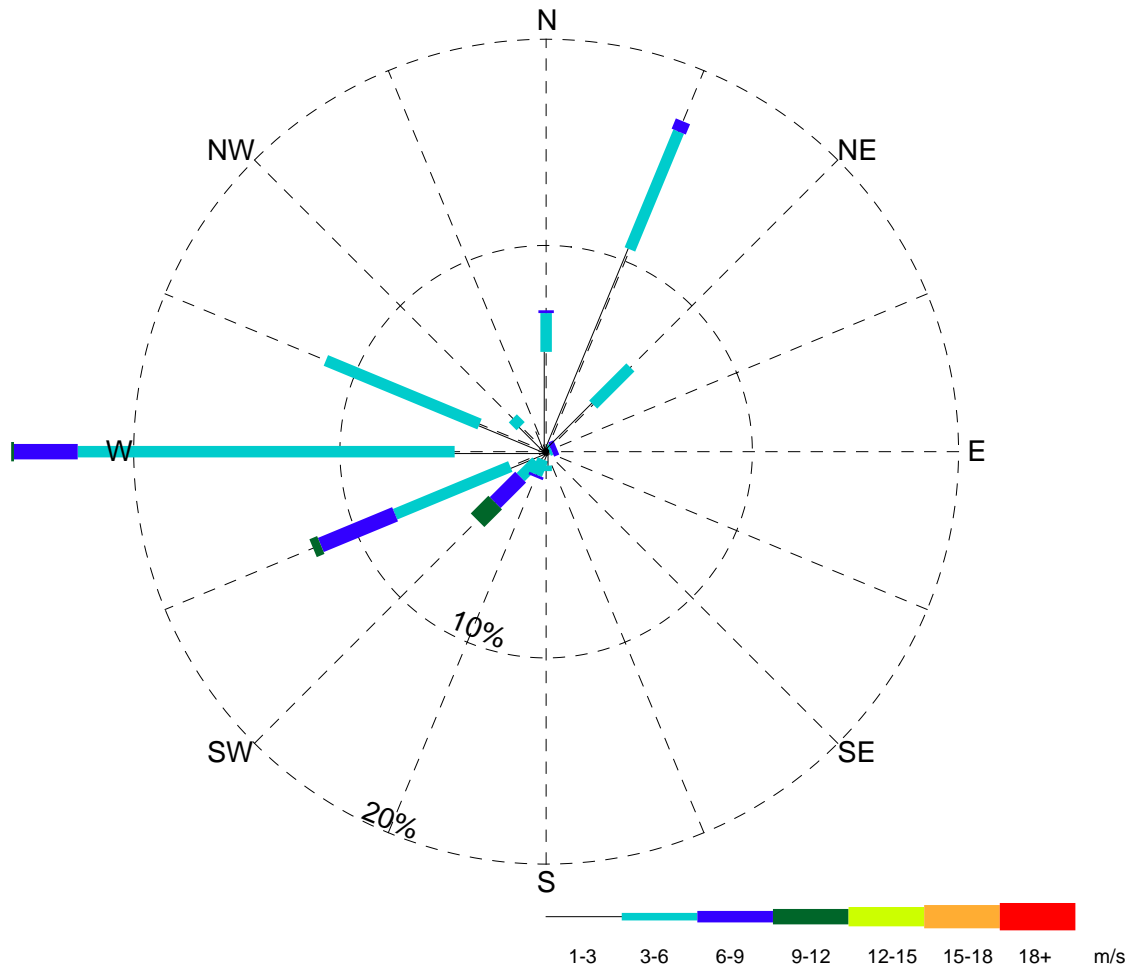
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Figure C-32



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: March 1, 2008
 End Date: March 31, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.13	0.13	0.27	-	-	-	-	0.54
NE	-	3.23	2.55	-	-	-	-	-	5.78
NNE	-	10.62	6.18	0.54	-	-	-	-	17.34
N	-	4.84	1.88	0.13	-	-	-	-	6.86
NNW	-	1.08	-	-	-	-	-	-	1.08
NW	-	1.75	0.54	-	-	-	-	-	2.29
WNW	-	3.49	8.06	-	-	-	-	-	11.56
W	-	4.43	18.28	3.09	0.13	-	-	-	25.94
WSW	-	1.88	6.05	3.90	0.40	-	-	-	12.23
SW	-	0.67	1.08	1.75	1.21	-	-	-	4.70
SSW	-	0.40	0.81	0.13	-	-	-	-	1.34
S	-	0.67	0.27	-	-	-	-	-	0.94
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
Calm	9.41	-	-	-	-	-	-	-	9.41
Total (%)	9.41	33.20	45.83	9.81	1.75	-	-	-	100.00

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**Mactung Station
Wind Rose
March 2008**

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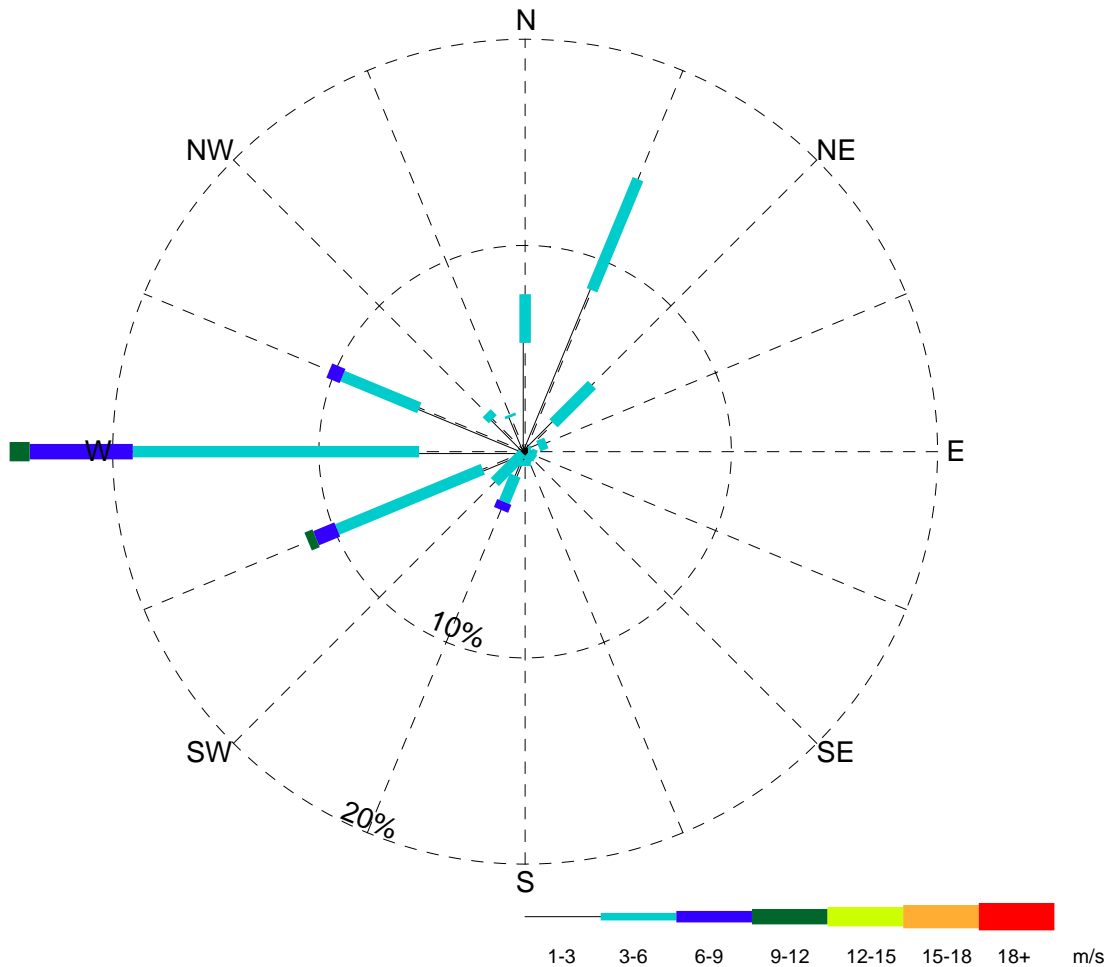


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Figure C-33



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: April 1, 2008
 End Date: April 30, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.69	0.42	-	-	-	-	-	1.11
NE	-	1.94	2.64	-	-	-	-	-	4.58
NNE	-	8.47	5.83	-	-	-	-	-	14.31
N	-	5.28	2.36	-	-	-	-	-	7.64
NNW	-	1.81	0.14	-	-	-	-	-	1.94
NW	-	2.22	0.42	-	-	-	-	-	2.64
WNW	-	5.56	4.03	0.69	-	-	-	-	10.28
W	-	5.14	13.89	5.00	0.97	-	-	-	25.00
WSW	-	2.22	7.64	1.11	0.42	-	-	-	11.39
SW	-	0.14	1.94	-	-	-	-	-	2.08
SSW	-	1.25	1.39	0.42	-	-	-	-	3.06
S	-	0.42	0.28	-	-	-	-	-	0.69
SSE	-	0.28	-	-	-	-	-	-	0.28
SE	-	0.14	0.42	-	-	-	-	-	0.56
ESE	-	0.28	0.28	-	-	-	-	-	0.56
E	-	0.14	0.14	-	-	-	-	-	0.28
Calm	13.61	-	-	-	-	-	-	-	13.61
Total (%)	13.61	35.97	41.81	7.22	1.39	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
April 2008**

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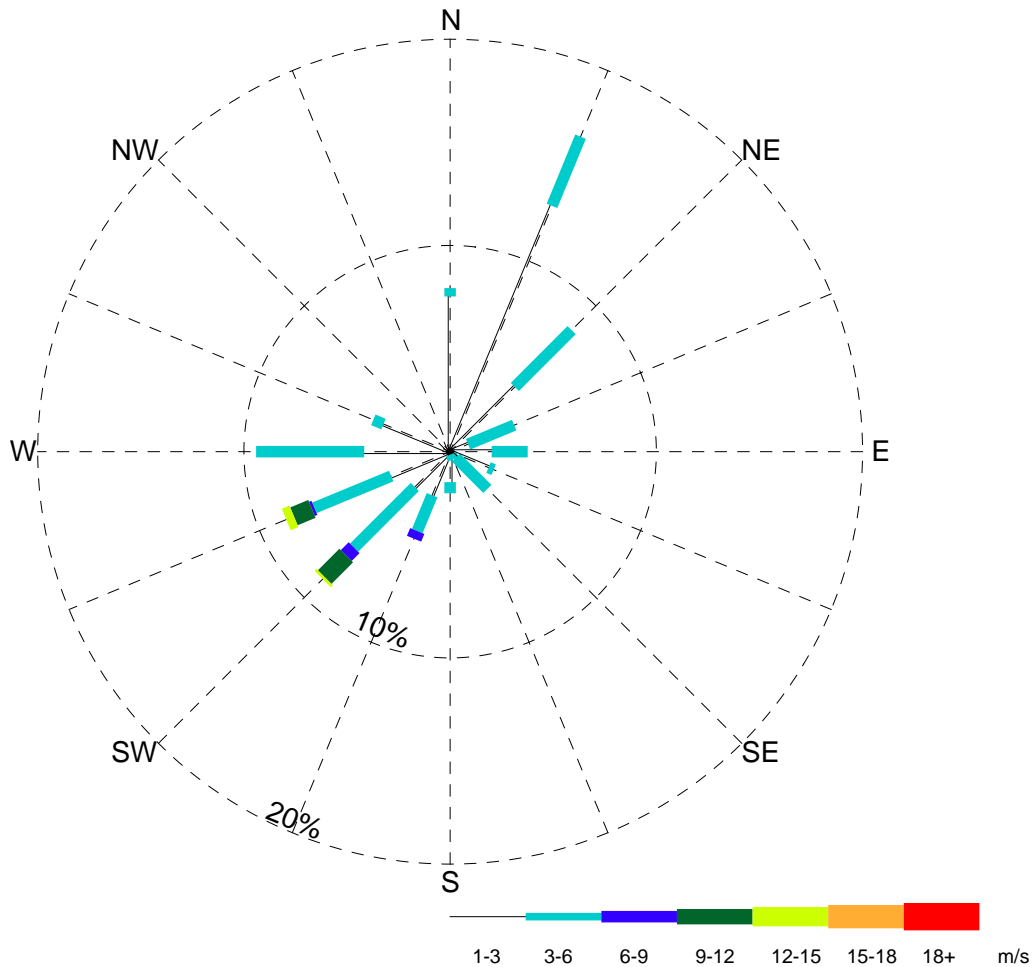


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Figure C-34



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	0.94	2.42	-	-	-	-	-	3.36
NE	-	4.43	3.90	-	-	-	-	-	8.33
NNE	-	12.90	3.63	-	-	-	-	-	16.53
N	-	7.53	0.40	-	-	-	-	-	7.93
NNW	-	0.54	-	-	-	-	-	-	0.54
NW	-	0.67	-	-	-	-	-	-	0.67
WNW	-	3.49	0.54	-	-	-	-	-	4.03
W	-	4.17	5.24	-	-	-	-	-	9.41
WSW	-	3.09	4.03	0.13	0.94	0.40	-	-	8.60
SW	-	2.42	4.17	0.54	1.48	0.13	-	-	8.74
SSW	-	2.29	1.88	0.40	-	-	-	-	4.57
S	-	1.48	0.54	-	-	-	-	-	2.02
SSE	-	0.13	0.27	-	-	-	-	-	0.40
SE	-	0.40	2.15	-	-	-	-	-	2.55
ESE	-	2.02	0.27	-	-	-	-	-	2.29
E	-	2.02	1.75	-	-	-	-	-	3.76
Calm	16.26	-	-	-	-	-	-	-	16.26
Total (%)	16.26	48.52	31.18	1.08	2.42	0.54	-	-	100.00

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: May 1, 2008
 End Date: May 31, 2008

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Wind Rose
 May 2008**

EBA Engineering
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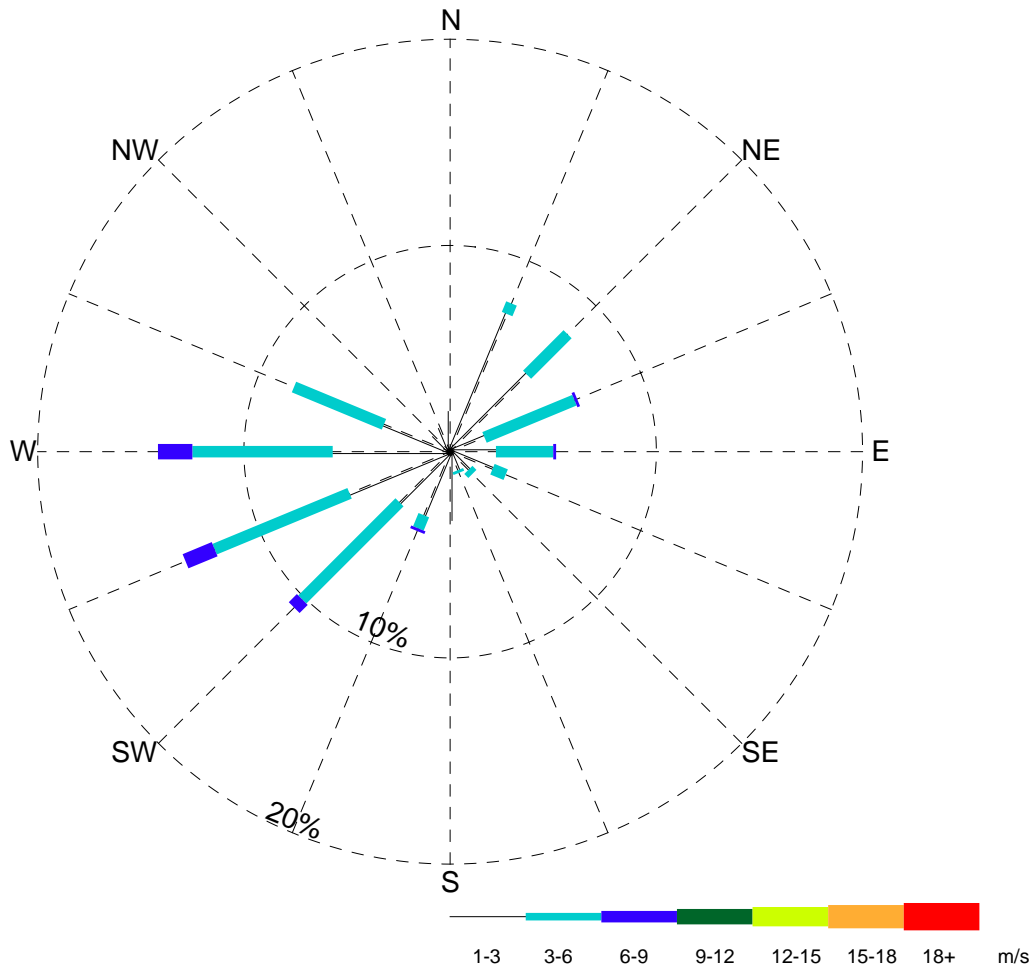


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Figure C-35



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 30 days
 Start Date: June 1, 2008
 End Date: June 30, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.81	4.72	0.14	-	-	-	-	6.67
NE	-	5.28	2.78	-	-	-	-	-	8.06
NNE	-	7.22	0.56	-	-	-	-	-	7.78
N	-	1.94	-	-	-	-	-	-	1.94
NNW	-	1.25	-	-	-	-	-	-	1.25
NW	-	1.11	-	-	-	-	-	-	1.11
WNW	-	3.47	4.72	-	-	-	-	-	8.19
W	-	5.69	6.81	1.67	-	-	-	-	14.17
WSW	-	5.28	7.08	1.53	-	-	-	-	13.89
SW	-	3.47	6.67	0.56	-	-	-	-	10.69
SSW	-	3.33	0.69	0.14	-	-	-	-	4.17
S	-	3.33	-	-	-	-	-	-	3.33
SSE	-	0.97	0.14	-	-	-	-	-	1.11
SE	-	1.25	0.28	-	-	-	-	-	1.53
ESE	-	2.22	0.69	-	-	-	-	-	2.92
E	-	2.22	2.78	0.14	-	-	-	-	5.14
Calm	8.06	-	-	-	-	-	-	-	8.06
Total (%)	8.06	49.86	37.92	4.17	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
June 2008**

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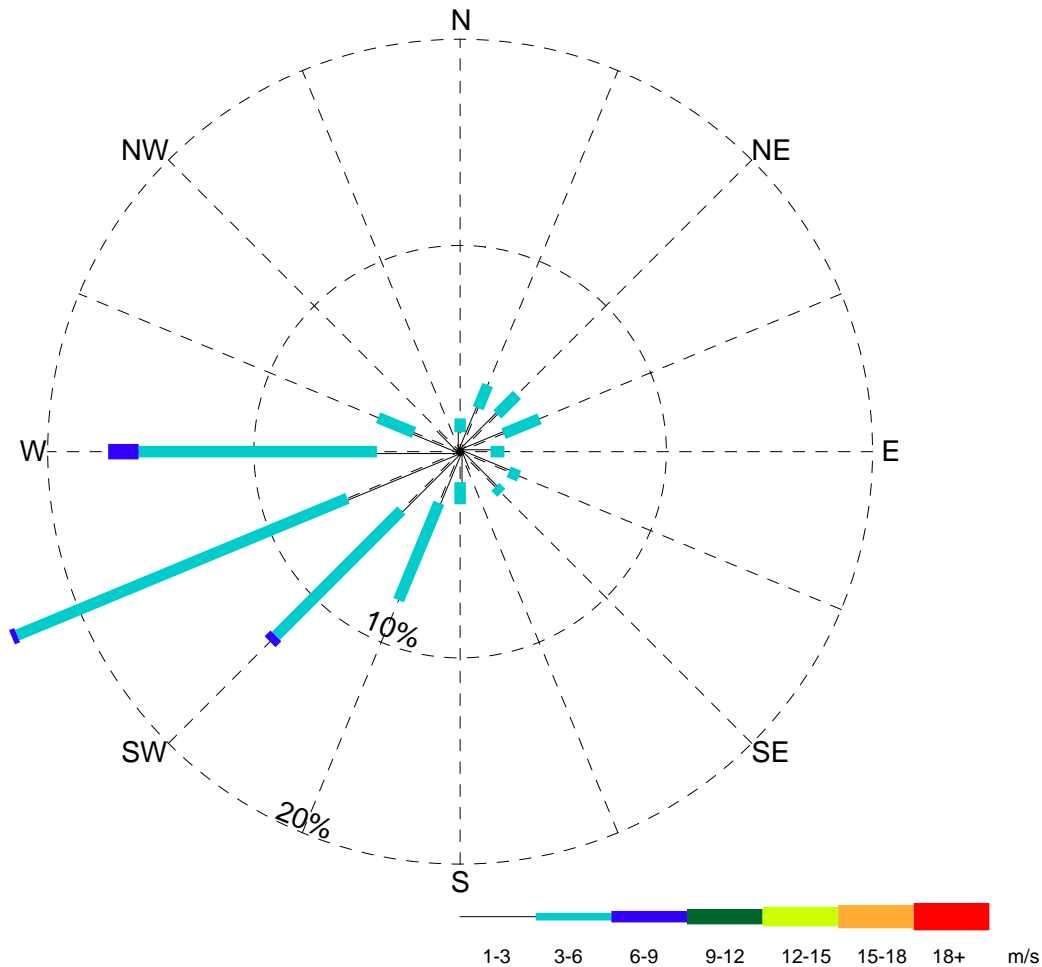


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Figure C-36



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 31 days
 Start Date: July 1, 2008
 End Date: July 31, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.29	1.88	-	-	-	-	-	4.17
NE	-	2.55	1.34	-	-	-	-	-	3.90
NNE	-	2.29	1.21	-	-	-	-	-	3.49
N	-	0.94	0.67	-	-	-	-	-	1.61
NNW	-	0.13	-	-	-	-	-	-	0.13
NW	-	1.48	-	-	-	-	-	-	1.48
WNW	-	2.42	1.88	-	-	-	-	-	4.30
W	-	4.03	11.56	1.48	-	-	-	-	17.07
WSW	-	5.91	17.34	0.27	-	-	-	-	23.52
SW	-	4.03	8.60	0.40	-	-	-	-	13.04
SSW	-	2.69	5.11	-	-	-	-	-	7.80
S	-	1.48	1.08	-	-	-	-	-	2.55
SSE	-	0.94	-	-	-	-	-	-	0.94
SE	-	2.42	0.40	-	-	-	-	-	2.82
ESE	-	2.55	0.54	-	-	-	-	-	3.09
E	-	1.48	0.67	-	-	-	-	-	2.15
Calm	7.93	-	-	-	-	-	-	-	7.93
Total (%)	7.93	37.63	52.28	2.15	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
July 2008**

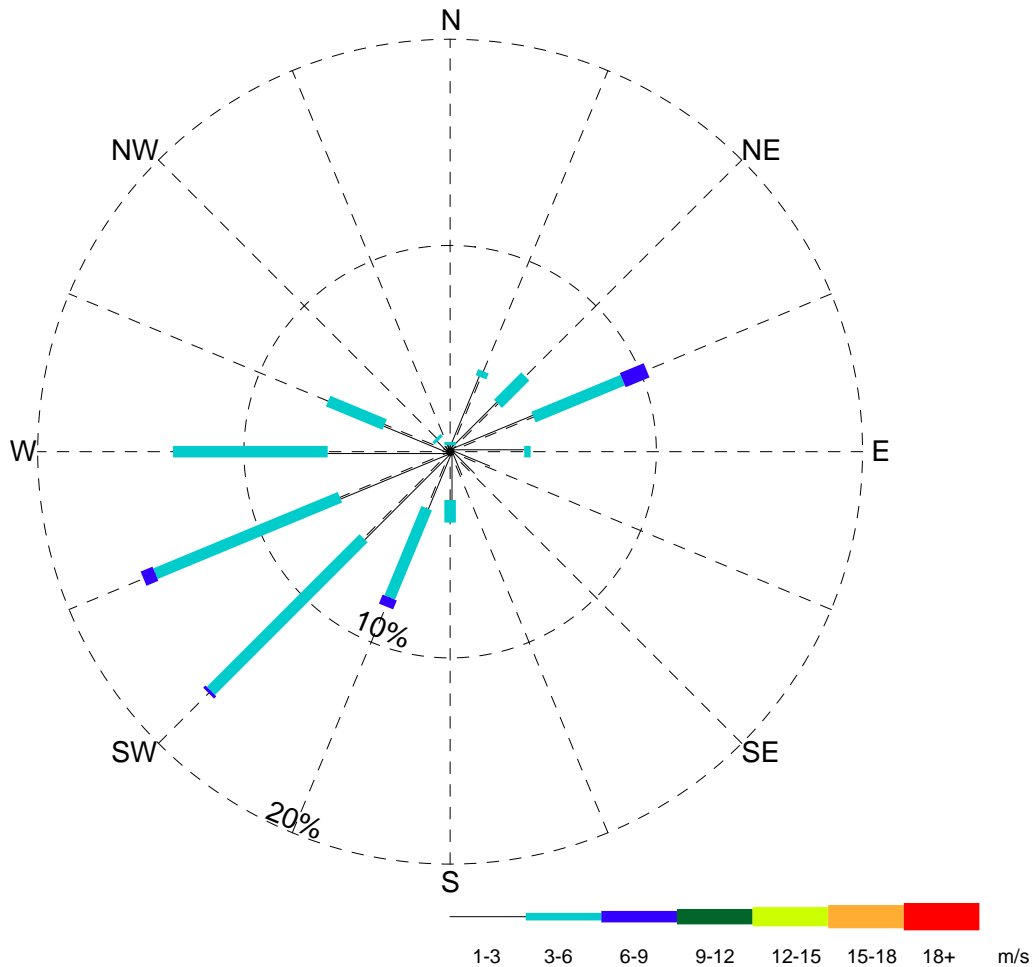
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Figure C-37



Wind Speed & Direction Frequency Distribution Table

Station Name: MacTung Station
 NAD 27 Location:
 N63° 16' 50.2" W130° 8' 50.3"
 Elev. above SL: 1860 m
 Tower height: 3 m
 Record length: 27 days
 Start Date: August 1, 2008
 End Date: August 27, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.38	4.69	1.25	-	-	-	-	10.31
NE	-	3.28	1.88	-	-	-	-	-	5.16
NNE	-	3.91	0.31	-	-	-	-	-	4.22
N	-	0.31	0.16	-	-	-	-	-	0.47
NNW	-	0.31	-	-	-	-	-	-	0.31
NW	-	0.78	0.16	-	-	-	-	-	0.94
WNW	-	3.44	2.97	-	-	-	-	-	6.41
W	-	5.94	7.50	-	-	-	-	-	13.44
WSW	-	5.78	9.69	0.62	-	-	-	-	16.09
SW	-	5.94	10.47	0.16	-	-	-	-	16.56
SSW	-	2.97	4.69	0.47	-	-	-	-	8.12
S	-	2.34	1.09	-	-	-	-	-	3.44
SSE	-	1.25	-	-	-	-	-	-	1.25
SE	-	1.56	-	-	-	-	-	-	1.56
ESE	-	2.03	-	-	-	-	-	-	2.03
E	-	3.59	0.31	-	-	-	-	-	3.91
Calm	5.78	-	-	-	-	-	-	-	5.78
Total (%)	5.78	47.81	43.91	2.50	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Wind Rose
August 2008**

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Figure C-38



APPENDIX D

APPENDIX D MONTHLY MACTUNG STATION WEATHER SUMMARIES AUGUST 2005 TO AUGUST 2008



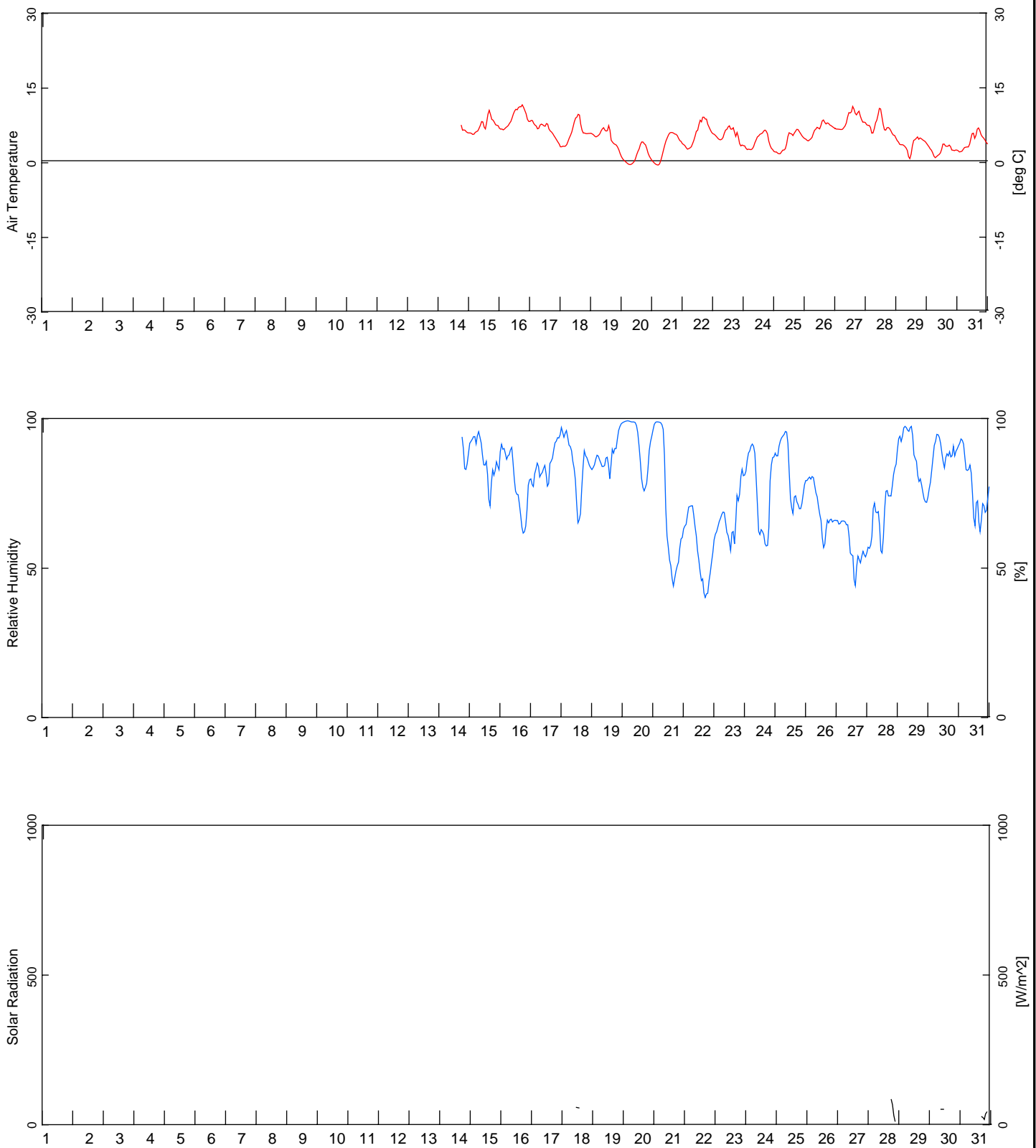
APPENDIX D

Monthly Mactung Station Weather Summaries

August 2005 – August 2008

- D-01 Mactung Station Weather Parameters – July 2005
- D-02 Mactung Station Weather Parameters – August 2005
- D-03 Mactung Station Weather Parameters – September 2005
- D-04 Mactung Station Weather Parameters – October 2005
- D-05 Mactung Station Weather Parameters – November 2005
- D-06 Mactung Station Weather Parameters – December 2005
- D-07 Mactung Station Weather Parameters – January 2006
- D-08 Mactung Station Weather Parameters – February 2006
- D-09 Mactung Station Weather Parameters – March 2006
- D-10 Mactung Station Weather Parameters – April 2006
- D-11 Mactung Station Weather Parameters – May 2006
- D-12 Mactung Station Weather Parameters – June 2006
- D-13 Mactung Station Weather Parameters – July 2006
- D-14 Mactung Station Weather Parameters – August 2006
- D-15 Mactung Station Weather Parameters – September 2006
- D-16 Mactung Station Weather Parameters – October 2006
- D-17 Mactung Station Weather Parameters – November 2006
- D-18 Mactung Station Weather Parameters – December 2006
- D-19 Mactung Station Weather Parameters – January 2007
- D-20 Mactung Station Weather Parameters – February 2007
- D-21 Mactung Station Weather Parameters – March 2007
- D-22 Mactung Station Weather Parameters – April 2007
- D-23 Mactung Station Weather Parameters – May 2007

- D-24 Mactung Station Weather Parameters – June 2007
- D-25 Mactung Station Weather Parameters – July 2007
- D-26 Mactung Station Weather Parameters – August 2007
- D-27 Mactung Station Weather Parameters – September 2007
- D-28 Mactung Station Weather Parameters – October 2007
- D-29 Mactung Station Weather Parameters – November 2007
- D-30 Mactung Station Weather Parameters – December 2007
- D-31 Mactung Station Weather Parameters – January 2008
- D-32 Mactung Station Weather Parameters – February 2008
- D-33 Mactung Station Weather Parameters – March 2008
- D-34 Mactung Station Weather Parameters – April 2008
- D-35 Mactung Station Weather Parameters – May 2008
- D-36 Mactung Station Weather Parameters – June 2008
- D-37 Mactung Station Weather Parameters – July 2008
- D-38 Mactung Station Weather Parameters – August 2008



NOTES

Meteorological station installed on July 14, 2005
 Pyranometer not functioning correctly

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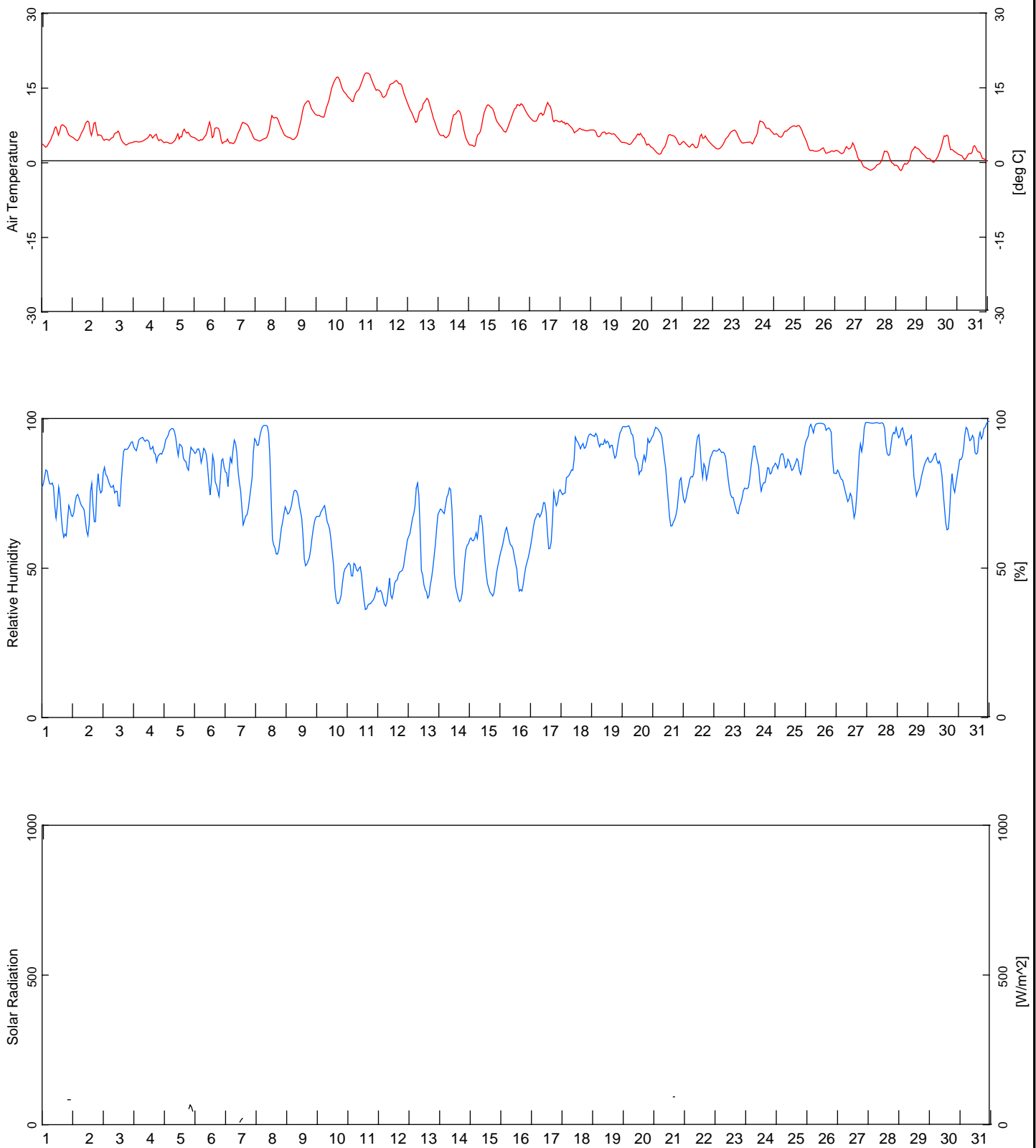


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 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Weather Parameters
 July 2005**

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Figure D-01



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Pyranometer not functioning correctly

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
August 2005**

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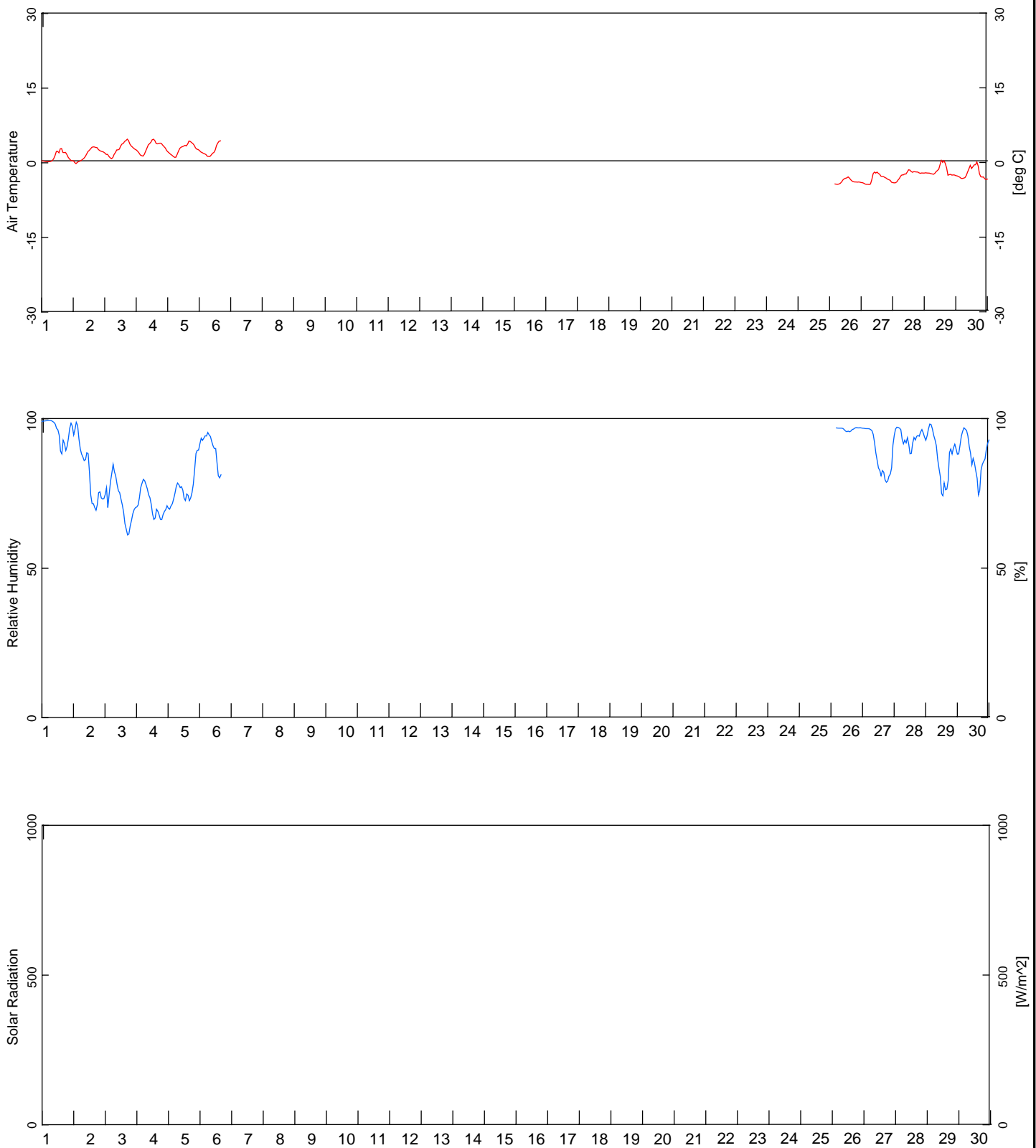
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Figure D-02



NOTES

No data collected from September 7, 2005 to September 25, 2005
 Pyranometer not functioning correctly

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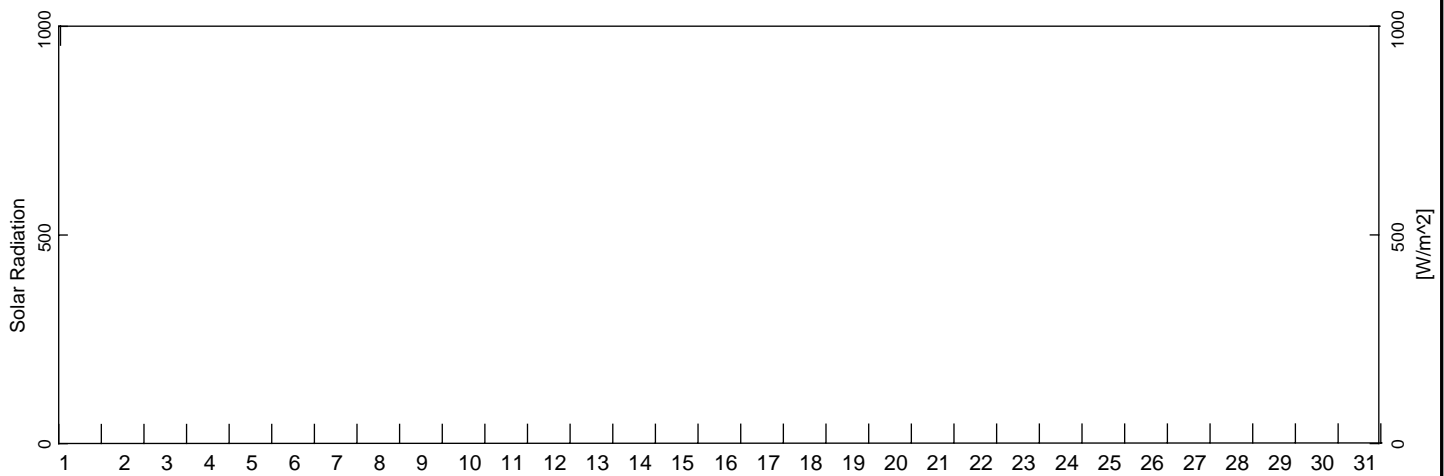
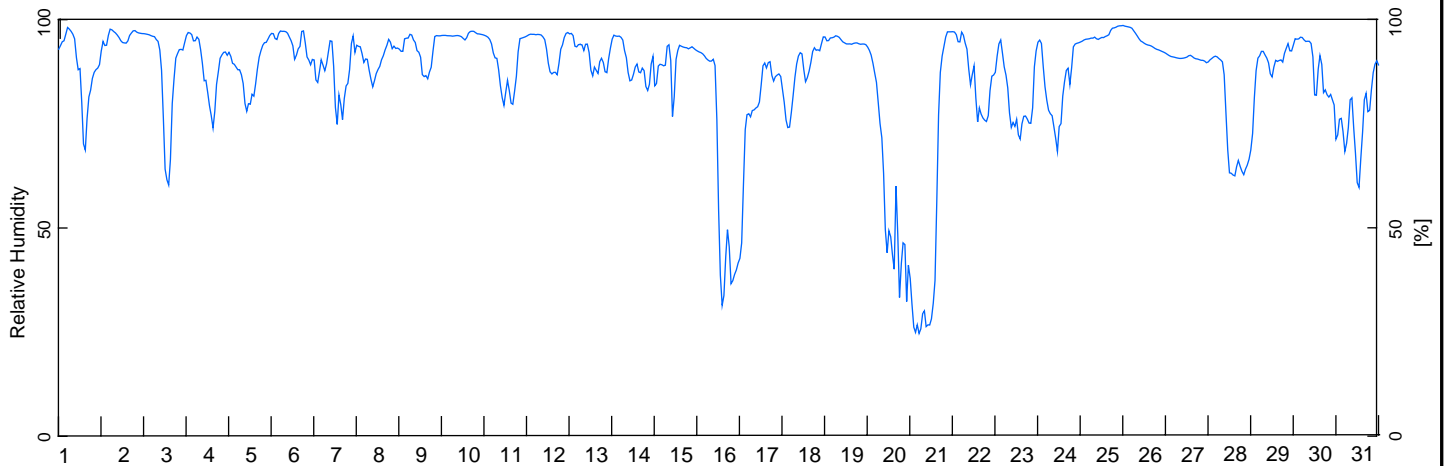
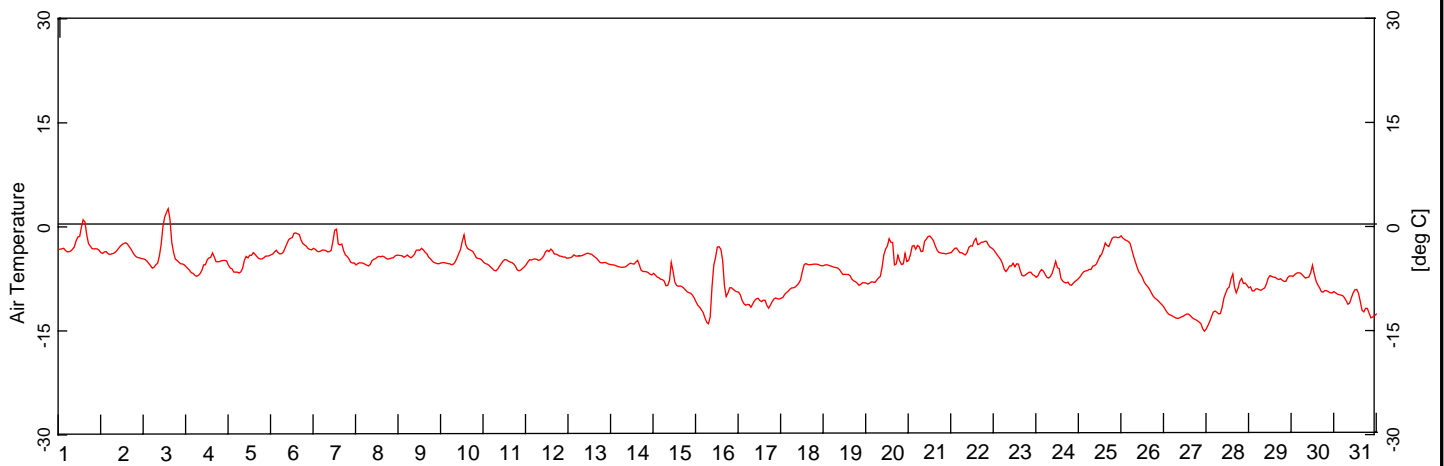


**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Weather Parameters
 September 2005**

PROJECT NO. W23101021	DWN RED	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure D-03



NOTES

Pyranometer not functioning correctly

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
October 2005**

PROJECT NO.
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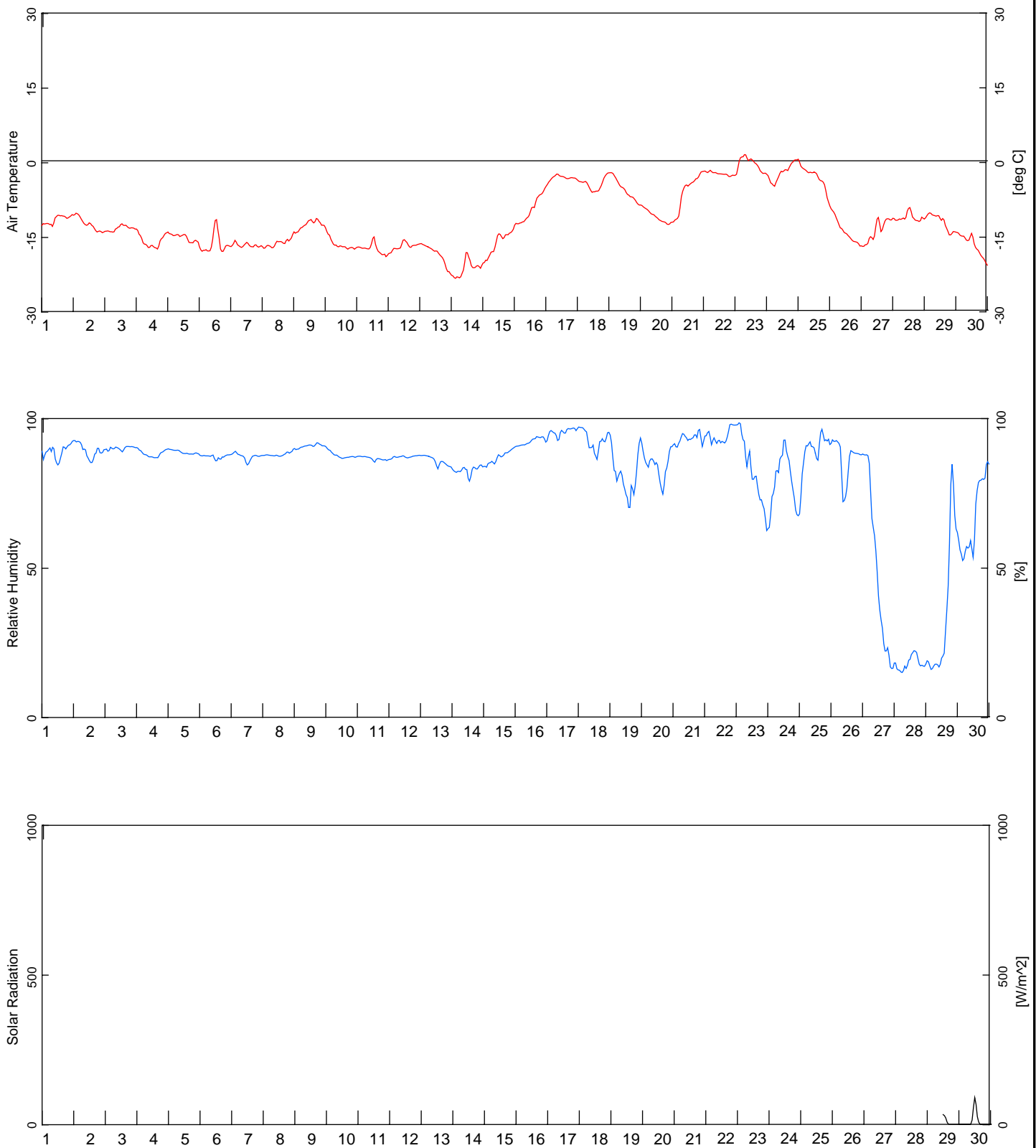
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Figure D-04



NOTES

Pyranometer not functioning correctly

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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
November 2005**

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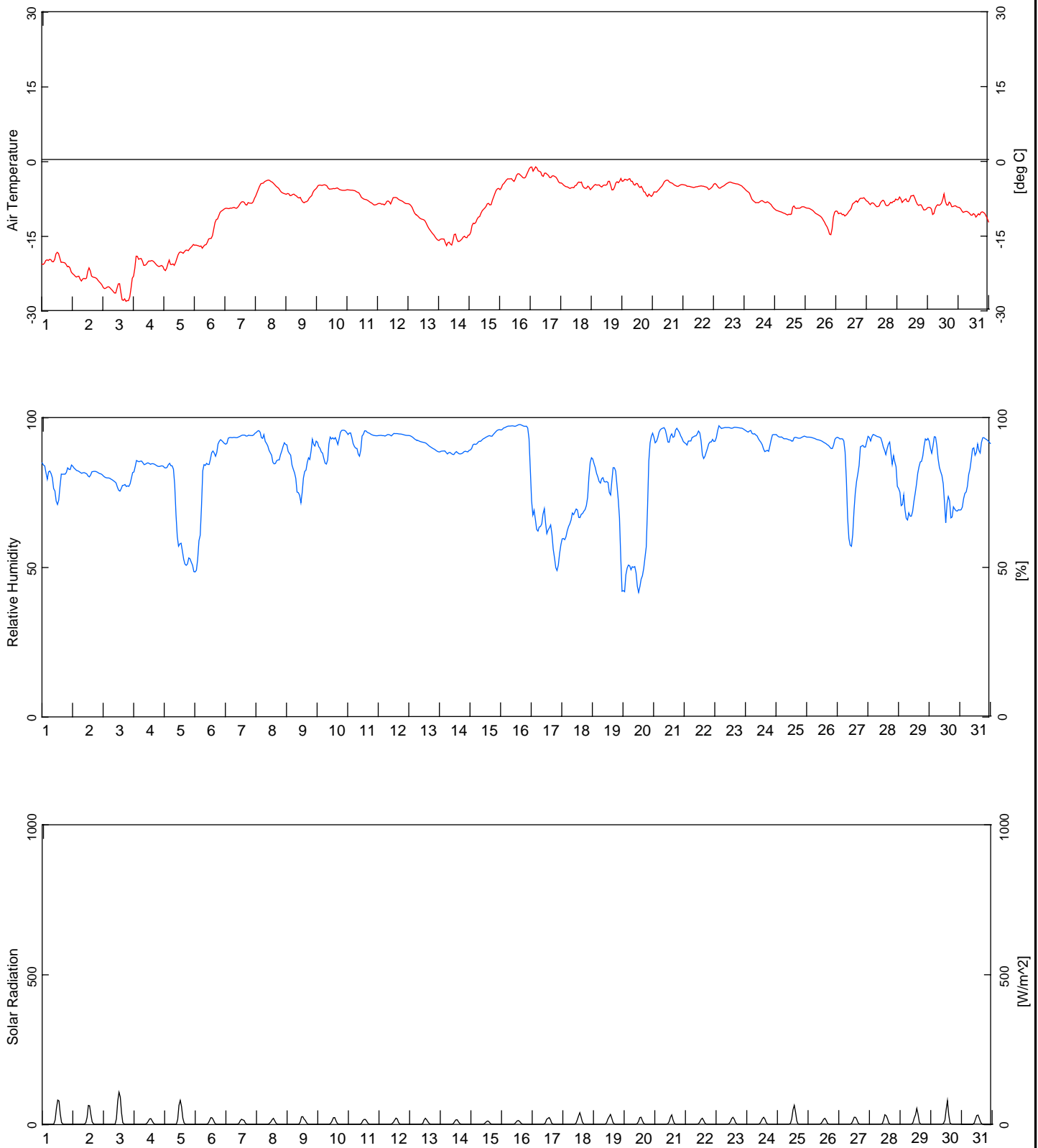
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Figure D-05



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Weather Parameters
December 2005**

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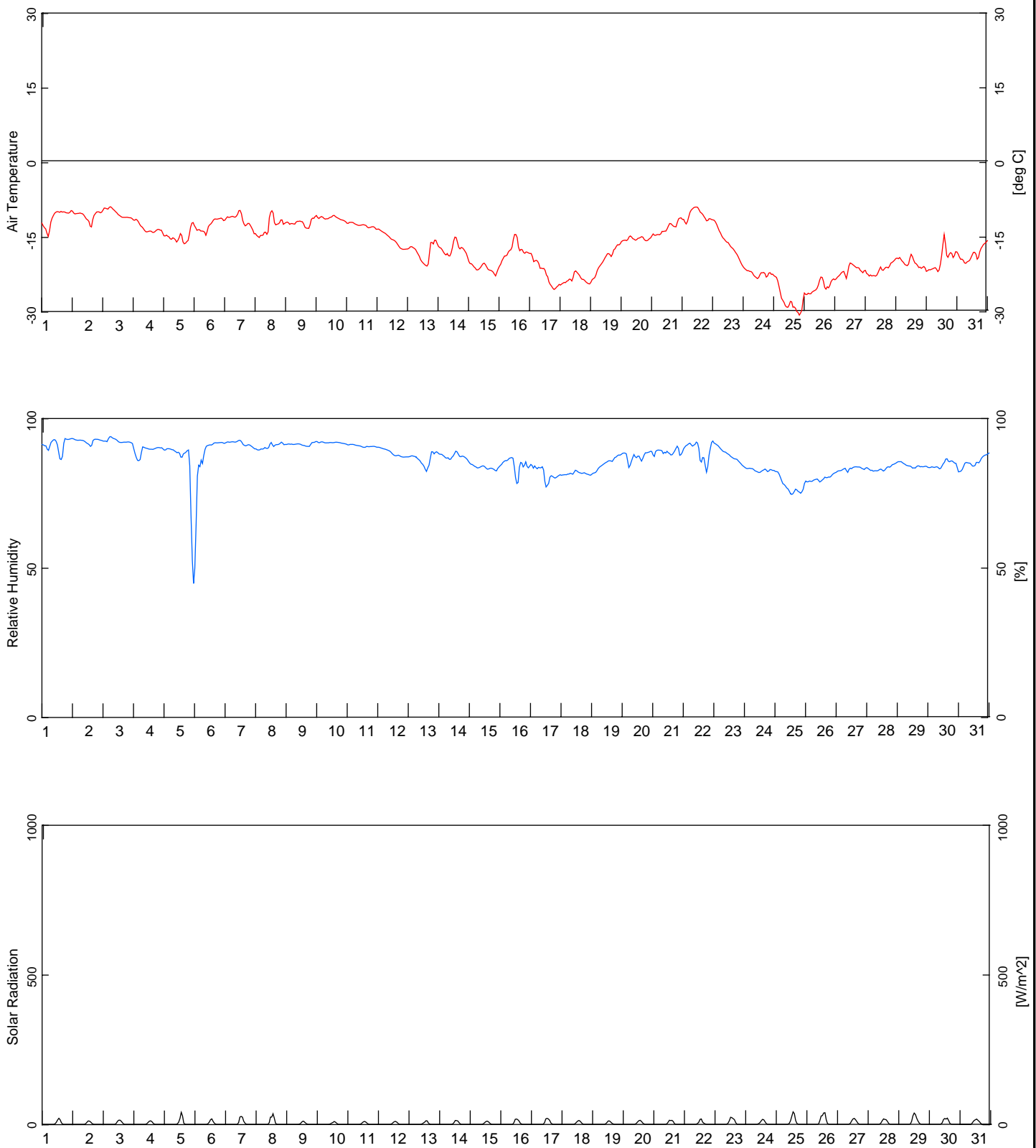
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Figure D-06



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Weather Parameters
January 2006**

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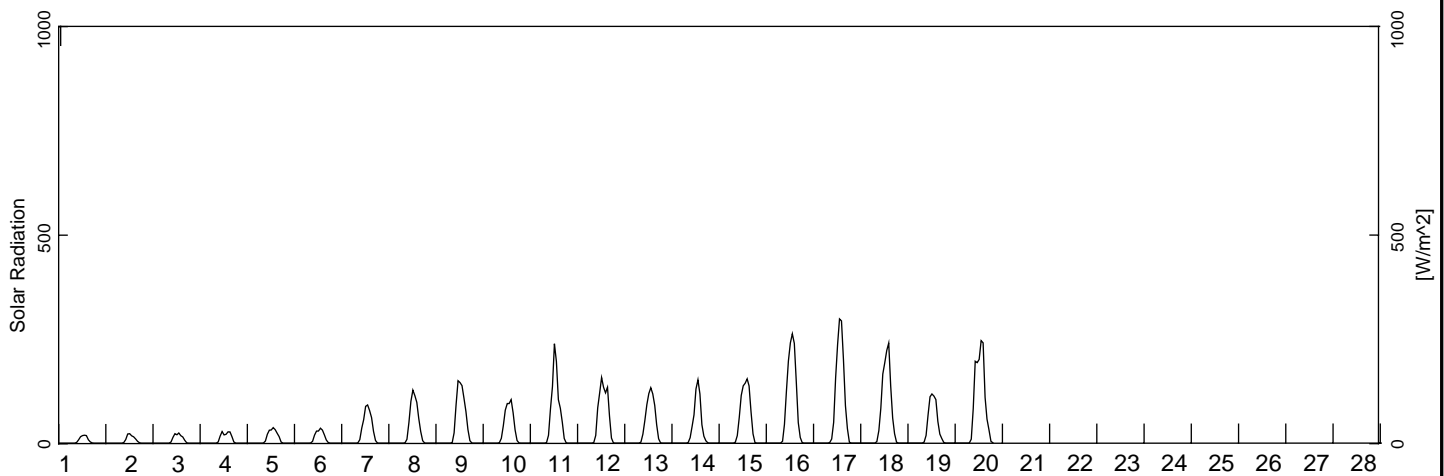
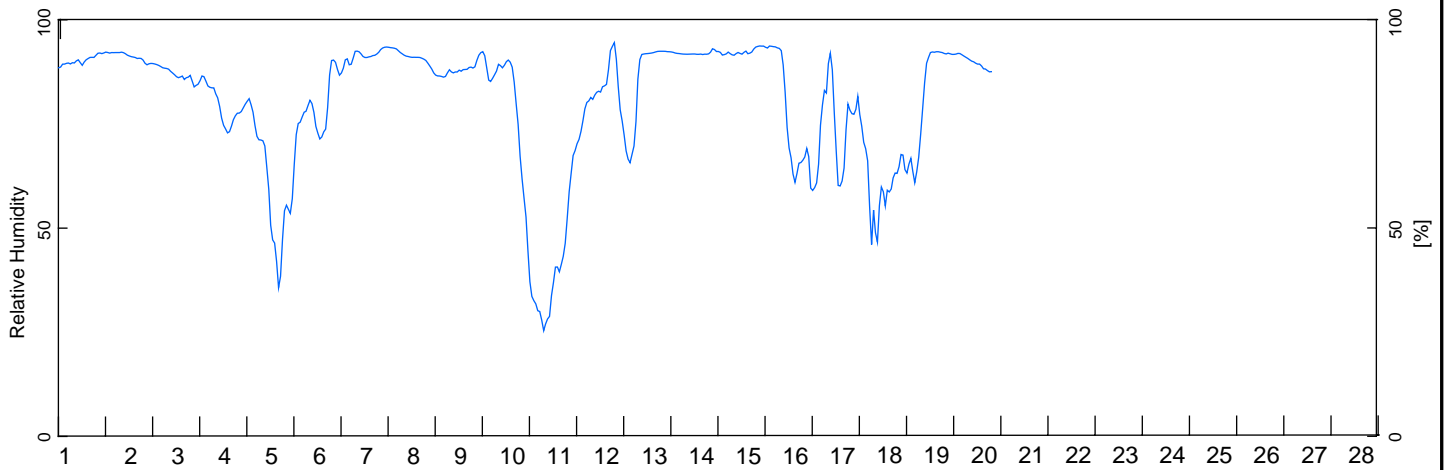
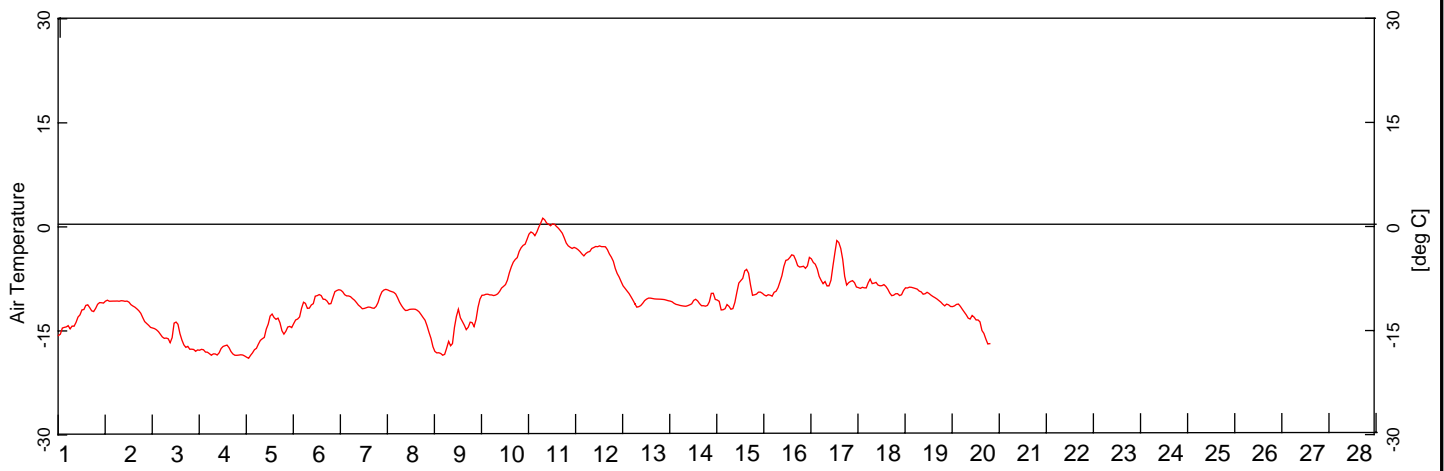
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Figure D-07



NOTES
 No data available from
 February 16 to 28, 2006

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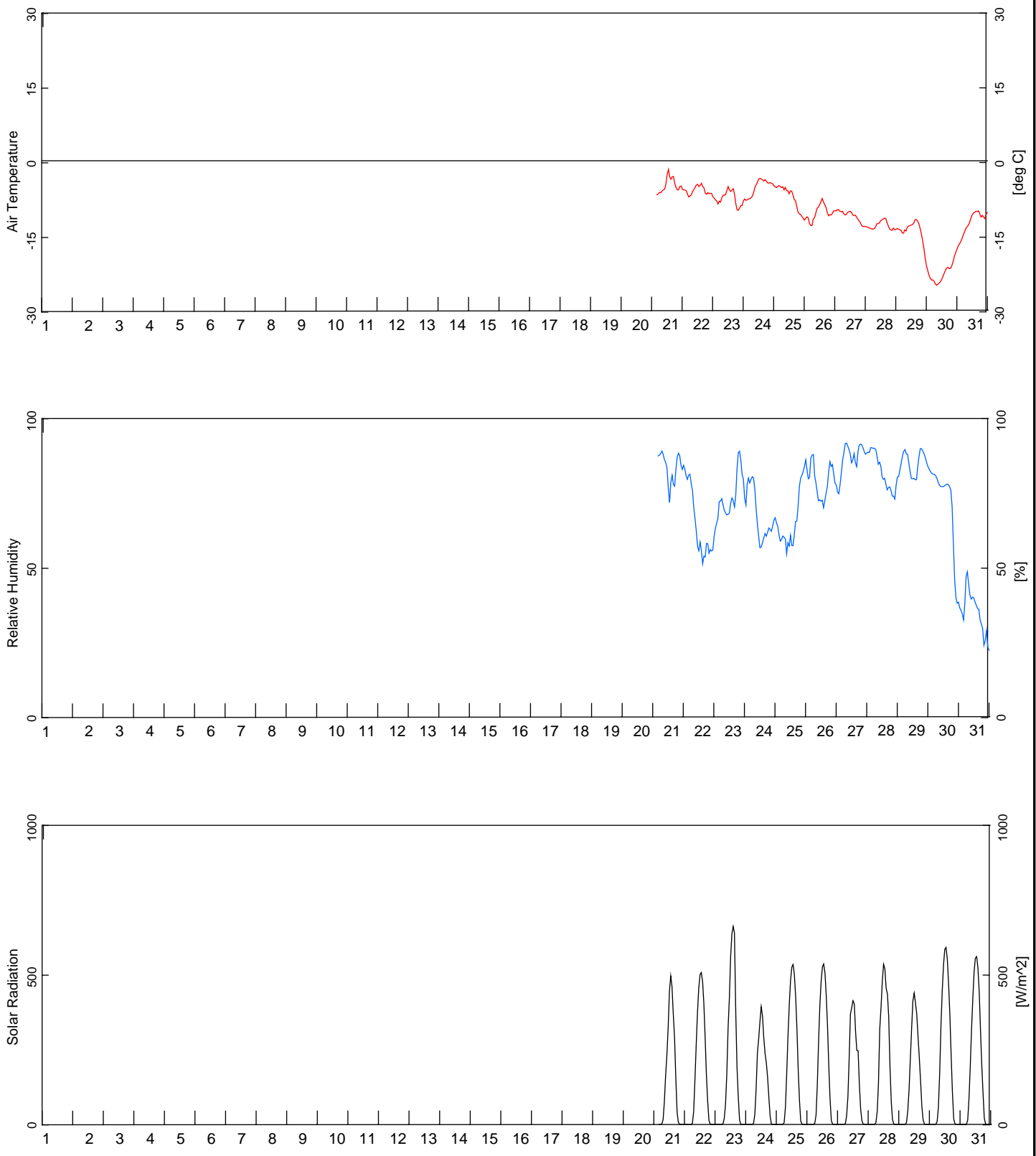
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 2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
 Weather Parameters
 February 2006**



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Figure D-08



NOTES

No data available from
March 1 - 20, 2006

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**Mactung Station
Weather Parameters
March 2006**

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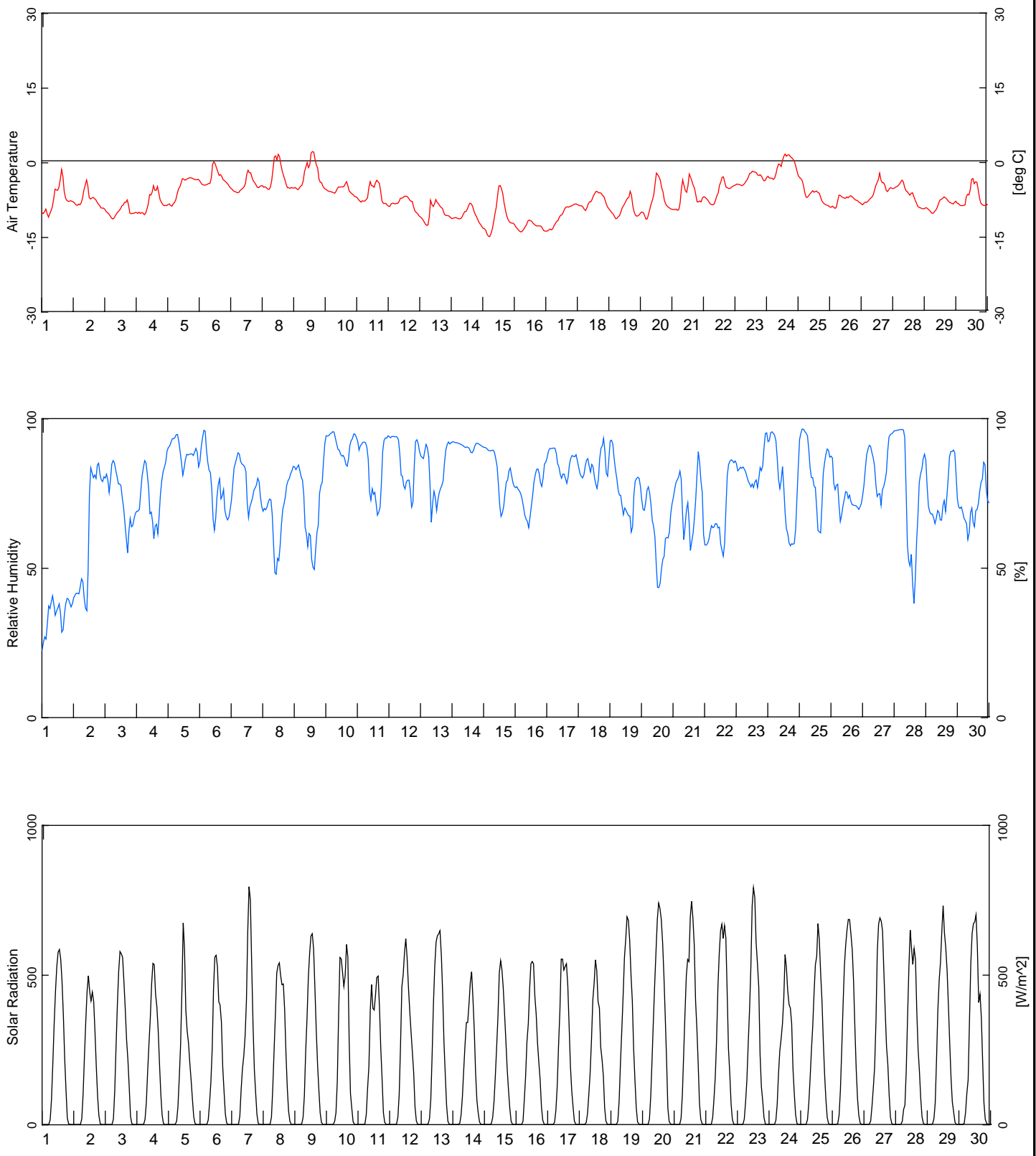
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Figure D-09



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April 2006**

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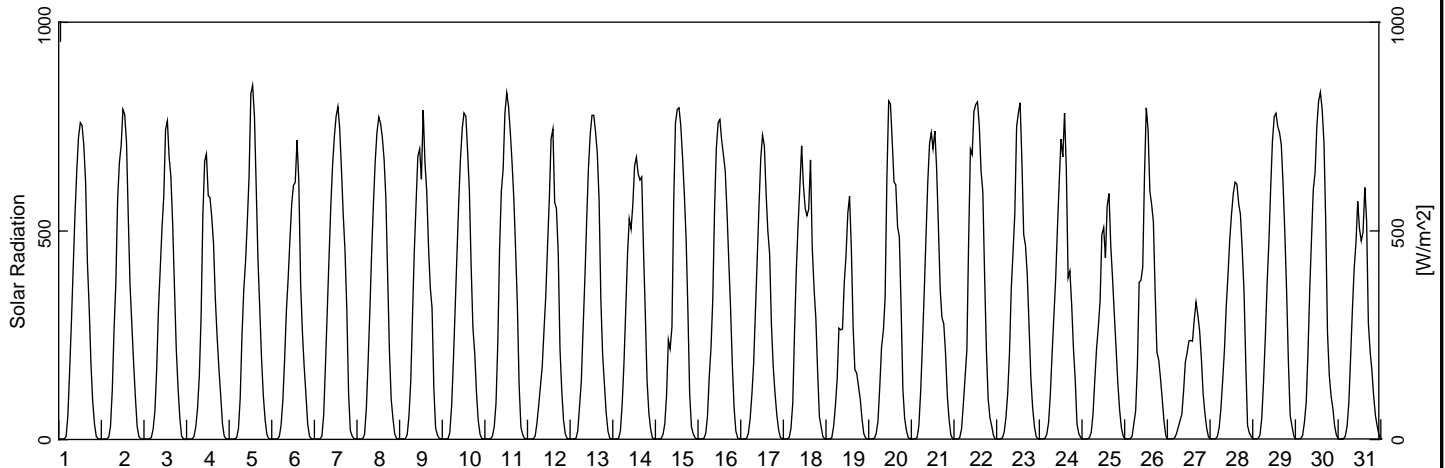
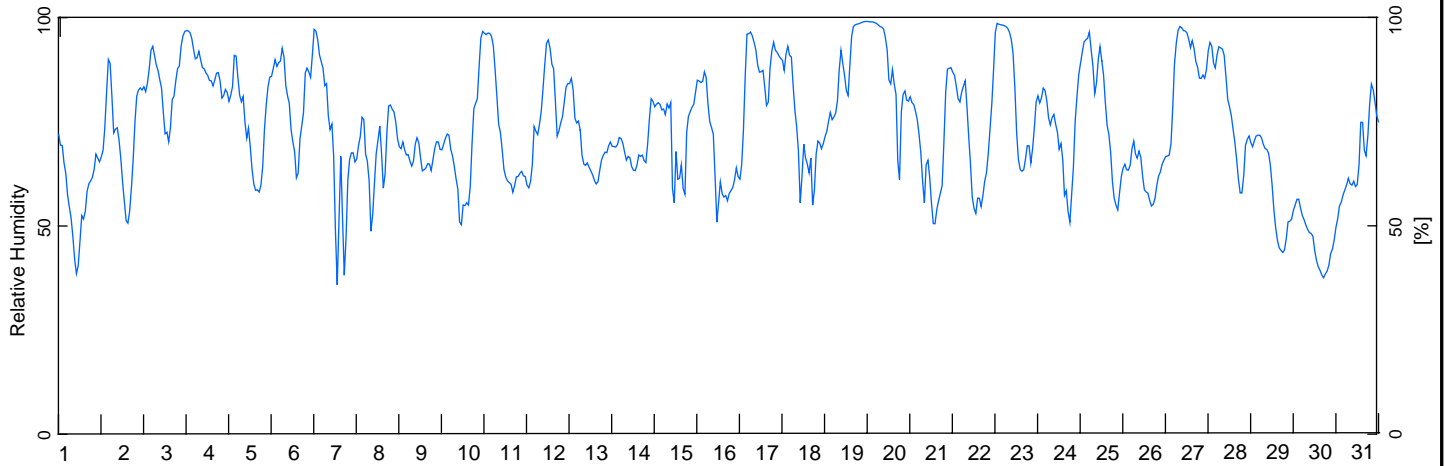
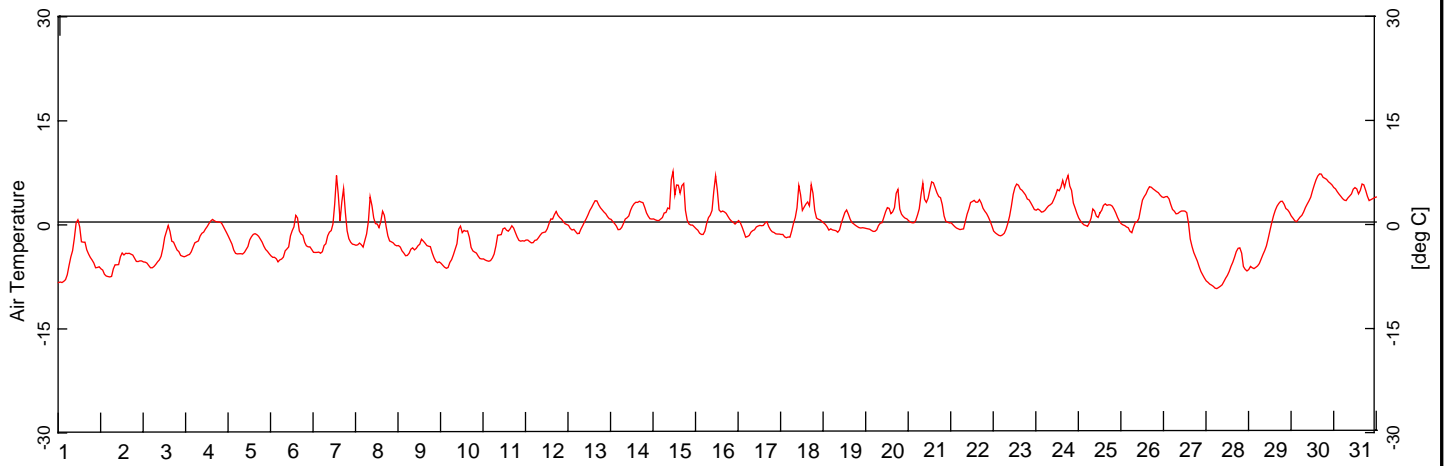
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Figure D-10



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**Mactung Station
Weather Parameters
May 2006**

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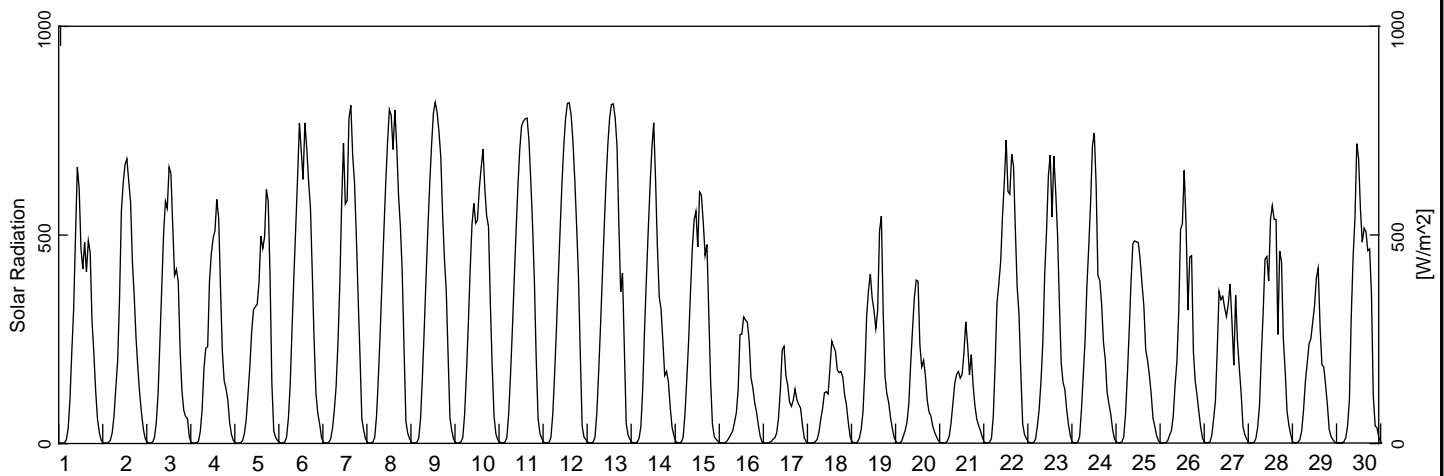
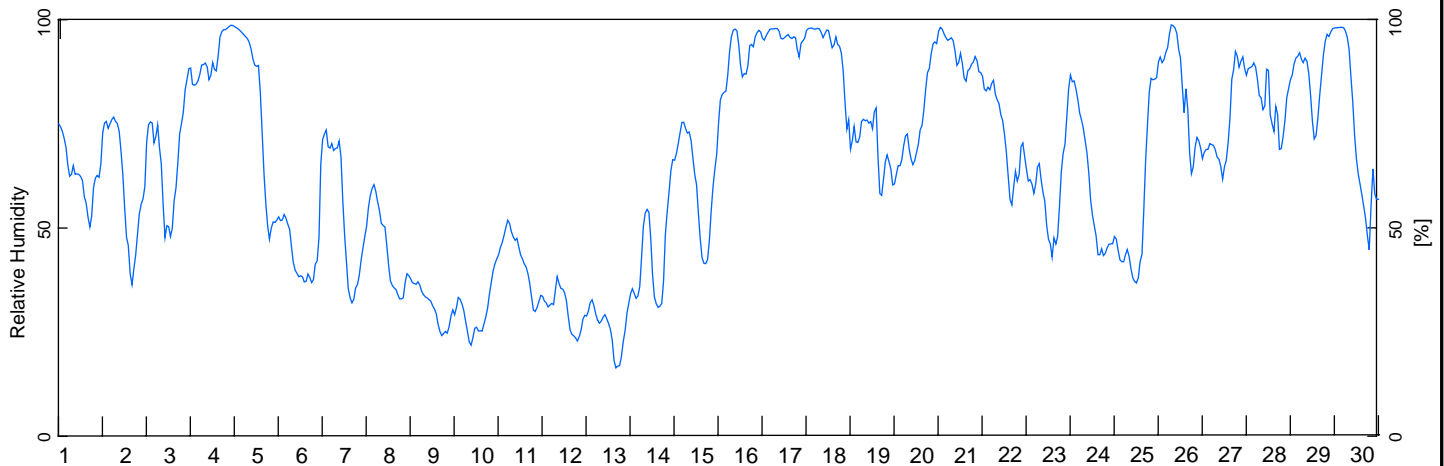
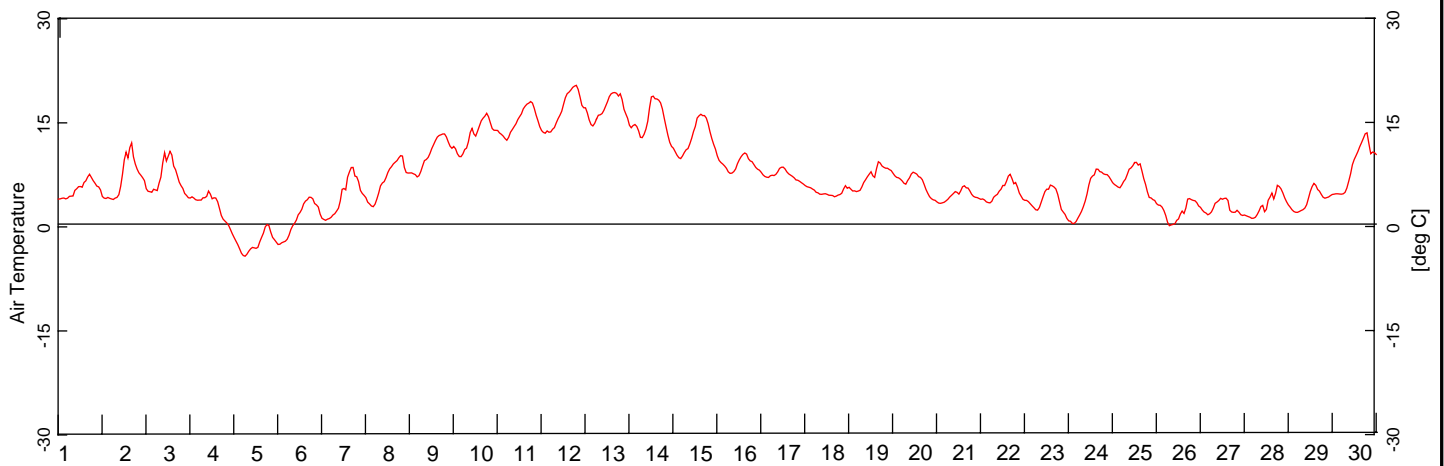
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Figure D-11



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**Mactung Station
Weather Parameters
June 2006**

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Consultants Ltd.



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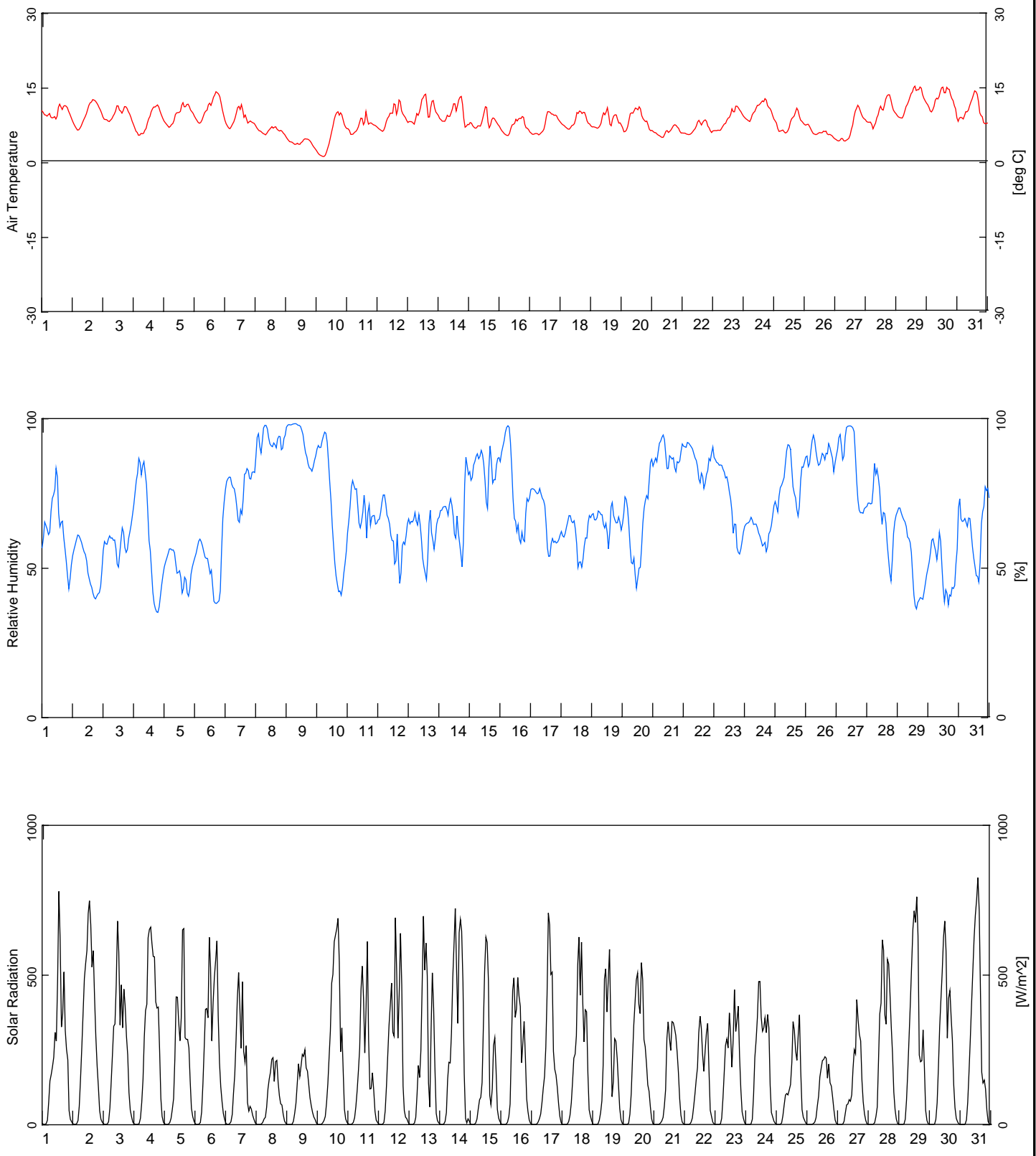
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Figure D-12



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**MACTUNG PROJECT
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**Mactung Station
Weather Parameters
July 2006**

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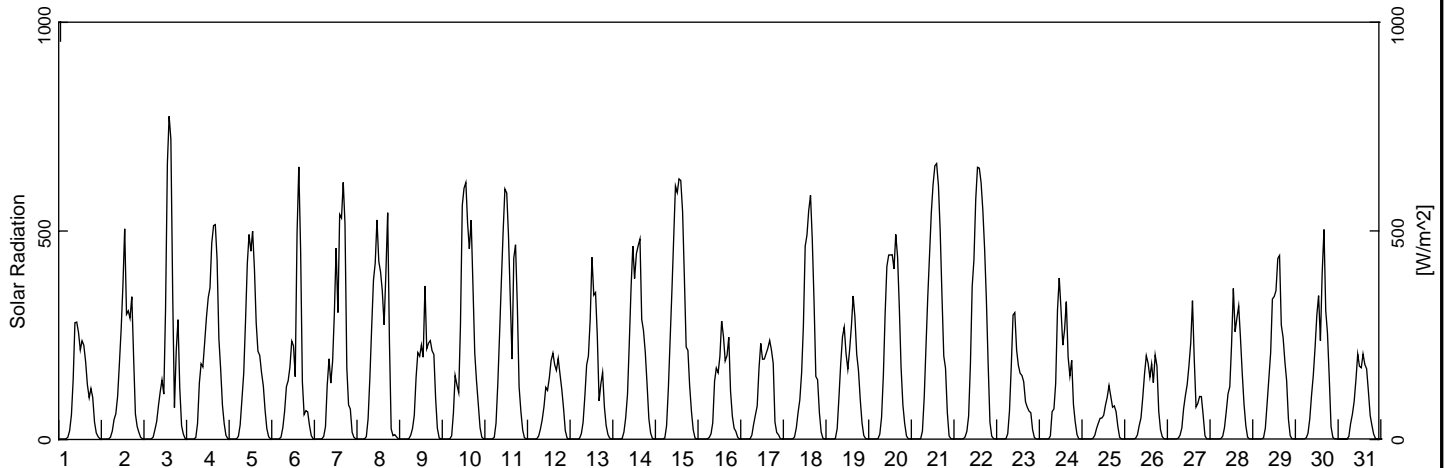
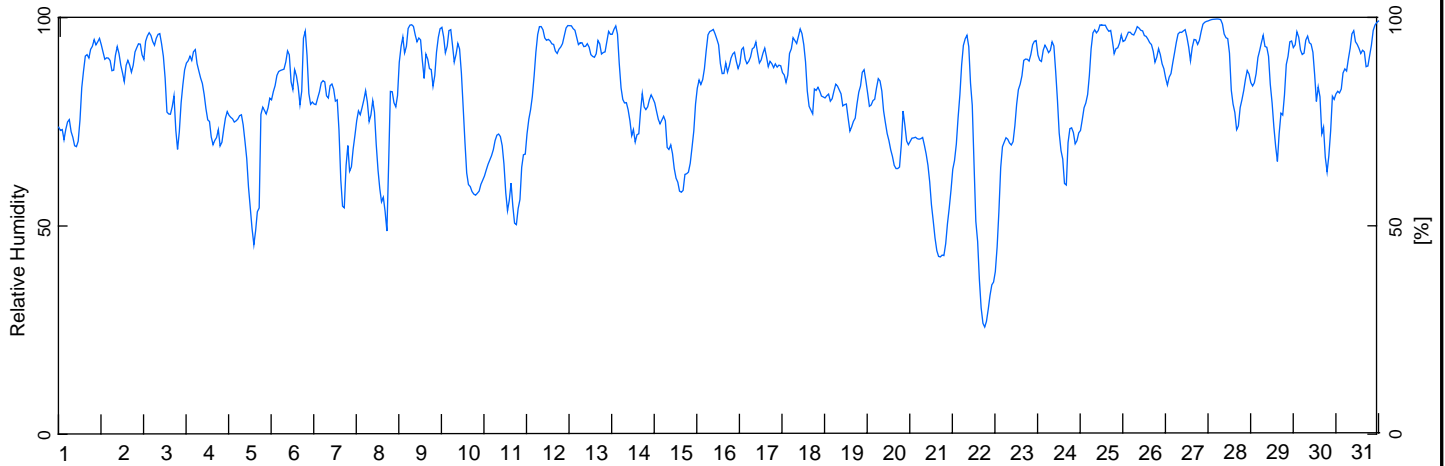
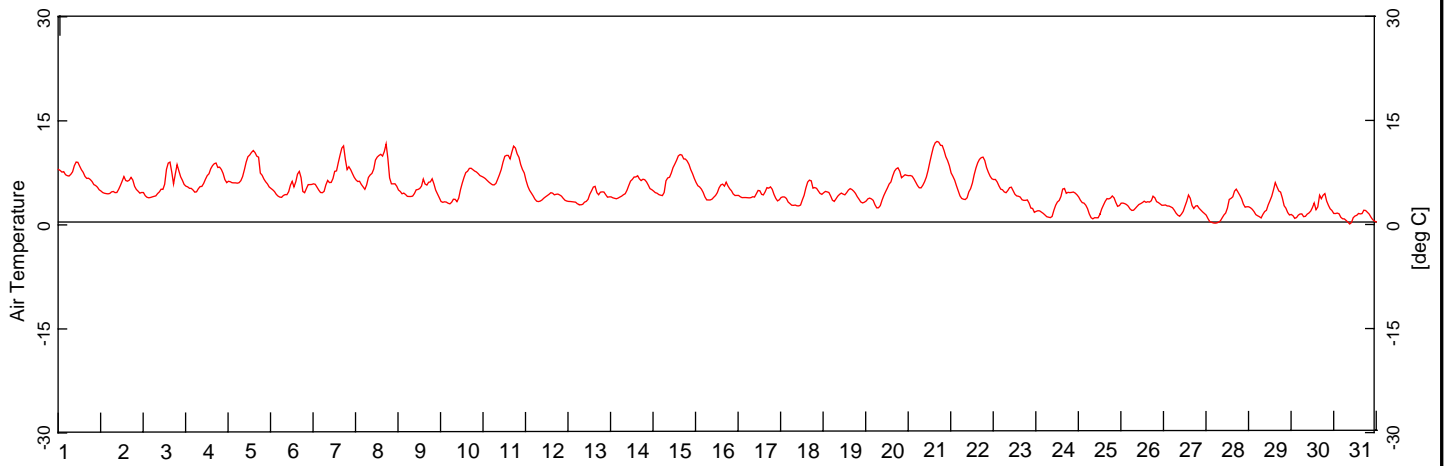
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Figure D-13



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2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
August 2006**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

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RED

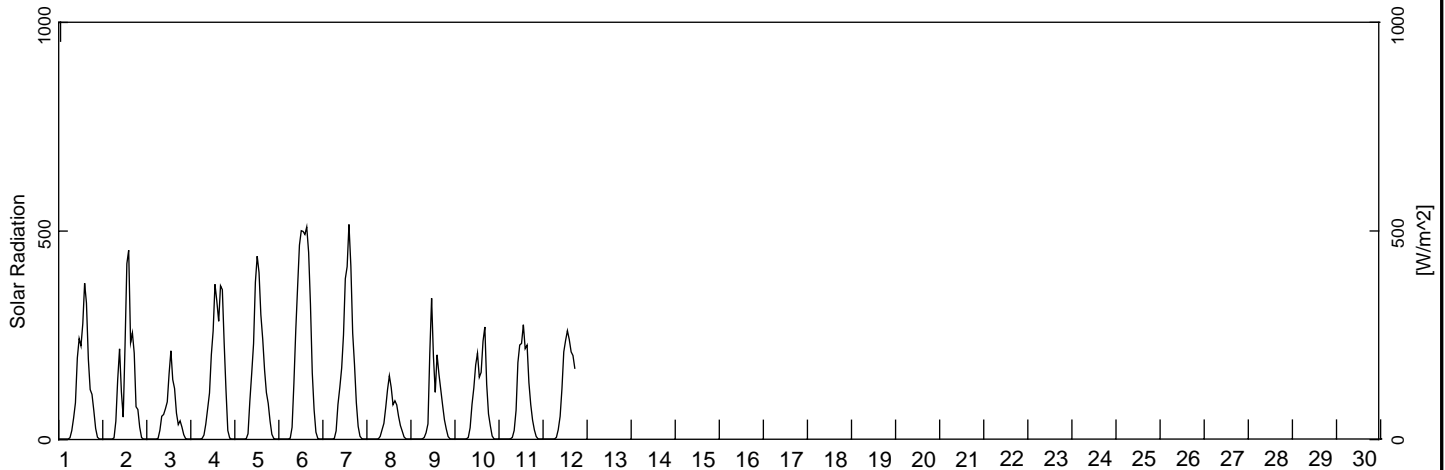
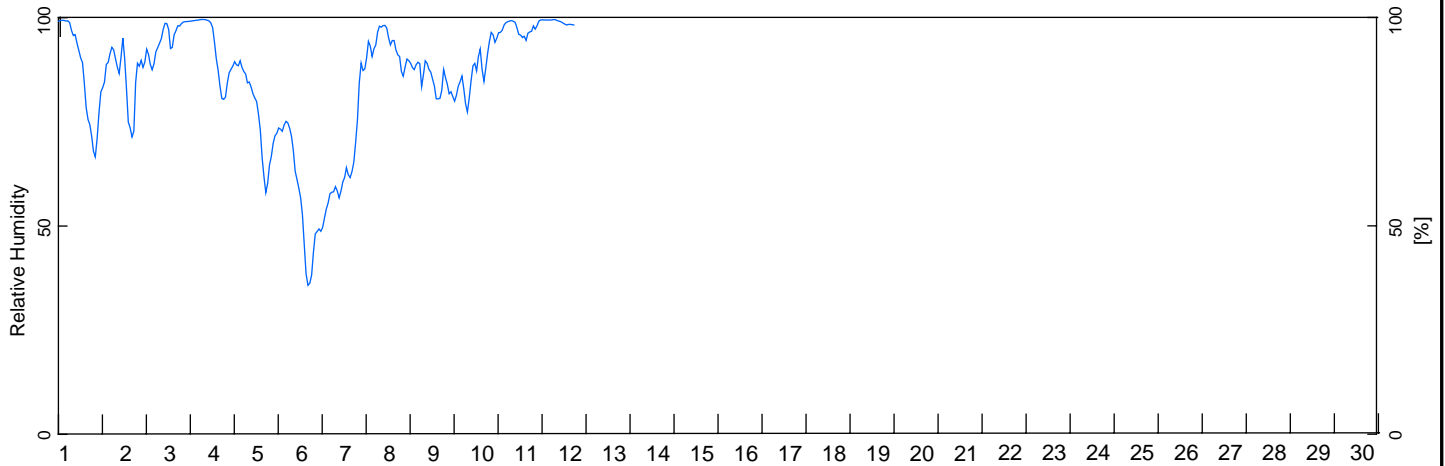
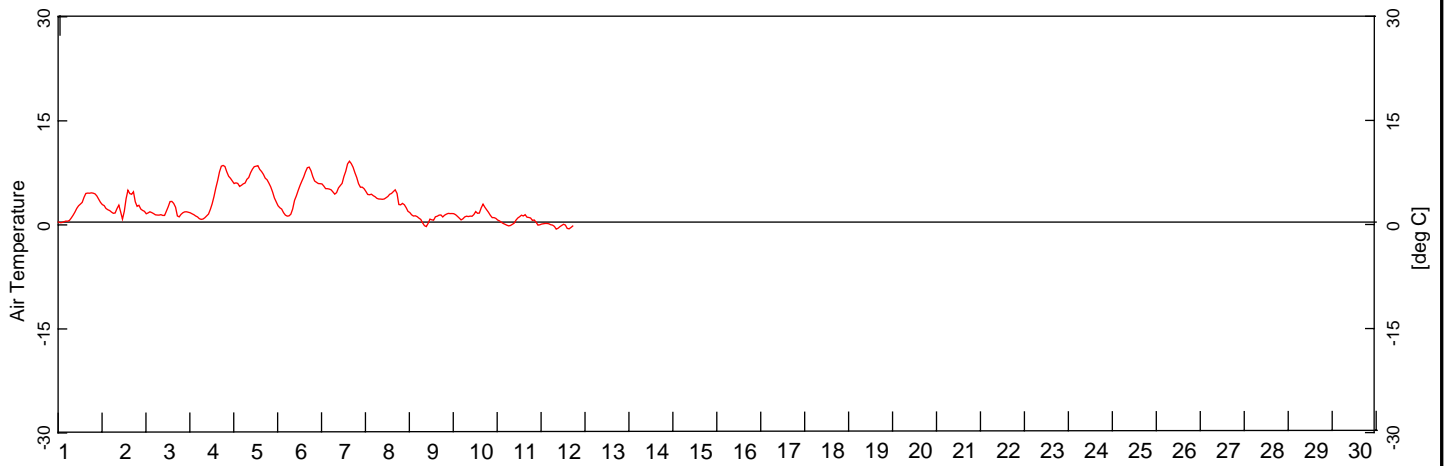
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EBA-VANC

DATE
November 2008

Figure D-14



NOTES

No data available from
September 13 to 30, 2006

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
September 2006**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

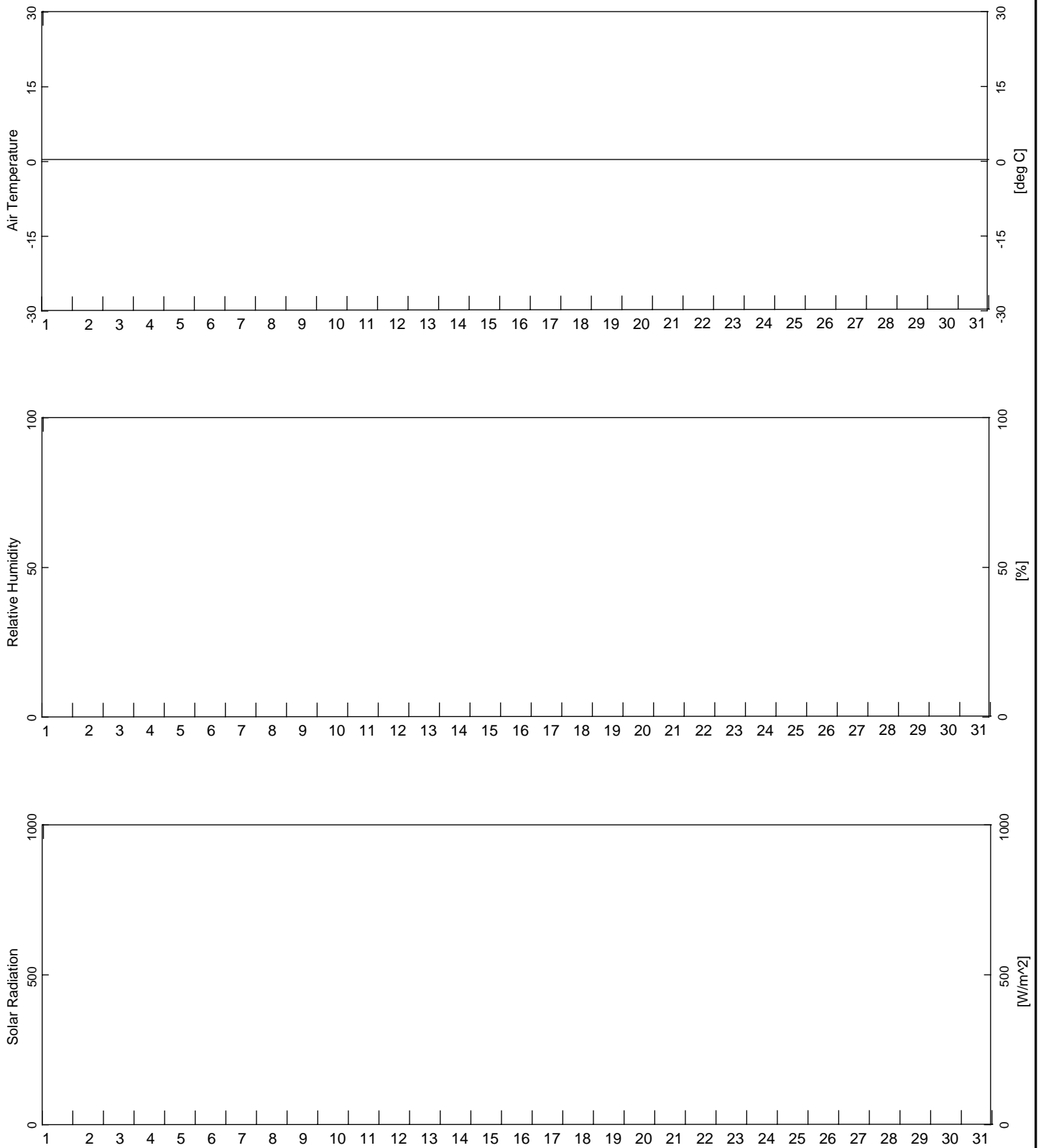
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EBA-VANC

DATE
November 2008

Figure D-15



NOTES

No data available from
October 1 to 31, 2006

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
October 2006**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
RED

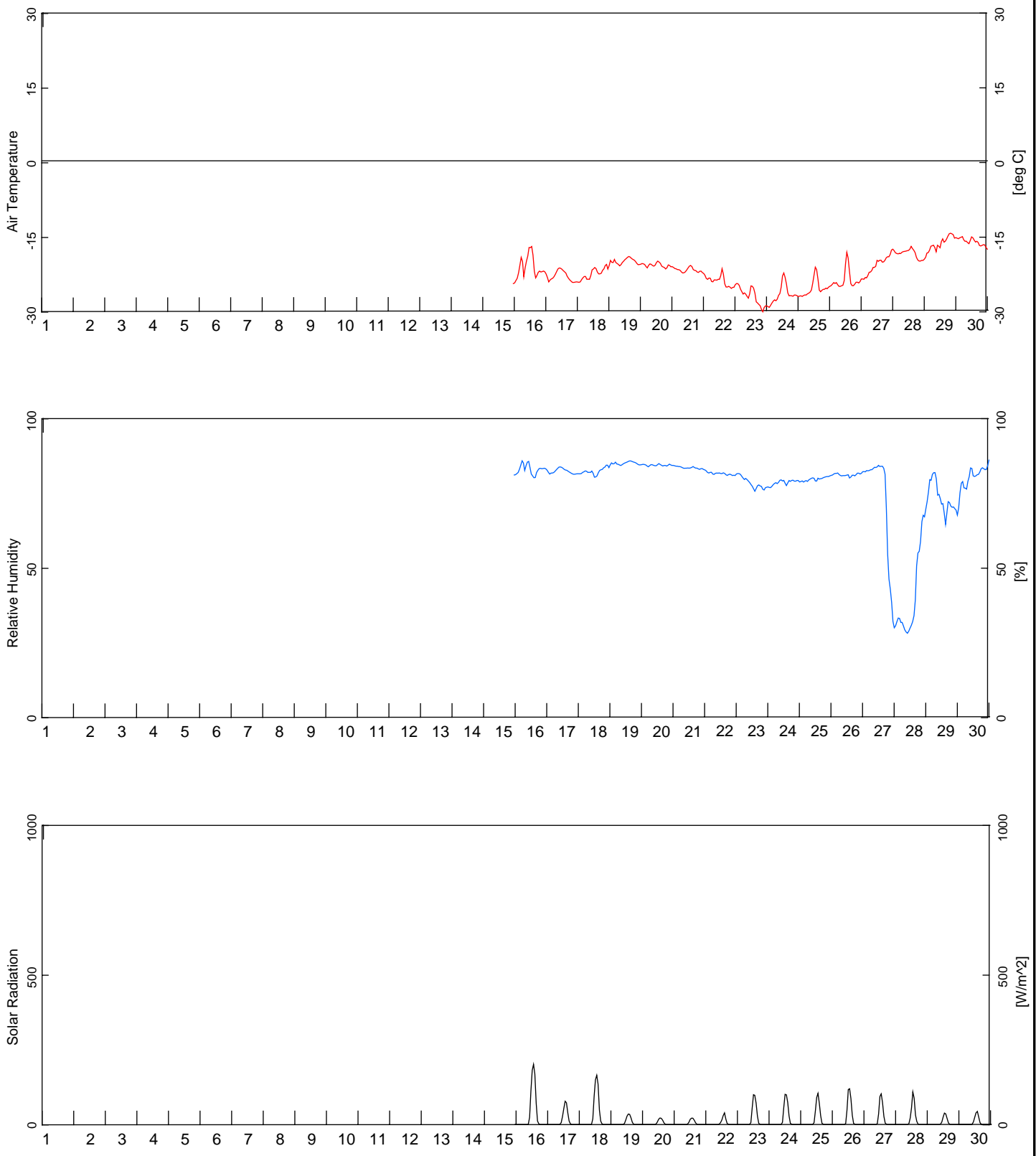
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DATE
November 2008

Figure D-16



NOTES

No data available from
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CLIENT

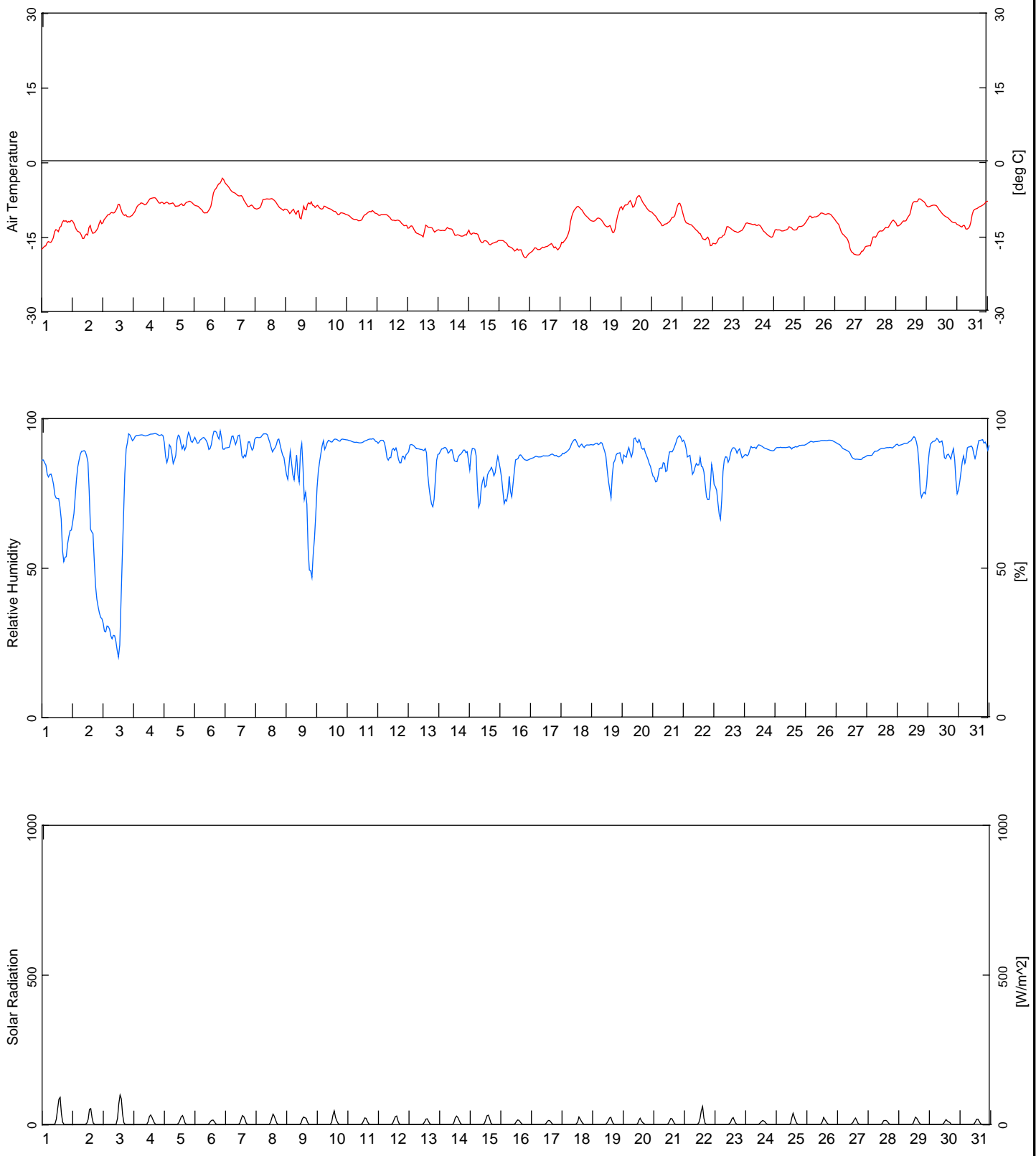
**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
November 2006**

**EBA Engineering
Consultants Ltd.** 

PROJECT NO. W23101021	DWN RED	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure D-17



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
December 2006**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

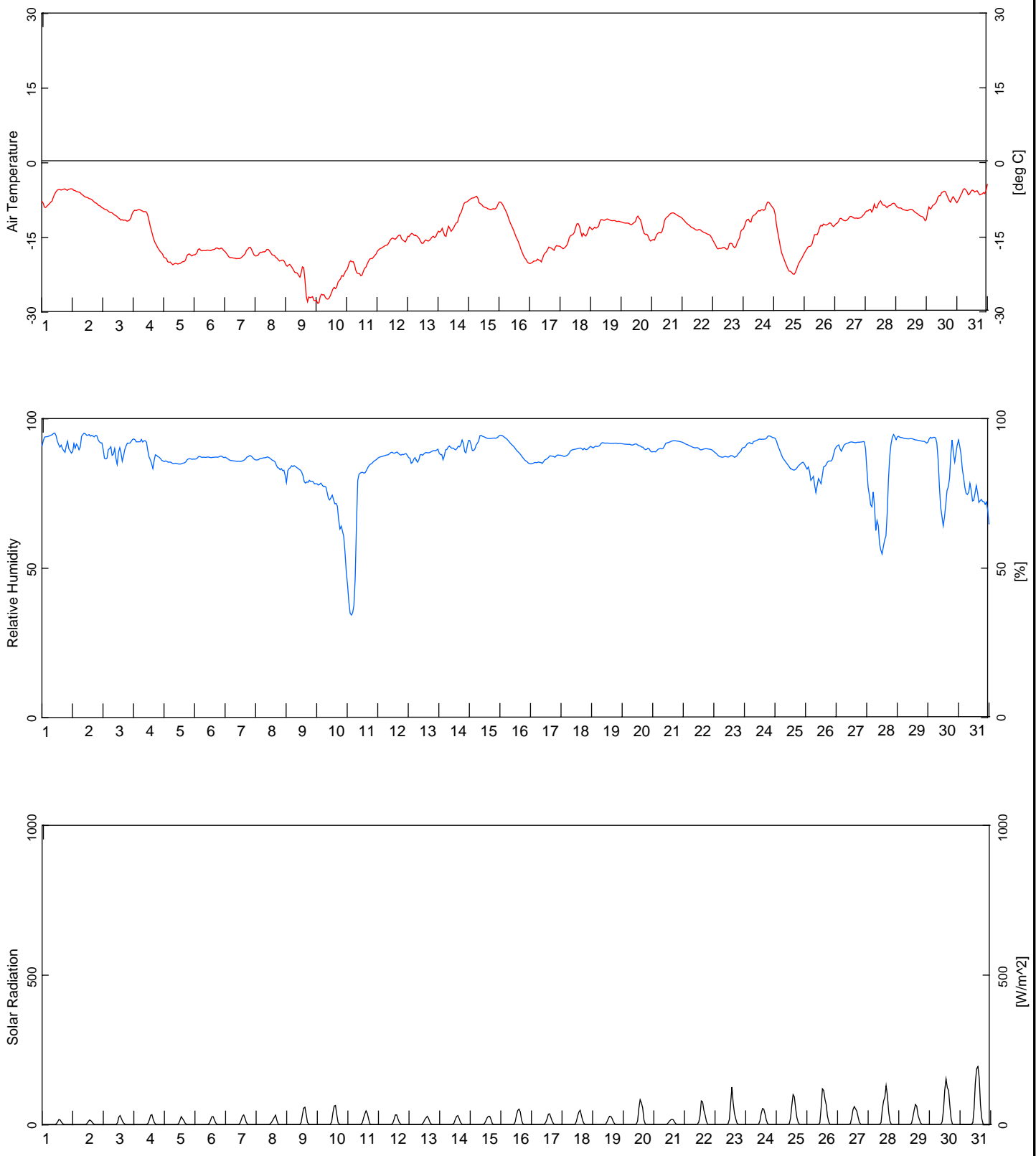
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-18



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
January 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

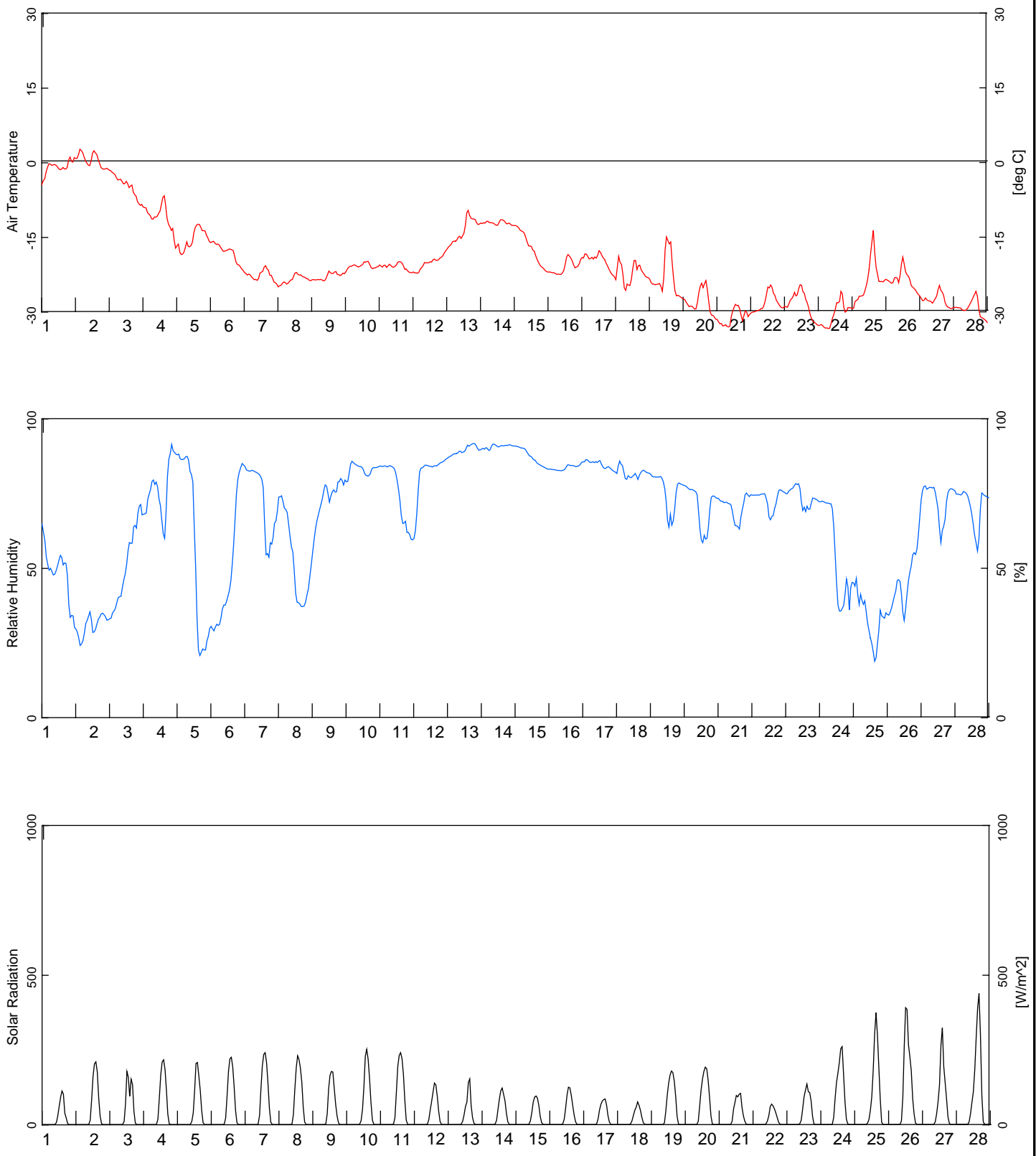
CHK
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-19



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
February 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

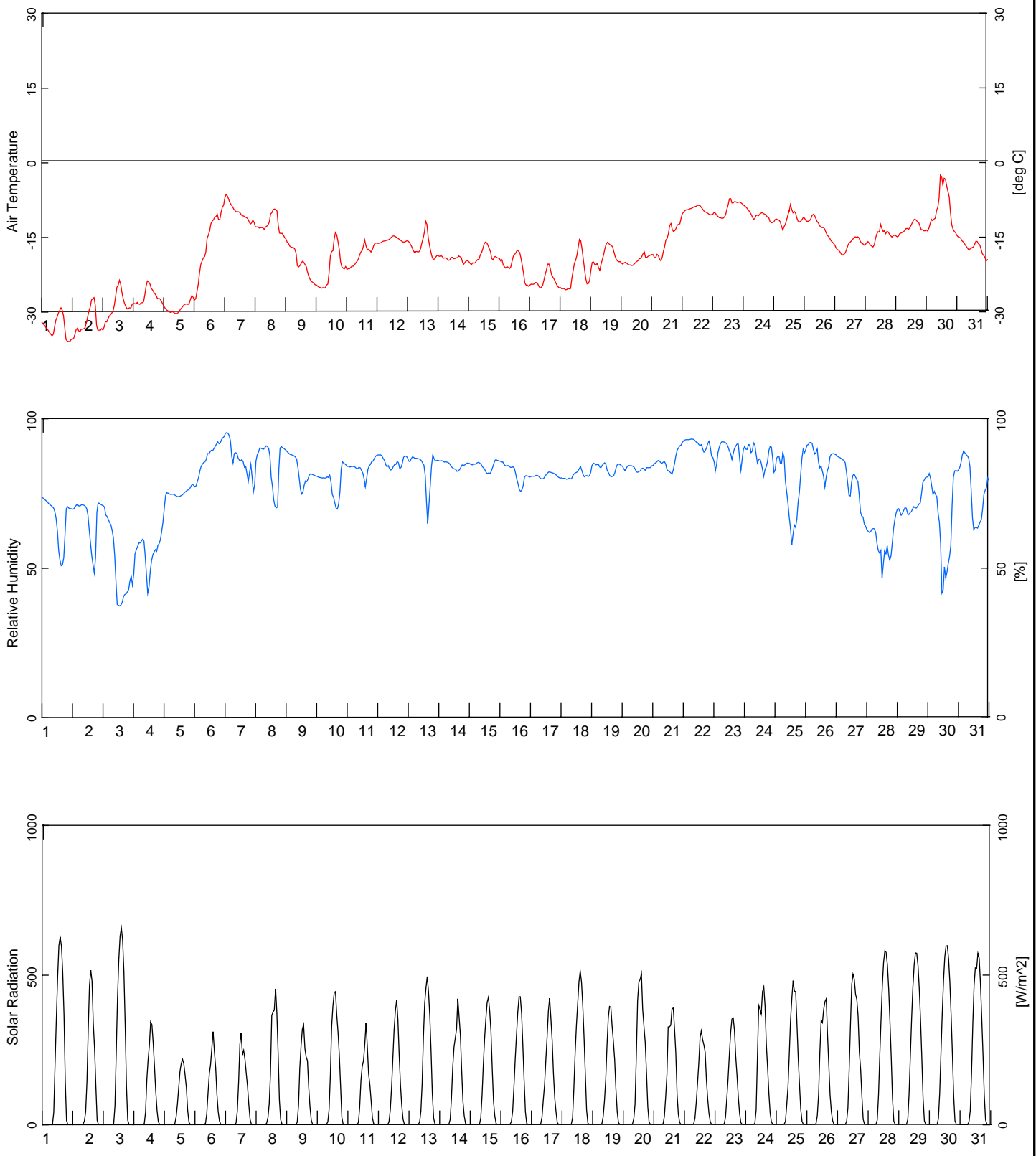
CHK
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-20



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
March 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
RED

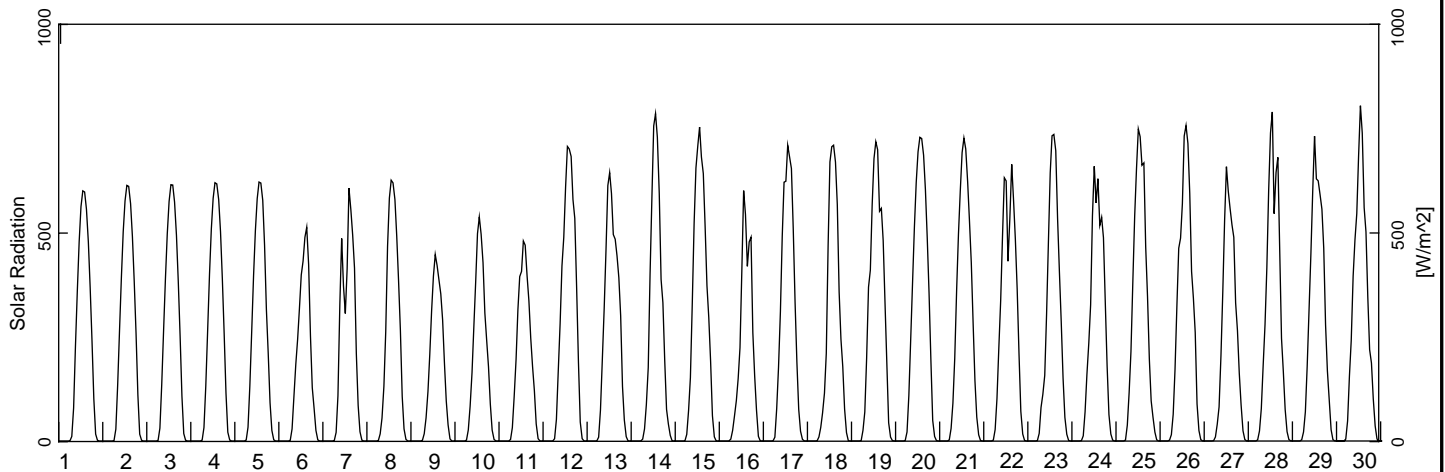
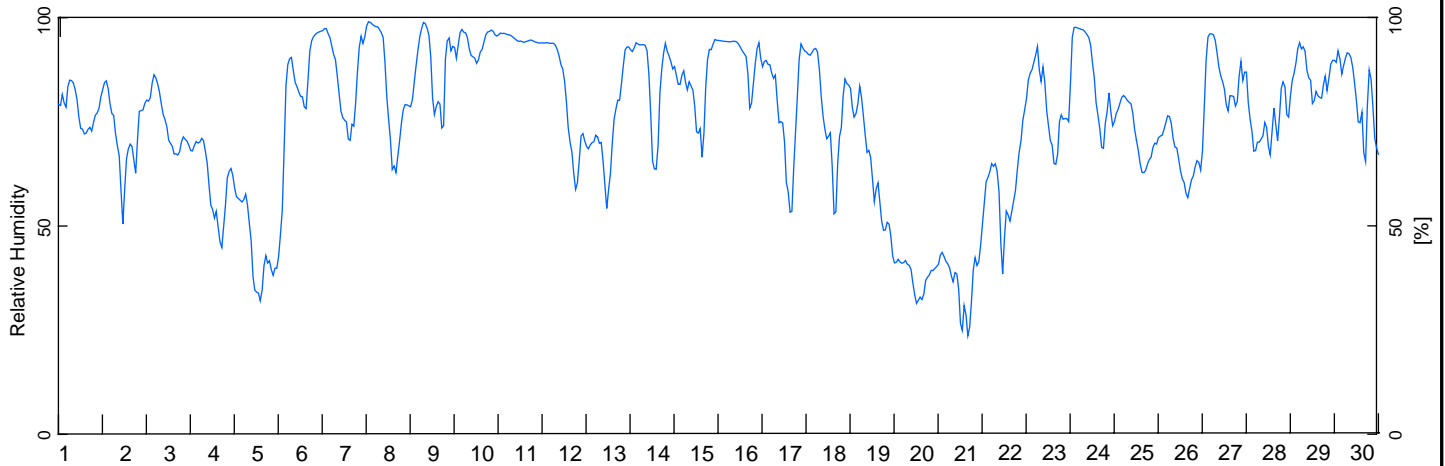
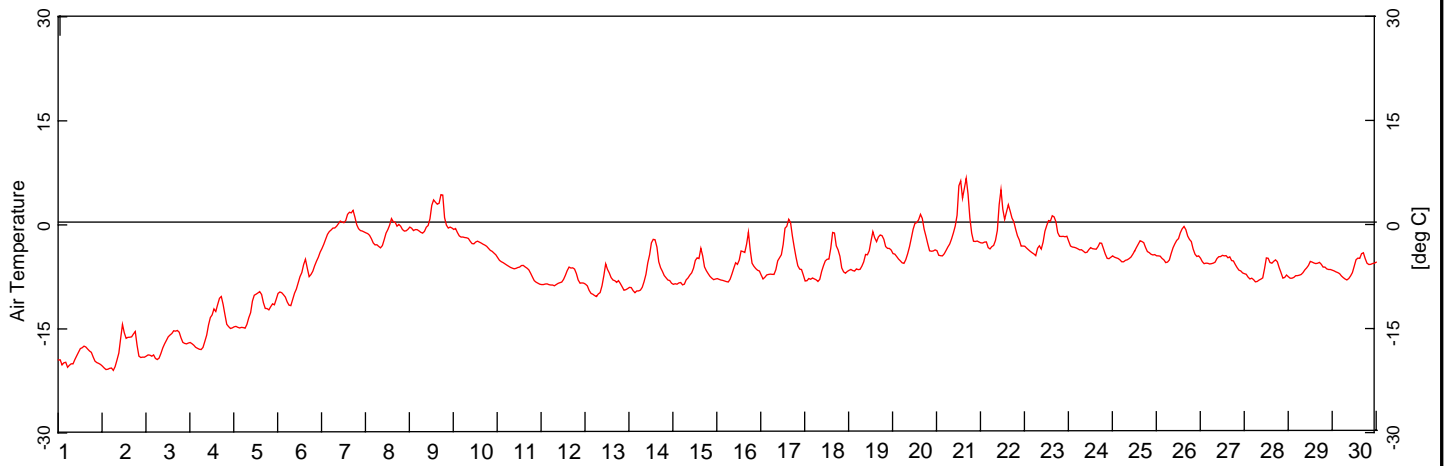
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-21



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
April 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

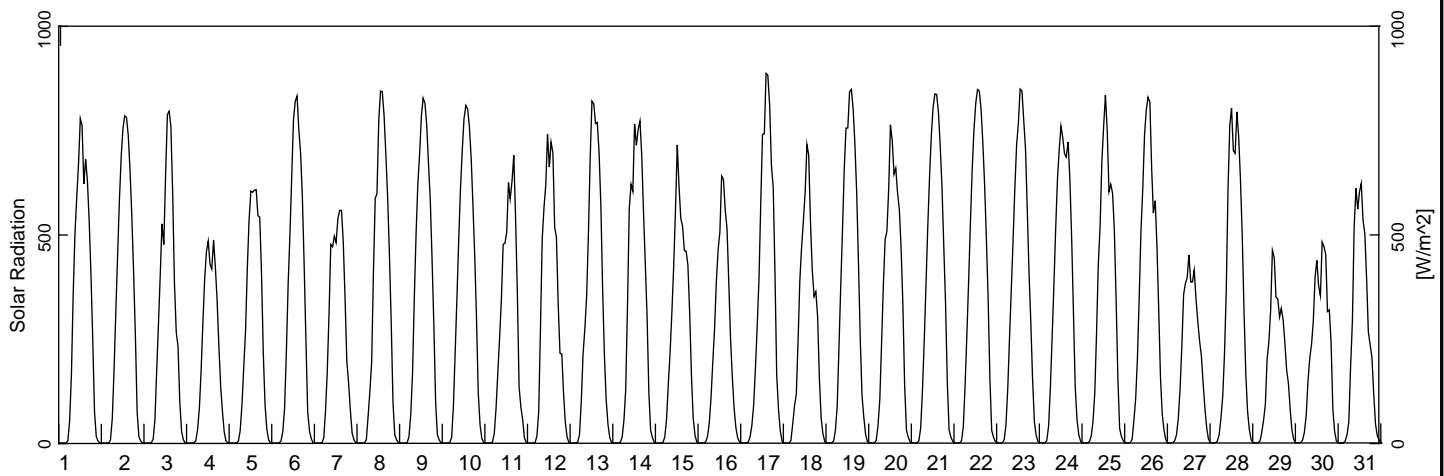
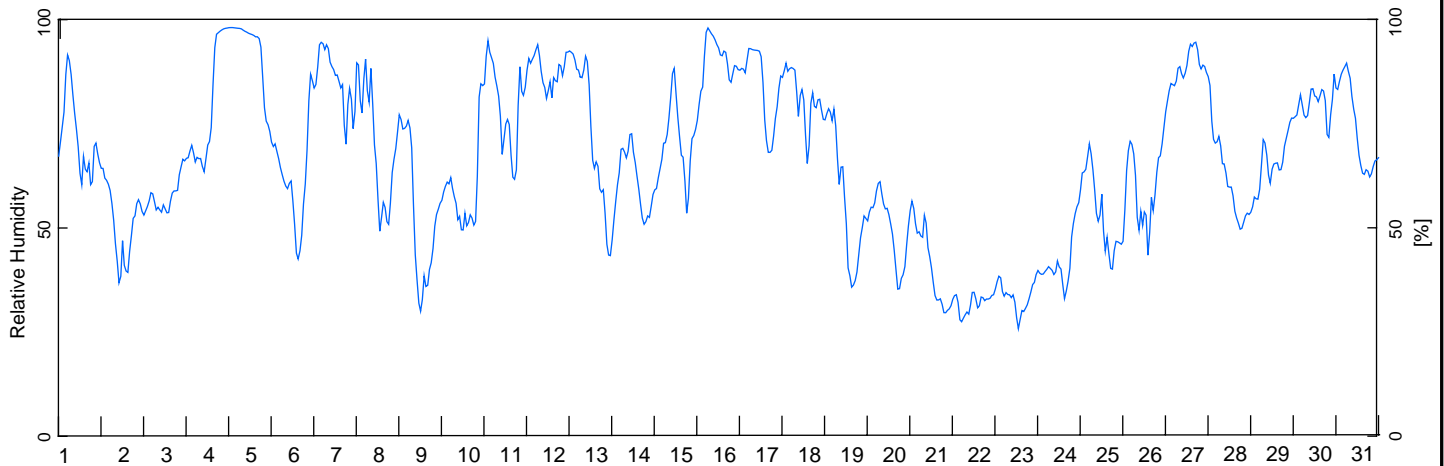
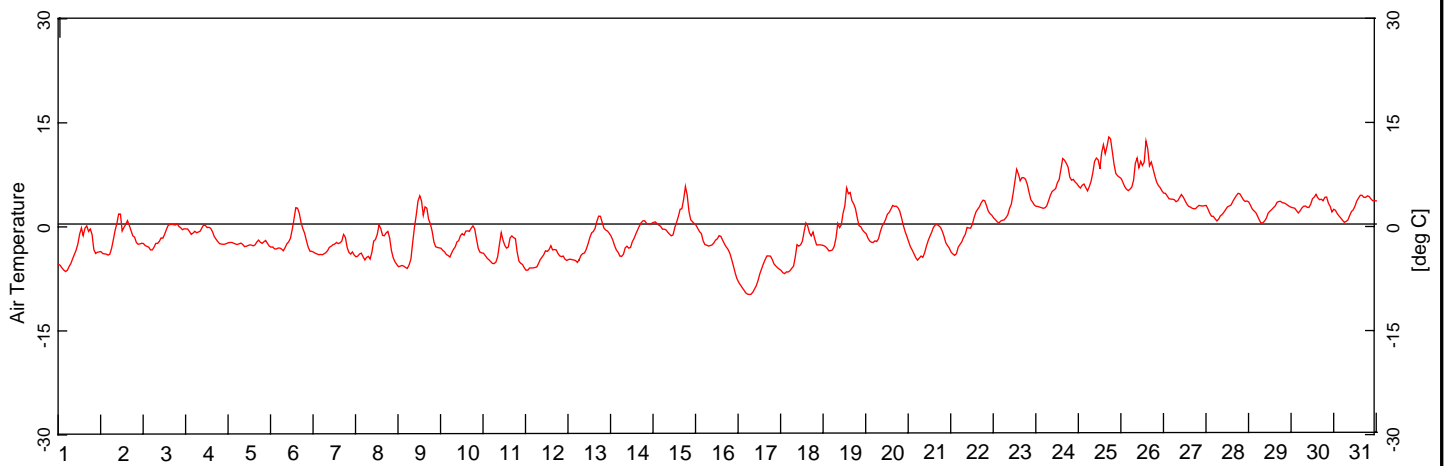
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EBA-VANC

DATE
November 2008

Figure D-22



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
May 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

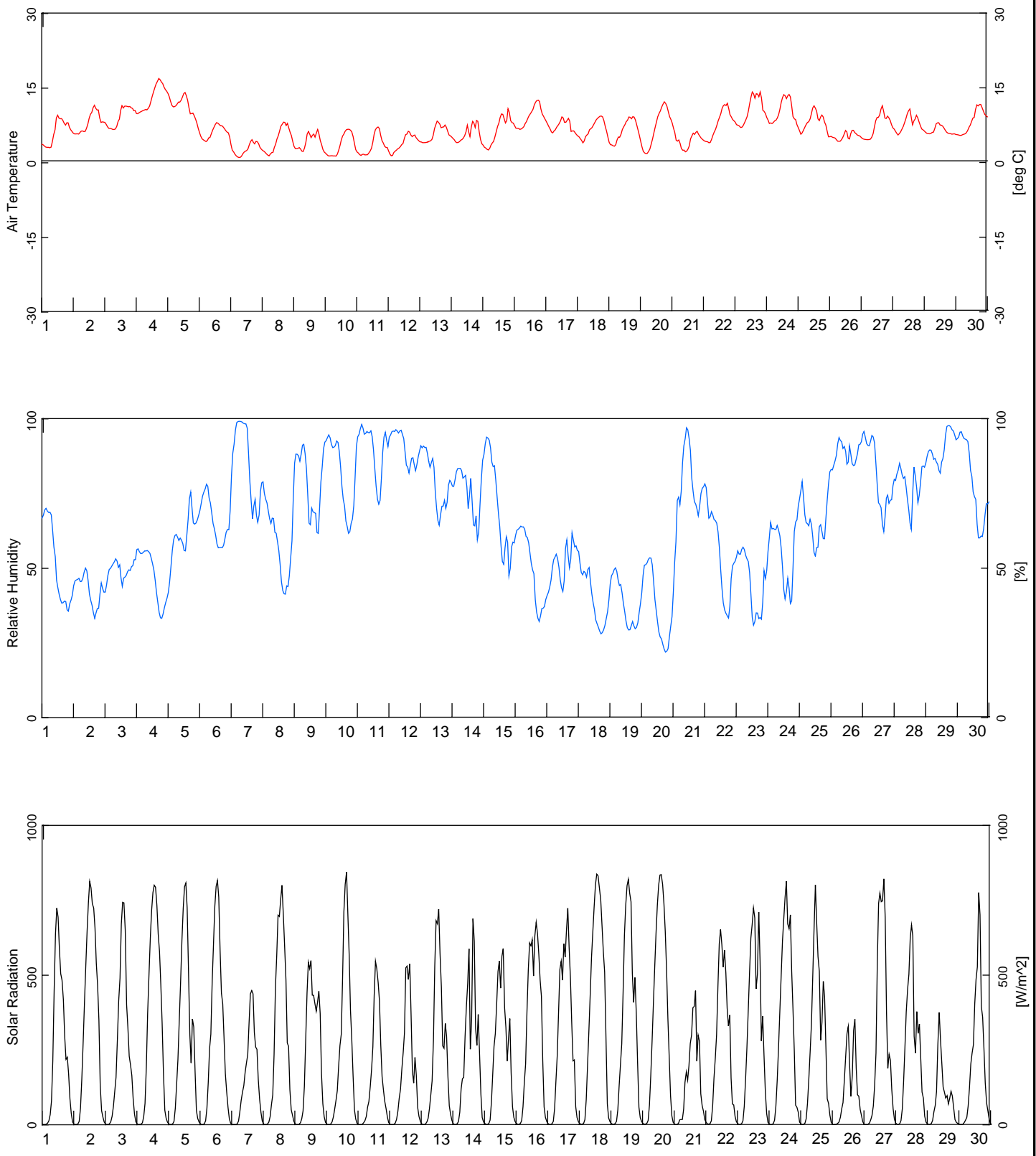
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OFFICE
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DATE
November 2008

Figure D-23



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
June 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

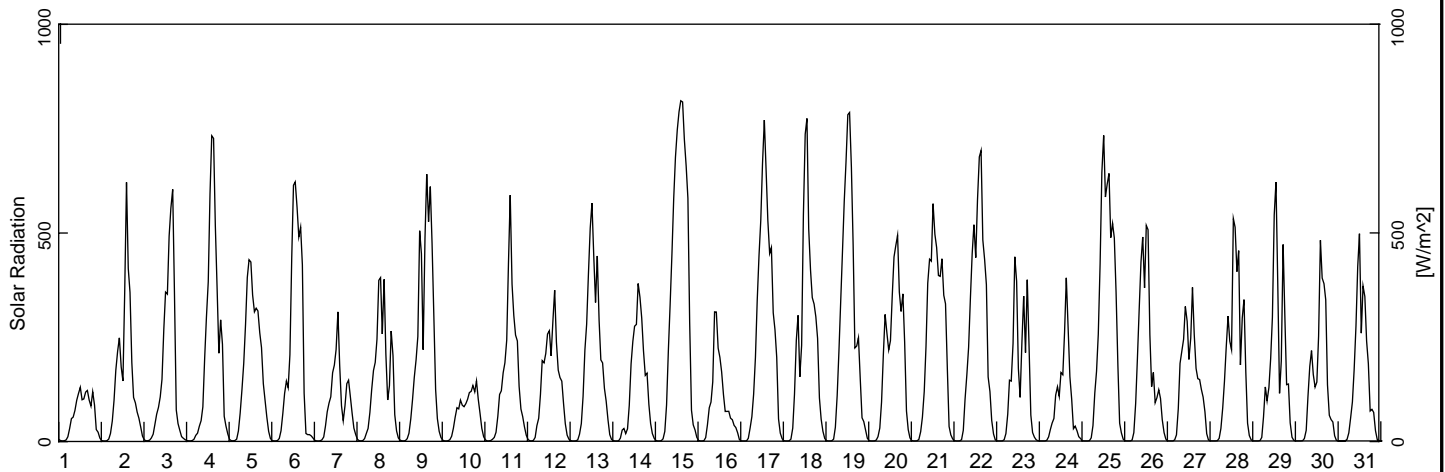
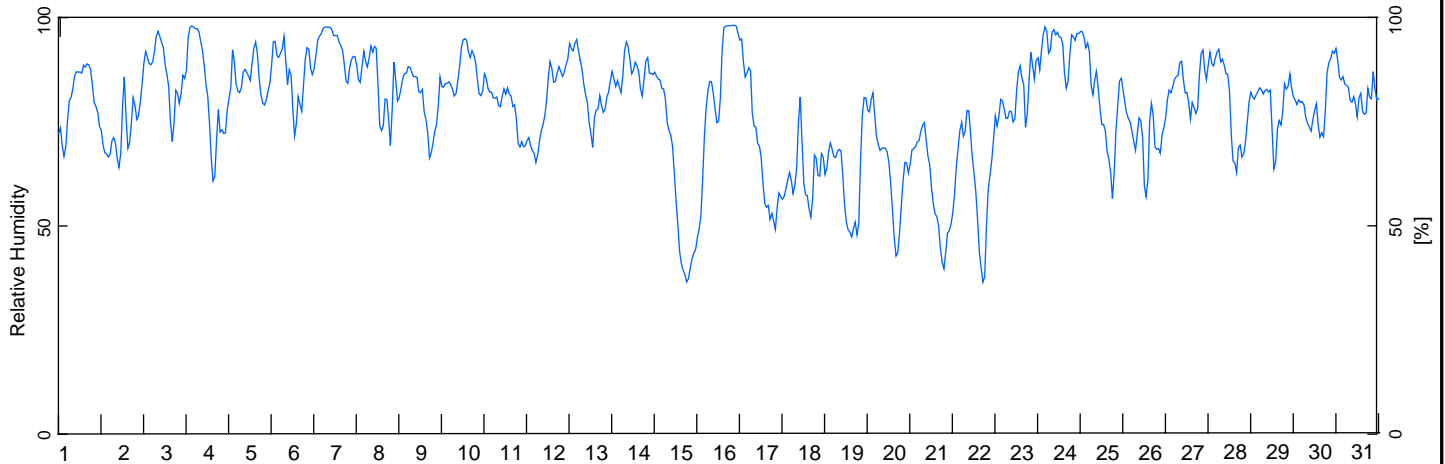
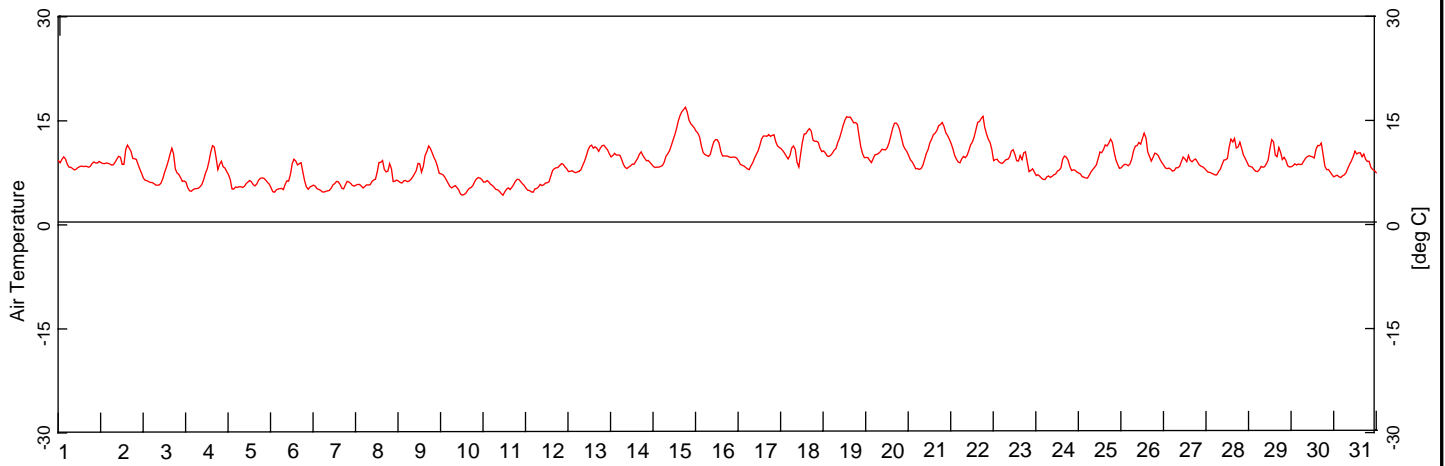
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-24



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
July 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

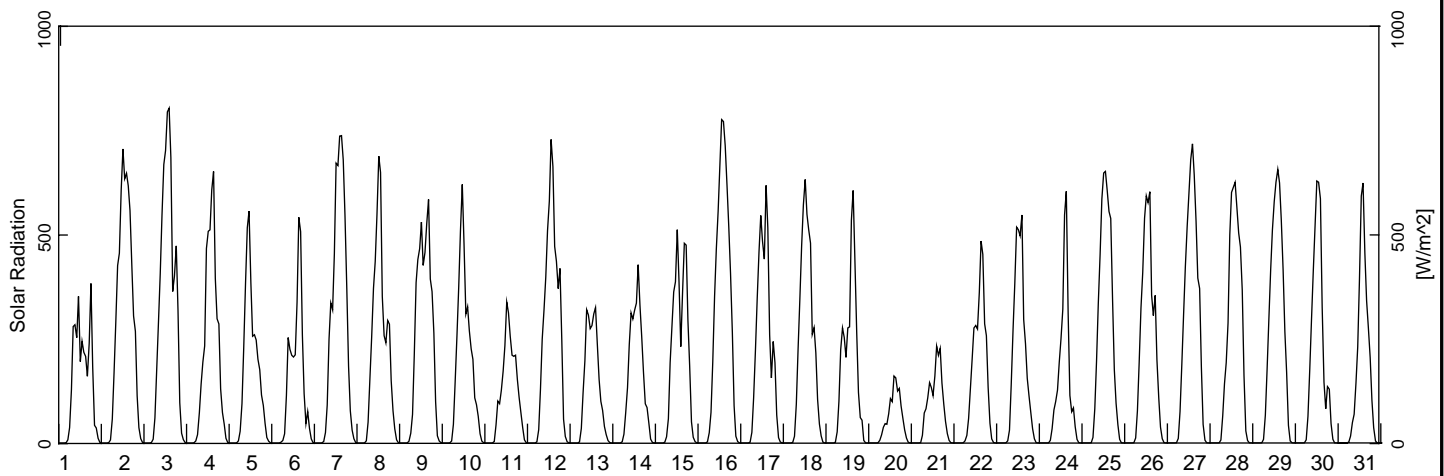
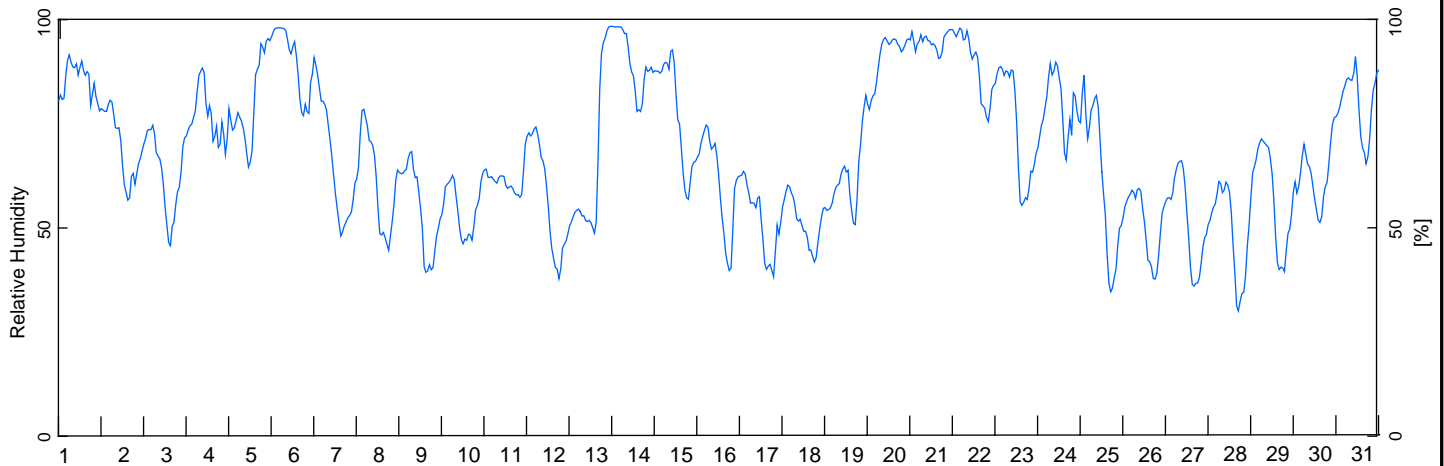
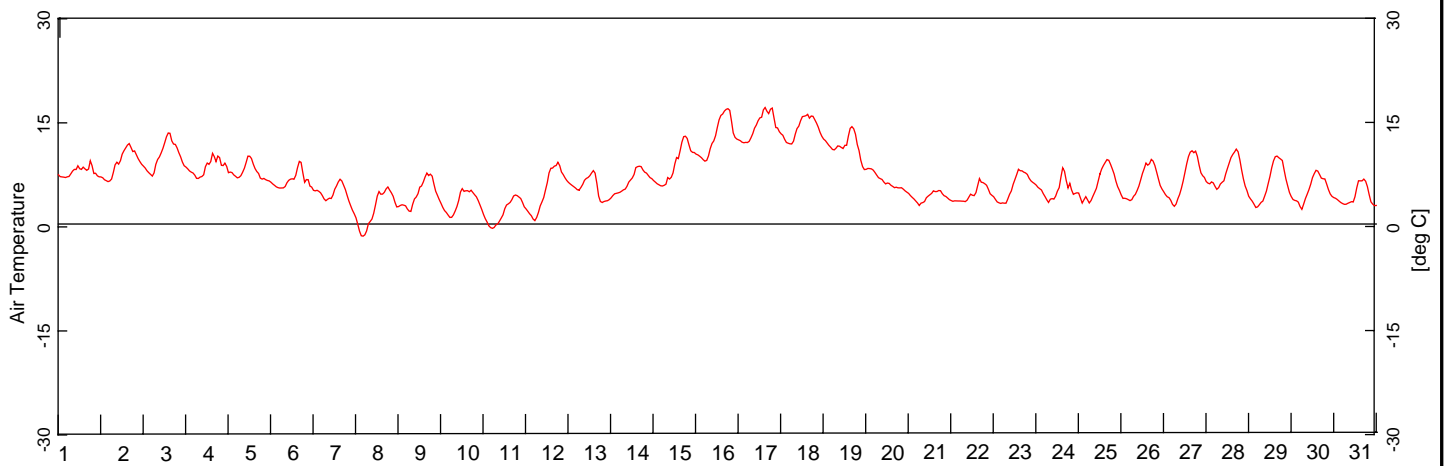
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-25



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
August 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

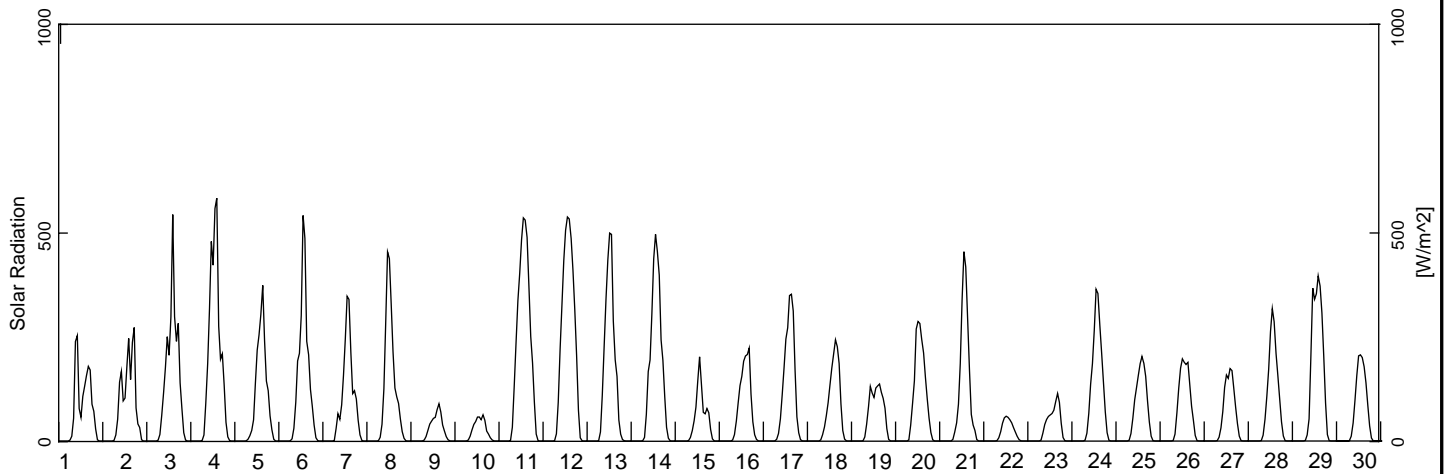
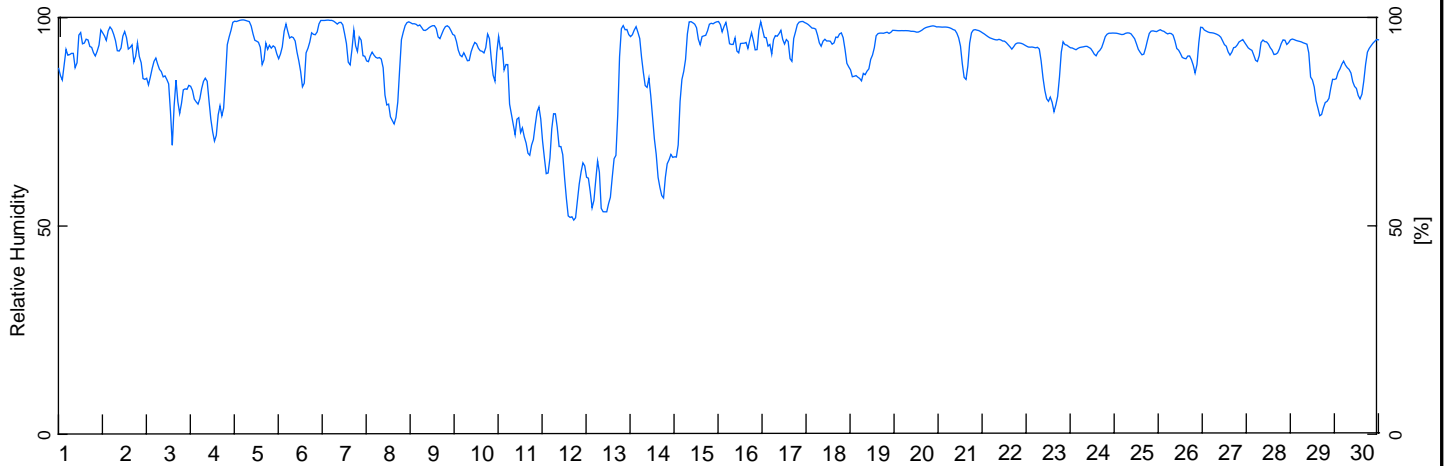
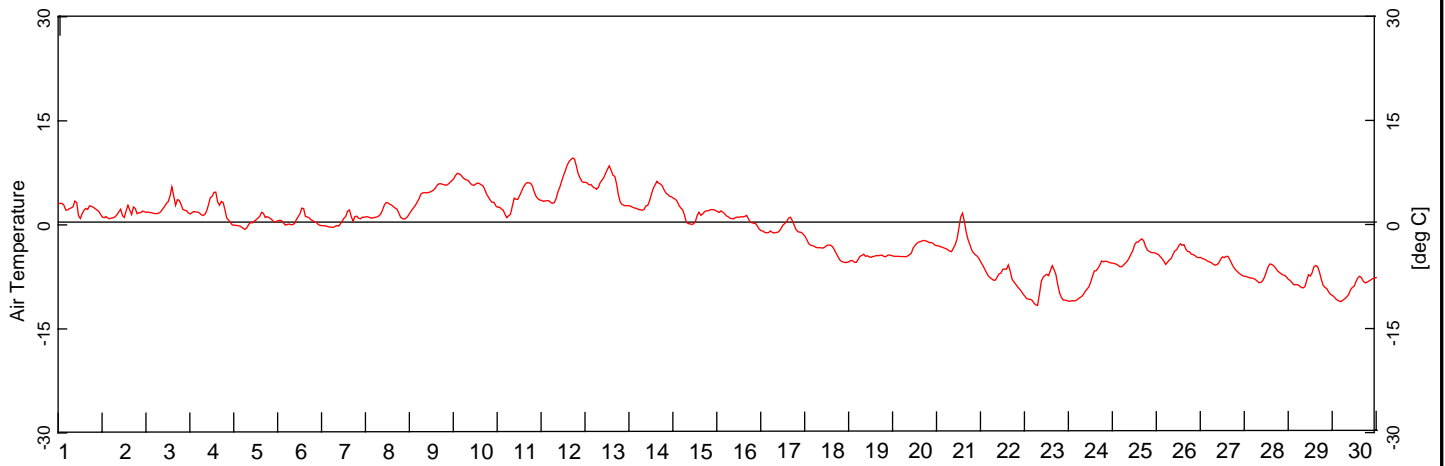
CHK
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-26



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
September 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

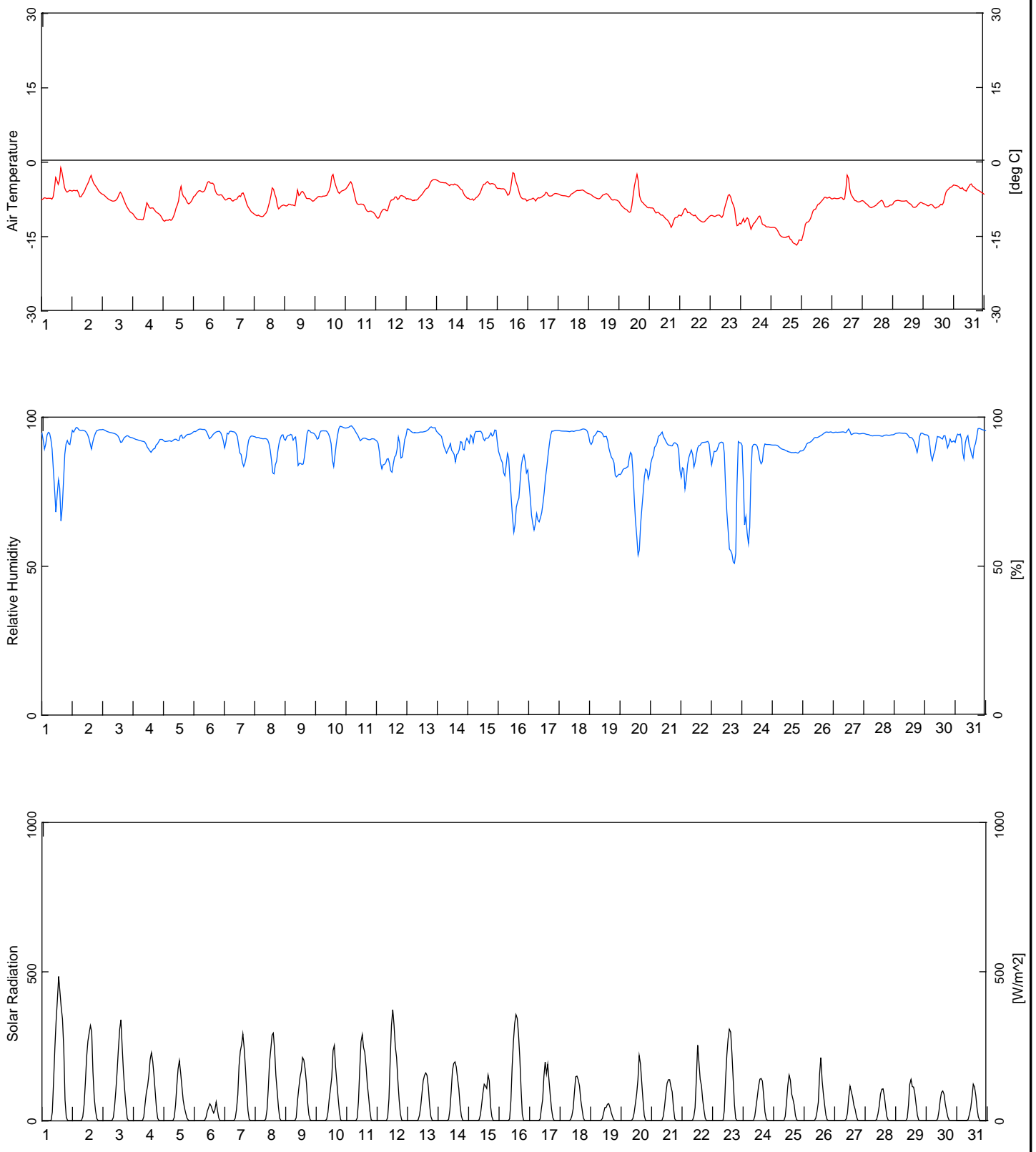
CHK
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REV
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-27



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
October 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

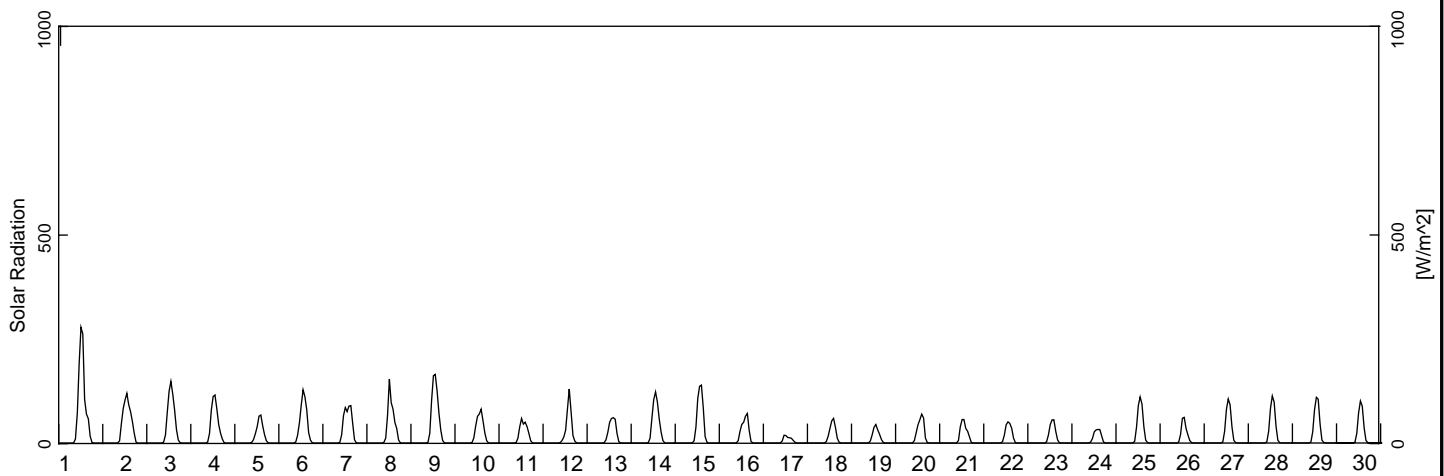
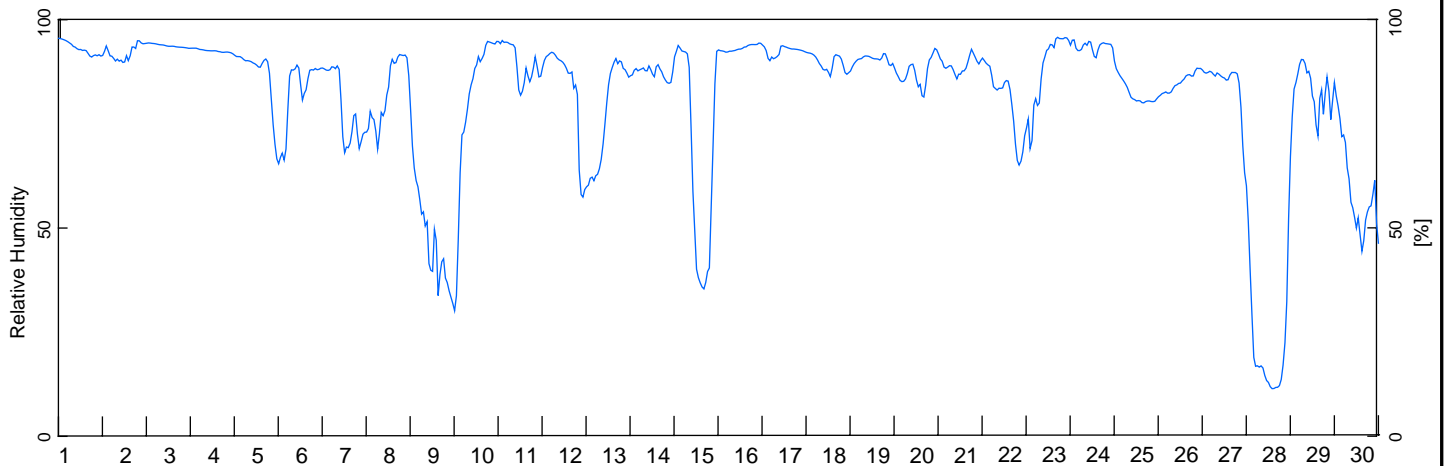
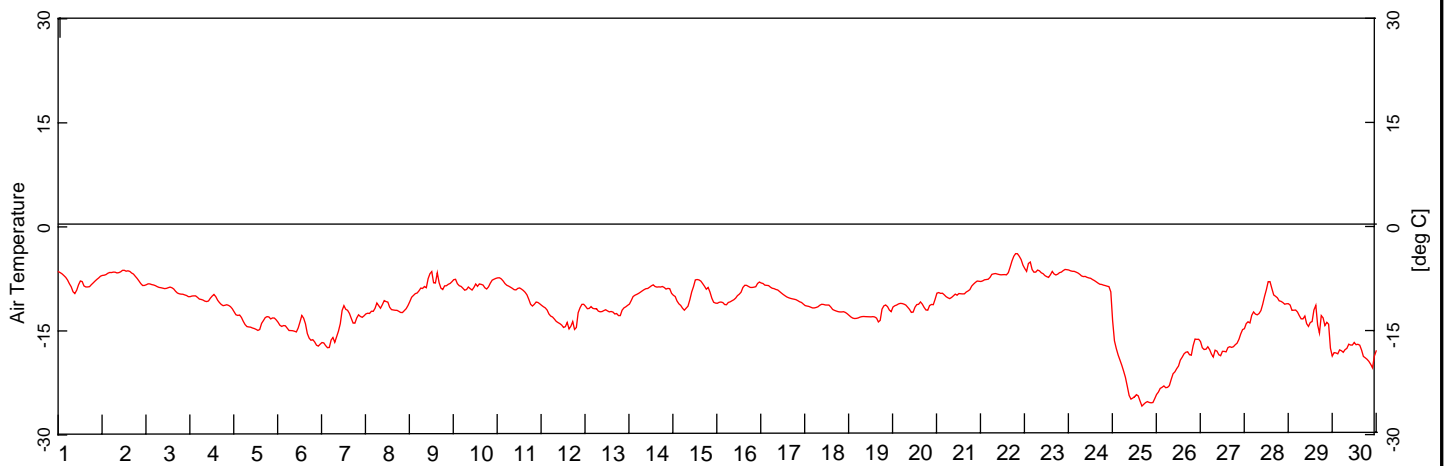
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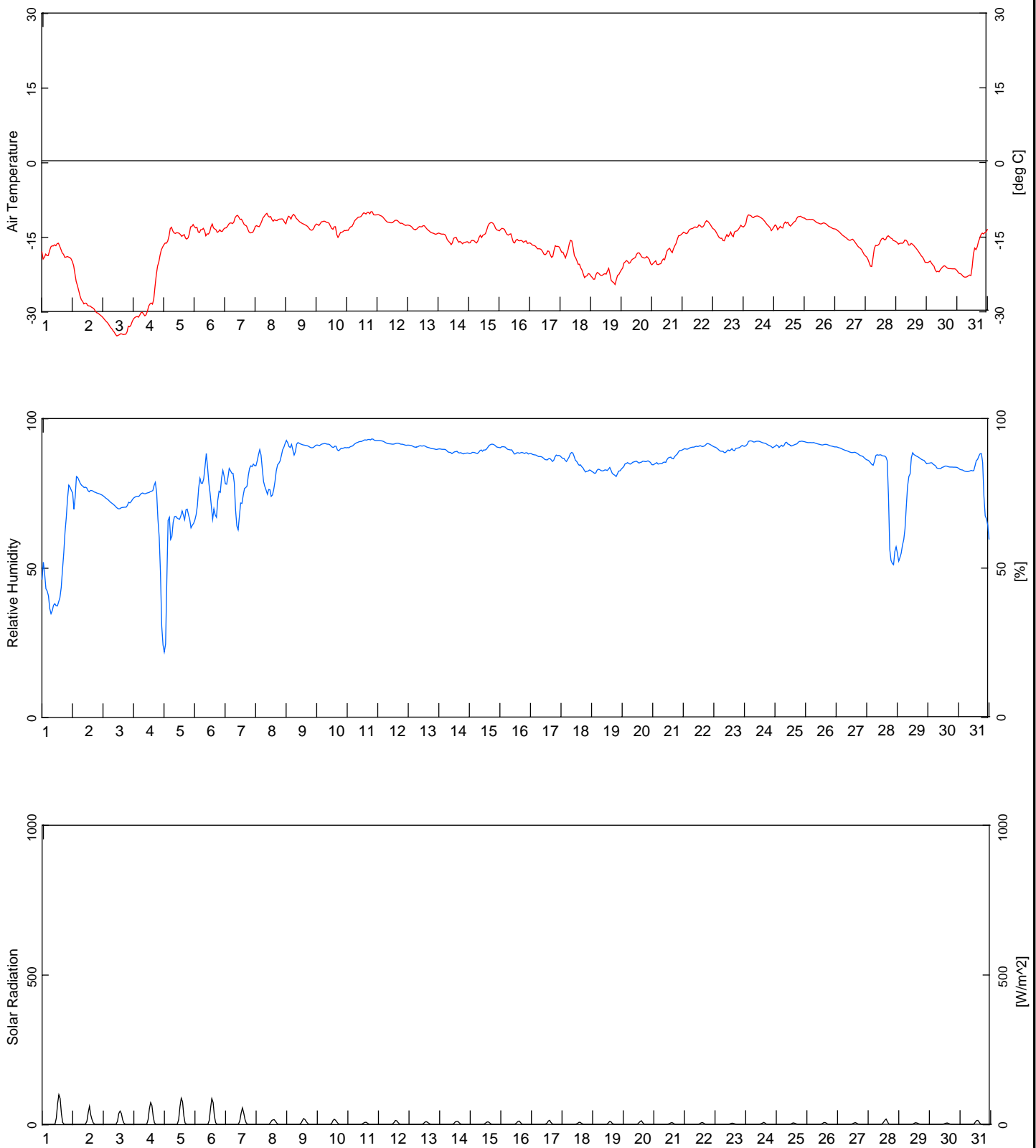
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DATE
November 2008

Figure D-28



NOTES	CLIENT	MACTUNG PROJECT 2008 HYDROMETEOROLOGICAL SURVEY			
		Mactung Station Weather Parameters November 2007			
	EBA Engineering Consultants Ltd.	PROJECT NO. W23101021	DWN RED	CHK JAS	REV 0
		OFFICE EBA-VANC	DATE November 2008		Figure D-29



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
December 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

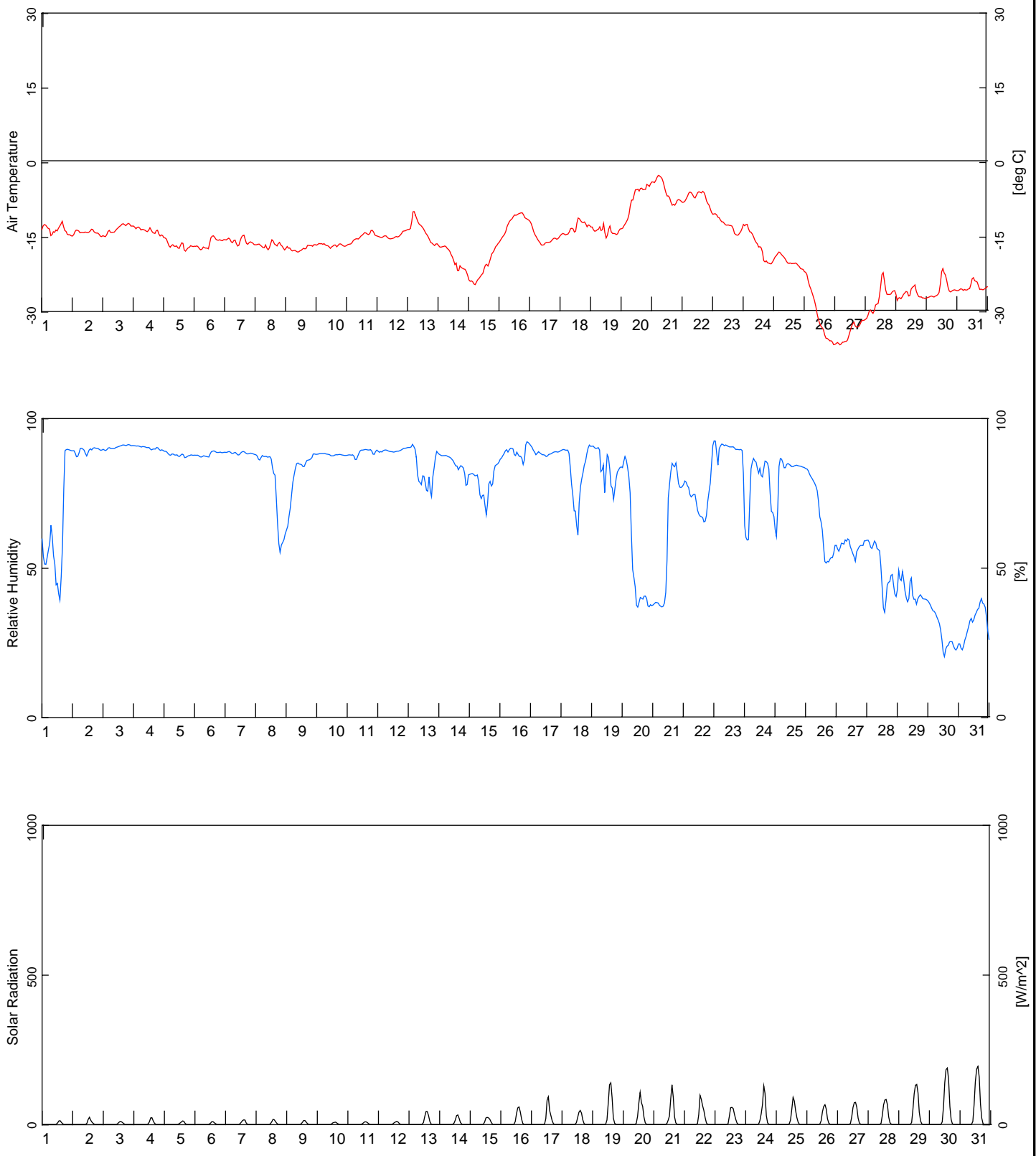
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-30



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
January 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

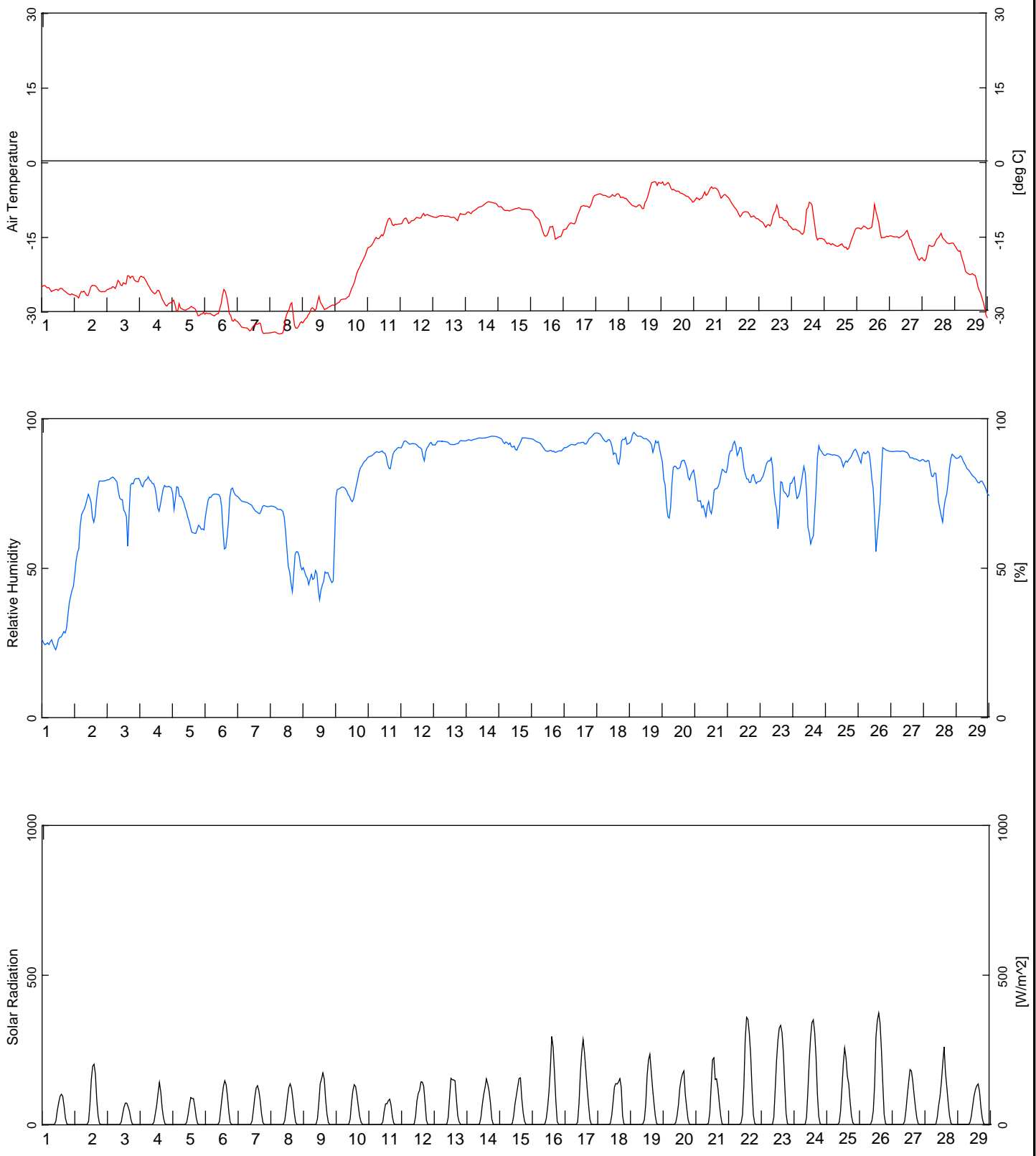
CHK
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-31



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
February 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

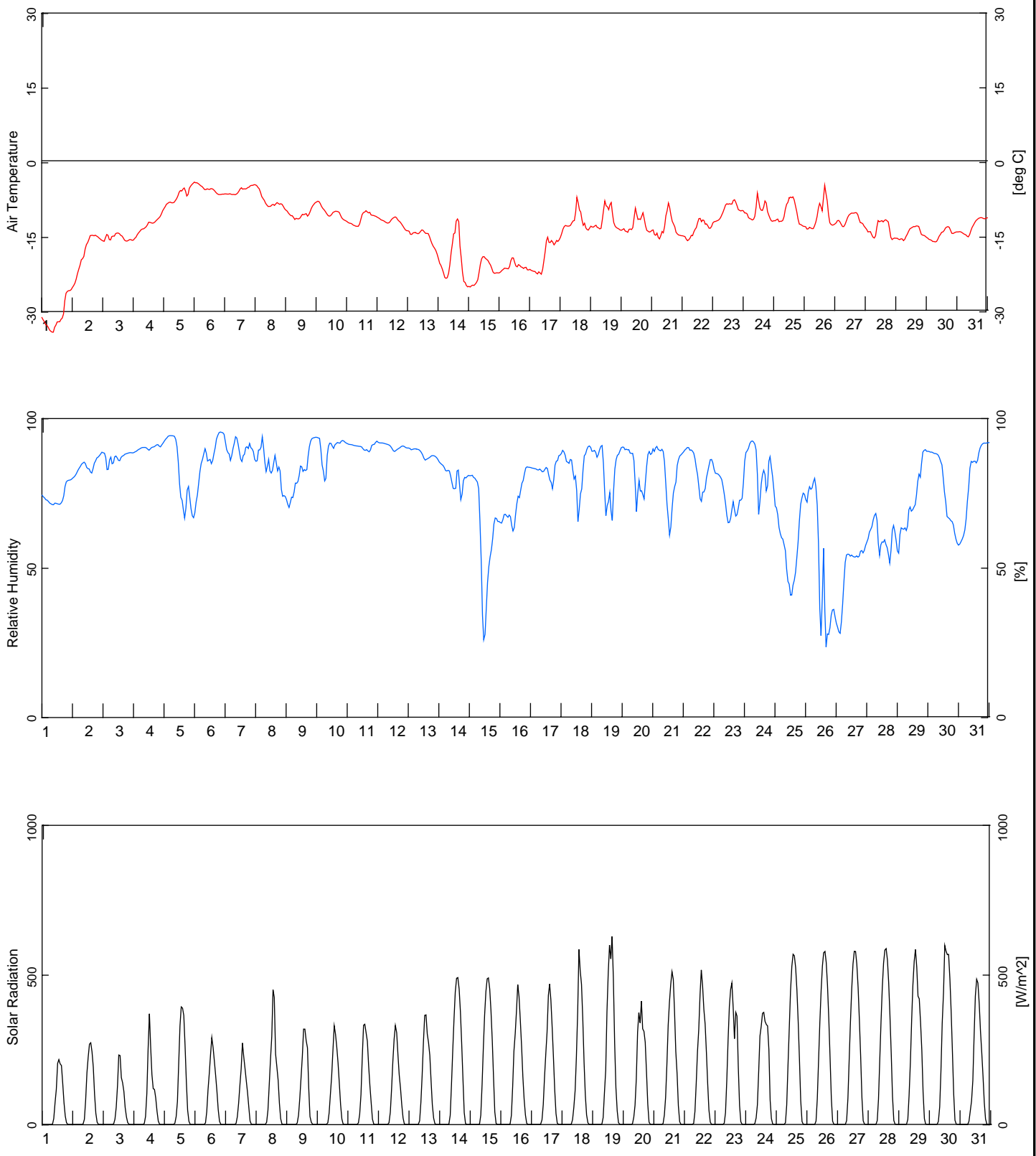
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-32



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
March 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
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RED

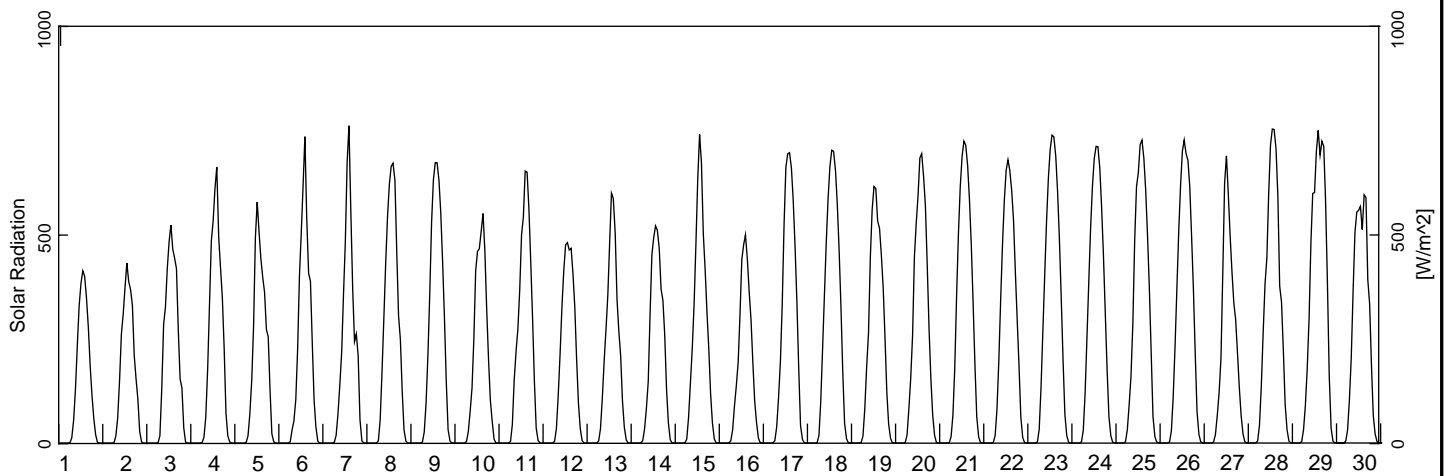
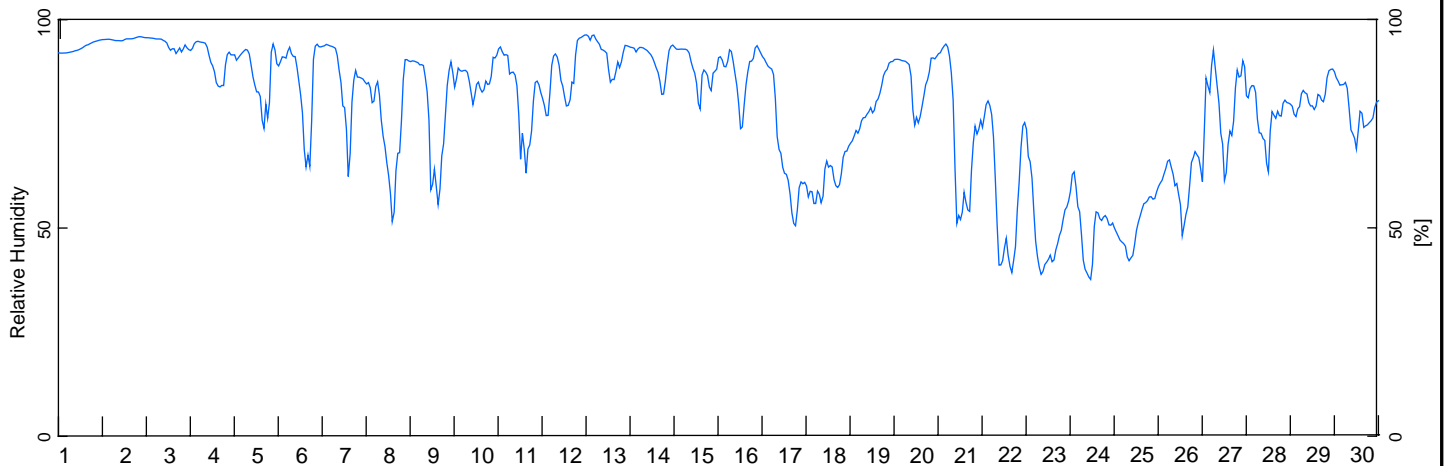
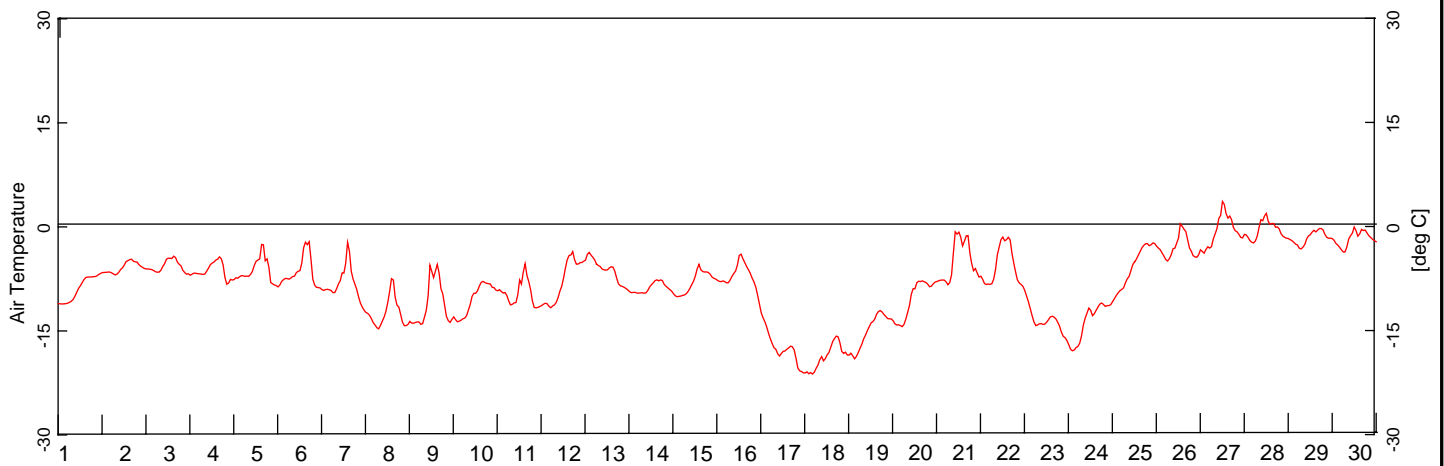
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-33



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
April 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

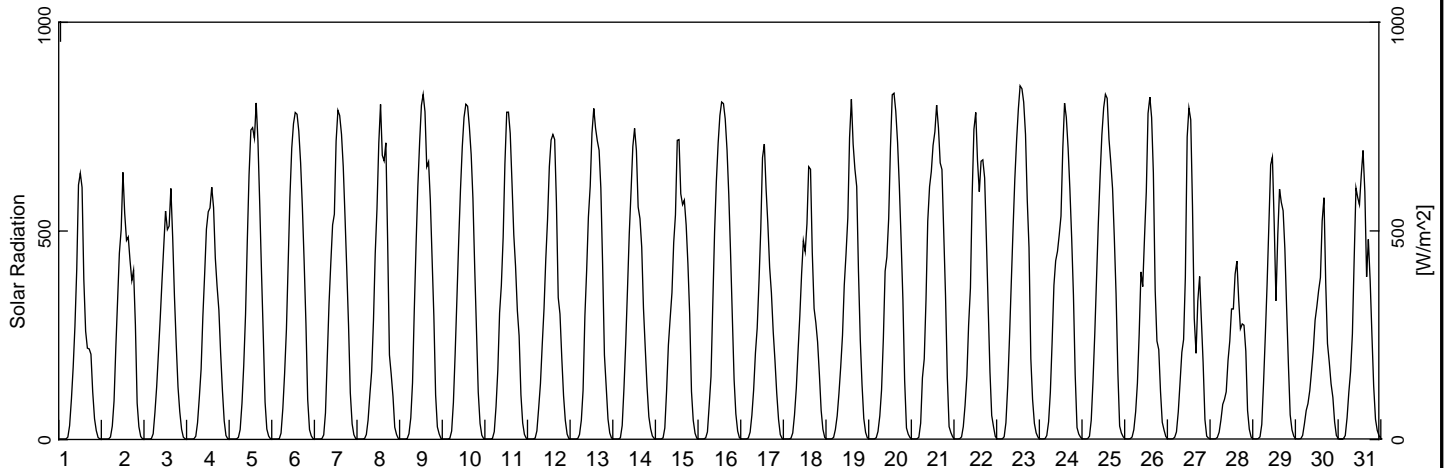
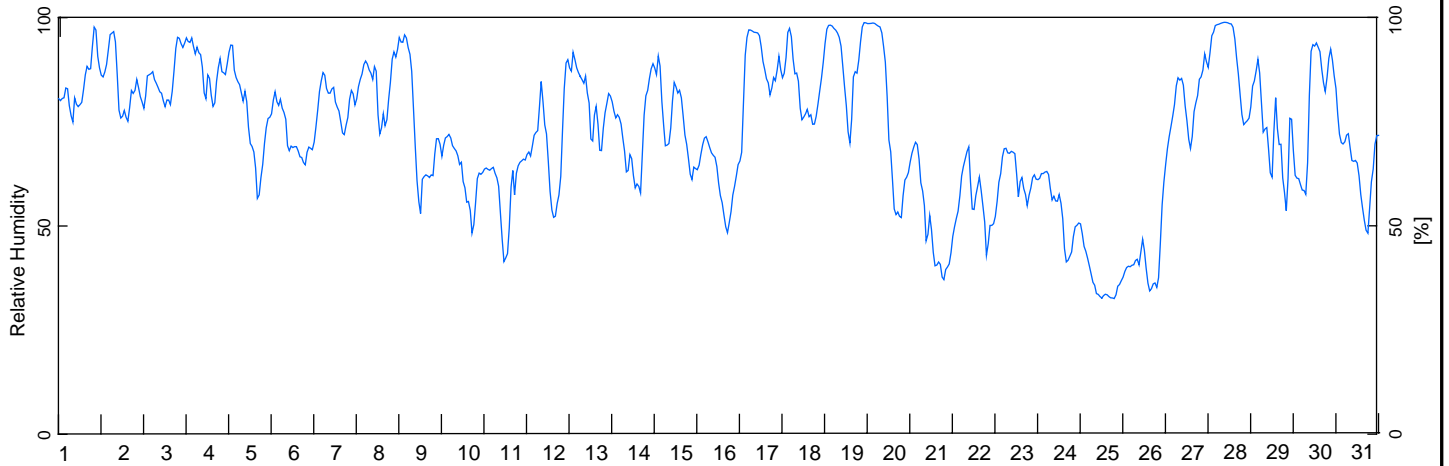
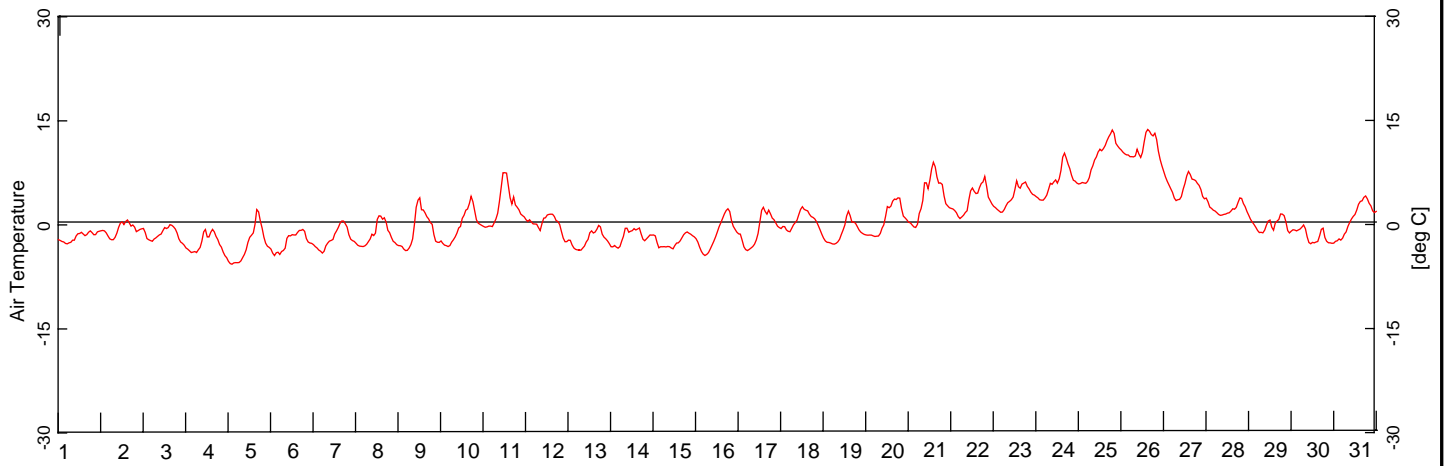
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EBA-VANC

DATE
November 2008

Figure D-34



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
May 2008**

EBA Engineering
Consultants Ltd.



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DWN
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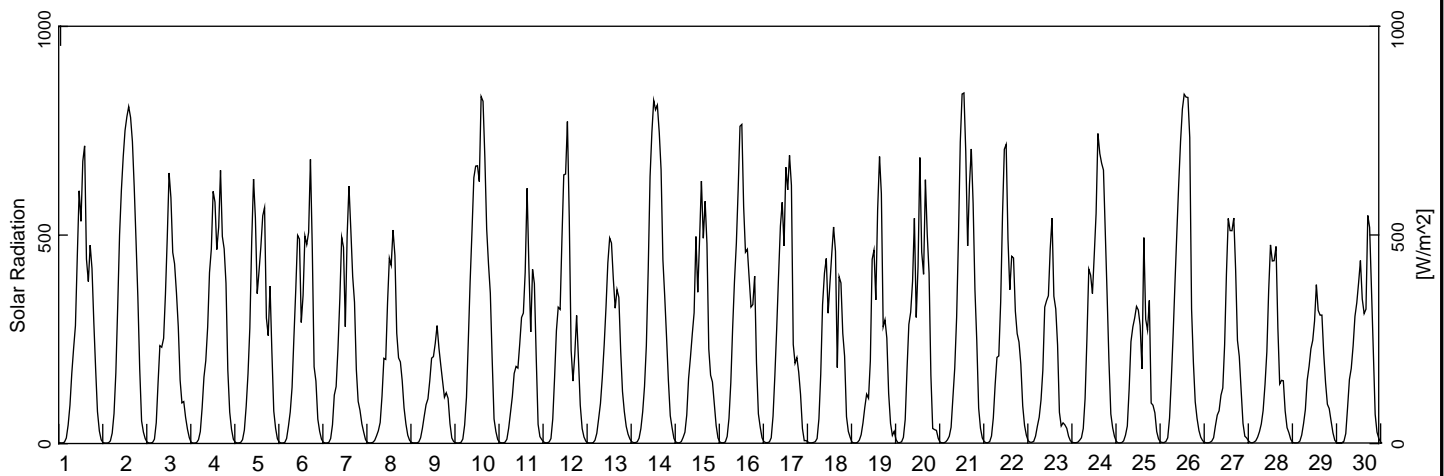
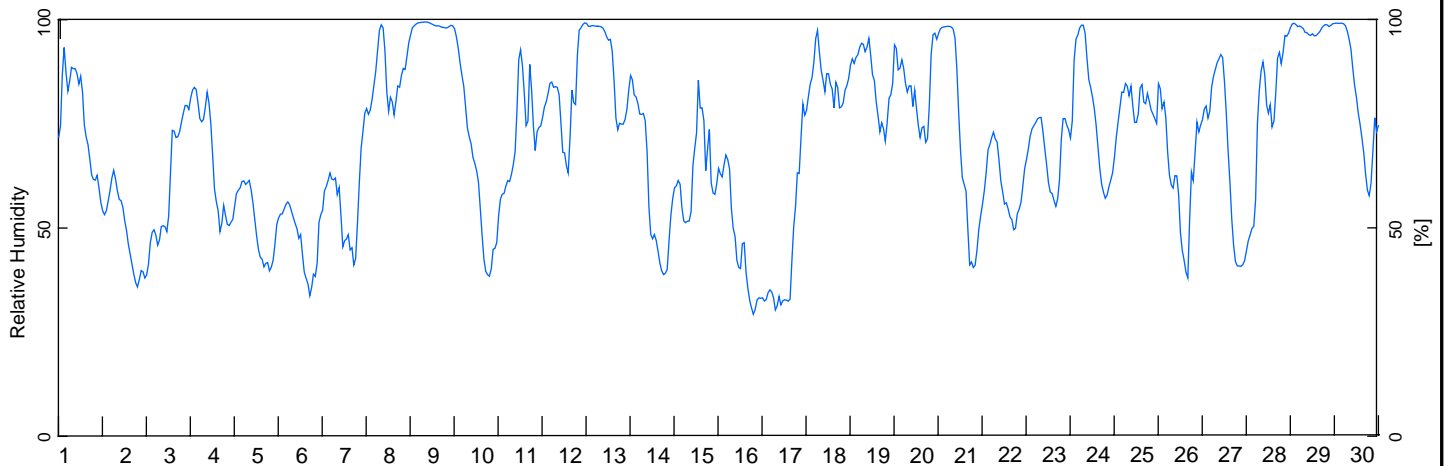
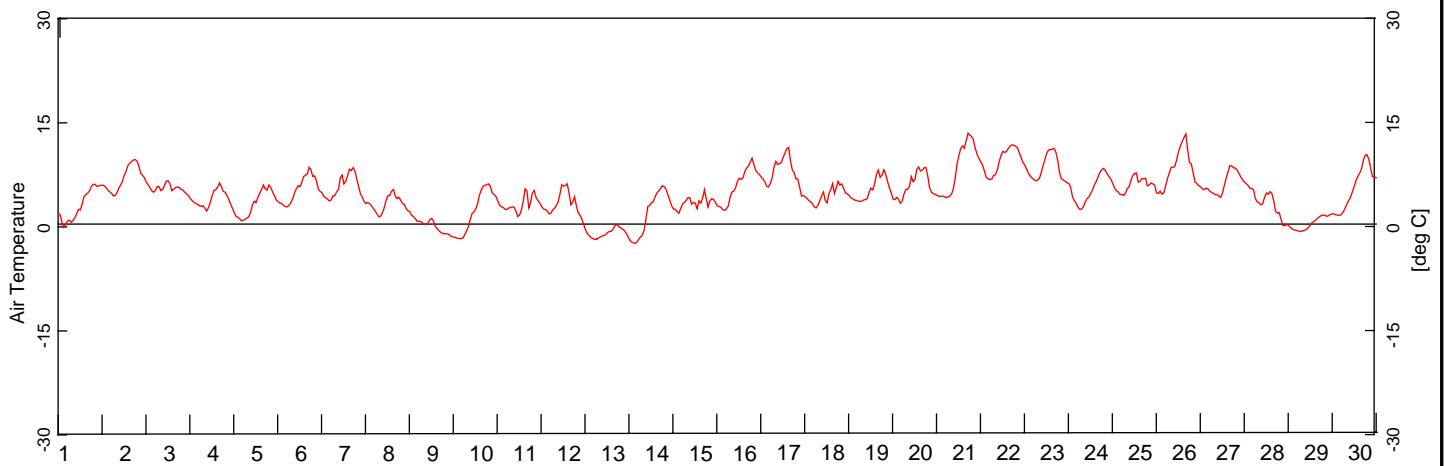
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EBA-VANC

DATE
November 2008

Figure D-35



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
June 2008**

EBA Engineering
Consultants Ltd.



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DWN
RED

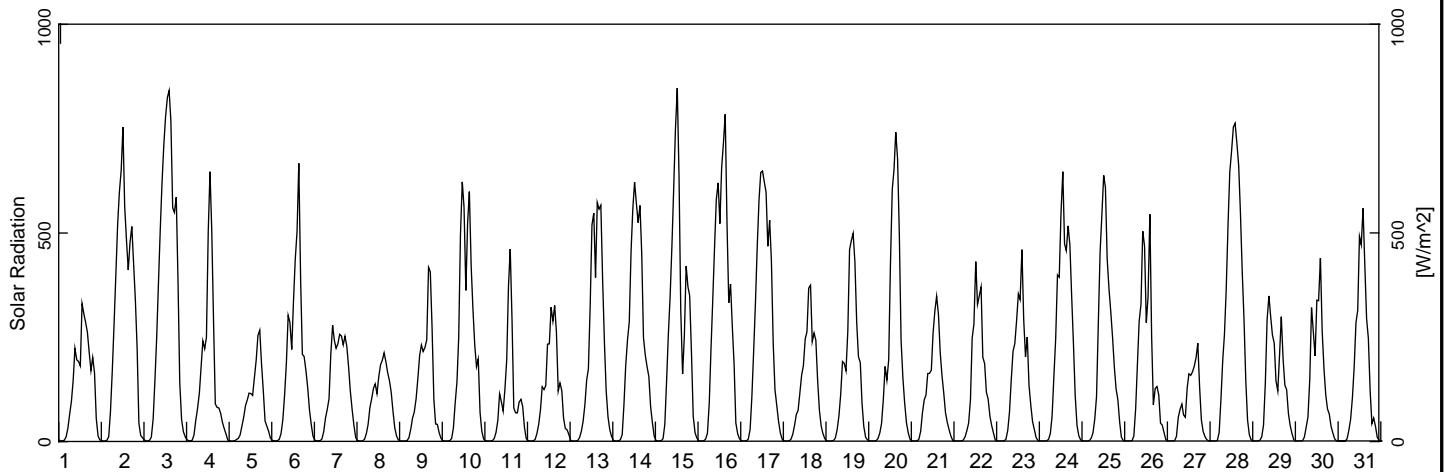
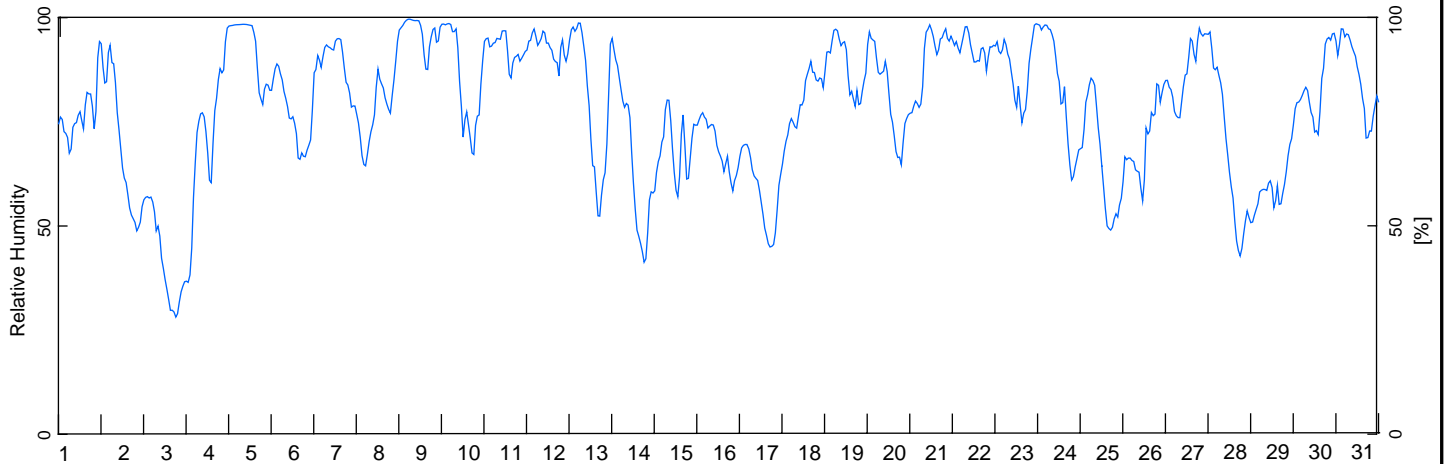
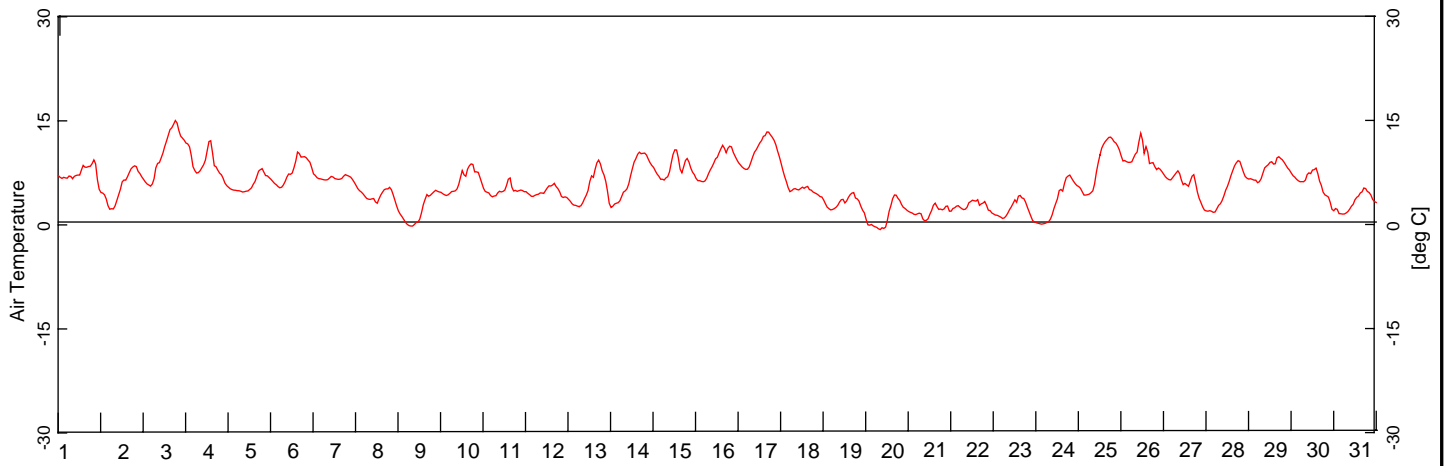
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-36



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
July 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
RED

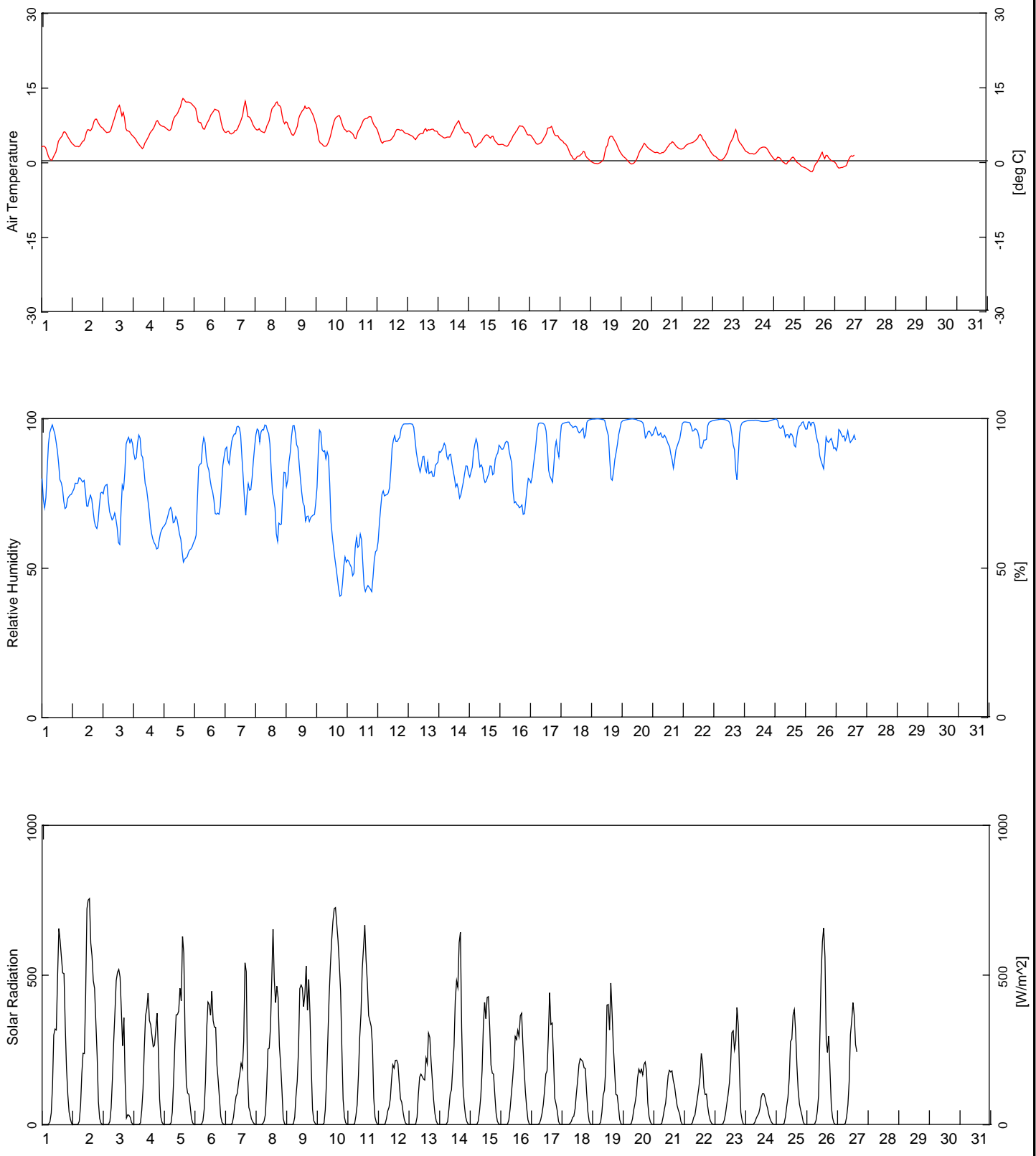
CHK
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OFFICE
EBA-VANC

DATE
November 2008

Figure D-37



NOTES

CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Mactung Station
Weather Parameters
August 2008**

**EBA Engineering
Consultants Ltd.**



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W23101021

DWN
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DATE
November 2008

Figure D-38



APPENDIX E

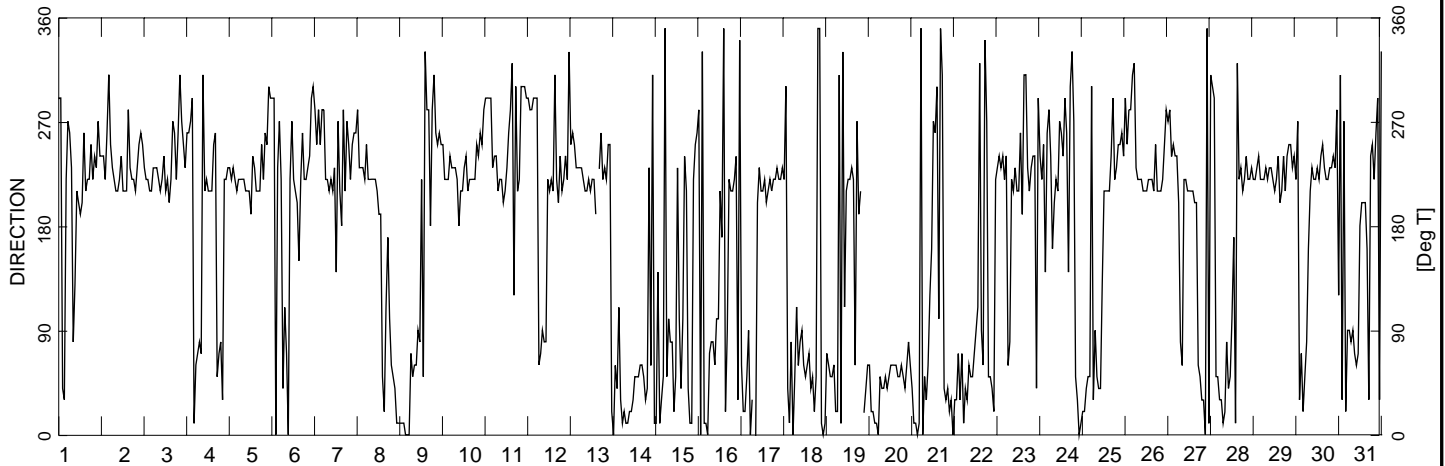
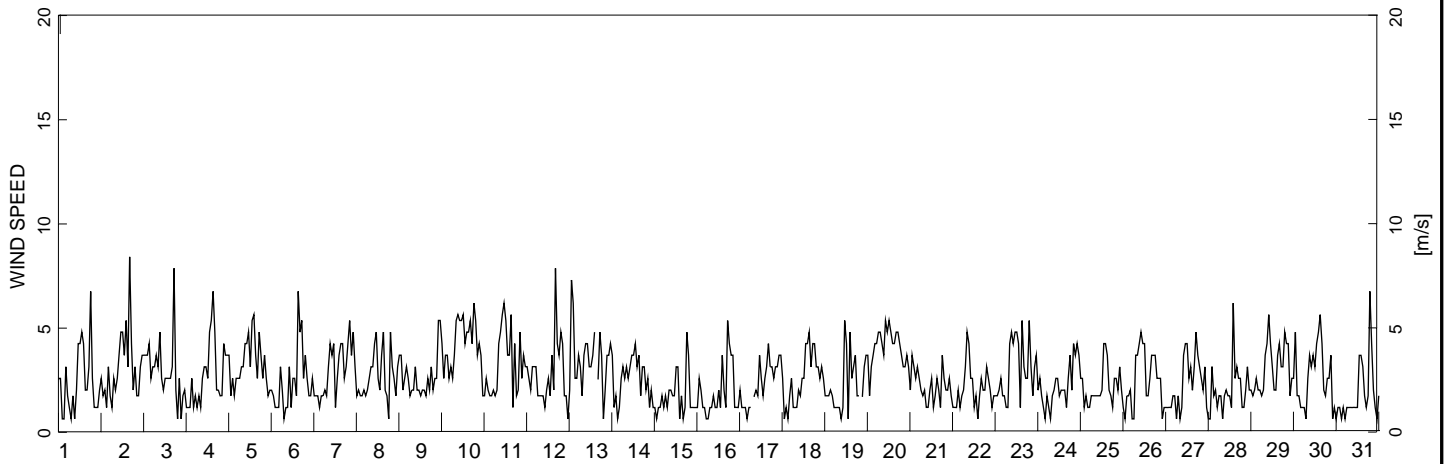
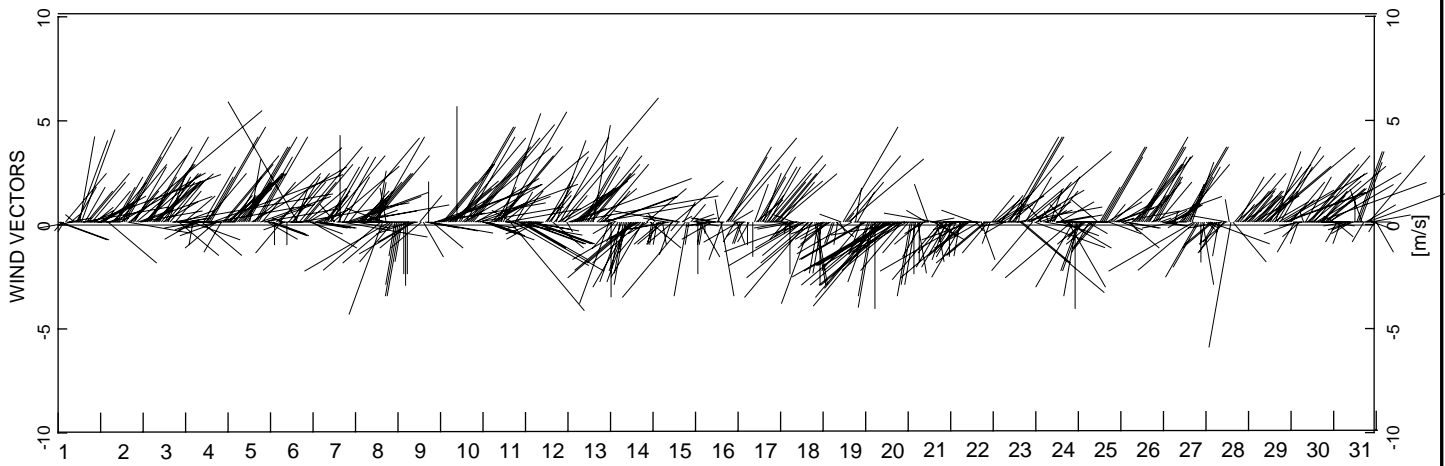
APPENDIX E MONTHLY MACMILLAN PASS WIND DATA – JULY 2005 TO AUGUST 2008

APPENDIX E

Monthly Macmillan Pass Wind Summaries August 2006 – August 2008

- E-01 Macmillan Pass Wind Data – July 2005
- E-02 Macmillan Pass Wind Data – August 2005
- E-03 Macmillan Pass Wind Data – September 2005
- E-04 Macmillan Pass Wind Data – October 2005
- E-05 Macmillan Pass Wind Data – November 2005
- E-06 Macmillan Pass Wind Data – December 2005
- E-07 Macmillan Pass Wind Data – January 2006
- E-08 Macmillan Pass Wind Data – February 2006
- E-09 Macmillan Pass Wind Data – March 2006
- E-10 Macmillan Pass Wind Data – April 2006
- E-11 Macmillan Pass Wind Data – May 2006
- E-12 Macmillan Pass Wind Data – June 2006
- E-13 Macmillan Pass Wind Data – July 2006
- E-14 Macmillan Pass Wind Data – August 2006
- E-15 Macmillan Pass Wind Data – September 2006
- E-16 Macmillan Pass Wind Data – October 2006
- E-17 Macmillan Pass Wind Data – November 2006
- E-18 Macmillan Pass Wind Data – December 2006
- E-19 Macmillan Pass Wind Data – January 2007
- E-20 Macmillan Pass Wind Data – February 2007
- E-21 Macmillan Pass Wind Data – March 2007
- E-22 Macmillan Pass Wind Data – April 2007
- E-23 Macmillan Pass Wind Data – May 2007

- E-24 Macmillan Pass Wind Data – June 2007
- E-25 Macmillan Pass Wind Data – July 2007
- E-26 Macmillan Pass Wind Data – August 2007
- E-27 Macmillan Pass Wind Data – September 2007
- E-28 Macmillan Pass Wind Data – October 2007
- E-29 Macmillan Pass Wind Data – November 2007
- E-30 Macmillan Pass Wind Data – December 2007
- E-31 Macmillan Pass Wind Data – January 2008
- E-32 Macmillan Pass Wind Data – February 2008
- E-33 Macmillan Pass Wind Data – March 2008
- E-34 Macmillan Pass Wind Data – April 2008
- E-35 Macmillan Pass Wind Data – May 2008
- E-36 Macmillan Pass Wind Data – June 2008
- E-37 Macmillan Pass Wind Data – July 2008
- E-38 Macmillan Pass Wind Data – August 2008



NOTES

CLIENT



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
July 2005**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

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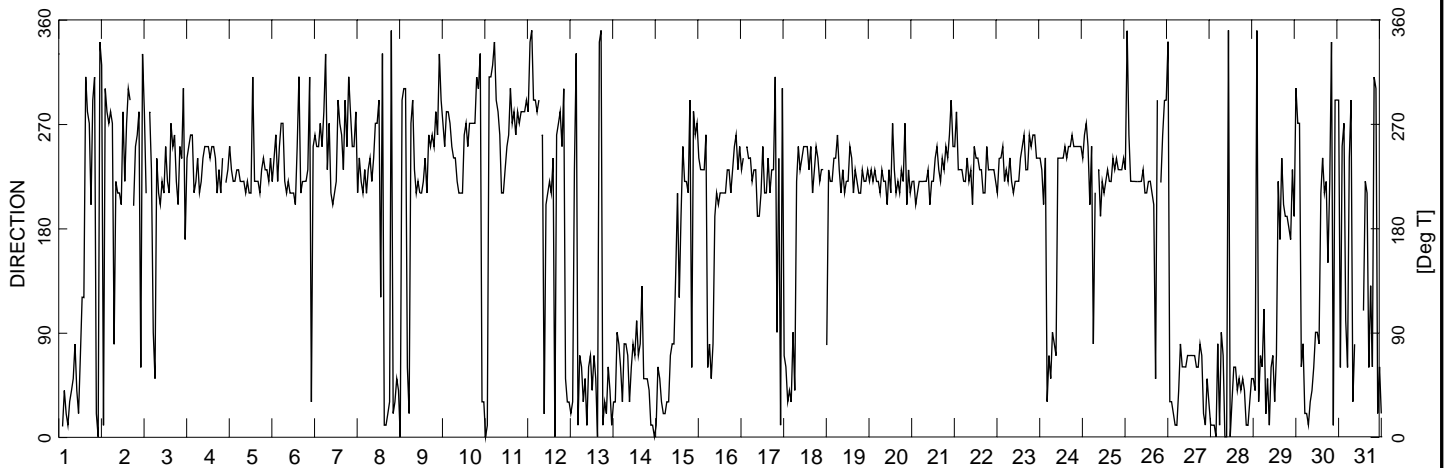
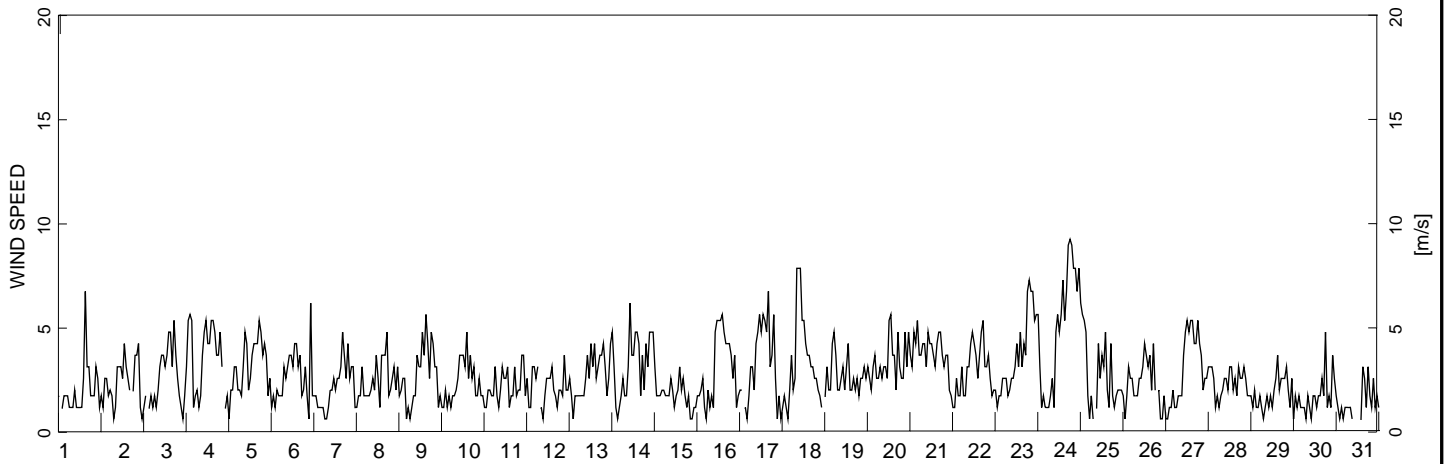
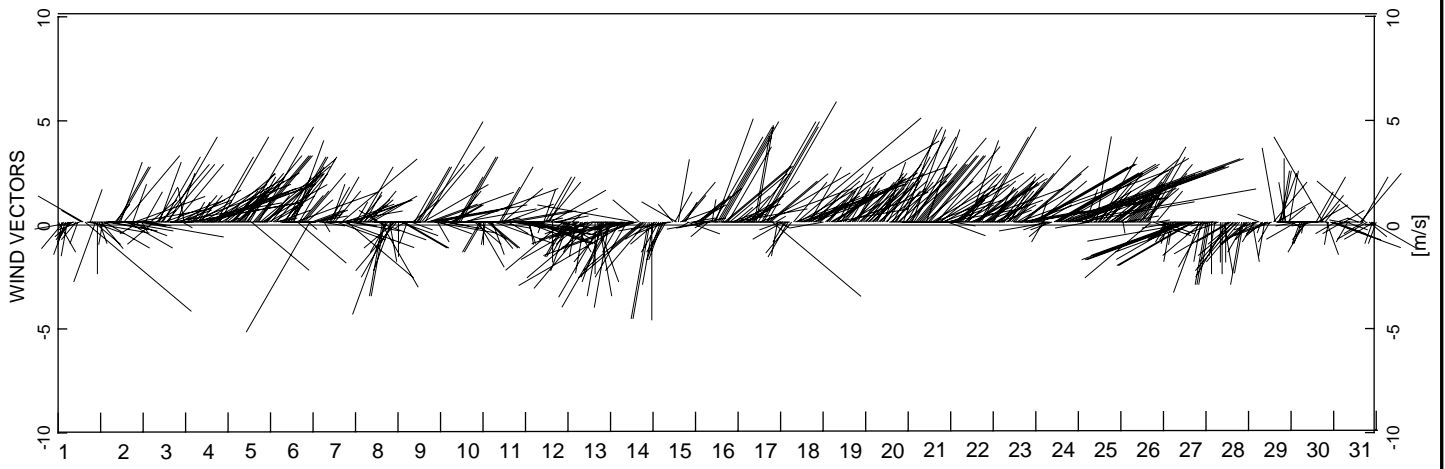
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Figure E-01



NOTES

CLIENT



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
August 2005**

**EBA Engineering
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JR

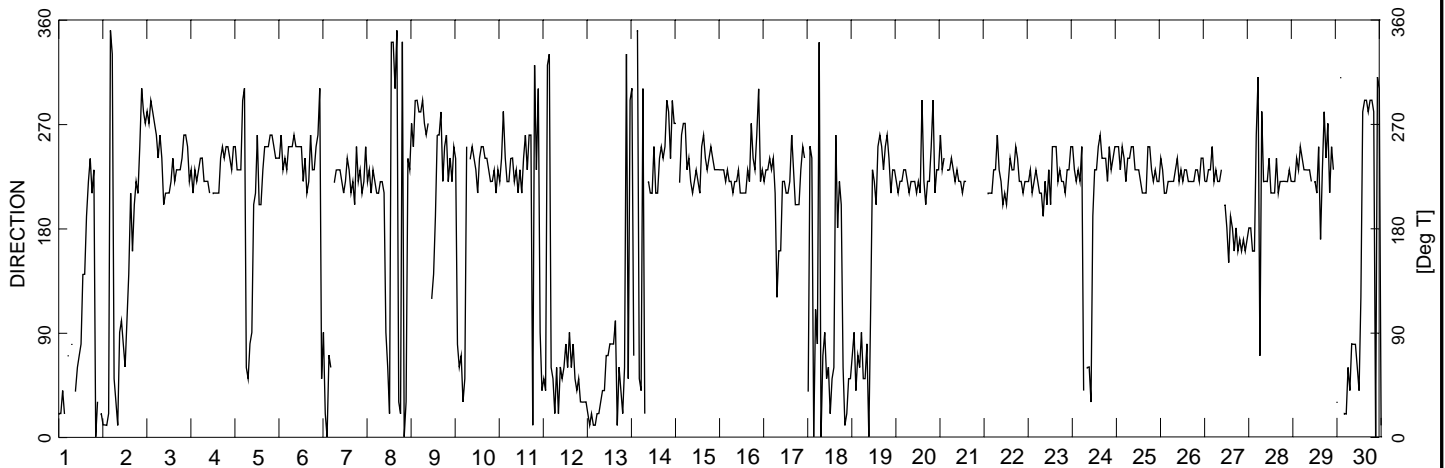
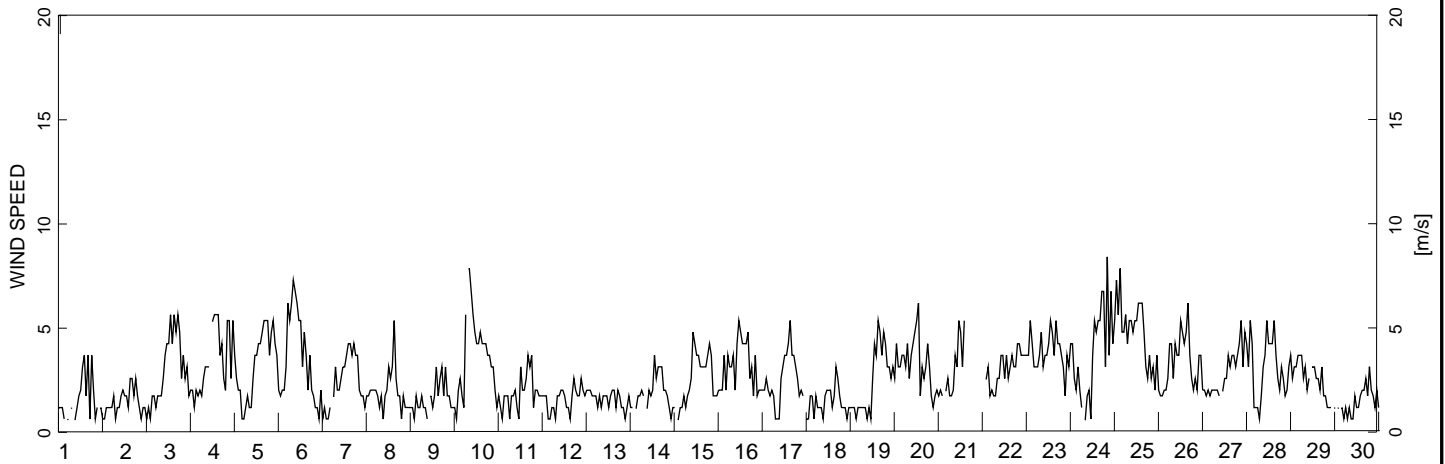
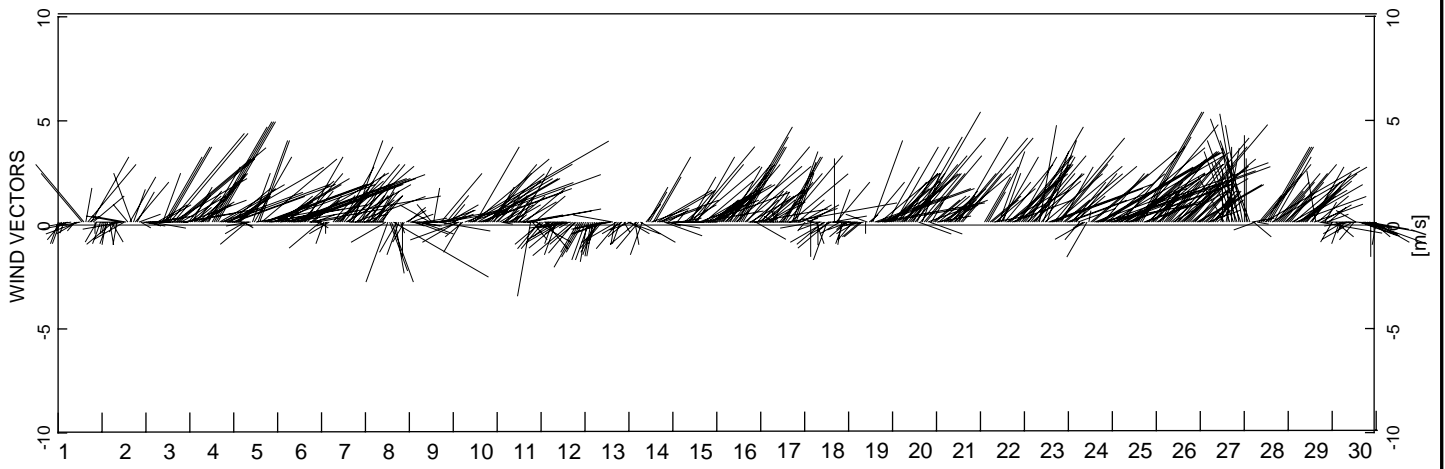
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Figure E-02



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
September 2005**

EBA Engineering
Consultants Ltd.



PROJECT NO.
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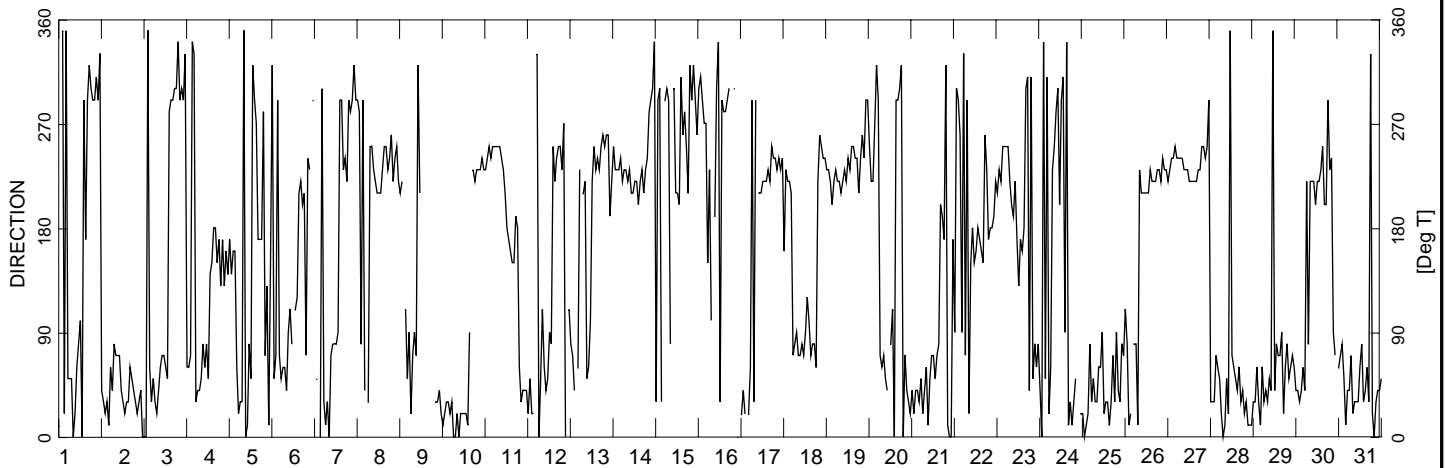
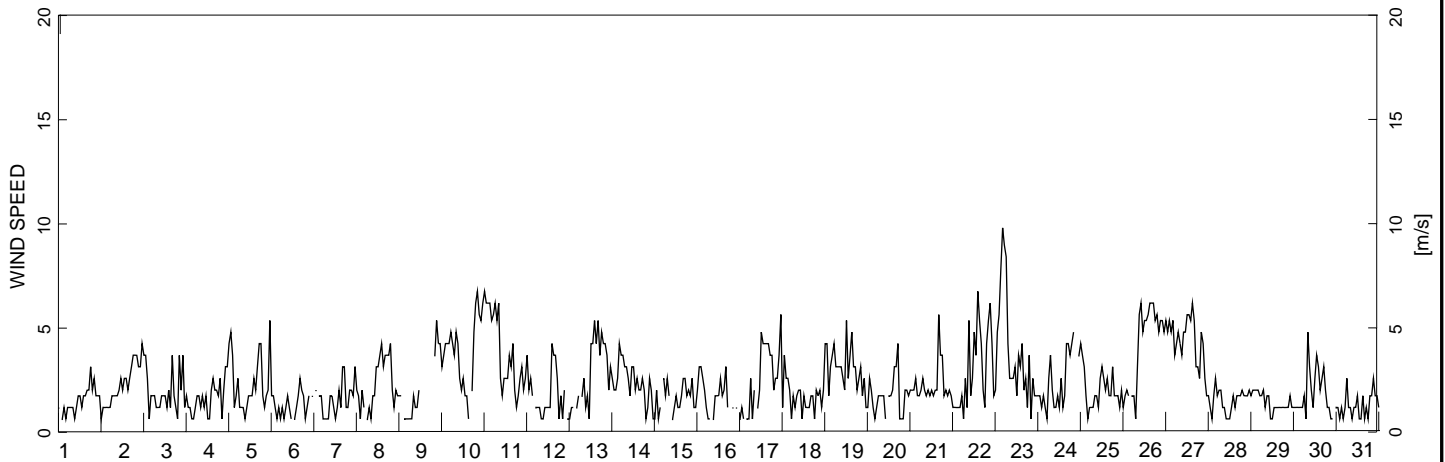
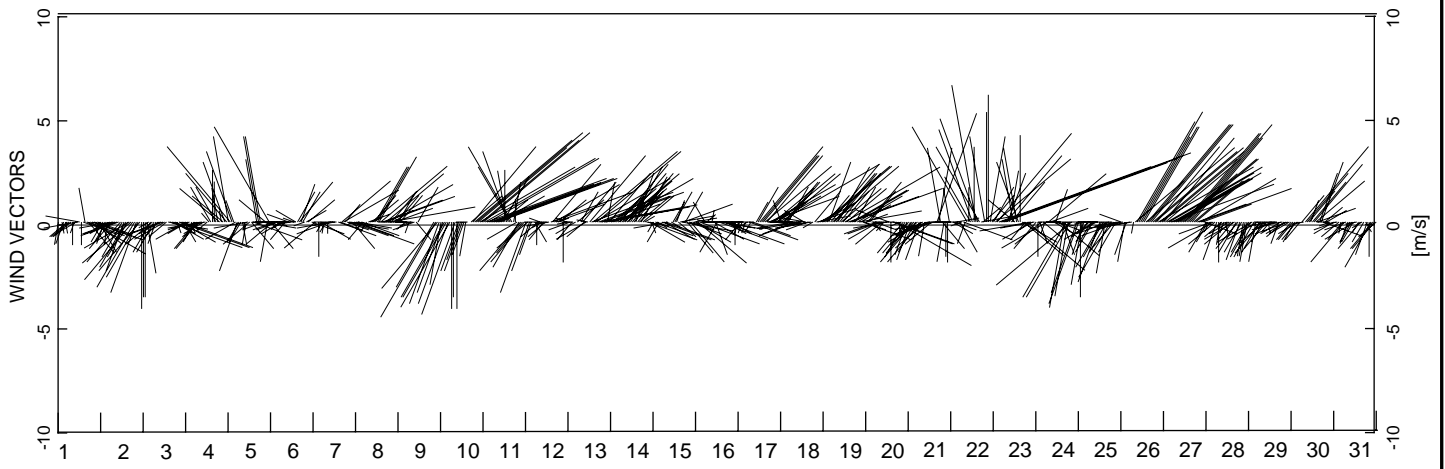
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Figure E-03



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
October 2005**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

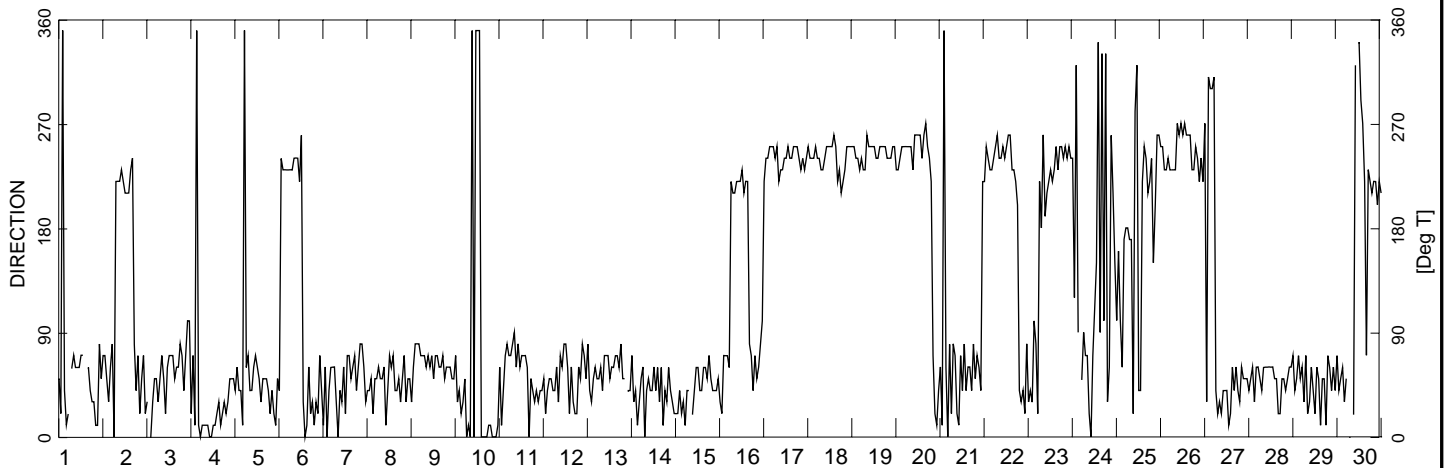
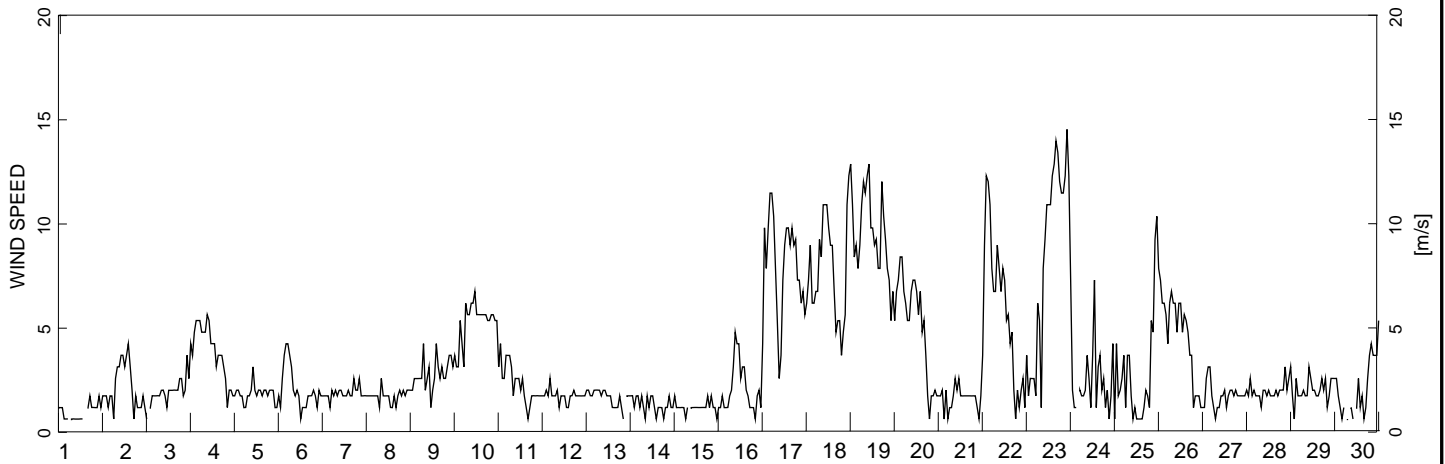
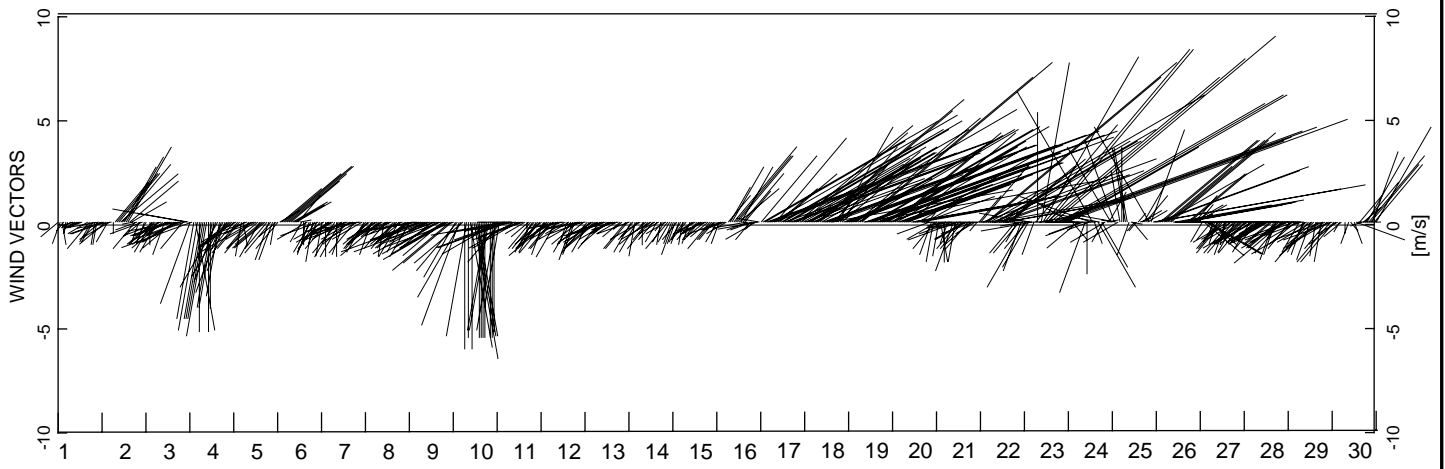
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Figure E-04



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
November 2005**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
JR

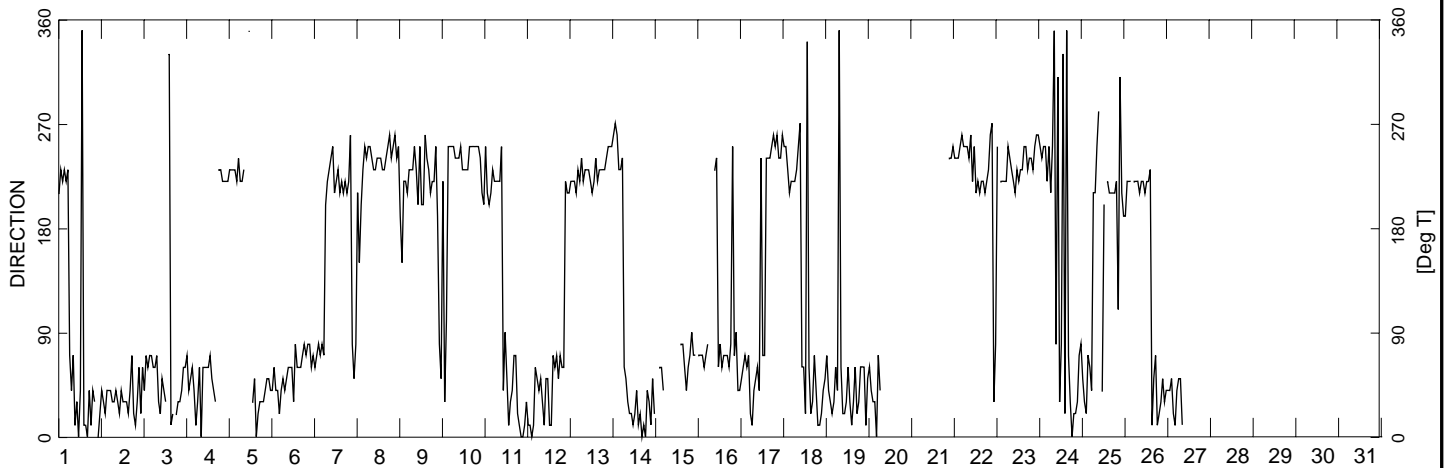
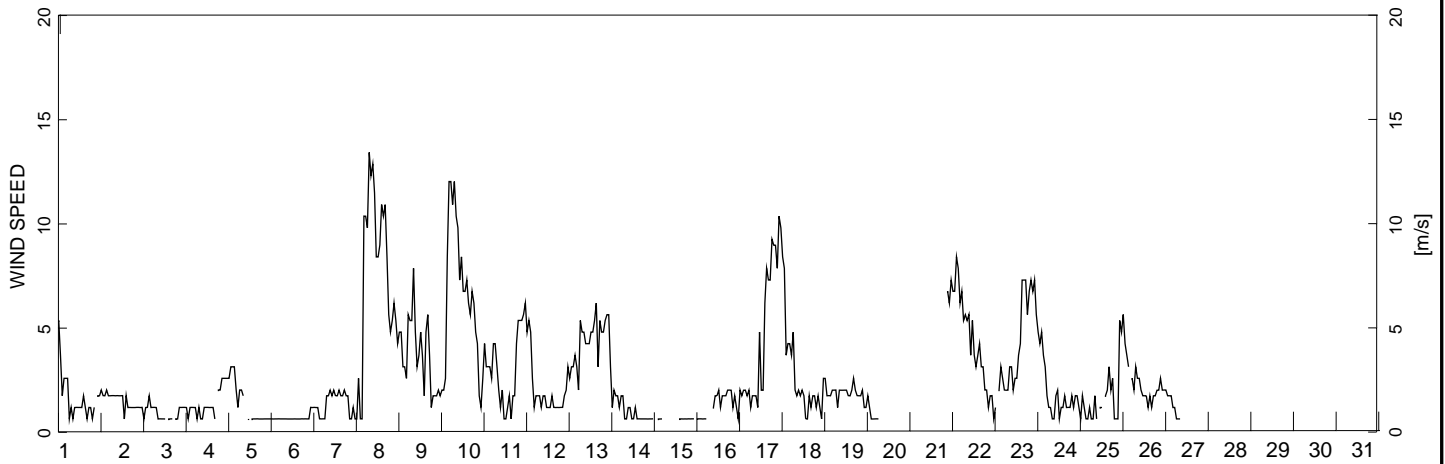
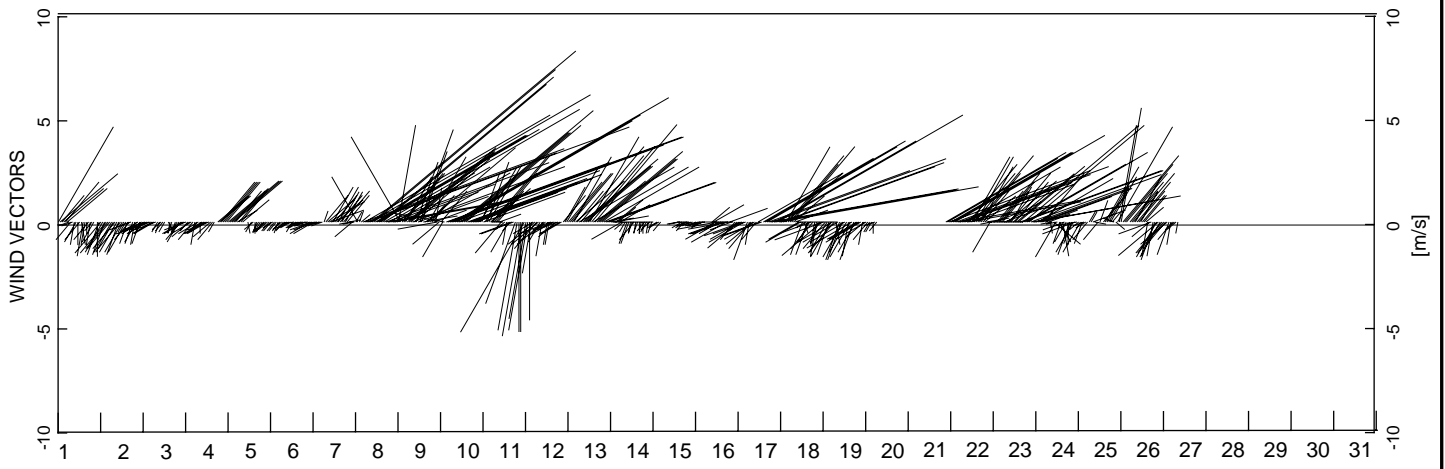
CHK
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Figure E-05



NOTES

No data available from
December 20 - 22, 2005
and December 28 - 31, 2005

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
December 2005**

PROJECT NO.
W23101021

DWN
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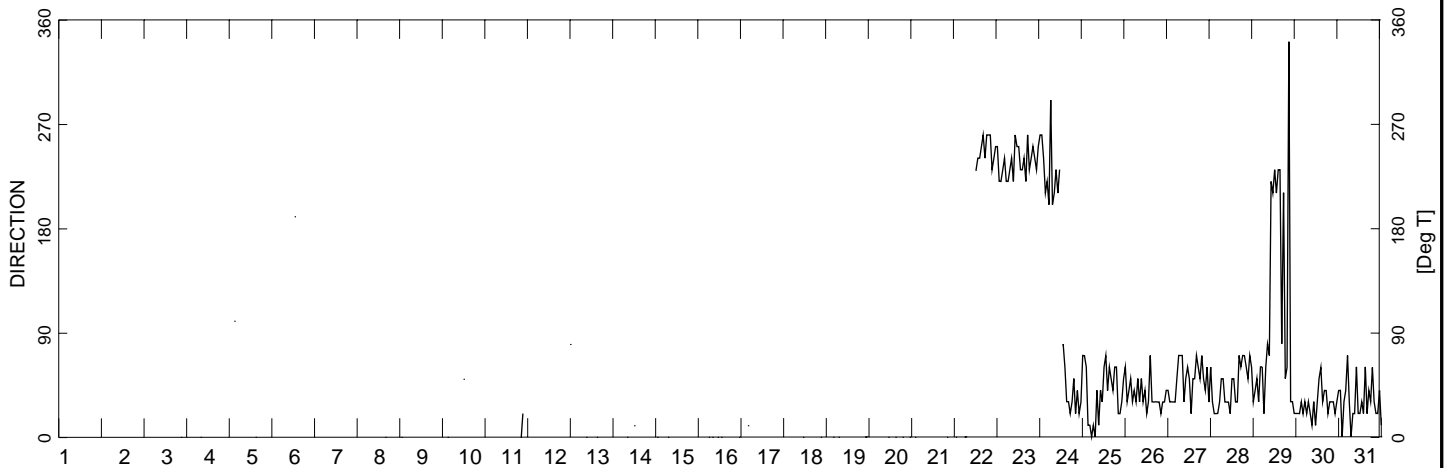
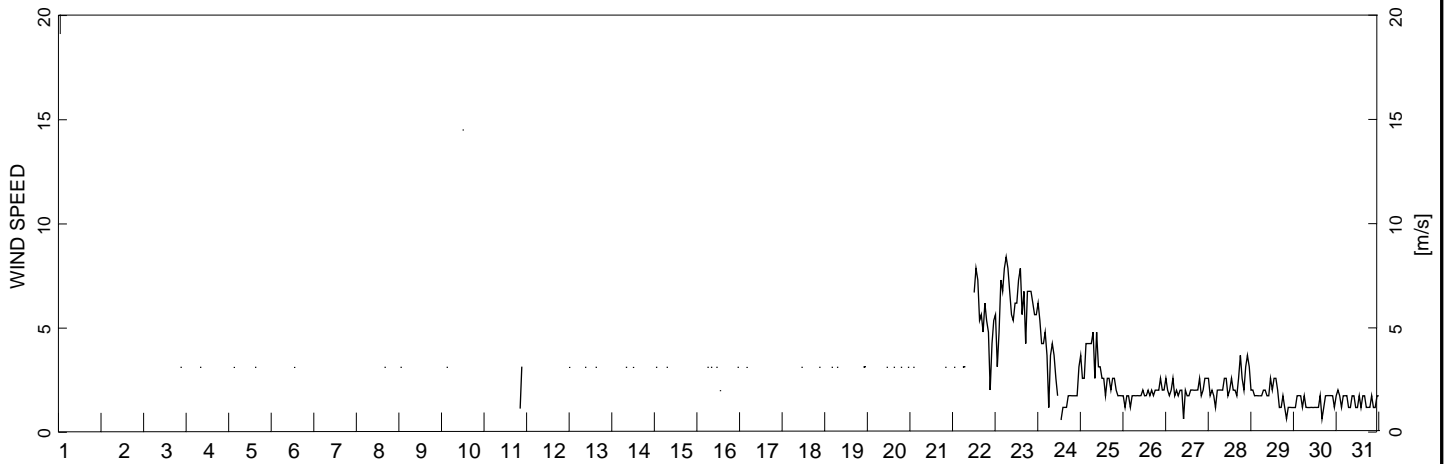
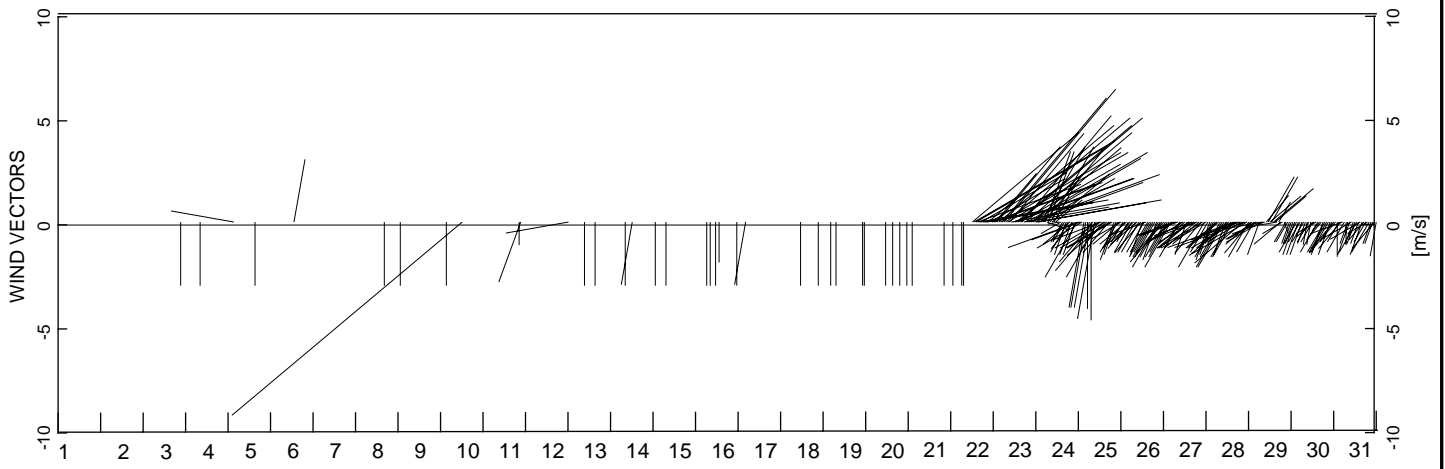
CHK
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DATE
November 2008

Figure E-06



NOTES

No data available from
January 1 - 21, 2006

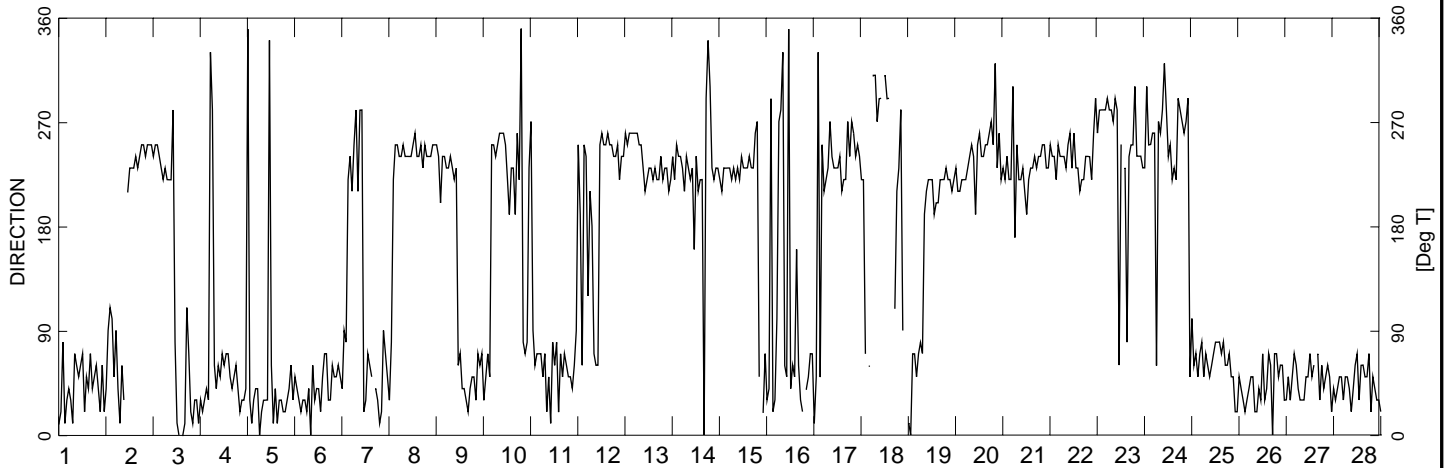
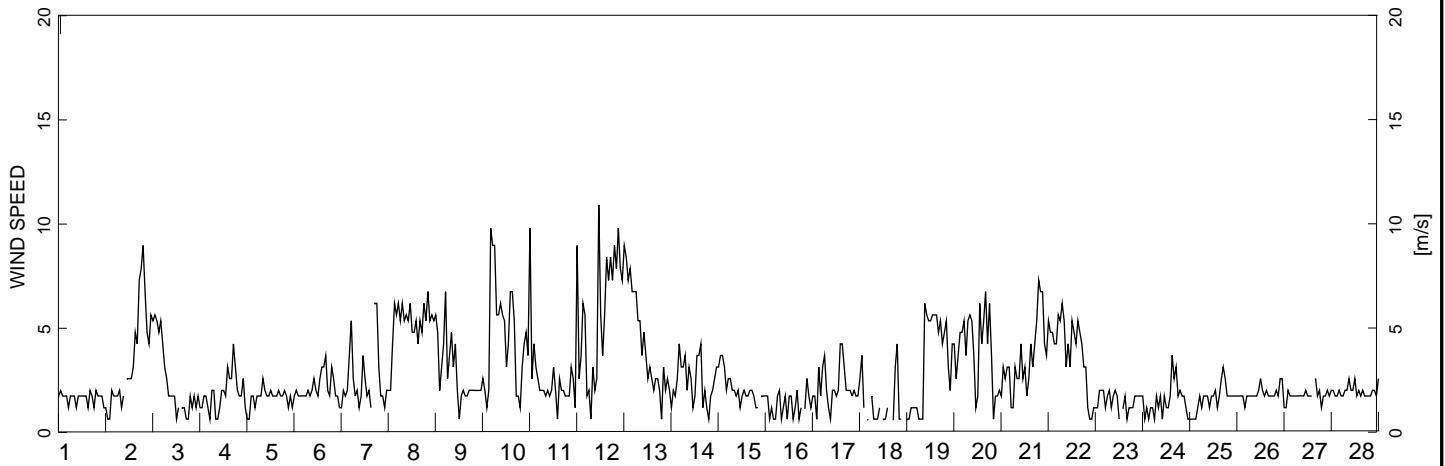
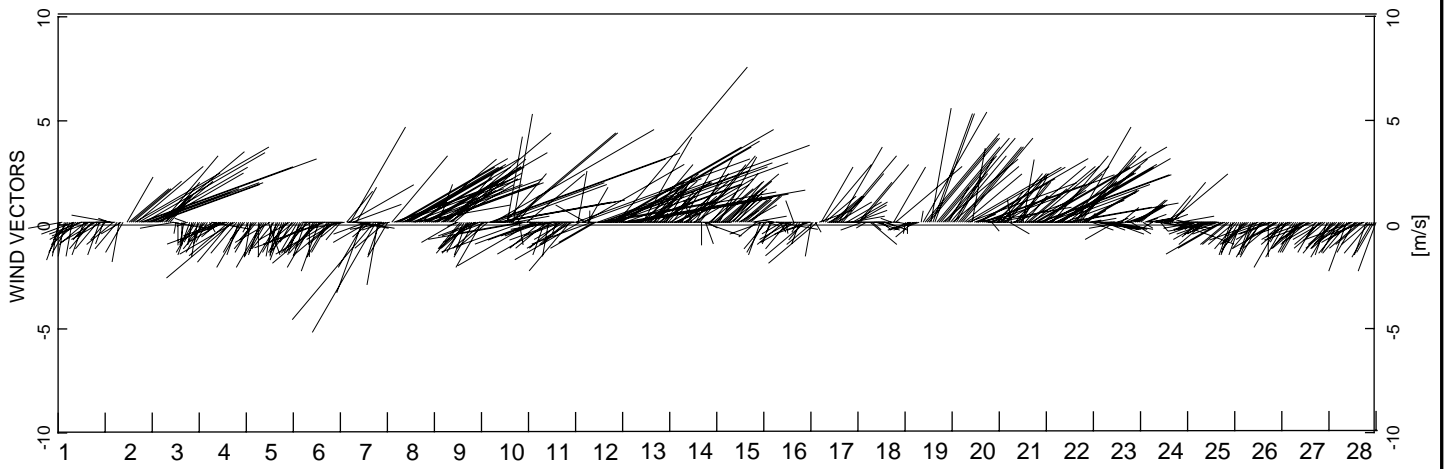
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
January 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-07



NOTES

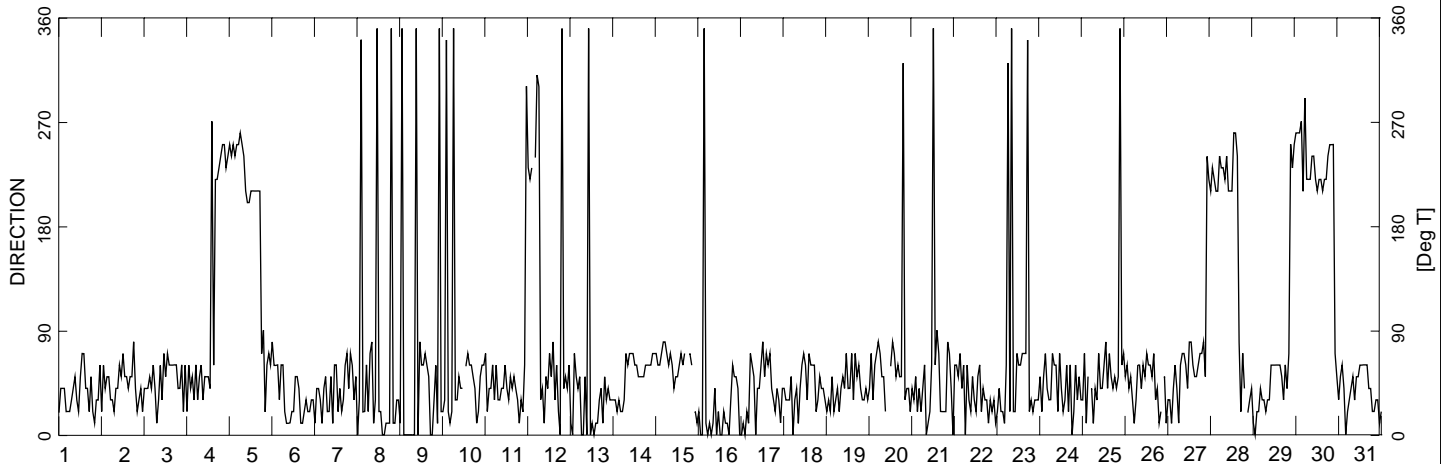
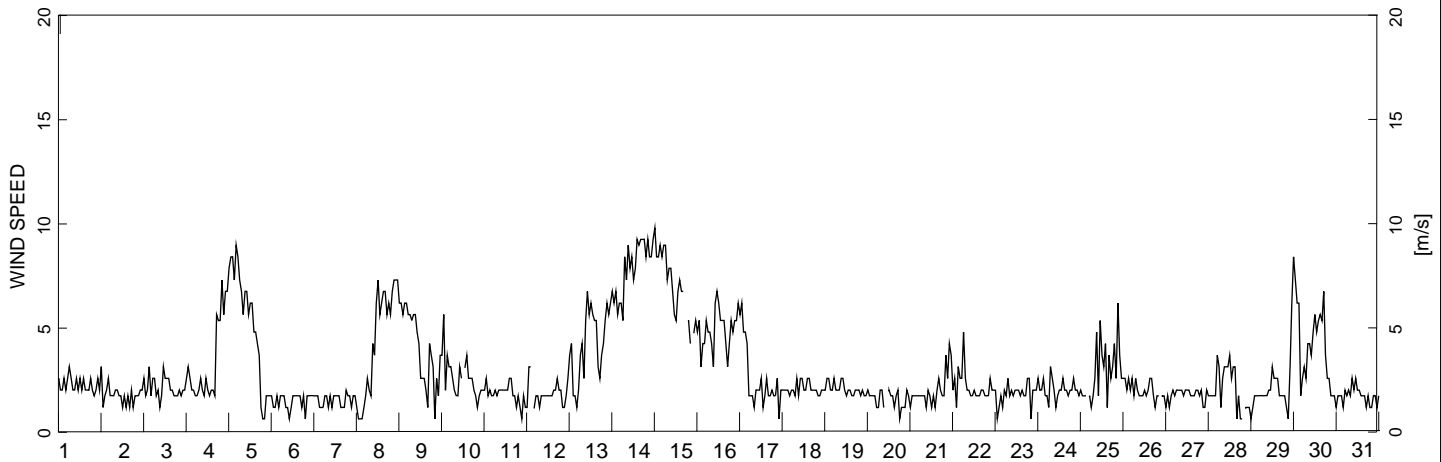
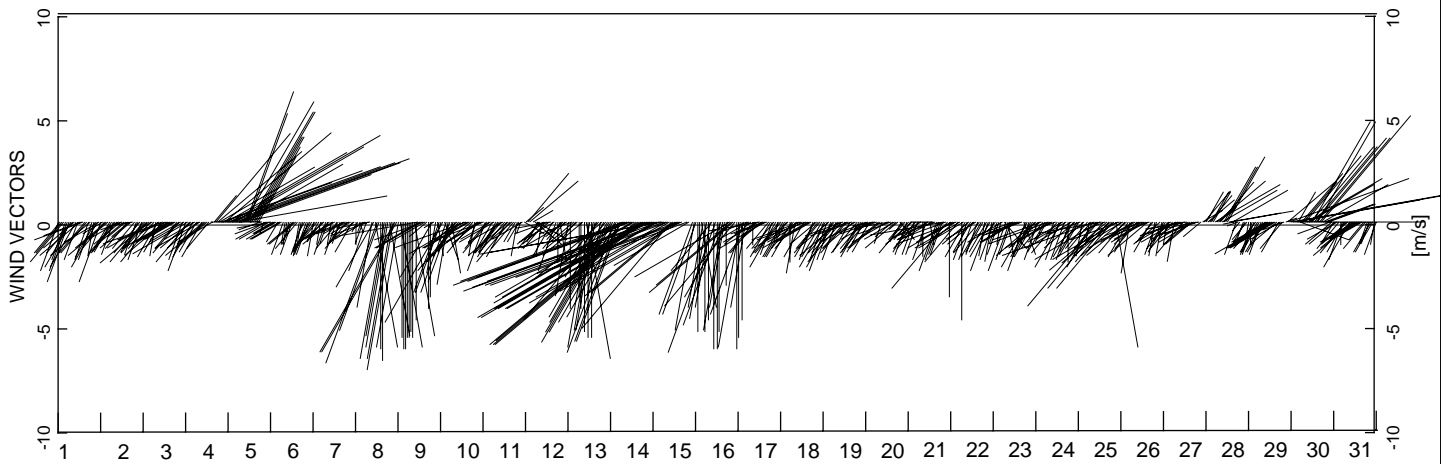
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
February 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-08



NOTES

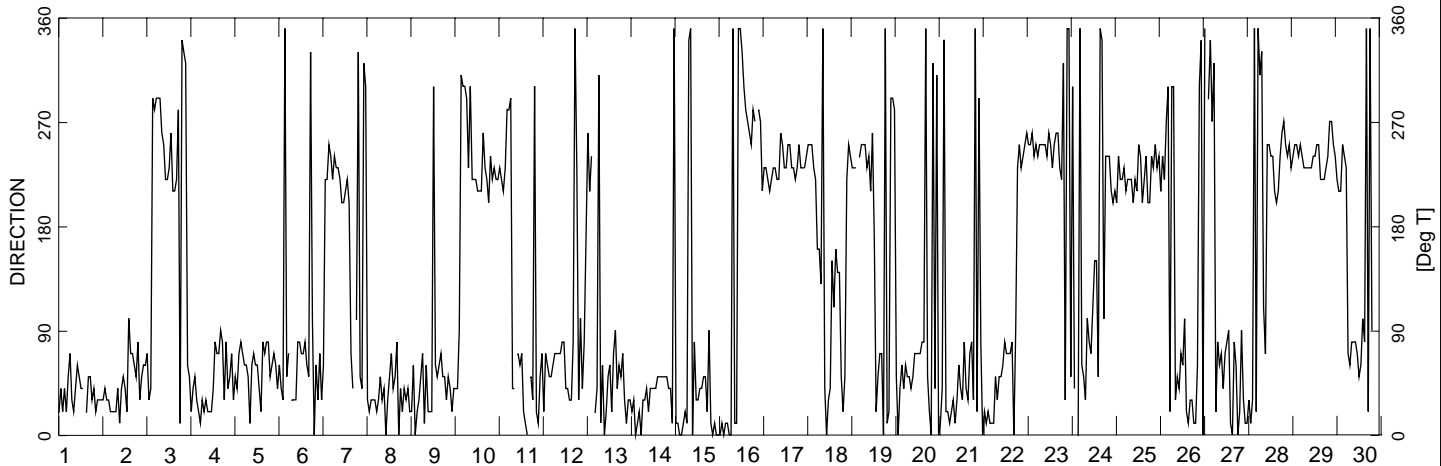
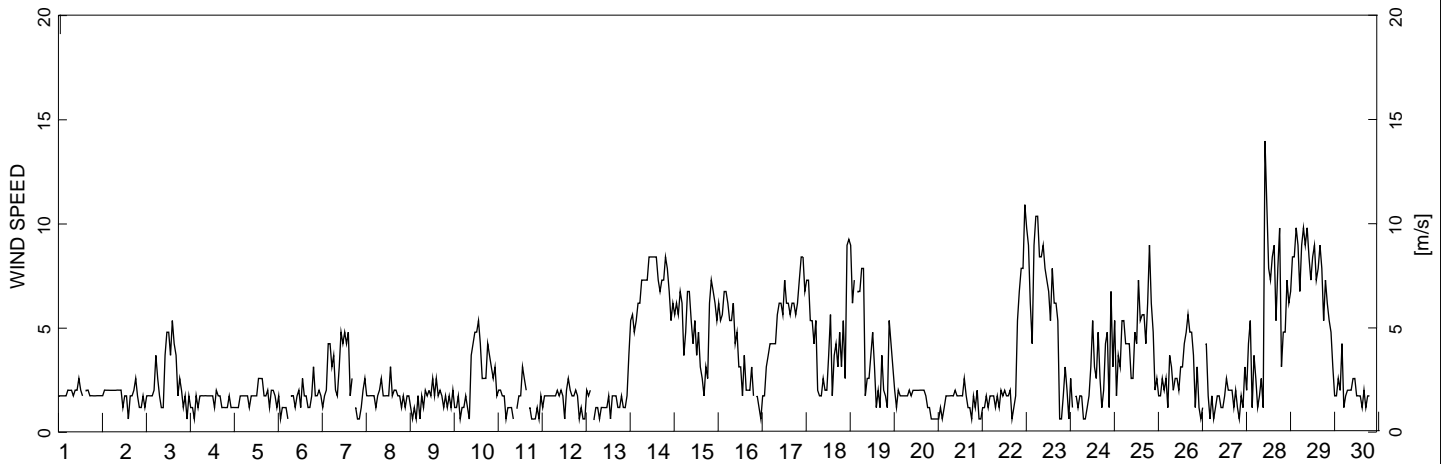
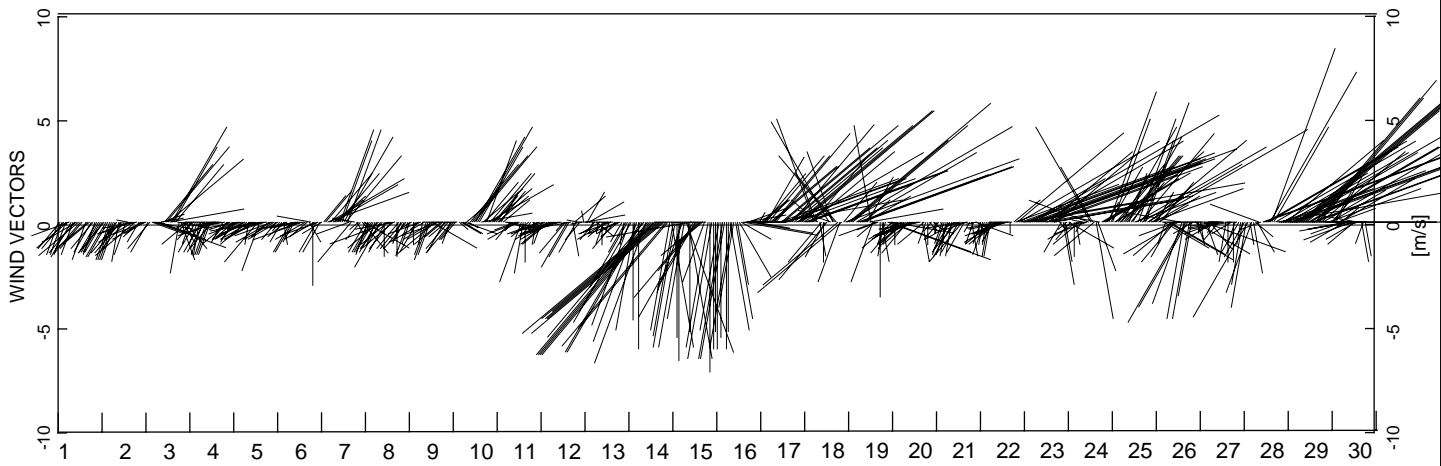
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
March 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-09



NOTES

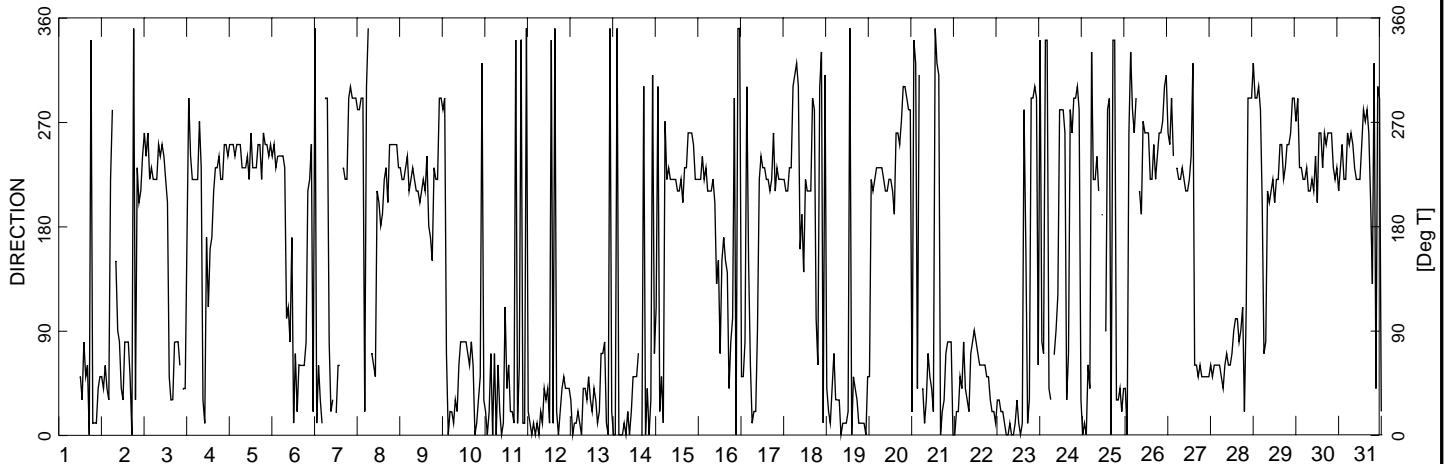
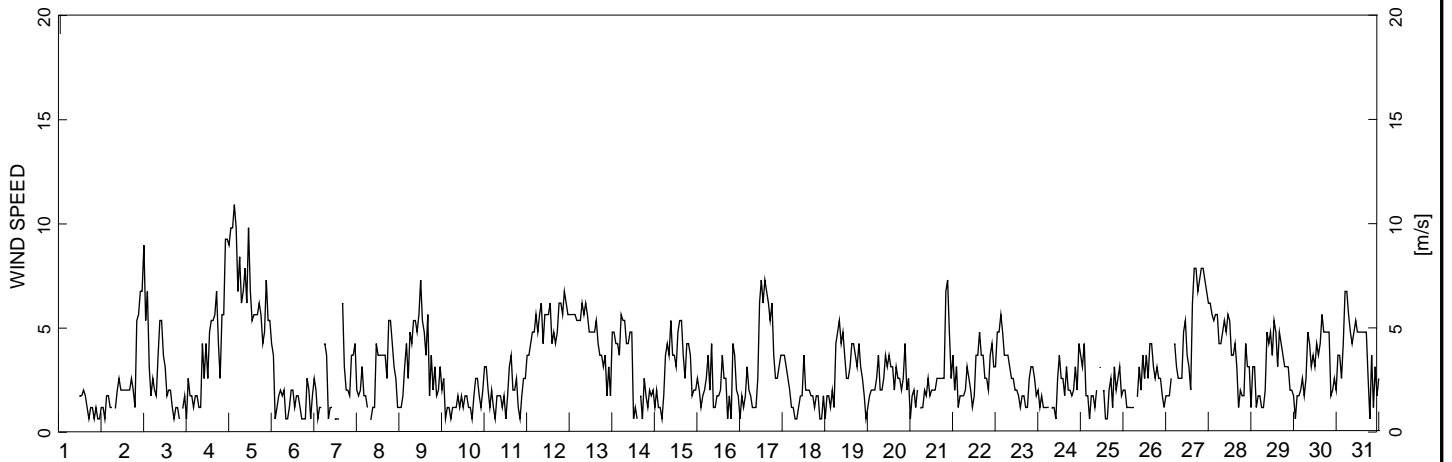
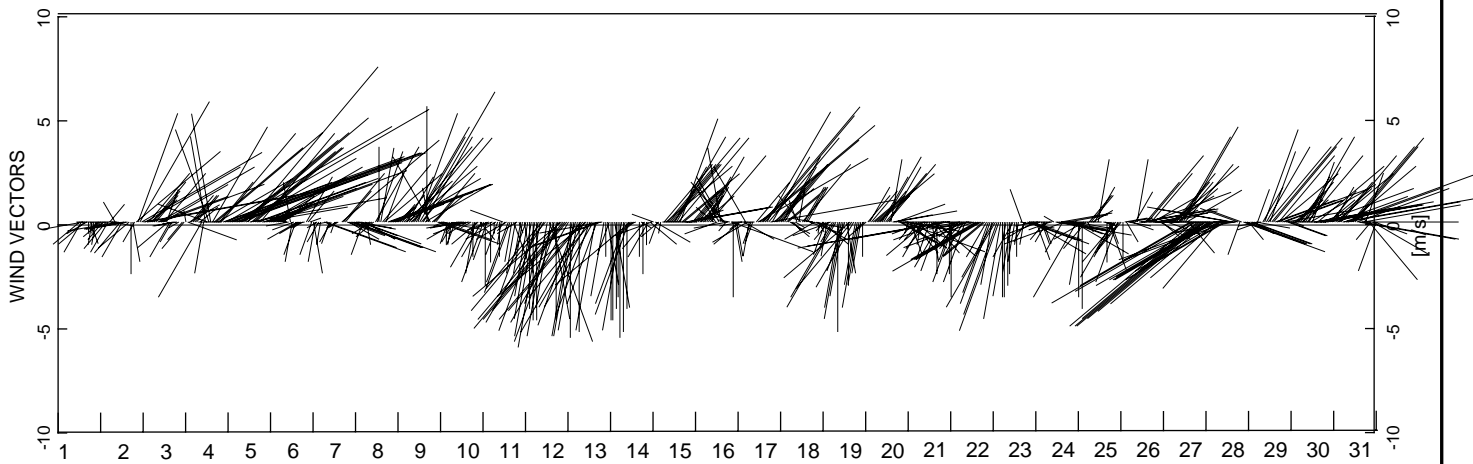
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
April 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-10



NOTES

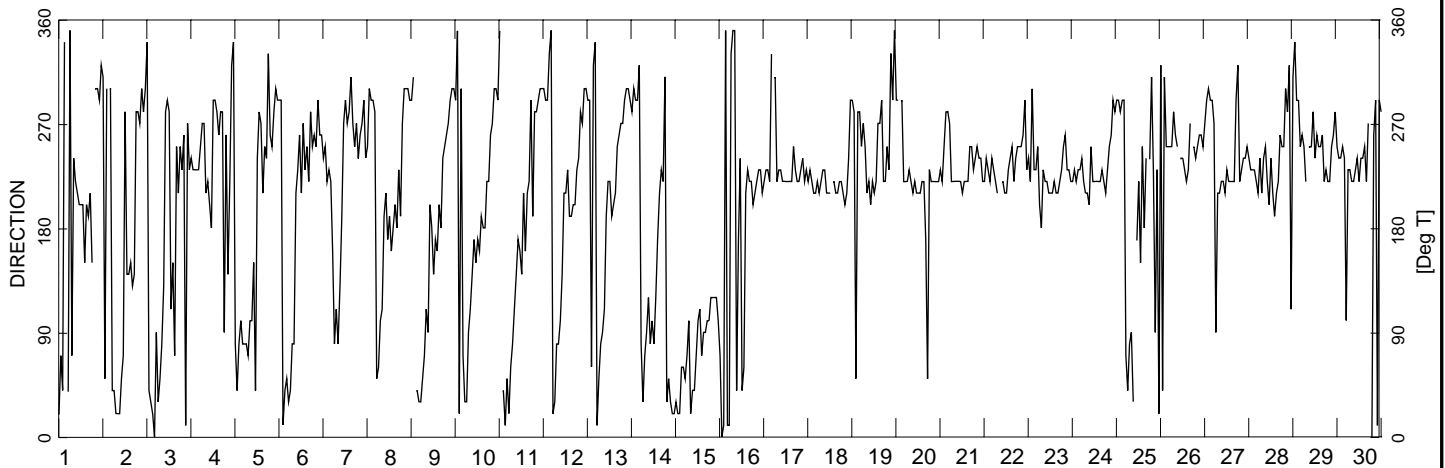
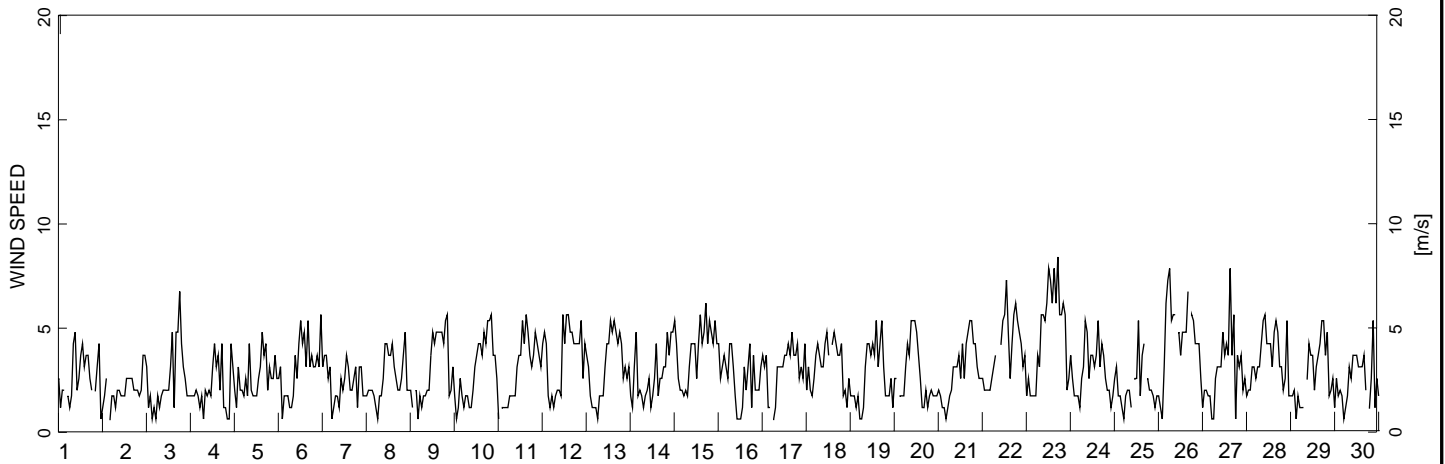
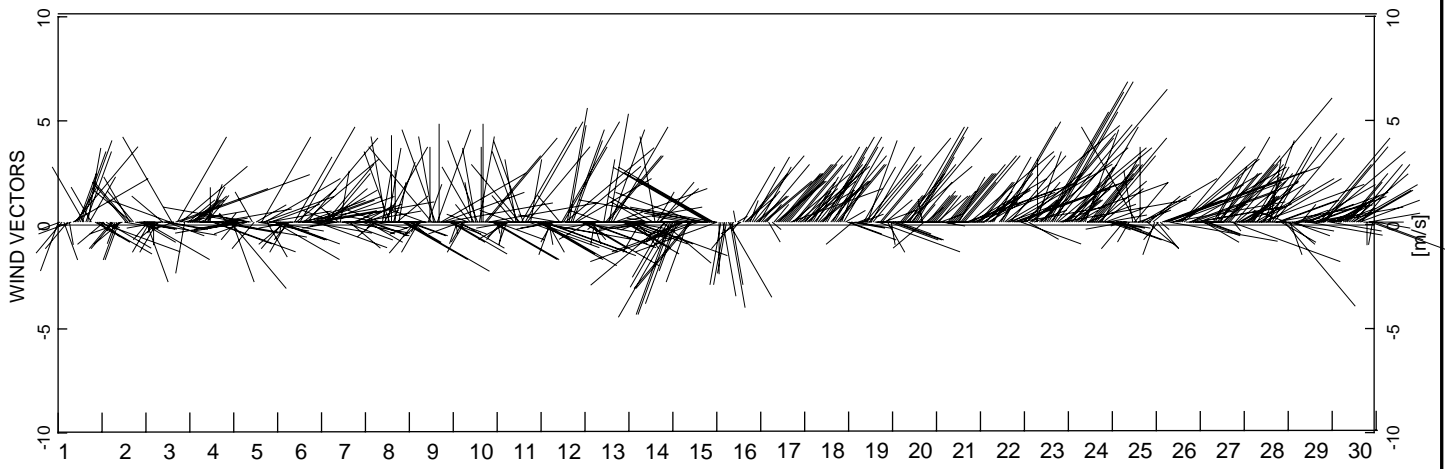
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
May 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-11



NOTES

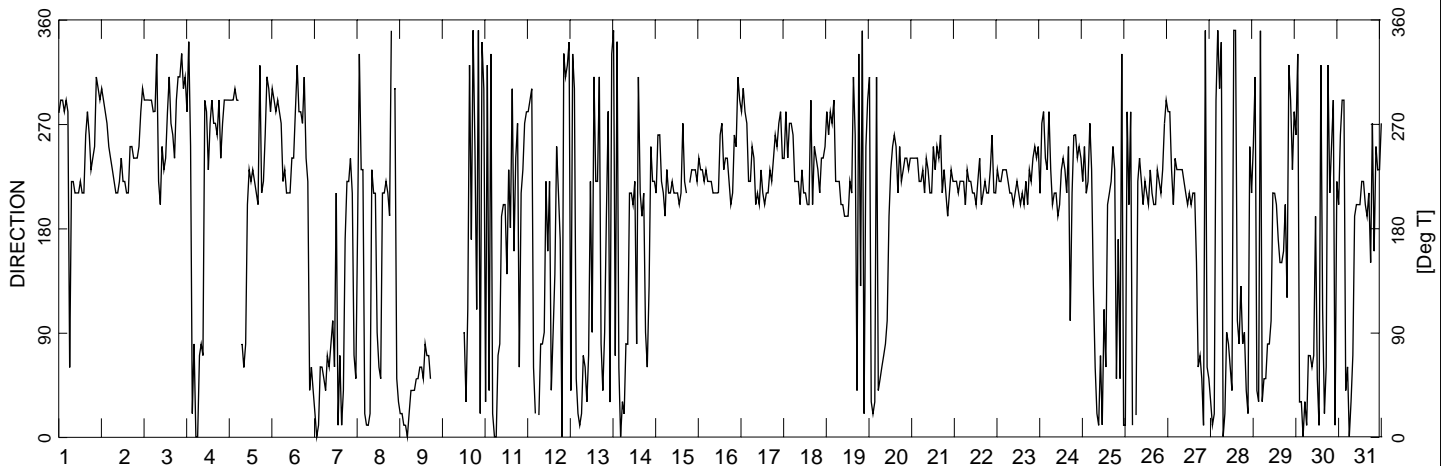
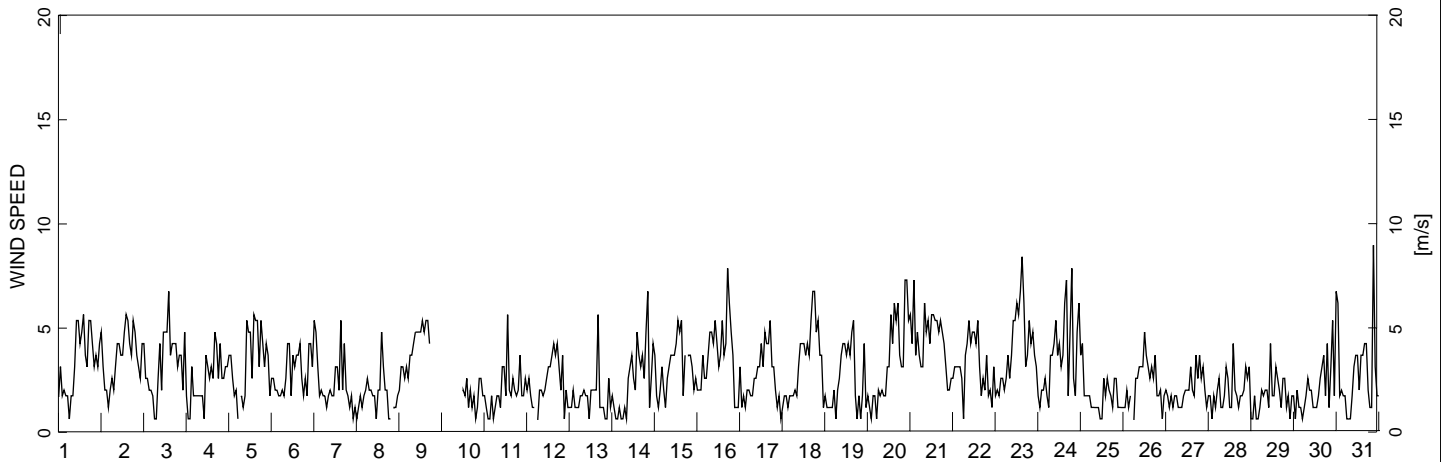
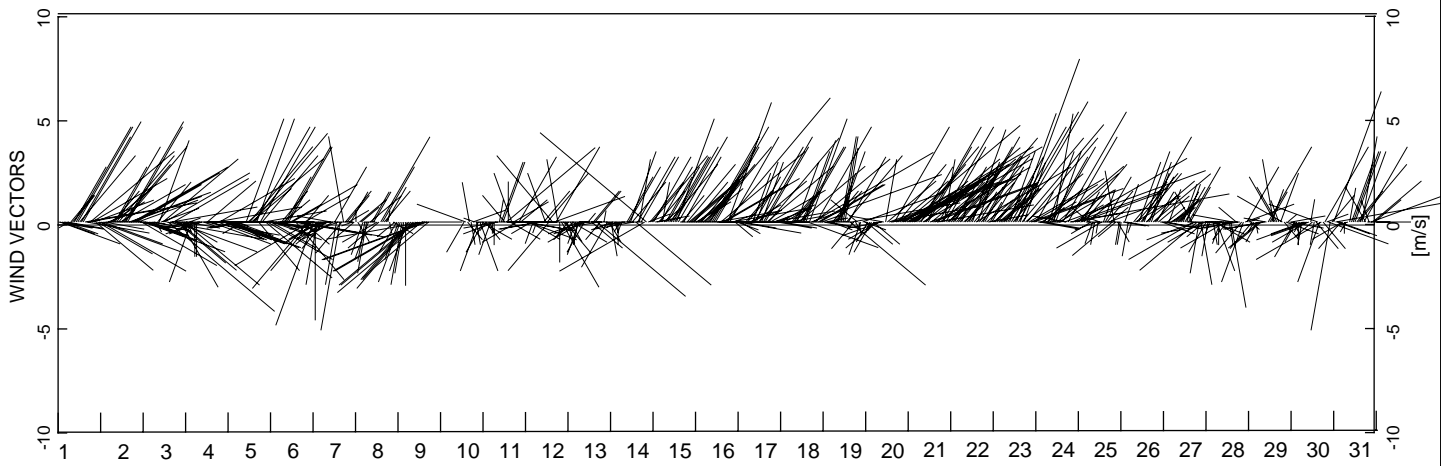
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
June 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-12



NOTES

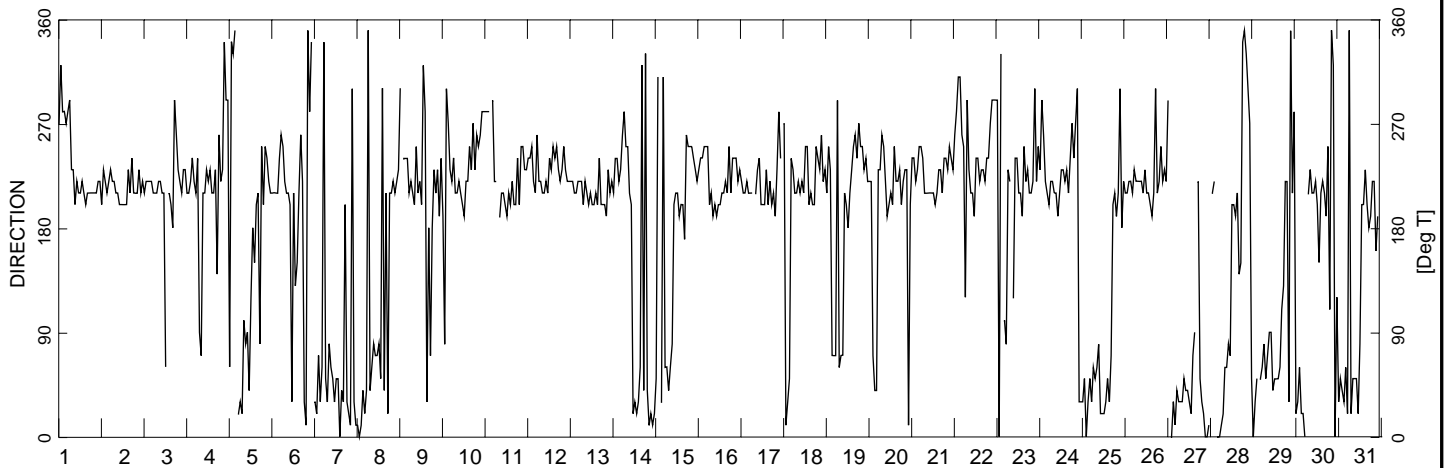
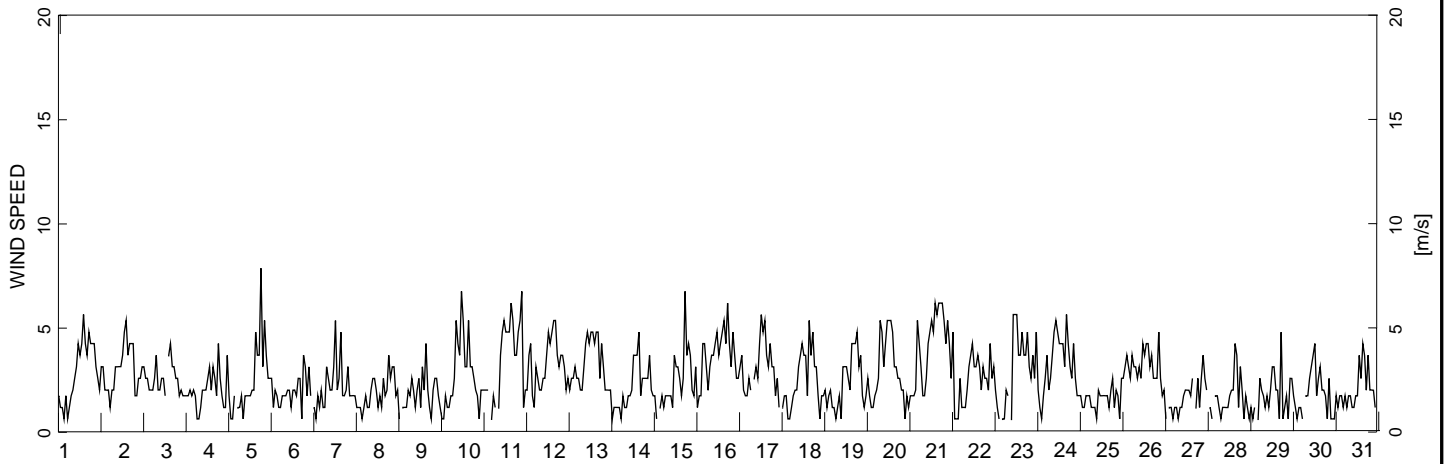
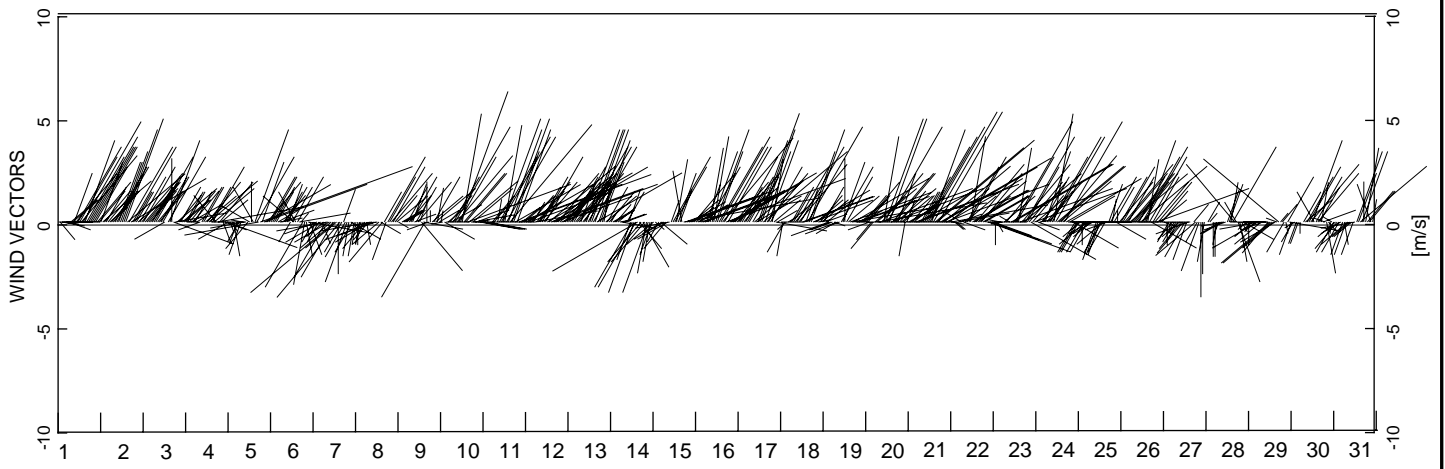
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
July 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-13



NOTES

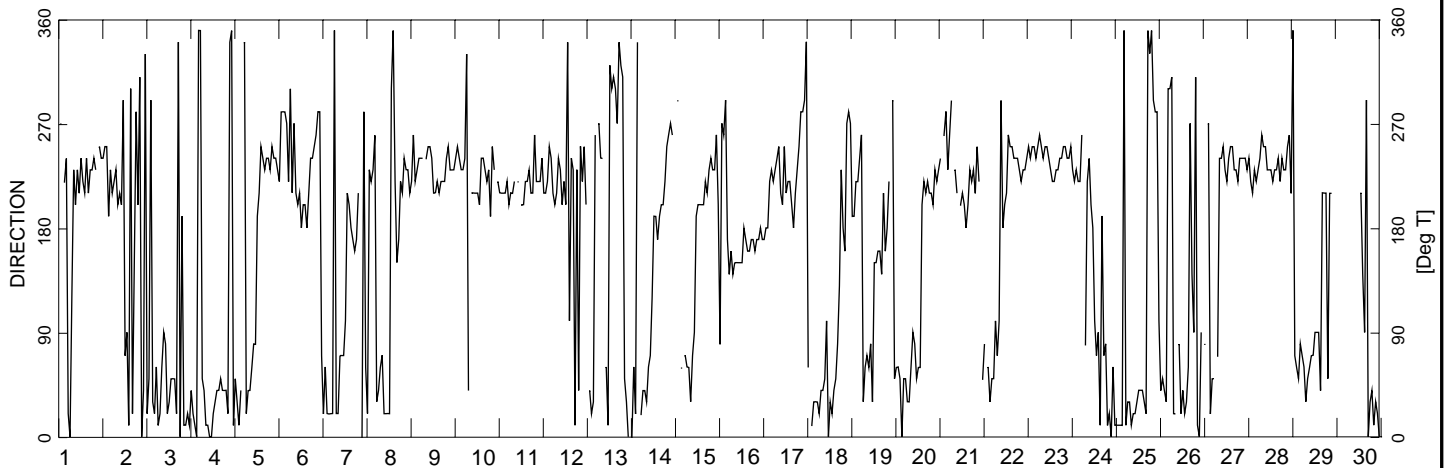
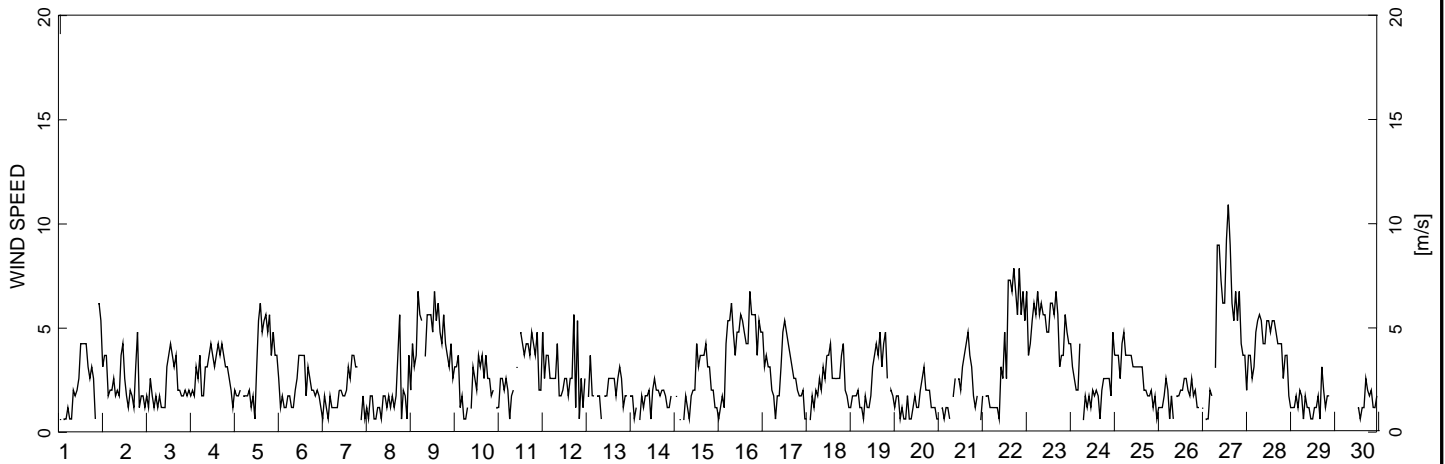
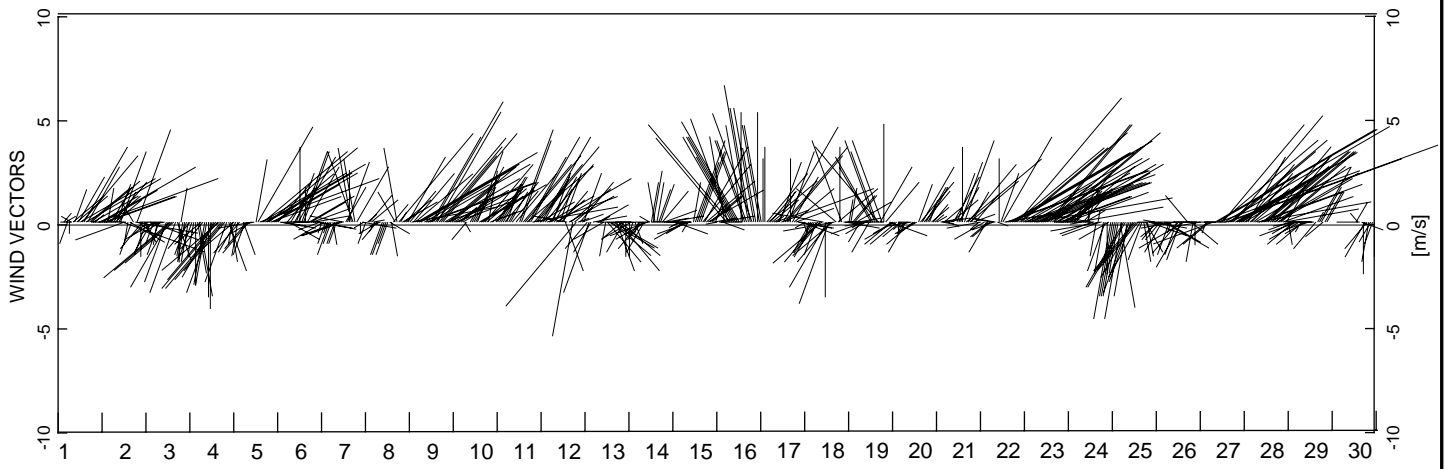
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
August 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-14



NOTES

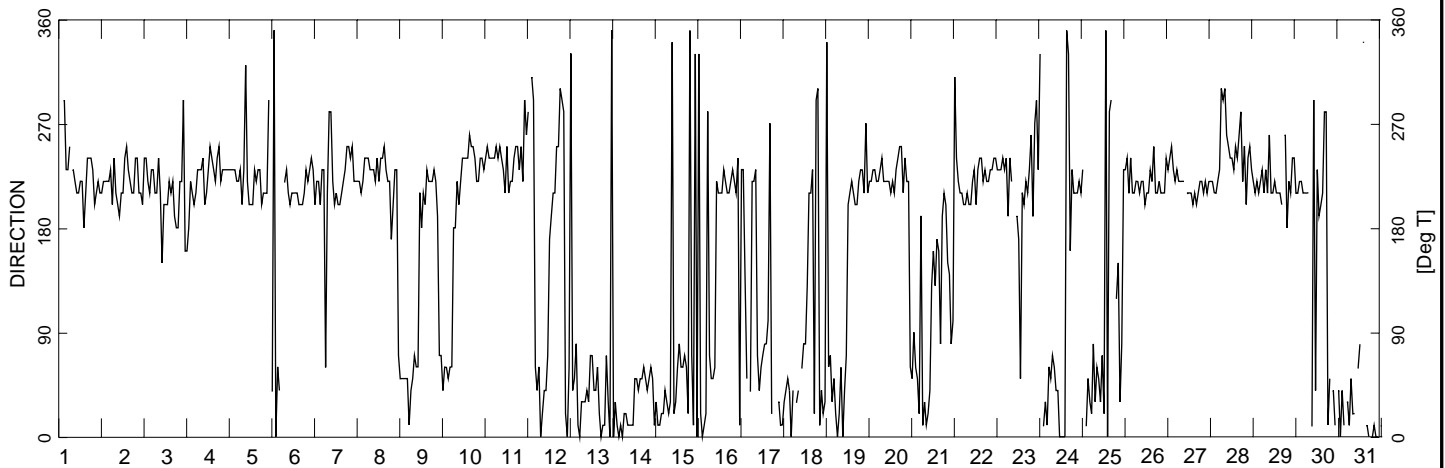
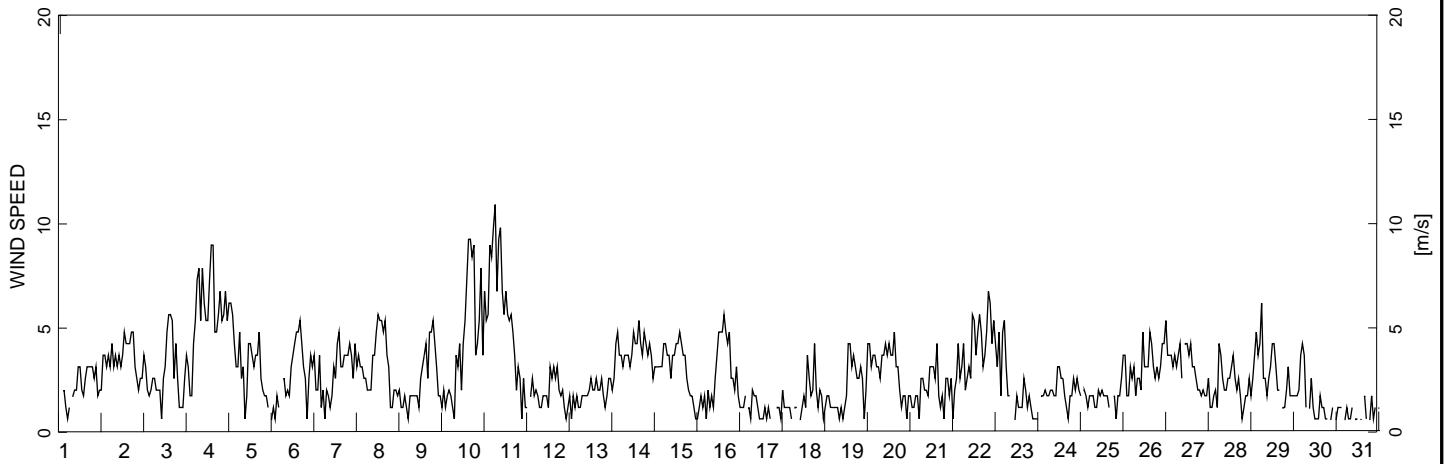
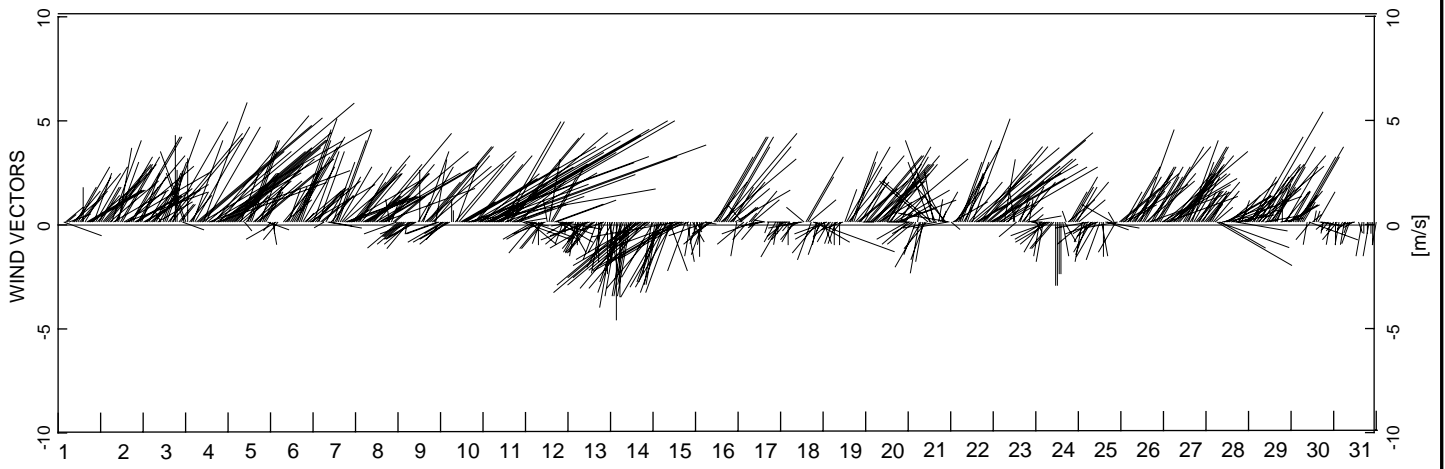
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
September 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-15



NOTES

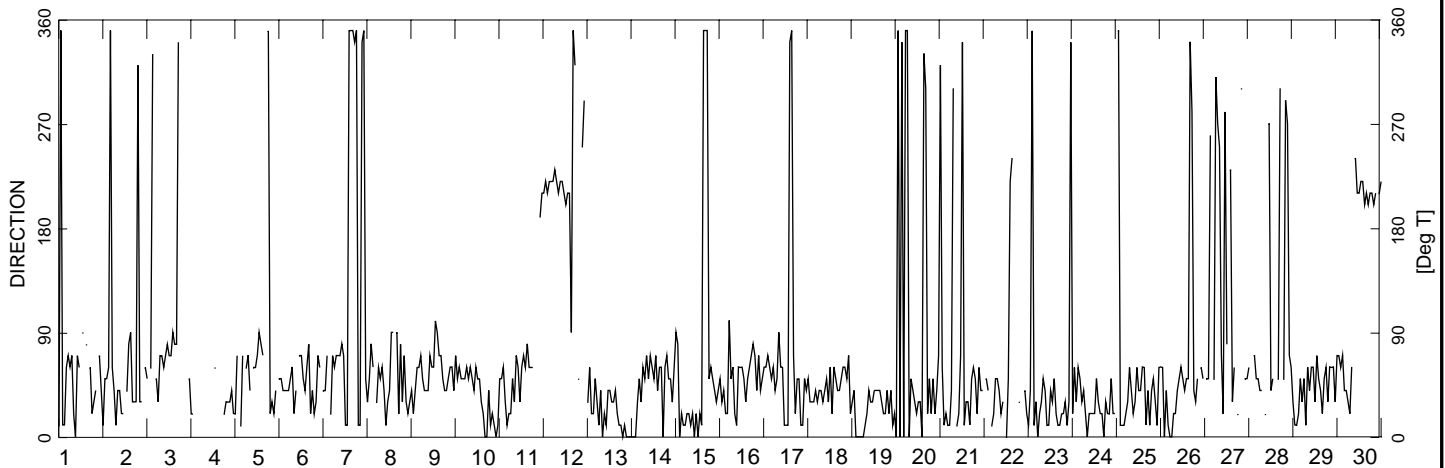
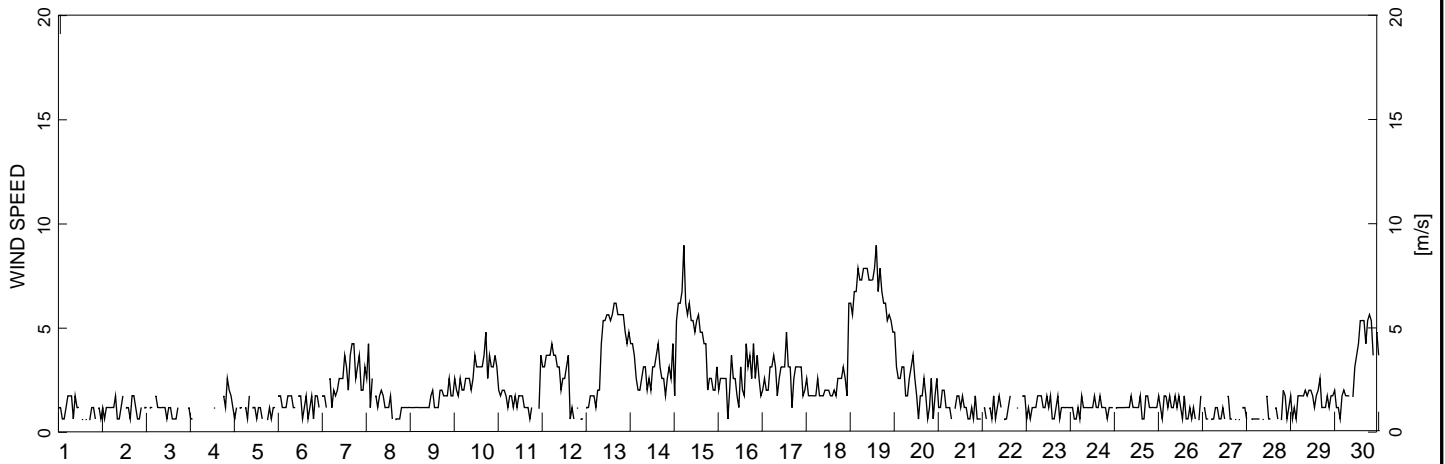
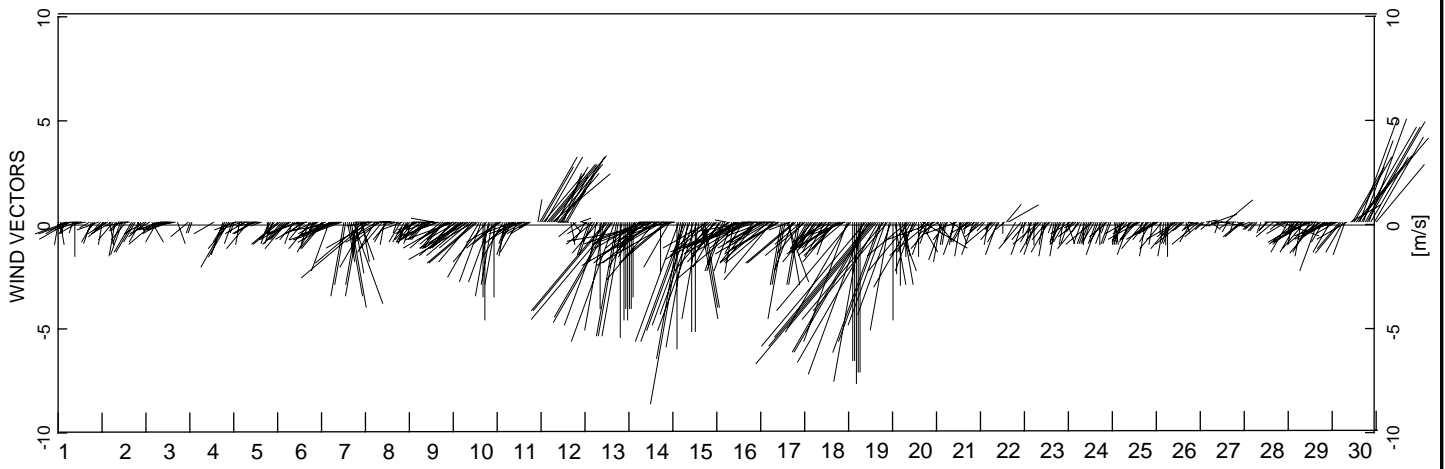
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
October 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-16



NOTES

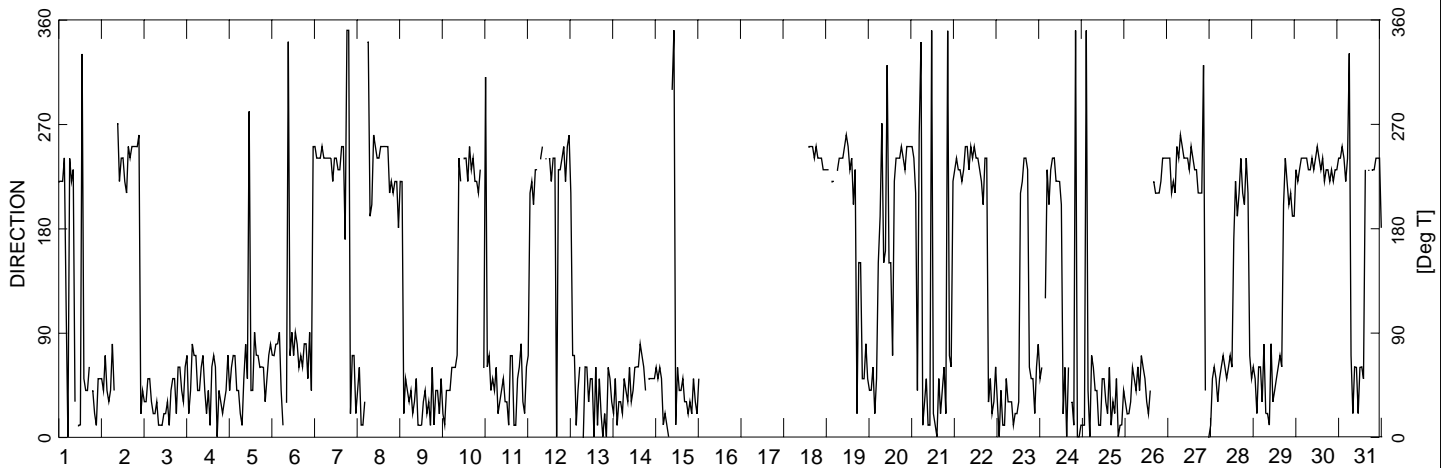
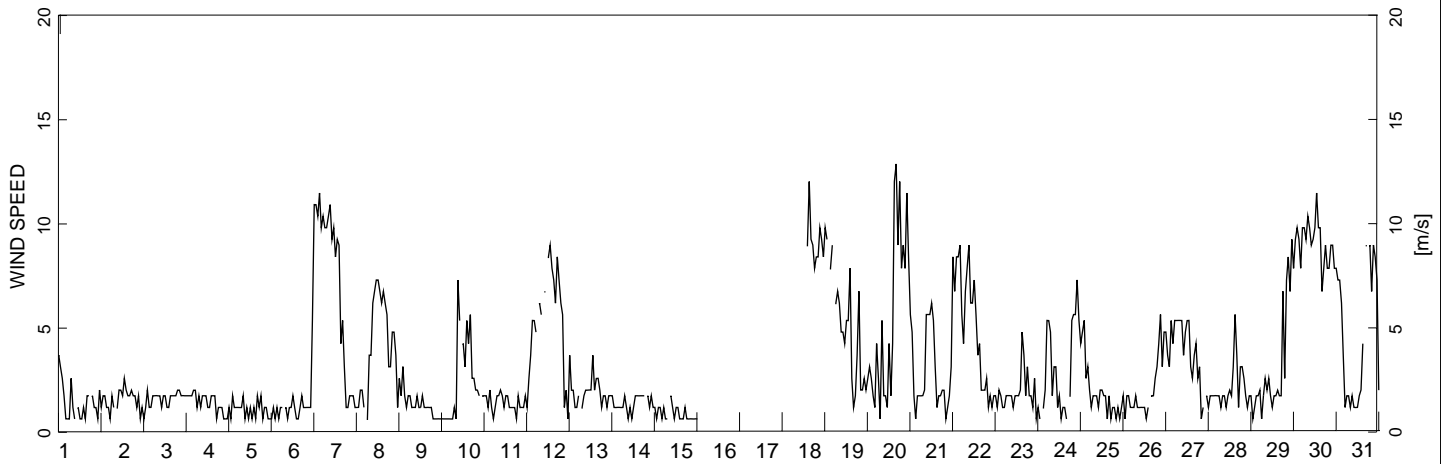
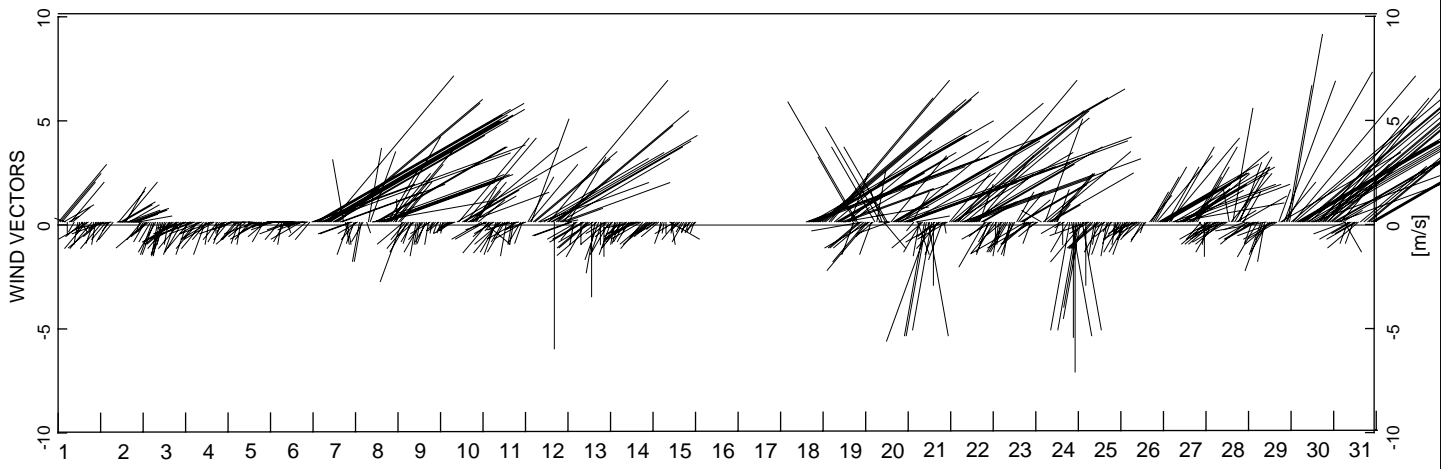
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
November 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-17



NOTES

No data available from
December 16 - 18, 2006

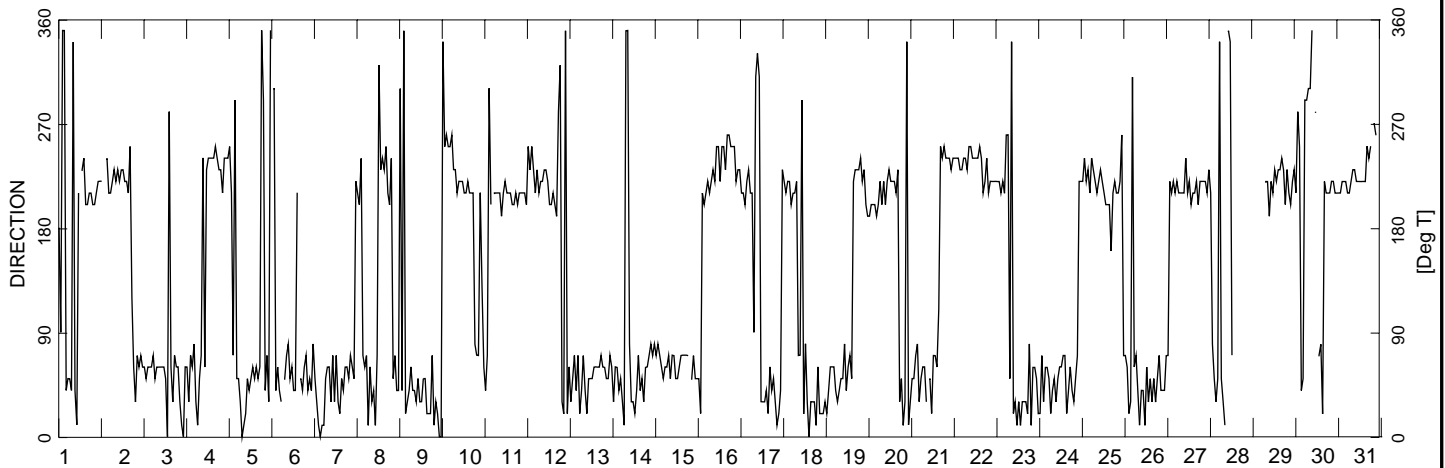
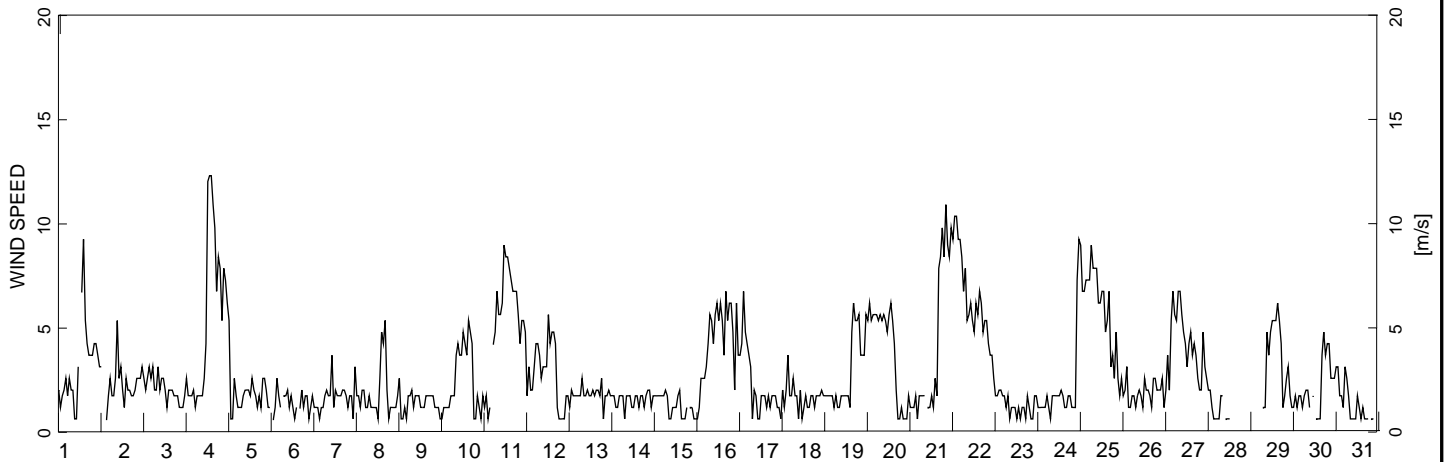
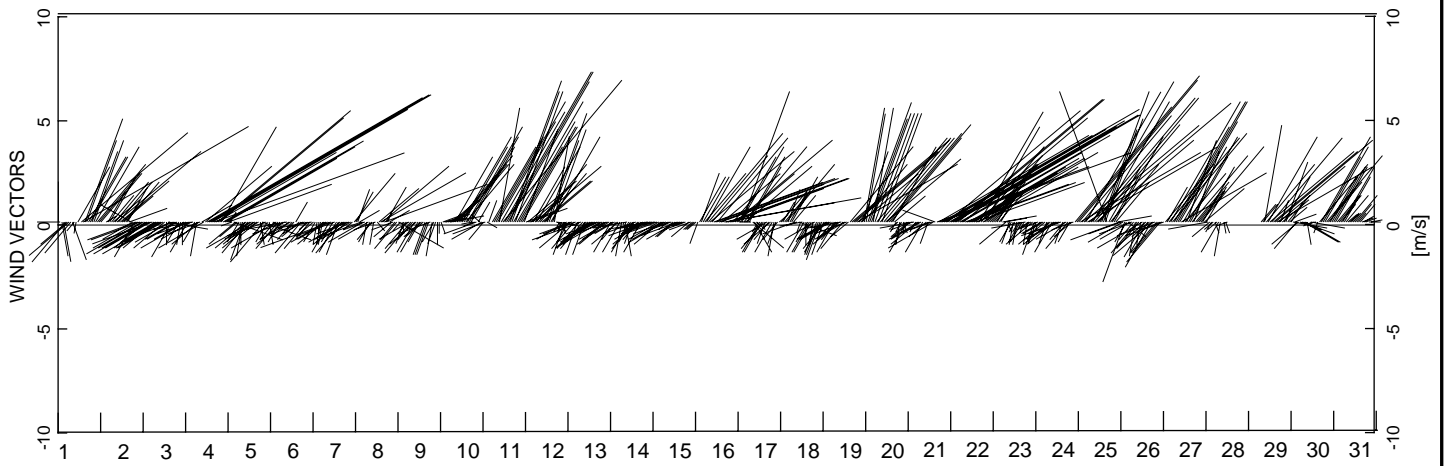
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
December 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure E-18



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
January 2007**

**EBA Engineering
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PROJECT NO.
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JR

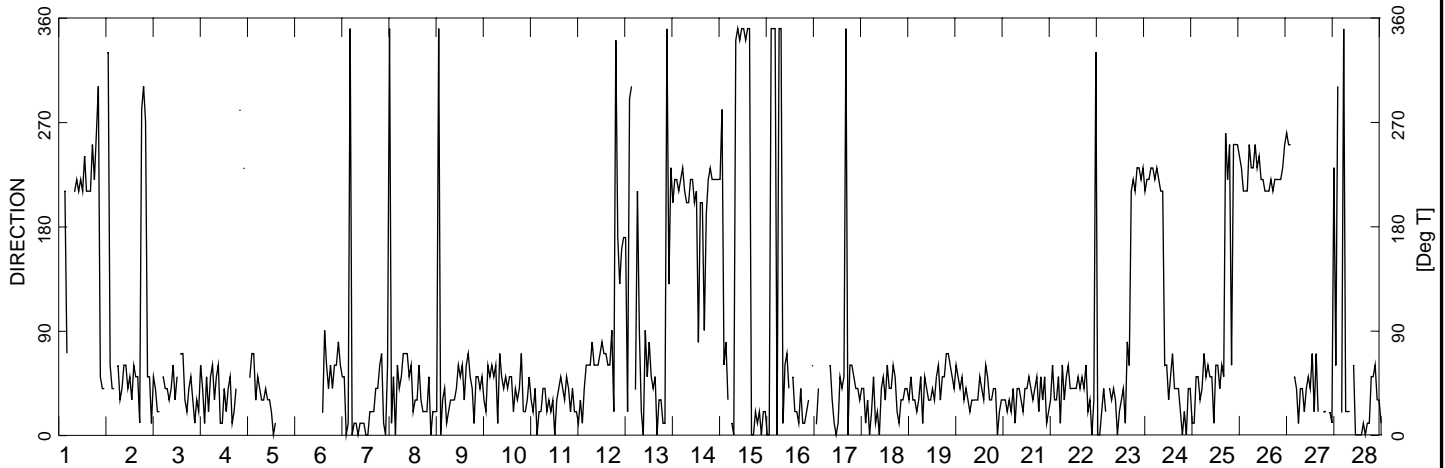
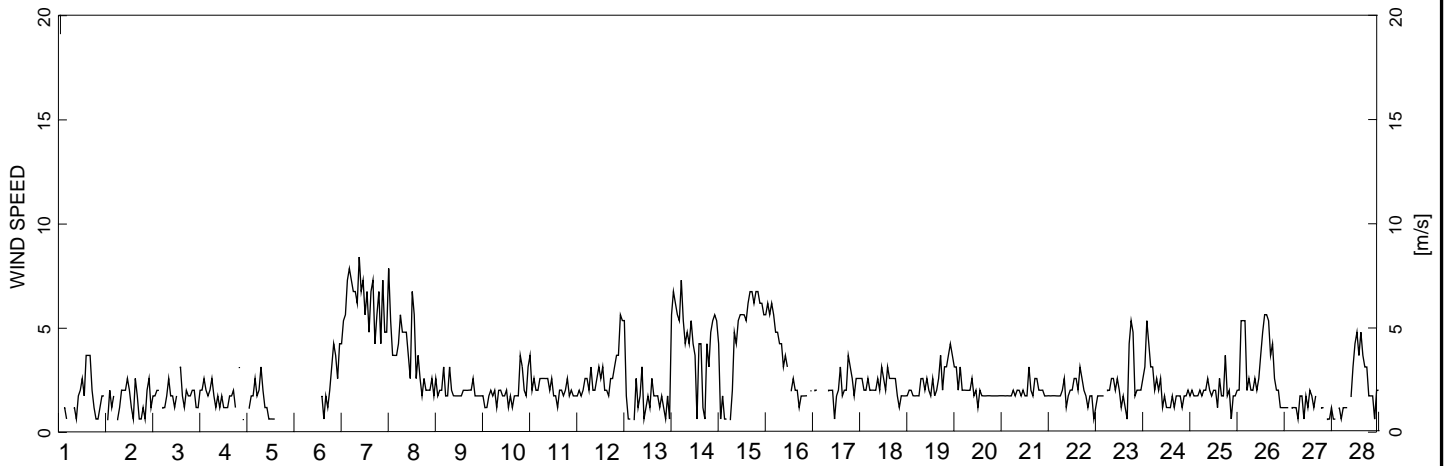
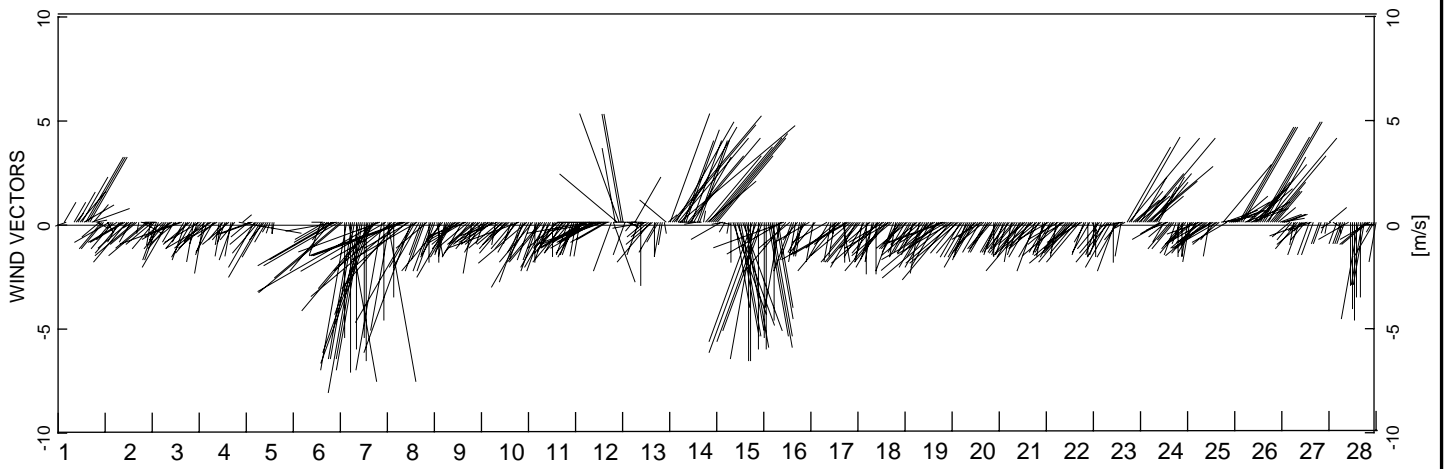
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Figure E-19



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
February 2007**

**EBA Engineering
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PROJECT NO.
W23101021

DWN
JR

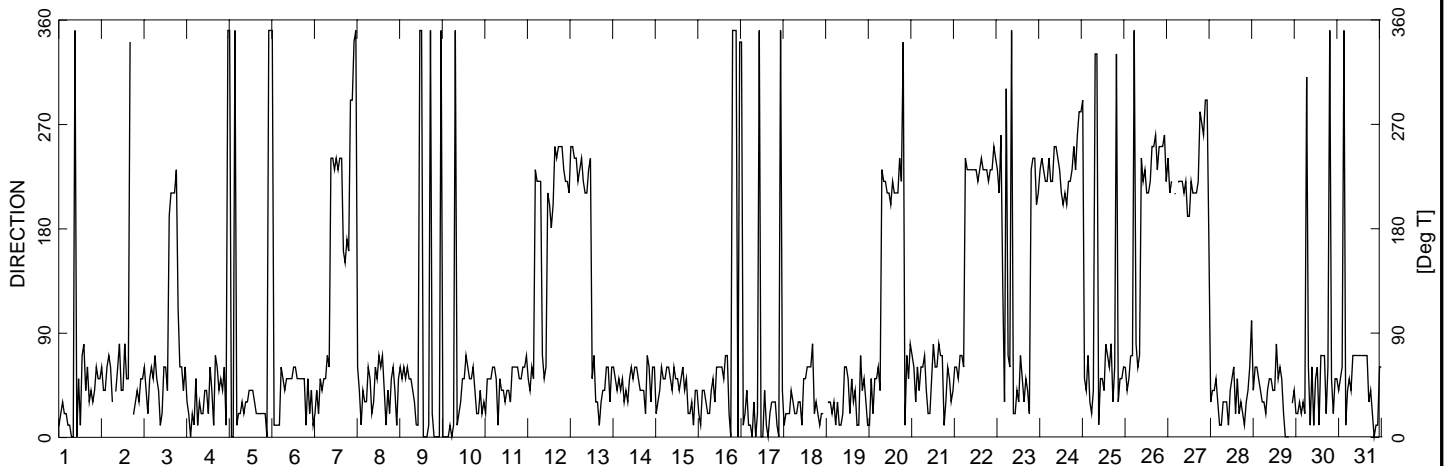
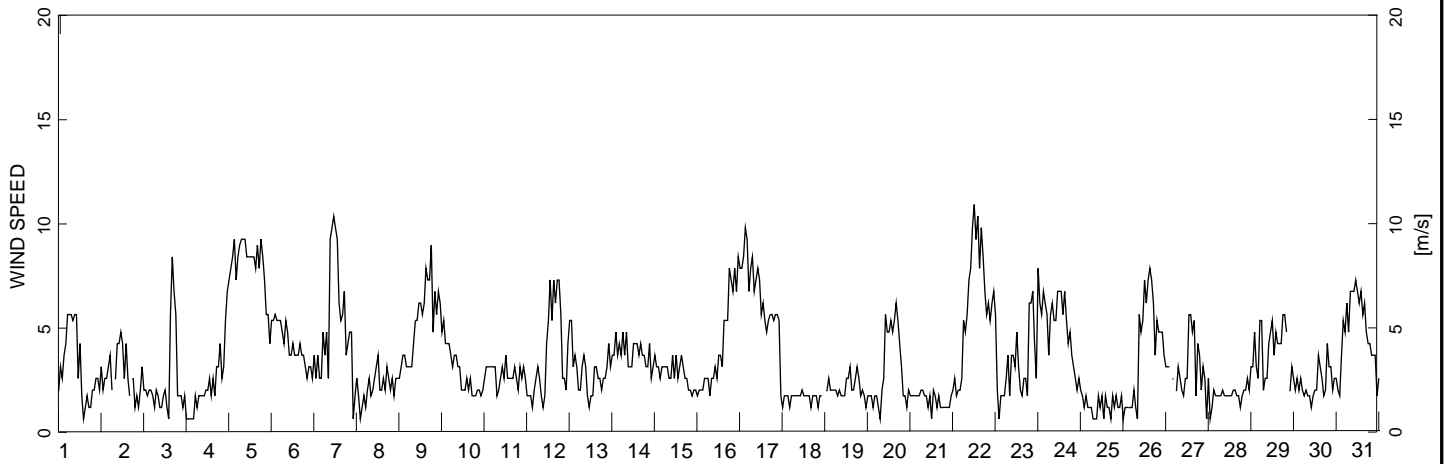
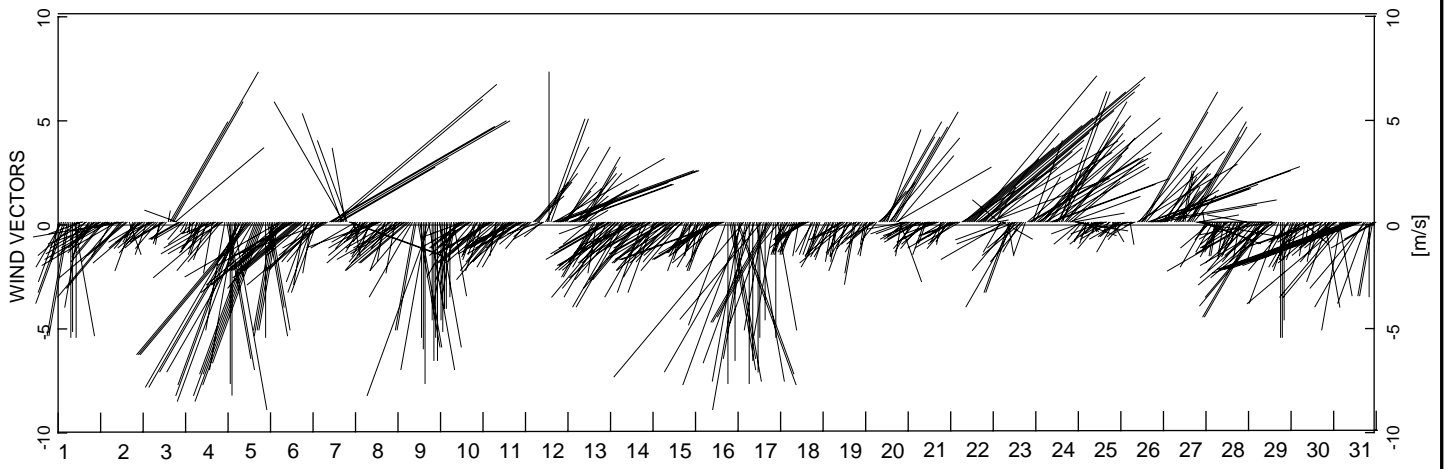
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Figure E-20



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
March 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

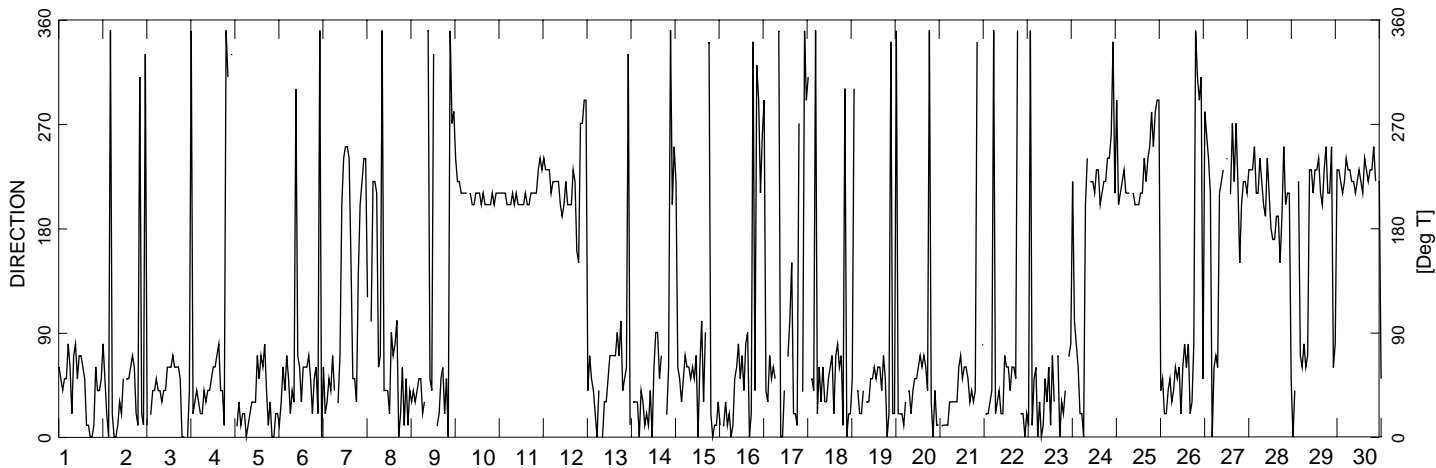
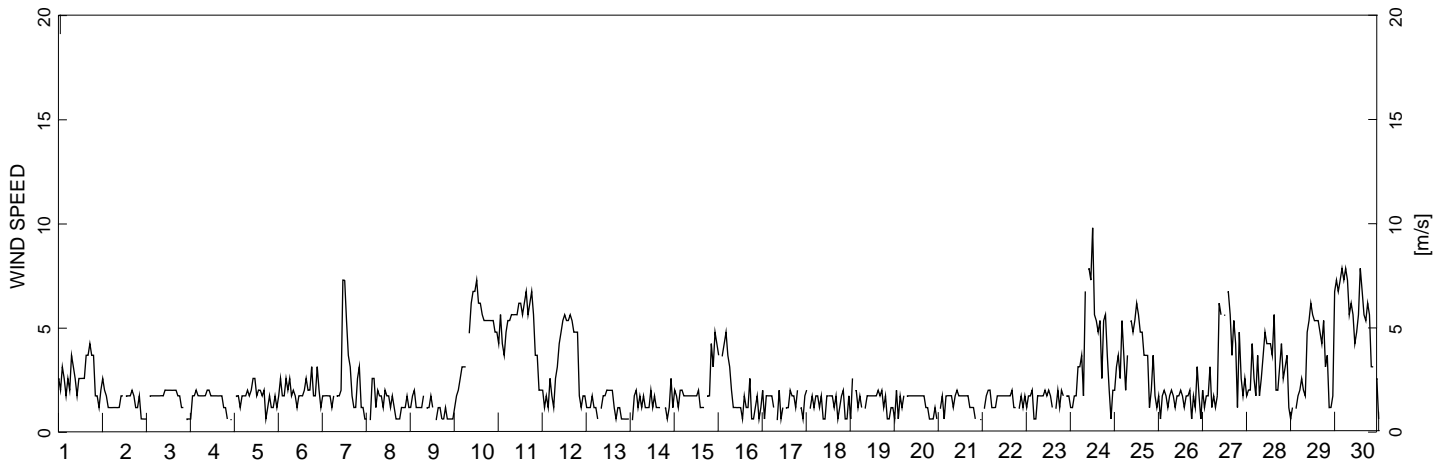
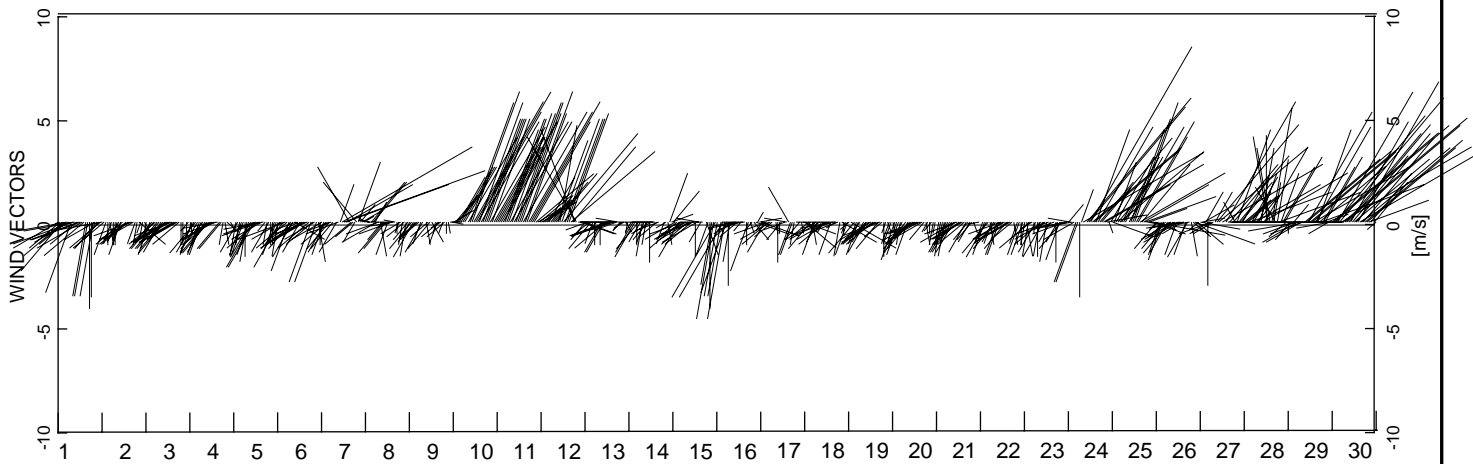
CHK
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EBA-VANC

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November 2008

Figure E-21



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
April 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

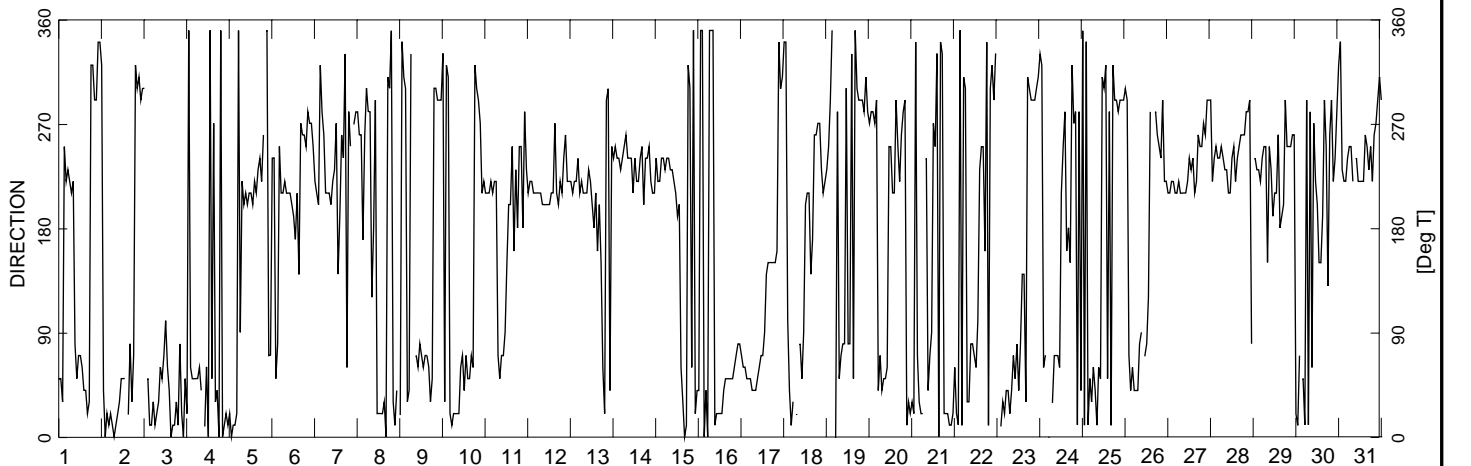
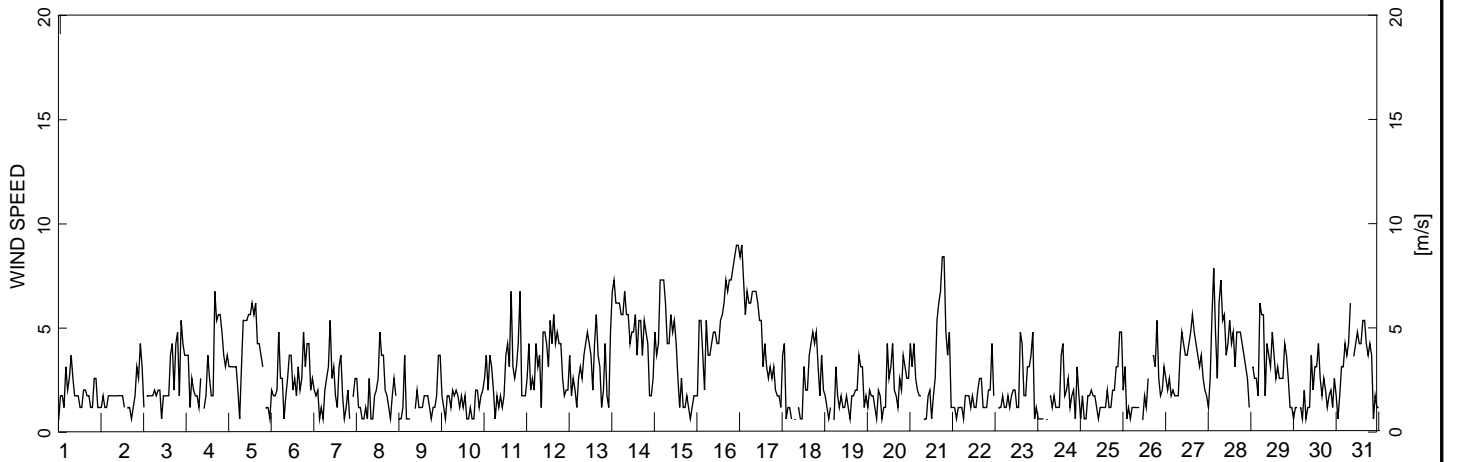
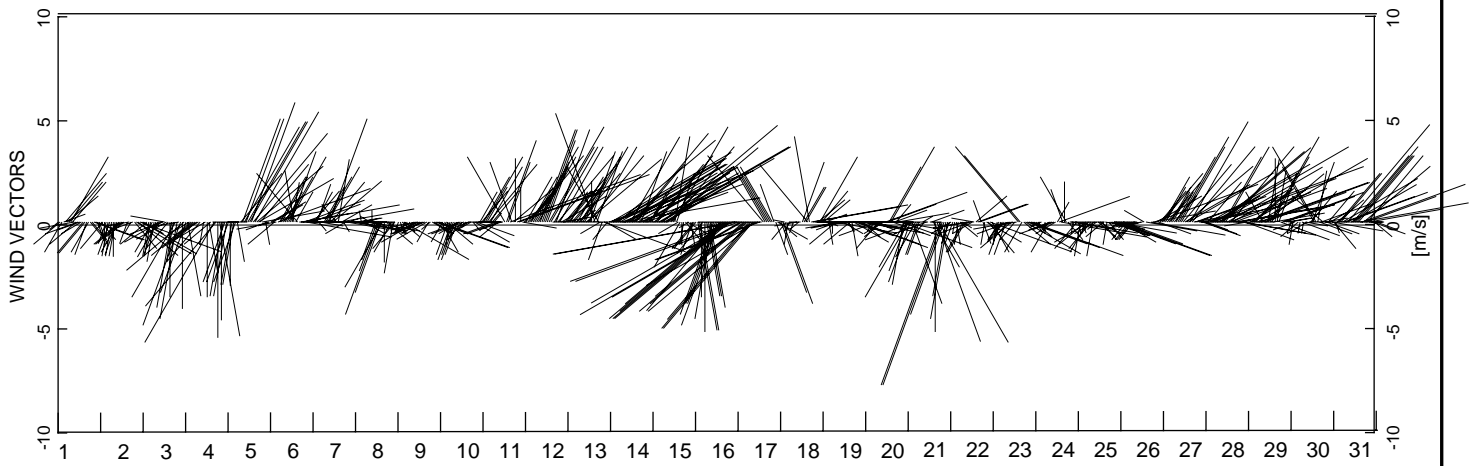
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EBA-VANC

DATE
November 2008

Figure E-22



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
May 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

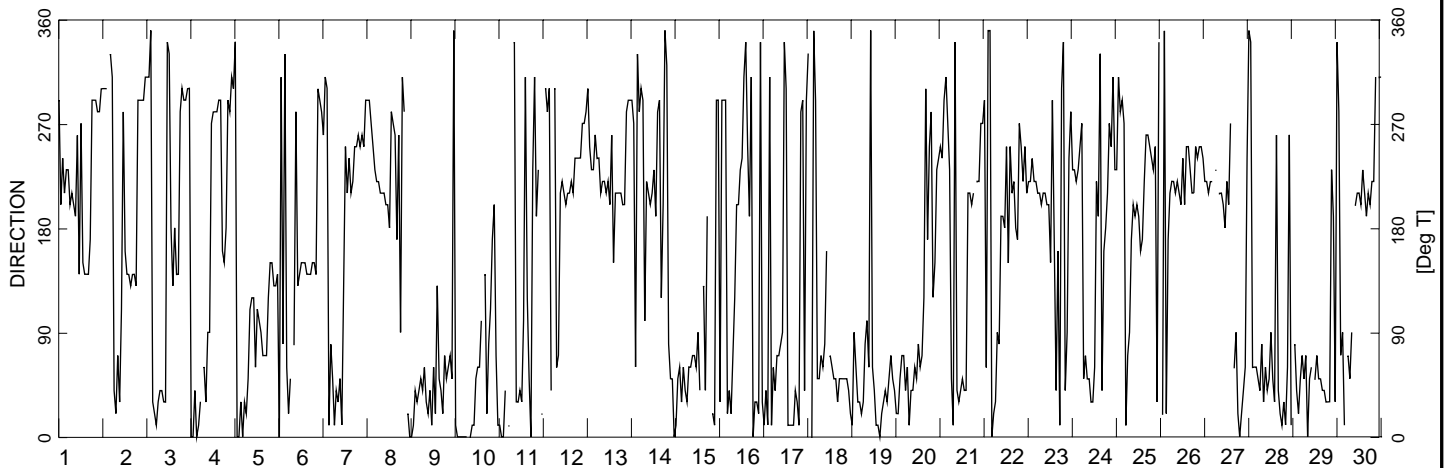
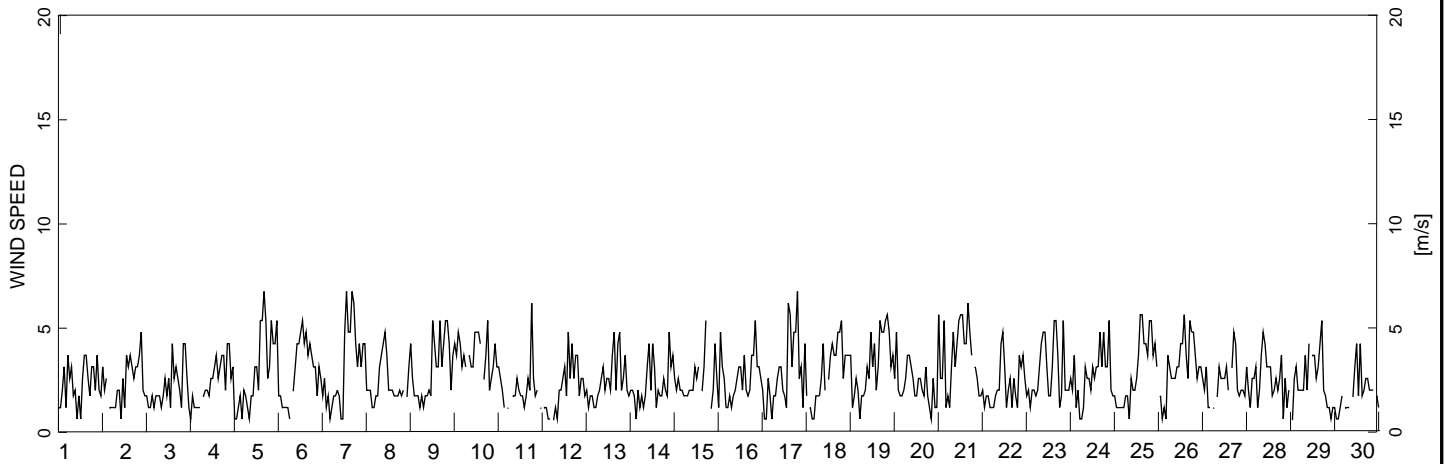
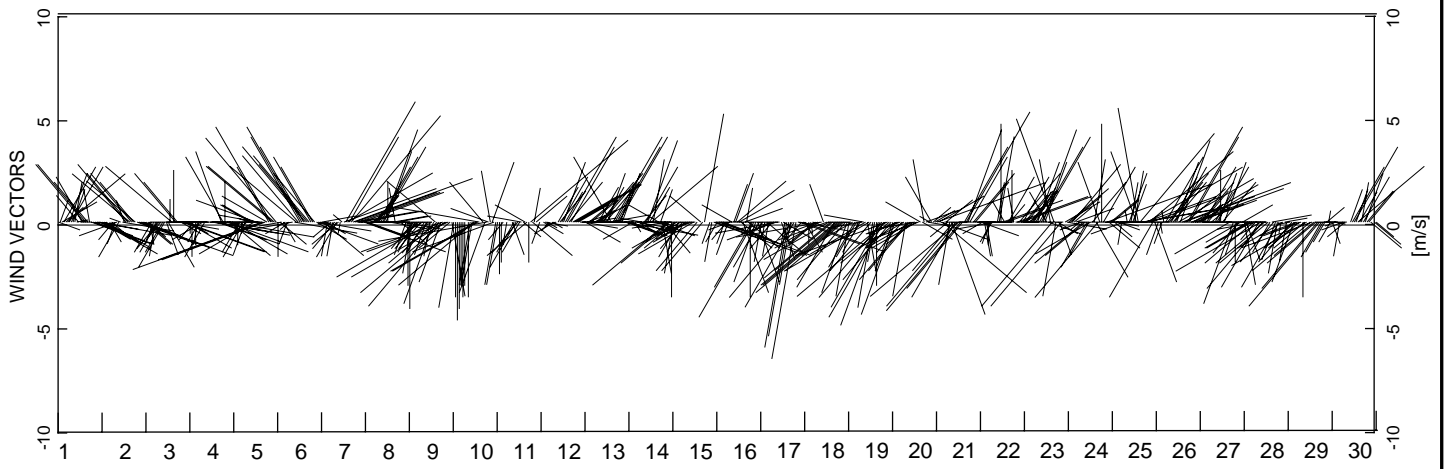
CHK
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REV
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EBA-VANC

DATE
November 2008

Figure E-23



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
June 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

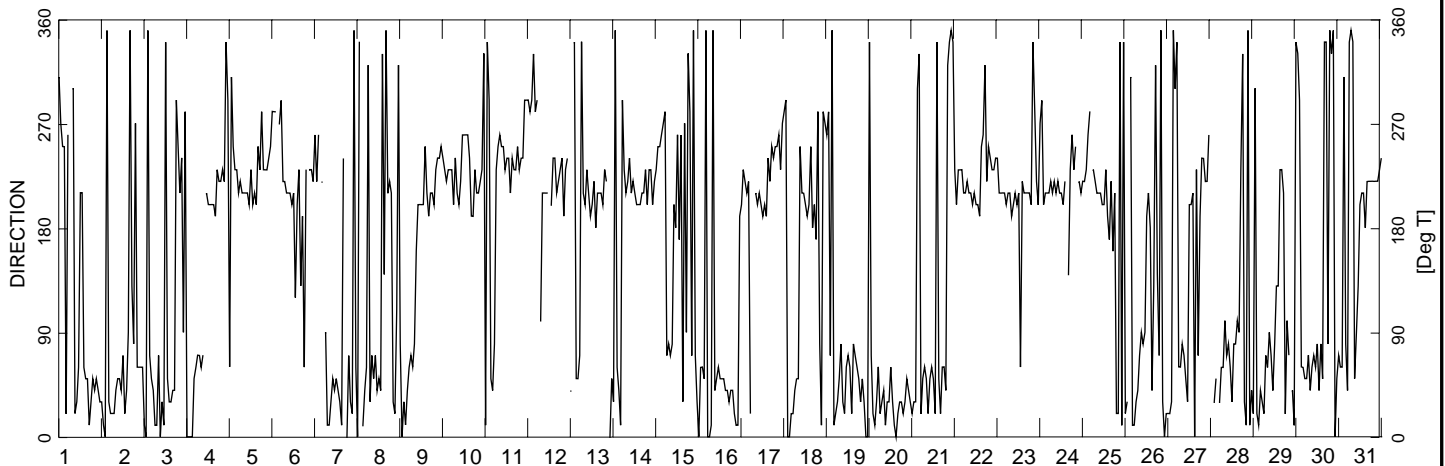
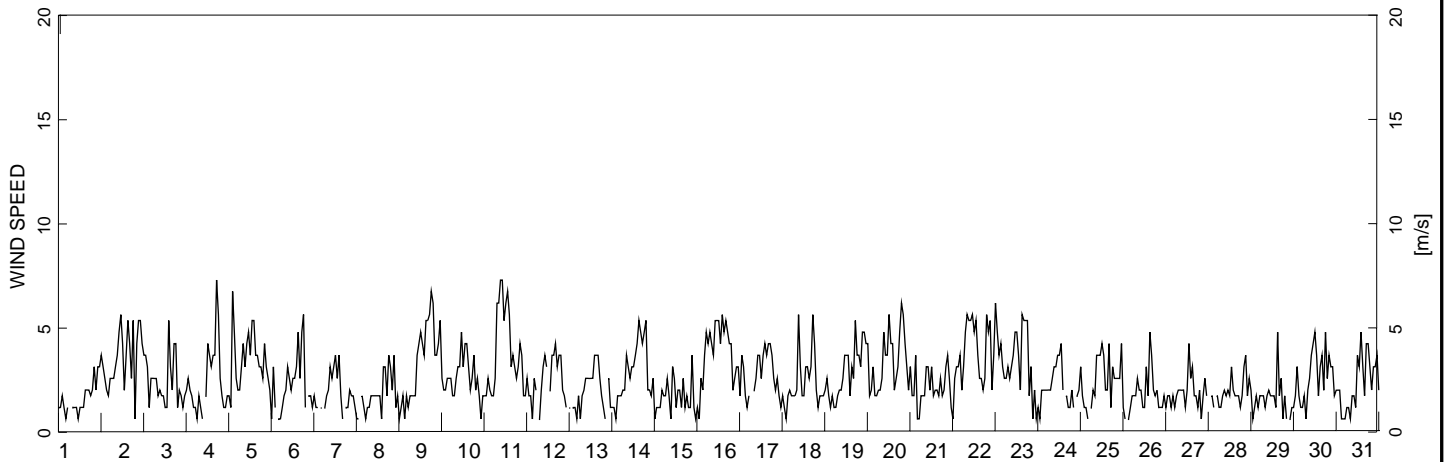
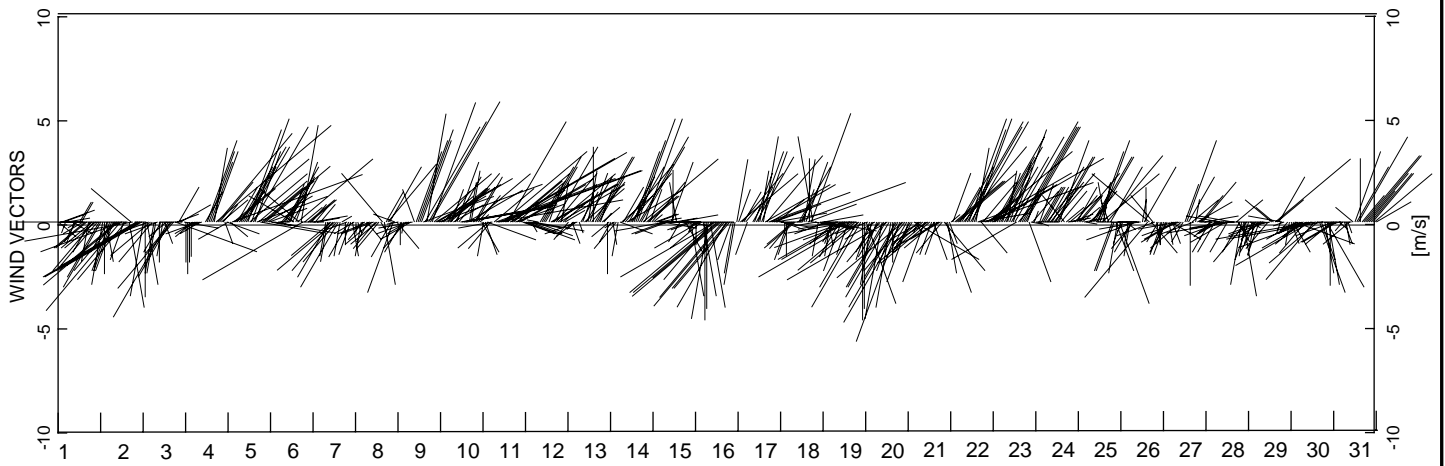
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Figure E-24



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
July 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

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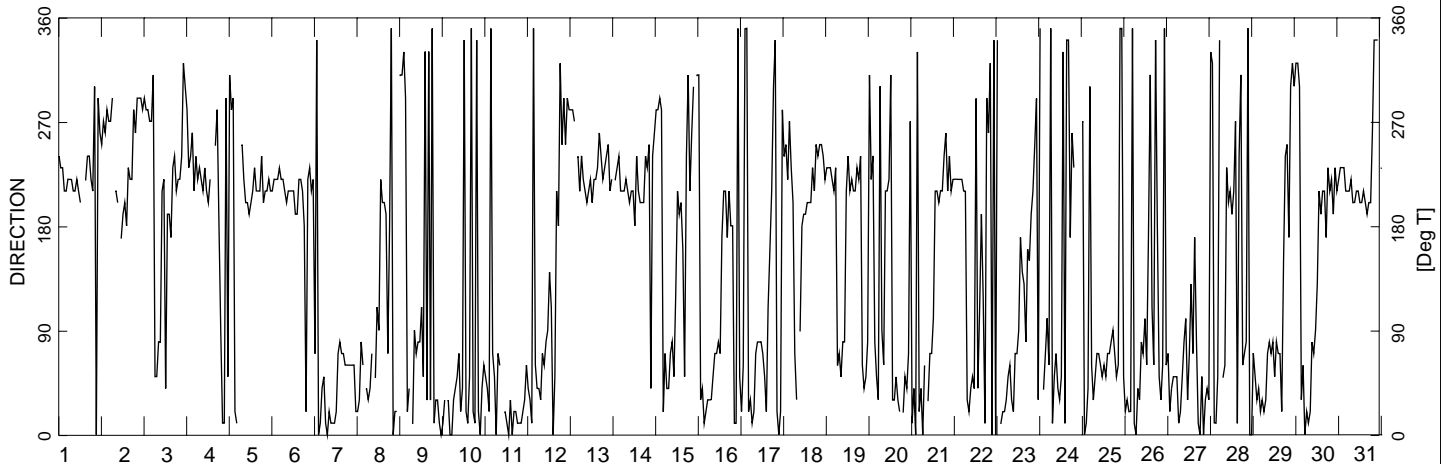
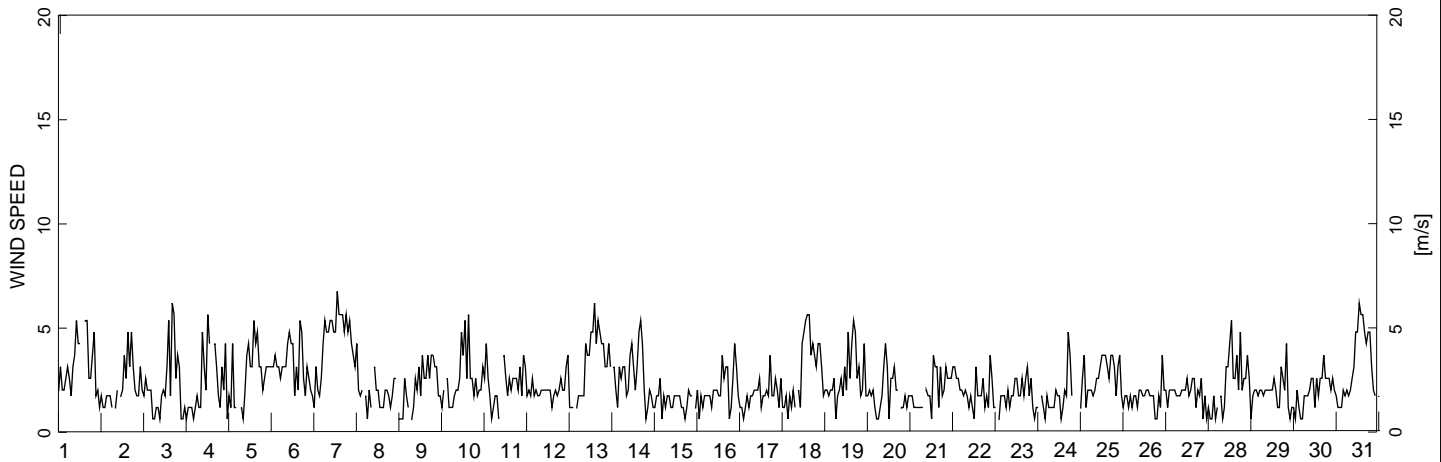
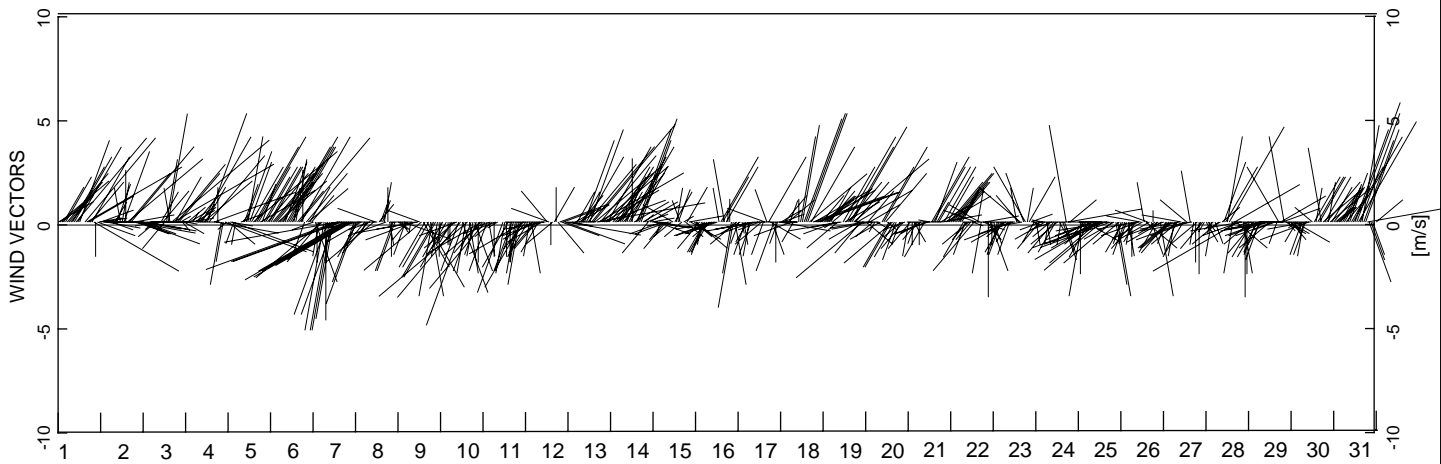
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Figure E-25



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
August 2007**

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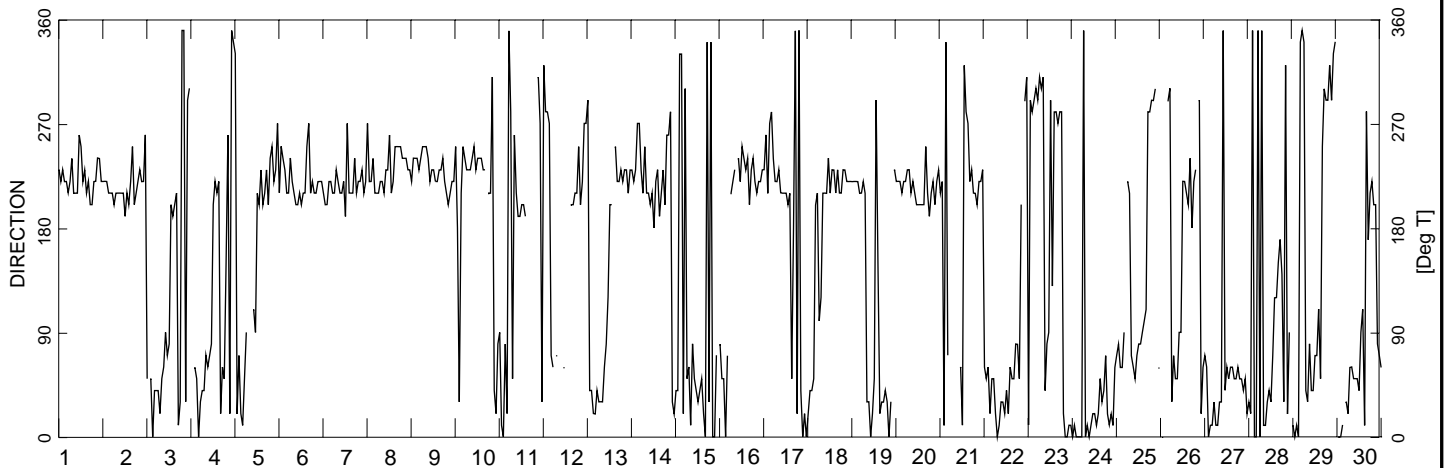
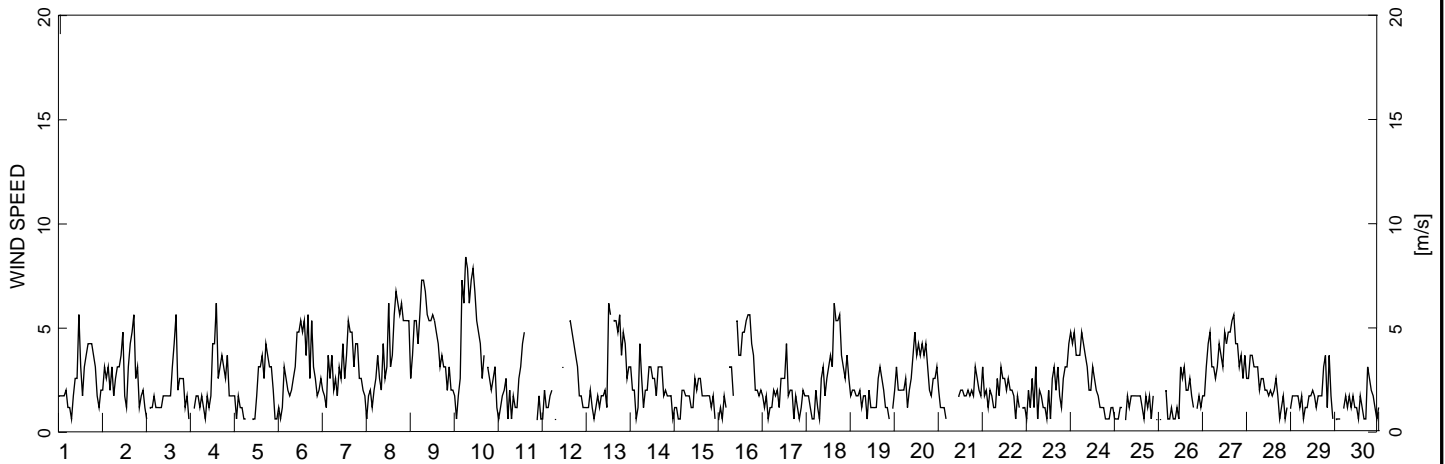
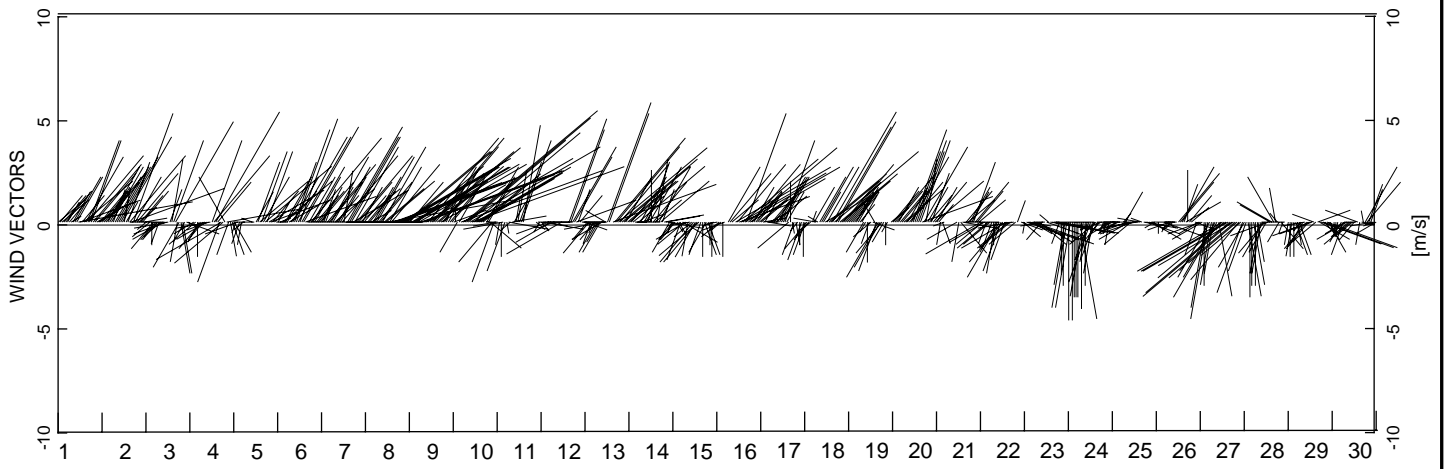
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Figure E-26



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
September 2007**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

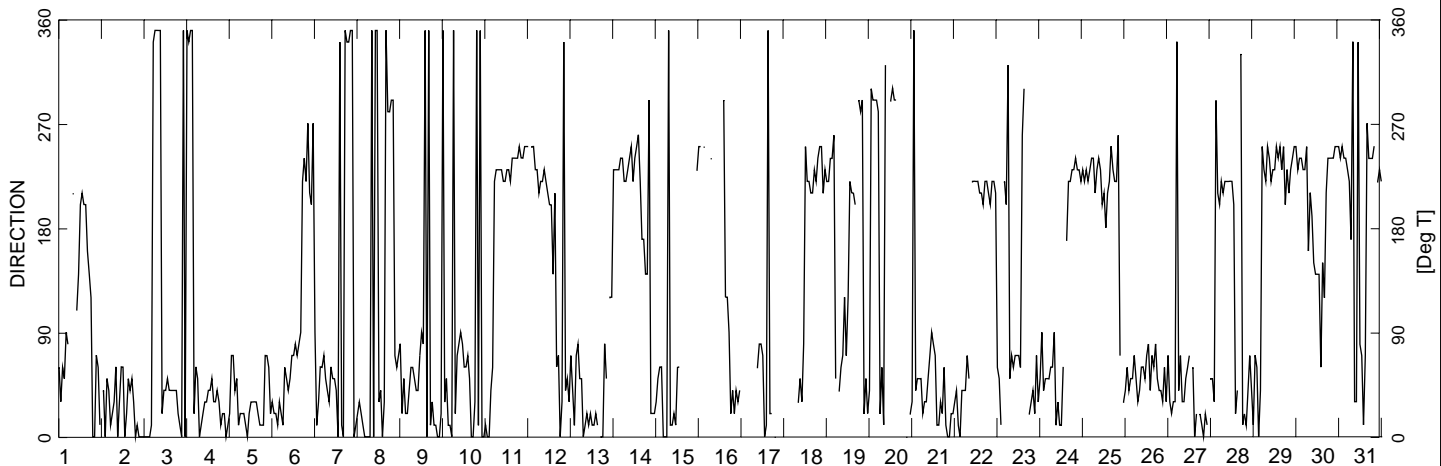
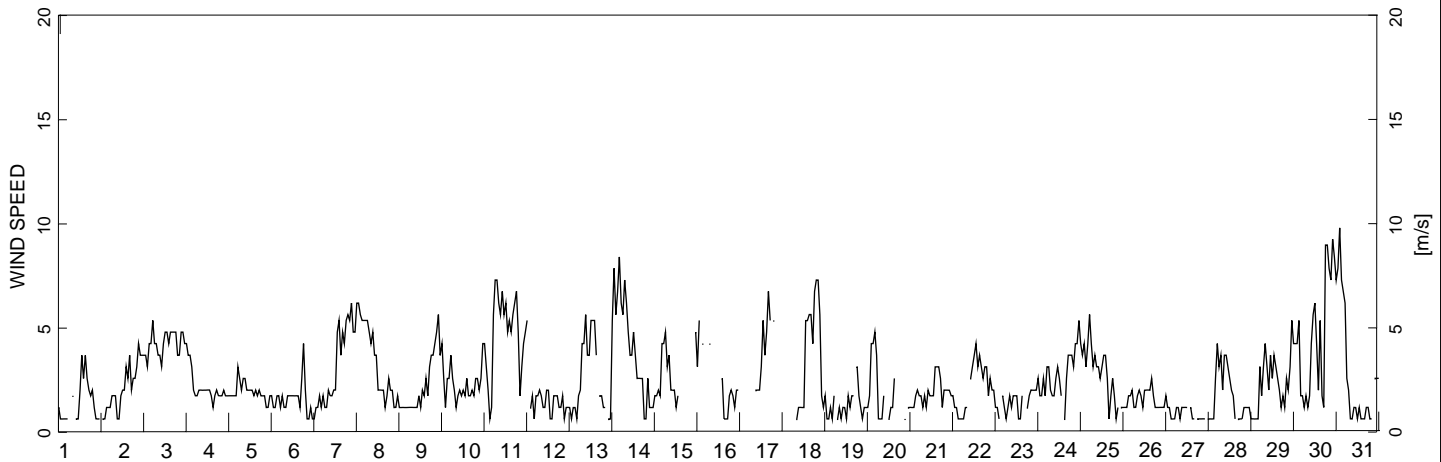
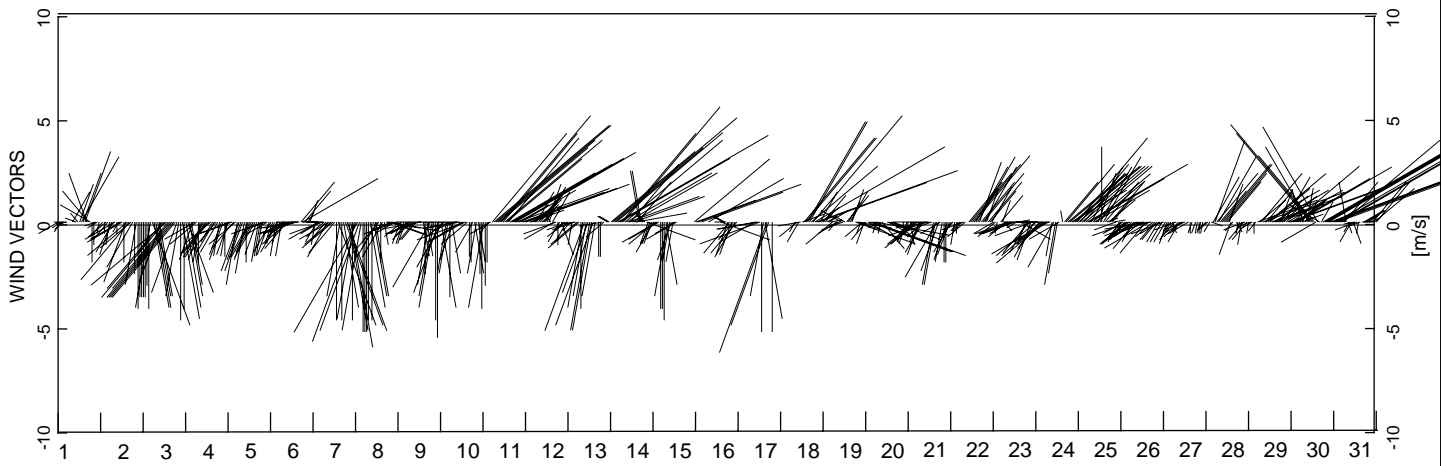
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Figure E-27



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
October 2007**

**EBA Engineering
Consultants Ltd.**



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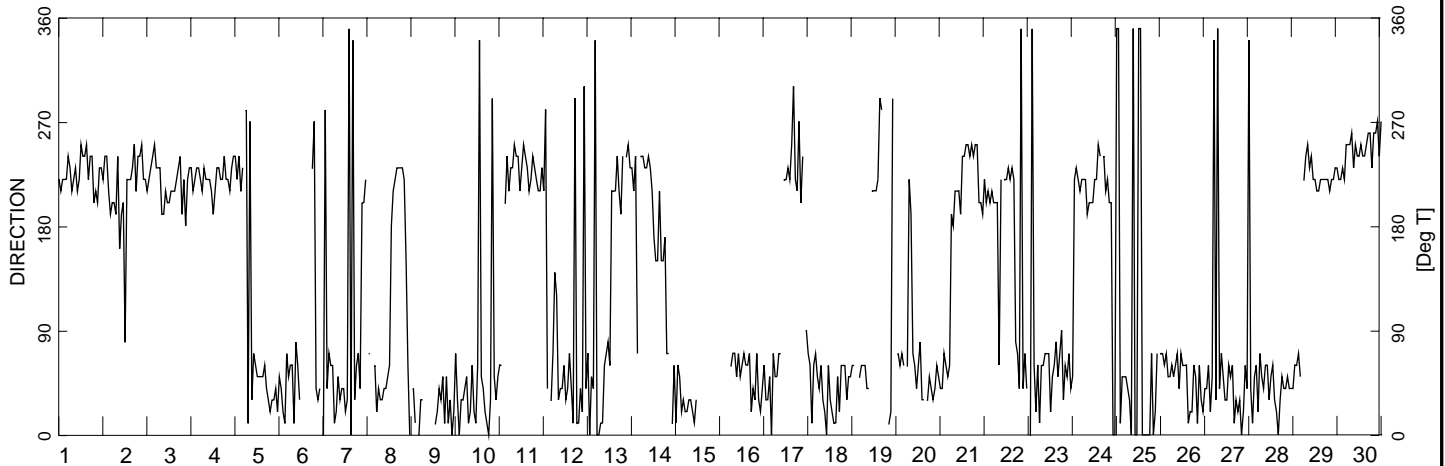
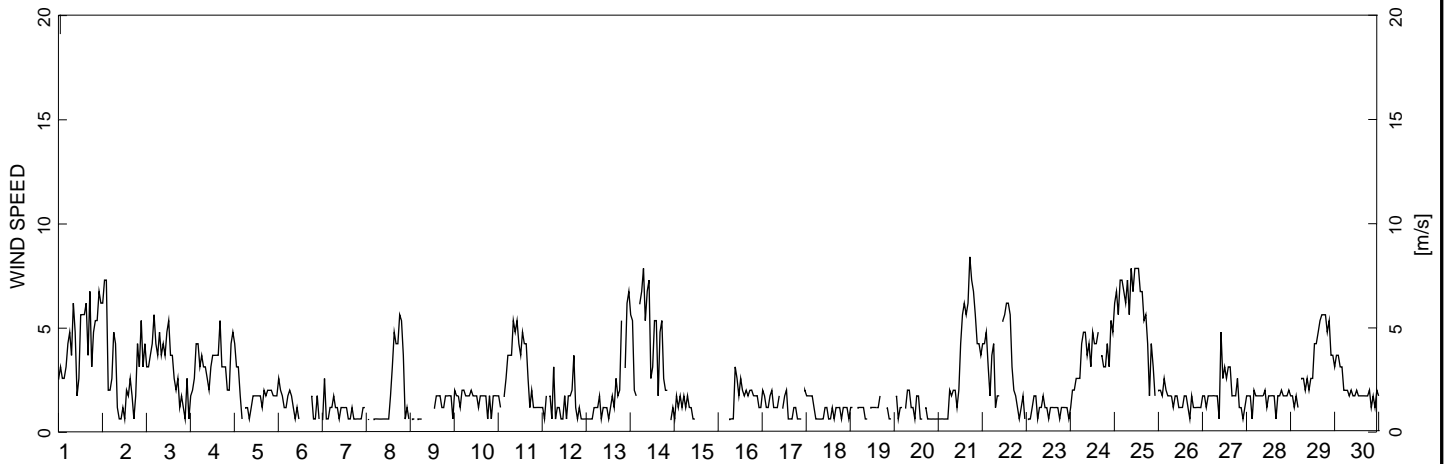
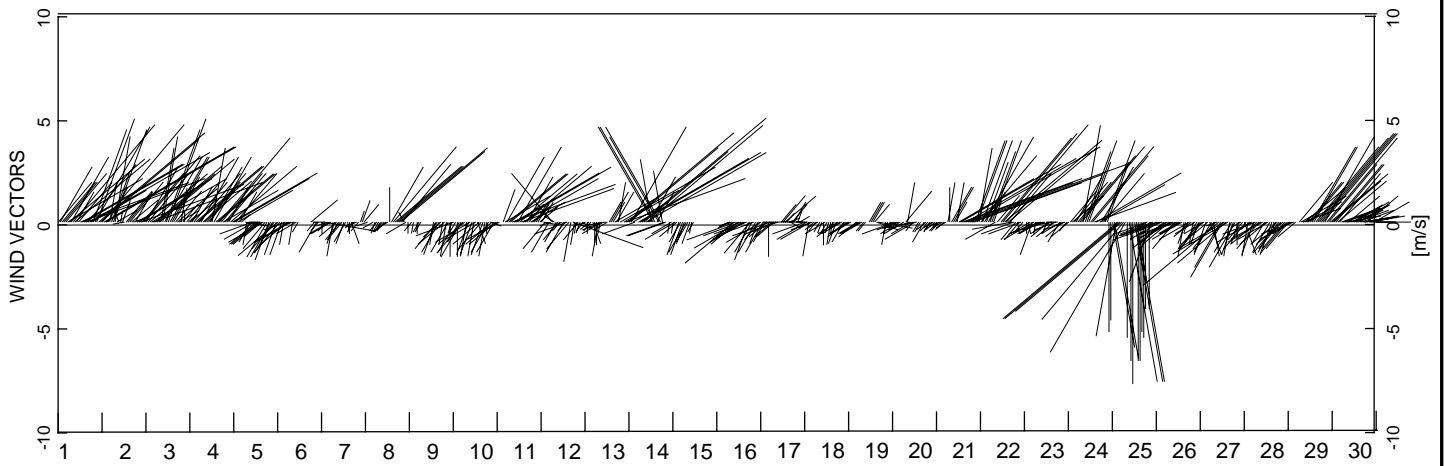
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Figure E-28



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
November 2007**

**EBA Engineering
Consultants Ltd.**



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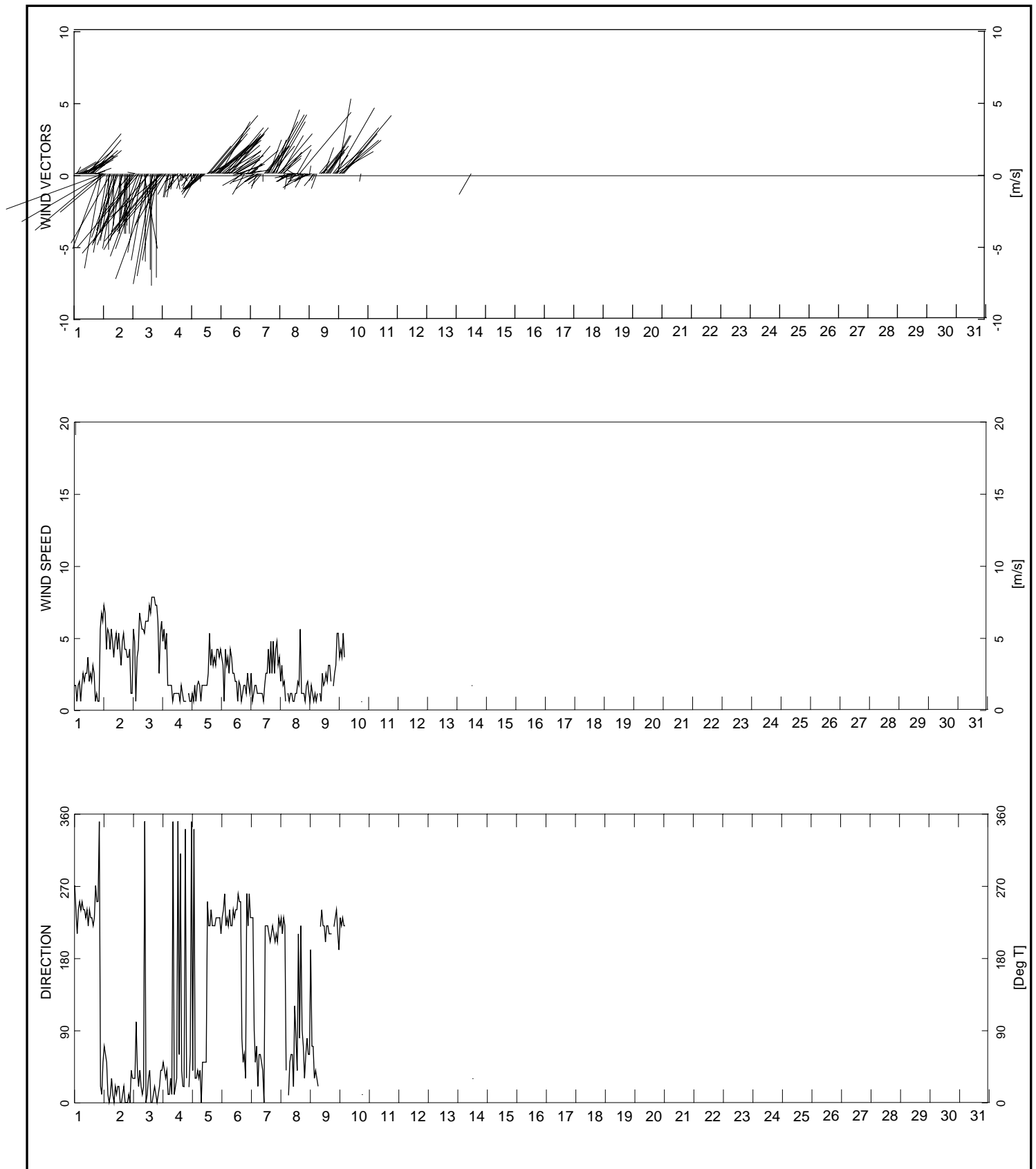
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Figure E-29



NOTES

No data available from
December 10 - 31, 2007

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2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
December 2007**

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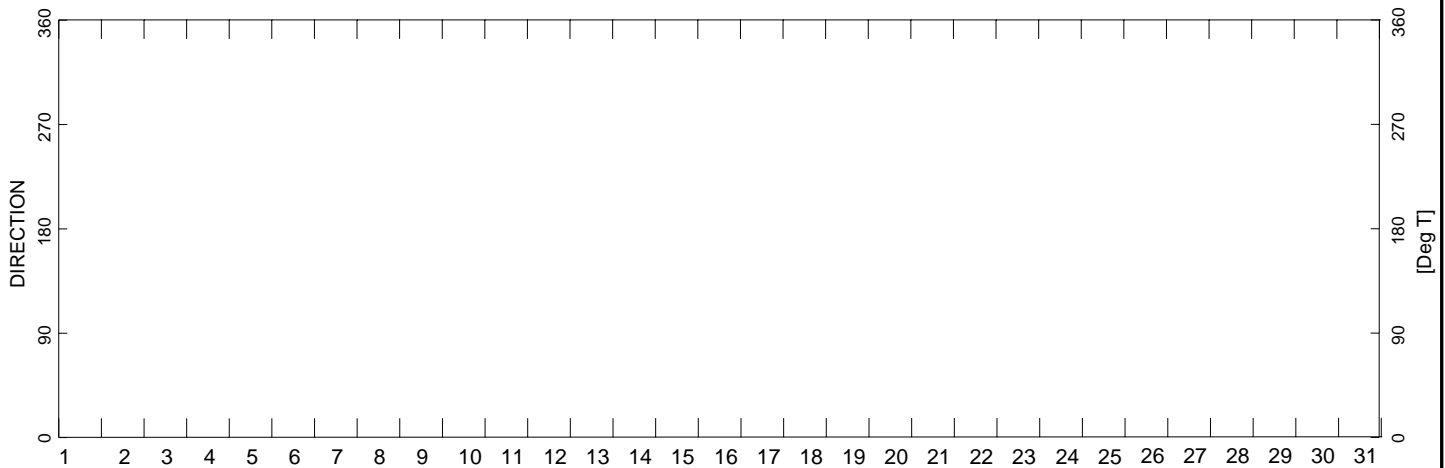
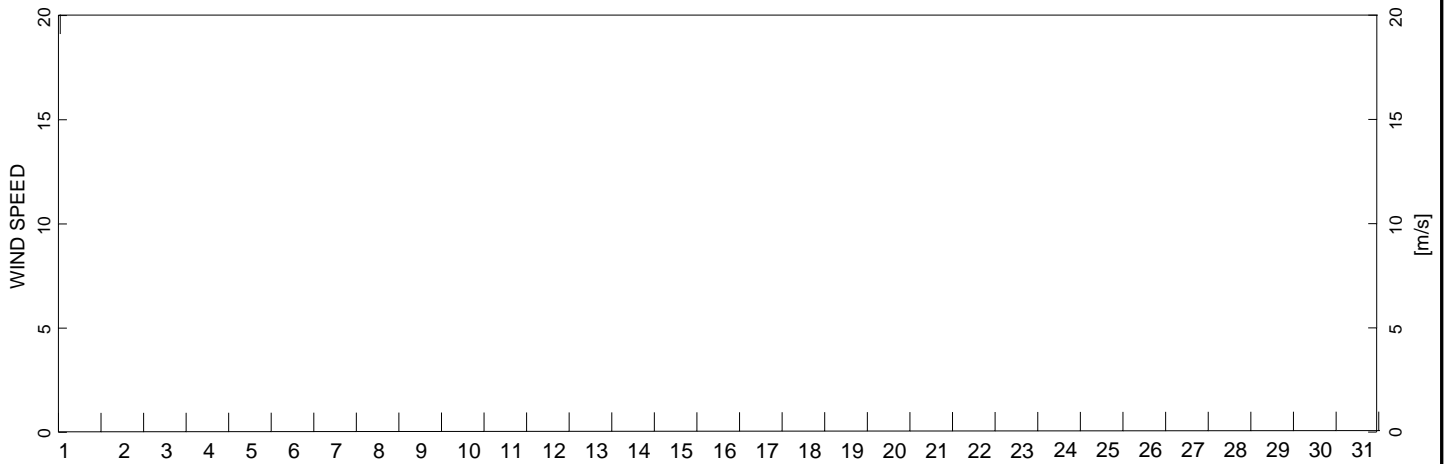
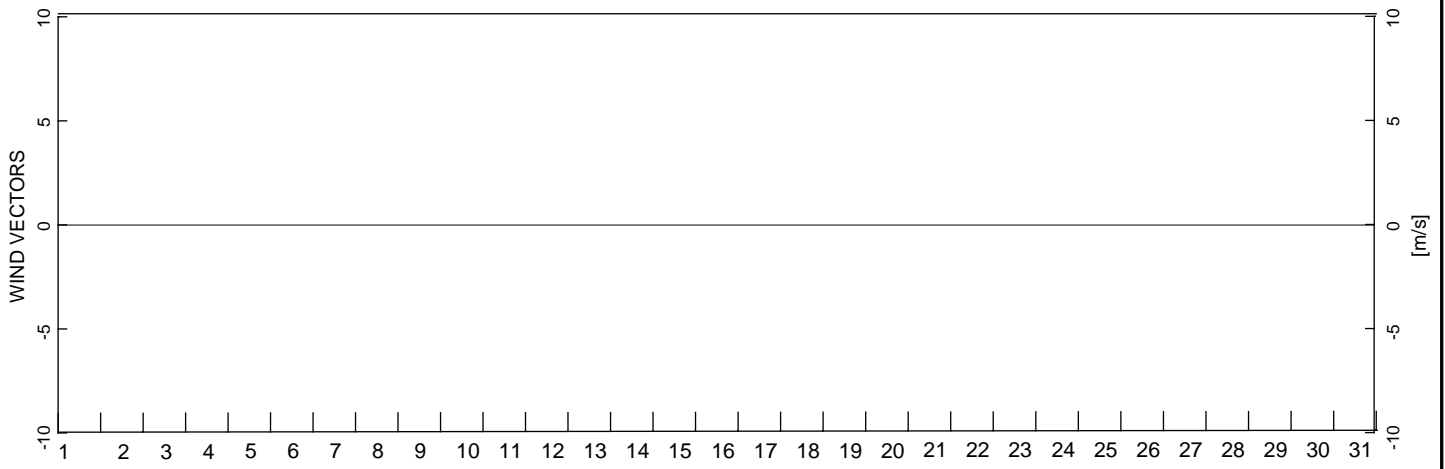
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Figure E-30



NOTES

No data available from
January 1 - 31, 2008

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
January 2008**

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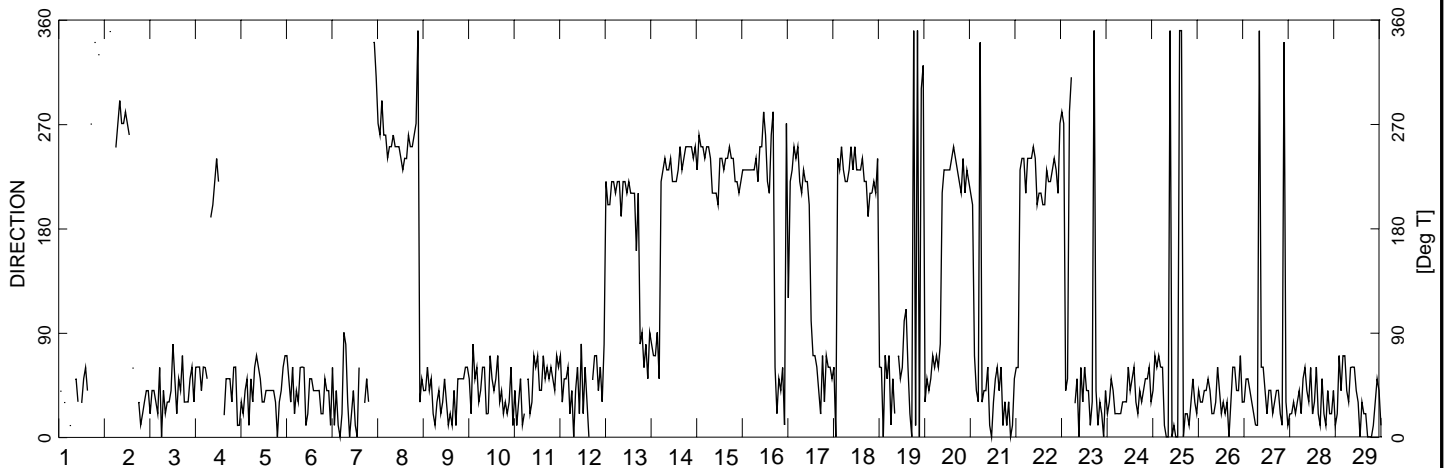
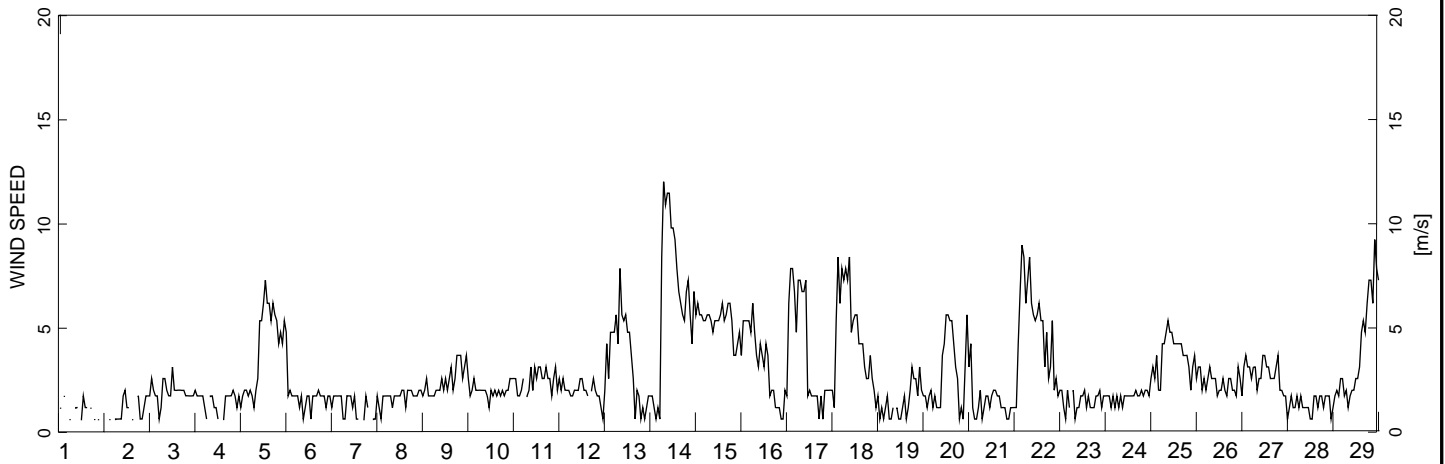
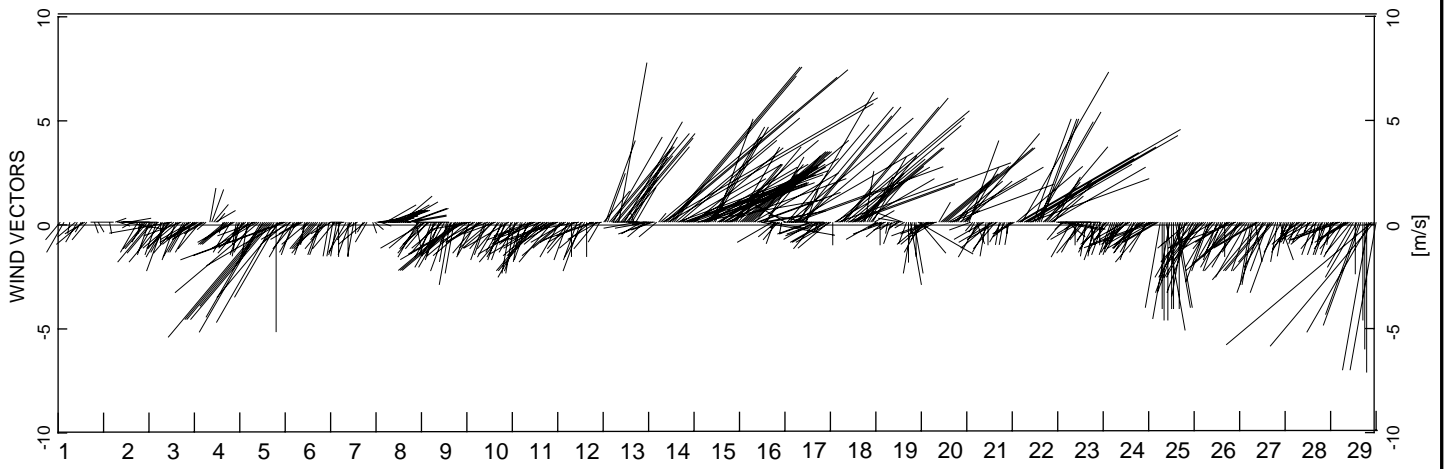
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November 2008

Figure E-31



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
February 2008**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.
W23101021

DWN
JR

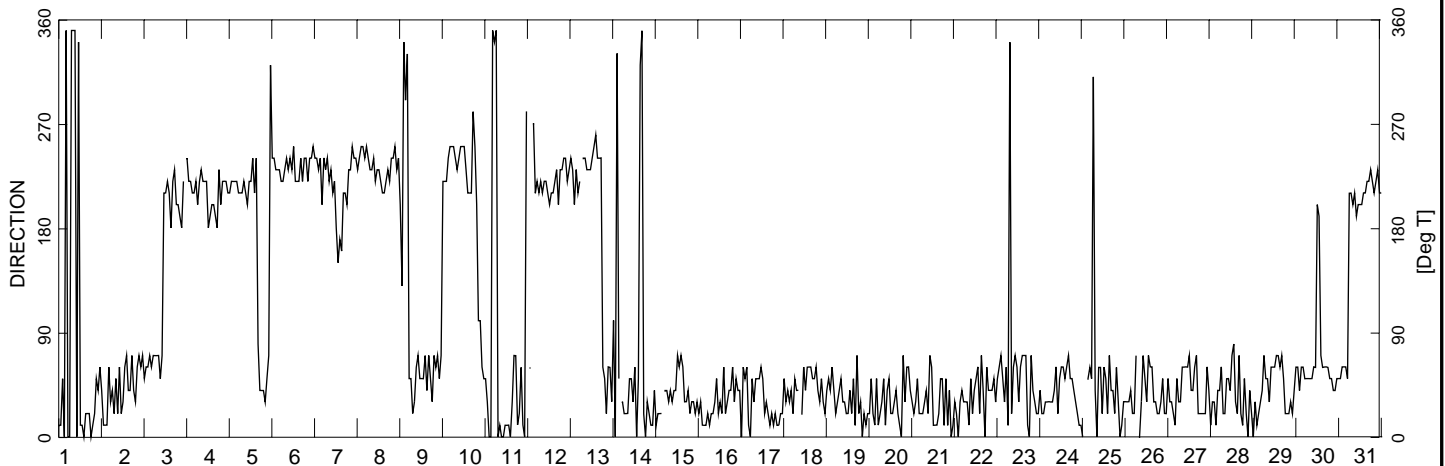
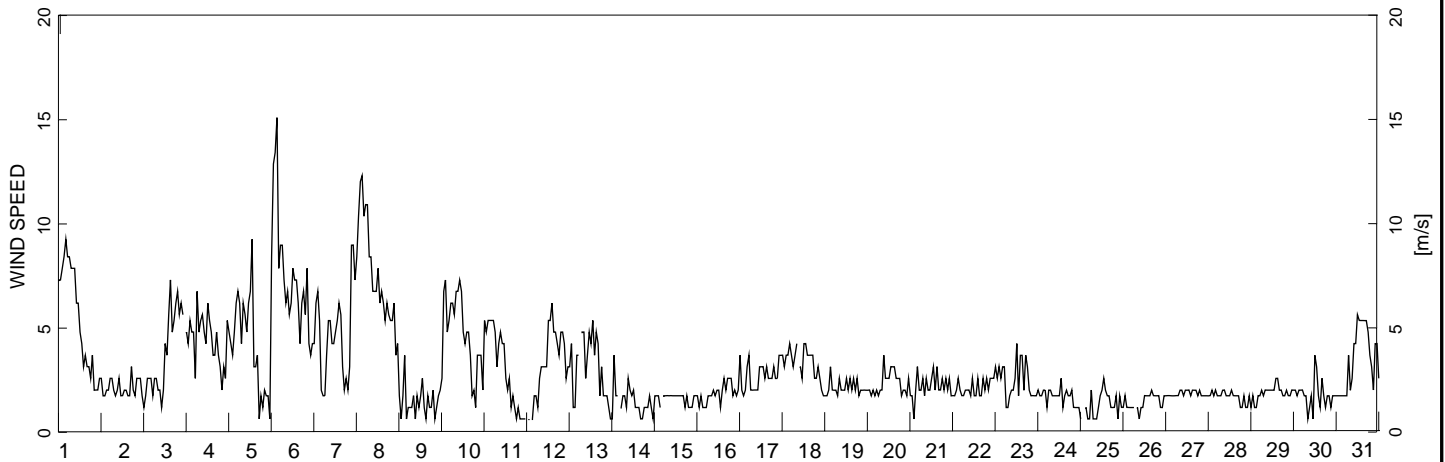
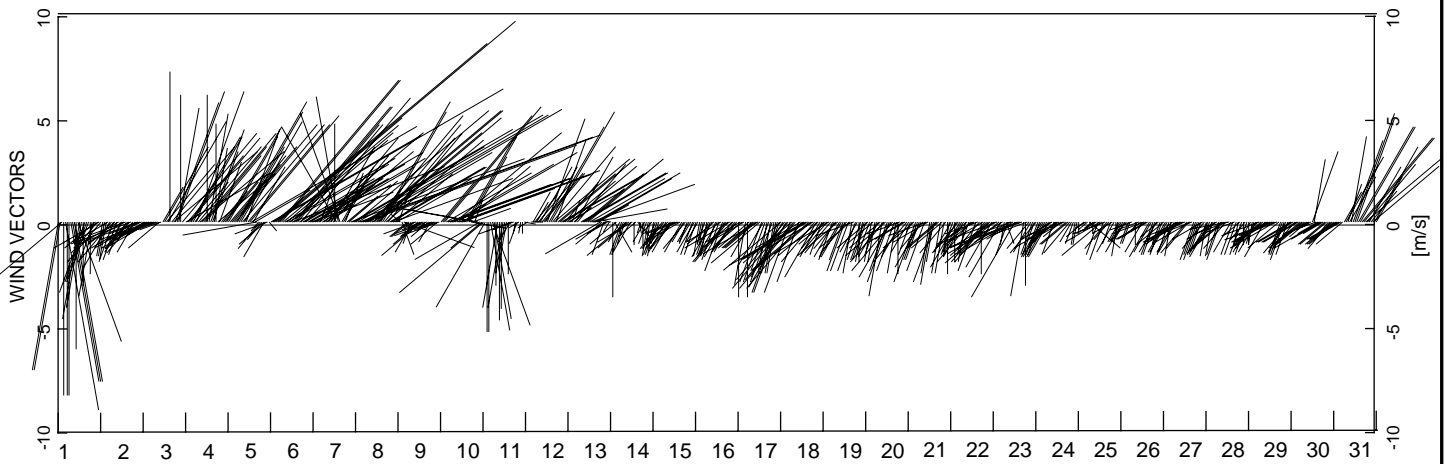
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Figure E-32



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
March 2008**

**EBA Engineering
Consultants Ltd.**



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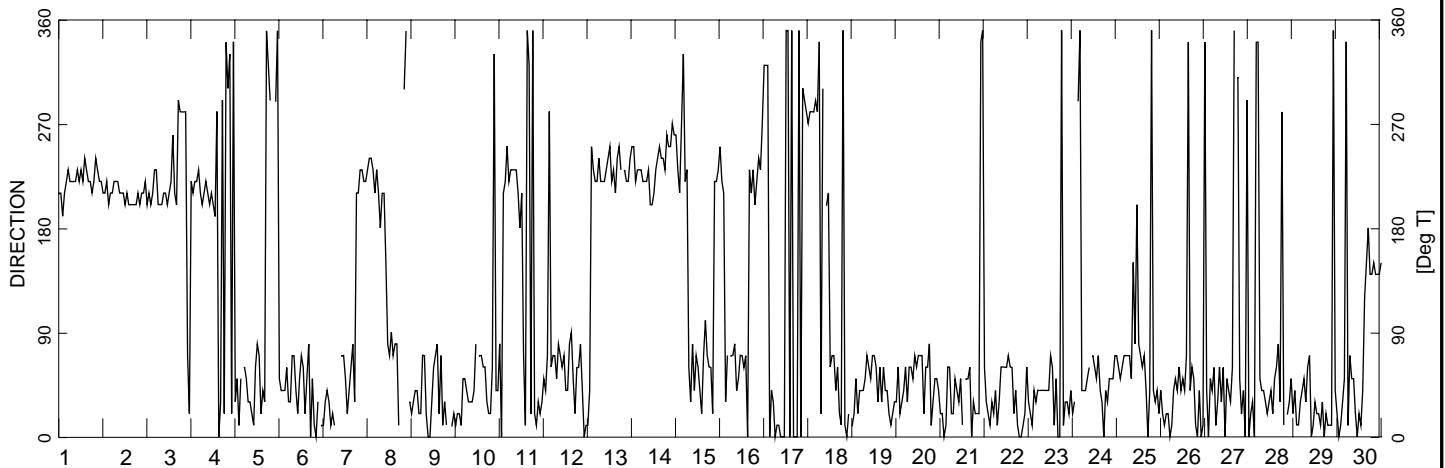
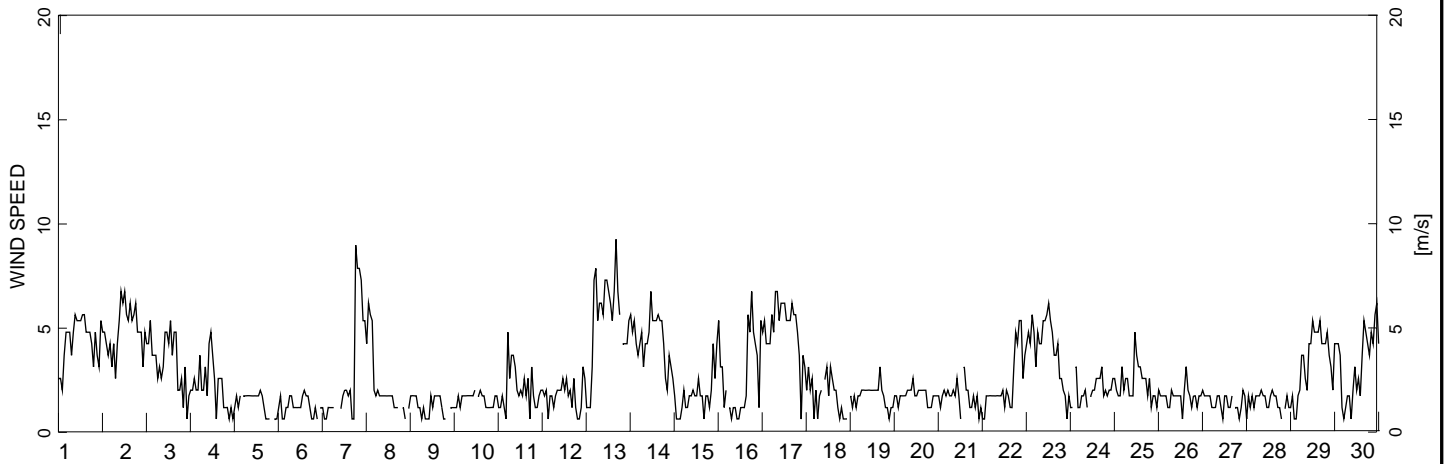
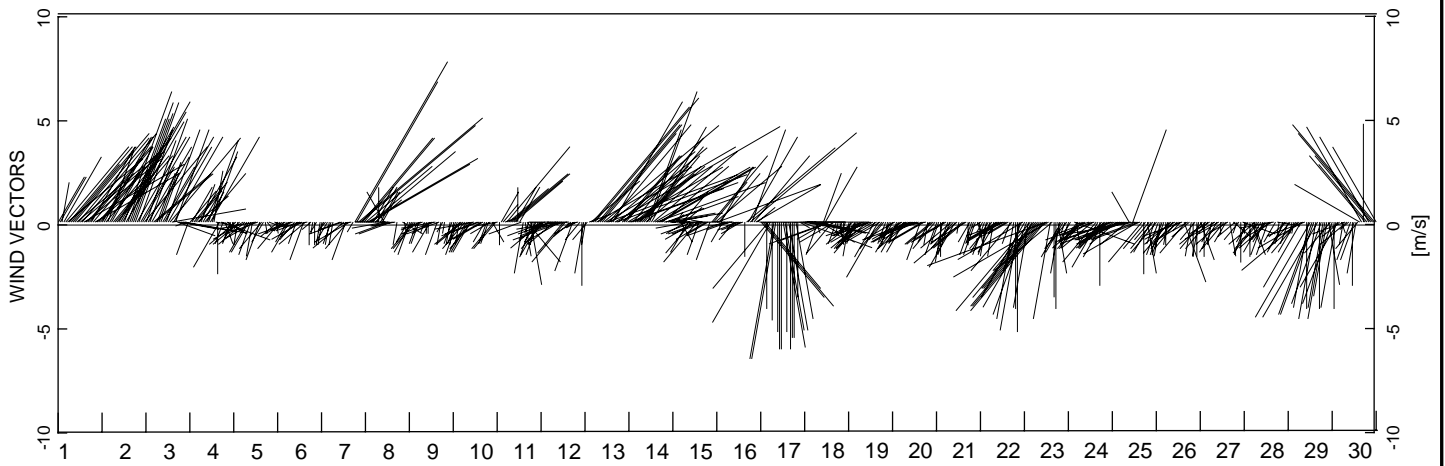
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Figure E-33



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2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
April 2008**

**EBA Engineering
Consultants Ltd.**



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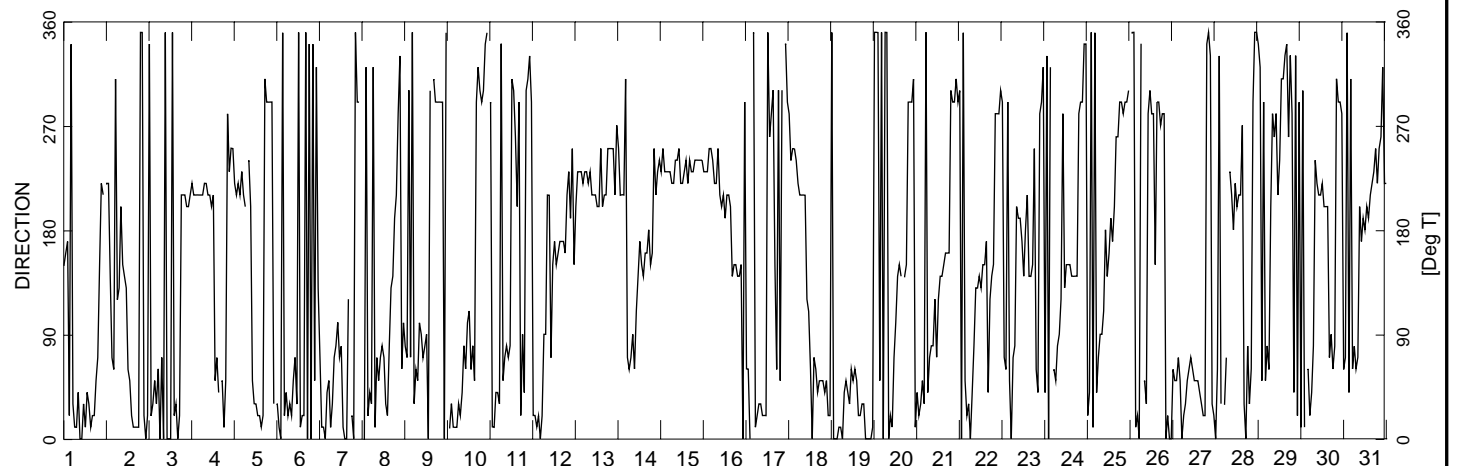
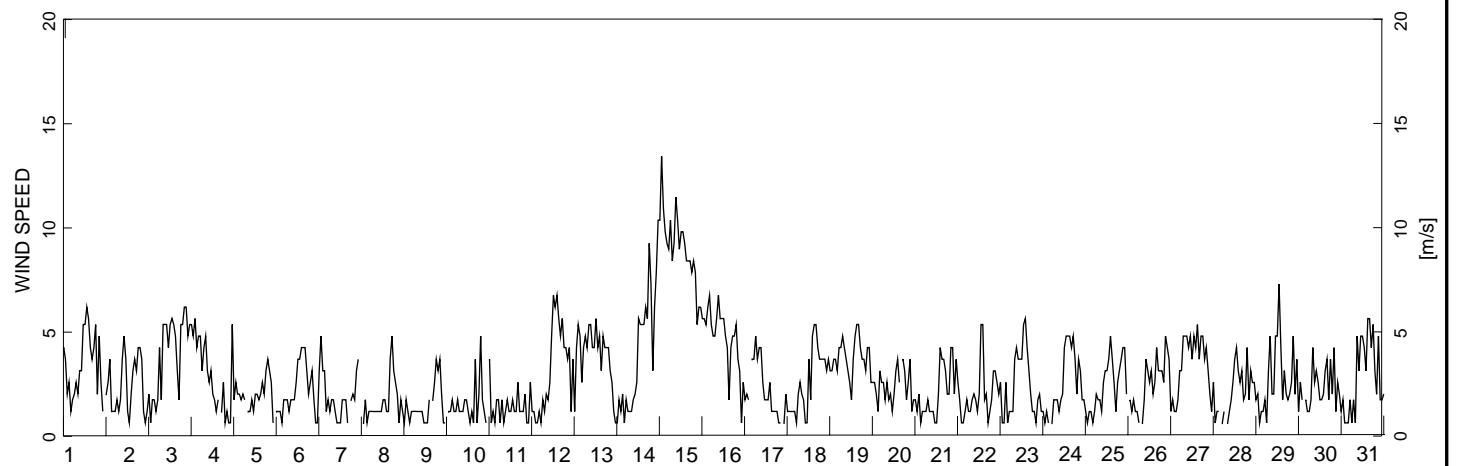
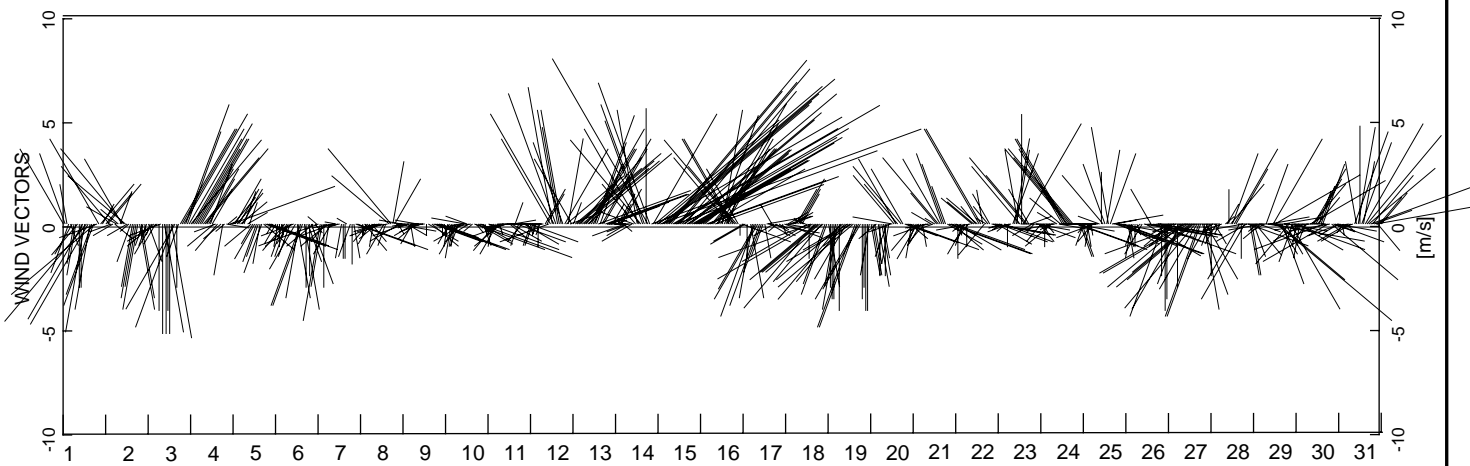
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Figure E-34



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
May 2008**

**EBA Engineering
Consultants Ltd.**



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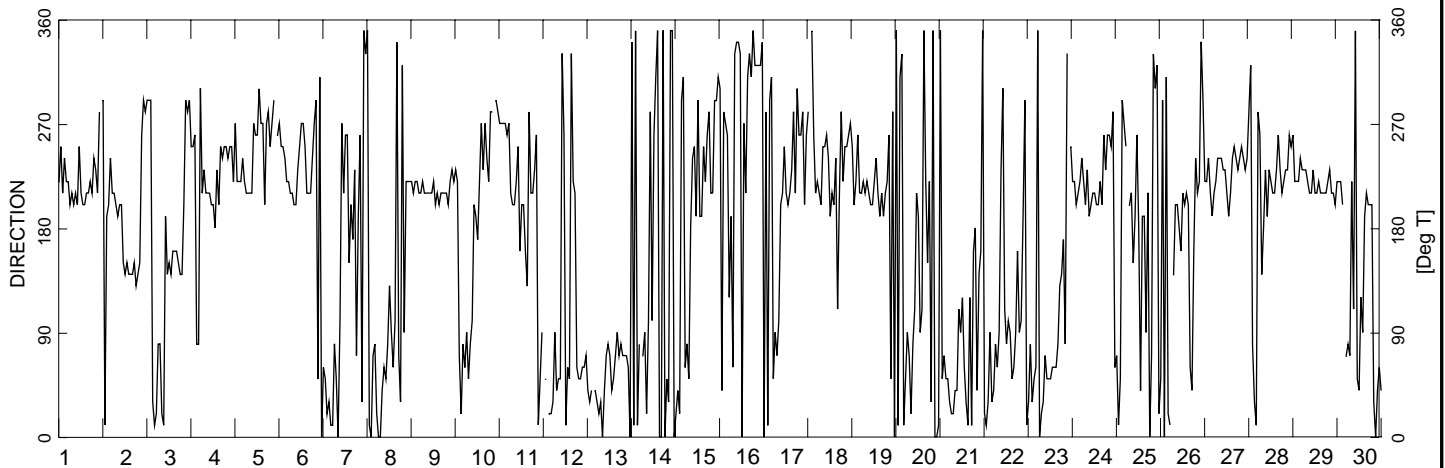
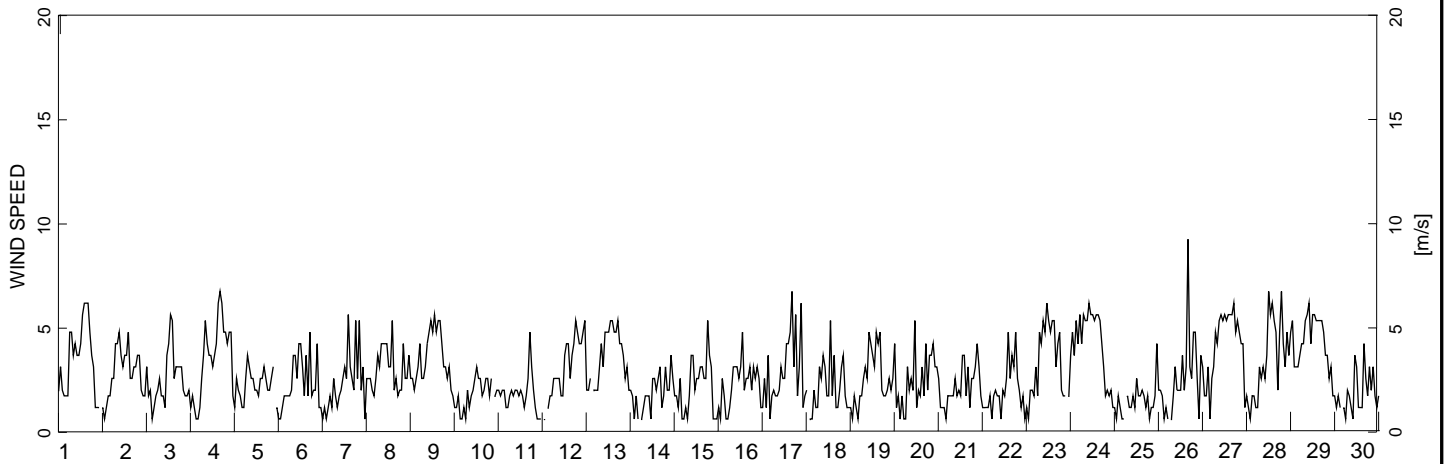
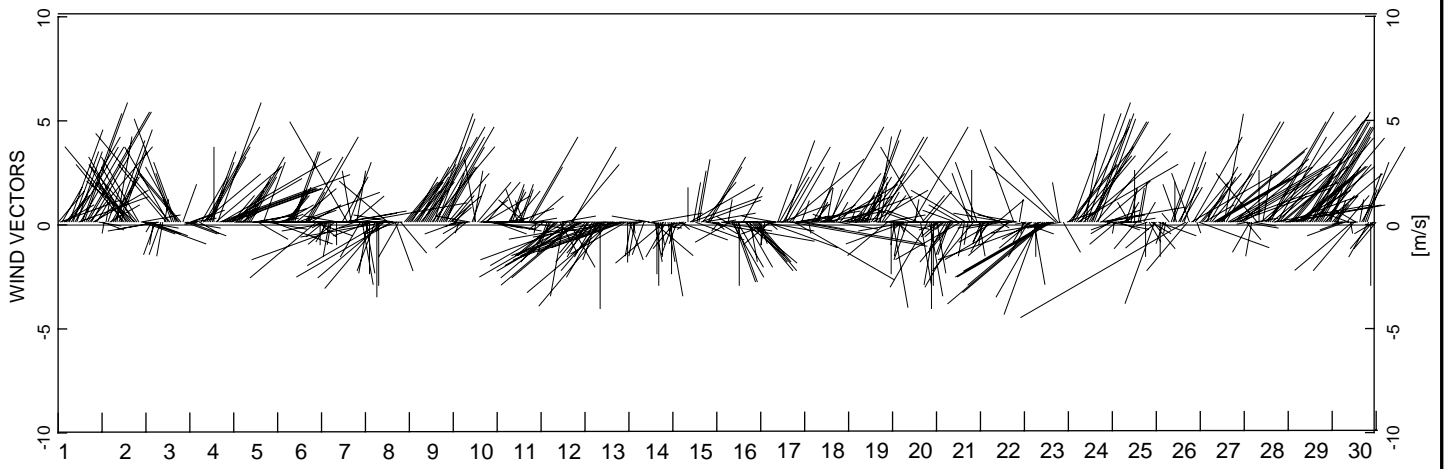
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Figure E-35



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
June 2008**

**EBA Engineering
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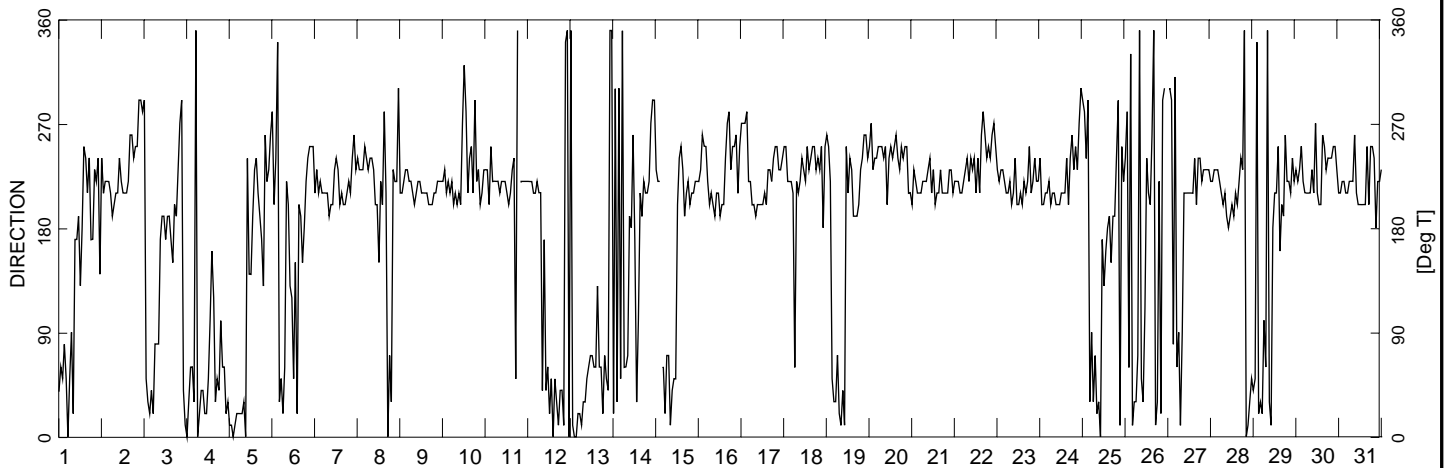
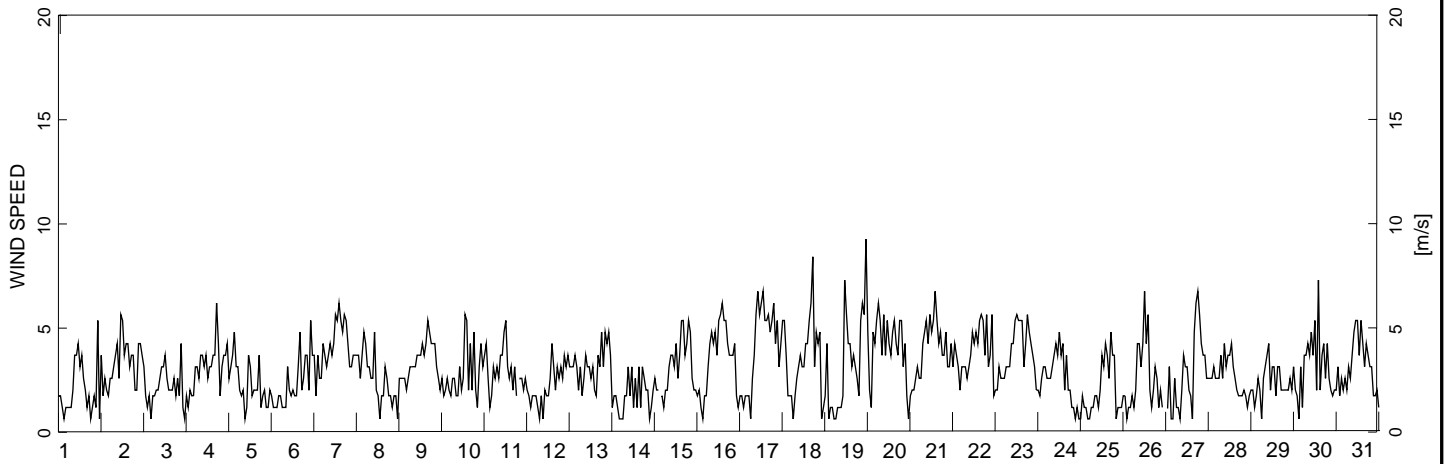
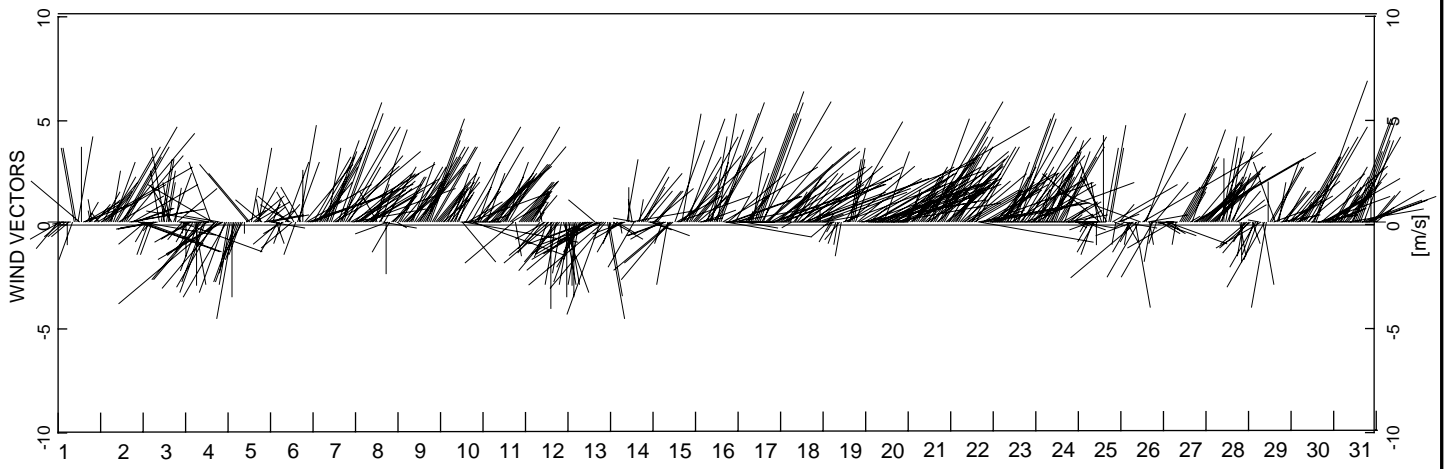
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Figure E-36



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2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
July 2008**

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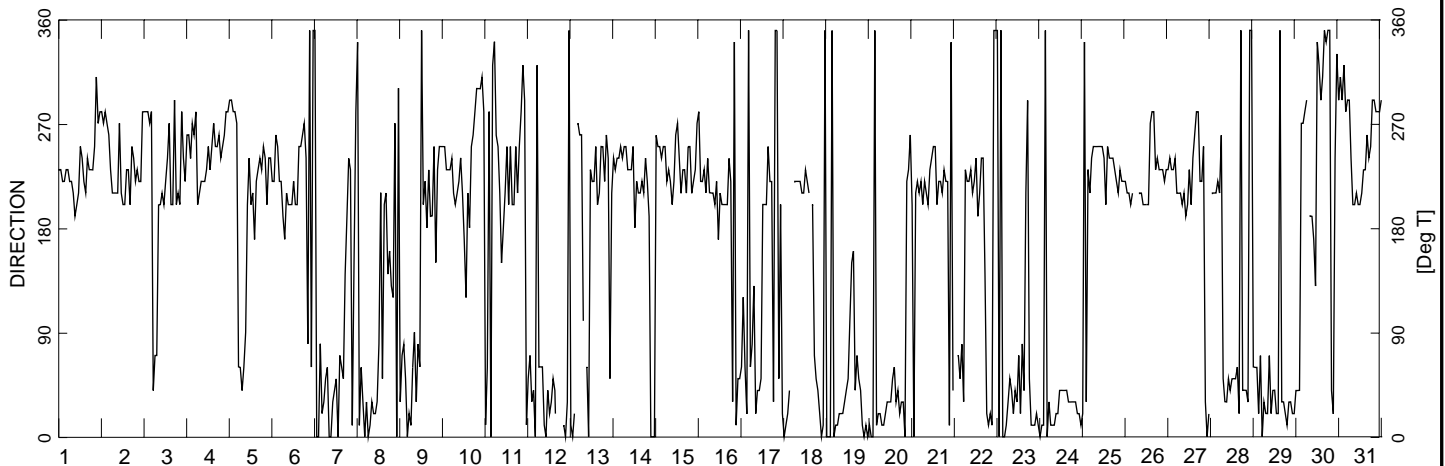
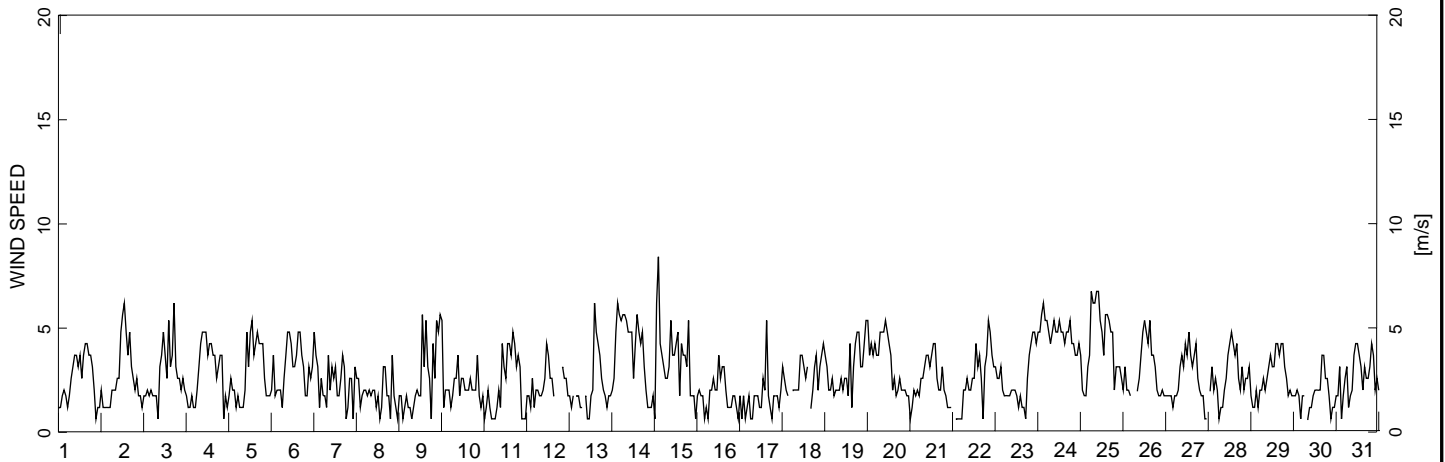
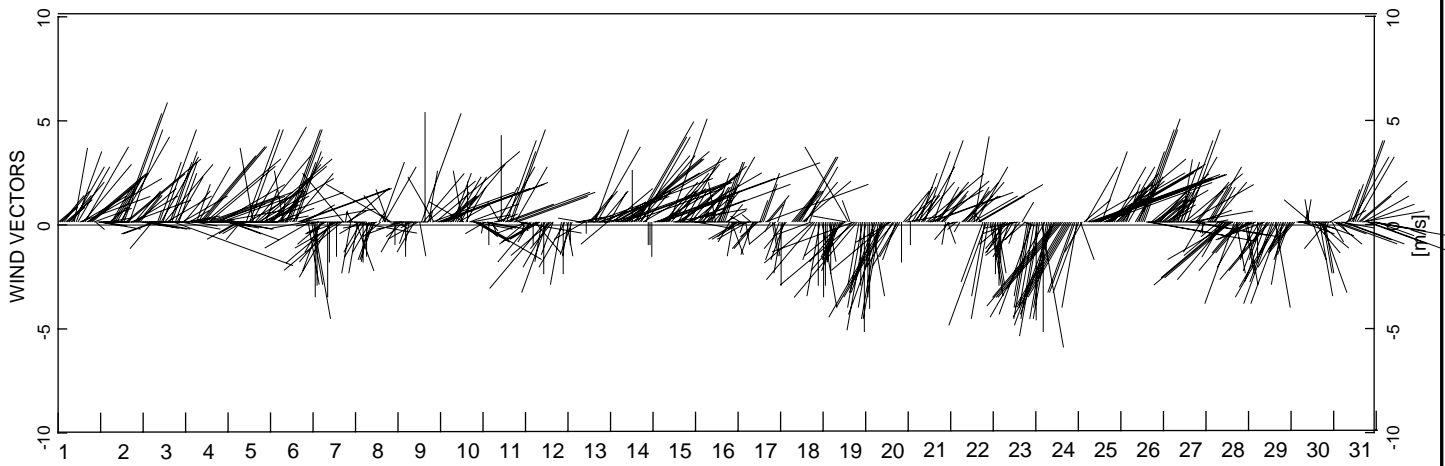
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Figure E-37



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Data
August 2008**

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Figure E-38



APPENDIX F

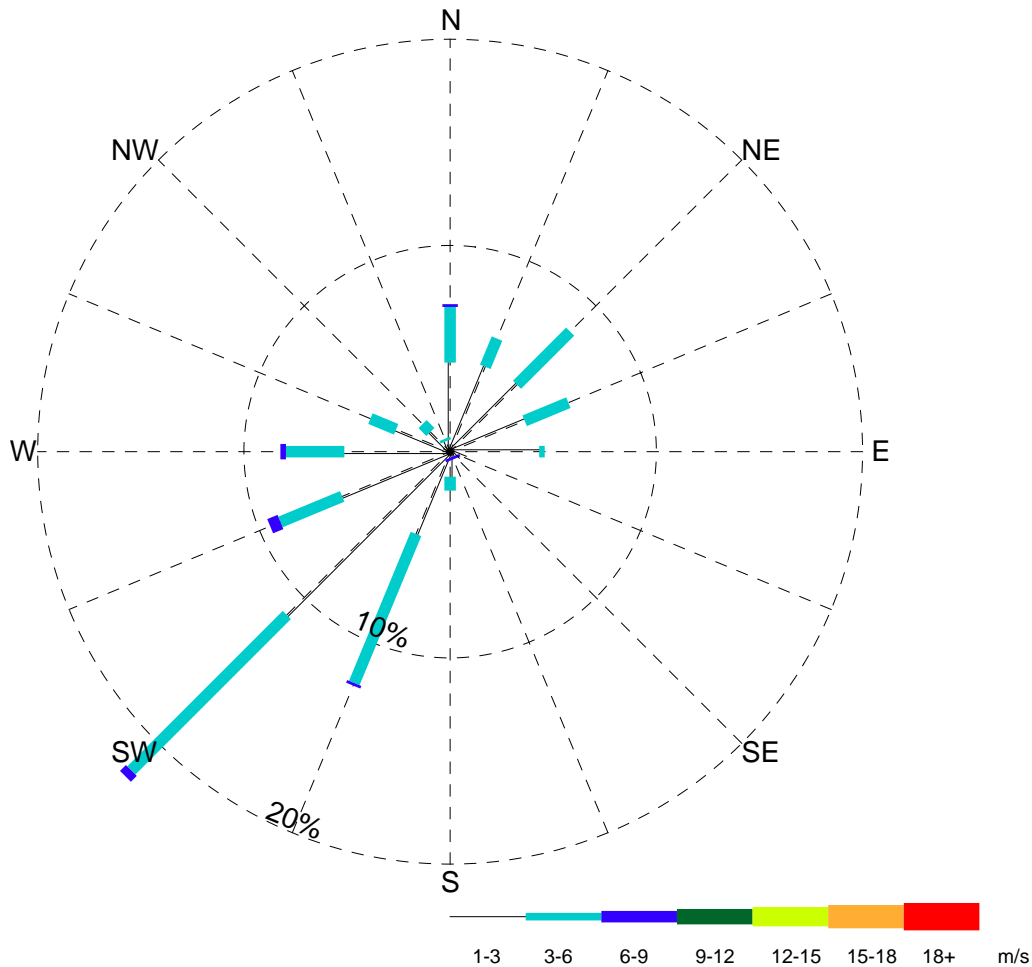
APPENDIX F MONTHLY MACMILLAN PASS WIND ROSES – JULY 2005 TO AUGUST 2008

APPENDIX F

Monthly Macmillan Pass Wind Roses August 2006 – August 2008

- F-01 Macmillan Pass Wind Rose – July 2005
- F-02 Macmillan Pass Wind Rose – August 2005
- F-03 Macmillan Pass Wind Rose – September 2005
- F-04 Macmillan Pass Wind Rose – October 2005
- F-05 Macmillan Pass Wind Rose – November 2005
- F-06 Macmillan Pass Wind Rose – December 2005
- F-07 Macmillan Pass Wind Rose – January 2006
- F-08 Macmillan Pass Wind Rose – February 2006
- F-09 Macmillan Pass Wind Rose – March 2006
- F-10 Macmillan Pass Wind Rose – April 2006
- F-11 Macmillan Pass Wind Rose – May 2006
- F-12 Macmillan Pass Wind Rose – June 2006
- F-13 Macmillan Pass Wind Rose – July 2006
- F-14 Macmillan Pass Wind Rose – August 2006
- F-15 Macmillan Pass Wind Rose – September 2006
- F-16 Macmillan Pass Wind Rose – October 2006
- F-17 Macmillan Pass Wind Rose – November 2006
- F-18 Macmillan Pass Wind Rose – December 2006
- F-19 Macmillan Pass Wind Rose – January 2007
- F-20 Macmillan Pass Wind Rose – February 2007
- F-21 Macmillan Pass Wind Rose – March 2007
- F-22 Macmillan Pass Wind Rose – April 2007
- F-23 Macmillan Pass Wind Rose – May 2007

- F-24 Macmillan Pass Wind Rose – June 2007
- F-25 Macmillan Pass Wind Rose – July 2007
- F-26 Macmillan Pass Wind Rose – August 2007
- F-27 Macmillan Pass Wind Rose – September 2007
- F-28 Macmillan Pass Wind Rose – October 2007
- F-29 Macmillan Pass Wind Rose – November 2007
- F-30 Macmillan Pass Wind Rose – December 2007
- F-31 Macmillan Pass Wind Rose – January 2008
- F-32 Macmillan Pass Wind Rose – February 2008
- F-33 Macmillan Pass Wind Rose – March 2008
- F-34 Macmillan Pass Wind Rose – April 2008
- F-35 Macmillan Pass Wind Rose – May 2008
- F-36 Macmillan Pass Wind Rose – June 2008
- F-37 Macmillan Pass Wind Rose – July 2008
- F-38 Macmillan Pass Wind Rose – August 2008



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: July 1, 2005
 End Date: July 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.91	2.29	-	-	-	-	-	6.21
NE	-	4.59	3.64	-	-	-	-	-	8.23
NNE	-	4.45	1.48	-	-	-	-	-	5.94
N	-	4.32	2.70	0.14	-	-	-	-	7.15
NNW	-	0.54	0.14	-	-	-	-	-	0.68
NW	-	1.35	0.54	-	-	-	-	-	1.89
WNW	-	2.83	1.35	-	-	-	-	-	4.18
W	-	5.13	2.83	0.27	-	-	-	-	8.23
WSW	-	5.67	3.24	0.54	-	-	-	-	9.45
SW	-	11.20	10.66	0.41	-	-	-	-	22.27
SSW	-	4.32	7.83	0.14	-	-	-	-	12.28
S	-	1.22	0.68	-	-	-	-	-	1.89
SSE	-	0.27	-	0.14	-	-	-	-	0.41
SE	-	0.54	-	-	-	-	-	-	0.54
ESE	-	0.81	-	-	-	-	-	-	0.81
E	-	4.32	0.27	-	-	-	-	-	4.59
Calm	5.26	-	-	-	-	-	-	-	5.26
Total (%)	5.26	55.47	37.65	1.62	-	-	-	-	100.00

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 July 2005**

PROJECT NO.
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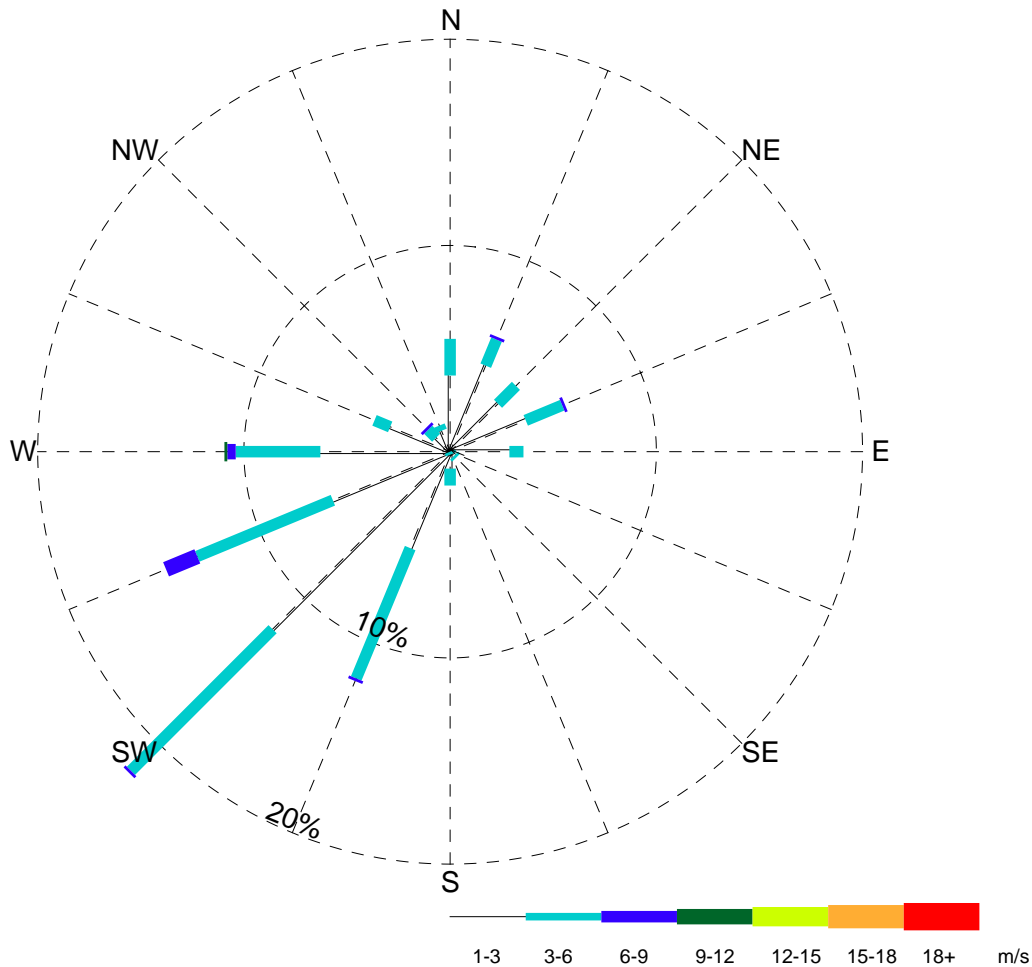
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Figure F-01



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: August 1, 2005
 End Date: August 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.97	1.91	0.14	-	-	-	-	6.02
NE	-	3.28	1.23	-	-	-	-	-	4.51
NNE	-	4.51	1.37	0.14	-	-	-	-	6.02
N	-	3.69	1.78	-	-	-	-	-	5.47
NNW	-	1.09	0.27	-	-	-	-	-	1.37
NW	-	0.96	0.55	0.14	-	-	-	-	1.64
WNW	-	3.15	0.82	-	-	-	-	-	3.97
W	-	6.29	4.10	0.41	0.14	-	-	-	10.94
WSW	-	6.16	7.11	1.64	-	-	-	-	14.91
SW	-	12.18	9.71	0.14	-	-	-	-	22.02
SSW	-	5.06	6.84	0.14	-	-	-	-	12.04
S	-	0.82	0.82	-	-	-	-	-	1.64
SSE	-	-	0.14	-	-	-	-	-	0.14
SE	-	0.27	0.14	-	-	-	-	-	0.41
ESE	-	0.68	-	-	-	-	-	-	0.68
E	-	2.87	0.68	-	-	-	-	-	3.56
Calm	4.65	-	-	-	-	-	-	-	4.65
Total (%)	4.65	54.99	37.48	2.74	0.14	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
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August 2005**

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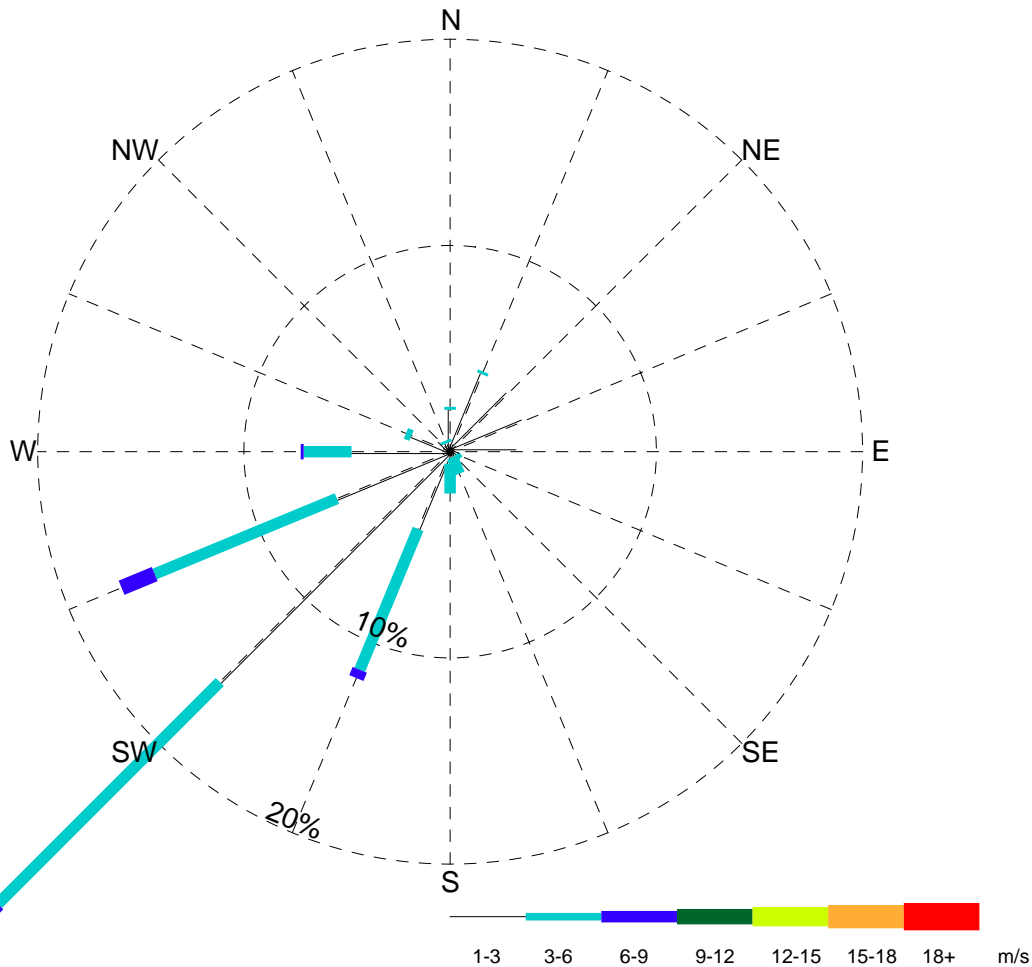
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DATE
November 2008

Figure F-02



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: September 1, 2005
 End Date: September 30, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.77	-	-	-	-	-	-	3.77
NE	-	3.91	-	-	-	-	-	-	3.91
NNE	-	4.06	0.14	-	-	-	-	-	4.20
N	-	2.03	0.14	-	-	-	-	-	2.17
NNW	-	0.44	0.14	-	-	-	-	-	0.58
NW	-	0.73	-	-	-	-	-	-	0.73
WNW	-	2.03	0.29	-	-	-	-	-	2.32
W	-	4.78	2.32	0.14	-	-	-	-	7.25
WSW	-	5.94	9.56	1.74	-	-	-	-	17.25
SW	-	15.80	15.22	0.29	-	-	-	-	31.30
SSW	-	4.06	7.39	0.44	-	-	-	-	11.88
S	-	0.58	1.45	-	-	-	-	-	2.03
SSE	-	0.29	0.87	-	-	-	-	-	1.16
SE	-	0.29	0.29	-	-	-	-	-	0.58
ESE	-	0.44	-	-	-	-	-	-	0.44
E	-	3.19	-	-	-	-	-	-	3.19
Calm	7.25	-	-	-	-	-	-	-	7.25
Total (%)	7.25	52.32	37.83	2.61	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
September 2005**

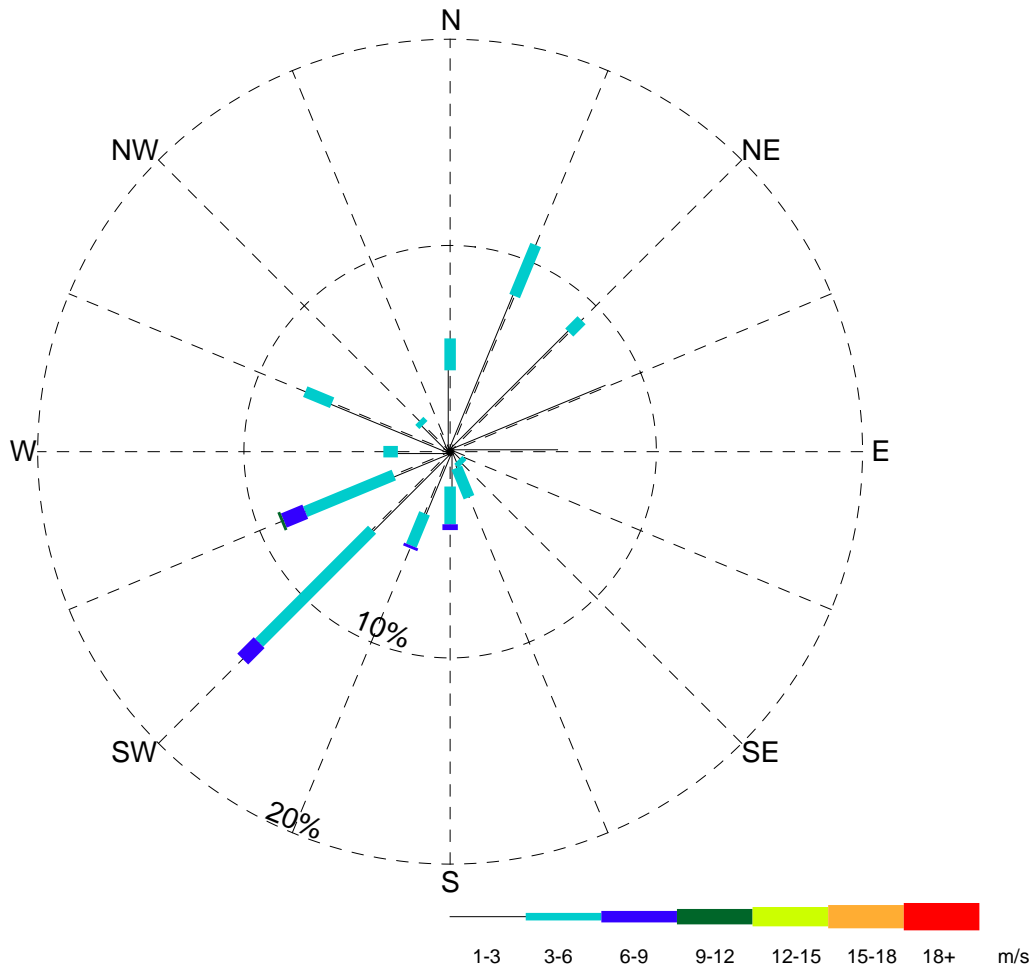
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DATE
November 2008

Figure F-03



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: October 1, 2005
 End Date: October 31, 2005

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	8.17	-	-	-	-	-	-	8.17
NE	-	8.17	0.85	-	-	-	-	-	9.01
NNE	-	8.17	2.68	-	-	-	-	-	10.85
N	-	3.94	1.55	-	-	-	-	-	5.49
NNW	-	0.99	-	-	-	-	-	-	0.99
NW	-	1.83	0.28	-	-	-	-	-	2.11
WNW	-	6.20	1.41	-	-	-	-	-	7.61
W	-	2.54	0.70	-	-	-	-	-	3.24
WSW	-	2.96	4.65	1.13	0.14	-	-	-	8.87
SW	-	5.35	7.75	1.13	-	-	-	-	14.23
SSW	-	3.24	1.69	0.14	-	-	-	-	5.07
S	-	1.69	1.83	0.28	-	-	-	-	3.80
SSE	-	0.85	1.55	-	-	-	-	-	2.39
SE	-	0.56	0.28	-	-	-	-	-	0.85
ESE	-	0.70	-	-	-	-	-	-	0.70
E	-	5.21	-	-	-	-	-	-	5.21
Calm	11.41	-	-	-	-	-	-	-	11.41
Total (%)	11.41	60.56	25.21	2.68	0.14	-	-	-	100.00

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2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
October 2005**

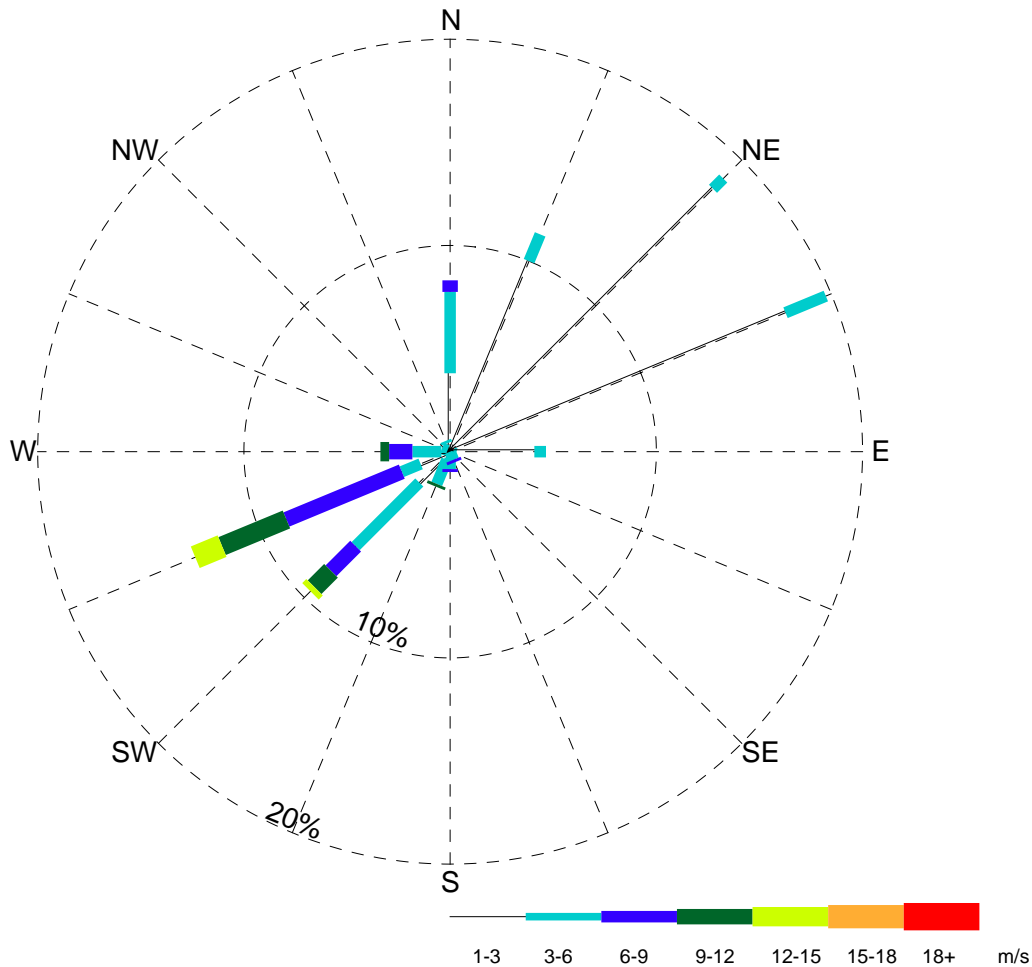
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Figure F-04



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	17.61	2.11	-	-	-	-	-	19.72
NE	-	18.03	0.70	-	-	-	-	-	18.73
NNE	-	10.00	1.41	-	-	-	-	-	11.41
N	-	3.80	3.94	0.56	-	-	-	-	8.31
NNW	-	0.42	0.14	-	-	-	-	-	0.56
NW	-	0.56	-	-	-	-	-	-	0.56
WNW	-	0.14	0.28	-	-	-	-	-	0.42
W	-	0.42	1.41	1.13	0.42	-	-	-	3.38
WSW	-	1.55	0.99	6.06	3.38	1.41	-	-	13.38
SW	-	2.11	4.37	1.69	1.13	0.28	-	-	9.58
SSW	-	0.42	1.27	-	0.14	-	-	-	1.83
S	-	0.28	0.56	0.14	-	-	-	-	0.99
SSE	-	-	0.42	0.14	-	-	-	-	0.56
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.14	0.14	-	-	-	-	-	0.28
E	-	4.09	0.56	-	-	-	-	-	4.65
Calm	5.63	-	-	-	-	-	-	-	5.63
Total (%)	5.63	59.58	18.31	9.72	5.07	1.69	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: November 1, 2005
 End Date: November 30, 2005

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**Macmillan Pass
 Wind Rose
 November 2005**

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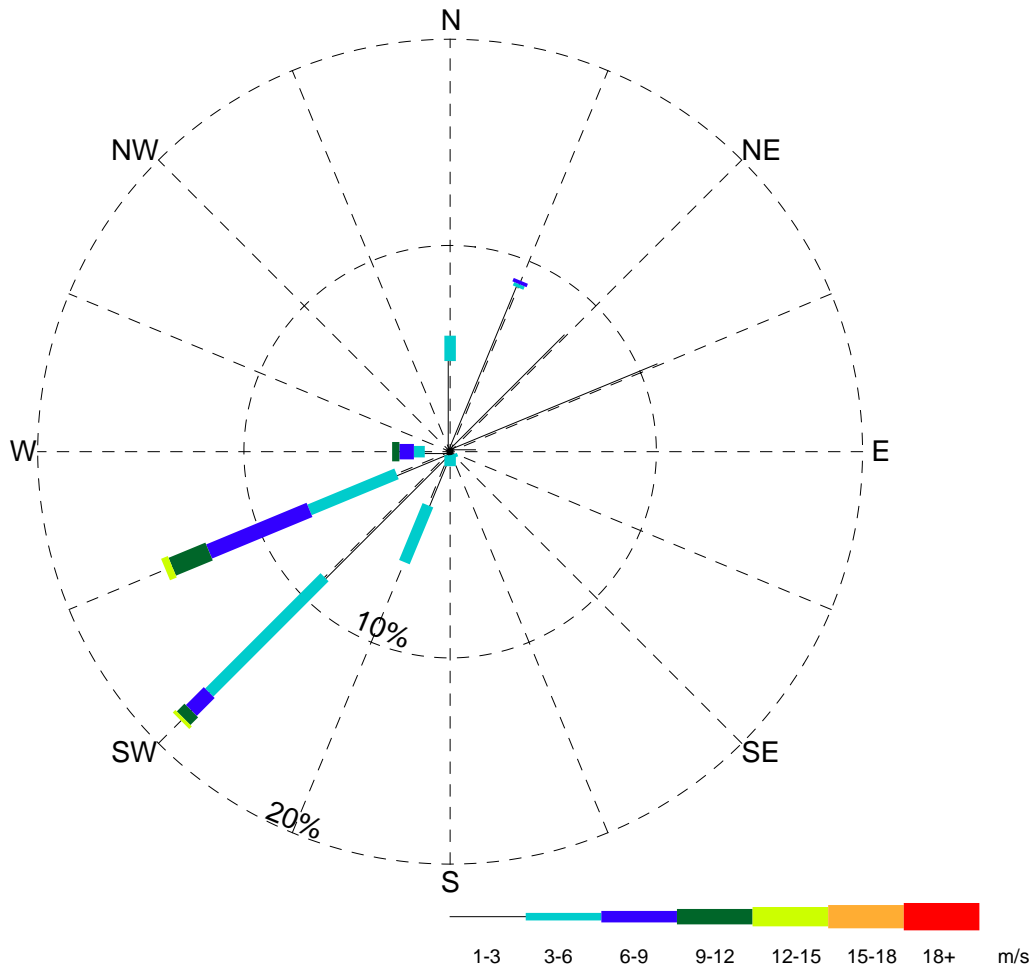


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Figure F-05



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	10.90	-	-	-	-	-	-	10.90
NE	-	7.91	-	-	-	-	-	-	7.91
NNE	-	8.61	0.18	0.18	-	-	-	-	8.96
N	-	4.39	1.23	-	-	-	-	-	5.62
NNW	-	0.18	-	-	-	-	-	-	0.18
NW	-	0.18	-	-	-	-	-	-	0.18
WNW	-	-	-	-	-	-	-	-	-
W	-	1.23	0.53	0.70	0.35	-	-	-	2.81
WSW	-	2.81	4.57	5.27	1.93	0.35	-	-	14.94
SW	-	8.61	7.91	1.23	0.53	0.18	-	-	18.45
SSW	-	2.81	2.99	-	-	-	-	-	5.80
S	-	0.18	0.53	-	-	-	-	-	0.70
SSE	-	0.18	0.18	-	-	-	-	-	0.35
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	1.23	-	-	-	-	-	-	1.23
Calm	21.97	-	-	-	-	-	-	-	21.97
Total (%)	21.97	49.21	18.10	7.38	2.81	0.53	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 25 days
 Start Date: December 1, 2005
 End Date: December 31, 2005

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**Macmillan Pass
 Wind Rose
 December 2005**

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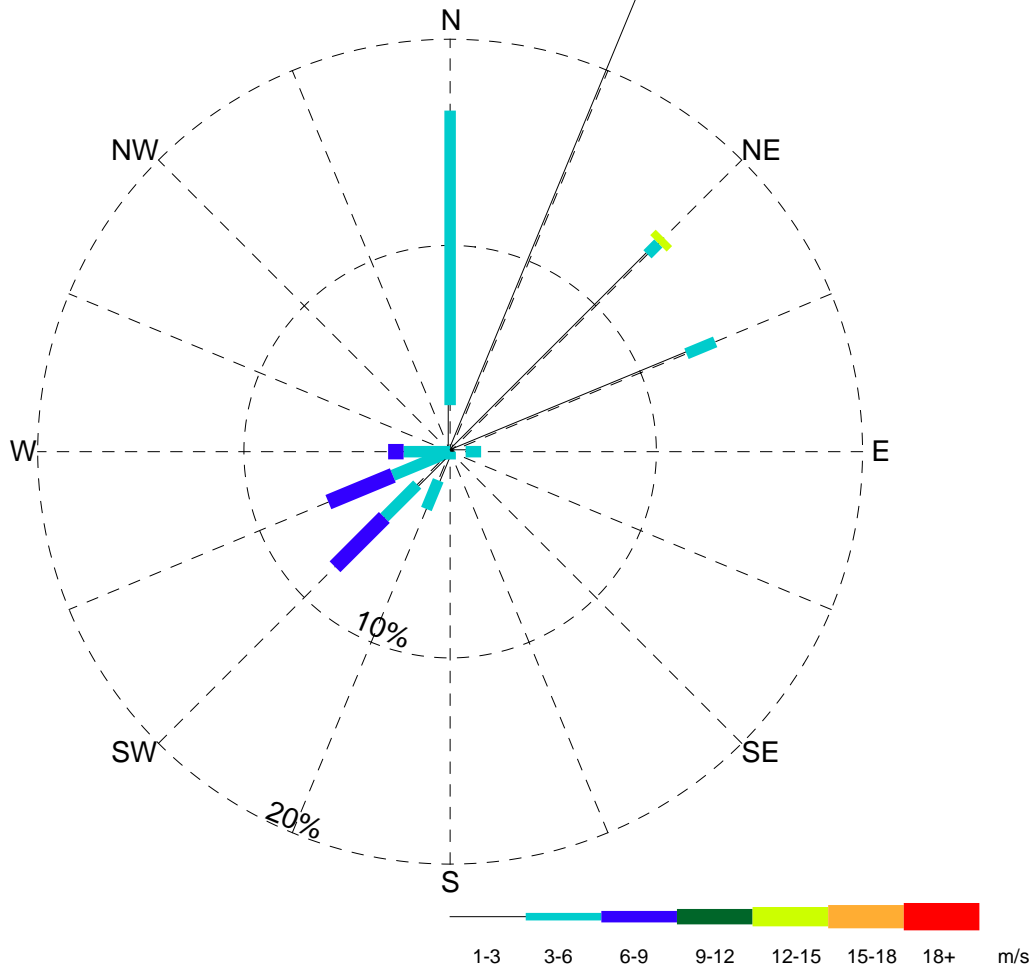


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Figure F-06



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)							Total (%)	
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s		18+ m/s
ENE	-	12.41	1.50	-	-	-	-	-	13.91
NE	-	13.53	0.75	-	-	0.38	-	-	14.66
NNE	-	29.70	1.13	-	-	-	-	-	30.83
N	-	2.26	14.29	-	-	-	-	-	16.54
NNW	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-
WNW	-	0.38	-	-	-	-	-	-	0.38
W	-	-	2.26	0.75	-	-	-	-	3.01
WSW	-	-	3.01	3.38	-	-	-	-	6.39
SW	-	2.26	2.26	3.38	-	-	-	-	7.89
SSW	-	1.50	1.50	-	-	-	-	-	3.01
S	-	-	0.38	-	-	-	-	-	0.38
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	0.75	0.75	-	-	-	-	-	1.50
Calm	1.50	-	-	-	-	-	-	-	1.50
Total (%)	1.50	62.78	27.82	7.52	-	0.38	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 10 days
 Start Date: January 1, 2006
 End Date: January 31, 2006

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**MACTUNG PROJECT
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**Macmillan Pass
Wind Rose
January 2006**

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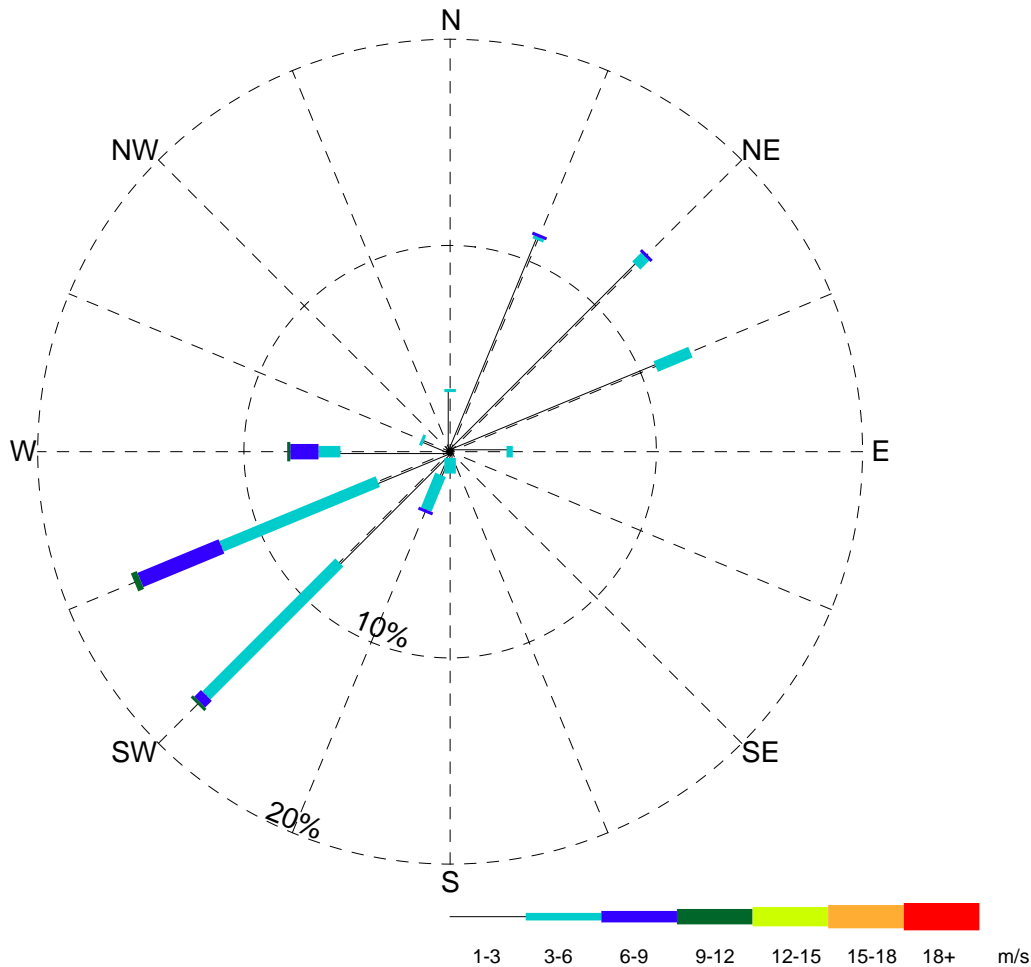
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Figure F-07



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	10.79	1.82	-	-	-	-	-	12.61
NE	-	12.77	0.61	0.15	-	-	-	-	13.53
NNE	-	11.09	0.15	0.15	-	-	-	-	11.40
N	-	2.89	0.15	-	-	-	-	-	3.04
NNW	-	0.30	-	-	-	-	-	-	0.30
NW	-	0.15	-	-	-	-	-	-	0.15
WNW	-	1.37	0.15	-	-	-	-	-	1.52
W	-	5.32	1.06	1.37	0.15	-	-	-	7.90
WSW	-	3.80	8.21	4.26	0.30	-	-	-	16.57
SW	-	7.60	9.12	0.46	0.15	-	-	-	17.33
SSW	-	1.22	1.82	0.15	-	-	-	-	3.19
S	-	0.30	0.76	-	-	-	-	-	1.06
SSE	-	0.30	-	-	-	-	-	-	0.30
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.15	-	-	-	-	-	-	0.15
E	-	2.74	0.30	-	-	-	-	-	3.04
Calm	7.90	-	-	-	-	-	-	-	7.90
Total (%)	7.90	60.79	24.16	6.53	0.61	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 28 days
 Start Date: February 1, 2006
 End Date: February 28, 2006

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
February 2006**

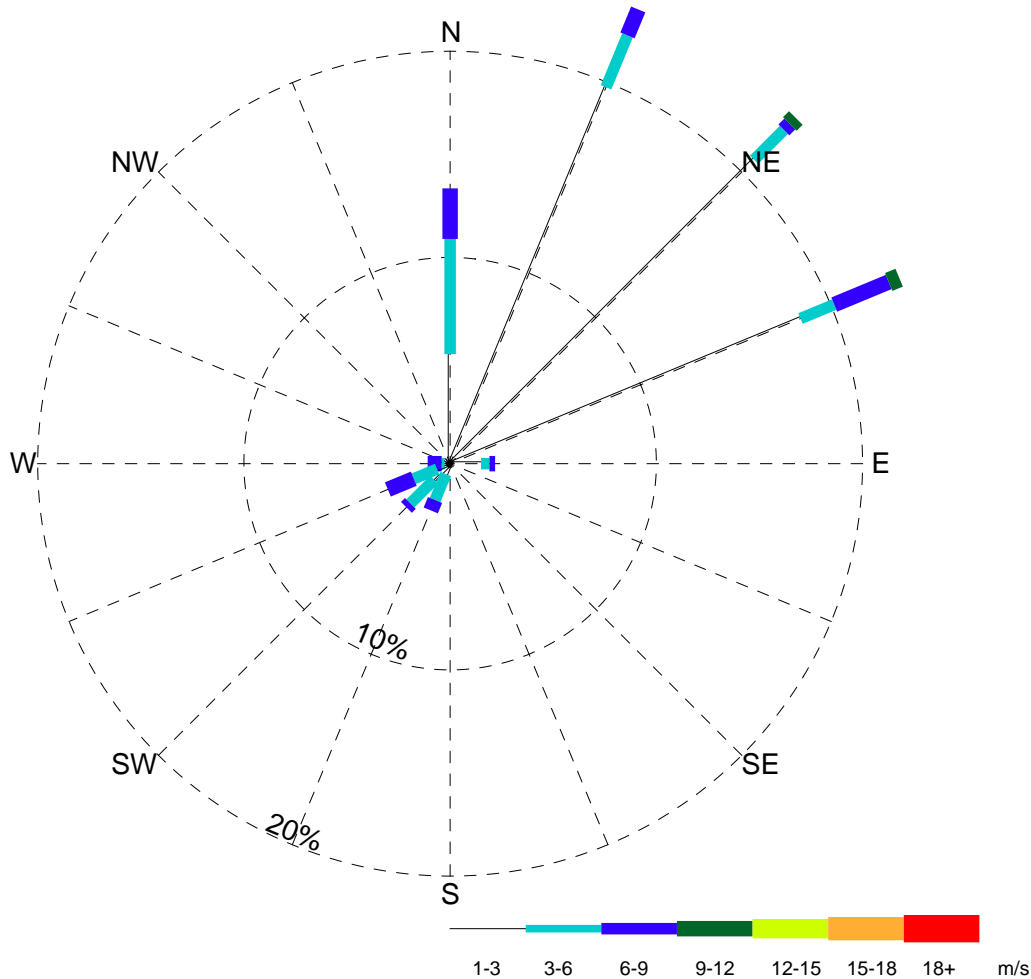
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Figure F-08



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	18.39	1.77	2.86	0.55	-	-	-	23.57
NE	-	20.84	2.04	0.41	0.41	-	-	-	23.71
NNE	-	19.75	2.72	1.36	-	-	-	-	23.84
N	-	5.31	5.59	2.45	-	-	-	-	13.35
NNW	-	0.27	-	-	-	-	-	-	0.27
NW	-	0.41	-	-	-	-	-	-	0.41
WNW	-	0.41	-	-	-	-	-	-	0.41
W	-	0.27	0.14	0.68	-	-	-	-	1.09
WSW	-	0.68	1.23	1.36	-	-	-	-	3.27
SW	-	1.09	1.63	0.27	-	-	-	-	3.00
SSW	-	0.55	1.36	0.55	-	-	-	-	2.45
S	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	1.50	0.41	0.27	-	-	-	-	2.18
Calm	2.45	-	-	-	-	-	-	-	2.45
Total (%)	2.45	69.48	16.89	10.22	0.95	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: March 1, 2006
 End Date: March 31, 2006

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 March 2006**

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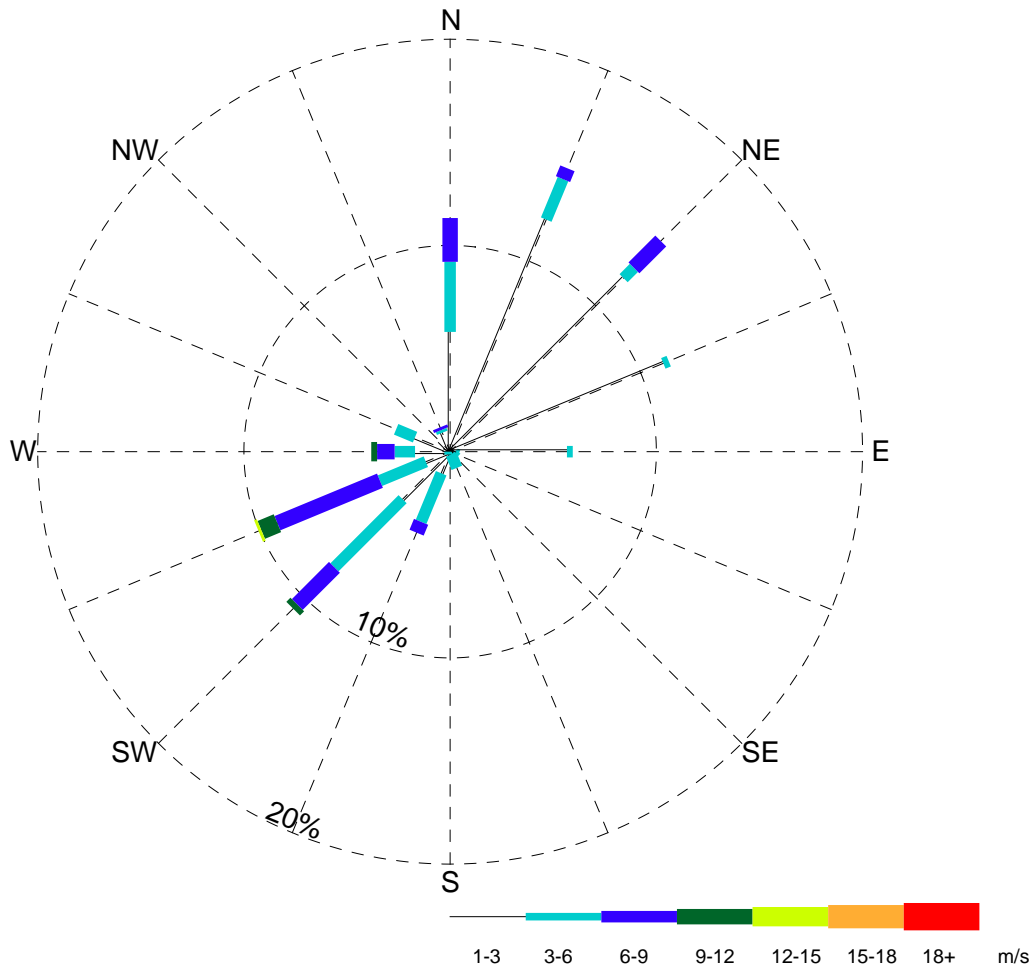


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Figure F-09



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	11.19	0.28	-	-	-	-	-	11.47
NE	-	11.90	0.71	1.84	-	-	-	-	14.45
NNE	-	12.18	2.12	0.57	-	-	-	-	14.87
N	-	5.81	3.40	2.12	-	-	-	-	11.33
NNW	-	0.99	0.14	0.14	-	-	-	-	1.27
NW	-	0.71	-	-	-	-	-	-	0.71
WNW	-	1.84	0.99	-	-	-	-	-	2.83
W	-	1.70	0.99	0.85	0.28	-	-	-	3.82
WSW	-	1.27	2.41	5.38	0.85	0.14	-	-	10.06
SW	-	3.26	4.67	2.55	0.28	-	-	-	10.77
SSW	-	1.13	2.55	0.57	-	-	-	-	4.25
S	-	-	0.14	-	-	-	-	-	0.14
SSE	-	0.14	0.71	-	-	-	-	-	0.85
SE	-	0.14	0.28	-	-	-	-	-	0.43
ESE	-	0.28	0.14	-	-	-	-	-	0.43
E	-	5.67	0.28	-	-	-	-	-	5.95
Calm	6.37	-	-	-	-	-	-	-	6.37
Total (%)	6.37	58.22	19.83	14.02	1.42	0.14	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: April 1, 2006
 End Date: April 30, 2006

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**Macmillan Pass
Wind Rose
April 2006**

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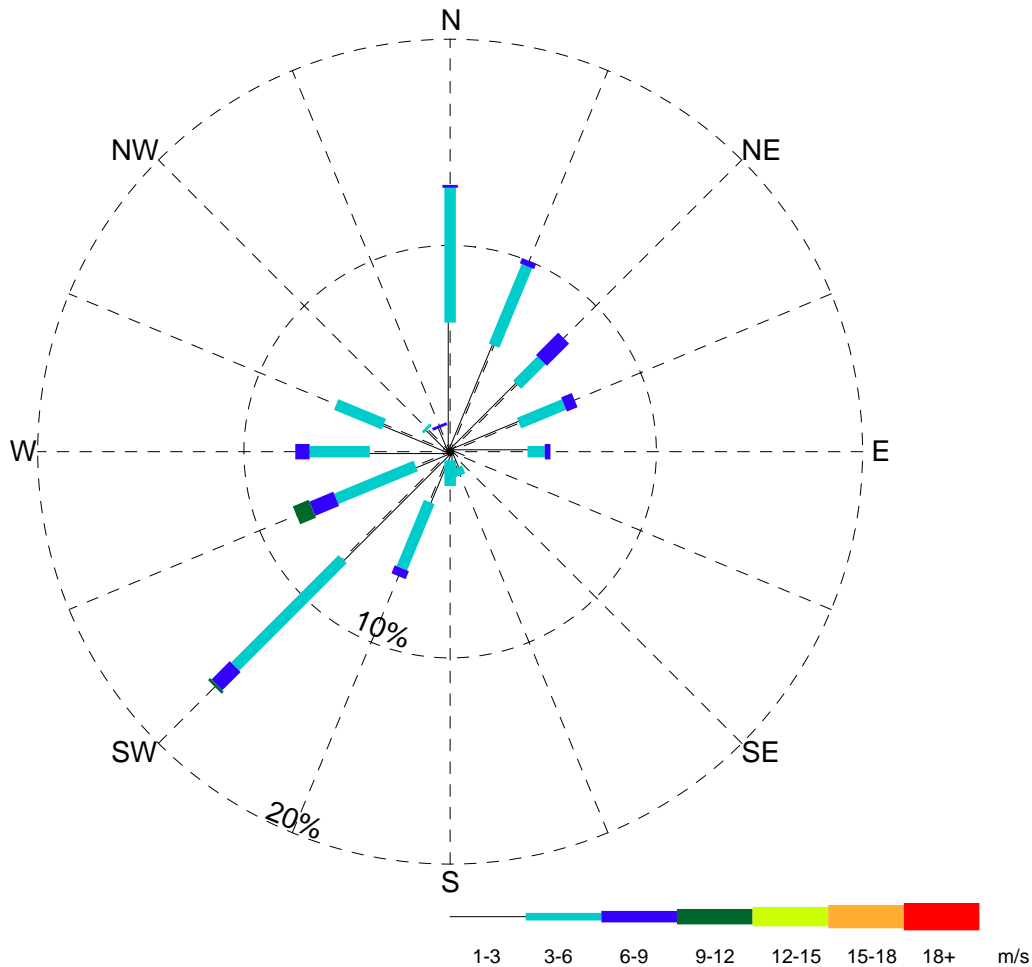


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Figure F-10



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.62	2.36	0.56	-	-	-	-	6.54
NE	-	4.59	1.67	1.53	-	-	-	-	7.79
NNE	-	5.56	4.17	0.28	-	-	-	-	10.01
N	-	6.26	6.54	0.14	-	-	-	-	12.94
NNW	-	1.25	-	0.14	-	-	-	-	1.39
NW	-	1.53	0.14	-	-	-	-	-	1.67
WNW	-	3.48	2.50	-	-	-	-	-	5.98
W	-	3.89	2.92	0.69	-	-	-	-	7.51
WSW	-	1.81	4.17	1.25	0.83	-	-	-	8.07
SW	-	7.37	7.37	1.25	0.14	-	-	-	16.13
SSW	-	2.64	3.48	0.42	-	-	-	-	6.54
S	-	0.42	1.25	-	-	-	-	-	1.67
SSE	-	0.83	0.42	-	-	-	-	-	1.25
SE	-	0.42	-	-	-	-	-	-	0.42
ESE	-	0.69	-	-	-	-	-	-	0.69
E	-	3.76	0.83	0.28	-	-	-	-	4.87
Calm	6.54	-	-	-	-	-	-	-	6.54
Total (%)	6.54	48.12	37.83	6.54	0.97	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: May 1, 2006
 End Date: May 31, 2006

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 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 May 2006**

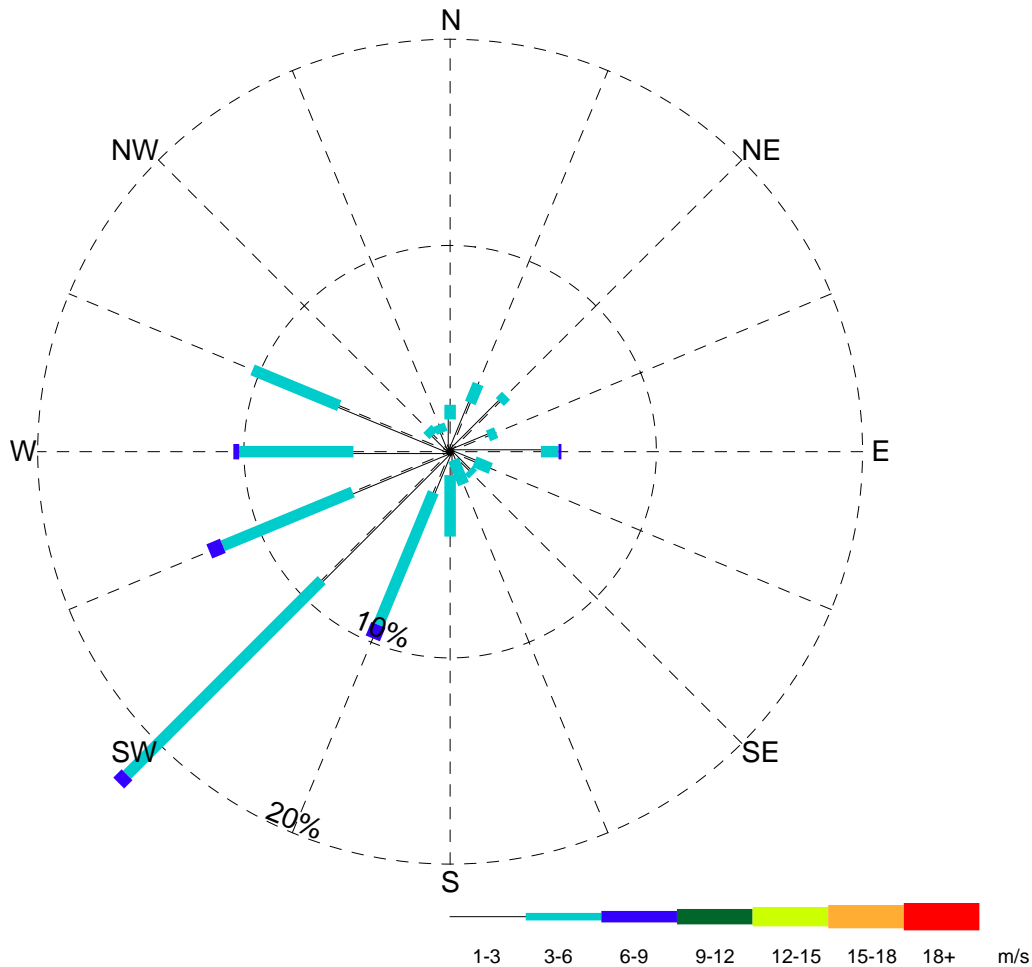
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Figure F-11



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: June 1, 2006
 End Date: June 30, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	1.99	0.43	-	-	-	-	-	2.41
NE	-	3.41	0.43	-	-	-	-	-	3.84
NNE	-	2.56	0.99	-	-	-	-	-	3.55
N	-	1.56	0.71	-	-	-	-	-	2.27
NNW	-	0.99	0.43	-	-	-	-	-	1.42
NW	-	1.14	0.43	-	-	-	-	-	1.56
WNW	-	5.82	4.55	-	-	-	-	-	10.37
W	-	4.69	5.54	0.28	-	-	-	-	10.51
WSW	-	5.11	6.82	0.71	-	-	-	-	12.64
SW	-	8.81	13.35	0.57	-	-	-	-	22.73
SSW	-	2.13	6.96	0.71	-	-	-	-	9.80
S	-	1.14	2.98	-	-	-	-	-	4.12
SSE	-	0.43	1.28	-	-	-	-	-	1.71
SE	-	1.28	0.28	-	-	-	-	-	1.56
ESE	-	1.28	0.85	-	-	-	-	-	2.13
E	-	4.40	0.85	0.14	-	-	-	-	5.40
Calm	3.98	-	-	-	-	-	-	-	3.98
Total (%)	3.98	46.73	46.88	2.41	-	-	-	-	100.00

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**Macmillan Pass
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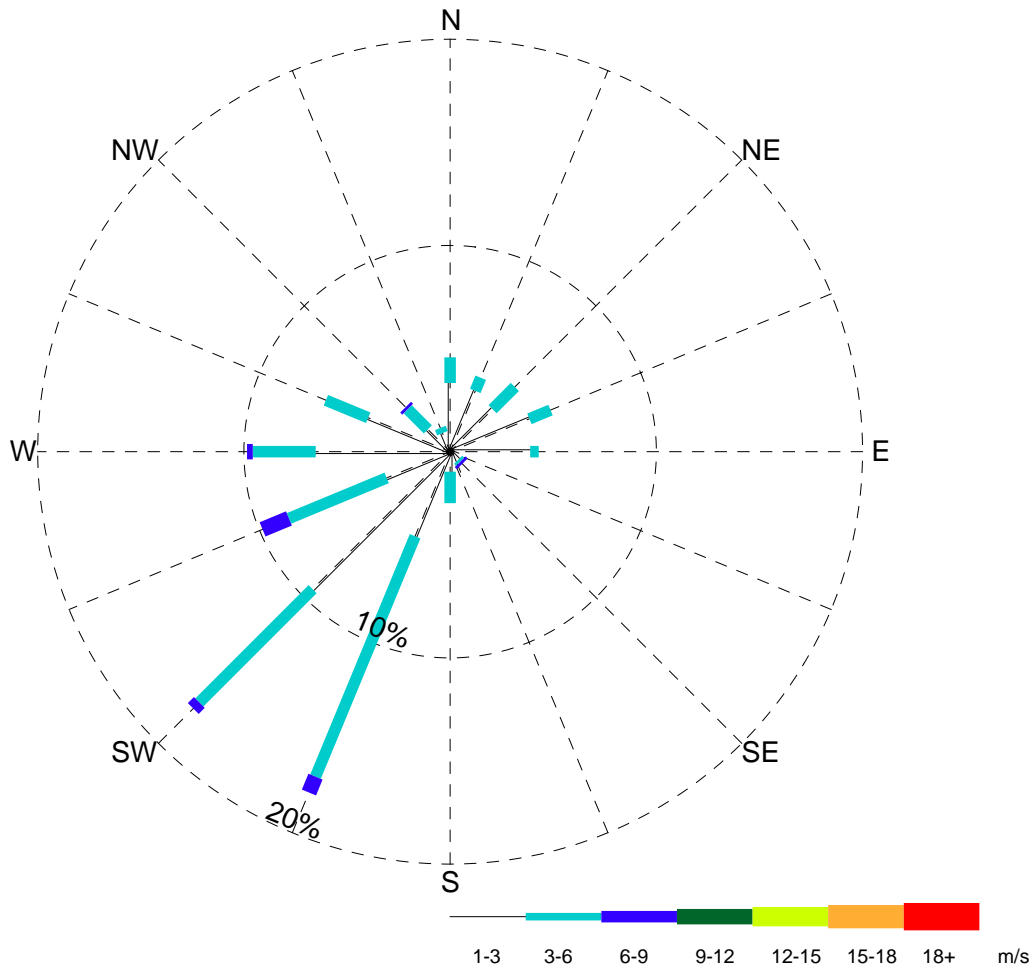
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Figure F-12



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.16	1.11	-	-	-	-	-	5.27
NE	-	2.91	1.53	-	-	-	-	-	4.44
NNE	-	3.19	0.69	-	-	-	-	-	3.88
N	-	3.33	1.25	-	-	-	-	-	4.58
NNW	-	0.97	0.28	-	-	-	-	-	1.25
NW	-	1.53	1.39	0.14	-	-	-	-	3.05
WNW	-	4.30	2.22	-	-	-	-	-	6.52
W	-	6.52	3.05	0.28	-	-	-	-	9.85
WSW	-	3.33	5.13	1.39	-	-	-	-	9.85
SW	-	9.43	7.77	0.42	-	-	-	-	17.61
SSW	-	4.44	12.62	0.83	-	-	-	-	17.89
S	-	0.97	1.53	-	-	-	-	-	2.50
SSE	-	1.11	-	-	-	-	-	-	1.11
SE	-	0.56	0.14	0.14	-	-	-	-	0.83
ESE	-	0.42	-	-	-	-	-	-	0.42
E	-	3.88	0.42	-	-	-	-	-	4.30
Calm	6.66	-	-	-	-	-	-	-	6.66
Total (%)	6.66	51.04	39.11	3.19	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: July 1, 2006
 End Date: July 31, 2006

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 July 2006**

PROJECT NO.
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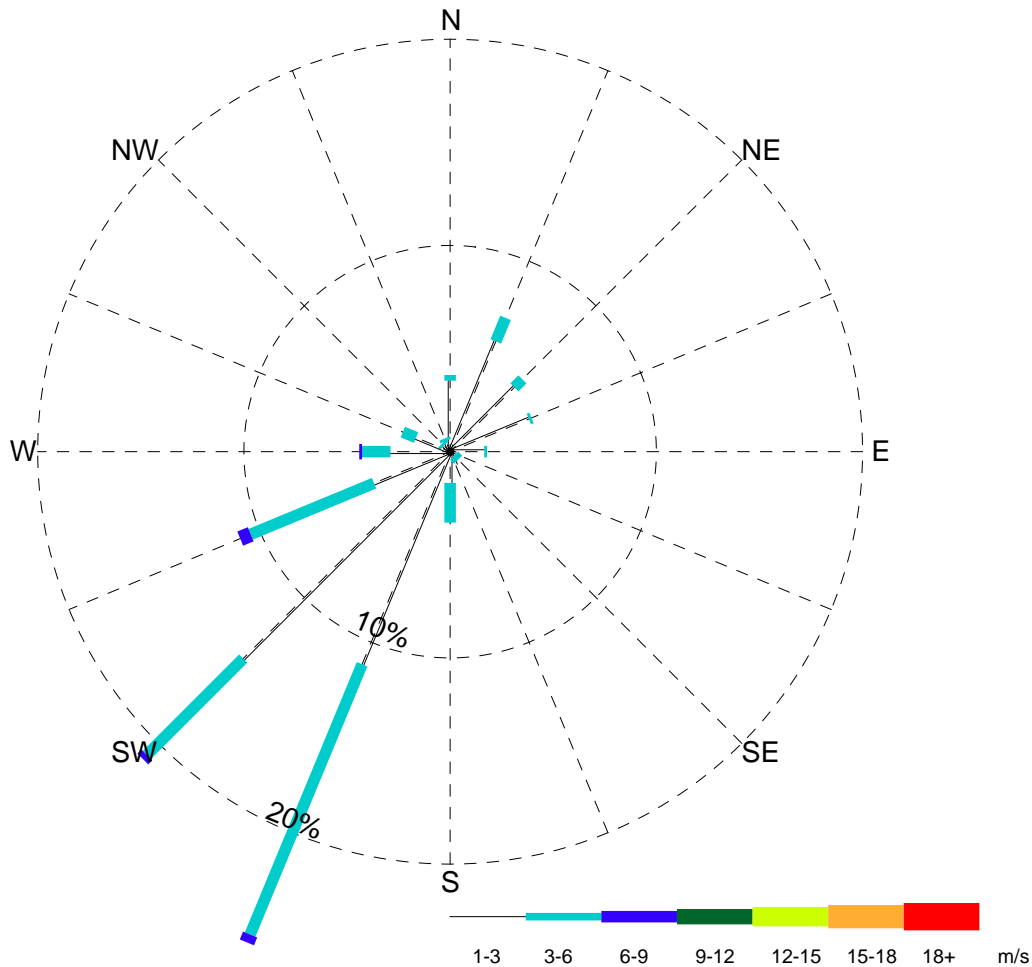
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Figure F-13



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: August 1, 2006
 End Date: August 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.13	0.14	-	-	-	-	-	4.27
NE	-	4.41	0.55	-	-	-	-	-	4.96
NNE	-	5.78	1.24	-	-	-	-	-	7.03
N	-	3.44	0.28	-	-	-	-	-	3.72
NNW	-	0.55	0.14	-	-	-	-	-	0.69
NW	-	0.41	0.14	-	-	-	-	-	0.55
WNW	-	1.79	0.69	-	-	-	-	-	2.48
W	-	2.89	1.38	0.14	-	-	-	-	4.41
WSW	-	3.99	6.47	0.55	-	-	-	-	11.02
SW	-	14.19	6.61	0.28	-	-	-	-	21.07
SSW	-	11.16	14.19	0.41	-	-	-	-	25.76
S	-	1.51	1.93	-	-	-	-	-	3.44
SSE	-	0.69	-	-	-	-	-	-	0.69
SE	-	0.28	0.28	-	-	-	-	-	0.55
ESE	-	0.28	-	-	-	-	-	-	0.28
E	-	1.65	0.14	-	-	-	-	-	1.79
Calm	7.30	-	-	-	-	-	-	-	7.30
Total (%)	7.30	57.16	34.16	1.38	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
August 2006**

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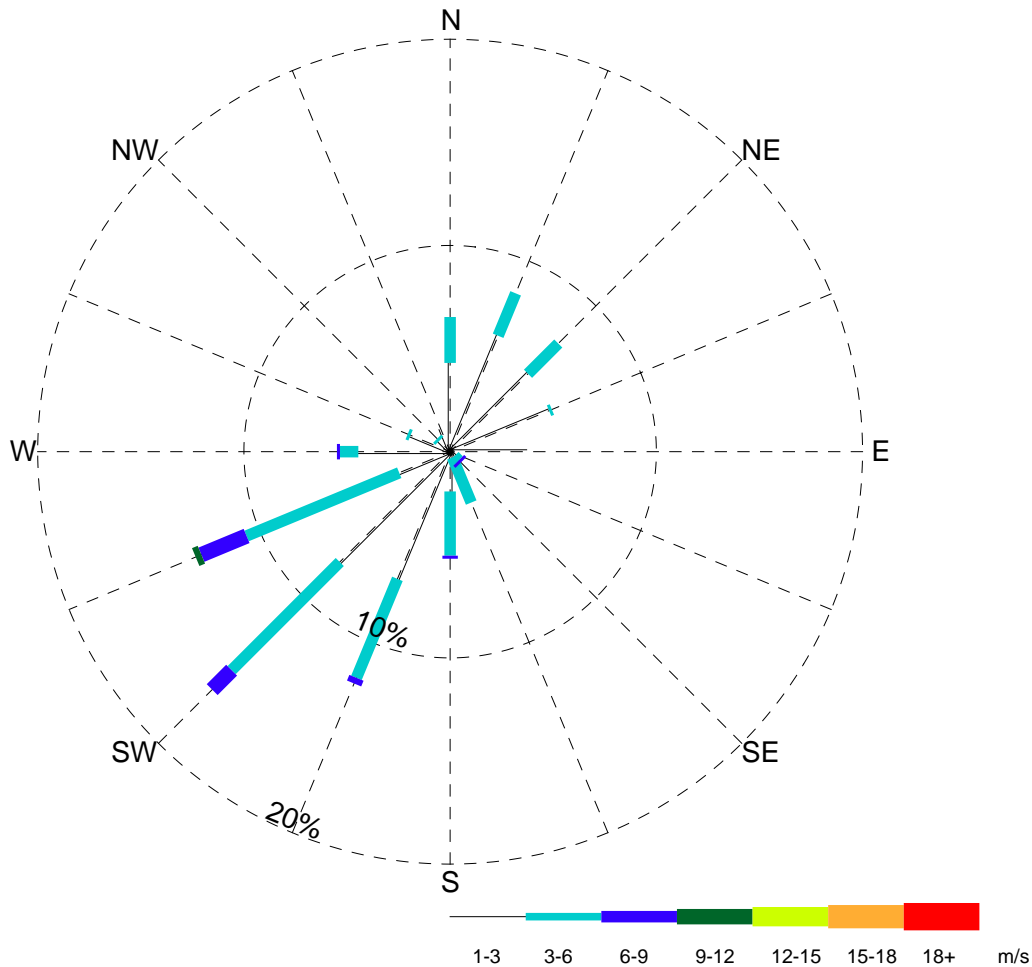


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Figure F-14



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	5.19	0.15	-	-	-	-	-	5.34
NE	-	5.34	2.08	-	-	-	-	-	7.42
NNE	-	6.08	2.23	-	-	-	-	-	8.31
N	-	4.30	2.23	-	-	-	-	-	6.53
NNW	-	1.19	-	-	-	-	-	-	1.19
NW	-	0.74	0.15	-	-	-	-	-	0.89
WNW	-	2.08	0.15	-	-	-	-	-	2.23
W	-	4.45	0.89	0.15	-	-	-	-	5.49
WSW	-	2.67	8.01	2.37	0.30	-	-	-	13.35
SW	-	7.57	7.42	1.34	-	-	-	-	16.32
SSW	-	6.68	5.19	0.30	-	-	-	-	12.17
S	-	1.93	3.12	0.15	-	-	-	-	5.19
SSE	-	0.30	2.37	-	-	-	-	-	2.67
SE	-	0.30	0.30	0.15	-	-	-	-	0.74
ESE	-	-	-	-	-	-	-	-	-
E	-	3.71	-	-	-	-	-	-	3.71
Calm	8.46	-	-	-	-	-	-	-	8.46
Total (%)	8.46	52.52	34.27	4.45	0.30	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: September 1, 2006
 End Date: September 30, 2006

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 September 2006**

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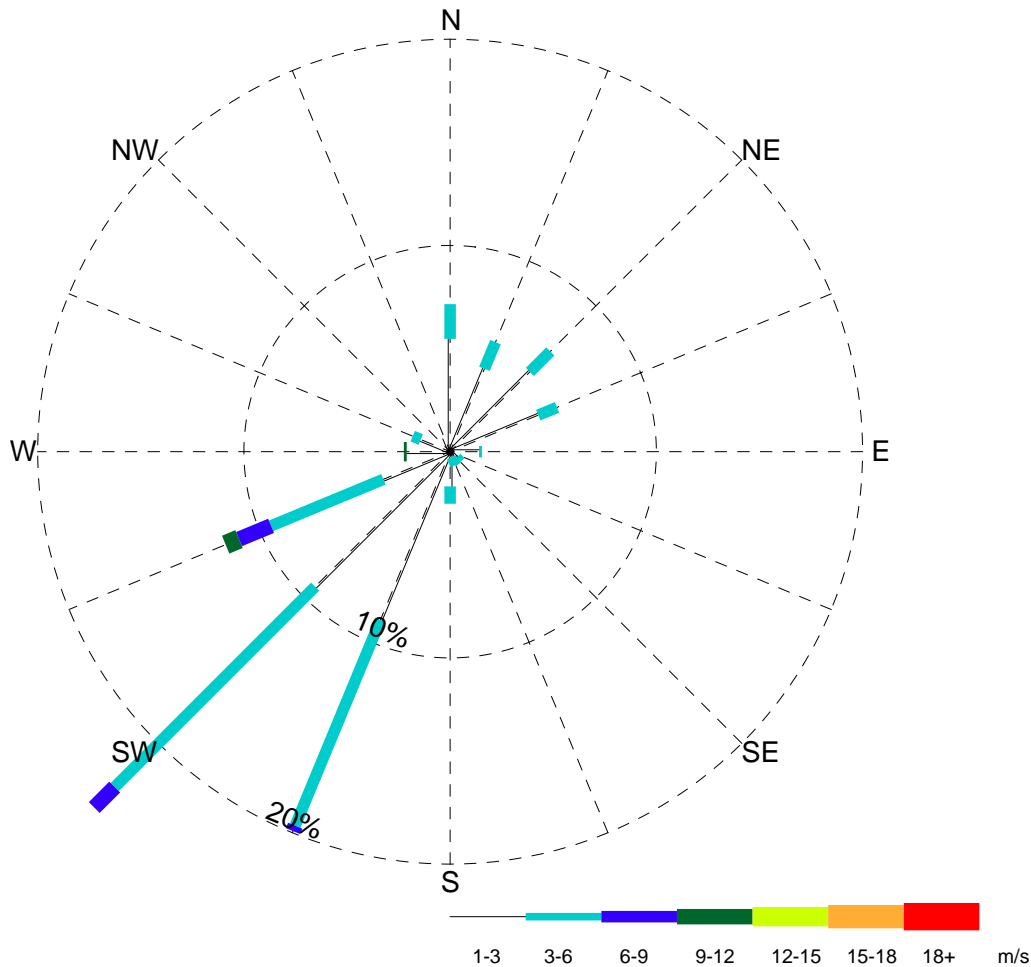
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Figure F-15



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: October 1, 2006
 End Date: October 31, 2006

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.63	0.98	-	-	-	-	-	5.61
NE	-	5.47	1.40	-	-	-	-	-	6.87
NNE	-	4.35	1.40	-	-	-	-	-	5.75
N	-	5.47	1.68	-	-	-	-	-	7.15
NNW	-	0.70	-	-	-	-	-	-	0.70
NW	-	0.14	-	-	-	-	-	-	0.14
WNW	-	1.54	0.42	-	-	-	-	-	1.96
W	-	2.10	-	-	0.14	-	-	-	2.24
WSW	-	3.51	5.89	1.68	0.70	-	-	-	11.78
SW	-	9.26	13.74	1.40	-	-	-	-	24.40
SSW	-	8.84	10.80	0.28	-	-	-	-	19.92
S	-	1.68	0.84	-	-	-	-	-	2.53
SSE	-	0.28	0.42	-	-	-	-	-	0.70
SE	-	0.42	0.28	-	-	-	-	-	0.70
ESE	-	0.14	-	-	-	-	-	-	0.14
E	-	1.40	0.14	-	-	-	-	-	1.54
Calm	7.85	-	-	-	-	-	-	-	7.85
Total (%)	7.85	49.93	38.01	3.37	0.84	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
October 2006**

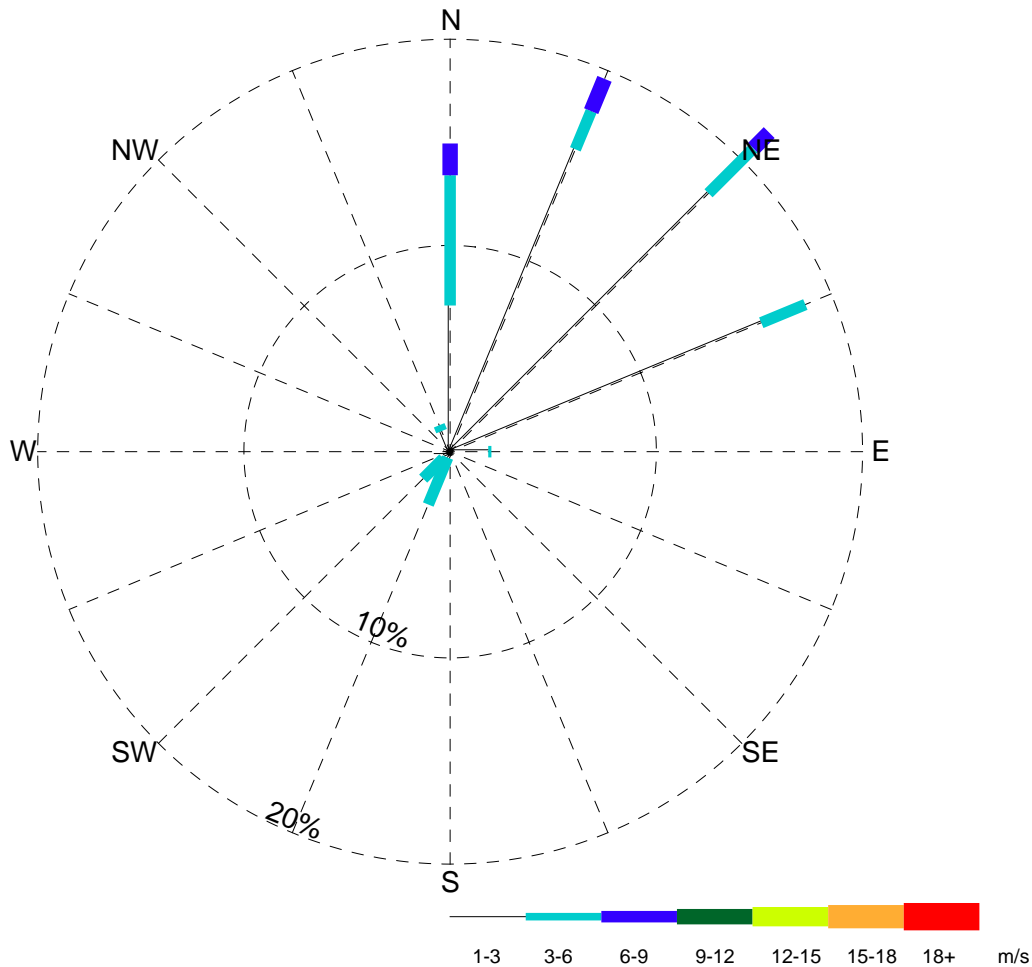
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Figure F-16



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	16.33	2.31	-	-	-	-	-	18.64
NE	-	17.72	3.08	1.08	-	-	-	-	21.88
NNE	-	15.87	2.00	1.70	-	-	-	-	19.57
N	-	7.09	6.32	1.54	-	-	-	-	14.95
NNW	-	1.08	0.31	-	-	-	-	-	1.39
NW	-	0.15	-	-	-	-	-	-	0.15
WNW	-	0.31	-	-	-	-	-	-	0.31
W	-	0.77	-	-	-	-	-	-	0.77
WSW	-	0.46	-	-	-	-	-	-	0.46
SW	-	0.46	1.39	-	-	-	-	-	1.85
SSW	-	0.31	2.46	-	-	-	-	-	2.77
S	-	0.15	-	-	-	-	-	-	0.15
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	1.85	0.15	-	-	-	-	-	2.00
Calm	15.10	-	-	-	-	-	-	-	15.10
Total (%)	15.10	62.56	18.03	4.31	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: November 1, 2006
 End Date: November 30, 2006

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
November 2006**

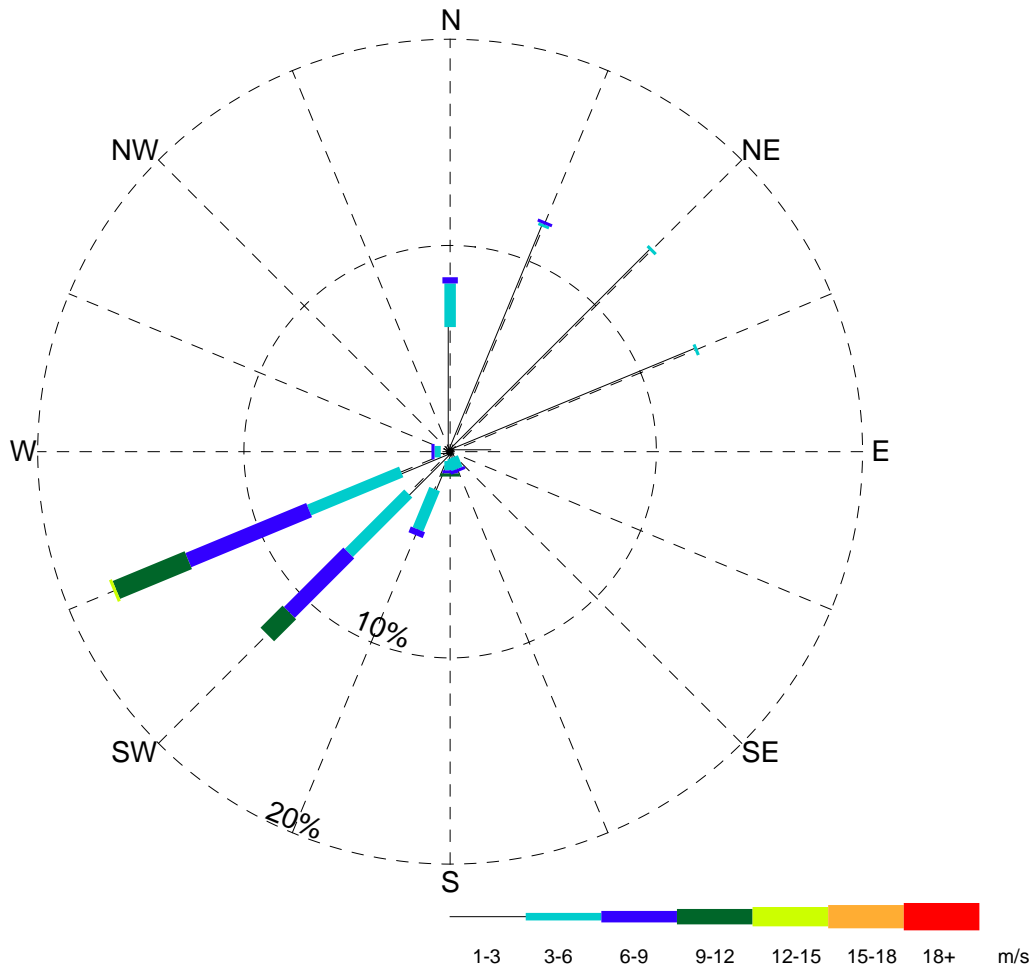
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Figure F-17



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	12.84	0.15	-	-	-	-	-	12.99
NE	-	13.75	0.15	-	-	-	-	-	13.90
NNE	-	11.78	0.15	0.15	-	-	-	-	12.09
N	-	6.04	2.12	0.30	-	-	-	-	8.46
NNW	-	0.30	-	-	-	-	-	-	0.30
NW	-	0.30	-	-	-	-	-	-	0.30
WNW	-	0.15	-	-	-	-	-	-	0.15
W	-	0.45	0.30	0.15	-	-	-	-	0.91
WSW	-	2.57	4.83	6.34	3.78	0.15	-	-	17.67
SW	-	2.87	4.08	4.08	1.51	-	-	-	12.54
SSW	-	1.96	2.12	0.30	-	-	-	-	4.38
S	-	0.45	0.45	0.15	0.15	-	-	-	1.21
SSE	-	0.30	0.60	0.15	-	-	-	-	1.06
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.15	-	-	-	-	-	-	0.15
E	-	1.96	-	-	-	-	-	-	1.96
Calm	11.93	-	-	-	-	-	-	-	11.93
Total (%)	11.93	55.89	14.95	11.63	5.44	0.15	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 28 days
 Start Date: December 1, 2006
 End Date: December 31, 2006

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2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
December 2006**

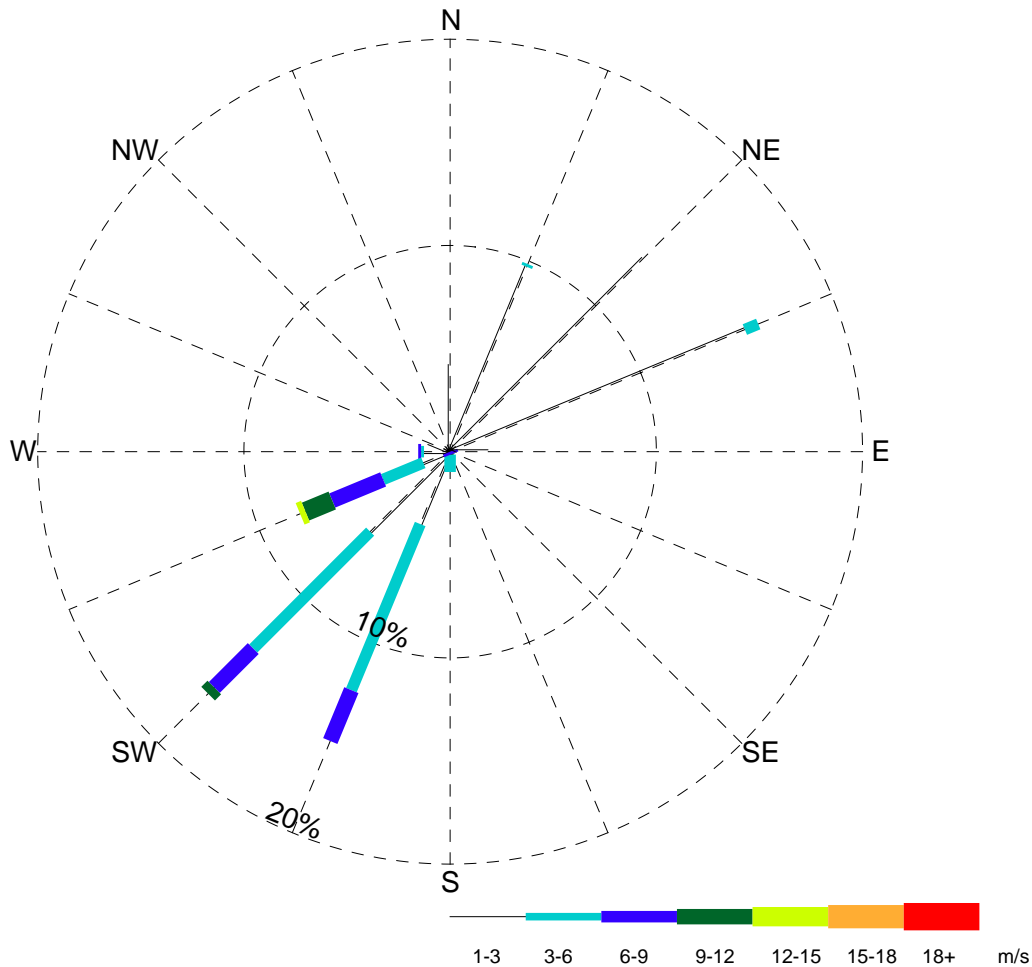
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Figure F-18



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	15.47	0.70	-	-	-	-	-	16.17
NE	-	13.22	-	-	-	-	-	-	13.22
NNE	-	9.70	0.14	-	-	-	-	-	9.85
N	-	4.22	-	-	-	-	-	-	4.22
NNW	-	0.28	-	-	-	-	-	-	0.28
NW	-	0.28	-	-	-	-	-	-	0.28
WNW	-	1.12	-	-	-	-	-	-	1.12
W	-	1.27	0.14	0.14	-	-	-	-	1.55
WSW	-	1.41	2.11	2.67	1.41	0.28	-	-	7.88
SW	-	5.49	8.02	2.67	0.42	-	-	-	16.60
SSW	-	3.80	8.72	2.67	-	-	-	-	15.19
S	-	0.14	0.84	-	-	-	-	-	0.99
SSE	-	-	-	0.14	-	-	-	-	0.14
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.28	-	-	-	-	-	-	0.28
E	-	1.83	-	-	-	-	-	-	1.83
Calm	10.41	-	-	-	-	-	-	-	10.41
Total (%)	10.41	58.51	20.67	8.30	1.83	0.28	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: January 1, 2007
 End Date: January 31, 2007

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**MACTUNG PROJECT
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**Macmillan Pass
 Wind Rose
 January 2007**

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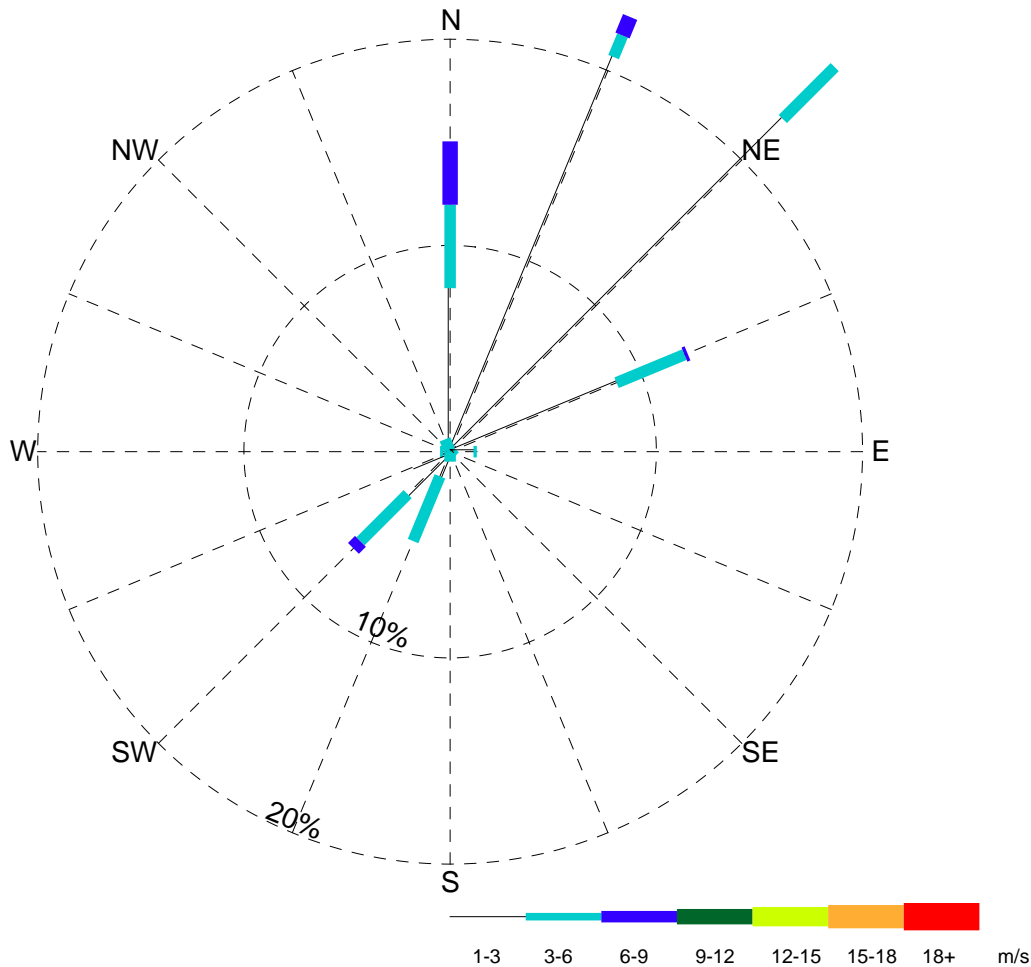
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Figure F-19



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	8.74	3.56	0.16	-	-	-	-	12.46
NE	-	22.82	3.56	-	-	-	-	-	26.38
NNE	-	20.71	1.13	0.97	-	-	-	-	22.82
N	-	7.93	4.05	3.07	-	-	-	-	15.05
NNW	-	-	0.65	-	-	-	-	-	0.65
NW	-	-	-	-	-	-	-	-	-
WNW	-	0.16	-	-	-	-	-	-	0.16
W	-	0.32	0.16	-	-	-	-	-	0.49
WSW	-	1.94	-	-	-	-	-	-	1.94
SW	-	2.91	3.24	0.49	-	-	-	-	6.63
SSW	-	1.29	3.40	-	-	-	-	-	4.69
S	-	-	0.49	-	-	-	-	-	0.49
SSE	-	-	0.16	-	-	-	-	-	0.16
SE	-	0.16	0.16	-	-	-	-	-	0.32
ESE	-	-	-	-	-	-	-	-	-
E	-	1.13	0.16	-	-	-	-	-	1.29
Calm	6.47	-	-	-	-	-	-	-	6.47
Total (%)	6.47	68.12	20.71	4.69	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 28 days
 Start Date: February 1, 2007
 End Date: February 28, 2007

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 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 February 2007**

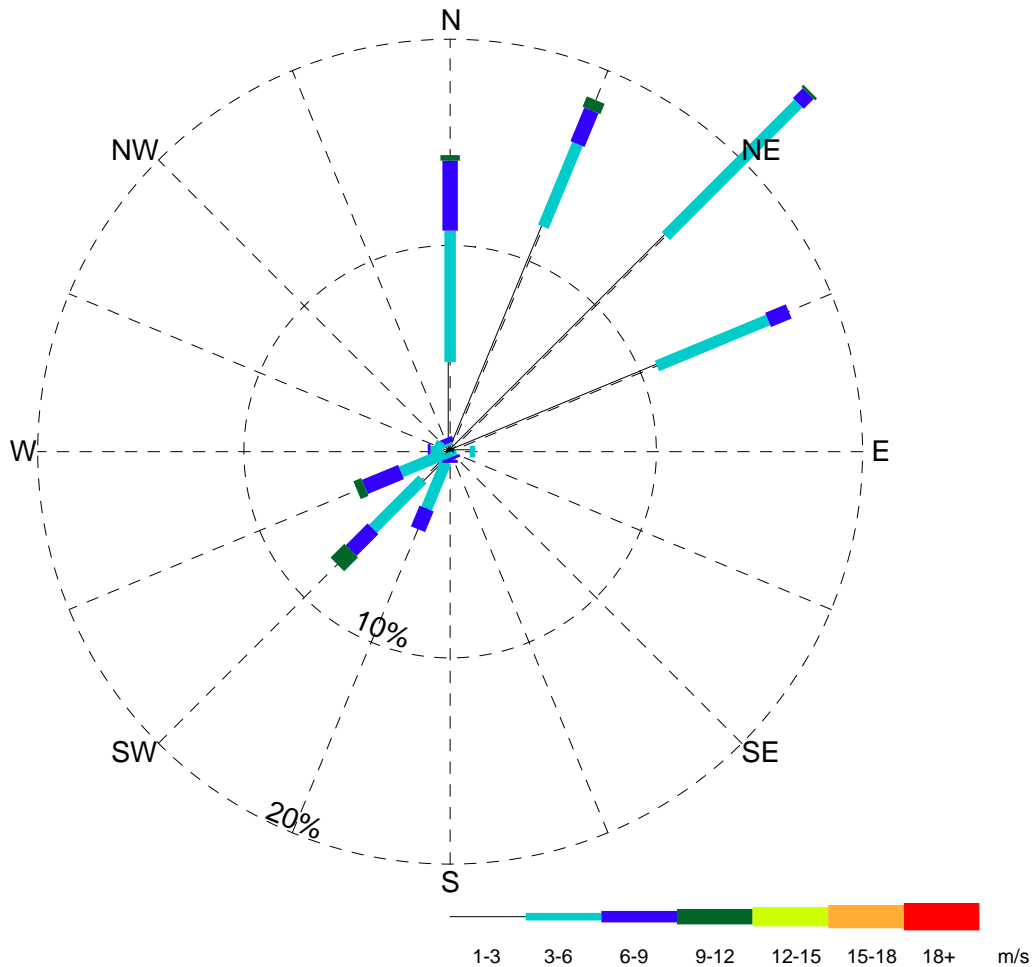
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Figure F-20



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	10.85	5.83	1.09	-	-	-	-	17.77
NE	-	14.79	9.09	0.68	0.14	-	-	-	24.69
NNE	-	11.81	4.34	1.76	0.54	-	-	-	18.45
N	-	4.34	6.38	3.39	0.27	-	-	-	14.38
NNW	-	0.27	0.14	0.27	-	-	-	-	0.68
NW	-	0.14	-	-	-	-	-	-	0.14
WNW	-	0.41	0.41	-	-	-	-	-	0.81
W	-	0.54	0.41	0.14	-	-	-	-	1.09
WSW	-	0.27	2.31	1.90	0.41	-	-	-	4.89
SW	-	1.90	3.39	1.49	0.95	-	-	-	7.73
SSW	-	0.54	2.44	1.09	-	-	-	-	4.07
S	-	0.27	0.14	0.14	-	-	-	-	0.54
SSE	-	-	0.27	0.14	-	-	-	-	0.41
SE	-	0.14	-	-	-	-	-	-	0.14
ESE	-	0.14	-	-	-	-	-	-	0.14
E	-	0.95	0.27	-	-	-	-	-	1.22
Calm	2.85	-	-	-	-	-	-	-	2.85
Total (%)	2.85	47.35	35.41	12.08	2.31	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: March 1, 2007
 End Date: March 31, 2007

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 March 2007**

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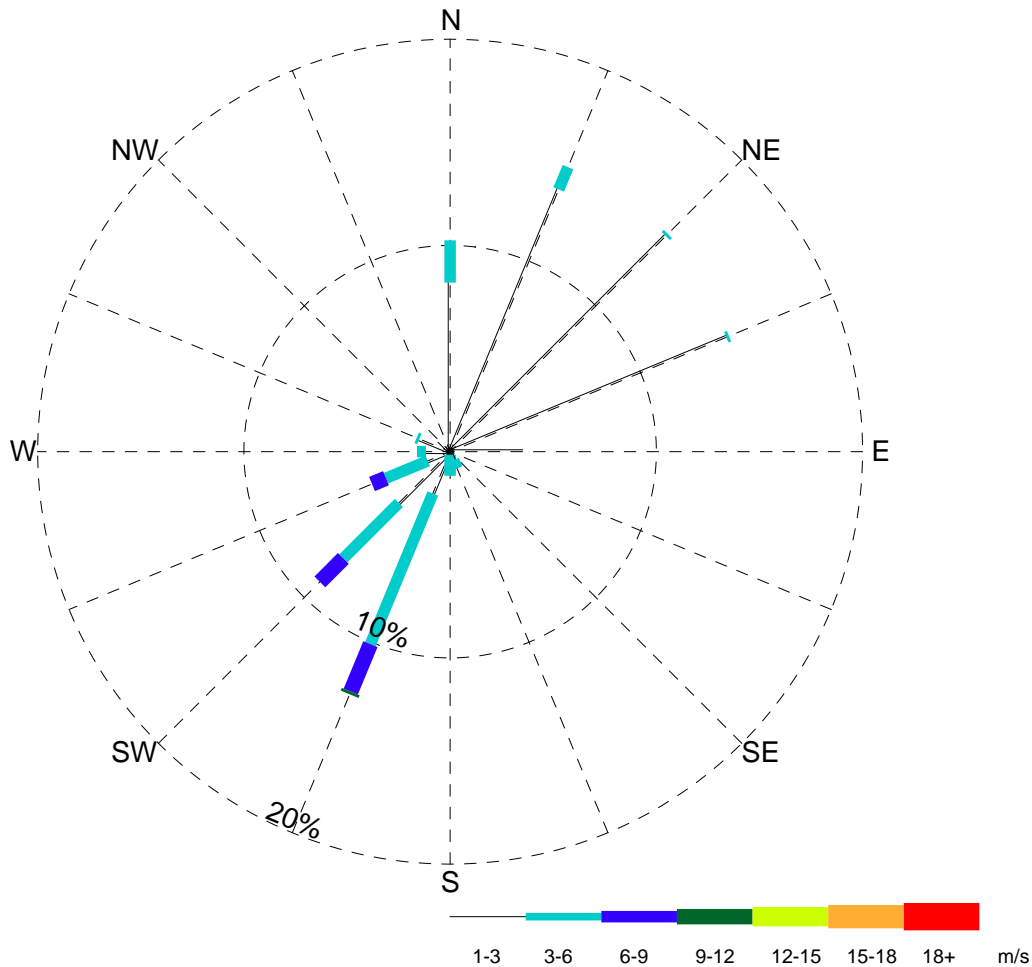
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Figure F-21



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	14.49	0.15	-	-	-	-	-	14.64
NE	-	14.79	0.15	-	-	-	-	-	14.93
NNE	-	13.76	1.17	-	-	-	-	-	14.93
N	-	8.20	2.05	-	-	-	-	-	10.25
NNW	-	0.29	-	-	-	-	-	-	0.29
NW	-	0.73	-	-	-	-	-	-	0.73
WNW	-	1.61	0.15	-	-	-	-	-	1.76
W	-	1.17	0.44	-	-	-	-	-	1.61
WSW	-	1.17	2.20	0.73	-	-	-	-	4.10
SW	-	3.51	3.81	1.61	-	-	-	-	8.93
SSW	-	2.20	7.91	2.49	0.15	-	-	-	12.74
S	-	0.15	1.02	-	-	-	-	-	1.17
SSE	-	0.44	0.44	-	-	-	-	-	0.88
SE	-	0.15	-	-	-	-	-	-	0.15
ESE	-	-	-	-	-	-	-	-	-
E	-	3.51	-	-	-	-	-	-	3.51
Calm	9.37	-	-	-	-	-	-	-	9.37
Total (%)	9.37	66.18	19.47	4.83	0.15	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: April 1, 2007
 End Date: April 30, 2007

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**MACTUNG PROJECT
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**Macmillan Pass
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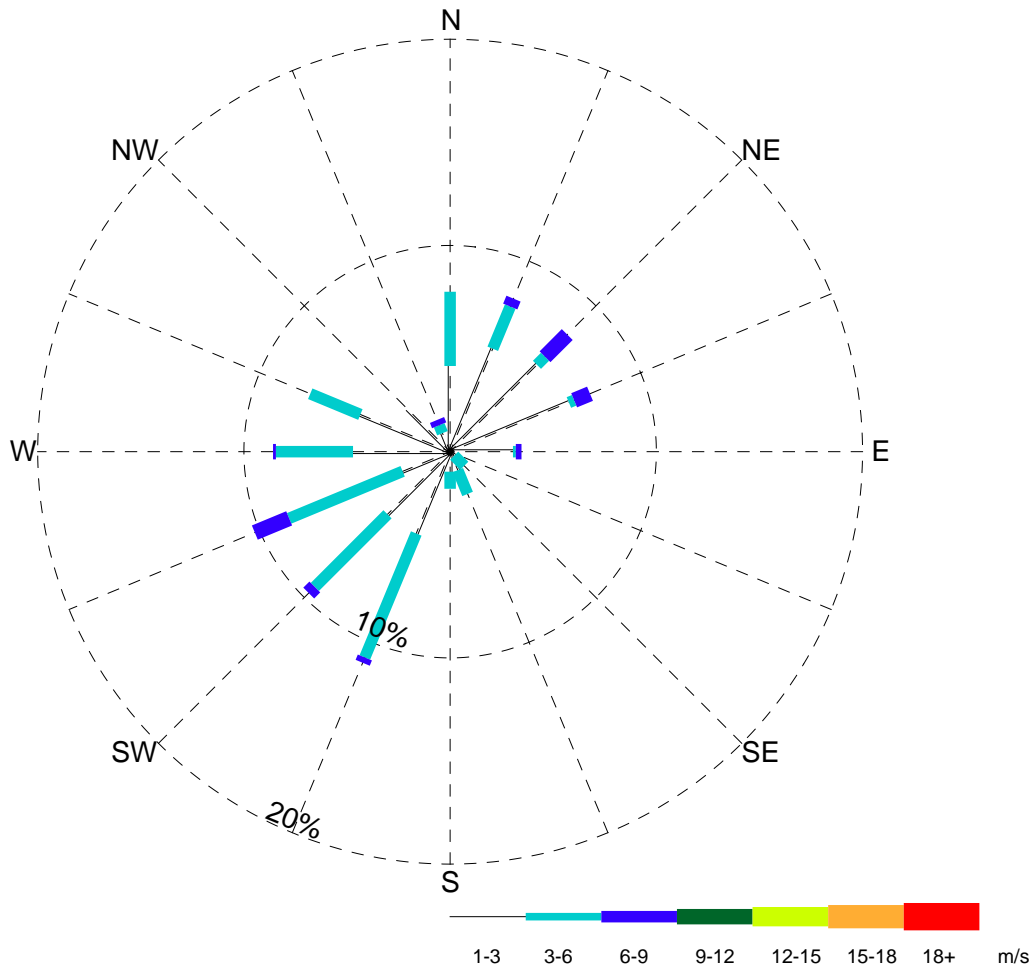
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Figure F-22



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	6.23	0.28	0.83	-	-	-	-	7.34
NE	-	5.96	0.55	1.52	-	-	-	-	8.03
NNE	-	5.40	2.22	0.42	-	-	-	-	8.03
N	-	4.16	3.60	-	-	-	-	-	7.76
NNW	-	0.97	0.42	0.28	-	-	-	-	1.66
NW	-	2.91	-	-	-	-	-	-	2.91
WNW	-	4.71	2.63	-	-	-	-	-	7.34
W	-	4.71	3.74	0.14	-	-	-	-	8.59
WSW	-	2.49	5.96	1.80	-	-	-	-	10.25
SW	-	4.29	4.99	0.42	-	-	-	-	9.69
SSW	-	4.29	6.51	0.28	-	-	-	-	11.08
S	-	0.97	0.83	-	-	-	-	-	1.80
SSE	-	0.97	1.25	-	-	-	-	-	2.22
SE	-	0.28	0.69	-	-	-	-	-	0.97
ESE	-	0.14	-	-	-	-	-	-	0.14
E	-	3.05	0.14	0.28	-	-	-	-	3.46
Calm	8.73	-	-	-	-	-	-	-	8.73
Total (%)	8.73	51.52	33.79	5.96	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: May 1, 2007
 End Date: May 31, 2007

NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
May 2007**

EBA Engineering
Consultants Ltd.



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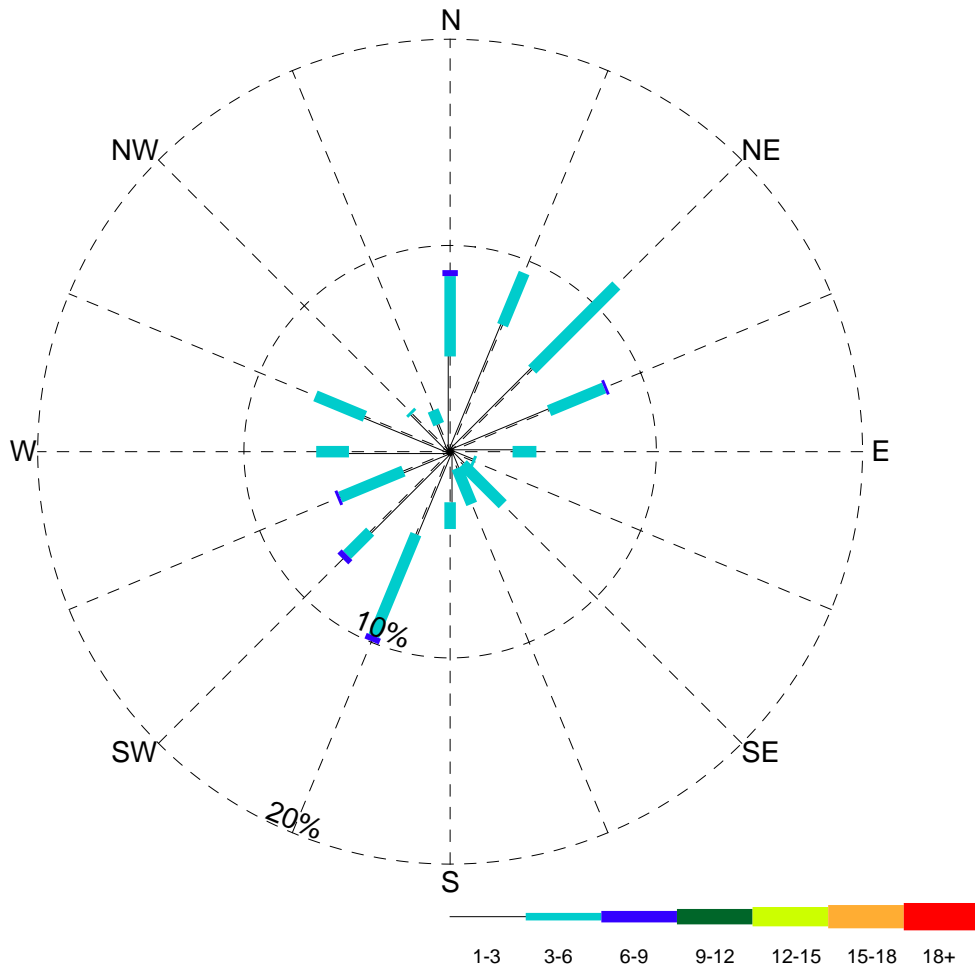
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November 2008

Figure F-23



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: June 1, 2007
 End Date: June 30, 2007

Direction	Percent Occurrence (%)							Total (%)	
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s		18+ m/s
ENE	-	5.20	2.89	0.14	-	-	-	-	8.23
NE	-	5.63	5.77	-	-	-	-	-	11.40
NNE	-	6.64	2.74	-	-	-	-	-	9.38
N	-	4.62	3.90	0.29	-	-	-	-	8.80
NNW	-	1.44	0.72	-	-	-	-	-	2.16
NW	-	2.60	0.14	-	-	-	-	-	2.74
WNW	-	4.47	2.60	-	-	-	-	-	7.07
W	-	4.91	1.59	-	-	-	-	-	6.49
WSW	-	2.45	3.32	0.14	-	-	-	-	5.92
SW	-	5.48	1.59	0.29	-	-	-	-	7.36
SSW	-	4.33	5.34	0.29	-	-	-	-	9.96
S	-	2.45	1.30	-	-	-	-	-	3.75
SSE	-	0.87	1.88	-	-	-	-	-	2.74
SE	-	0.87	2.74	-	-	-	-	-	3.61
ESE	-	1.15	0.14	-	-	-	-	-	1.30
E	-	3.03	1.15	-	-	-	-	-	4.18
Calm	4.91	-	-	-	-	-	-	-	4.91
Total (%)	4.91	56.13	37.81	1.15	-	-	-	-	100.00

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 June 2007**

EBA Engineering
 Consultants Ltd.



PROJECT NO.
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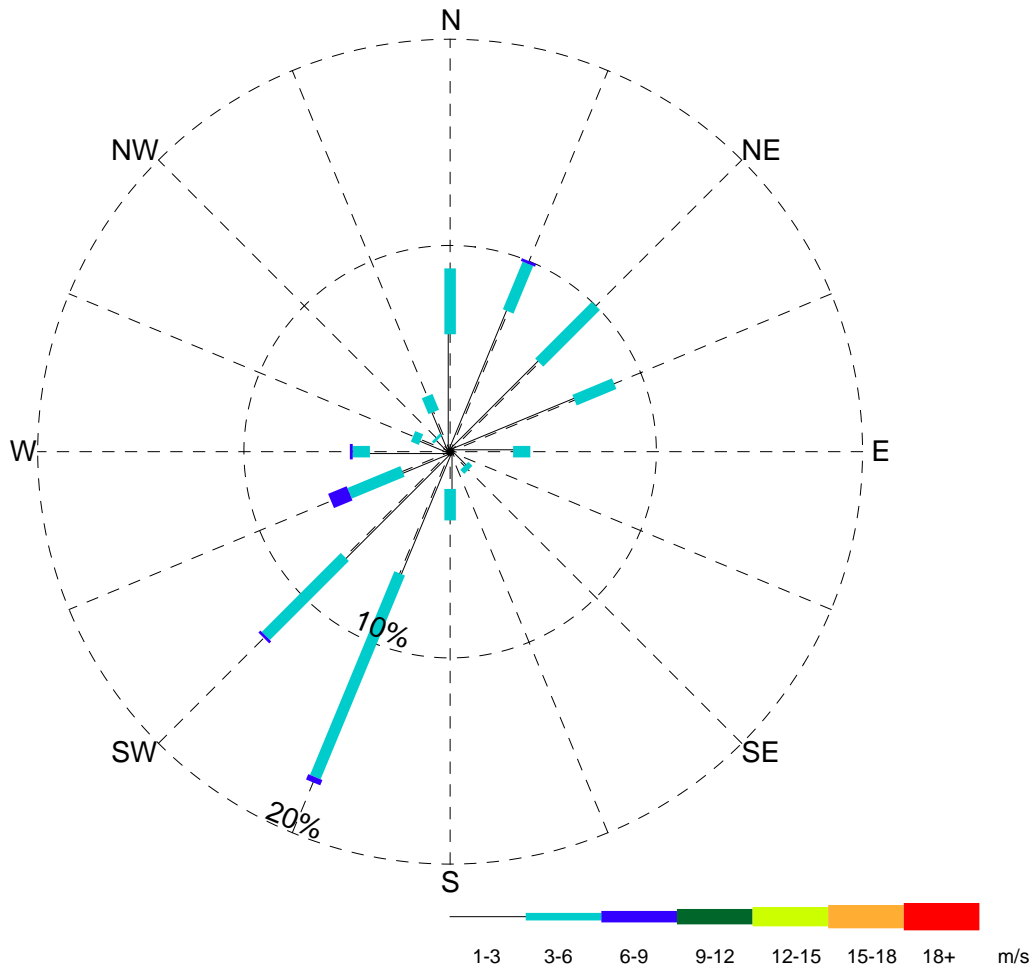
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Figure F-24



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	6.53	2.08	-	-	-	-	-	8.61
NE	-	6.11	3.89	-	-	-	-	-	10.00
NNE	-	7.36	2.50	0.14	-	-	-	-	10.00
N	-	5.69	3.19	-	-	-	-	-	8.89
NNW	-	2.08	0.83	-	-	-	-	-	2.92
NW	-	0.83	0.14	-	-	-	-	-	0.97
WNW	-	1.53	0.42	-	-	-	-	-	1.94
W	-	3.89	0.83	0.14	-	-	-	-	4.86
WSW	-	2.50	2.78	0.97	-	-	-	-	6.25
SW	-	7.22	5.42	0.14	-	-	-	-	12.78
SSW	-	6.39	10.69	0.28	-	-	-	-	17.36
S	-	1.81	1.53	-	-	-	-	-	3.33
SSE	-	0.28	-	-	-	-	-	-	0.28
SE	-	0.97	0.28	-	-	-	-	-	1.25
ESE	-	0.28	-	-	-	-	-	-	0.28
E	-	3.06	0.83	-	-	-	-	-	3.89
Calm	6.39	-	-	-	-	-	-	-	6.39
Total (%)	6.39	56.53	35.42	1.67	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: July 1, 2007
 End Date: July 31, 2007

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 July 2007**

EBA Engineering
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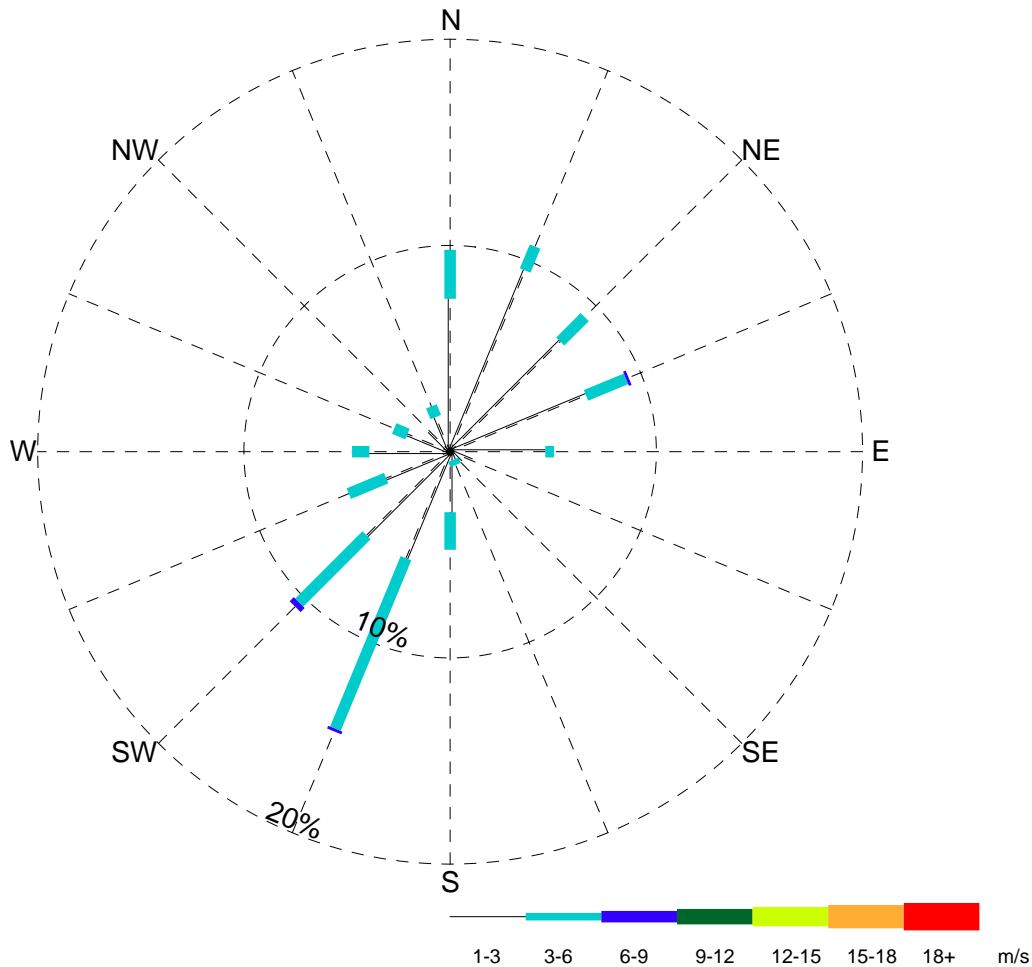
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Figure F-25



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: August 1, 2007
 End Date: August 31, 2007

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	7.13	2.10	0.14	-	-	-	-	9.37
NE	-	7.55	1.68	-	-	-	-	-	9.23
NNE	-	9.51	1.26	-	-	-	-	-	10.77
N	-	7.41	2.38	-	-	-	-	-	9.79
NNW	-	1.82	0.56	-	-	-	-	-	2.38
NW	-	1.40	-	-	-	-	-	-	1.40
WNW	-	2.24	0.70	-	-	-	-	-	2.94
W	-	3.92	0.84	-	-	-	-	-	4.76
WSW	-	3.36	1.96	-	-	-	-	-	5.32
SW	-	5.73	4.61	0.28	-	-	-	-	10.63
SSW	-	5.59	8.95	0.14	-	-	-	-	14.69
S	-	2.94	1.82	-	-	-	-	-	4.76
SSE	-	0.42	0.28	-	-	-	-	-	0.70
SE	-	0.70	-	-	-	-	-	-	0.70
ESE	-	1.12	-	-	-	-	-	-	1.12
E	-	4.61	0.42	-	-	-	-	-	5.03
Calm	6.43	-	-	-	-	-	-	-	6.43
Total (%)	6.43	65.46	27.55	0.56	-	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
August 2007**

EBA Engineering
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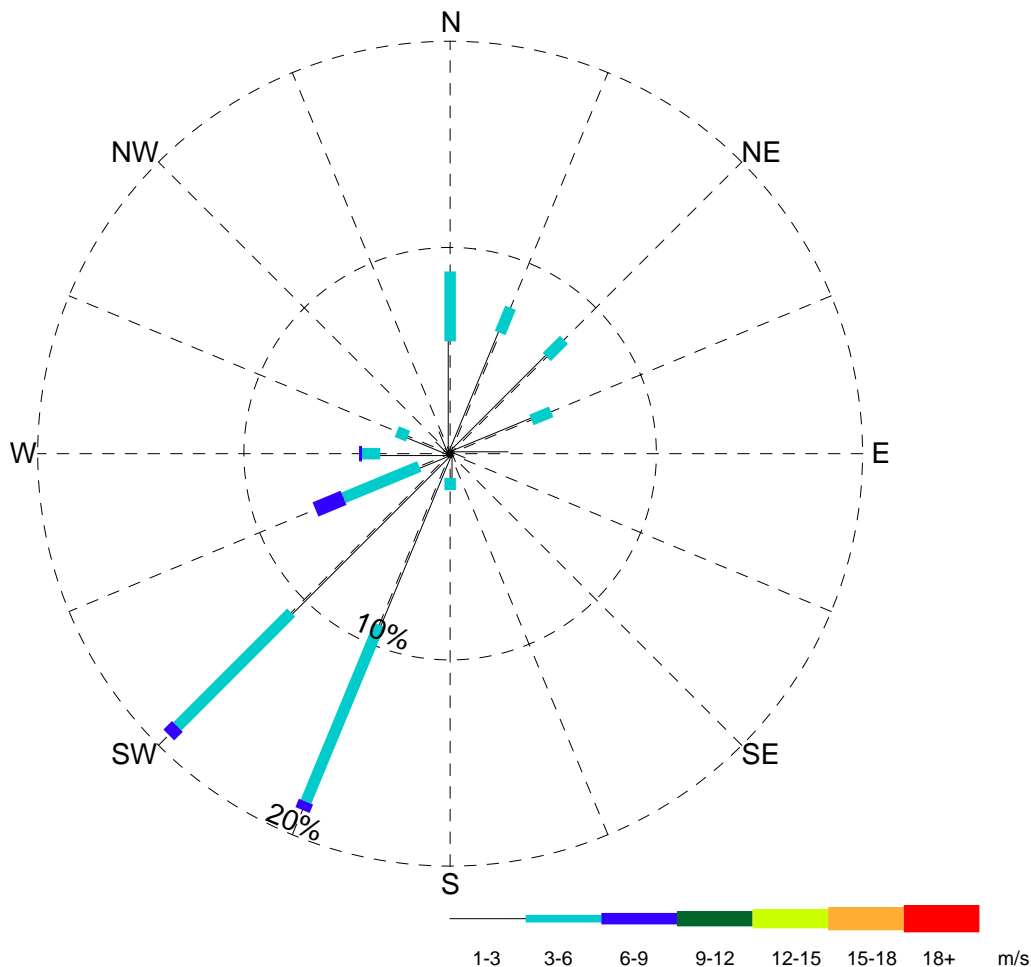
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Figure F-26



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	4.27	1.03	-	-	-	-	-	5.30
NE	-	6.63	1.18	-	-	-	-	-	7.81
NNE	-	6.33	1.33	-	-	-	-	-	7.66
N	-	5.45	3.39	-	-	-	-	-	8.84
NNW	-	1.18	-	-	-	-	-	-	1.18
NW	-	0.88	-	-	-	-	-	-	0.88
WNW	-	2.21	0.59	-	-	-	-	-	2.80
W	-	3.39	0.88	0.15	-	-	-	-	4.42
WSW	-	1.62	3.98	1.47	-	-	-	-	7.07
SW	-	10.90	7.81	0.59	-	-	-	-	19.29
SSW	-	8.98	9.28	0.44	-	-	-	-	18.70
S	-	1.18	0.59	-	-	-	-	-	1.77
SSE	-	0.44	-	-	-	-	-	-	0.44
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.74	-	-	-	-	-	-	0.74
E	-	2.80	-	-	-	-	-	-	2.80
Calm	10.31	-	-	-	-	-	-	-	10.31
Total (%)	10.31	57.00	30.04	2.65	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: September 1, 2007
 End Date: September 30, 2007

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
September 2007**

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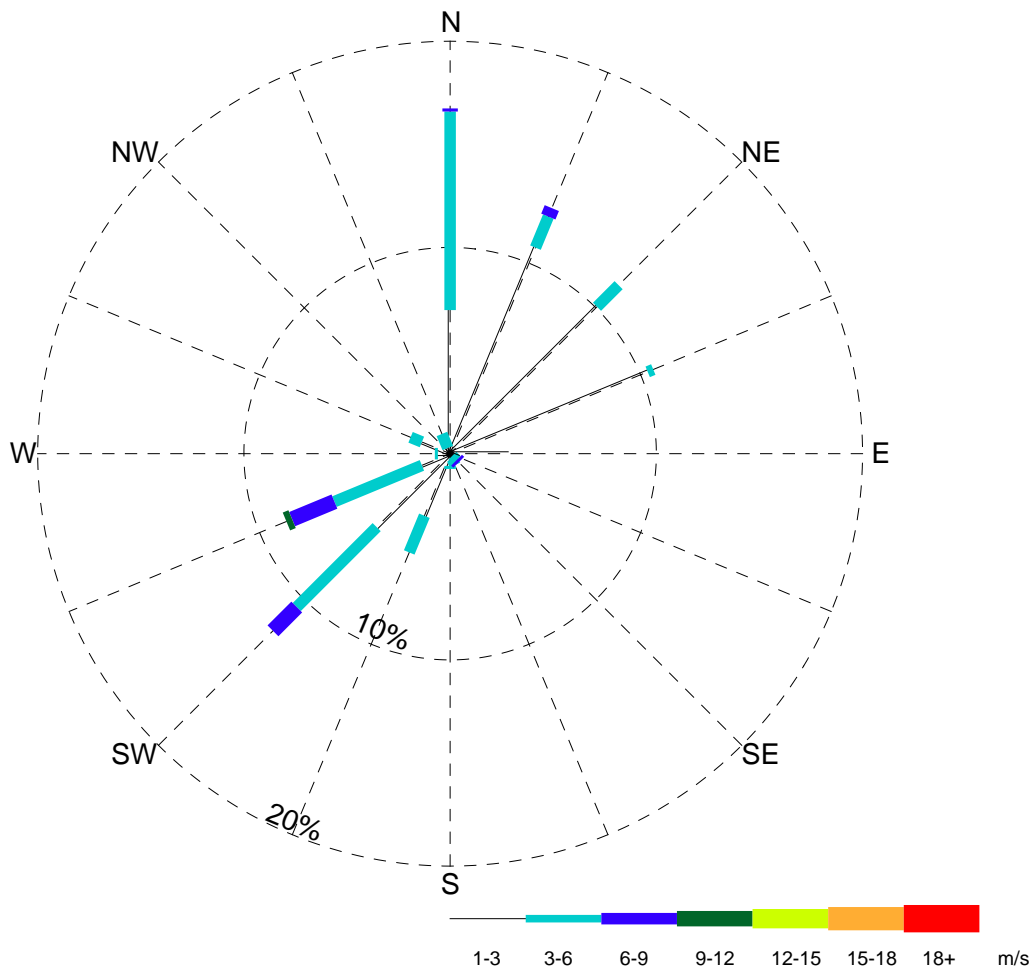
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Figure F-27



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	10.37	0.30	-	-	-	-	-	10.67
NE	-	10.07	1.48	-	-	-	-	-	11.56
NNE	-	10.81	1.63	0.44	-	-	-	-	12.89
N	-	6.96	9.63	0.15	-	-	-	-	16.74
NNW	-	0.30	0.74	-	-	-	-	-	1.04
NW	-	0.15	-	-	-	-	-	-	0.15
WNW	-	1.48	0.59	-	-	-	-	-	2.07
W	-	0.59	0.15	-	-	-	-	-	0.74
WSW	-	1.48	4.59	2.22	0.30	-	-	-	8.59
SW	-	5.04	5.48	1.63	-	-	-	-	12.15
SSW	-	3.26	1.93	-	-	-	-	-	5.18
S	-	0.59	0.15	-	-	-	-	-	0.74
SSE	-	0.30	0.30	-	-	-	-	-	0.59
SE	-	0.15	0.30	0.15	-	-	-	-	0.59
ESE	-	0.44	-	-	-	-	-	-	0.44
E	-	2.82	-	-	-	-	-	-	2.82
Calm	13.04	-	-	-	-	-	-	-	13.04
Total (%)	13.04	54.81	27.26	4.59	0.30	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: October 1, 2007
 End Date: October 31, 2007

NOTES

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 October 2007**

EBA Engineering
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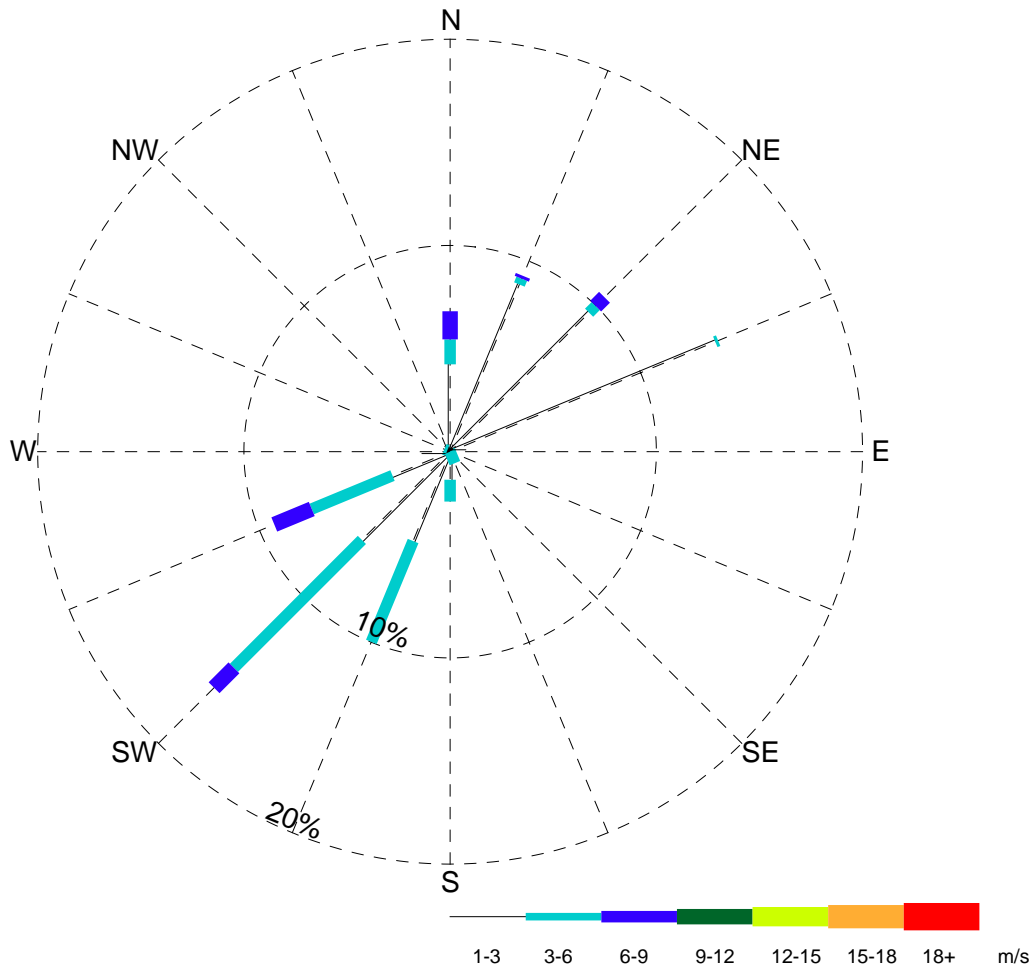
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Figure F-28



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	13.92	0.15	-	-	-	-	-	14.07
NE	-	9.53	0.45	0.61	-	-	-	-	10.59
NNE	-	8.77	0.30	0.15	-	-	-	-	9.23
N	-	4.24	1.21	1.36	-	-	-	-	6.81
NNW	-	0.76	-	-	-	-	-	-	0.76
NW	-	-	-	-	-	-	-	-	-
WNW	-	0.15	0.15	-	-	-	-	-	0.30
W	-	1.36	-	-	-	-	-	-	1.36
WSW	-	3.03	4.24	1.97	-	-	-	-	9.23
SW	-	6.05	8.77	1.36	-	-	-	-	16.19
SSW	-	4.69	5.30	-	-	-	-	-	9.98
S	-	1.36	1.06	-	-	-	-	-	2.42
SSE	-	-	0.61	-	-	-	-	-	0.61
SE	-	-	0.15	-	-	-	-	-	0.15
ESE	-	-	-	-	-	-	-	-	-
E	-	0.76	-	-	-	-	-	-	0.76
Calm	17.55	-	-	-	-	-	-	-	17.55
Total (%)	17.55	54.61	22.39	5.45	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: November 1, 2007
 End Date: November 30, 2007

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 November 2007**

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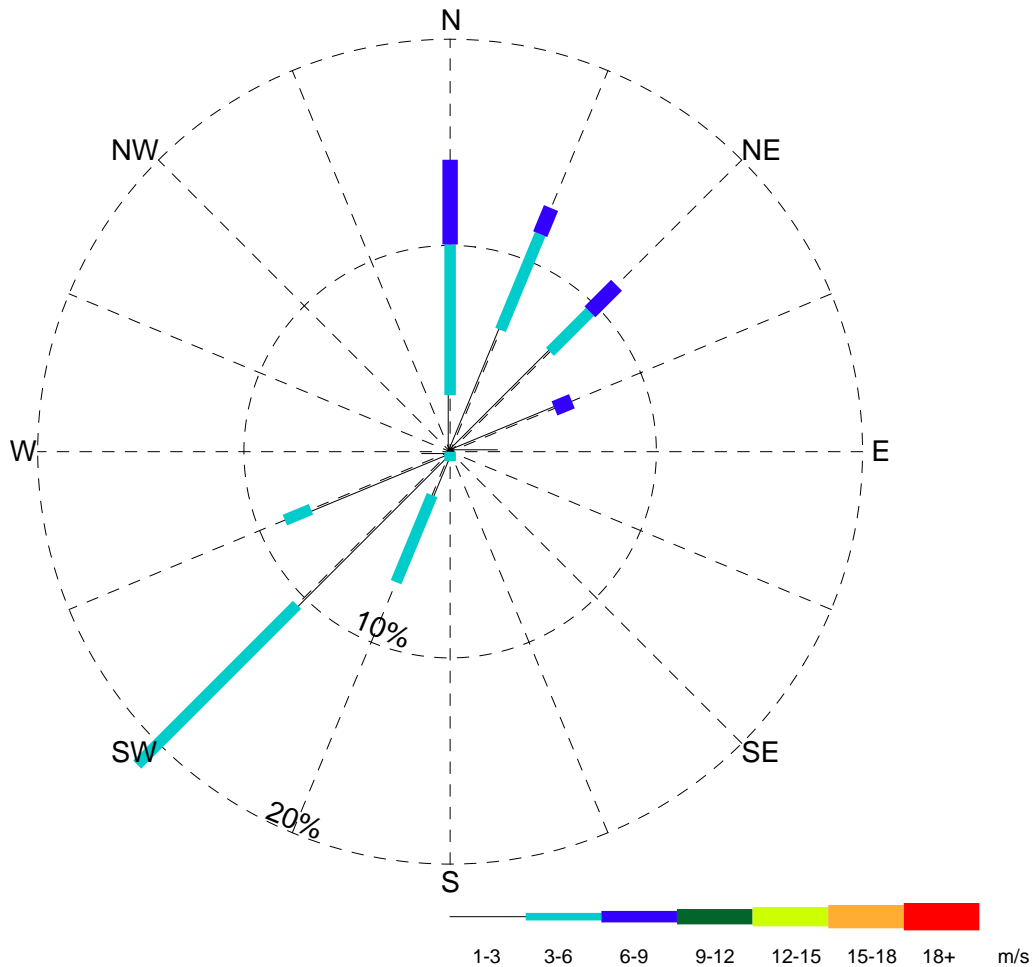
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Figure F-29



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)							Total (%)	
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s		18+ m/s
ENE	-	5.48	-	0.91	-	-	-	-	6.39
NE	-	6.85	2.74	1.83	-	-	-	-	11.42
NNE	-	6.39	5.02	1.37	-	-	-	-	12.78
N	-	2.74	7.31	4.11	-	-	-	-	14.15
NNW	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-
W	-	1.37	-	-	-	-	-	-	1.37
WSW	-	7.31	1.37	-	-	-	-	-	8.68
SW	-	10.50	10.96	-	-	-	-	-	21.46
SSW	-	2.28	4.57	-	-	-	-	-	6.85
S	-	-	0.46	-	-	-	-	-	0.46
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	2.28	-	-	-	-	-	-	2.28
Calm	14.15	-	-	-	-	-	-	-	14.15
Total (%)	14.15	45.21	32.42	8.22	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 9 days
 Start Date: December 1, 2007
 End Date: December 31, 2007

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 December 2007**

EBA Engineering
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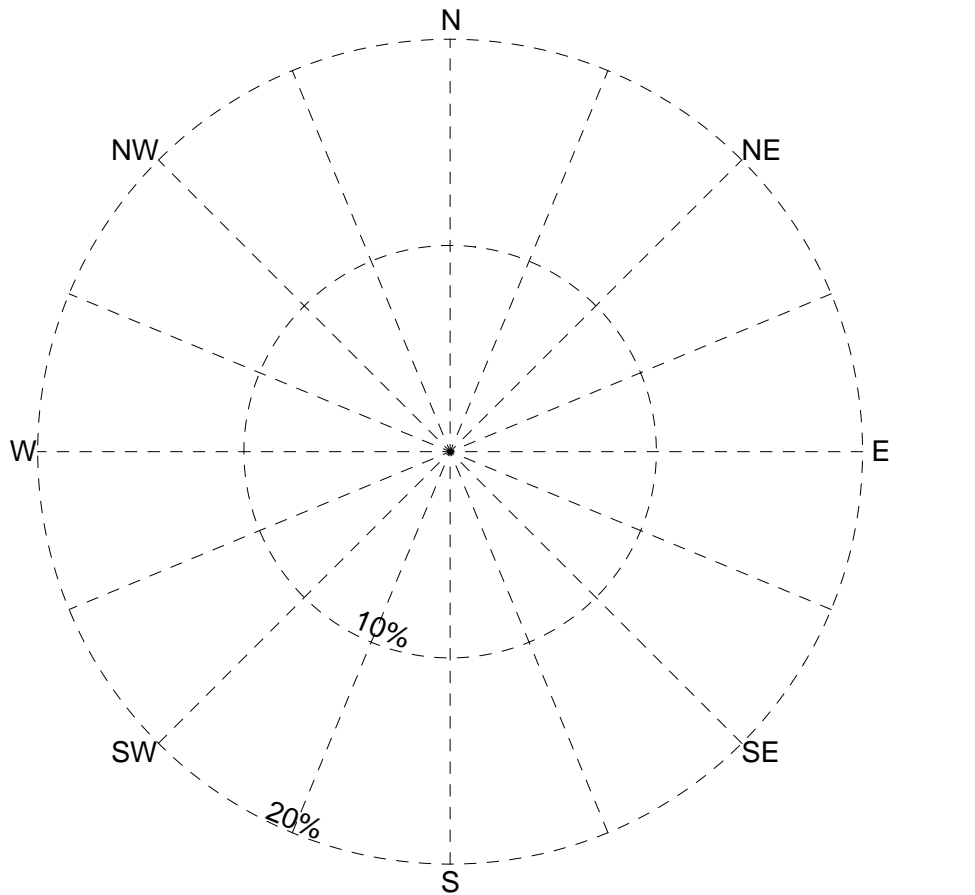


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Figure F-30



1-3 3-6 6-9 9-12 12-15 15-18 18+ m/s

Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 0 days
 Start Date: January 1, 2008
 End Date: January 31, 2008

Direction	Percent Occurrence (%)							Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	
ENE	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-
N	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-
Calm	-	-	-	-	-	-	-	-
Total (%)	-	-	-	-	-	-	-	-

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
January 2008**

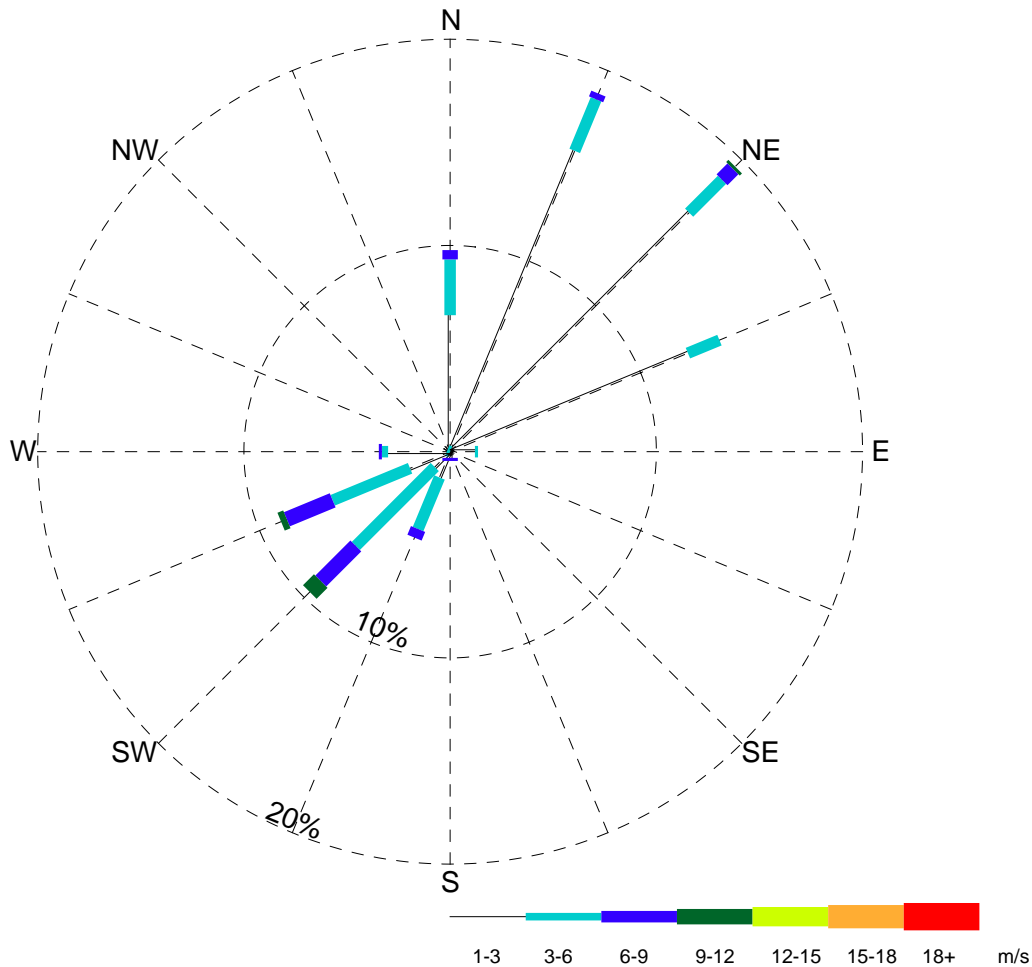
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Figure F-31



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	12.48	1.65	-	-	-	-	-	14.14
NE	-	16.39	2.26	0.75	0.15	-	-	-	19.55
NNE	-	15.79	2.71	0.30	-	-	-	-	18.80
N	-	6.62	2.71	0.45	-	-	-	-	9.77
NNW	-	0.30	-	-	-	-	-	-	0.30
NW	-	0.30	-	-	-	-	-	-	0.30
WNW	-	-	0.15	-	-	-	-	-	0.15
W	-	3.01	0.30	0.15	-	-	-	-	3.46
WSW	-	2.11	4.06	2.41	0.30	-	-	-	8.87
SW	-	1.05	5.41	2.41	0.75	-	-	-	9.62
SSW	-	1.35	2.71	0.45	-	-	-	-	4.51
S	-	0.30	-	0.15	-	-	-	-	0.45
SSE	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-
ESE	-	0.30	-	-	-	-	-	-	0.30
E	-	1.20	0.15	-	-	-	-	-	1.35
Calm	8.42	-	-	-	-	-	-	-	8.42
Total (%)	8.42	61.20	22.10	7.07	1.20	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 28 days
 Start Date: February 1, 2008
 End Date: February 28, 2008

NOTES

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 February 2008**

EBA Engineering
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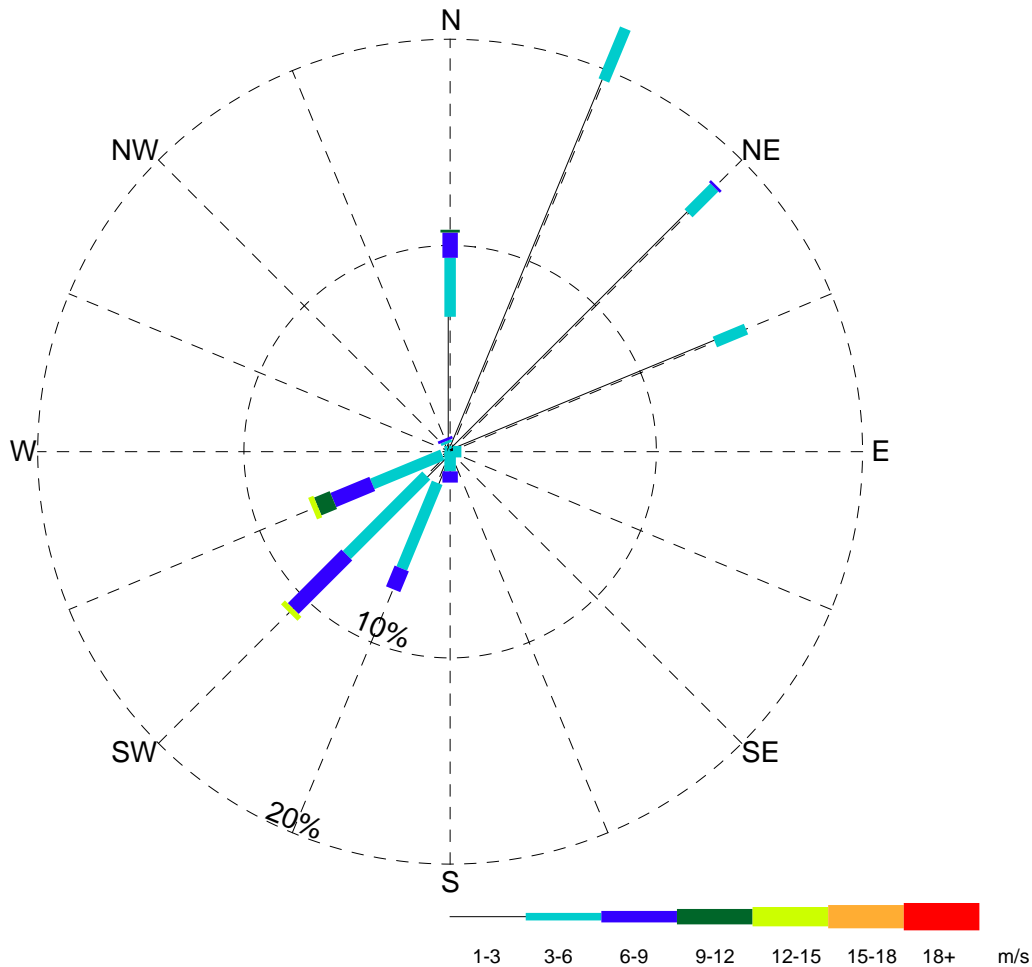
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Figure F-32



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	13.90	1.63	-	-	-	-	-	15.53
NE	-	16.35	1.77	0.14	-	-	-	-	18.26
NNE	-	19.48	2.72	-	-	-	-	-	22.21
N	-	6.54	2.86	1.23	0.14	-	-	-	10.76
NNW	-	0.41	0.14	0.14	-	-	-	-	0.68
NW	-	0.27	-	-	-	-	-	-	0.27
WNW	-	-	0.14	-	-	-	-	-	0.14
W	-	0.14	0.14	-	-	-	-	-	0.27
WSW	-	0.41	3.68	2.04	0.82	0.27	-	-	7.22
SW	-	1.63	5.45	3.68	-	0.27	-	-	11.03
SSW	-	1.63	4.50	1.09	-	-	-	-	7.22
S	-	-	0.95	0.55	-	-	-	-	1.50
SSE	-	-	0.27	-	-	-	-	-	0.27
SE	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-
E	-	0.14	0.41	-	-	-	-	-	0.55
Calm	4.09	-	-	-	-	-	-	-	4.09
Total (%)	4.09	60.90	24.66	8.86	0.95	0.55	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: March 1, 2008
 End Date: March 31, 2008

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Wind Rose
 March 2008**

EBA Engineering
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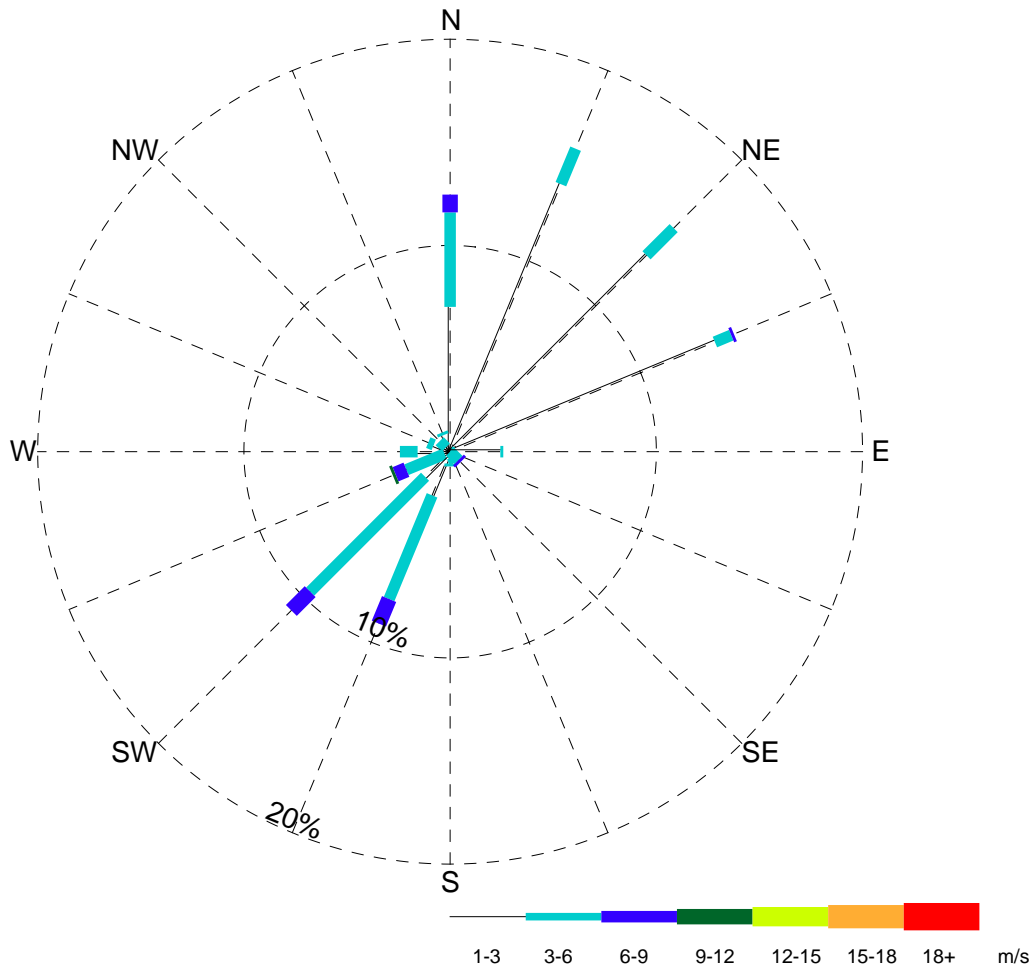


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 DATE
 November 2008

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Figure F-33



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: April 1, 2008
 End Date: April 30, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	13.90	0.86	0.14	-	-	-	-	14.90
NE	-	13.47	1.86	-	-	-	-	-	15.33
NNE	-	14.04	1.86	-	-	-	-	-	15.90
N	-	7.02	4.59	0.86	-	-	-	-	12.46
NNW	-	0.86	0.14	-	-	-	-	-	1.00
NW	-	0.29	0.43	-	-	-	-	-	0.72
WNW	-	0.86	0.29	-	-	-	-	-	1.15
W	-	1.58	0.86	-	-	-	-	-	2.44
WSW	-	0.29	2.01	0.57	0.14	-	-	-	3.01
SW	-	1.72	7.88	1.29	-	-	-	-	10.89
SSW	-	2.29	5.44	1.29	-	-	-	-	9.03
S	-	0.57	0.14	-	-	-	-	-	0.72
SSE	-	0.29	0.29	-	-	-	-	-	0.57
SE	-	-	0.57	0.14	-	-	-	-	0.72
ESE	-	-	0.14	-	-	-	-	-	0.14
E	-	2.44	0.14	-	-	-	-	-	2.58
Calm	8.45	-	-	-	-	-	-	-	8.45
Total (%)	8.45	59.60	27.51	4.30	0.14	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
April 2008**

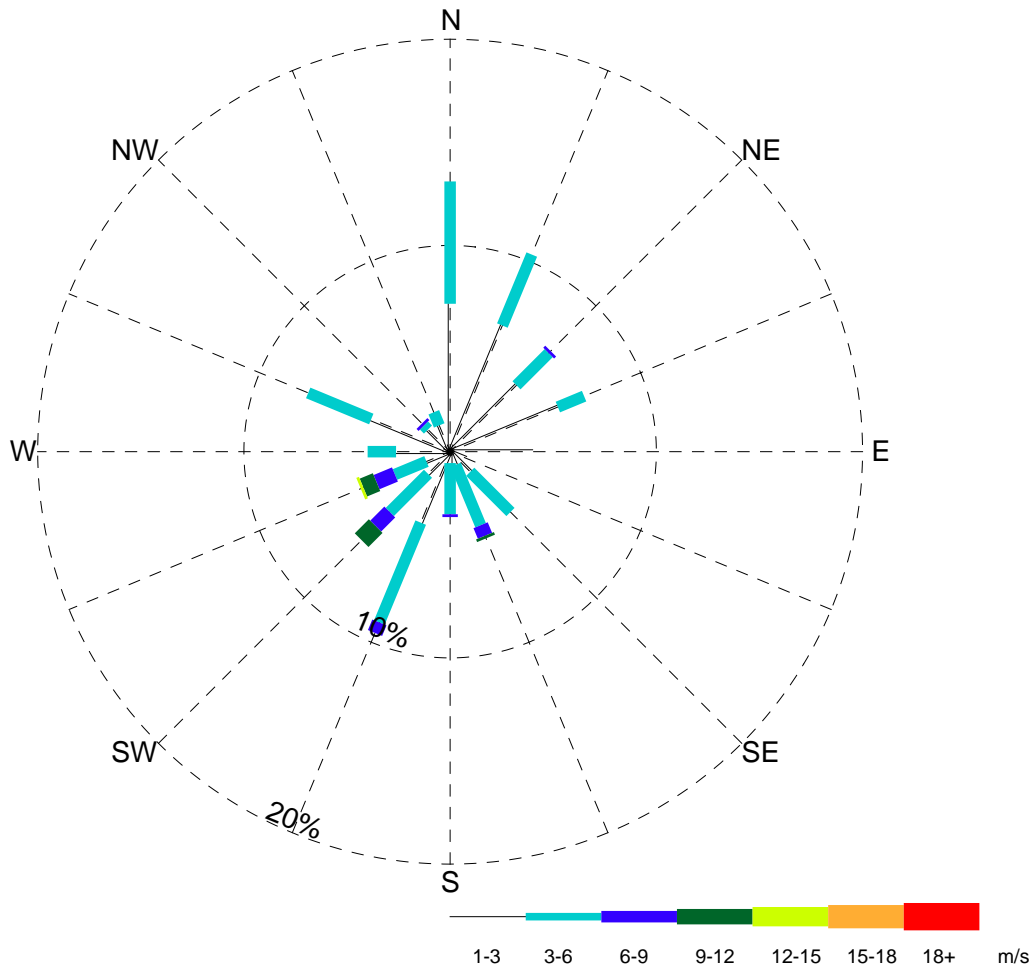
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DATE
November 2008

Figure F-34



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: May 1, 2008
 End Date: May 31, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	5.66	1.38	-	-	-	-	-	7.03
NE	-	4.55	2.21	0.14	-	-	-	-	6.90
NNE	-	6.62	3.72	-	-	-	-	-	10.35
N	-	7.17	5.93	-	-	-	-	-	13.10
NNW	-	1.38	0.69	-	-	-	-	-	2.07
NW	-	1.52	0.28	0.14	-	-	-	-	1.93
WNW	-	4.14	3.31	-	-	-	-	-	7.45
W	-	2.62	1.38	-	-	-	-	-	4.00
WSW	-	1.24	1.65	0.97	0.69	0.14	-	-	4.69
SW	-	1.52	2.62	0.97	0.97	-	-	-	6.07
SSW	-	3.72	5.24	0.55	-	-	-	-	9.52
S	-	0.55	2.48	0.14	-	-	-	-	3.17
SSE	-	0.69	3.17	0.55	0.14	-	-	-	4.55
SE	-	1.38	2.76	-	-	-	-	-	4.14
ESE	-	0.83	-	-	-	-	-	-	0.83
E	-	4.00	-	-	-	-	-	-	4.00
Calm	10.21	-	-	-	-	-	-	-	10.21
Total (%)	10.21	47.59	36.83	3.45	1.79	0.14	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
May 2008**

EBA Engineering
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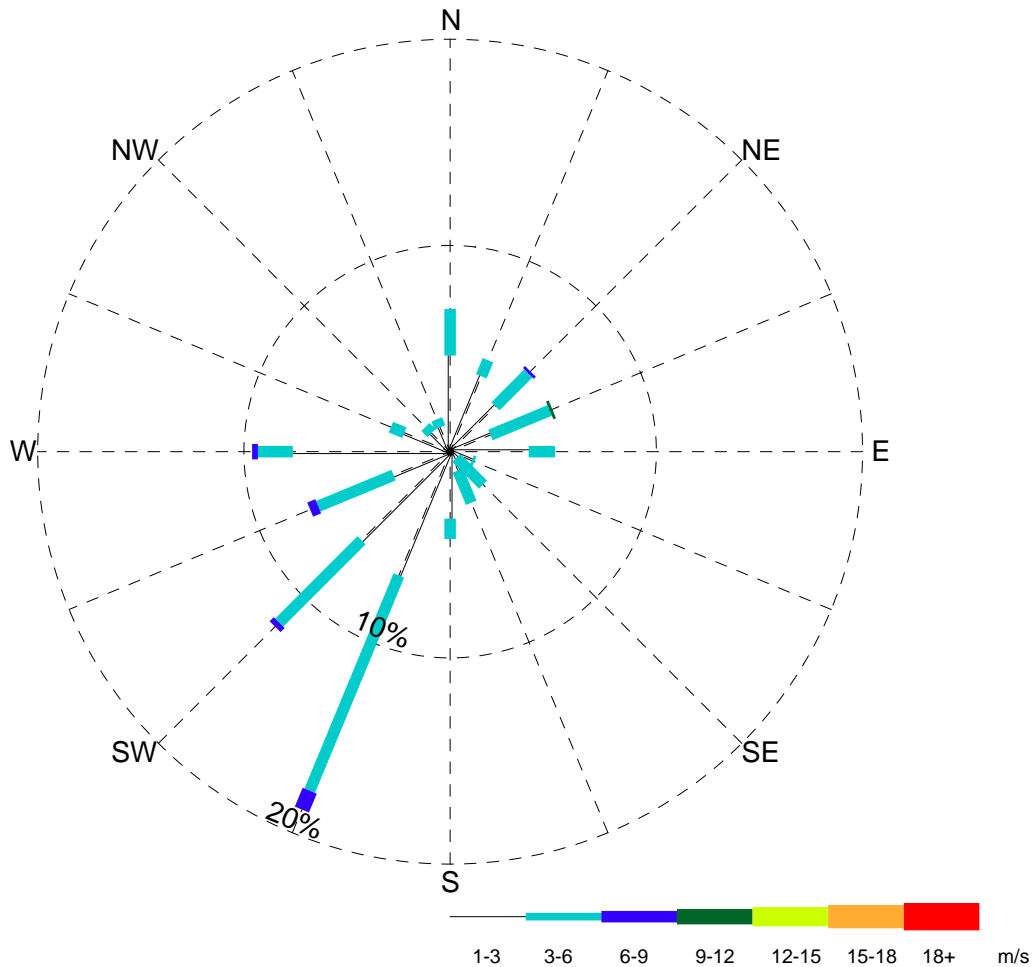
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Figure F-35



Wind Speed & Direction Frequency Distribution Table

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 30 days
 Start Date: June 1, 2008
 End Date: June 30, 2008

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.12	3.11	-	0.14	-	-	-	5.37
NE	-	3.11	2.26	0.14	-	-	-	-	5.51
NNE	-	3.95	0.85	-	-	-	-	-	4.80
N	-	4.66	2.26	-	-	-	-	-	6.92
NNW	-	1.27	0.42	-	-	-	-	-	1.70
NW	-	1.27	0.42	-	-	-	-	-	1.70
WNW	-	2.40	0.71	-	-	-	-	-	3.11
W	-	7.63	1.70	0.28	-	-	-	-	9.60
WSW	-	2.97	3.95	0.42	-	-	-	-	7.34
SW	-	6.07	5.65	0.28	-	-	-	-	12.01
SSW	-	6.50	11.30	0.99	-	-	-	-	18.78
S	-	3.25	0.99	-	-	-	-	-	4.24
SSE	-	0.99	1.70	-	-	-	-	-	2.68
SE	-	0.42	1.84	-	-	-	-	-	2.26
ESE	-	1.13	0.14	-	-	-	-	-	1.27
E	-	3.81	1.27	-	-	-	-	-	5.09
Calm	7.63	-	-	-	-	-	-	-	7.63
Total (%)	7.63	51.55	38.56	2.12	0.14	-	-	-	100.00

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
June 2008**

EBA Engineering
Consultants Ltd.



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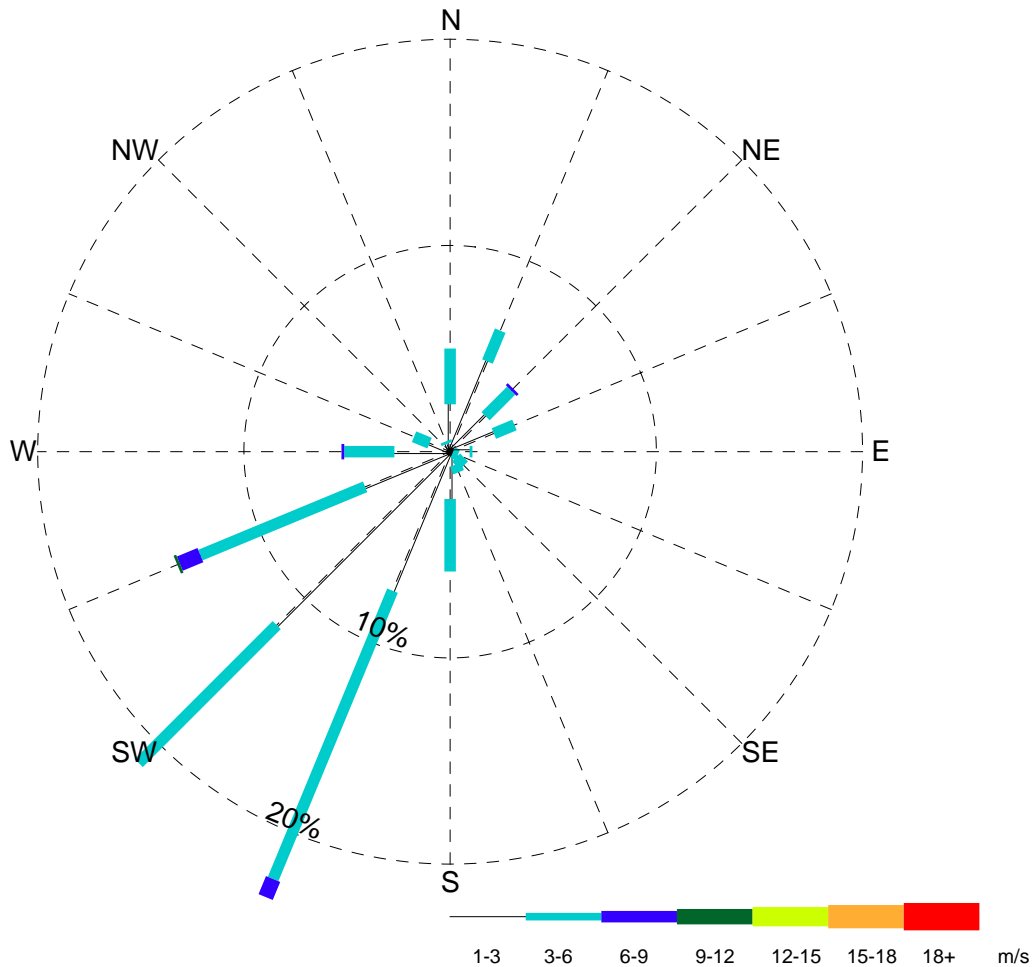
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Figure F-36



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	2.30	1.08	-	-	-	-	-	3.38
NE	-	2.43	1.76	0.14	-	-	-	-	4.32
NNE	-	4.73	1.62	-	-	-	-	-	6.35
N	-	2.30	2.70	-	-	-	-	-	5.00
NNW	-	0.41	0.14	-	-	-	-	-	0.54
NW	-	0.14	-	-	-	-	-	-	0.14
WNW	-	1.08	0.81	-	-	-	-	-	1.89
W	-	2.70	2.43	0.14	-	-	-	-	5.27
WSW	-	4.46	8.65	1.08	0.14	-	-	-	14.32
SW	-	11.89	9.46	-	-	-	-	-	21.35
SSW	-	7.30	15.14	0.95	-	-	-	-	23.38
S	-	2.30	3.51	-	-	-	-	-	5.81
SSE	-	0.68	0.41	-	-	-	-	-	1.08
SE	-	0.41	0.54	-	-	-	-	-	0.95
ESE	-	0.14	0.27	-	-	-	-	-	0.41
E	-	0.95	0.14	-	-	-	-	-	1.08
Calm	4.73	-	-	-	-	-	-	-	4.73
Total (%)	4.73	44.19	48.65	2.30	0.14	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: July 1, 2008
 End Date: July 31, 2008

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**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
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 July 2008**

PROJECT NO.
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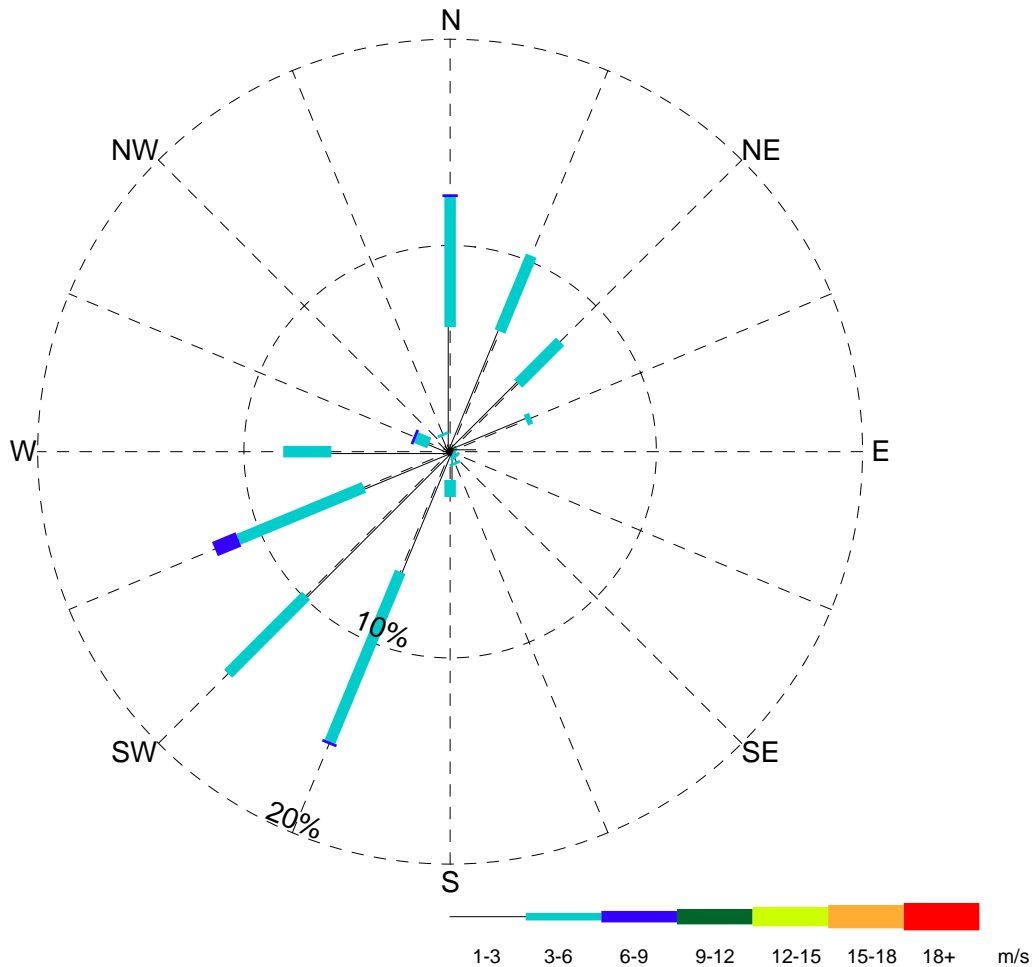
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Figure F-37



Wind Speed & Direction Frequency Distribution Table

Direction	Percent Occurrence (%)								Total (%)
	0-1 m/s	1-3 m/s	3-6 m/s	6-9 m/s	9-12 m/s	12-15 m/s	15-18 m/s	18+ m/s	
ENE	-	3.98	0.27	-	-	-	-	-	4.25
NE	-	4.66	2.88	-	-	-	-	-	7.55
NNE	-	6.31	3.98	-	-	-	-	-	10.29
N	-	6.04	6.31	0.14	-	-	-	-	12.48
NNW	-	0.82	0.14	-	-	-	-	-	0.96
NW	-	0.69	-	-	-	-	-	-	0.69
WNW	-	1.10	0.69	0.14	-	-	-	-	1.92
W	-	5.76	2.33	-	-	-	-	-	8.09
WSW	-	4.53	6.58	1.24	-	-	-	-	12.35
SW	-	9.88	5.35	-	-	-	-	-	15.23
SSW	-	6.31	8.92	0.14	-	-	-	-	15.36
S	-	1.37	0.82	-	-	-	-	-	2.19
SSE	-	0.55	0.14	-	-	-	-	-	0.69
SE	-	0.27	0.14	-	-	-	-	-	0.41
ESE	-	0.14	0.14	-	-	-	-	-	0.27
E	-	1.24	-	-	-	-	-	-	1.24
Calm	6.04	-	-	-	-	-	-	-	6.04
Total (%)	6.04	53.63	38.68	1.65	-	-	-	-	100.00

Station Name: Macmillan Pass
 NAD 27 Location:
 N63° 14' 36.9" W130° 2' 7.1"
 Elev. above SL: 1379 m
 Tower height: 10 m
 Record length: 31 days
 Start Date: August 1, 2008
 End Date: August 31, 2008

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Wind Rose
August 2008**

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Figure F-38



APPENDIX G

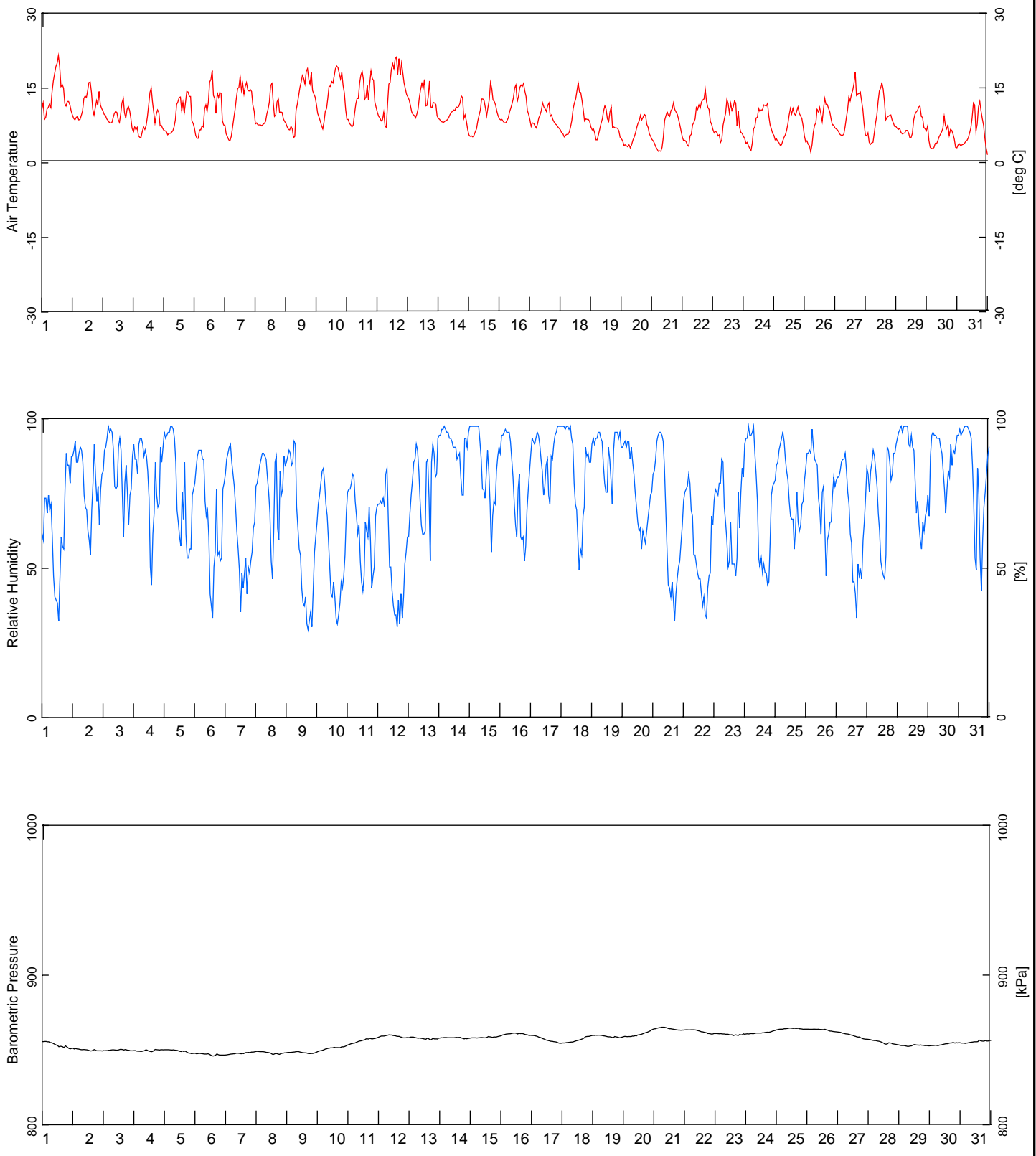
APPENDIX G MONTHLY MACMILLAN PASS WEATHER PARAMETERS – JULY 2005 TO AUGUST 2008

APPENDIX G

Monthly Macmillan Pass Weather Summaries July 2005 – August 2008

- G-01 Macmillan Pass Weather Parameters – July 2005
- G-02 Macmillan Pass Weather Parameters – August 2005
- G-03 Macmillan Pass Weather Parameters – September 2005
- G-04 Macmillan Pass Weather Parameters – October 2005
- G-05 Macmillan Pass Weather Parameters – November 2005
- G-06 Macmillan Pass Weather Parameters – December 2005
- G-07 Macmillan Pass Weather Parameters – January 2006
- G-08 Macmillan Pass Weather Parameters – February 2006
- G-09 Macmillan Pass Weather Parameters – March 2006
- G-10 Macmillan Pass Weather Parameters – April 2006
- G-11 Macmillan Pass Weather Parameters – May 2006
- G-12 Macmillan Pass Weather Parameters – June 2006
- G-13 Macmillan Pass Weather Parameters – July 2006
- G-14 Macmillan Pass Weather Parameters – August 2006
- G-15 Macmillan Pass Weather Parameters – September 2006
- G-16 Macmillan Pass Weather Parameters – October 2006
- G-17 Macmillan Pass Weather Parameters – November 2006
- G-18 Macmillan Pass Weather Parameters – December 2006
- G-19 Macmillan Pass Weather Parameters – January 2007
- G-20 Macmillan Pass Weather Parameters – February 2007
- G-21 Macmillan Pass Weather Parameters – March 2007
- G-22 Macmillan Pass Weather Parameters – April 2007
- G-23 Macmillan Pass Weather Parameters – May 2007

- G-24 Macmillan Pass Weather Parameters – June 2007
- G-25 Macmillan Pass Weather Parameters – July 2007
- G-26 Macmillan Pass Weather Parameters – August 2007
- G-27 Macmillan Pass Weather Parameters – September 2007
- G-28 Macmillan Pass Weather Parameters – October 2007
- G-29 Macmillan Pass Weather Parameters – November 2007
- G-30 Macmillan Pass Weather Parameters – December 2007
- G-31 Macmillan Pass Weather Parameters – January 2008
- G-32 Macmillan Pass Weather Parameters – February 2008
- G-33 Macmillan Pass Weather Parameters – March 2008
- G-34 Macmillan Pass Weather Parameters – April 2008
- G-35 Macmillan Pass Weather Parameters – May 2008
- G-36 Macmillan Pass Weather Parameters – June 2008
- G-37 Macmillan Pass Weather Parameters – July 2008
- G-38 Macmillan Pass Weather Parameters – August 2008



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
July 2005**

PROJECT NO.
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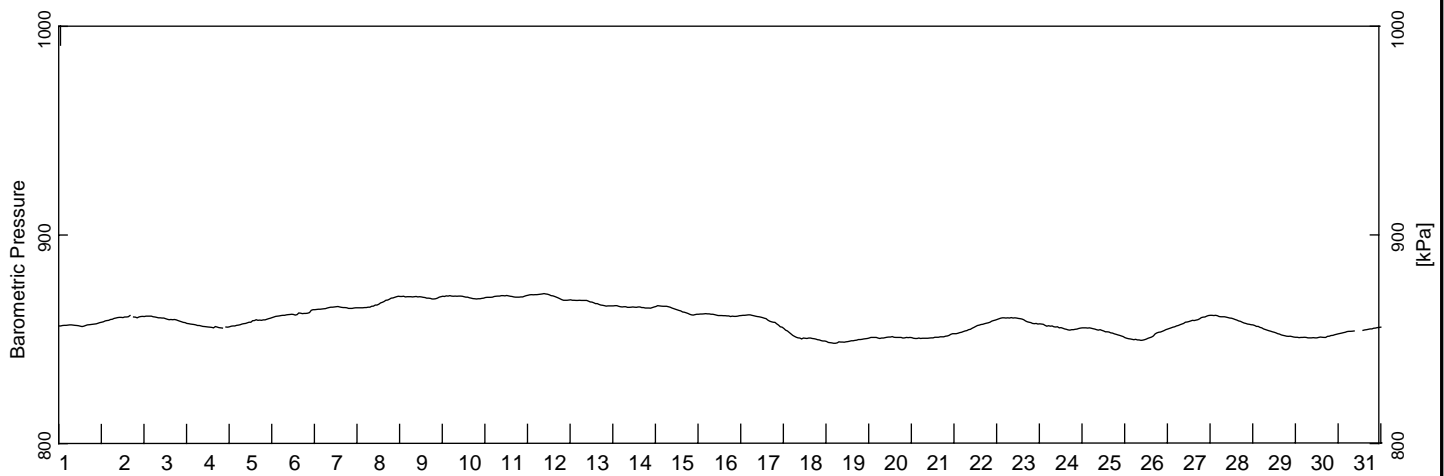
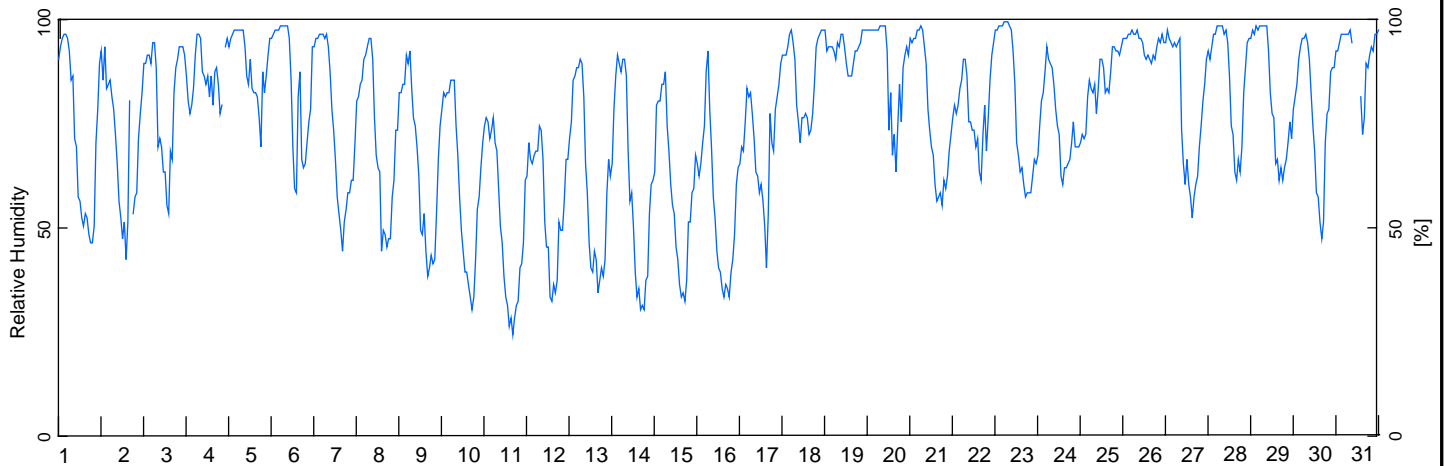
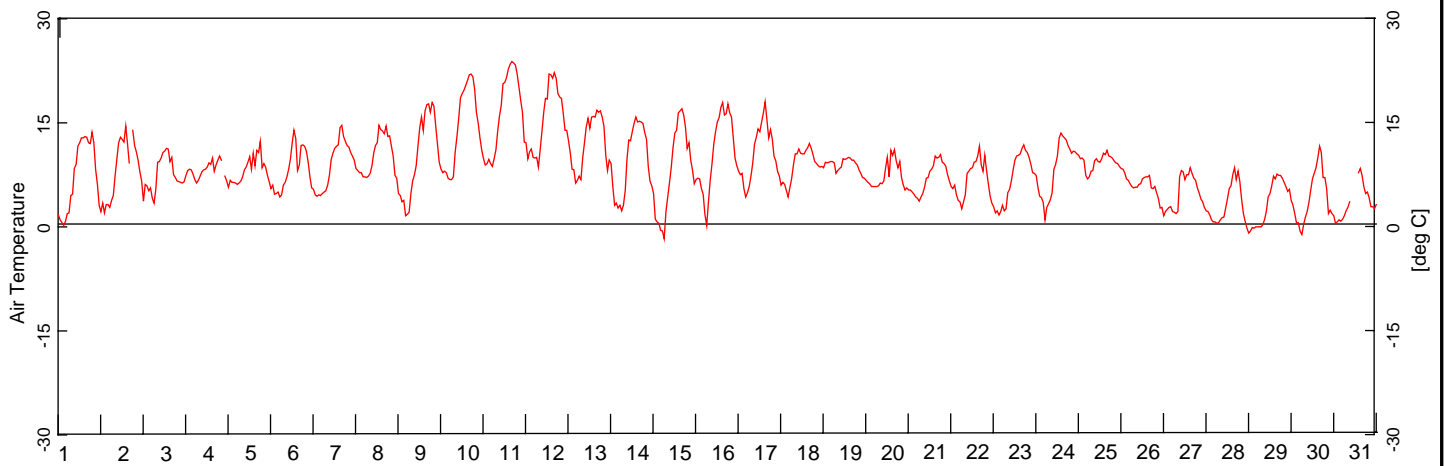
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November 2008

Figure G-01



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
August 2005**

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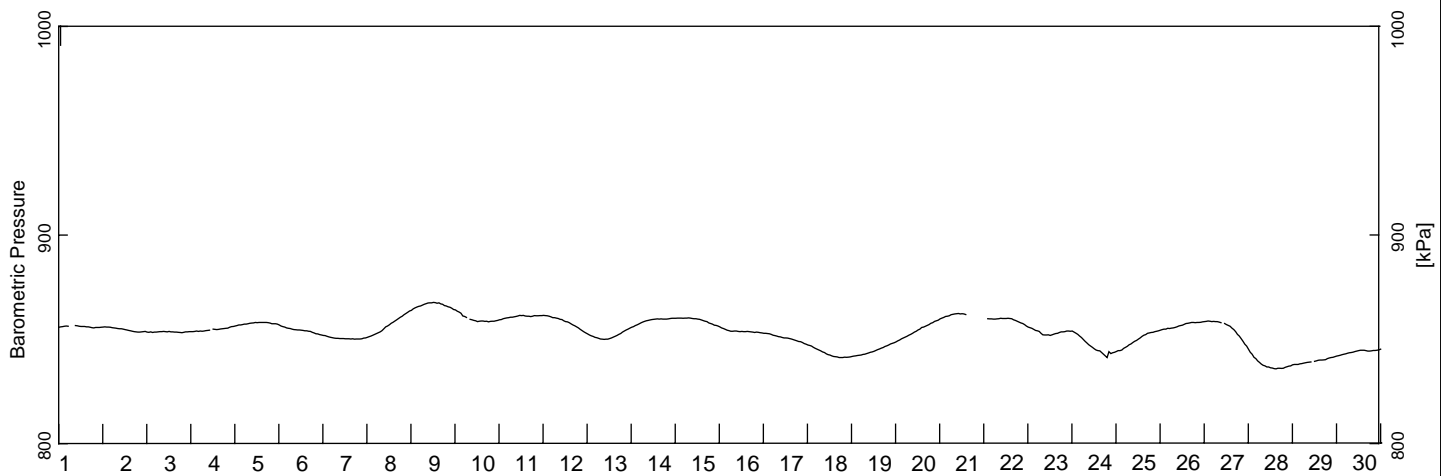
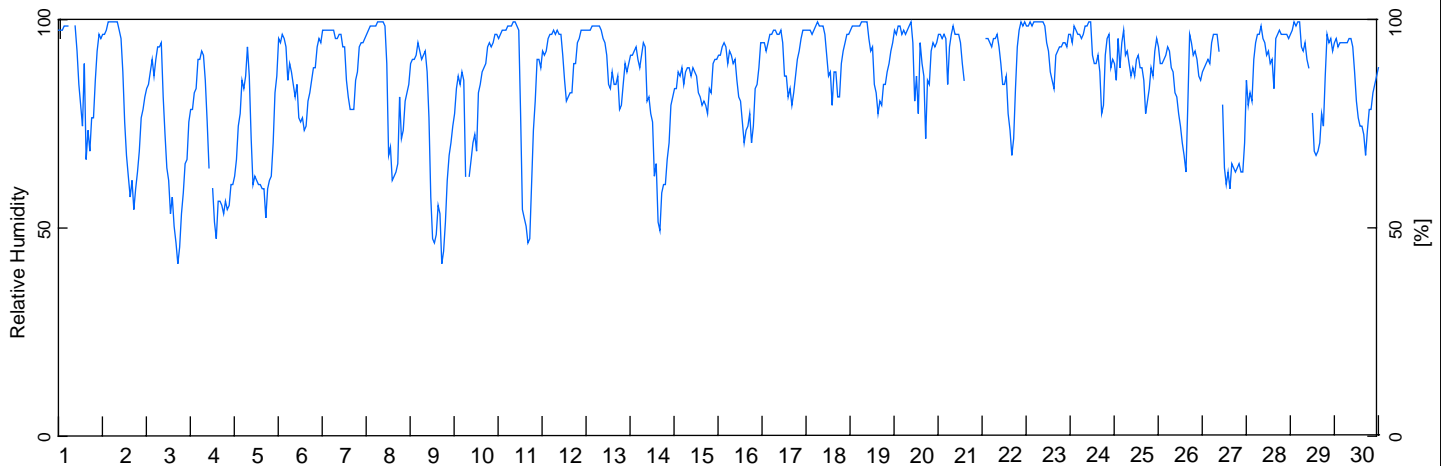
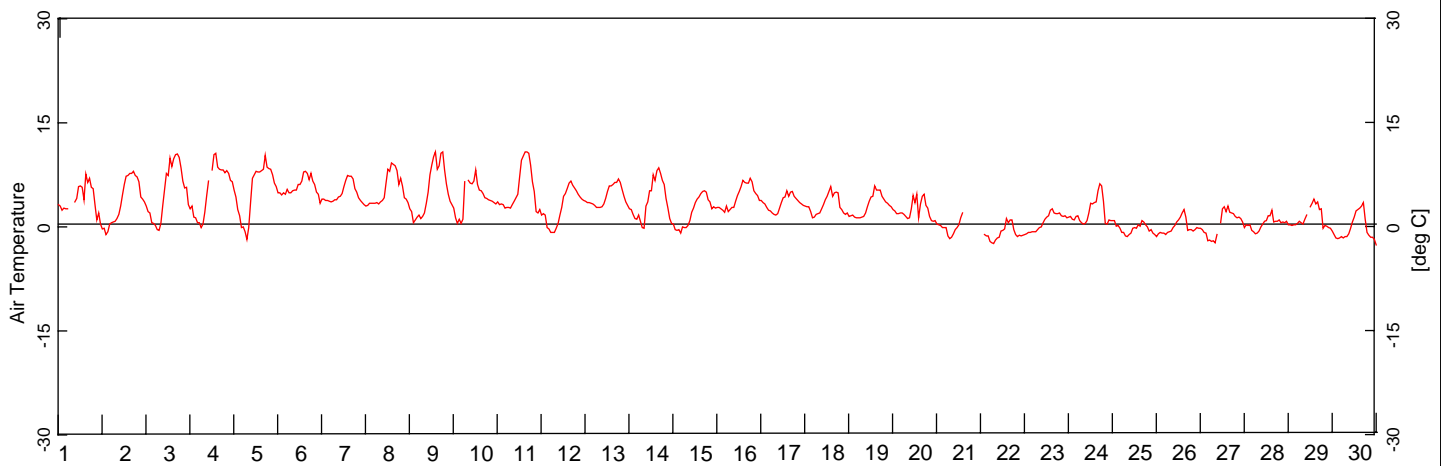
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DATE
November 2008

Figure G-02



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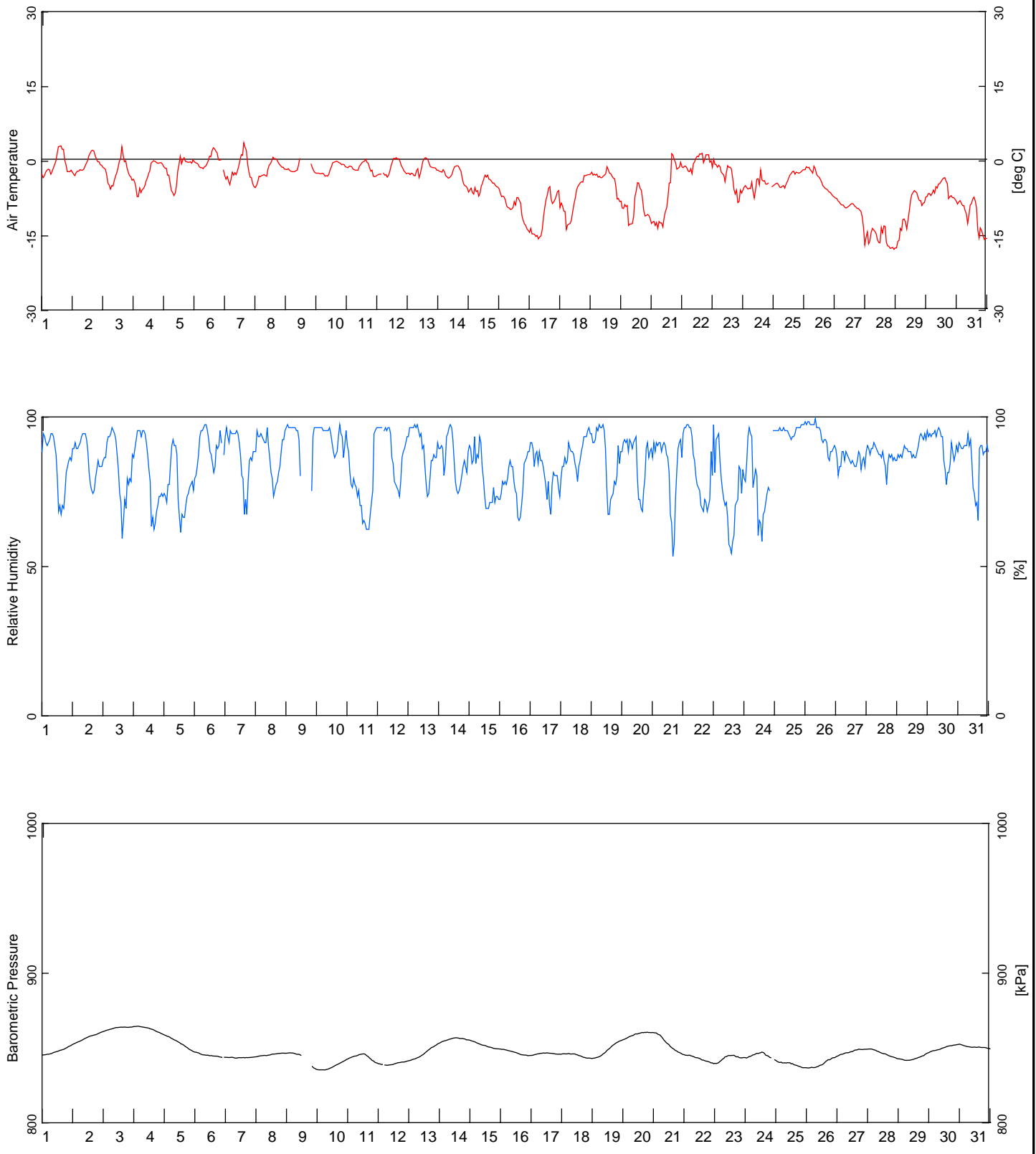


**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Weather Parameters
 September 2005**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-03



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
October 2005**

PROJECT NO.
W23101021

DWN
JR

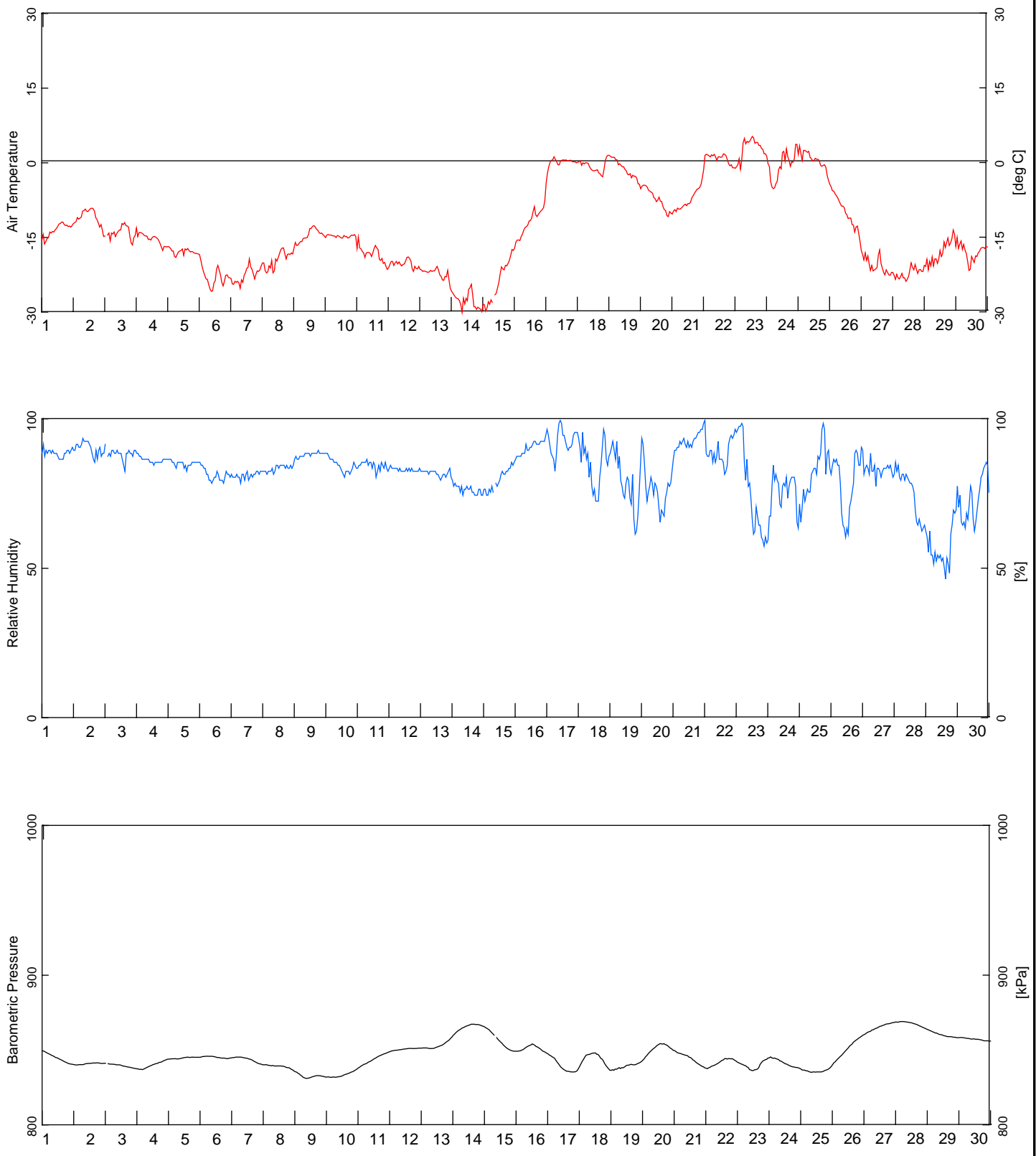
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Figure G-04



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
November 2005**

PROJECT NO.
W23101021

DWN
JR

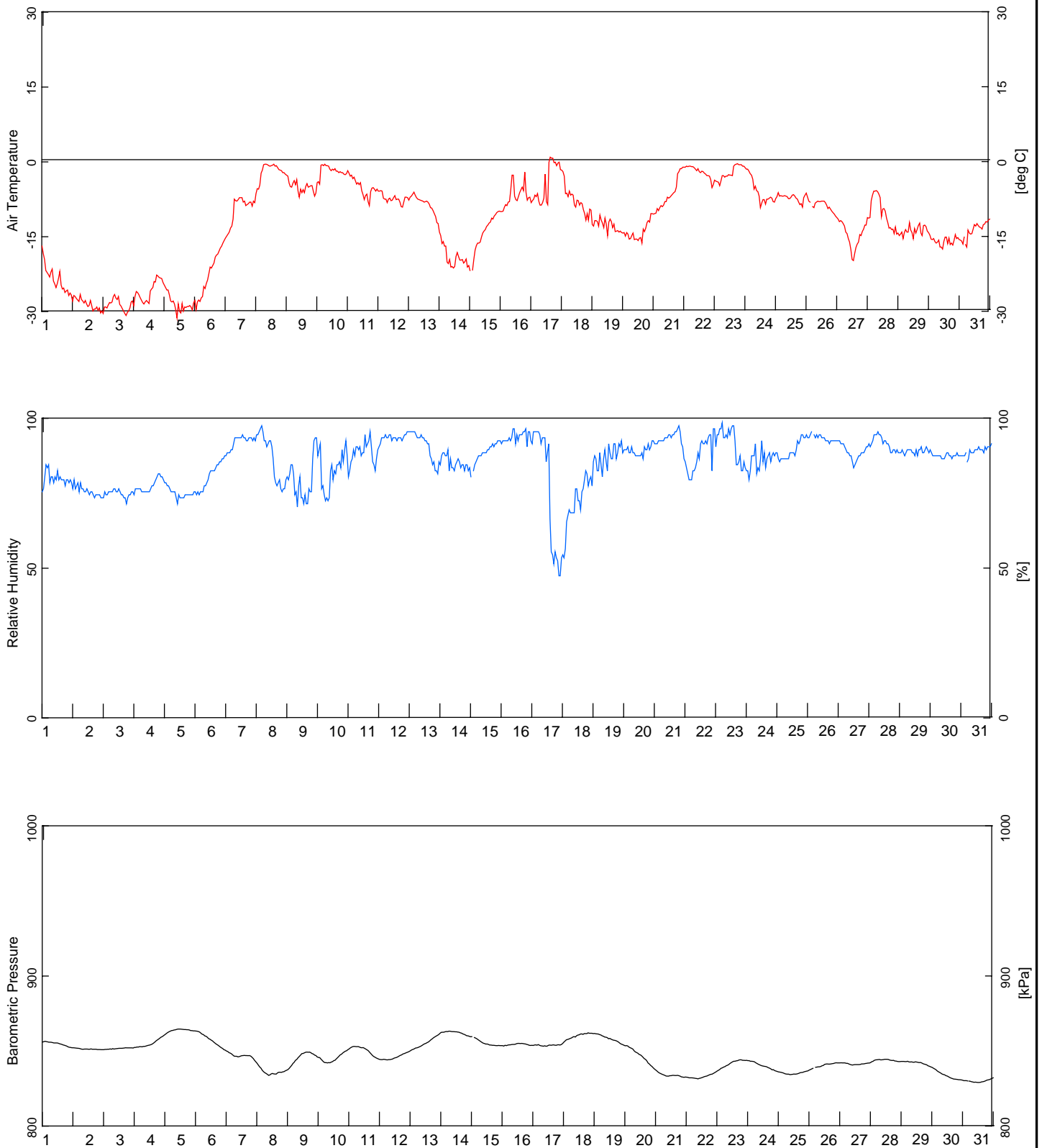
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DATE
November 2008

Figure G-05



NOTES

No data available from
 December 20 - 22, 2005
 and December 28 - 31, 2005

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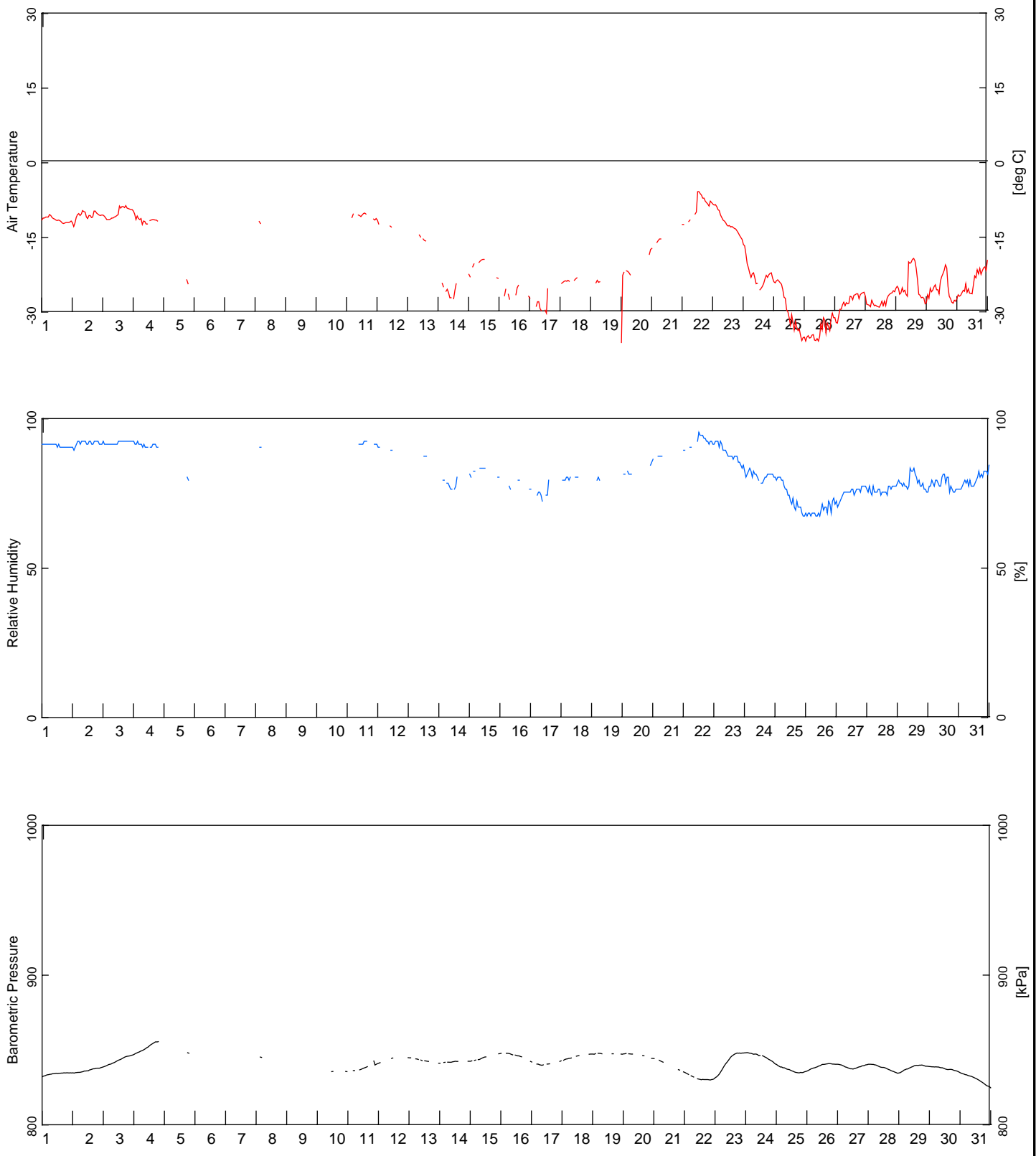


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 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Weather Parameters
 December 2005**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-06



NOTES
 No data available from
 January 1 - 21, 2006

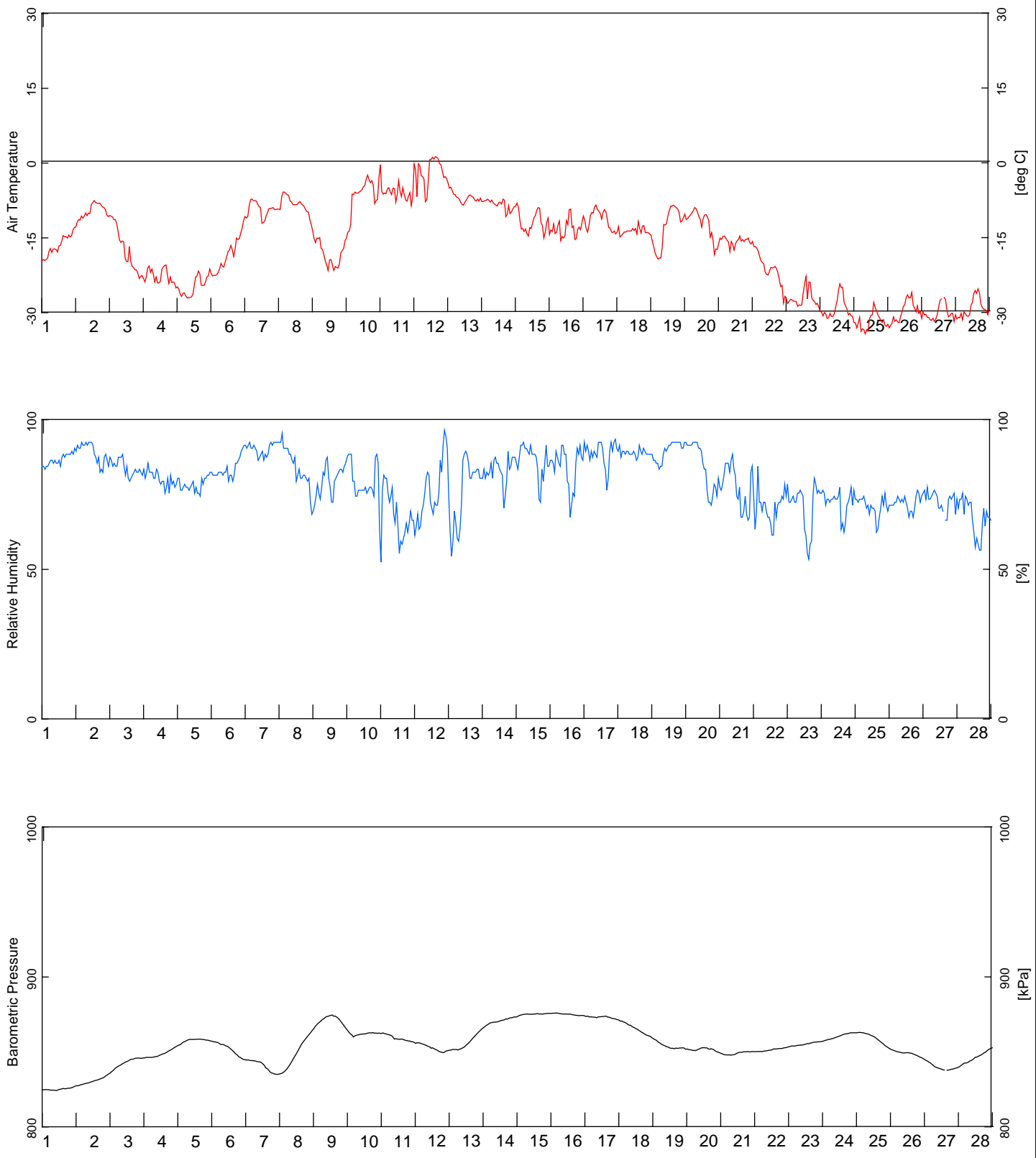
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 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Weather Parameters
 January 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-07



NOTES

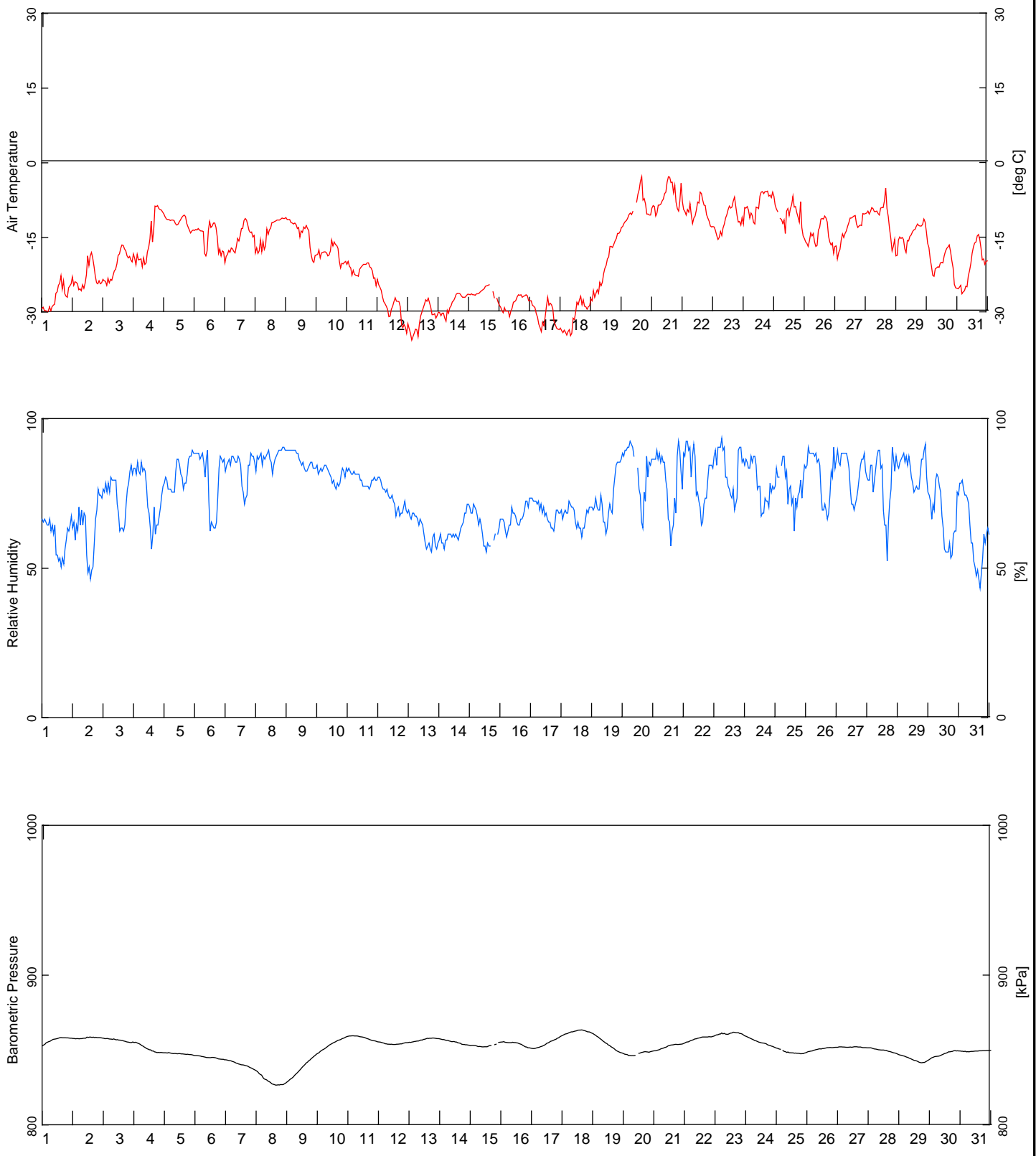
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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
February 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-08



NOTES

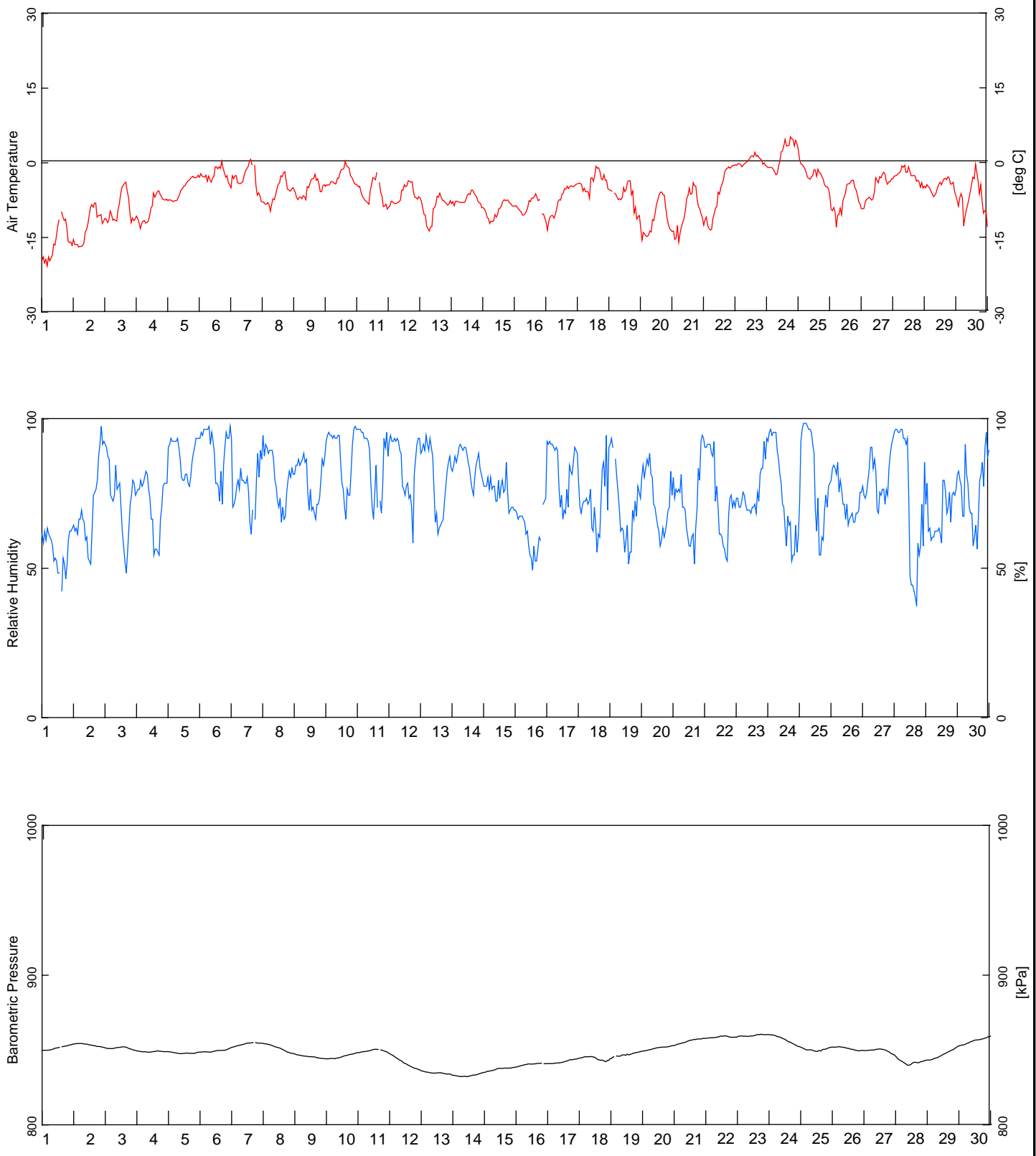
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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
March 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-09



NOTES

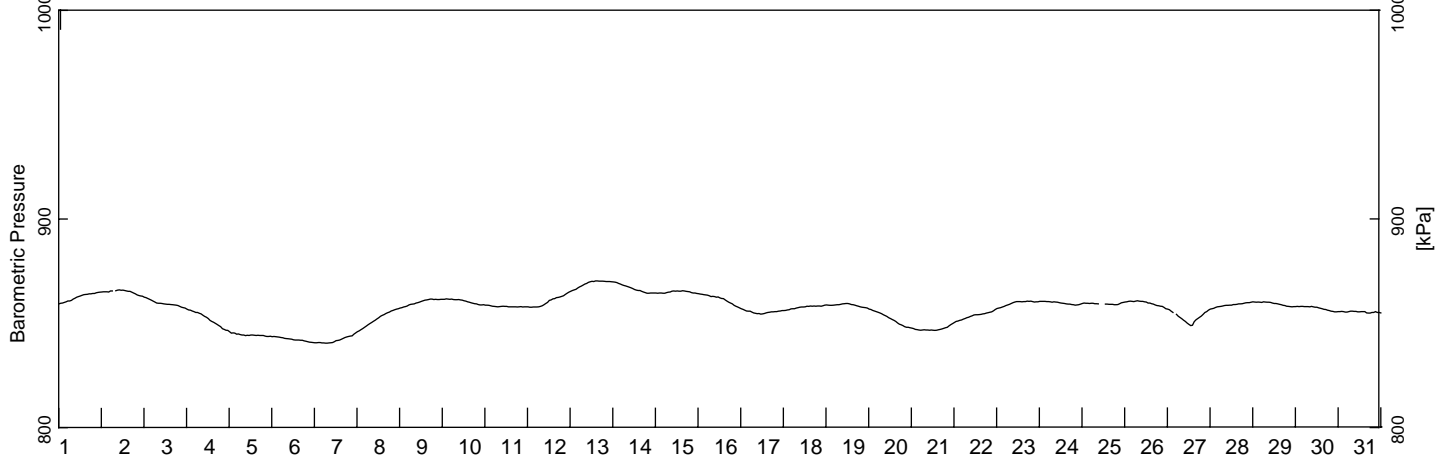
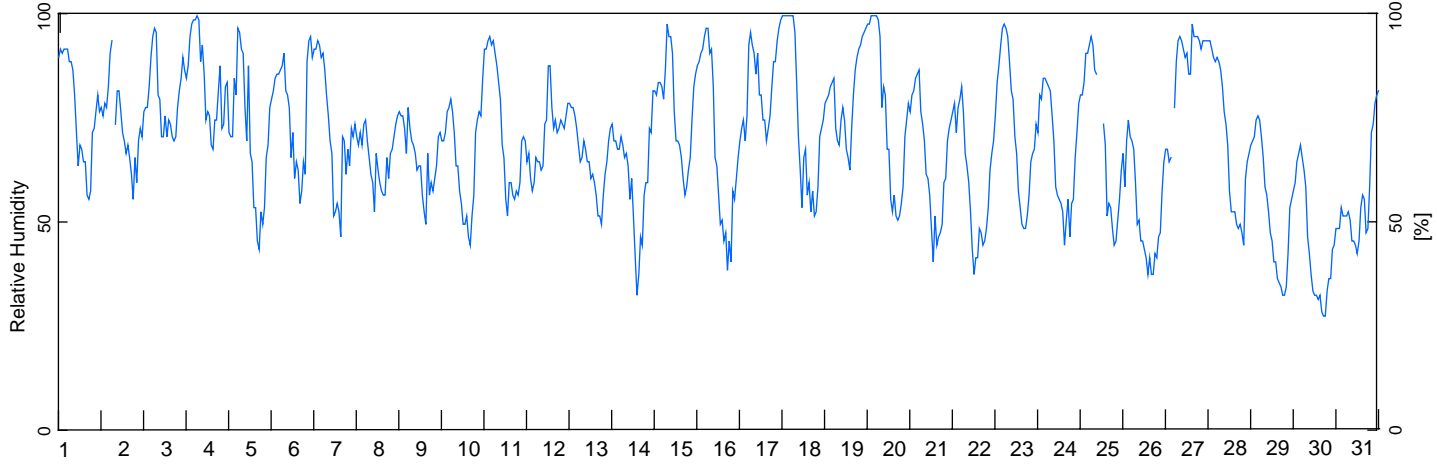
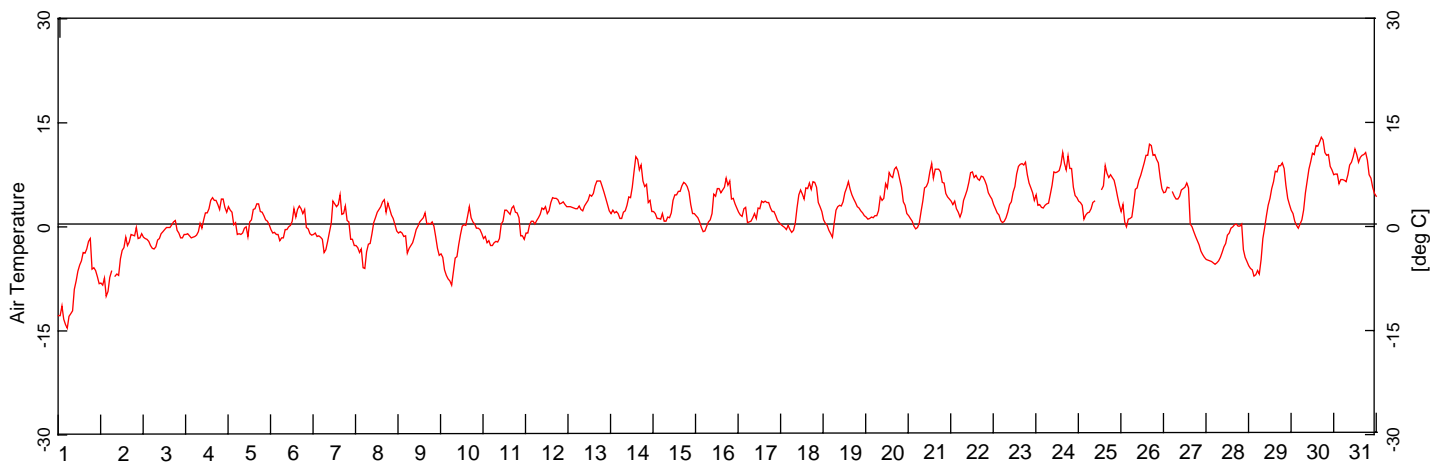
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

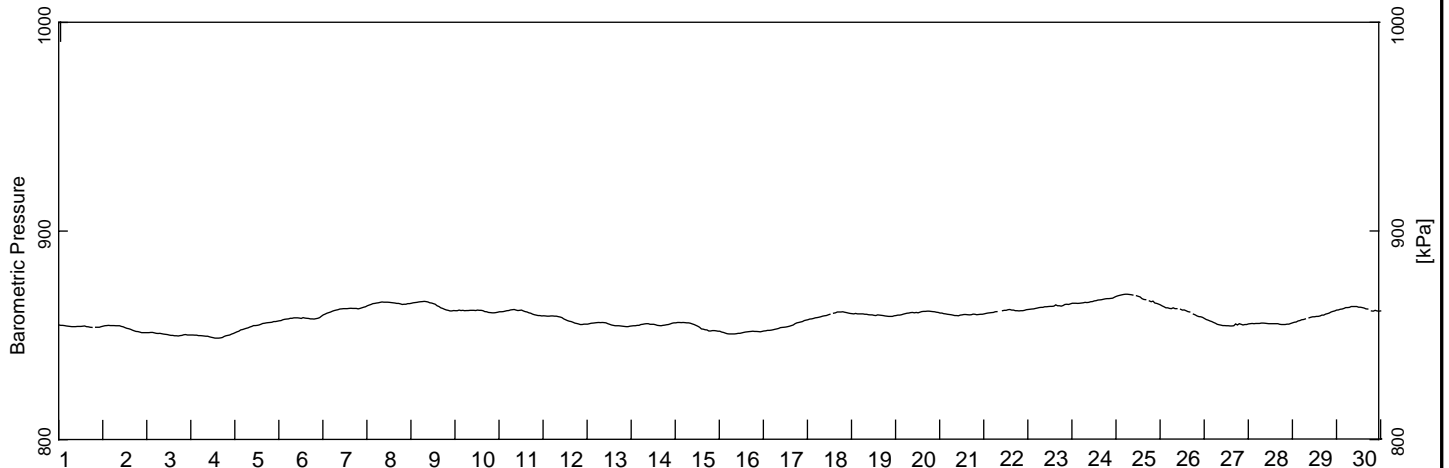
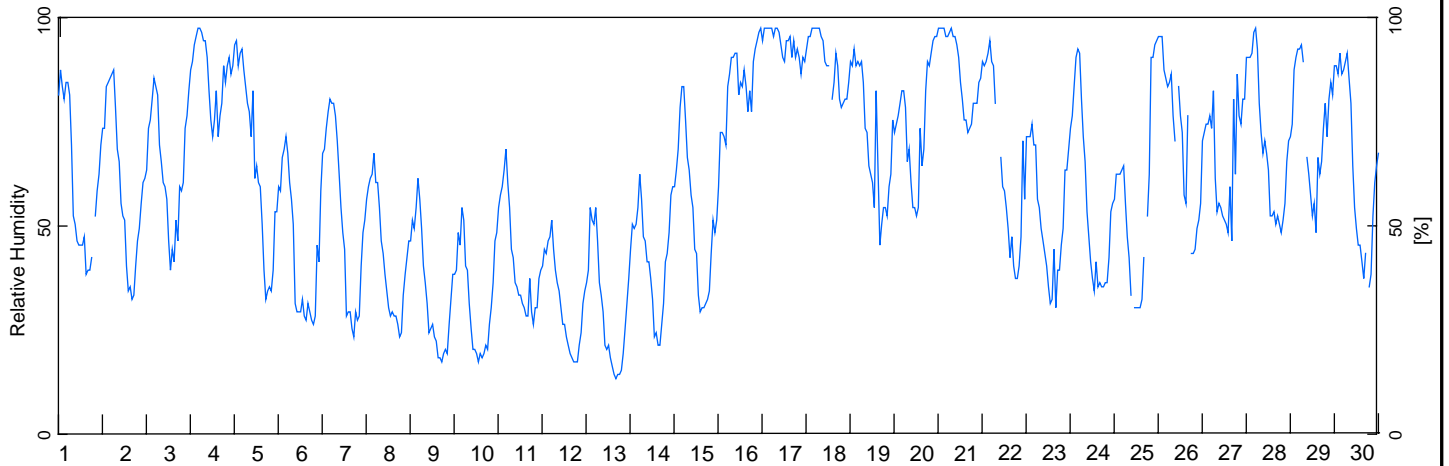
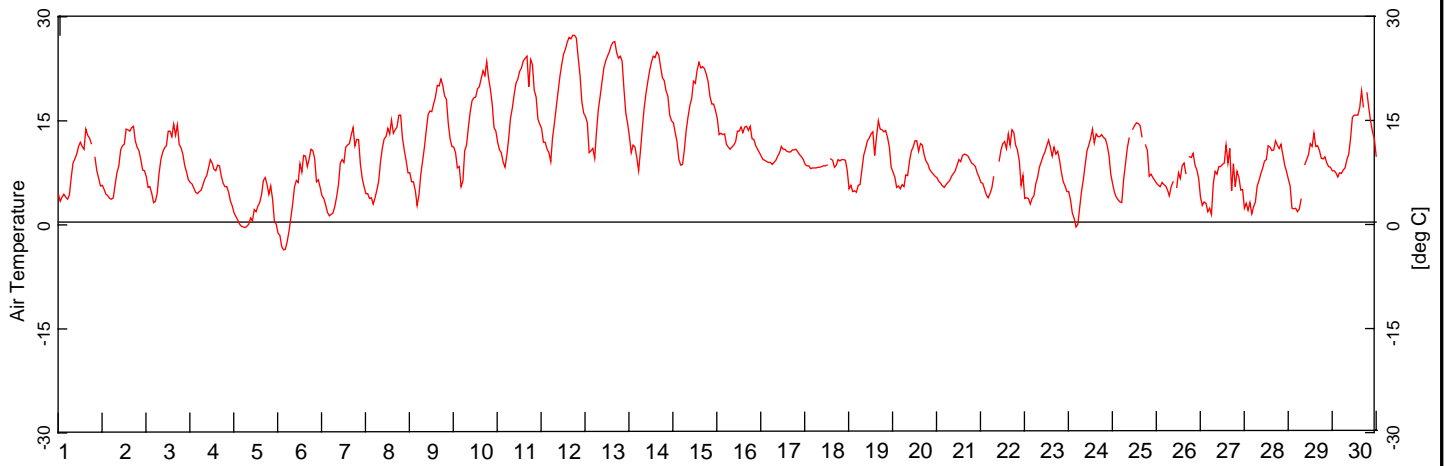
**Macmillan Pass
Weather Parameters
April 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-10



NOTES	CLIENT	MACTUNG PROJECT 2008 HYDROMETEOROLOGICAL SURVEY			
		Macmillan Pass Weather Parameters May 2006			
		PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
	OFFICE EBA-VANC	DATE November 2008		Figure G-11	



NOTES

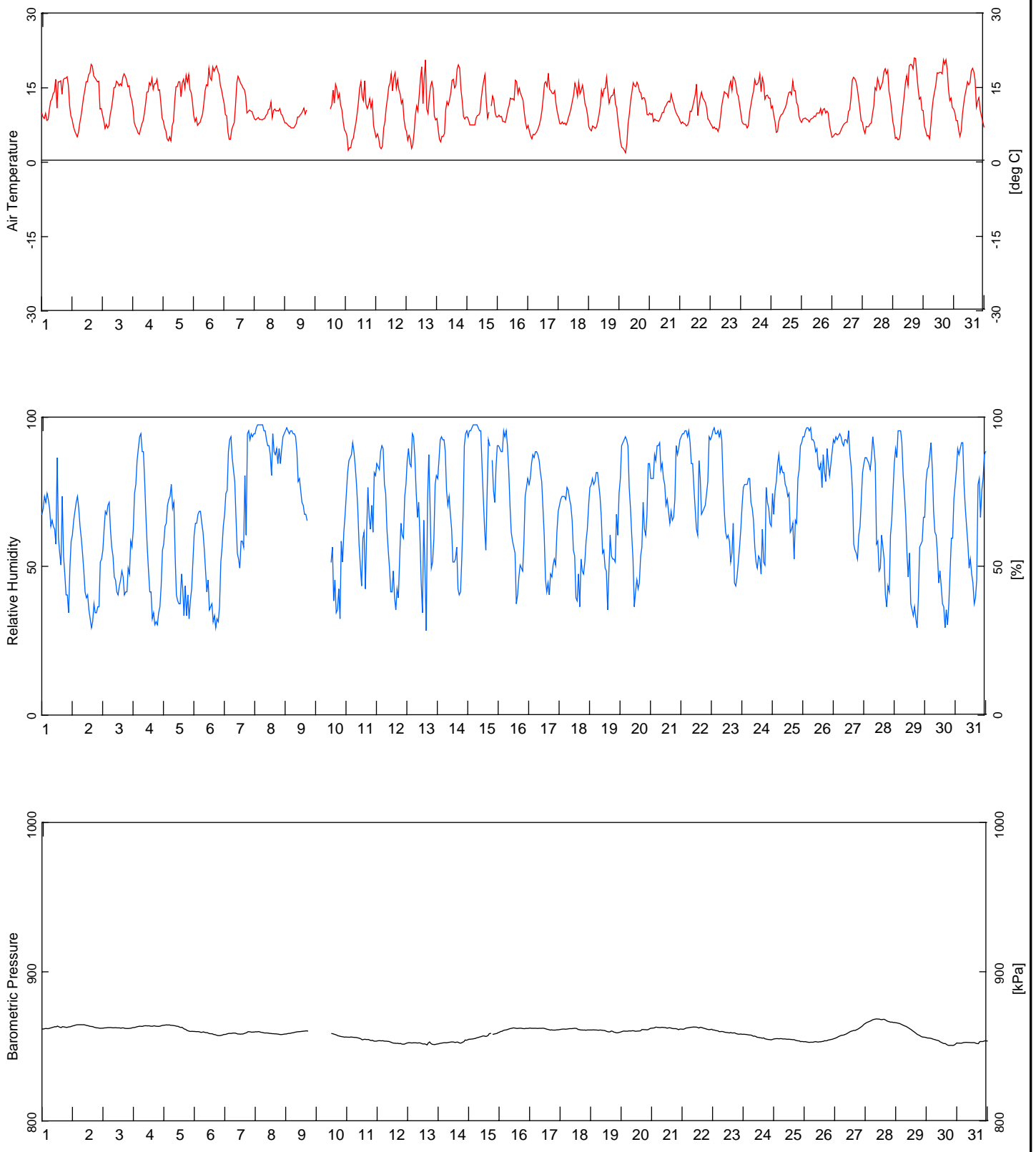
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
June 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-12



NOTES

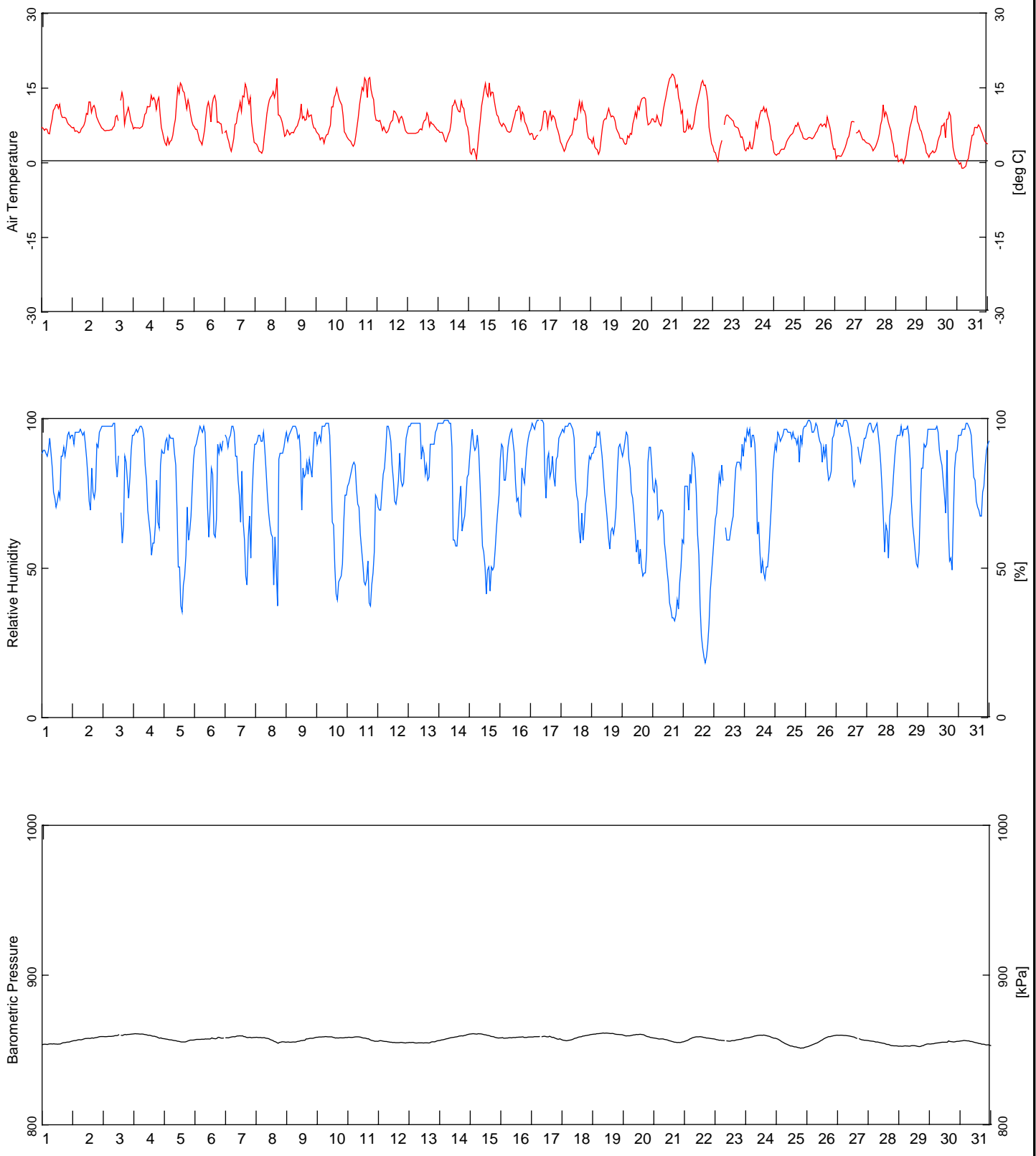
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
July 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-13



NOTES

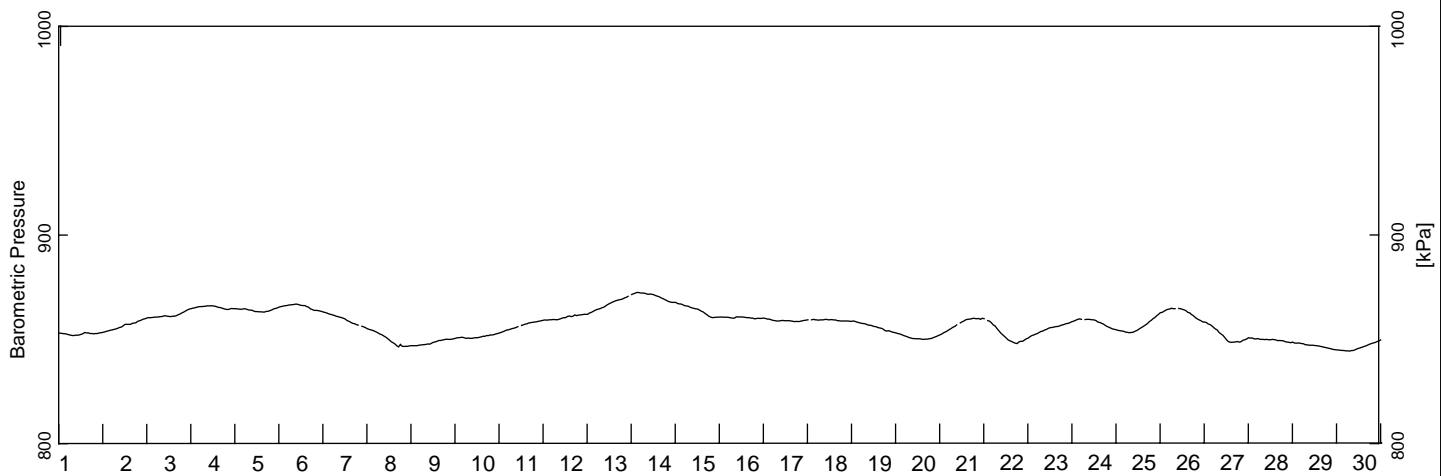
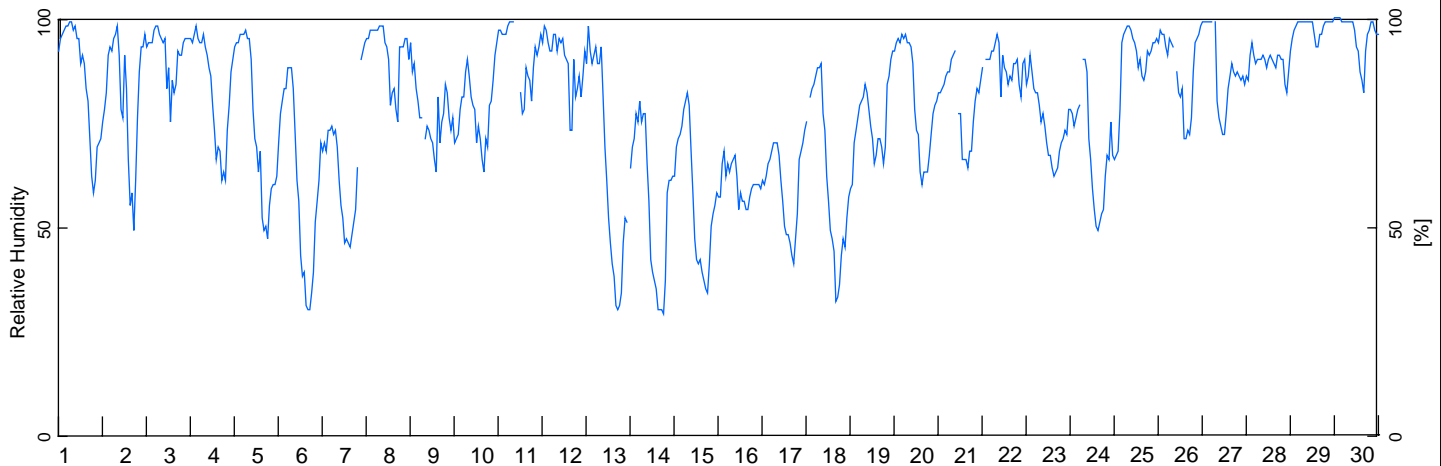
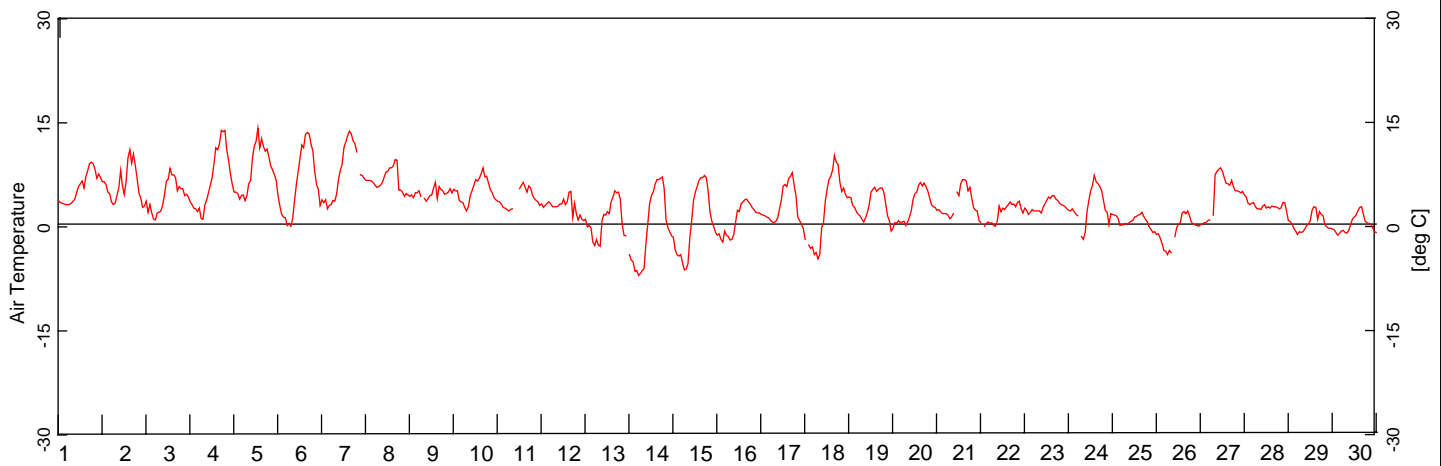
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
August 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-14



NOTES

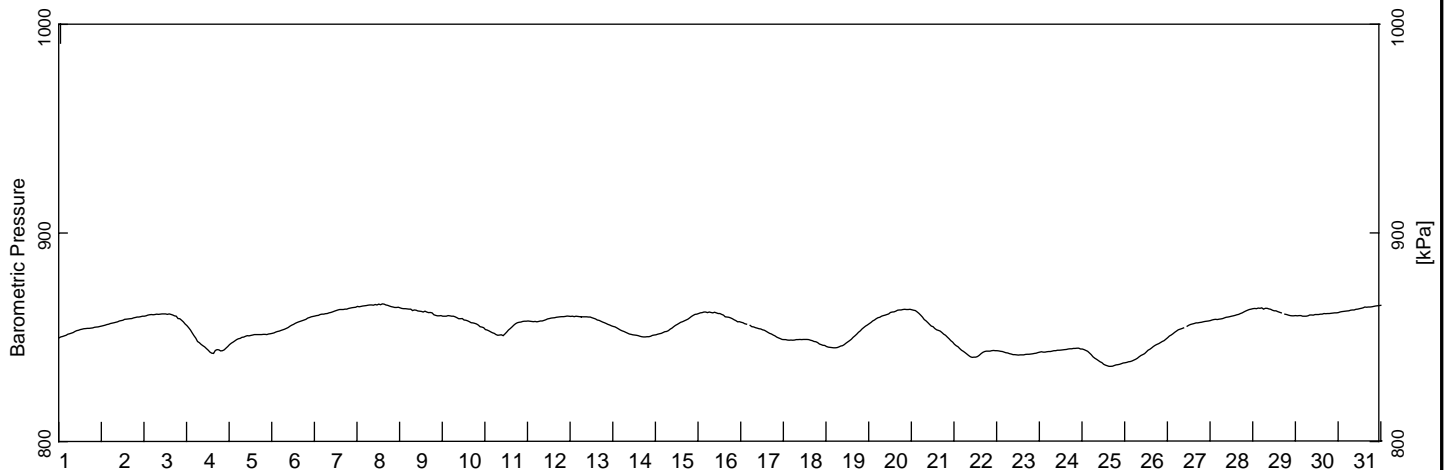
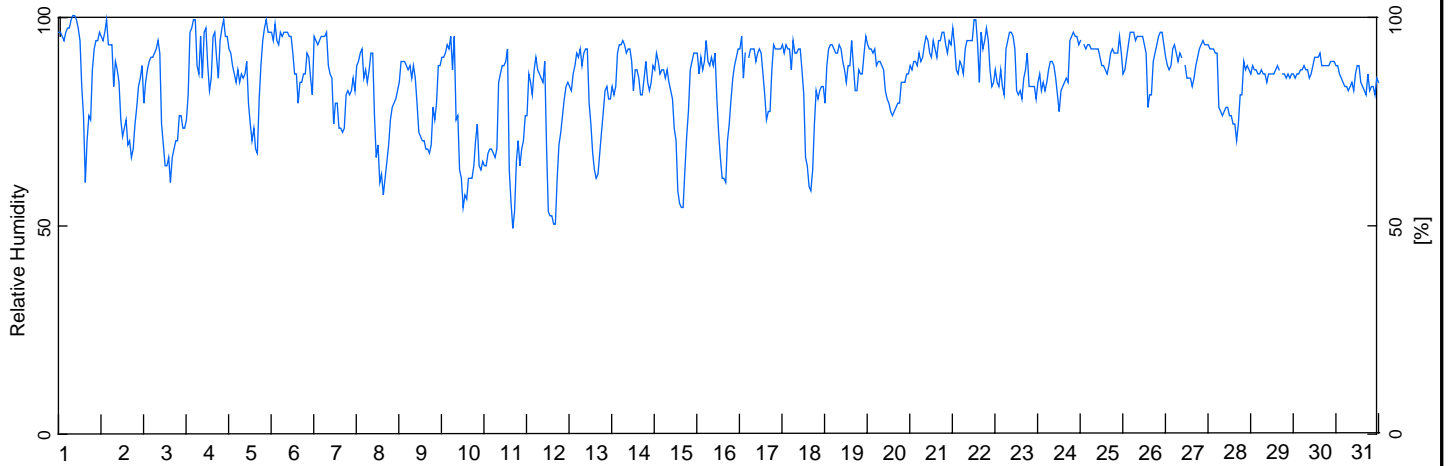
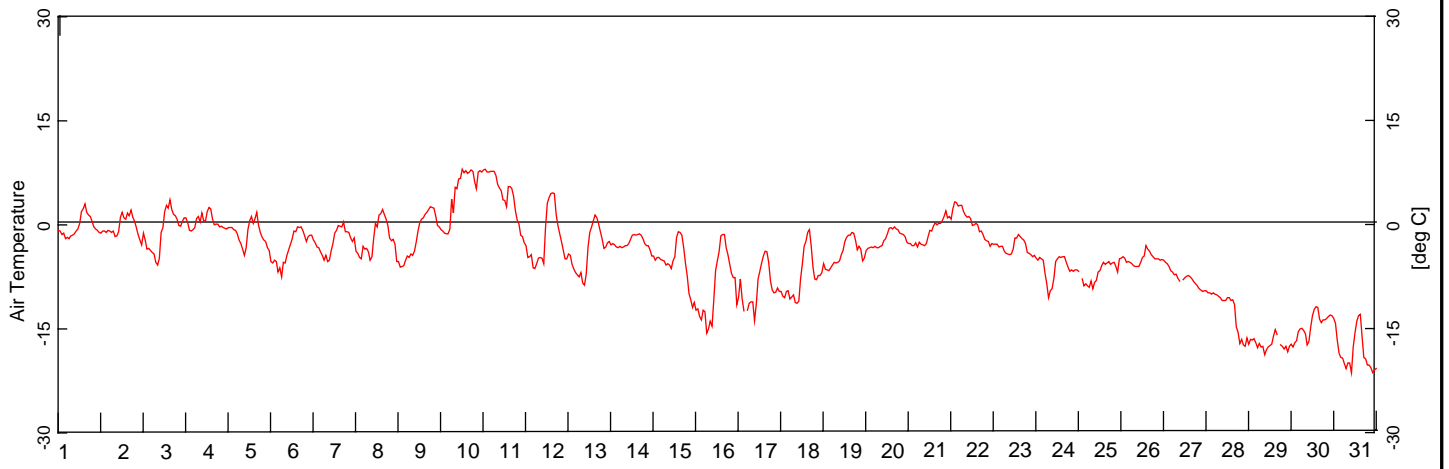
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
September 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-15



NOTES

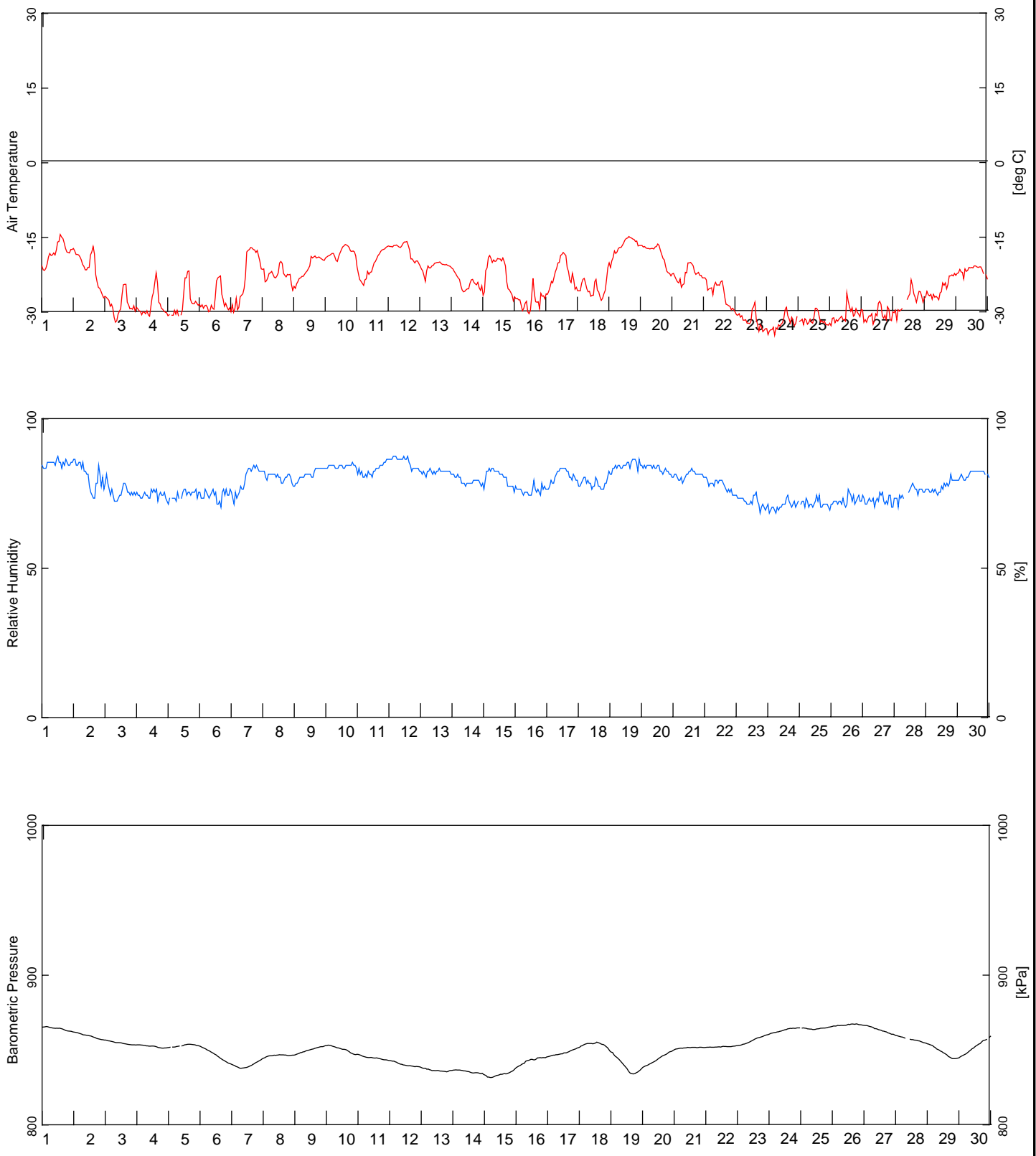
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
October 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-16



NOTES

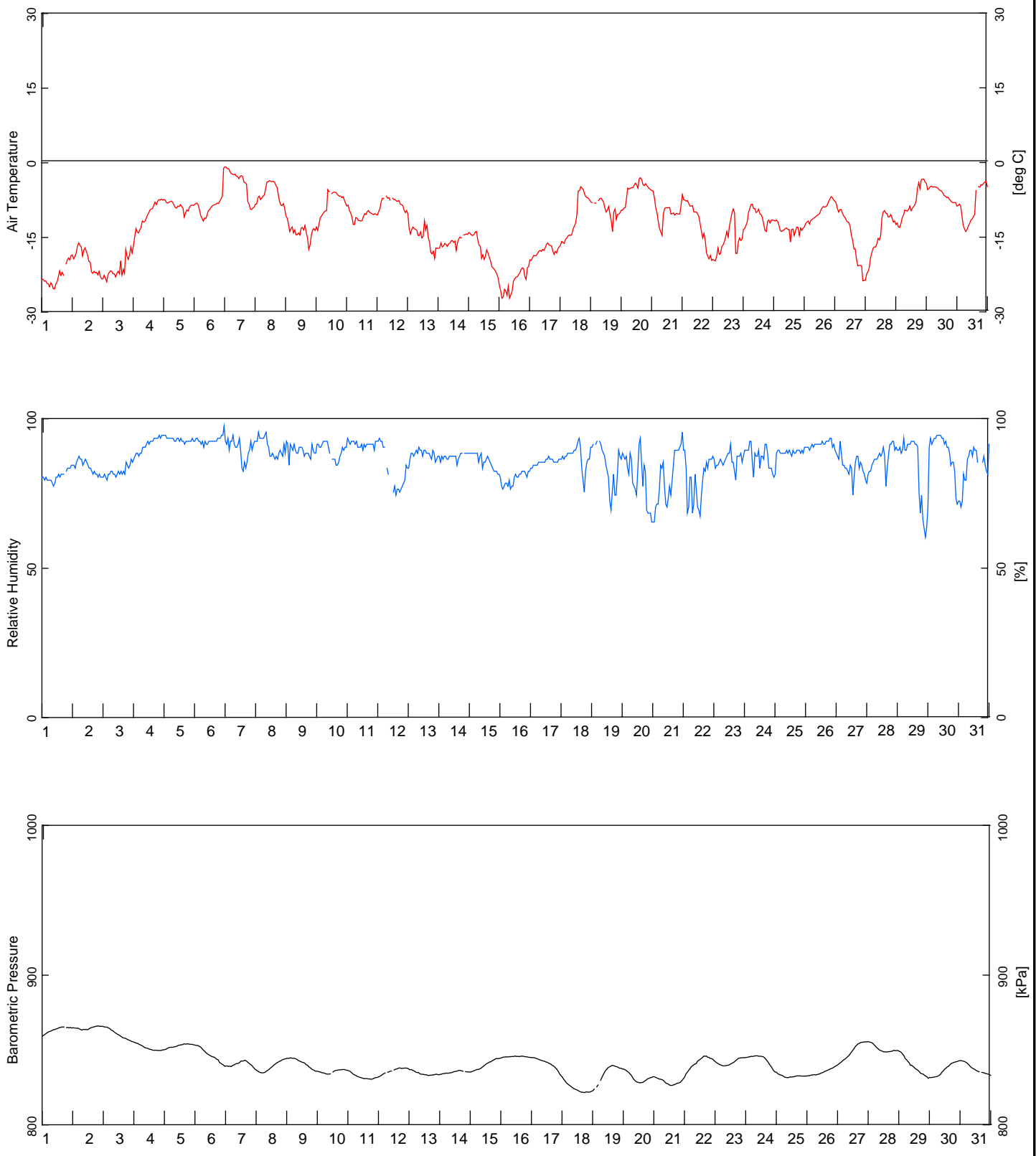
CLIENT

**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
November 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-17



NOTES
 No data available from
 December 16 - 18, 2006

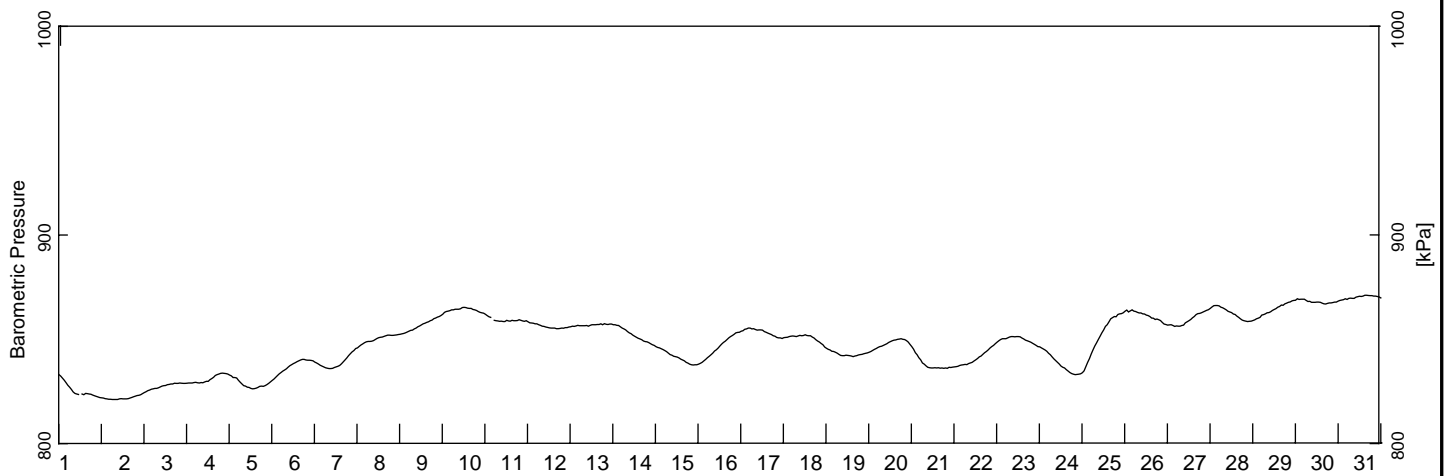
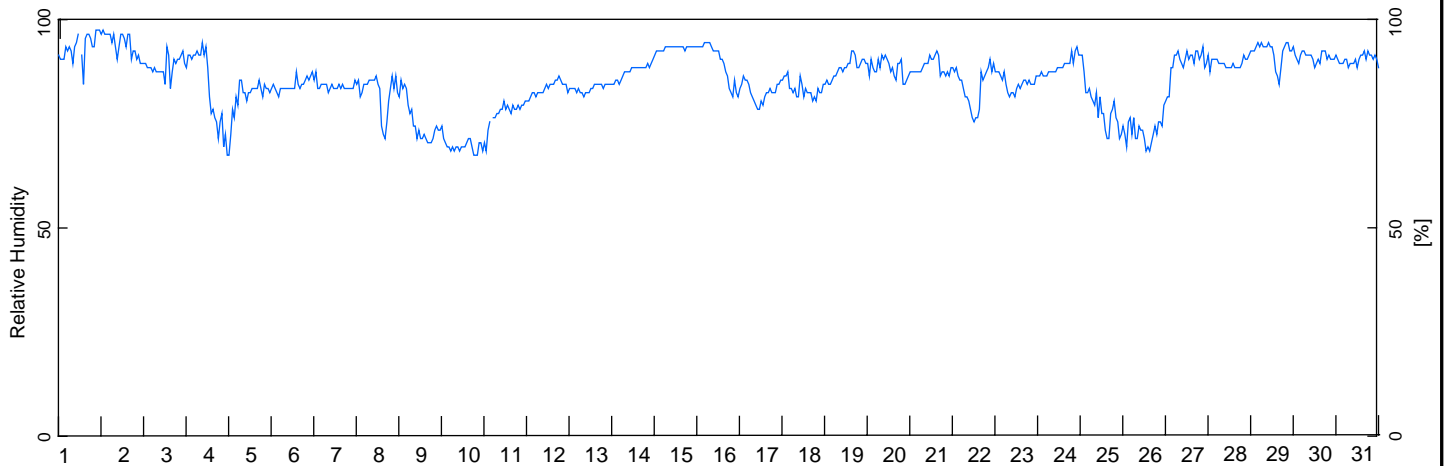
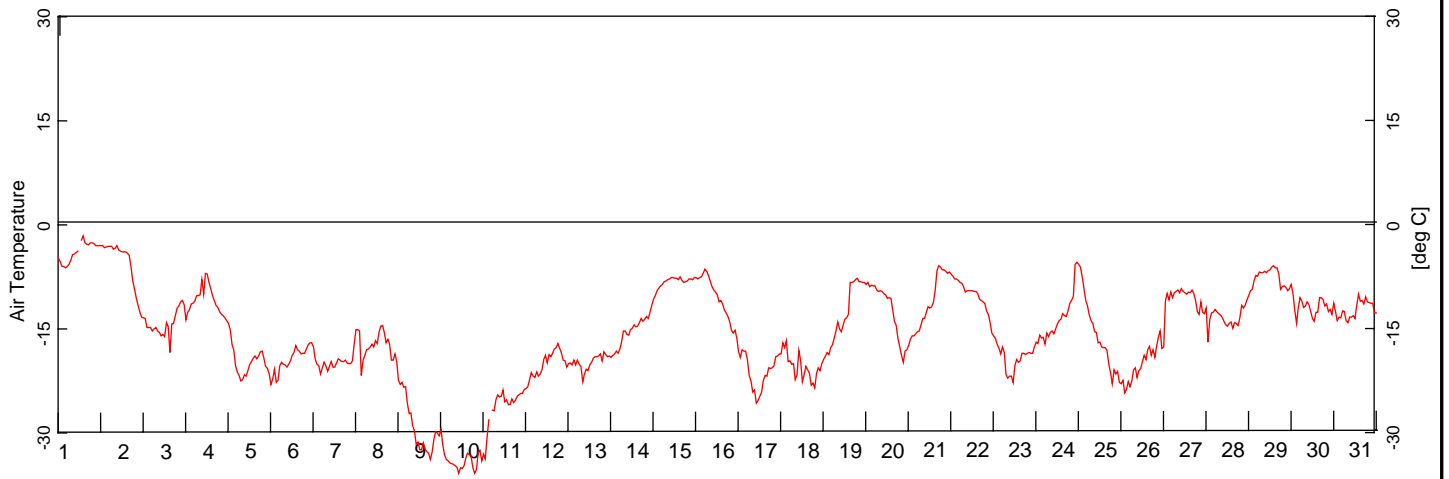
CLIENT

**MACTUNG PROJECT
 2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
 Weather Parameters
 December 2006**

PROJECT NO. W23101021	DWN JR	CHK JAS	REV 0
OFFICE EBA-VANC	DATE November 2008		

Figure G-18



NOTES

CLIENT



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
January 2007**

PROJECT NO.
W23101021

DWN
JR

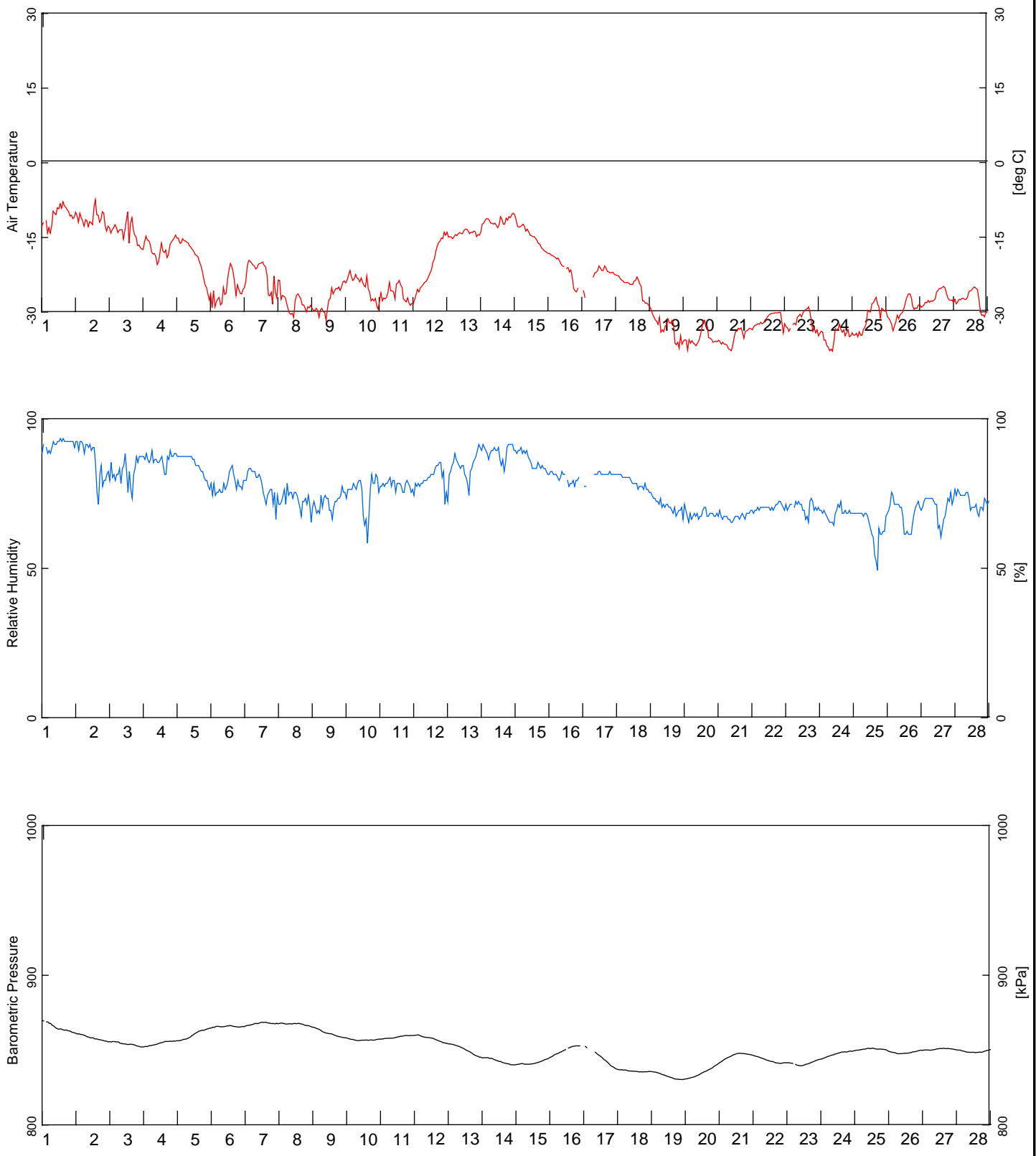
CHK
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REV
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EBA-VANC

DATE
November 2008

Figure G-19



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
February 2007**

PROJECT NO.
W23101021

DWN
JR

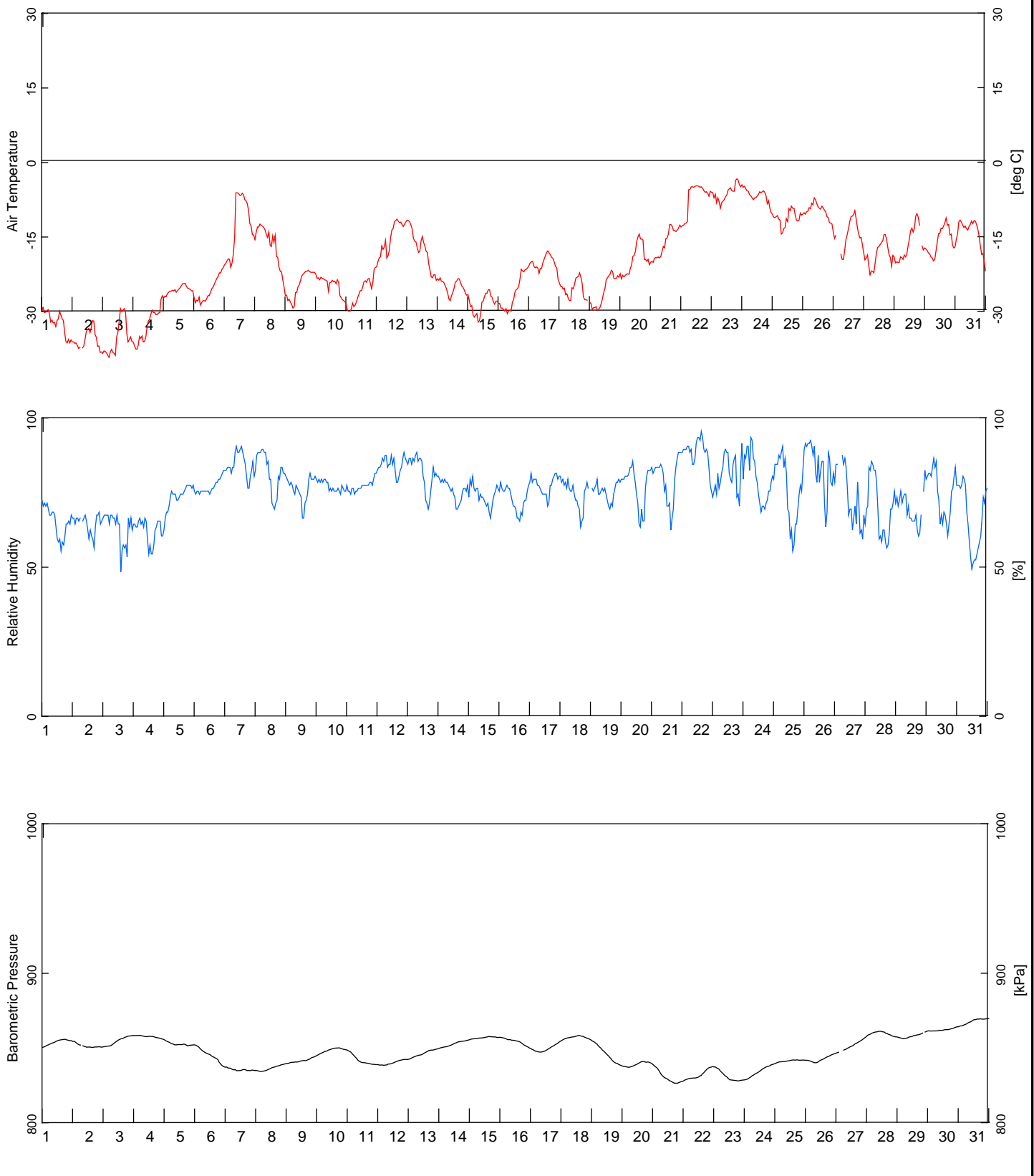
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November 2008

Figure G-20



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
March 2007**

PROJECT NO.
W23101021

DWN
JR

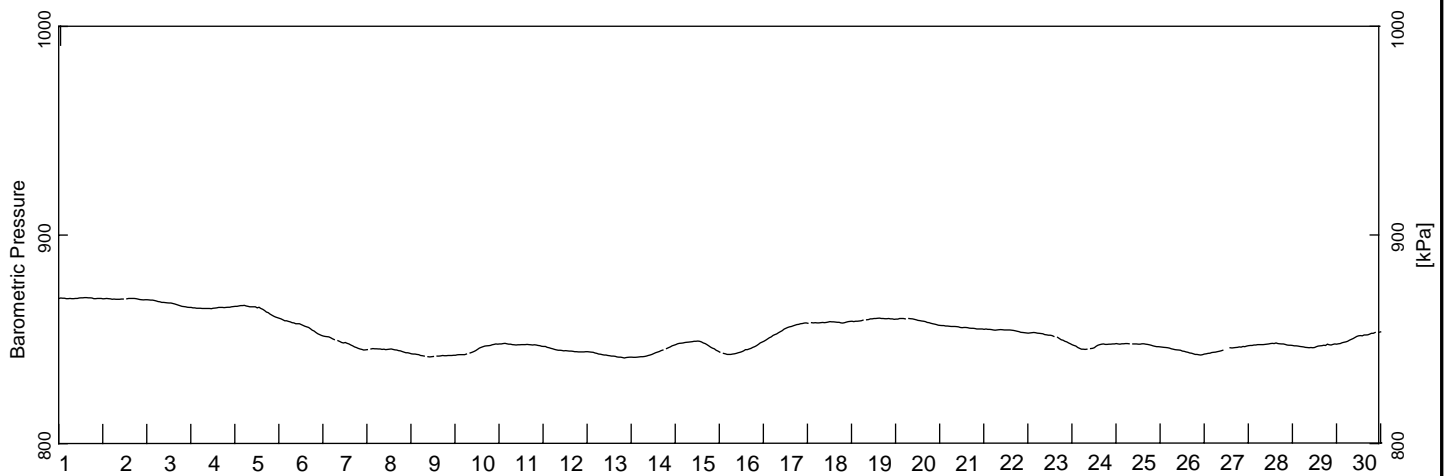
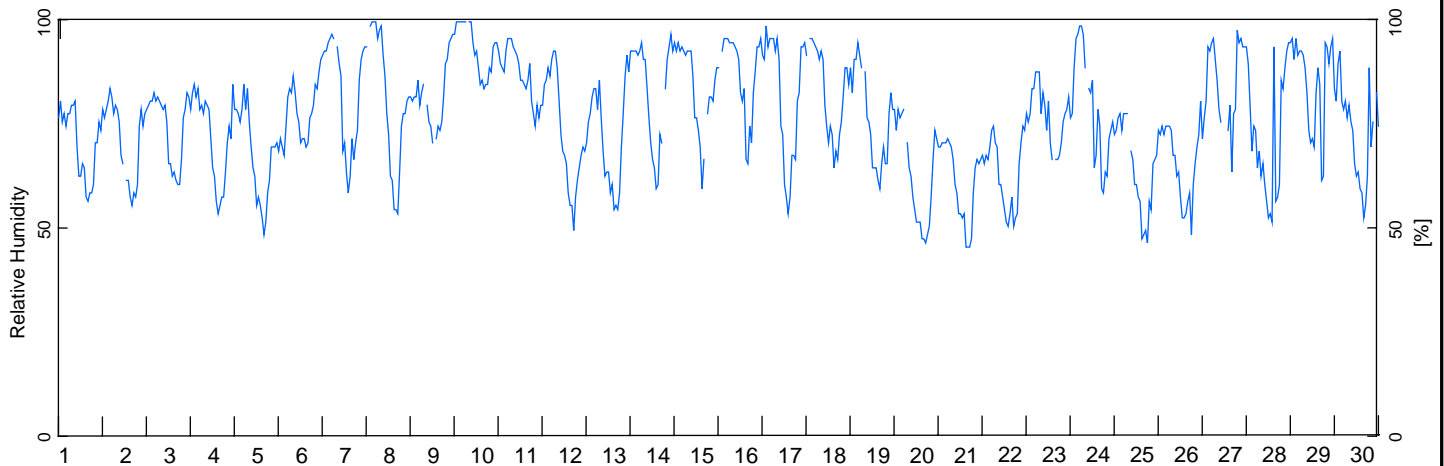
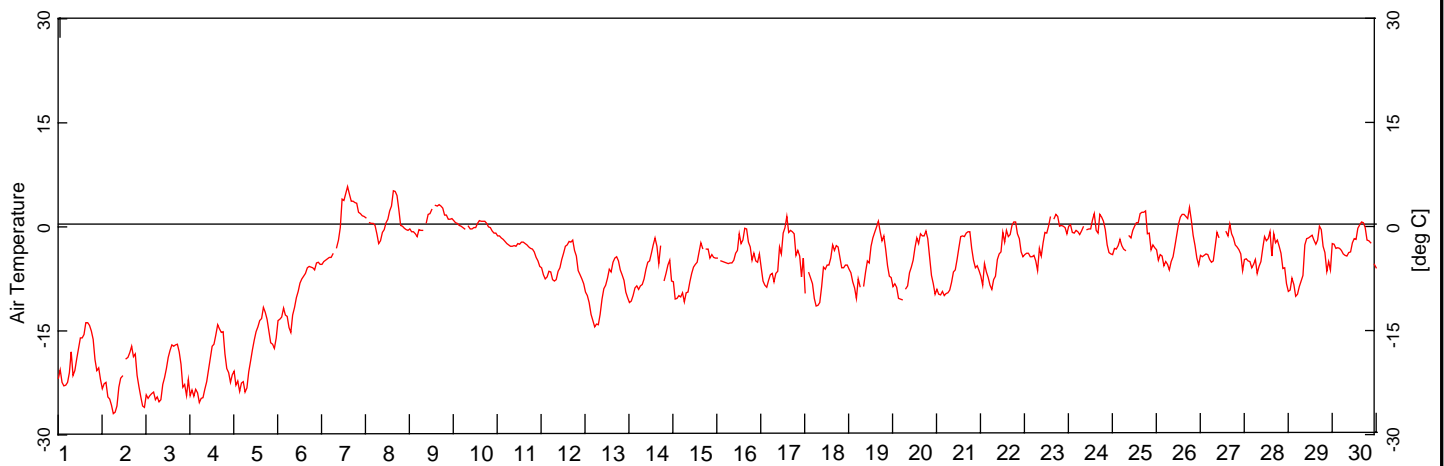
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Figure G-21



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
April 2007**

PROJECT NO.
W23101021

DWN
JR

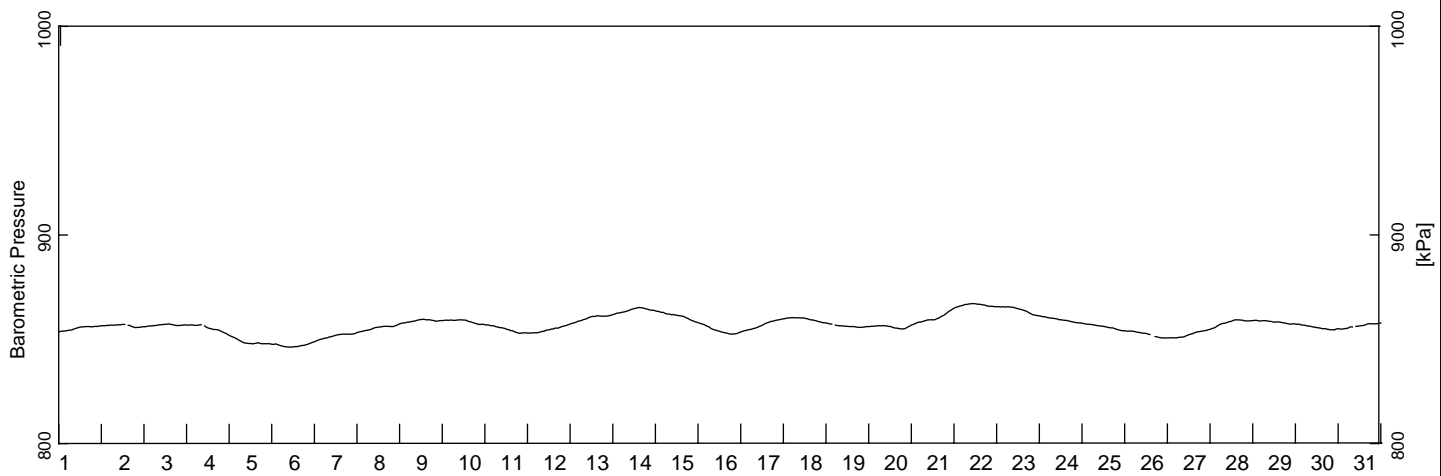
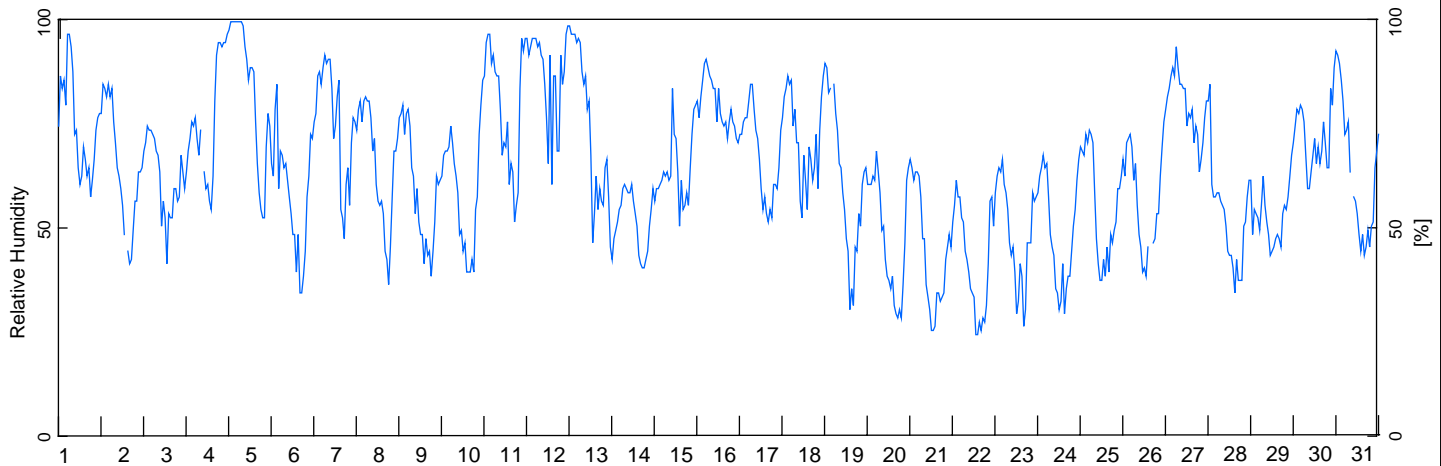
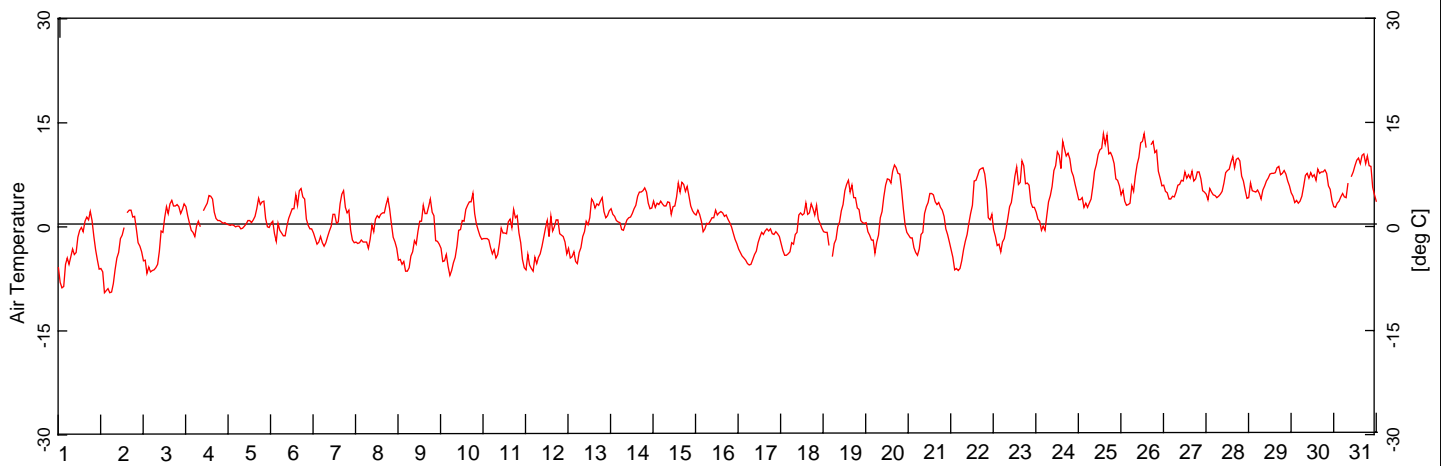
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Figure G-22



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
May 2007**

PROJECT NO.
W23101021

DWN
JR

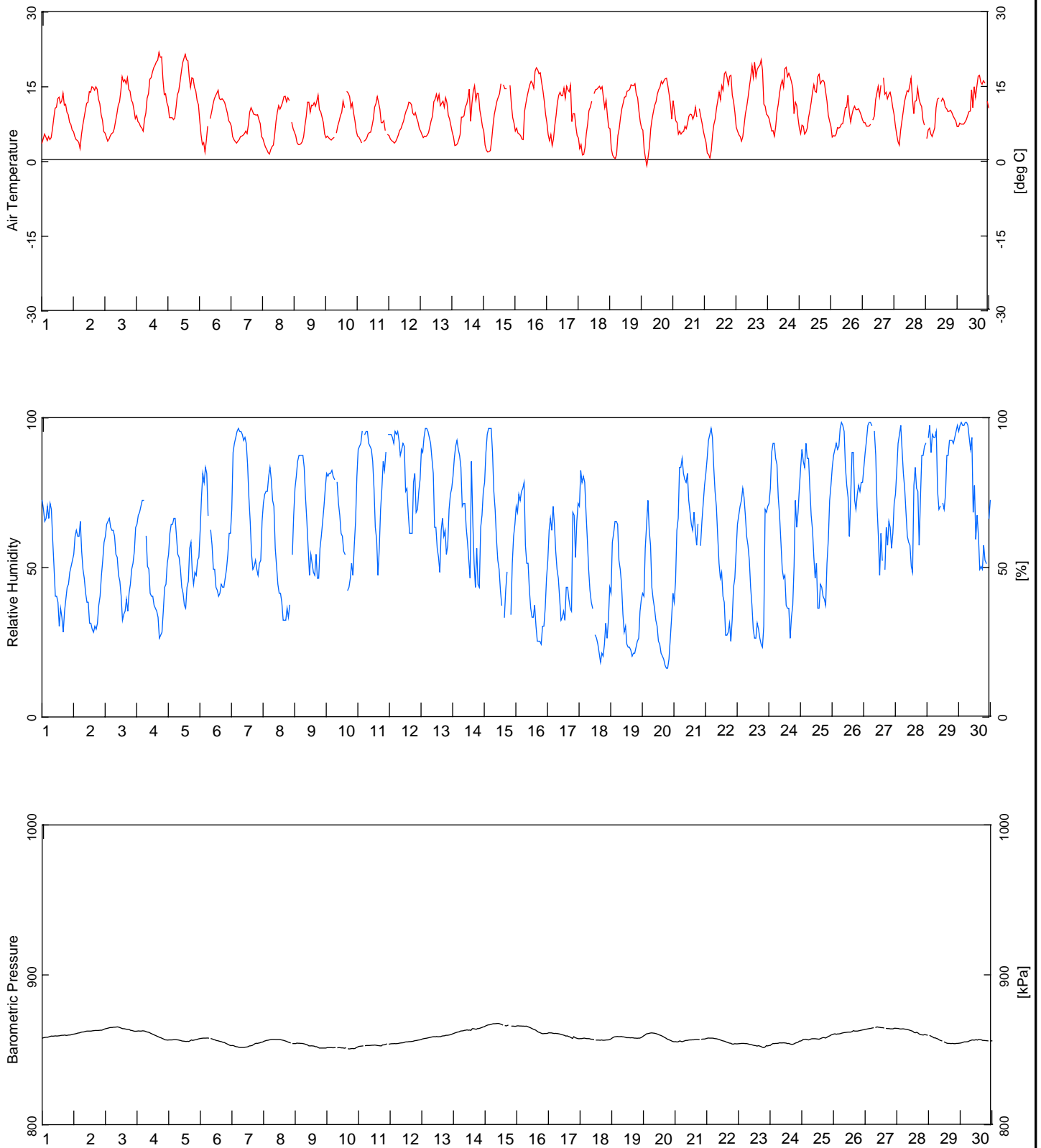
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Figure G-23



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
June 2007**

PROJECT NO.
W23101021

DWN
JR

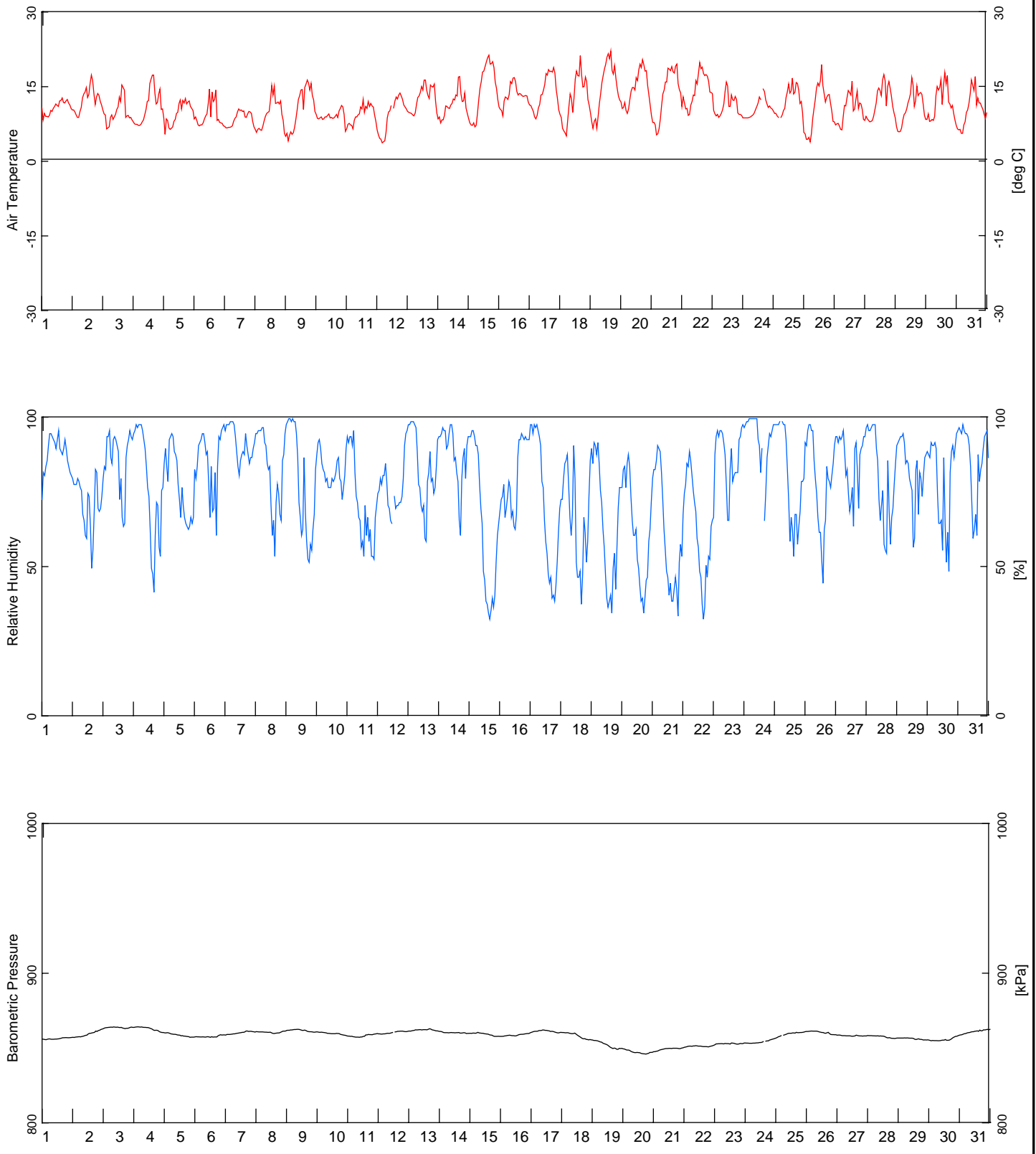
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November 2008

Figure G-24



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
July 2007**

PROJECT NO.
W23101021

DWN
JR

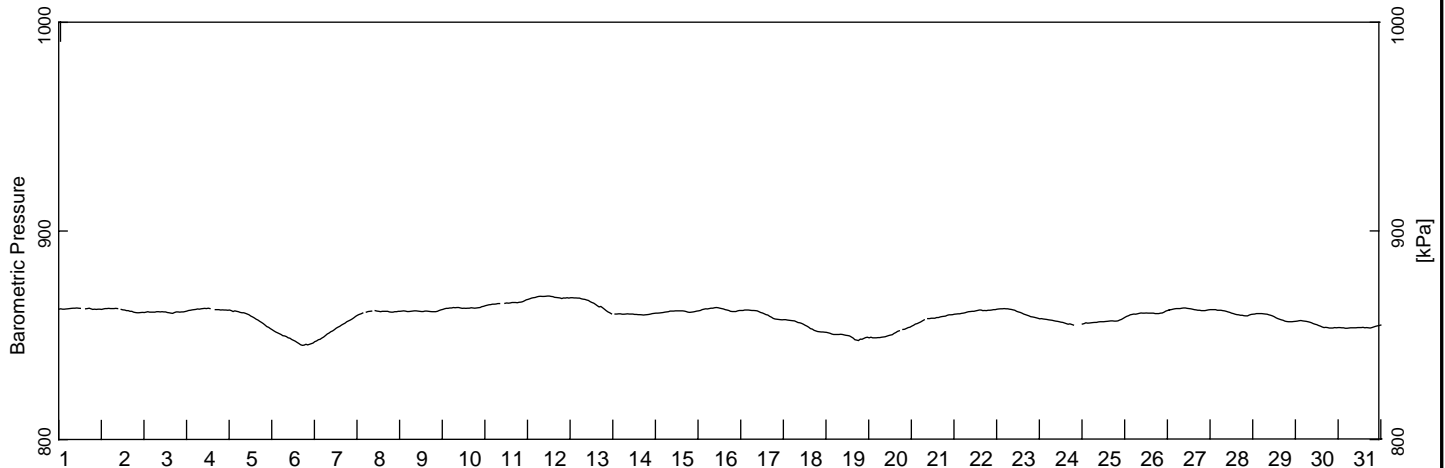
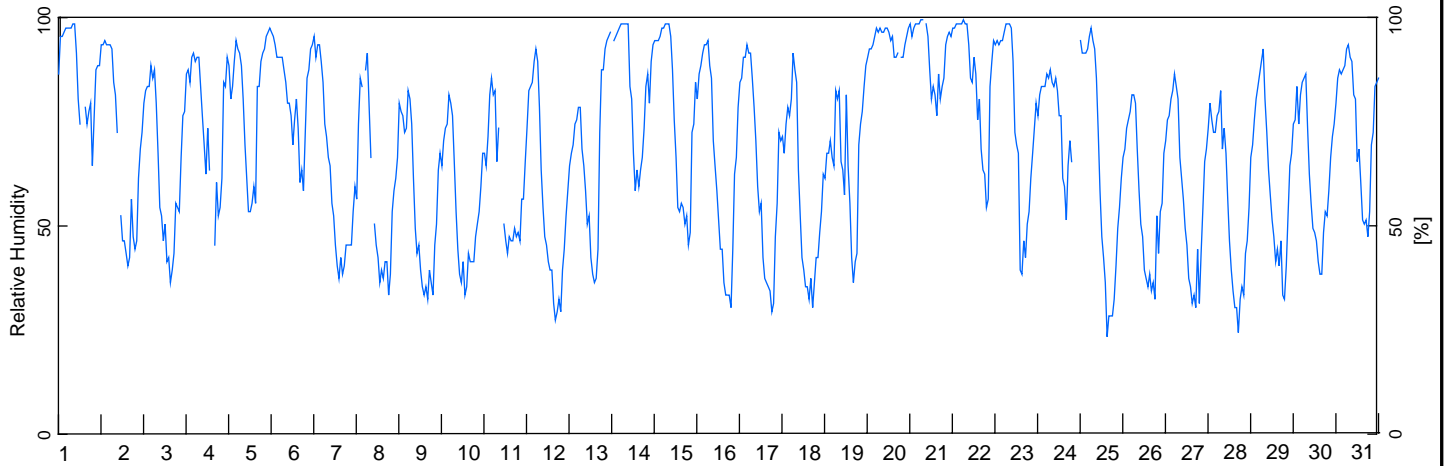
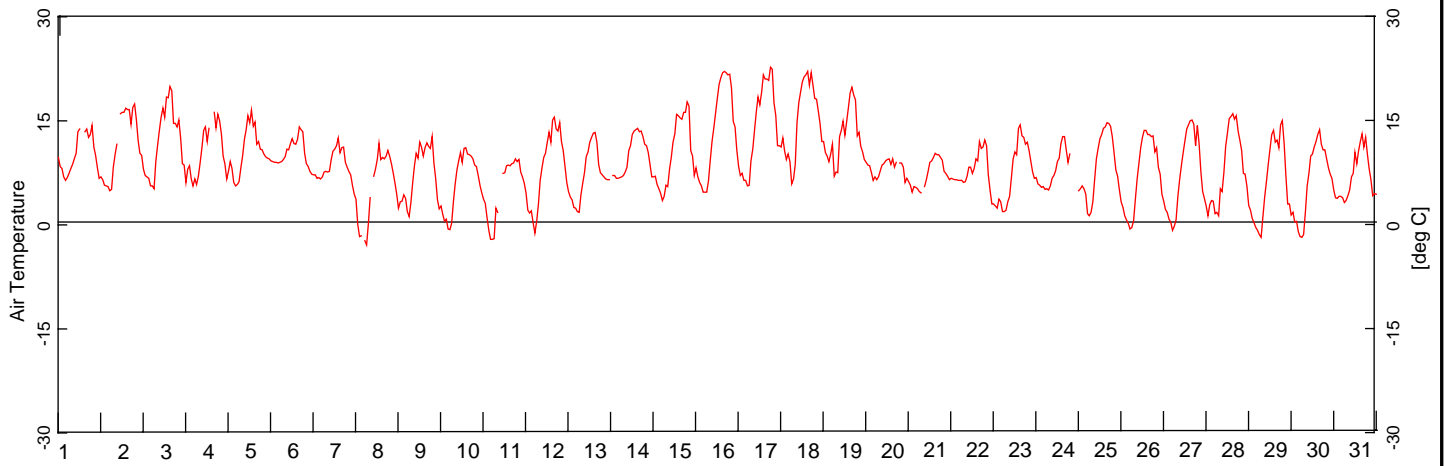
CHK
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November 2008

Figure G-25



NOTES

CLIENT



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
August 2007**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
JR

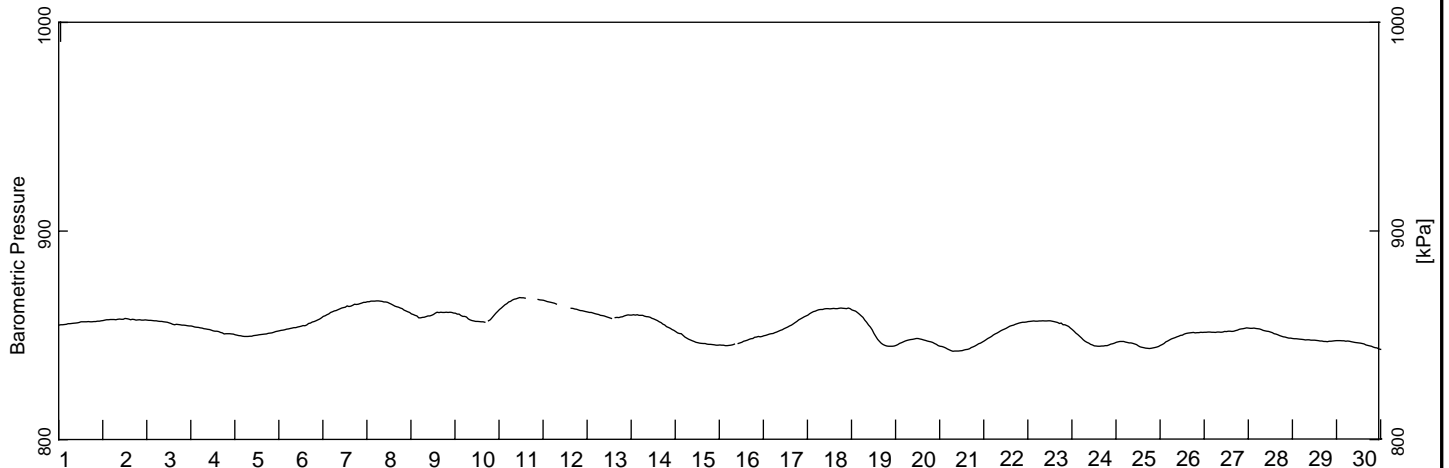
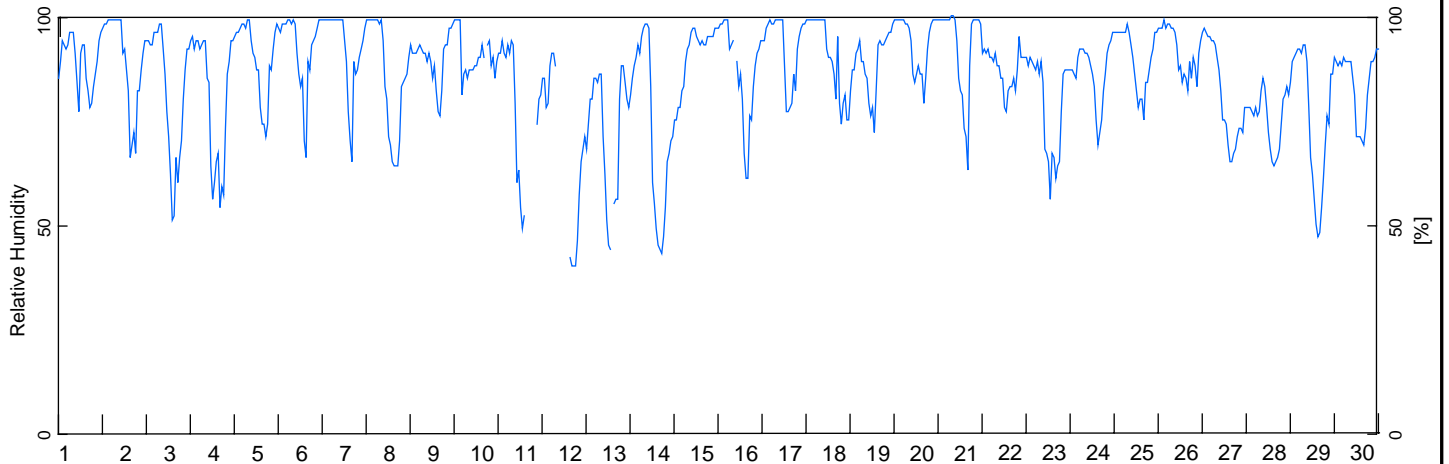
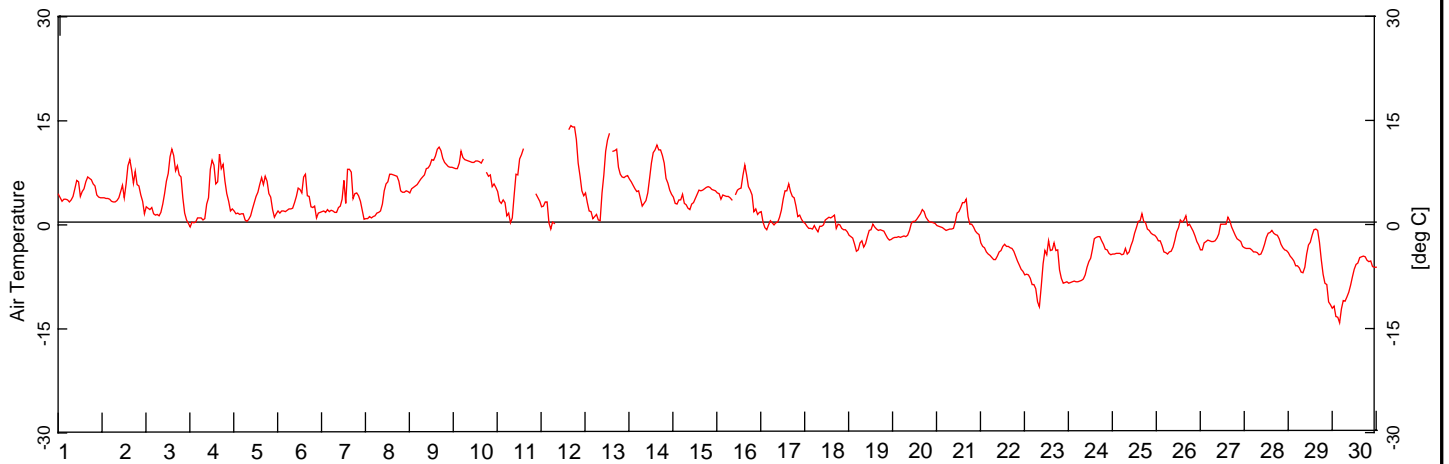
CHK
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0

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DATE
November 2008

Figure G-26



NOTES

CLIENT



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
September 2007**

PROJECT NO.
W23101021

DWN
JR

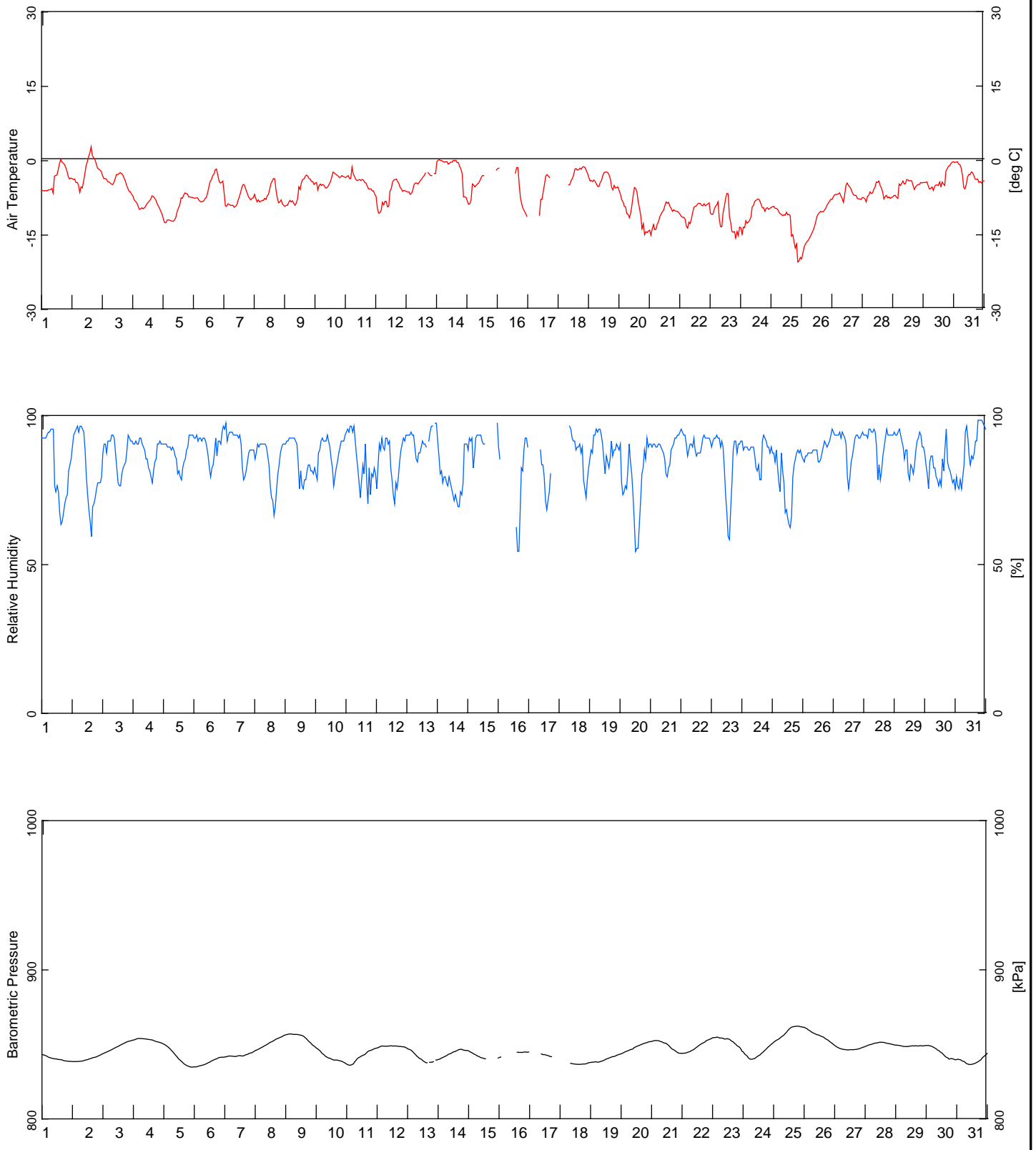
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DATE
November 2008

Figure G-27



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
October 2007**

PROJECT NO.
W23101021

DWN
JR

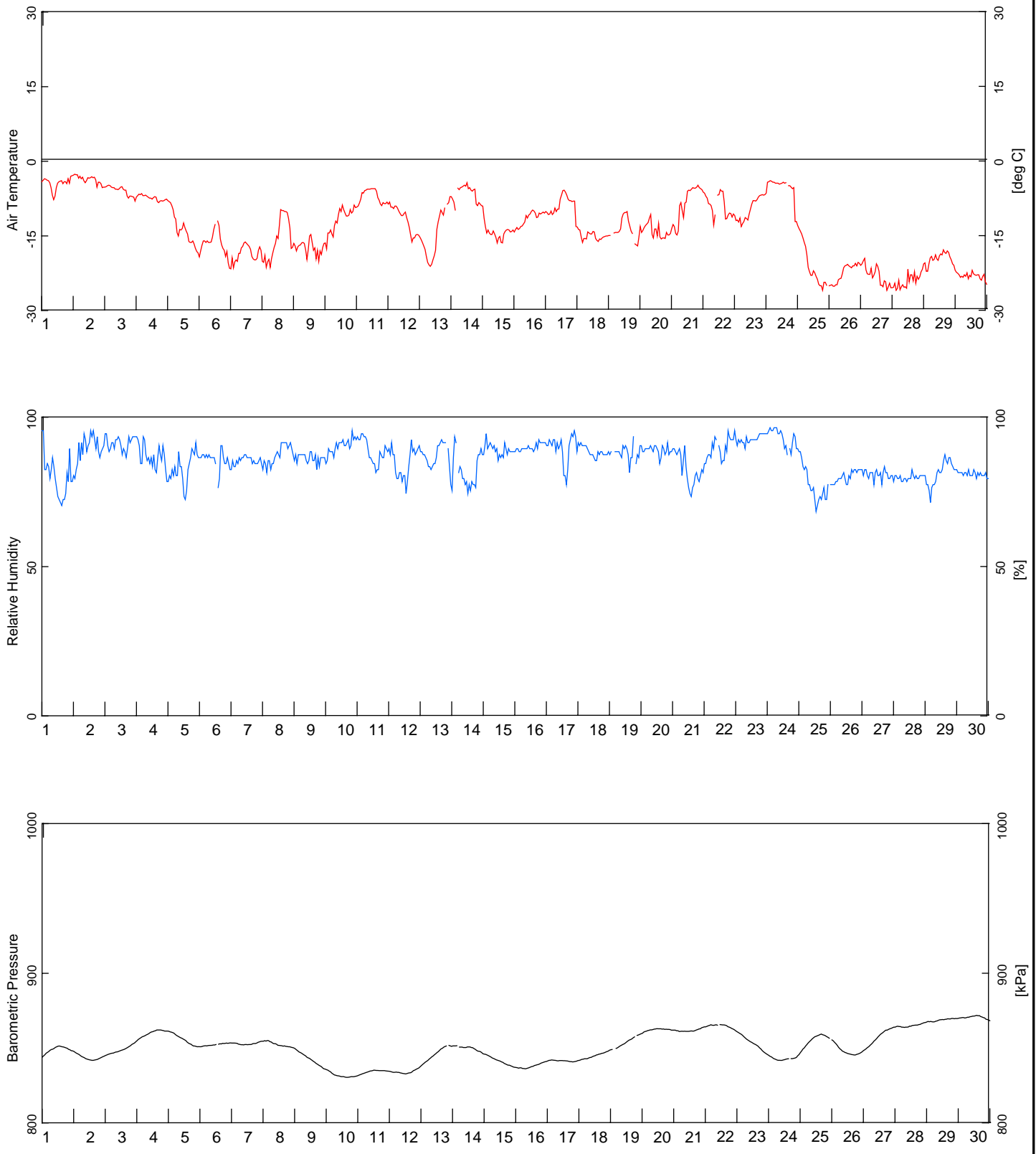
CHK
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DATE
November 2008

Figure G-28



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
November 2007**

PROJECT NO.
W23101021

DWN
JR

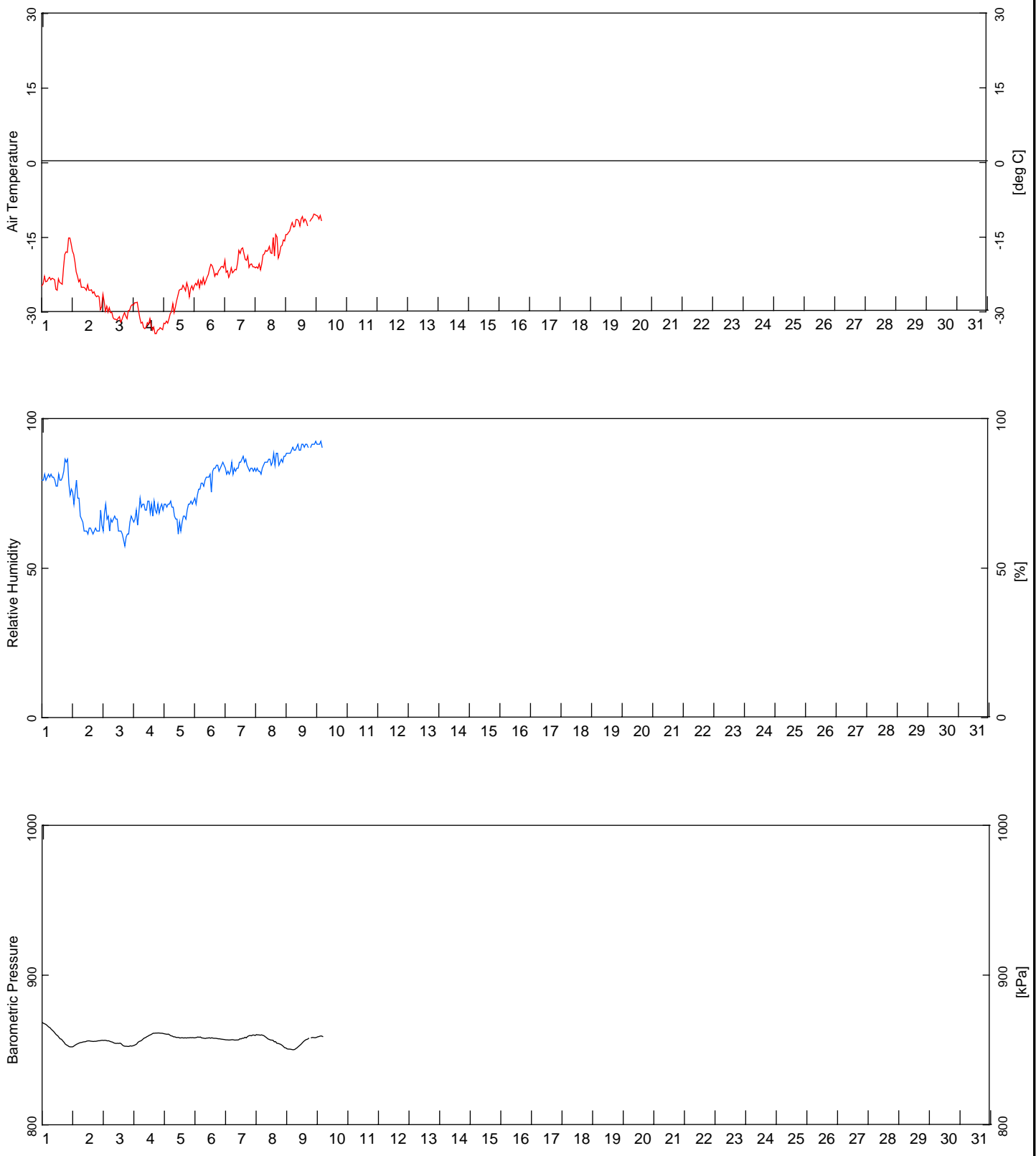
CHK
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DATE
November 2008

Figure G-29



NOTES

No data available from
December 10 - 31, 2007

CLIENT



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
December 2007**

PROJECT NO.
W23101021

DWN
JR

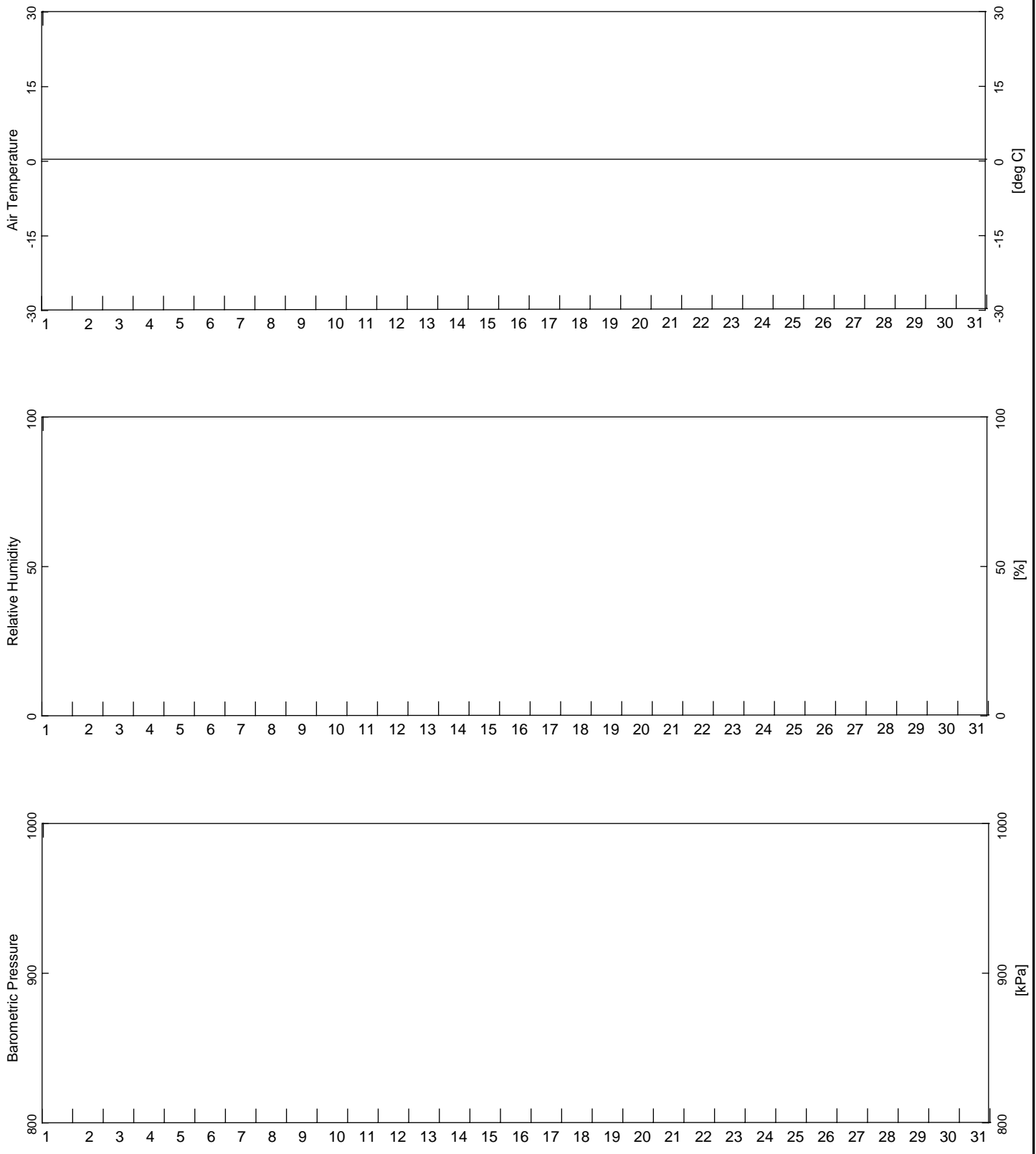
CHK
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DATE
November 2008

Figure G-30



NOTES

No data available from
January 1 - 31, 2008

CLIENT



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
January 2008**

PROJECT NO.
W23101021

DWN
JR

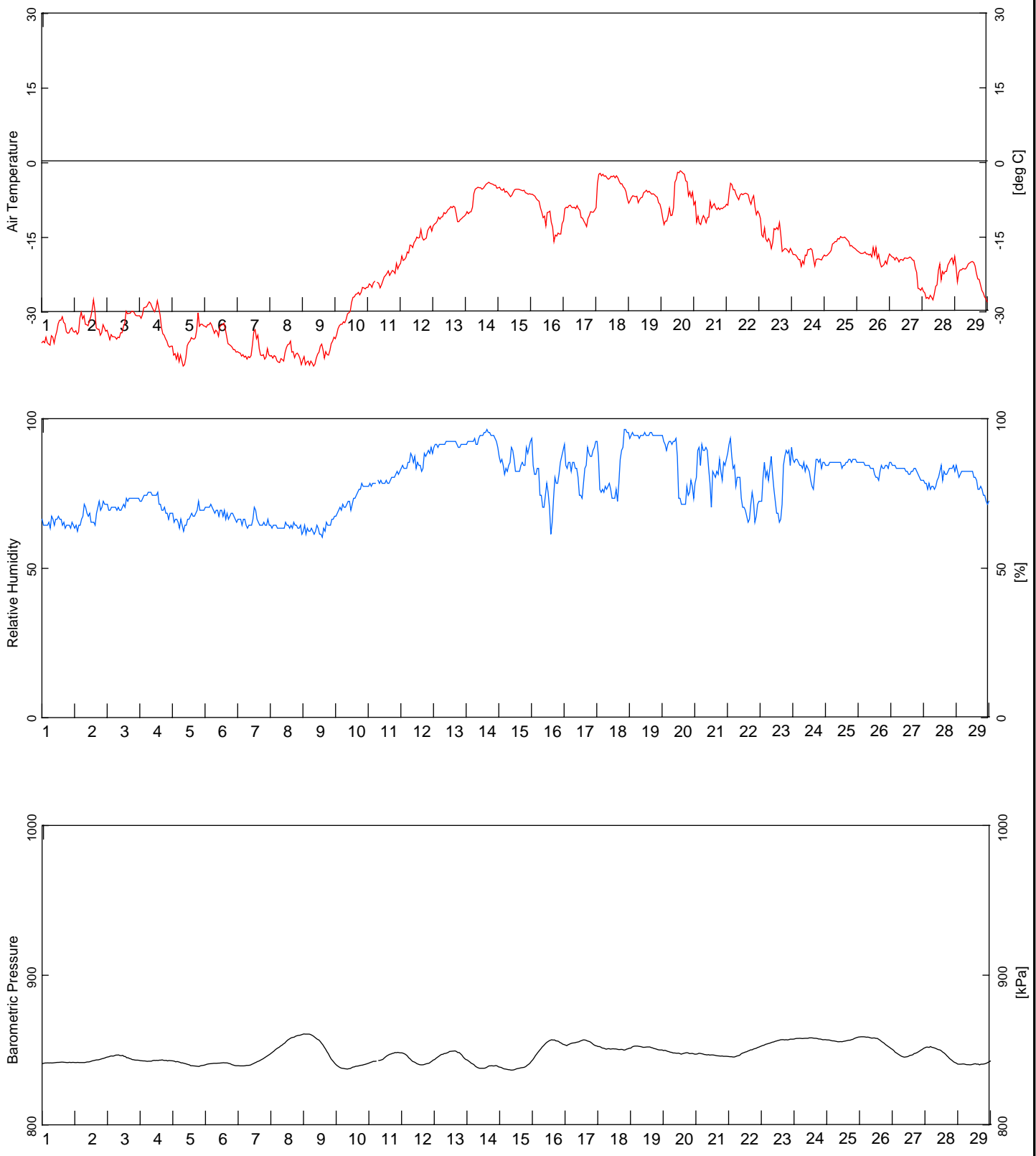
CHK
JAS

REV
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OFFICE
EBA-VANC

DATE
November 2008

Figure G-31



NOTES

CLIENT



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Consultants Ltd.



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
February 2008**

PROJECT NO.
W23101021

DWN
JR

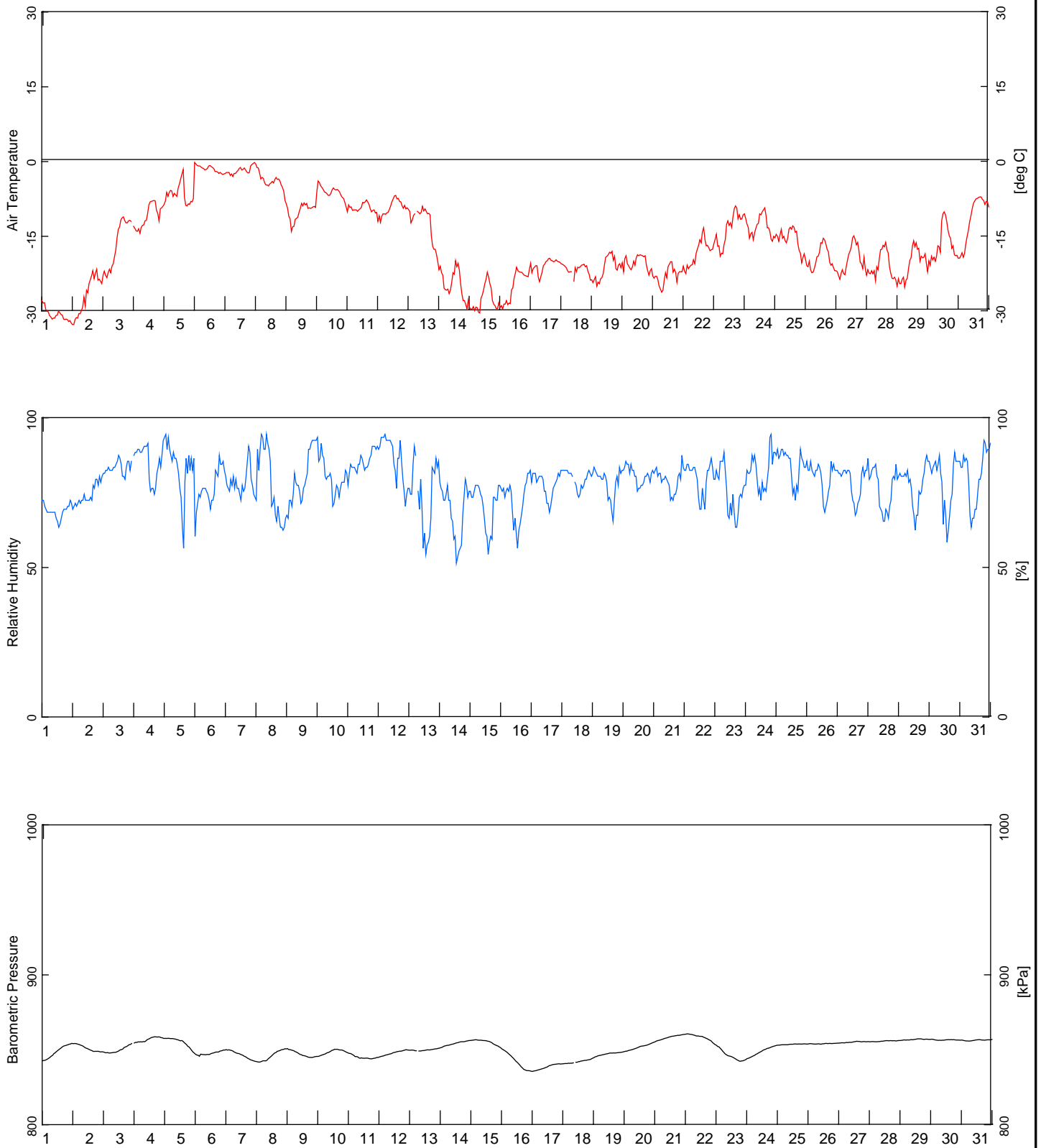
CHK
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REV
0

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DATE
November 2008

Figure G-32



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
March 2008**

PROJECT NO.
W23101021

DWN
JR

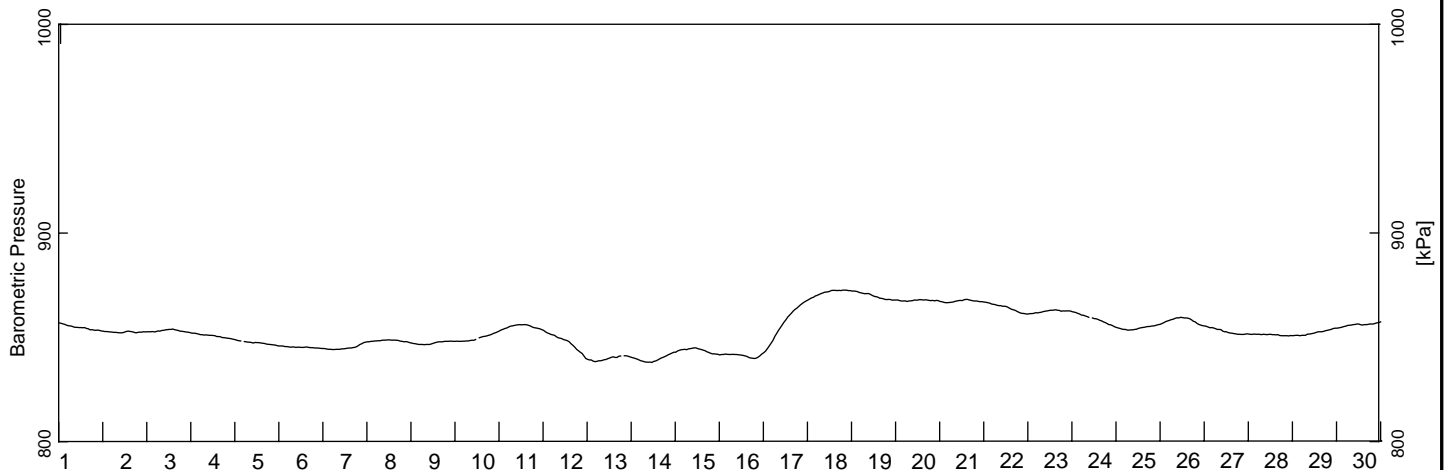
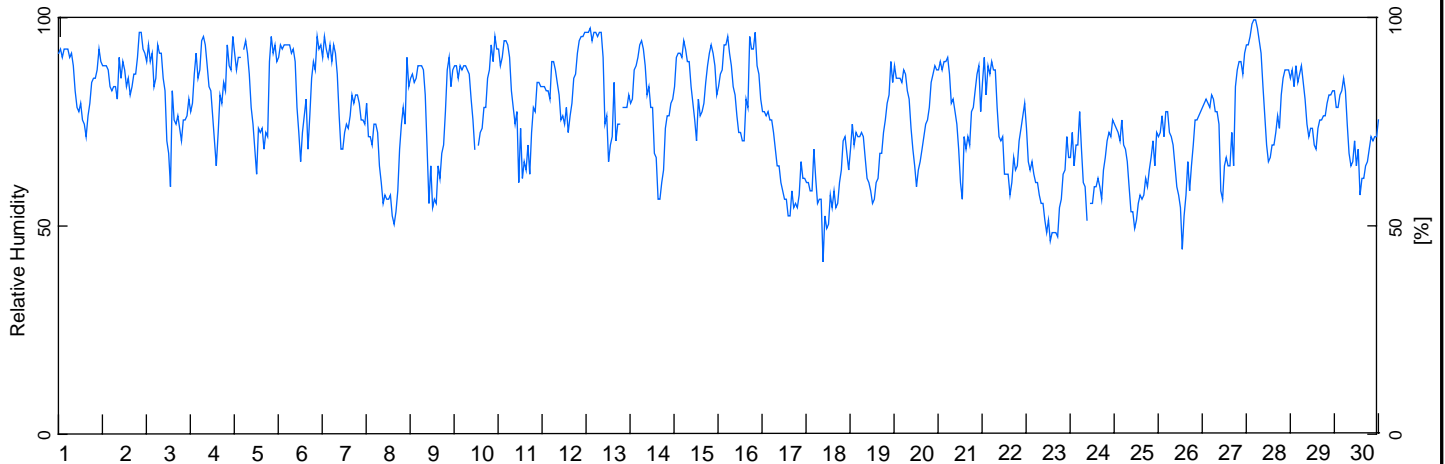
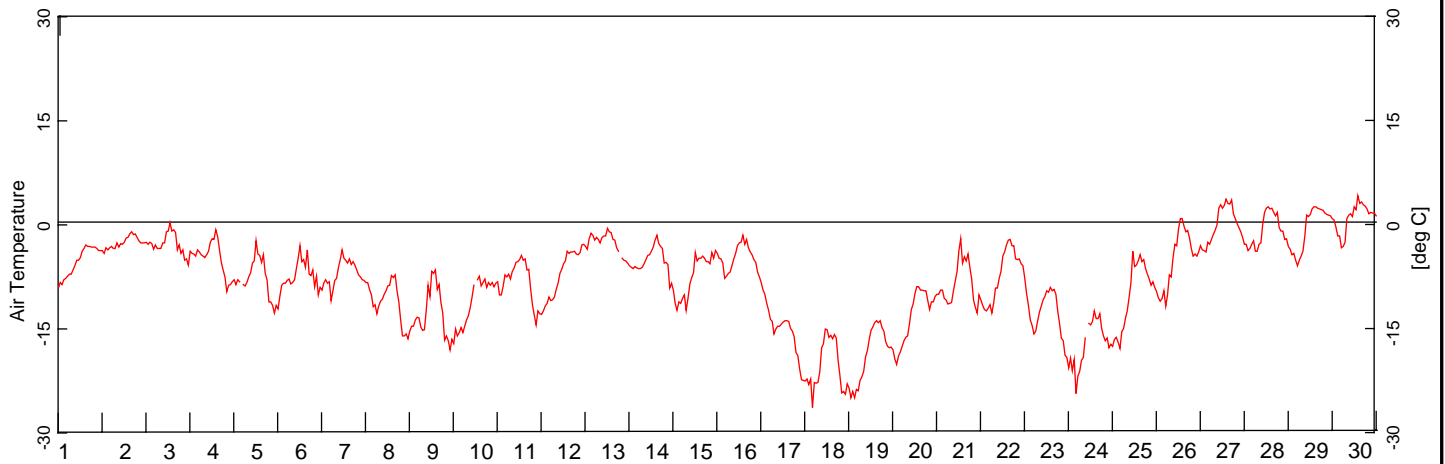
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure G-33



NOTES

CLIENT



EBA Engineering
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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
April 2008**

PROJECT NO.
W23101021

DWN
JR

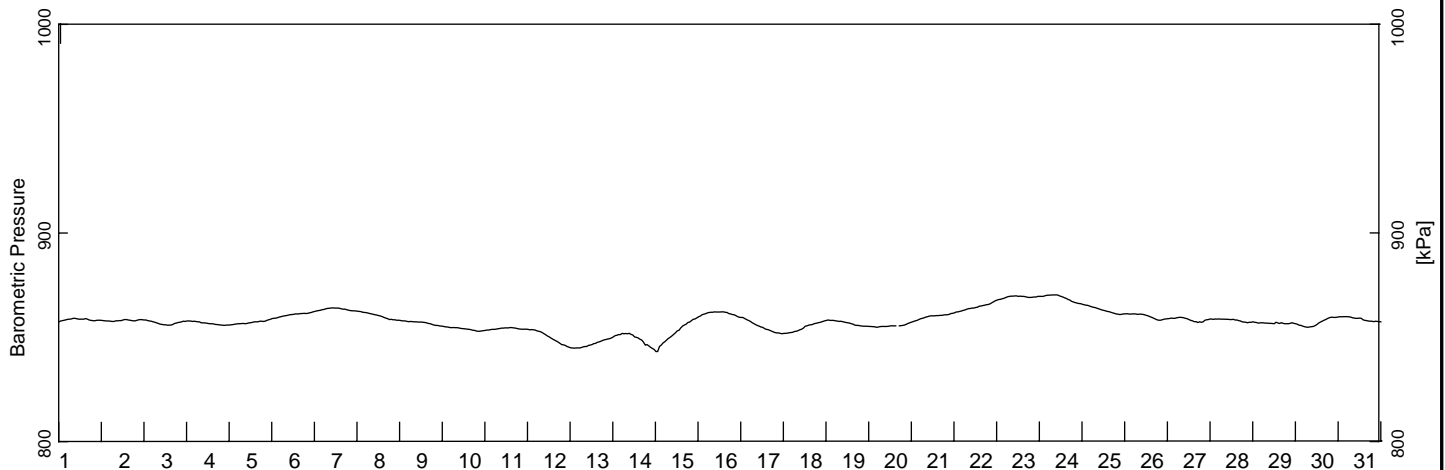
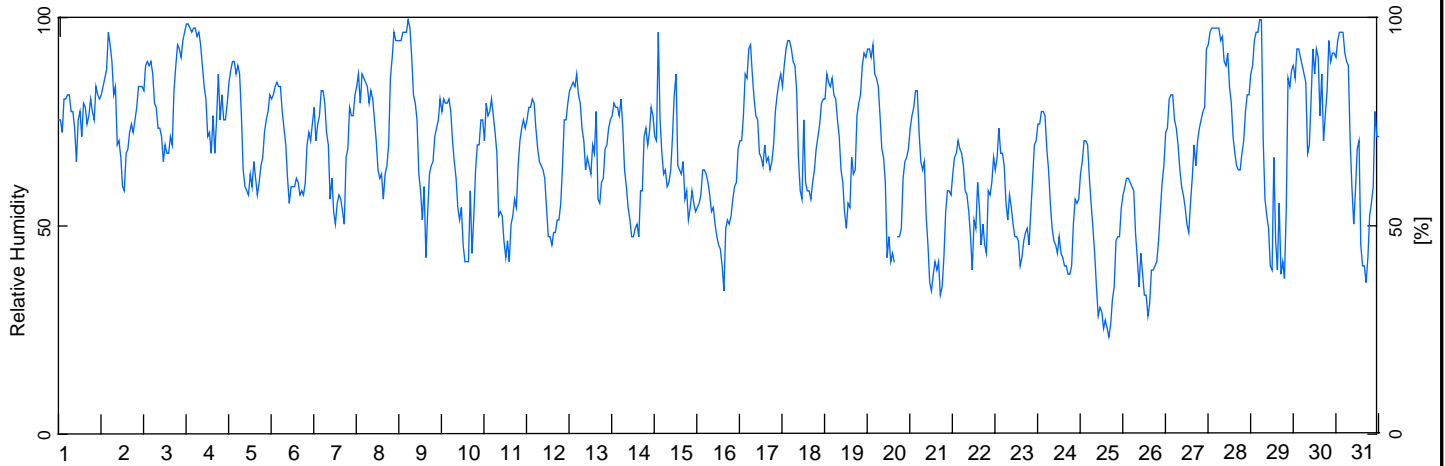
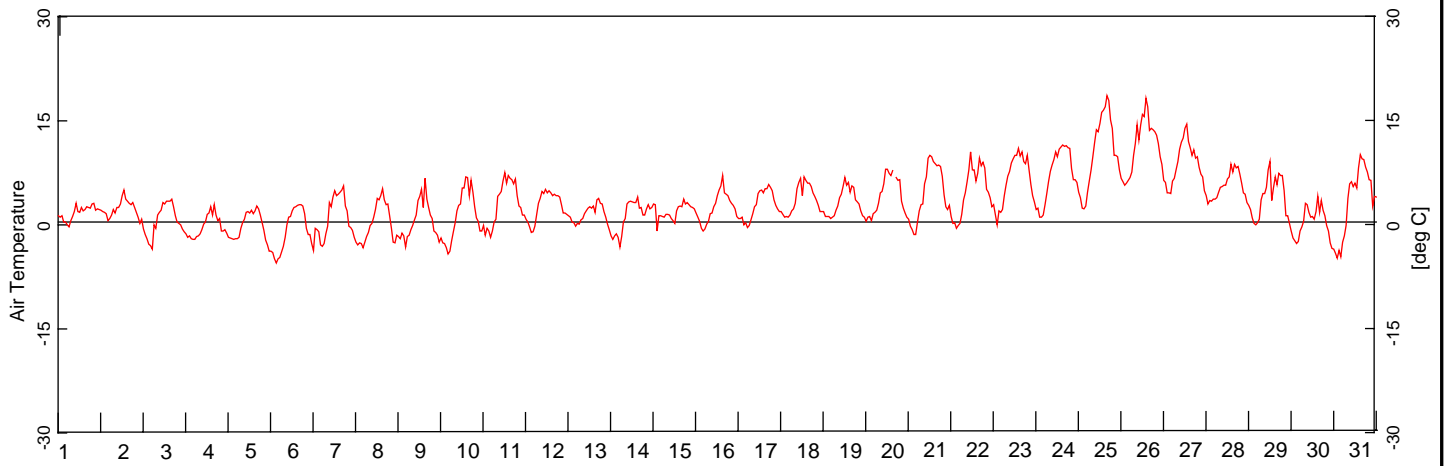
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure G-34



NOTES

CLIENT



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
May 2008**

**EBA Engineering
Consultants Ltd.**



PROJECT NO.

W23101021

DWN

JR

CHK

JAS

REV

0

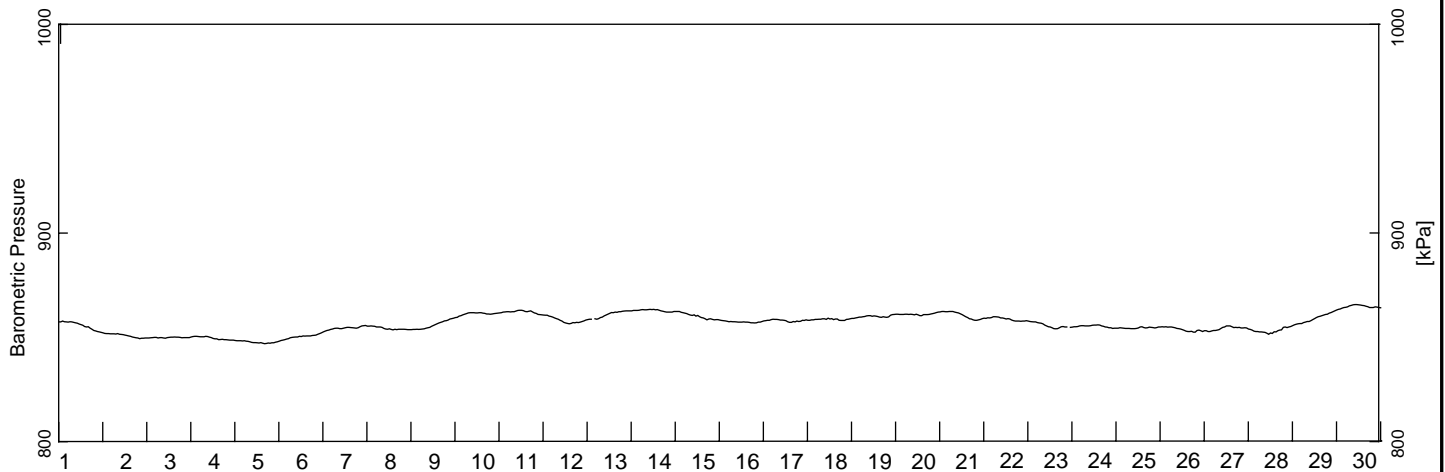
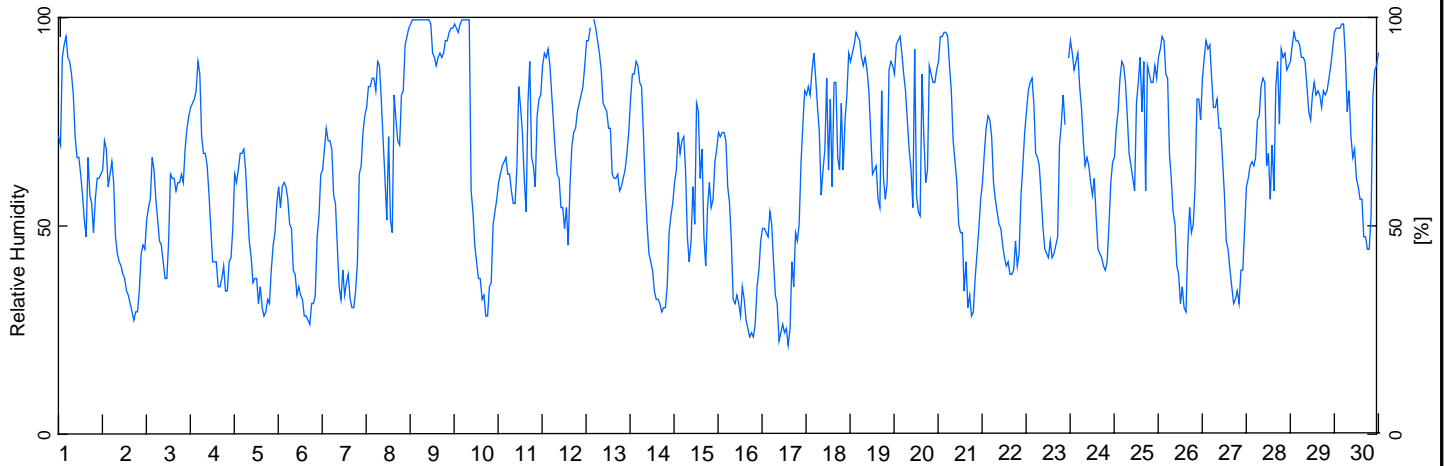
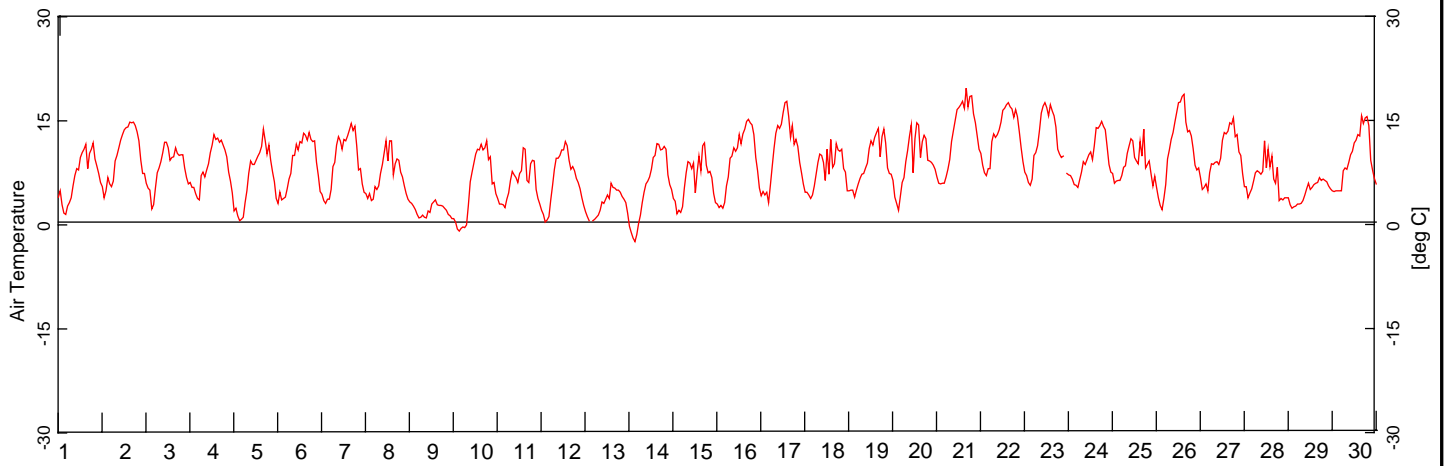
OFFICE

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DATE

November 2008

Figure G-35



NOTES

CLIENT



**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
June 2008**

EBA Engineering
Consultants Ltd.



PROJECT NO.
W23101021

DWN
JR

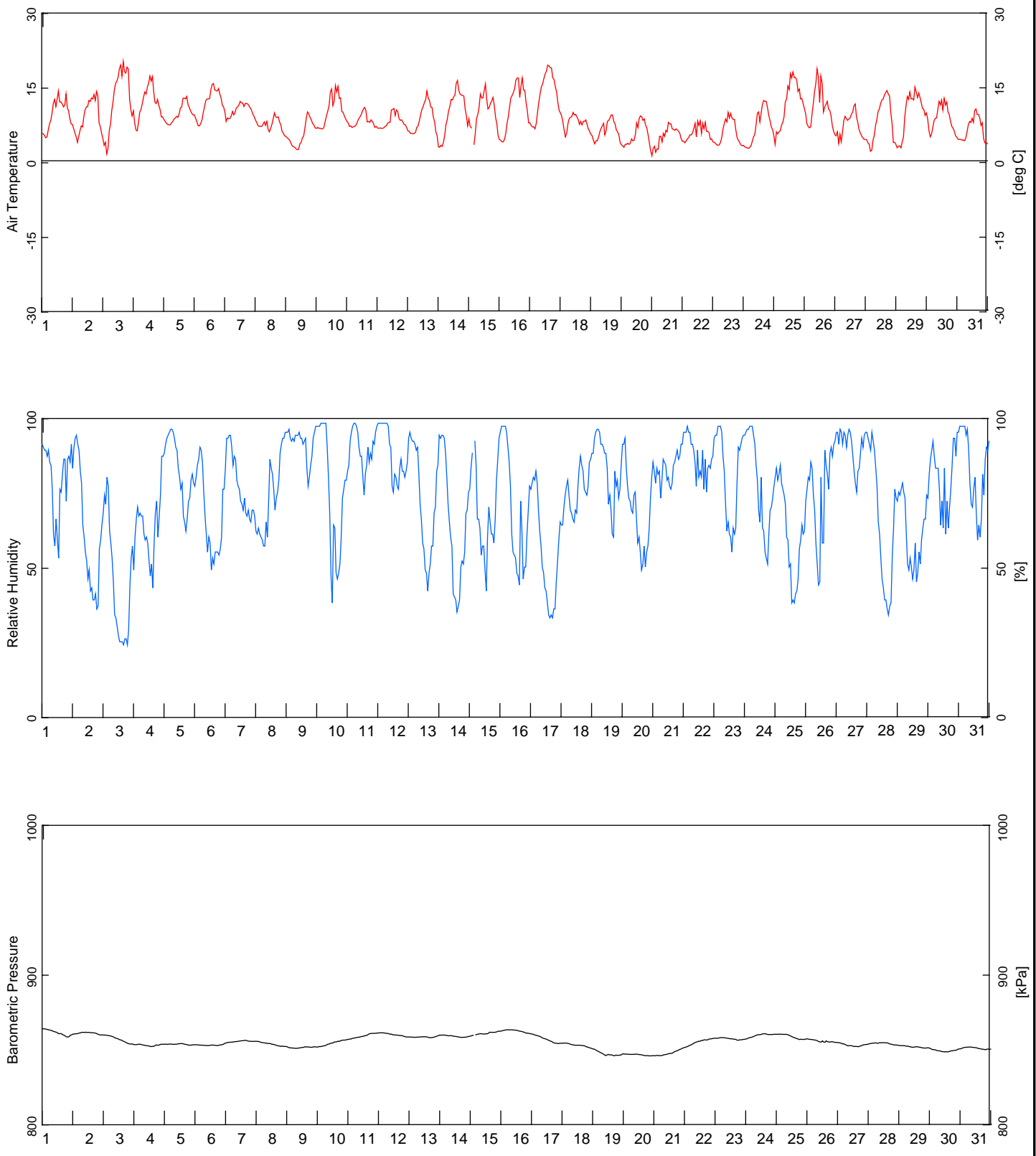
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure G-36



NOTES

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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
July 2008**

PROJECT NO.
W23101021

DWN
JR

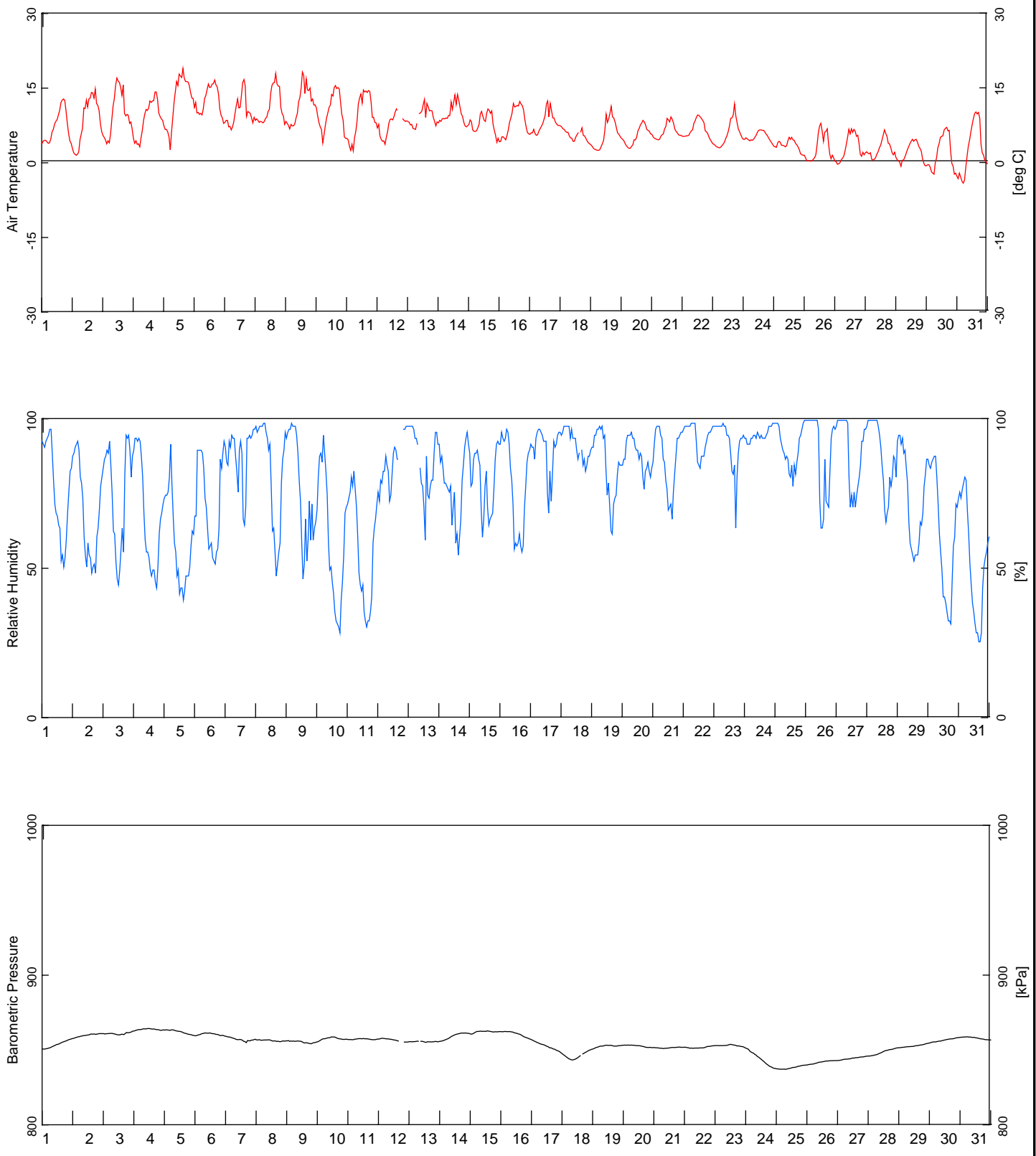
CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure G-37



NOTES

CLIENT



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**MACTUNG PROJECT
2008 HYDROMETEOROLOGICAL SURVEY**

**Macmillan Pass
Weather Parameters
August 2008**

PROJECT NO.
W23101021

DWN
JR

CHK
JAS

REV
0

OFFICE
EBA-VANC

DATE
November 2008

Figure G-38



APPENDIX H

APPENDIX H EBA'S GENERAL CONDITIONS



ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.