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LAKE TANGANYIKA HYDRODYNAMICS (RESULTS OF MARCH 1993-DECEMBER 1994)

by

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PREFACE

The Research for the Management of the Fisheries on Lake Tanganyika project (Lake Tanganyika Research) became fully operational in January 1992. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA) and the Arab Gulf Programme for United Nations Development Organizations (AGFUND).

This project aims at the determination of the biological basis for fish production on Lake Tanganyika, in order to permit the formulation of a coherent lake–wide fisheries management policy for the four riparian States (Burundi, Tanzania, Zaïre and Zambia).

Particular attention will be also given to the reinforcement of the skills and physical facilities of the fisheries research units in all four beneficiary countries as well as to the buildup of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

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1. INTRODUCTION

The abiotic environment of Lake Tanganyika has been studied since the beginning of this century. Cunnington (1920) measured surface temperatures in 1904-05 and almost 10 years later Stappers and Jakobs made a bathymetric survey and found the deepest parts of the lake (Stappers, 1914) . In 1938, Beauchamp (1939) studied temperature and oxygen stratification and the major nutrients off Kigoma and to the south of Kigoma, in the southern part of the lake. He recorded the vertical stratification during the wet season and noticed that upwelling took place during the dry season in the south. Furthermore, he noticed, that the water in deeper layers was deoxygenated. The Belgian 'Exploration Hydrobiologique' in 1946-47 proved the presence of internal waves in the thermocline (Servais, 1957) and the stratification of the lake was measured more accurately than before (Capart, 1952) . The same expedition also produced the first bathymetric chart of the lake (Capart 1949) . During the late 1950s, Dubois (1958) made the first depth—time—series of temperature and oxygen data. In early 1960s, Coulter (1967) continued studying hydrodynamics in the south and later, 1973-75, with Ferro (1975), in the northern part of the lake. Although a lot of hydrological and limnological studies have been conducted on Lake Tanganyika, its hydrodynamic characteristics are poorly understood. Coulter (1991) indicated some reasons for this. For example, previous studies have tended to be localised rather than lake wide. The lake is large and to conduct a lake wide study requires a lot of resources and effort. Past data collection has been uneven spatially and temporally and sampling has been carried out mainly around a few major ports of the lake. Up to the present study no accurate automatic recording devices have been used on Lake Tanganyika.

In the LTR hydrodynamic component several hydrological sampling stations have been established around and on the lake and data have been collected since March 1993. One of the objectives of the hydrological studies of LTR is to develop a hydrodynamic model for Lake Tanganyika and the data presented here will be used for this modelling work. This document presents the results of initial data analysis in hydrodynamics up to the end of 1994.

2. RECORDING EQUIPMENT AND SAMPLING METHODS

2.1 Automatic recorders

Since March 1993, LTR has equipped three stations and two substations around the lake and two other offshore stations with automatic meteorological and hydrodynamical data recording instruments (Figure 1)

At Bujumbura, Burundi, are located a weather station and a water level recorder. At Kigoma, Tanzania, a wind station and a water level recorder and at Mpulungu, Zambia, a water level recorder, a wind station and a manual anemometer have been installed. At the two LTR sub—stations, Kalemie in Zaïre, and Kipili in Tanzania are located a wind station and a manual anemometer, respectively. LTR's offshore stations, two lake meteo buoys, are outside Kigoma in the northern main basin and 40 km to the north of Mpulungu. The installed recorders, collecting data continuously all around the lake, ensure a comprehensive coverage, more complete than previous studies.

The first recorders were installed in March 1993 and the last in August 1994. Some of the instruments have collected data for more than two years. A list of collected data up to the end of 1994 is presented in Appendix 1.

In addition to these recorders, data on water currents with flow cylinders are collected regularly off Bujumbura, Kigoma and Mpulungu.

2.1.1 Weather station at Bujumbura

The Bujumbura weather station was installed in Bujumbura port, on a pier, in March 1993. The station has a recording unit in a housing and 9 sensors at two different heights, at 4 and 13 m above the lake surface. A total of 11 parameters is recorded at an interval of 10 mm. The sensors at 4 m are for wind speed, air temperature and relative humidity, and at 13 m for wind speed and wind gust, wind direction, air temperature, relative humidity, air pressure, solar radiation and rainfall. The parameters are mainly recorded as momentary values or as total sums within an interval. The structure of the weather station and technical specifications have been described in detail by Huttula, Peltonen and Nieminen (1993)

2.1.2 Wind stations at Kigoma, Mpulungu and Kalemie

The Kigoma wind station was installed on a cliff south of Kigoma port in July 1993. It has a scanning unit and two sensors. The measured parameters are wind speed, wind gust and wind direction. The recording interval has been set to 10 mm and the parameters are recorded as momentary values.

The same type of wind stations have been installed at Mpulungu and Kalemie. The one at Mpulungu was installed in April 1994 and the other, sent to Kalemie in March 1994, was installed in May 1994, but no data are yet available from it.

2.1.3 Lake meteo stations off Kigoma and Mpulungu

The lake meteorological (meteo) station off Mpulungu was installed in the lake during the first hydrodynamic cruise in March 1993 (Figure 1) . It consists of a scanning unit, wind speed, wind direction and air temperature sensors, a sub—surface temperature sensor chain and a memory unit. The thermistor chain has eleven temperature sensors in depths from 1 to 300 m. Data recording interval has been set to 60 mm and observations are stored in the memory unit as momentary values from each depth. The depths are 1, 5, 30, 50, 70, 90, 110, 150, 200, 250 and 300 m. The measured parameters are water temperatures at different depths, wind speed, wind gust, wind direction and air temperature. The structure of the station has been described in detail by Huttula, Peltonen and Nieminen (1993)

A similar type of lake meteo station is located off Kigoma (Figure 1) . It was installed in March 1994. The depths of the sensors differ slightly from the station off Mpulungu and they are 1, 5, 15, 30, 50, 70, 90, 110, 150, 200 and 300 m. The sensors above the surface are similar to the ones outside Mpulungu. The recording interval of the lake meteo station off Kigoma has been set to 30 mm.

2.1.4 Water level recorders

Each water level recorder located at Bujumbura, Kigoma and Mpulungu, three in total, has a data recording unit and a pressure sensor. It registers momentary values of water pressure and thus the depth of the sensor every 2 s. This means that the observations are not fixed to any absolute value and only the periodicity and the amplitude of oscillation can be obtained. The range of the sensor is 0—0.7 m. Prevailing air pressure is accounted for in the recordings. Recordings are saved as one hour averages. The water pressure recorders were all installed in March 1993. The pressure sensor, connected to the recording unit, is inside a polyvinyl tube which is fixed to a pier in order to avoid biased recordings caused by waves. More information about the structure of the water level recorder is provided by Huttula, Peltonen and Nieminen (1993)

2.2 Manual recorders

2.2.1 Anemometers

The manual anemometers (Lambrecht, KG Göttingen, type 1440) are situated at Kipili and Mpulungu. They have a standard rotator and a counter. Recordings of the counter and the cardinal wind directions are registered three times a day. In Kipili the recording times are 0800, 1400 and 2000h and in Mpulungu 0800, 1400 and 1900h (Burundi time) . The Kipili and Mpulungu anemometers were installed in June 1993 and in March 1993 respectively.

2.3 Flow cylinders

Flow cylinders are used for measuring current speed and direction. They are of standard size, 60 x 100 cm. During use they are attached with a rope to a buoy. The depth of a measurement is determined with the length of the rope. The usual depths are 2, 5, 10, 20 and 40 m, the most common depth is 2 m. Normally 5 to 6 cylinders are used on one measurement line. When the cylinders are put in the water the position and the time of installation of each cylinder are recorded. The Global Positioning System (GPS) is used to determine the position of the cylinders. One measurement lasts 1-2 h. When they are lifted the position and the lifting time of each cylinder are recorded. The average drifting speed and direction of each cylinder between the two points (start and end) can be calculated. Before and after each measurement, wind speed and direction are measured. The execution of the measurements is given in more detail by Huttula, Peltonen, Nieminen (1993) and Kotilainen (1994) . Current flow measurements are conducted once a week in three areas, off Bujumbura, Kigoma and Mpulungu, each having 4 to 5 measurement lines. The locations of the lines are presented in Figures 2-4.

3. DATA UNLOADING AND PROCESSING

3.1 Automatic recorders

Every automatic recorder has a memory unit where recordings are stored. The memories have a limited capacity which depends on preset recording intervals and the number of recorded parameters. Therefore, the capacity of a memory varies from 1 to 9 months. Recording intervals and the memory capacity of each station are presented in Table 1. Recorders need frequent checking and maintenance so, in practice, their full capacity is hardly ever used.

The weather, lake and wind stations are unloaded using Aanderaa Instruments P3059 software and water level recorders with Telog Inc. software. The procedures are given by Huttula, Peltonen, Nieminen (1993) and Kotilainen (1994) . Further data processing has mainly been done using Aanderaa software and MS-DOS EXCEL.

3.1.1 Weather station at Bujumbura

Most of the data from the Bujumbura weather station, wind speed, wind gust, air temperature, relative humidity, air pressure and solar radiation, are compiled as weekly and monthly averages. Standard deviations and minimum and maximum values have been calculated over the data collection period, March 1993 to December 1994. Rainfall data have been summed on a weekly basis. The data are presented in Appendix 2. Wind directions have been divided into 16 main directions and percentages of each direction are obtained on a monthly basis.

Table 1. Automatic recording stations, recording intervals, number of channels and capacity of memories.

STATION	Recording interval	Number of channels	Capacity of the memory in days
Weather station at Bujumbura	10 mm	12	37 days
Wind station at Kigoma	10 mm	3	150 days
Wind station at Mpulungu	10 mm	3	150 days
Lake meteo station off Kigoma	30 mm	16	85 days
Lake meteo station off Mpulungu	60 mm	16	170 days
Water level stations	60 mm	1	270 days

3.1.2 Wind stations of Kigoma and Mpulungu

Daily averages, standard deviations and minimum and maximum values of wind speed and gust on a monthly basis have been calculated both from Kigoma and Mpulungu wind station data. The data of Kigoma from July 1993 to September 1994 are presented in Appendix 3 and the data of Mpulungu from April to December 1994 in Appendix 4. The wind direction data have been treated as for Bujumbura (section 3.1.1)

3.1.3 Lake meteo buoys off Kigoma and Mpulungu

Averages of wind speed and gust, air temperatures and water temperatures of different layers (see section 2.1.3) have been calculated from Kigoma lake meteo station data on a weekly basis. The data are presented in Appendix 5. Percentages of each 16 main wind directions are obtained on a monthly basis.

The same parameters as above on a weekly basis, have been calculated from the Mpulungu buoy data. Two depths of the water temperature sensors of the Mpulungu chain are different than those of to the Kigoma thermistor chain. In the Mpulungu chain there is no 15 m sensor, but a sensor at 250 m. The data of the Mpulungu buoy over the recording period are presented in Appendix 6.

3.1.4 Water level recorders

Daily and monthly means of relative water level, monthly standard deviations and minimum and maximum values have been calculated. Results of different stations have been compiled to compare between stations changes in water level. Because of the relatively narrow range of the pressure sensor, from 0 to 0.7 m, and the highly varying water level between the dry and wet season, the sensors have had to be lowered or lifted several times during the recording period. The change of sensor level, when a sensor has been moved, has been calculated as the difference of the last recording before and the averages of the few first stable recordings after lowering or lifting. This difference has been added to or subtracted from the first reading after the change of the sensor level, respectively. This is necessary to keep the following recordings relative to the starting level of the measurement. Naturally the corrections are applied for all future recordings. Therefore, some results (of Kigoma) are negative. The data are presented in Appendix 7.

3.2 Anemometers

The averages of wind speeds have been calculated for three different periods of a day as follows: at Kipili 0900—1500 h, 1500-2100 h and 2100—0900 h Tanzania time and at Mpulungu 0800—1400 h, 1400—1900 h and 1900-0800 h Zambian time. Percentages of all the observations of momentary wind directions from both Kipili and Mpulungu data have been obtained. The average wind speed of each recording interval (see above) has been calculated by subtracting the current registered number of rotations from the previous one and then dividing by the time between the two recordings. Wind direction has been determined by an observer. The data have been compiled on a monthly basis separately for each period of a day and are presented in Appendices 8 and 9.

3.3 Flow cylinders

Current flow measurements, current speeds and directions, have been calculated in Excel. All lines of the current flow measurements have been analyzed separately, but different depths for each line have been pooled together. The speeds and the directions of each line have been plotted as scattered graphs to give a general view of the dominant current speeds and directions in different areas over the data collection period.

4. RESULTS

4.1 Automatic recorders

4.1.1 Weather station at Bujumbura

The data of Bujumbura meteo station have been collected in the period 13 March 1993 to 31 December 1994. In March and April 1993, during the wet season, wind speed (weekly mean) was 2.5

m/s and the dominant wind direction (>50%) was between NW-NNE (Figures 5 and 6). In mid-June the weekly average wind speed increased to almost 4 m/s. Also the wind direction changed at the time coming mostly from SSE. Average wind gust in June was 4.5 m/s. Strong SSE winds continued till late October, but after the first rains, average wind speed was <3 m/s and later in January decreased to 2 m/s. During the dry season 1993 the winds were stronger than in the previous wet season (Figures 5 and 6) . When the rains started the southern winds were still quite frequent, although less than during the 1993 dry season. The northern winds became dominant only in January 1994 and remained prevalent till April (Figures 5 and 6) . Typically the range of direction for northern winds is wide and southern winds blow only from two to three directions. Due to an accident in late May 1994 the station was out of order until late August 1994. In late August 1994 when the station was again in function, the wind was still prevalent from the south. In 1994 the wet season started in September, one month earlier than the previous year. In November, wind speed decreased and the prevailing direction of the wind was north, being more typical 'rainy season' wind.

Weekly mean air temperatures varied during the recording period from <23.0 to >26.0°C. The lowest temperatures were observed during the wet season and the highest temperatures at the end of dry season or just at the beginning of the wet season. At the beginning of the 1993 dry season weekly average air temperature rose continuously till the end of the season, but when the rains started in October 1993, the average temperature decreased by 2 degrees. In 1994 the decrease of the average temperature was even greater, 3 degrees (Figure 7a)

Weekly means of relative humidity varied between 77 and 87 % at the beginning of the recording period clearly declining during the dry season. After the first rains in late October 1993 average humidity increased to 85 % and at the end of the wet season it reached almost 90 %. In August 1994 the average humidity was as low as 55—60 %, but after the first rains in October it increased rapidly reaching a level of 70-80 % in December 1994 (Figure 7b) . However, it did not reach the same level as in December 1993.

The rainfall data shows that the dry season started in 1993 in late May, changing to the wet season in late October. Total rainfall measured at Bujumbura port during the rainy season of 1993-94 was 460 mm. In 1994, the dry season started again in late May but the wet season began in early September, one month earlier than the previous year. The shift from the dry to the wet season has been determined according to the dates of the first and the last recorded rains in Bujumbura port. Because the data collection period started during the wet season of 1993 and ended in December 1994, the total rainfall from only one wet season, 1993-94, has been recorded (Figure 7b)

As with most of the measured meteorological parameters, the variation in solar radiation followed a seasonal pattern and it was highest on average (weekly) just before the start of the wet season both in September 1993 and late August 1994, ca. 300

W/m^2. During the heaviest rains in January and February 1994 weekly average solar radiation reached the lowest values (150 W/m^2 of the observation period (Figures 7b and 7c) . The highest averages have been recorded just before the wet season.

Seasonal changes are clearly seen in the variation of the air pressure (weekly means), although the variation was quite small, between 922 and 928 mbar. At the beginning of the dry season of 1993 the weekly average air pressure reached 928 mbar. It decreased steadily from July and in September dropped sharply just at the end of the dry season. The lowest average was recorded in November but and the started increasing to its maximum which was reached in May 1994. The lowest value in 1994 was recorded in September after the rains had started (Figure 7c) . Seasonal variations were similar for both years. Occasionally the air pressure values were low due to the altitude of the region.

All the measured parameters show a clear seasonal variation that more or less follows the changes of the wet and dry periods, but the timing of large changes varies slightly for various reasons. For example, the maximum weekly average air temperature in 1993 and 1994 was reached in late September. However, in 1993 it occurred before the start of the wet season but in 1994 only after the rains had started. The rains in 1993 started one month mater than in 1994. Significant differences can be seen in relative humidity values at the beginning of the wet season in 1993 and 1994. In 1993 the average relative humidity was >75% while in 1994 relative humidity was 55%. Late in 1993 the prevailing winds were from the south untypical for wet season. The variation of the different parameters is highest during the shifts between wet and dry seasons.

4.1.2 Wind station at Kigoma

The recording started in Kigoma in July 1993. Weekly average wind speed at the beginning of the dry season was 4.5 m/s, and the prevalent wind direction from the coast was E-NE (Figures 8 and 9). During the dry season in 1993 the wind was blowing across the lake from E or from W. Average wind speed was reduced to 2.5 m/s towards the end of the season and at the start of the wet season in late November. In 1993 the rainy season started in Kigoma one month later than in Bujumbura. At this time the wind direction changed slightly, lake wind shifted more towards NE. During the wet season, the average wind speed varied from 2.5 to 3.5 m/s_1 but again, as in 1993, at the beginning of the dry season of 1994 increased to 4 m/s. The wind direction also changed to across the lake, mainly from land. In August-September 1994, the easterly winds became less dominant and indicated the change in seasons but the average wind speed was still as high as during the dry season (Figures 8 and 9)

4.1.3 Wind station at Mpulungu

At Mpulungu station the daily average wind speed and wind gust varied during the recording period April-December 1994 from

2 to 6 m/s and 4 to 12 m/s, respectively (Figure 10) . The dry season started in early to mid April just before the station became functional. During the dry season high variation in the daily average wind speed can be seen, especially from July to early September (Figure 10) . In July standard deviation of the average wind speed was as high as 1.2 m/s. In mid—September 1994 the wet season started, and wind speed and variation decreased gradually from 3.1 m/s and 0.8 m/s respectively in September to 2.0 and 0.2 m/s in December (Appendix 4) . During the dry season the prevailing wind was blowing from the SSE (Figure 10).
In general, the average wind speed was strongest at Mpulungu compared to the other stations.

4.1.4 Lake meteo station off Mpulungu

Data collection at Mpulungu lake meteo station started in March 1993. In the beginning, the wind direction was SE or NW and weekly average wind speed was ca. 3.0 m/s. In mid-May 1993, at the beginning of the dry season, south-easterly winds became more prevalent and average wind speed increased from 4 to 6 m/s. Average wind speed and gust were at maximum in July, 6 and 9 m/s_1 respectively (Figures 11 and 12a) . These strong south-easterly winds continued till early September (start of the wet season) when winds started to diminish and shift. From October the winds were weak until mid-April 1994. After the last rains wind speed increased again coming dominantly from the S-SE. In July 1994 the strongest winds were recorded, as in July 1993. The period of strong, apparently SSE winds continued till early September (Figure 11) and then weakened towards the end of December (Figure 12a)

At the beginning of the recording period in 1993, weekly average air temperature decreased slightly and reached almost 27.0°C just before the start of the dry season. In late May the air temperature decreased significantly and by late June was only 23.5°C. Towards the end of the dry season the air temperature started increasing slowly and by mid-September 1993 it reached 25.3°C, the average for the recording period. The maximum weekly averages were recorded at the beginning of the wet season but in January the average air temperature decreased to 25.0°C. The dry season started in mid-April 1994 and in early June the average air temperature was as low as 23.0°C. It increased again to 26.5 °C in late September when the wet season started, but in mid-November decreased to 25.0°C (Figure 12b) . Thus very clear periodicity was observed in air temperature.

The water column was vertically stratified in March 1993 and the thermocline was between 30 and 50 m. At one metre depth the average water temperature (weekly mean) was >27.0°C, in 90 m >24.0°C and at 300 m 23.4°C. In April, well before the start of the dry season, at depths of 30 and 50 m, the water temperature decreased more than one degree indicating the weakening of stratification. Later the upper layers began to cool down as the air temperature dropped. The water temperature decreased rapidly in June 1993. In July, in the middle of the dry season, the difference in the water temperature between 1 and 300 m was <1.0 °C. In September the surface temperature started increasing and

vertical stratification was re-established in November. Stratification continued during the whole wet season *i.e.* until the April 1994. In mid-April the vertical stratification started to break down and the water column was apparently unstratified in July. Just before the wet season in 1994 the water temperatures at 1 and 5 m started to increase rapidly and in late October the temperature reached 27.0°C. There is a clear seasonality in the water temperature down to 150 m. The temperature variation between the seasons is highest in the surface to 50 m range. In deeper waters 70 to 110-150 m seasonality is clear but the variation in the temperature is fairly small, between 0.1 and 0.3°C. (Figures 12c and 12d)

A short-term variation in water temperatures can be seen between 70 and 300 m. The periodicity in this variation is approximately one month. It appears that the amplitude varies depending on the season. During the dry season and in deep layers the amplitude is the highest becoming weaker towards the end of April. In March and April 1993 this variation could hardly be seen at 200 and 300 m (Figure 12d)

The effects of different factors which cause the cooling of the surface water and results in upwelling can be clearly seen. While the wind is increasing and the prevailing wind direction turns to the SE the air temperature decreases (Figures 11, 12a and 12b) . Increased evaporation, due to the stronger winds, together with sensible heat flux cools down the surface water. Late in June the air temperature is lower than the surface water temperature. Due to the strong SE winds warm surface water is moved towards the north and cooler water from deeper layers wells up.

4.1.5 Lake meteo station off Kigoma

The recording period started in March 1994. At the start the weekly mean of wind speed was 3-4 m/s (Figure 14a) and the direction was from E-NE (Figure 13) . The wind speed decreased slightly towards May, but the dominant wind direction was still the same. Data collection was not carried out between June and mid-August 1994, so an important period of the dry season was not recorded. In late August to September the winds were weaker, well below the average speed, and prevailing directions were different from those of April to May (Figure 13) . The main directions were then north and south. In October to December average wind speeds remained weak and the directions shifted slightly from land to S—SE.

In March 1994 the weekly average air temperature was about the same as the average value of the recording period and then in September, before the start of the wet season, it increased to 26.0°C. It decreased again being <24.0°C in December. The air temperature variation was the highest in October to December 1994 (Figure 14b)

Weekly means of water temperature near the surface, at 1 and 10 m, were between 26.5 and 27.0°C. At the beginning of the recording period, the vertical stratification was clear and the

thermocline was estimated to have been between 50 and 70 m where the temperature difference was highest. The variation between the surface and 300 m was at maximum 4.5°C from 27.0°C to <23.5°C (Figures 14c and 14d). During the dry season stratification apparently broke down. It could still be detected in August and September due to cooling of the surface. This was noticeable down to 70 m. A very rapid restratification took place in late—September when the surface temperature increased and the layers between 50—90 m cooled down. Water remained stratified till late November which was unusual since the air temperature was low, 2.0°C below the surface water temperature and the winds were very weak.

Due to the short recording period and no data collection in the dry season, it is difficult to discern a clear seasonal periodicity of water temperature at depths of 200 and 300 m. Apart from the seasonal periodicity at 200 m is there some indication of internal waves, but these waves are not as clear as in the southern part of the lake. The periodicity of the internal waves seems to be ca. 1 month (Figure 14d).

4.1.6 Water level recorders

Relative changes of the water level at the three stations are presented as daily means in Figure 15. The recording period at Mpulungu was from March to December 1993, at Bujumbura from March 1993 to the end of August 1994 and at Kigoma from March 1993 to the end of November 1994. The recording commenced during the wet season when the water level was almost at its highest. At each station at the beginning of the wet season, the level started decreasing and was lowest at the end of October at Bujumbura and Mpulungu. The dry season continued slightly longer at Kigoma, until late November. The lake level rose when the rains started. At the beginning of the dry season in 1994 the drop in the water level at Bujumbura was greater than at Kigoma. The peak value of the recorded water level at the end of the wet season in May 1994 was 40 cm and 15 cm less for Kigoma and 15 cm Bujumbura respectively, compared to May 1993.

The measured relative changes of water level could not be compared to lake water level data because no water level data from the recording period were available. Nevertheless, the last data available at Bujumbura port recorded in December 1992 have been used as baseline data to obtain the real water level values. These are presented in Figure 16 together with the cumulative rainfall from the same station. It can be clearly seen from the figure, especially in 1994, that when the rains diminished and then stopped, evaporation became a dominant factor and the lake level started to go down. This occurred one to two weeks before the rains finally ended.

In general, the periodicity in water level change is clear at each station depending on two main factors: rainfall and evaporation. The outflow remains a less important factor.

4.2 Anemometers

4.2.1 Kipili

The data of the Kipili anemometer station were divided into three parts, morning/early afternoon wind (0900—1500h), late afternoon/evening wind (1500—2100h) and night wind (2100-0900h). The recording period started in July 1993 during the dry season.

Weekly average wind speed was at the beginning of the recording period 2.5-3.0 m/s (Figure 17) . Late in August and early September it increased to 4.5 m/s and was 3.5 m/s in October—November 1993. It dropped again during the wet season to 2.0-2.5 m/s and towards May 1994, at the beginning of the dry season, it increased slightly to 3.0 m/s (Figure 17) . The prevalent momentary wind direction in July-August was S. In September the direction changed and was blowing from NW and W. Up to April 1994 these were dominant directions, except in February, when some E land wind was recorded. In May the S and W winds became prevalent indicating the start of the dry season (Figure
17)

During the recording period both afternoon/evening and night wind speeds have been weaker than the morning/early afternoon wind speeds, the latter >2.0 m/s on average. Momentary wind directions of these wind were dominantly from land between NE and SE, but no seasonal patterns were observed (Figures 18-19)

4.2.2 Mpulungu

At Mpulungu anemometer station, as at Kipili, the weekly average wind speed and momentary direction were recorded three times a day, between 0800—1400h as morning and early afternoon wind, 1400—1900h as late afternoon and early evening wind, and 1900-0800h as night wind.

The weekly average wind speed in the morning presented in Figure 21 shows that at the average wind speed increased steadily from the beginning of the dry season until July-August decreasing again in September. In February the average was 2.0 m/s. In April 1994 the average wind speed started increasing and was strongest in August 1994 at 6 m/s. Towards the end of 1994 the wind decreased again, to 3.0 m/s. The prevailing wind direction was NW throughout the recording period (Figures 20 and 21)

The afternoon—early evening winds were weaker, 2.0—4.0 m/s_1 than the morning winds (Figures 21 and 23), but a large variation during the dry seasons can be noted (Figure 23) . The prevalent direction was SE and, especially in February-August 1994 these winds were very dominant (Figures 22 and 23)

The night winds appear to be the strongest offshore winds at Mpulungu. A clear seasonality in the wind speeds can be seen (Figure 25) . At the beginning of the dry season the average

wind speed increased from 2.5 to 5.0 m/s and in July to 7.0 m/s. It decreased again in September 1993 and was weakest in January 1994, 2.0—2.5 m/s on average at which time the prevailing winds were southeast (Figures 24 and 25) . In May 1994 the average wind speed increased to 7.0 m/s_1 but decreased again in August-September to 3.0 m/s and later to 2.0 m/s. In general the direction was SE, although from October to December the SE winds were not so dominant. During the dry season, June to September the wind was only from the SE (Figures 24 and 25)

4.3 Current flow measurements

4.3.1 Bujumbura

Current speeds and direction at all depths measured, for line 1 are compiled in Figure 26. The figure shows that the currents were rarely >10 cm/s and then only at 2 m depth. The currents at line 1 corresponded approximately with the wind pattern of Bujumbura, especially at 2 m depth. The prevailing current directions, SE-SW and NE-NW, were similar to the winds. The currents moving to the north were the strongest matching the S winds. These winds were stronger than the N winds in this area. The directions of slow currents were between SE and SW. The maximum measured current speeds were 18 cm/s and their direction N.

The speeds of the currents in line 2 were slowest in the Bujumbura area, at maximum 13 cm/s. The prevailing direction differed from line 1. Fast flows were to the south, while slow currents moved in directions. The NE-NW directions were the most common. The strongest currents, even at 2 m depth, were against the southern wind which prevailed in the Bujumbura area. The currents at 2 m depth were the fastest, while the currents in deeper layers, 20 and 40 m were ≤ 5 cm/s (Figure 27)

At line 3 the prevailing and fastest currents were to the south, similar to line 2, and against the wind even at 2 m (Figure 28). In deeper layers the currents were slower and their patterns unclear. The currents were clearly faster (at maximum 18 cm/s) than at line 2.

At line 4 the current flows were the fastest of the all sampled areas off Bujumbura, at maximum >20 cm/s. The direction pattern clearly followed the coastline (Figures 2 and 29), currents flowed either to the S or SE or to the NW-NE. Although most of the currents were to the south a few fast north currents were recorded at 2 m, following the wind direction pattern of the area (Figure 29)

4.3.2 Kigoma

At general the currents were faster at Kigoma than at Bujumbura. In three lines out of four the maximum current speeds were >25 cm/s (Figures 31—34)

At line 1, to the north of Kigoma, maximum speeds reached 27 cm/s. The prevailing direction of these currents was between SE and SW. The currents to the north were normally slower hardly exceeding a speed of 6 cm/s (Figure 30) . The currents at line 1 did not follow the local wind pattern of the area. Prevailing winds were across the lake, while the currents were flowing longitudinally. Some of the currents at 20 and 40 m depths were >15 cm/s. However, they did not have a clear directional patterns.

At line 2 both speed and direction were very similar to line 1. The currents at 2 m were the fastest, but they were not as strongly directed to the south as the currents at line 1. However, the main direction was S, which did not follow prevailing wind directions. The currents at 20 and 40 m were weak, ≤15 cm/s_1 and were dispersed in many directions (Figure 31)

In line 3 south of Kigoma (Figure 3), the currents were the fastest. Maximum speeds were 30 cm/s even at 40 m depth. Prevailing flow was S, but there was an indication of NW currents. A few fast NW flows were recorded as well at 40 m (Figure 32) . It should be noted that the currents at 40 m were as fast as at 2 m, although the currents in 20 m were usually <15 cm/s (Figure 32) . Without exception all the southerly currents at 40 m were >20 cm/s.

The currents at line 4 outside Ujiji, differed from the other currents of this area both in speed and direction. The speeds of the currents were slower than at the other lines (Figure 33) . The direction of the currents partially corresponded with the wind pattern of the Kigoma area, where the fastest winds were from the west and slower winds from the land, in the east. However, the prevailing direction could not be detected as they were in the other lines. Most of the currents at all of the lines mainly followed the coastal contour (Figures 3 and 33) . The currents at 20 and 40 m were especially slow, normally <5 cm/s and flowing in several directions.

4.3.3 Mpulungu

Current flow measurements made at 5 lines (Figure 4) were the most complete for all the current recording areas around the lake. The southern part of the lake was considered to be the most important area to study currents because of the strong upwelling during the dry season. The average current speeds reached 35—40 cm/s and were the highest of the 3 sampling areas.

At line 1, on the east coast, the currents were the slowest in the Mpulungu area. Maximum recorded current speeds were 24 cm/s. The currents flowed in several different directions but the prevailing and fastest to the SE and SW. The currents were fastest at 2 m depth (Figure 34) . The currents followed the wind direction in the area, where daytime prevailing winds were from the NW.

The current directions at line 2 differed from those at line 1. At the latter the prevailing currents were to the SE and

SW compared to NW and NE at line 2 (Figure 35) . Some of the weaker currents flowed to SE and speeds were <10 cm/s. Maximum recorded speeds in line 2 were 25 cm/s. Strong surface currents were quite common. Currents in 10 and 20 m depths reached a speed of 20 cm/s, flowing towards the north. The currents at line 2 were mainly opposite to the prevailing winds.

Line 3 was located on the western coast (Figure 4) . There the measured currents were fast and mainly in two directions SE and NW, following the coast. The NE currents were faster but were less in number compared to the south-easterly currents. The NE currents matched the prevailing wind direction. In general the currents at line 3 were fast at all depths even at 20 and 40 m (Figure 36) . The maximum speeds at 20 and 40m were 30-40 cm/s, twice the maximum speed recorded off Bujumbura.

The currents at line 4 differed from line 3 in their speed and direction. The maximum speed was ca. 30 cm/s and the dominant direction of the currents seemed to be more across the lake from E-SE to W—NW or vice versa (Figure 37) . The prevailing currents were to the W—NW and as at line 3 fast currents were observed at depths of 20 and 40 m.

At line 5, the currents flowed at maximum 40 cm/s, and were predominantly NW or to E-NE. The NW currents were the fastest. The total number of measurements at line 5 was low compared to other lines in the Mpulungu area, but the direction pattern was very clear. Fast currents existed at all depths and the maximum speed was 40 cm/s (Figure 38) . Prevailing strong southern winds did not match the dominant current direction.

5. DISCUSSION

Bujumbura: meteorology in the northern part of the lake

The dry season at 1993 started in Bujumbura in late May and continued until late October. A long dry season is typical for Burundi and for the whole lake region. The wet season in 1993-94 started at Bujumbura in late October and continued until May. The amount of rainfall decreased slightly in late December 1993, but the heaviest rains were in January 1994. The occurrence of dry and rainy seasons and their causes are described by Bidou *et al.* (1991) . In general a short wet period starts in October and continues to December. It is normally followed by a short dry period and then a long rainy period. However, in 1993-94 the rains diminished in December but the real short dry period could not be observed.

In the lake region the change from the dry season to the rainy season is probably regulated by the austral and boreal trade winds, which are closely linked with the Inter-Tropical Convergence Zone (ITCZ) and its active rainy zone movement. The movement of the ITCZ is based on the high pressure and anti-cyclone zones in Arabia and the Indian Ocean. The ITCZ passes over Burundi from north to south in from October to December. In January it is usually located to the south of Burundi, causing the short dry season. In March it again moves towards the north,

normally giving the heaviest rains of the whole year (Bidou *et al.,* 1991) . The simplified dynamics of ITCZ are presented in Figure 39. Burundi is located in the transition area between equatorial and tropical climates. The equatorial climate, as in Uganda, to the north of Burundi, has two rainy and two dry seasons. The tropical climate area, to the south of Burundi has one dry and one rainy season. Therefore, it is possible that the dominance of these two climates changes and in some years, in Burundi, the short dry season does not occur as was the case in 1993-94.

The average total rainfall in the 1993—94 wet season at Bujumbura port was below the normal average recorded at Bujumbura airport, 460 mm and 840 mm/y, respectively (unpubl. data from 1922—93 of IGEBU, Institut Geographique du Burundi) . From October 1993 to May 1994 the active zone of ITCZ did not move to the south of Bujumbura, but affected the region for the whole time. However the wet season started later than usual and when it did start the active rain zone of ITCZ was found to be dispersed resulting in rainfall below normal (Anon., 1994).

In Bujumbura slow northerly winds are prevalent during the wet season and faster southerly winds during the dry season. The dominant wind directions in the East African region are also related to the movement of ITCZ. The ITCZ is at the confrontation of the southern and northern trade winds. When the ITCZ passes Burundi at the beginning of the wet season the prevailing wind changes from south to north (Anon., 1993; Anon., 1994).

Although the ITCZ strongly affects the winds in this region, local factors such as air temperature and topography play an important role especially in the dial rain and wind patterns. The location of the meteorological station at Bujumbura port on a pier being a semi-lacustrine station. Lower rainfall recordings are made here compared to the land station *at* Bujumbura airport (see above). Unpublished data of IGEBU (Institute Geographique du Burundi) from January 1992—June 1993 showed that the precipitation at the Bujumbura airport was 429 mm/y less than at Kamenge, which is situated only a few kilometers from the airport at the higher altitude. The local, daily lake wind, ‘Mirwa’, created by hot air on land, causes convection rainfall on the escarpments around Bujumbura at noon or early afternoon (Bidou *et al.* 1991) . During this short but heavy rain the different air masses are quickly mixed and rainfall decreases before reaching the coastal area and the lake. Beachamp (1939) concluded that the rainfall was greatest on the lake, but this was proved to be a wrong by Capart (1952) and Coulter (1963) . The dispersion of precipitation during the wet season and the location of the LTR station at Bujumbura port may be the cause of the very low precipitation measured in 1993-94.

The factors mentioned above, probably regulate the meteorological parameters like temperature, humidity, solar radiation and air pressure. A rapid drop in temperature just before the start of the wet season both in 1993 and 1994 was probably linked to the ITCZ front. It is evident that the

increase in relative humidity was caused by the first rains. A decrease in the air pressure at the end of the dry season indicated the approaching rainy zone and the start of the wet season. The great variability of the relative humidity between 1993 and 1994 before the wet season, supports the view that the sporadic rain around the area in 1993 and .the trade wind from the south together caused an exceptional 'dry' dry season. Due to this in December 1994 relative humidity was much lower than at the same time in the previous year. When the humidity was low, due to the reduced rainfall, evaporation increased considerably. This was clearly observed in 1993-94. The average evaporation in the dry season (June—September) 1994 was 140 mm/month while in 1993 it was 90 mm/month (Kakogozo, pers.comm.). Evaporation and rainfall are the main factors which regulate lake level.

Kigoma: wind pattern on-shore and off-shore and changes in vertical stratification in the north main basin of the lake

At Kigoma land station the prevailing winds are usually across the lake, from the east or from the west. The winds are thermal in their origin. Beauchamp (1939) observed the same phenomena in Mpulungu. During the night, air temperature on the lake is higher than on land, but during the day the opposite occurs. Dial variation of air temperature is smaller on the lake than on land. In the morning a light wind blows from land but towards noon the wind shifts to the west and intensifies. This wind continues normally for a few hours until early evening when the wind shifts again to the east and decreases. During the noon and early afternoon the temperature differences of air masses between the land and the lake are greatest causing the strongest winds of the day from the lake (Beauchamp, 1939) . During the dry season at Kigoma, the winds are stronger than the wet season due to the greater differences between daily minimum and maximum temperatures. At this time the prevailing easterly-westerly wind pattern is the clearest. A weak seasonal variation in average wind speeds compared to the seasonal wind patterns of Bujumbura and Mpulungu supports the observation that the wind pattern of Kigoma is mainly thermal in origin, and not strongly affected by the southerly and northerly trade winds. Therefore, the dial and seasonal temperature differences between lake and land are the main factors affecting the wind speeds of Kigoma.

In the open lake area off Kigoma the wind pattern differed from that on land. During the dry season the prevailing winds were westerly or directed longitudinally along the lake, south to north. The winds outside Kigoma were not thermal in origin. A wind speed and air temperature relationship, typical for wind that are thermal in origin, was not well defined in the present study off Kigoma as it was at Mpulungu. At Mpulungu, during the dry season, the dial variation of air temperature and wind speeds was the highest. The winds in the open waters off Kigoma were occasionally affected by the land wind pattern. It is possible that the wind pattern was a mixture of thermally originated and south trade winds, as the winds varied strongly between the seasons.

The seasonal variation in stratification off Kigoma was not well marked as off Mpulungu which was partly due to insufficient, missing data in the dry period. The strongest stratification occurred in March to May when the thermocline was between 50 to 70 m (Figure 14c) . Later, during the dry season there may have been some upwelling, although probably not as strong as off Mpulungu. van Meel (1987) noted a distinct thermocline still in early August at 85 m. In the present study some evidence for upwelling could be found. In late August and September when the stratification was weak, surface temperature was 1.5°C lower than in April at 70 m the average temperature was less than in May, before the dry season. As Beauchamp (1939) showed, some mixing occurs in September off Kigoma as late as early October. According to data in late September 1994 restratification was established rapidly and the thermocline was between 30 and 50 m (Figure 14c) . The winds were then weak, but despite decreased air temperature, the water temperature close to the surface remained fairly high (26.2°C) until mid-November. Normally a nocturnal sinking of cooler surface water causes mixing by convection (Home and Goldman, 1994) which would be seen as a decrease in the surface water temperature. This convection can even be more efficient than mixing due to the wind and is sometimes the main source of mixing in stratified temperate and tropical lakes. In Mpulungu but not in Kigoma, the effect of both the wind and decreased air temperature was noted. It has been suggested by Coulter (1991), that the warm surface water from the south, pushed by the trade wind, flows to the north and can be seen as a downward tilting of the thermocline in the northern part of the lake. Differences between the surface and air temperatures by as much as two degrees supports this theory. However the current measurements off Kigoma are not consistent with this as the currents flow mainly to the south. The measured currents were only from one part of the circulation system in this region and the northward movement of surface water was probably missed. It has been proved that the wind patterns on land and off shore are different and thus they might result in different onshore and offshore current patterns as well. The epilimnion water was >26°C for 2.5 months and cannot be explained as a local anomaly. After this 2.5 months period, in mid-November, the air temperature decreased below 24.0°C and surface water cooled down. Stratification became weaker, indicating some upwelling. This weak stratification was observed in January by Beauchamp (1939).

Kipili: wind pattern in the south middle part of the lake

There is some evidence for thermally originated wind patterns at Kipili, as at the other land wind stations. In the morning and in the evening there were land breezes and in the afternoon winds were from the lake. The wind speed was higher in the afternoon. Some seasonality could be seen as the wind was clearly stronger during the dry season. The difference in the wind direction between seasons is obvious, although the present data does not cover the whole year. The average wind speeds are in general fairly low, the lowest recorded around the lake.

Mpulungu: wind pattern on-shore and off-shore and changes in vertical stratification in the southernmost part of the lake

Wind pattern

The seasonality in wind speeds and direction was clearest in the southern part of the lake and this can be seen in all wind data collected in this area. The winds were strongest from late April-early May to late September. The prevailing wind direction was south-southeast. Apparently ITCZ, which determines the rain and dry seasons in the lake region, also affects the winds in the southern part. As can be seen in Figure 39, at ITCZ two different trade winds meet, the northern boreal, which is prevalent on the northern side of ITCZ, and the southern austral that prevails in the south (Bidou *et al.,* 1991) . Therefore, prevailing winds and rains around the lake may be based on the movement of this inter-tropical convergence zone and its active rainy zone. They are both dependent on the seasonal atmospheric circulation in the East African region (Bidou *et al.,* 1991) . During the warm wet season the winds are mainly weak although some storms with heavy rain may occur from the north and the southern wind are not prevalent (Coulter, 1991) . During the dry or cold seasons, when the ITCZ is located at the latitude of Ethiopia and Sudan (Bidou *et al.,* 1991), the dominant wind is the south trade wind.

Apart from general seasonal variation of wind direction and speed there is considerable dial variation, as shown by the data from three daily measurements at the anemometer. Off—shore winds were prevalent early in the morning and around noon, while in the afternoon, evening and during the night the dominant wind direction was from the southeast. This variation was thermally originated and seemed to be fairly common in the different parts of the lake. This dial wind regime has been recorded by Beauchamp (1939), Capart (1952) and Coulter (1963) . Additionally Coulter has stated, that in the Mpulungu area the wind is channeled by the high escarpments directly along the longitudinal axis. The southern trade wind starts in April probably causing the land air temperature to decrease. Because of the high heat capacity of large water masses, cooling of water is slower than air and the difference between the air temperatures on land and on the lake becomes greater during the dry season. Capart (1952) noted that air temperatures on the lake are strongly influenced by lake surface temperatures and maintained at a high stable level, maximum dial variation rarely exceeding 2.0°C. Coulter (1963) noted that at Mpulungu, between June and the end of August, night air temperatures of the plateau were <12.0°C and the variation in maximum and minimum temperatures were sometimes 12.0°C during the dry season, but only 5.0- 8.0°C during the wet season. The dry season is remarkably cooler than the wet season and the thermally originated winds are stronger during the former.

Seasonal temperature variation in the southern part of the lake

Seasonal changes in water temperature seasonality were clearest in the Mpulungu area. As mentioned in the previous section, the strong southerly winds caused partial cooling of the air, but the cooler air masses from the south may also have played an important role in cooling the surface water. The decrease of the air temperature together with the strong wind first cooled the surface. Due to the latent (evaporative) heat loss and sensible heat exchange, the vertical stratification started to break down and by late July 1993 and later become unstratified down to 110-150 m. Restratification started slowly in late August 1993 while the wind was still strong 5-6 m/s. As the wind speed decreased the restratification increased and by November was restored. This was the period of the highest (27°C) air temperature. The air temperature decreased in January 1994 resulting in cooling of the surface water. At that time the wind was weakest <3 m/s of the whole study period. It is possible that the heavy rains also caused the partial cooling of the surface temperature. The restored stratification persisted until April 1994, when it started again started to break down. In 1994 the effect of the strong winds seemed to be the main cause for destratification, although there are no data for mid-May. The temperatures during the upwelling were higher than those recorded by Coulter (1963). In this study the surface temperatures were >24.0°C, while Coulter measured surface temperature between 23.50-23.75°C. This kind of variation is normal between the years.

After destratification internal waves are found between 70 and 250 m. Their periodicity seems to be one month, but this can not be determined accurately from weekly mean data. Ferro (1975) found internal waves of several frequencies, 25 to 30 days, 10 to 14 days and 3 days. Coulter (1991) has evidence for 23 to 33 day and 3 day periods. According to Coulter (1991) internal waves are established by the relaxation of the wind followed by density redistribution and seiching. This is clearly seen in the deeper layers of 200 and 250 m almost throughout the period. They did not exist in March and April 1993. They probably originate during the dry season, slowly dampen down during the wet season and in some years they disappear completely before the start of the following dry season.

The main upwelling, taking place in the southern part of the lake, affects the middle and northern part of the lake by causing a downward tilting of the thermocline and some local upwelling. Speculations about the functions of these local upwellings have been given by Coulter (1991) but no one single explanation has been satisfactory. This is partly due to the complexity of the system.

Water level of Lake Tanganyika

The period of data collection in the present study is fairly short for conclusions to be made on the changes in the water level between the seasons or different years. At Bujumbura and Kigoma stations two peaks in water levels during the wet

season were recorded and showed similar trends. The peaks at the end of the season were much lower in 1994 than in 1993. Due to sporadic rains in 1993–94 in the lake area, low values of relative humidity at the end of the following dry season and high evaporation, there was a clear decrease in the lake level. Therefore the peak values for both Bujumbura and Kigoma were less in 1994 than in 1993. Outflow from the lake cannot be considered an important factor affecting water levels because of the scarcity of the rains. Bultot (1965) calculated that the difference in a normal year between the inflow from Rusizi and the outflow from Lukuga decreased the lake level 5 mm/year. An LTR expedition to Kalemie in October 1995 estimated the outflow from Lukuga to be the same order of magnitude as that of Bultot (1965) (Huttula pers. comm.)

The differences in the water level between Bujumbura and Kigoma stations cannot be explained. In 1993, the wet season did not start at Kigoma before mid-November (Mannini, pers. comm.), and apparently the rains at the beginning were scarce. The sensor at Kigoma port is located in a closed bay and the prevailing winds from the east could have caused a reduction in the total water volume in the bay resulting in a decrease in the water level. The difference in the levels between Bujumbura and Kigoma stations in June 1994 returned almost to the same level as it was a year before.

The high water at each station was reached by about 10 May, which is close to 08 May, given by Bultot (1965) . The average low water level was recorded on 30 October by Bultot (1965), which is similar to the date, 28 October, for low water levels in Bujumbura and Mpulungu in this study. However, the low water date does not correspond with the observed low water date for Kigoma, which took place between 18 and 20 November 1993. Bultot (1965) calculated the differences between the high and low waters from 1941 to 1959. The high water average was during the period 77 cm and low water average change 82 cm. The low water difference, meaning the difference between the peak and the lowest value in 1993, at Bujumbura and at Mpulungu was 60 cm and 55 cm respectively. At Kigoma it was ca. 70 cm, but all these values were less than the averages presented by Bultot (1965) . This applies also for high water measurements (the difference between the lowest value in 1993 and the highest value in the following year), which has been estimated to be at Kigoma 30 cm. This is below the average given by Bultot (1965) . The small change at Kigoma between the dry and wet season is significantly related to the rains and humidity around the lake and especially in the Kigoma region. According to the ‘Drought Monitoring for East and South Africa’ for the Kigoma region the rainfall from September to November 1993 was estimated to be 25-75% below the average and in November 1993 to January 1994, 75–125% below the average precipitation of the area (Anon. 1993; Anon. 1994)

Current flow measurements

Wind is the primary force moving the lake water at all depths. Its kinetic energy is transferred to the water causing the water motion. Currents build up slowly, but they contain most of the kinetic energy of the lake (Home and Goldman 1994). At Bujumbura where generally the winds are the weakest of the three station, currents are the slowest. In Mpulungu which has strong winds also have the fastest currents. At depths of 0 to 40 m current directions are usually the same as the wind direction. However, the winds are variable making the currents more unpredictable. The shape of the lake, the coastal effect and bottom depth all affect the currents.

At Bujumbura, line 1 (Figure 2), the maximum depth was <60 m and the currents were parallel with the wind direction. A clear relationship between the current and wind direction is difficult to detect in the present study at Bujumbura and Kigoma since measurements were taken when winds were shifting direction in the morning and in the afternoon. In the Mpulungu area the strongest winds were from the southeast and it could be assumed that the currents flowed northwards, but these strong southeasterly winds were usually only prevalent during the evening and night hours.

Bujumbura

The currents at line 1 in Bujumbura follow the wind direction, the prevailing directions being SE-SW and NE-NW. The north currents were the fastest, matching the southern winds which are the strongest in the Bujumbura area. At line 1, the topography of the coast and the River Rusizi may affect the currents in the area.

At lines 2 and 3 the prevailing and the fastest currents were to the south. Thus the strongest currents were against the wind, even at 2 m. Off Bujumbura the prevailing wind shifted from N-NW to S-SE around noon. Northern winds were mostly slow compared to southern afternoon winds. Measurements were carried out from morning till afternoon and conducted only a few hours when there was a southerly wind. The amount of kinetic energy needed to change the current direction is high taking most probably several hours to overcome the resisting current (Coulter 1991) . This partly applicables to observations from line 4, where most of the currents were to the south although the fastest currents were windward currents to the north. The fastest currents were near the surface at 2 and 5 m. In deeper layers were the currents were weaker their directions were not well defined and did not follow the prevailing wind direction. The deeper layers may be affected by the Coriolis force. According to Serruya and Pollingher (1983) the Coriolis force in Lake Tanganyika is at Bujumbura 5.8% and at Mpulungu 15.2% of its maximum value at the poles. Because of the size of the lake this force should be taken into account. The effect of the Coriolis force depends on the relative time scales of the motion and basin dimension characteristics (Coulter 1991) . If the time scale of current motion exceeds the earth’s rotation period,

then the Coriolis force can affect the current. Furthermore, in terms of length, 'the radius of deformation' the Lake should be wide enough for the Coriolis force to be significant. According to Coulter (1991) this is not the case in Lake Tanganyika. Prevailing wind directions are changing diurnally, so, at least at surface layers the Coriolis force cannot be effective. Probably the continual change in wind speed and direction is the main reason for the variable current directions.

Kigoma

Kigoma currents were faster than in Bujumbura as were the winds. Kigoma area is deeper and more open. Normally the currents in the Kigoma area follow the coast line, but except at line 3 they did not match the prevailing winds, which were usually directed across the lake when measurements were made. Due to the lack of the wind direction data during the dry season it is difficult to explain the current patterns of Kigoma. As suggested earlier, water from the south might flow to the Kigoma area during the dry, keeping the surface water temperature warm and aiding the restratification. This happened despite lower air temperatures. The prevailing current directions of Kigoma were to the south being fairly fast. At line 3 they persisted down to 40 m depth. Currents and winds recorded at line 4 were exceptional, partly due to shallowness and because the line's location. Coulter (1967) stated, that as a consequence of southerly winds and the Coriolis force, a combined north-westward movement should result in a deep current flowing along the western shore. This would cause an upwelling on the eastern shore and a superficial 'return' current to the south against the wind, especially where the transverse tilt is accentuated by a strong easterly wind, as is sometimes seen at Karema. The east—west wind pattern was typical for the Kigoma area. Latitudinal upwelling has not been proved and the effect of Coriolis is still unknown. The southern winds resulting the above situation explained by Coulter (1967) are prevalent only during the dry season and thus this does not explain the constant southern currents in the Kigoma area.

At Kigoma no effect of the local current pattern from the wind across the lake can be seen, but the prevailing currents are to the south following the shape of the coast. South from Kigoma some northwestern currents were measured, being wind-induced in origin, but the southern currents still remained dominant. The wind current speeds were higher than in Bujumbura and generally whenever the wind speeds were high the currents were too. This applies for all the stations. It is clear that the faster the currents the more precise were their direction, even at 20 and 40 m depth. Although the southerly currents on the west coast were prevalent, the effect of the strong southern winds could be seen. The dominant wind direction during the measurements was northwest, the direction where the fastest currents were flowing. The share of the southern currents were to the northwest or southeast and following the coast line. Again the slower the current the more dispersed was the direction. On the east coast the currents were the slowest and were directed mainly to the south following the prevailing winds

and the coast line.

Mpulungu

In the Mpulungu area the currents were the fastest. As the measurements were carried out in the daytime, the prevailing wind was assumed to have been W-NW. The prevailing currents, to match the daytime onshore winds, should be easterly or south-easterly. This was shown at lines 1 and 3 show this pattern. At lines 2 and 5 the currents were opposite to the dominant winds and at line 4 the currents flowed more across the lake. As the data were not divided into seasons, the differences between seasons could not be determined. Despite strong variability in current speed and direction off Mpulungu, most of the currents on the west coast were to the north and on the east coast to the south. This gave some evidence for clockwise current circulation in the southern part of the lake.

6. CONCLUSIONS

The Inter—Tropical Convergence Zone determines the occurrence of two seasons in the Lake Tanganyika region. In the northern and southern parts of the lake the wind is thermal in origin, and during the dry season, when the air temperature differences on the land and lake are the highest, the winds are the strongest. Daytime winds are onshore and night time winds are offshore.

In the open and middle part of the lake the wind pattern is not clear as illustrated by the Kigoma offshore and Kipili stations.

Water level changes are related to evaporation and rainfall, water inflow and outflow from rivers are only of minor importance.

Destratification of the water column and the occurrence of internal waves during the dry season in the southern part of the lake has been observed. In the Kigoma area these phenomena could not be proved but they might occur. They are probably induced by the strong southern winds and by surface cooling through evaporation.

Currents around the lake are strongly variable following local and seasonal wind patterns and having a possible clockwise circulation in the southern part of the lake.

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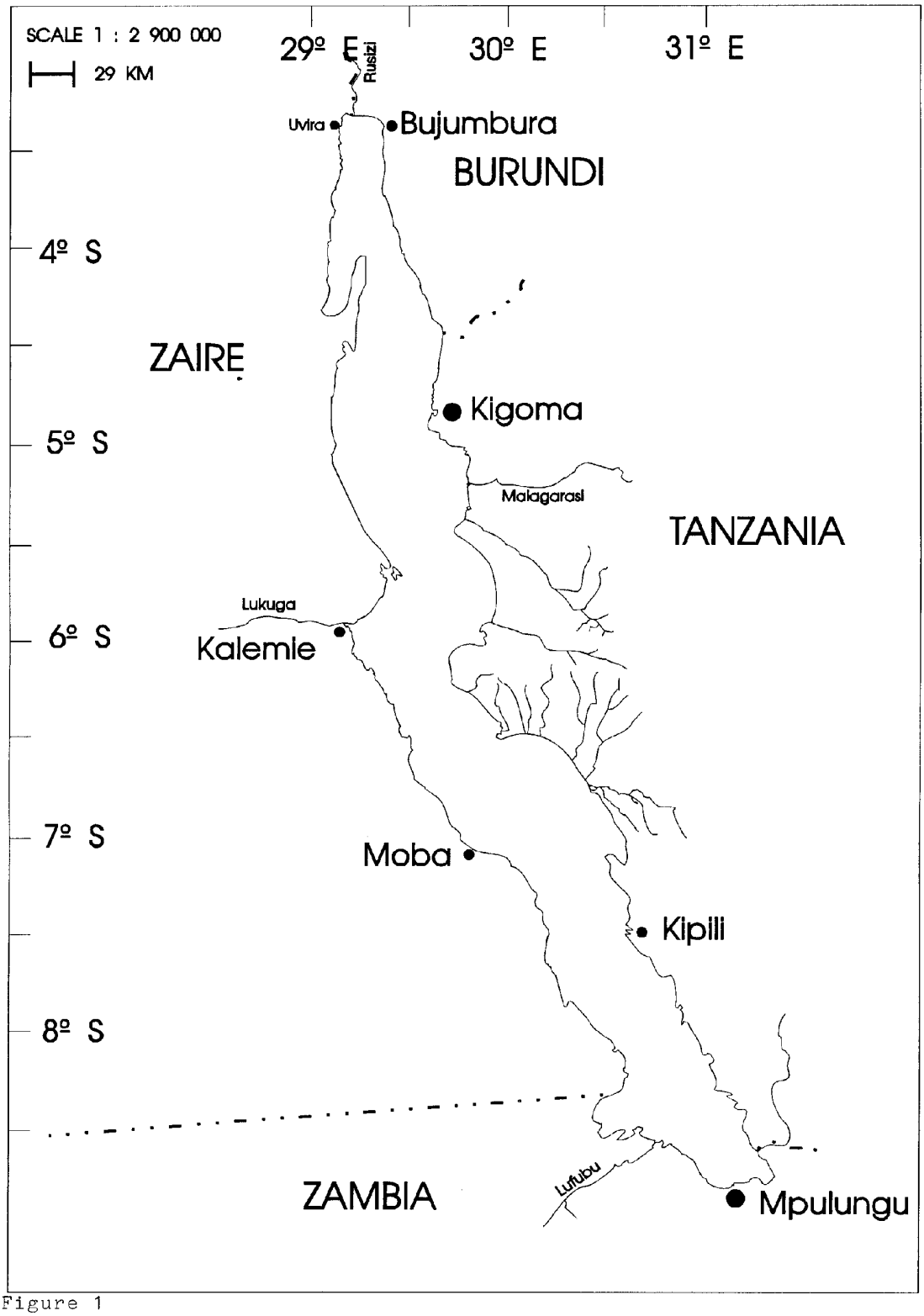
SCALE 1 : 2 900 000
29 KM
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TANZANIA
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Moba
Kipili
8º S
ZAMBIA
Lufubu
Mpulungu

Figure 1

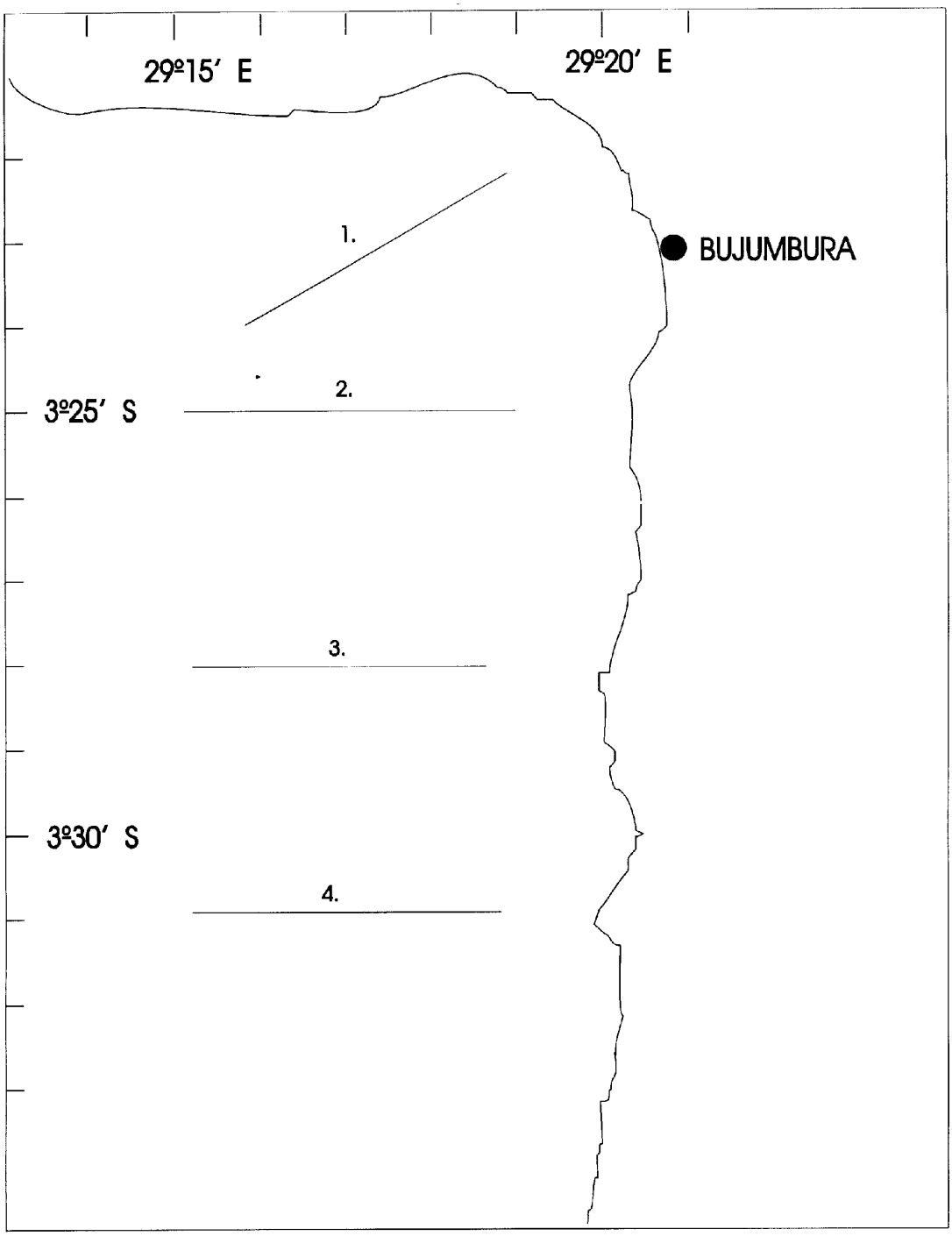


Figure 2. Current flow measurement lines (1-4) of Bujumbura station. Information recorded was date, depths of cylinders (2, 5, 10, 20 and 40 m) and wind and current speeds and directions.

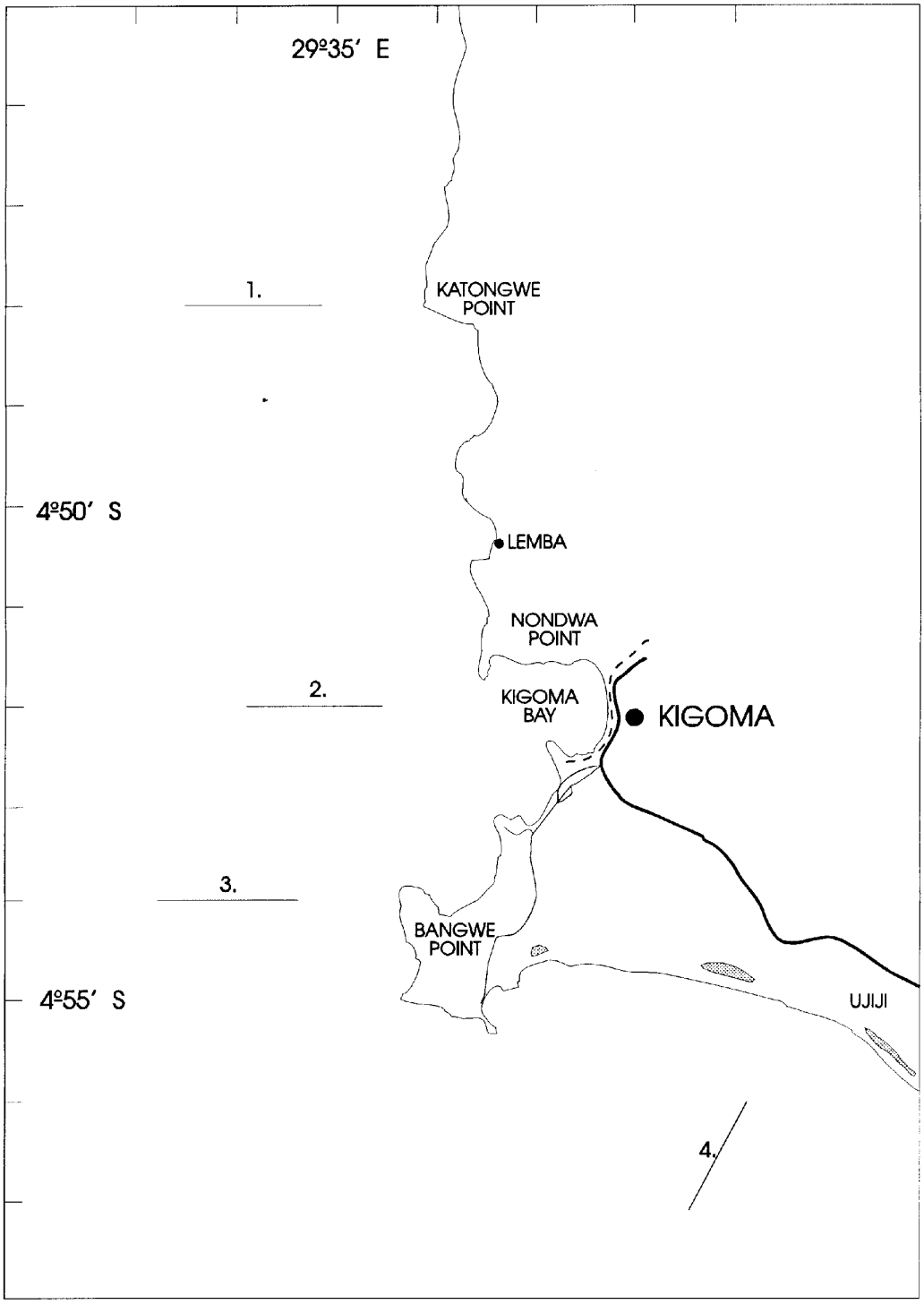


Figure 3. Current flow measurement lines (1-4) of Kigoma. Information recorded was date, depths of cylinders (2, 5, 10, 20 and 40 m) and wind and current speeds and directions.

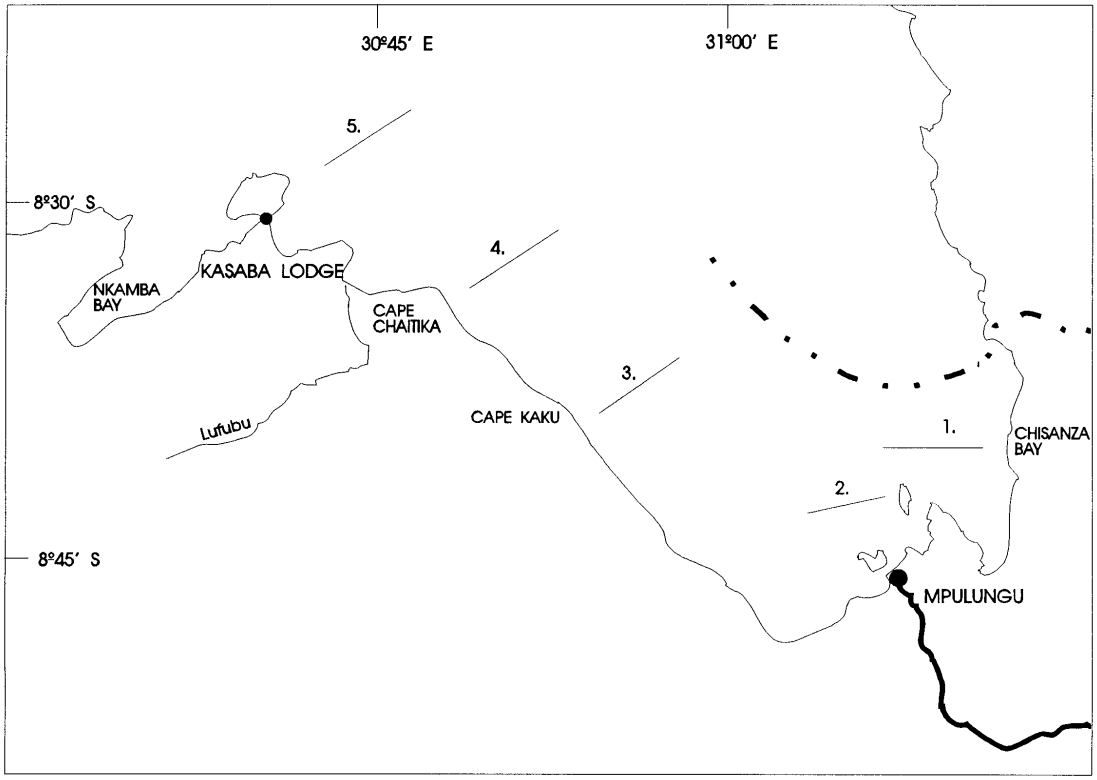


Figure 4. Current flow measurement lines of Mpulungu area. Information recorded was date, depths of cylinders (2, 5, 10, 20 and 40 m) and wind and current speeds and directions.

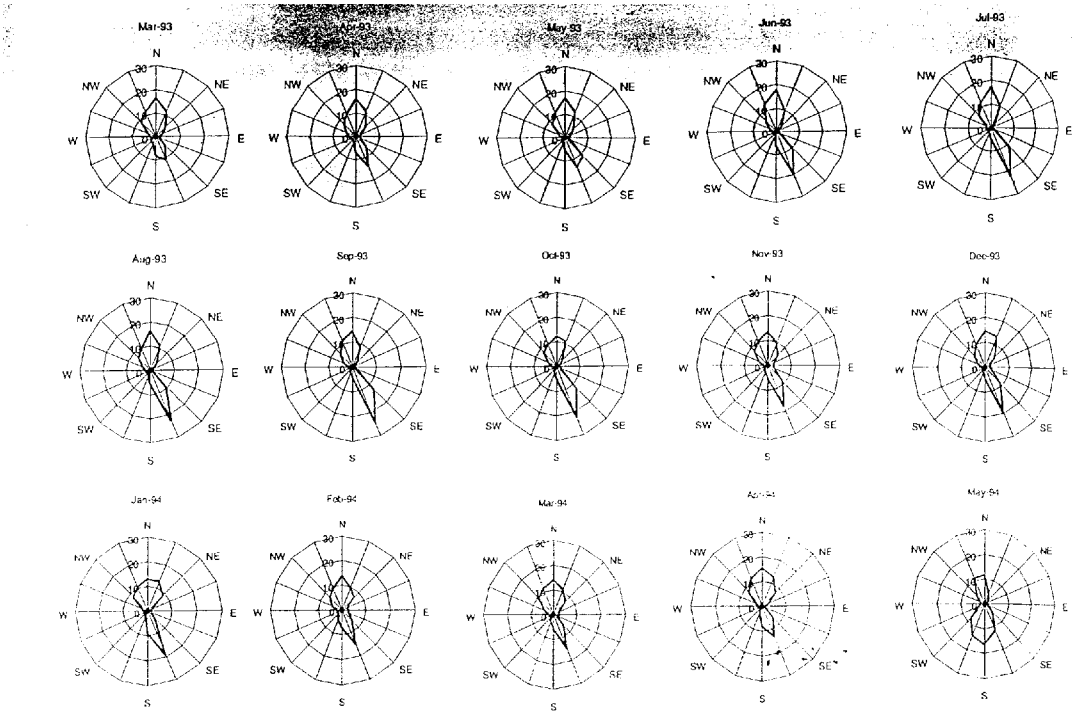


Figure 5. Wind direction distributions (%) on a monthly basis March 1993 - May 1994, at Bujumbura meteorological station.

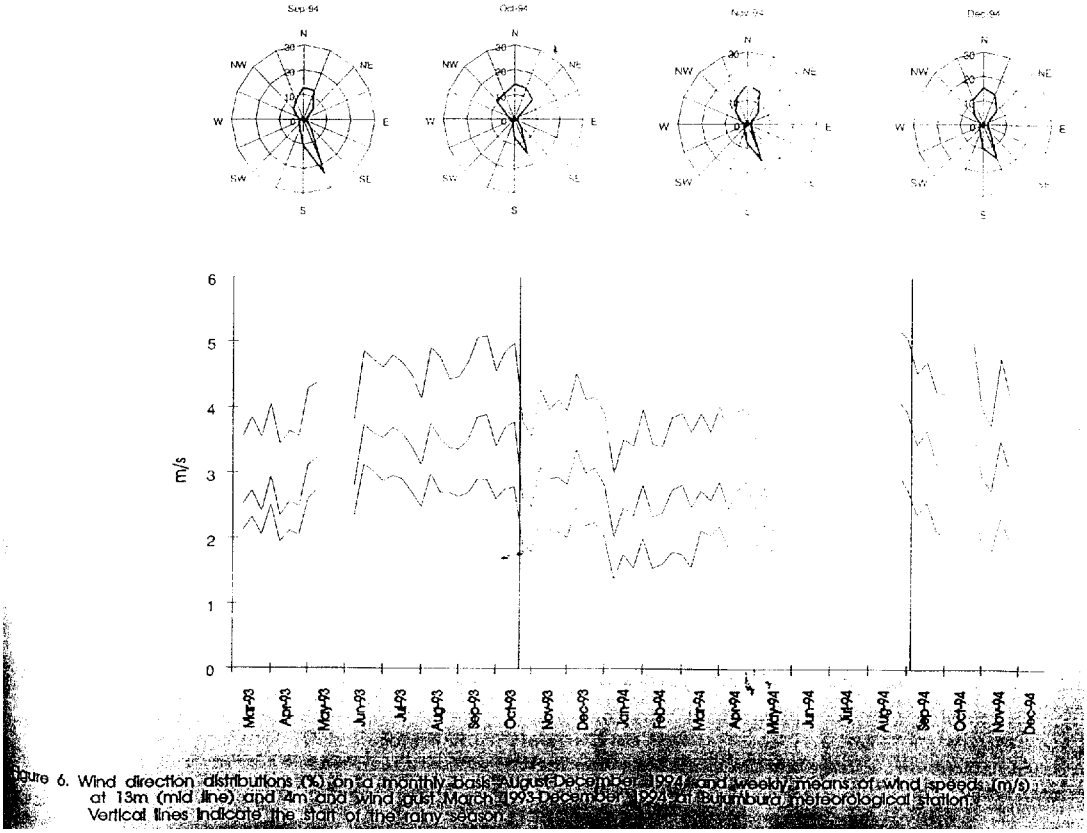


Figure 6. Wind direction distributions (%) on a monthly basis August-December 1994 and weekly means of wind speeds (m/s) at 13m (mid line) and 4m and wind gust March 1993-December 1994 at Bujumbura meteorological station. Vertical lines indicate the start of the rainy season.

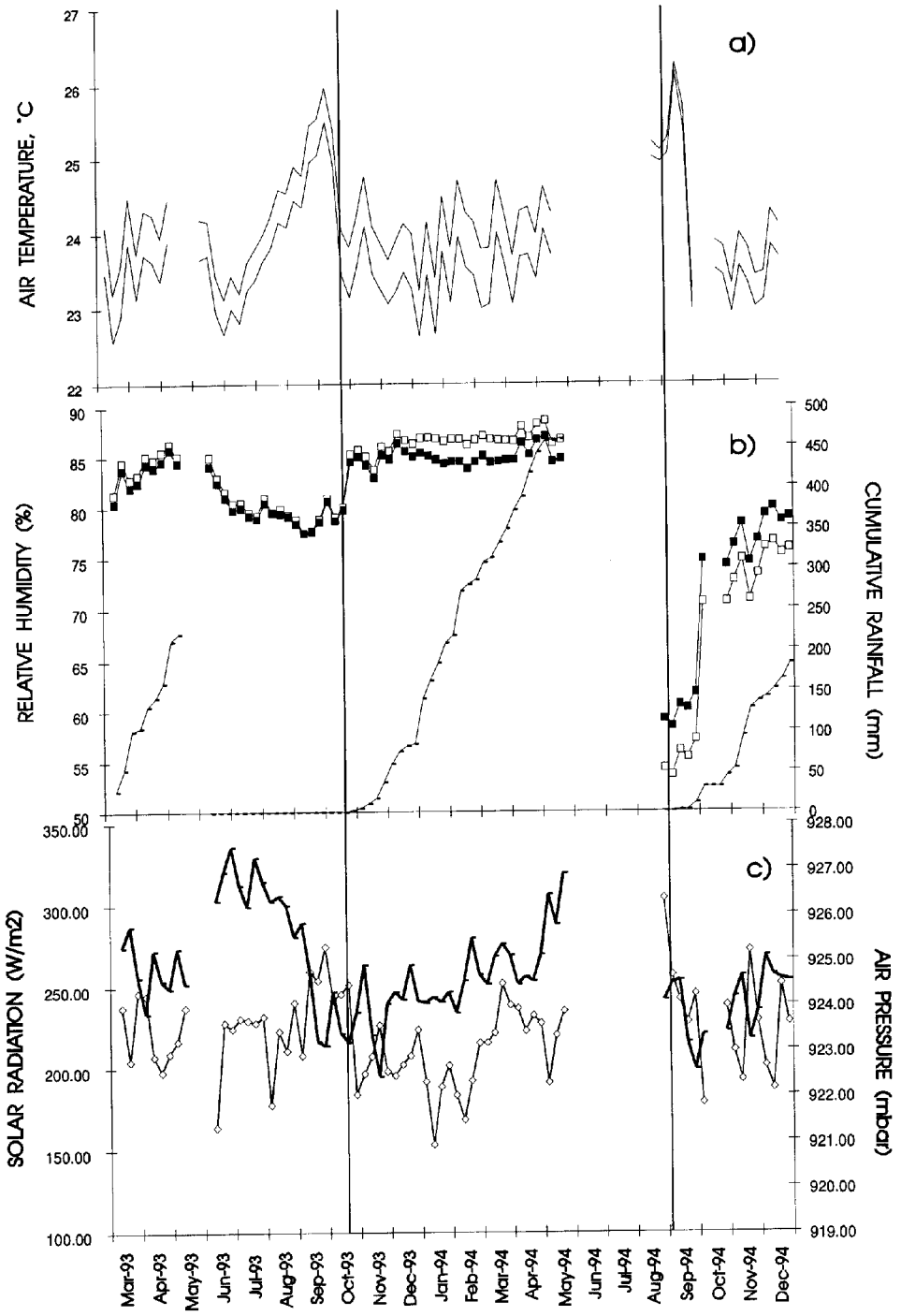


Figure 7. Weekly means of a) air temperatures (°C) at 13 m (lower line) and 4 m;
b) weekly means of relative humidities (%) at 13 m (lower line) and 4 m and cumulative rainfall (mm) and;
c) weekly means of air pressure (mbar) (thick line) and solar radiation (W/m.) in March 1993 - December 1994 at Bujumbura meteorological station.
Vertical lines indicate the start of the rainy season.

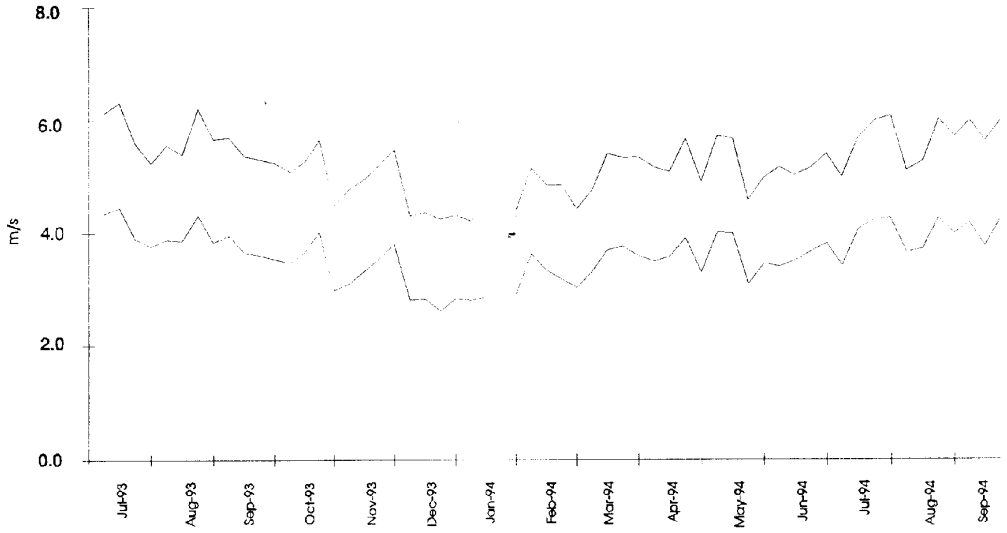


Figure 8. Average wind speed (m/s) and wind gust (m/s) on a weekly basis July 1993 - September 1994 at Kigoma wind station.

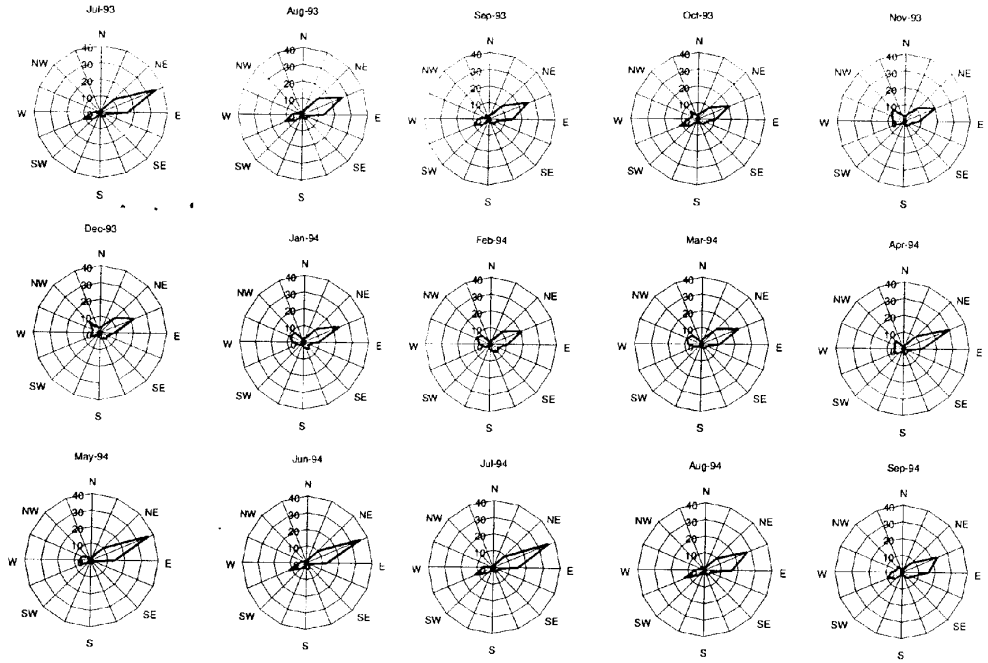


Figure 9. Wind direction distributions (%) on a monthly basis July 1993 - September 1994 at Kigoma wind station.

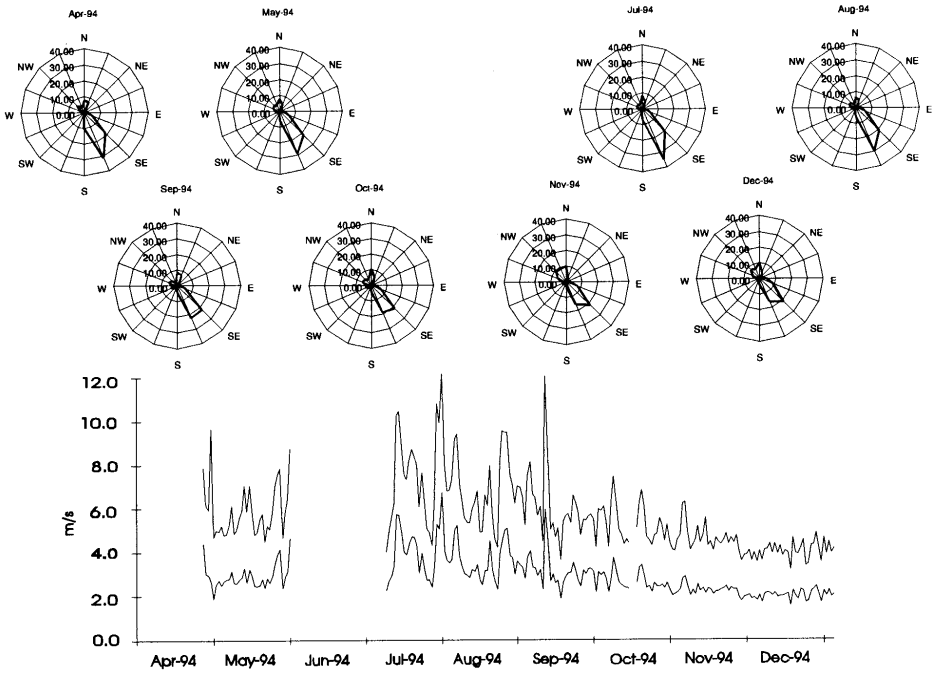


Figure 10. Daily average wind speed (m/s) and wind gust (m/s) and wind direction distributions (%) on a monthly basis April-December 1994 at Mpulungu wind station.

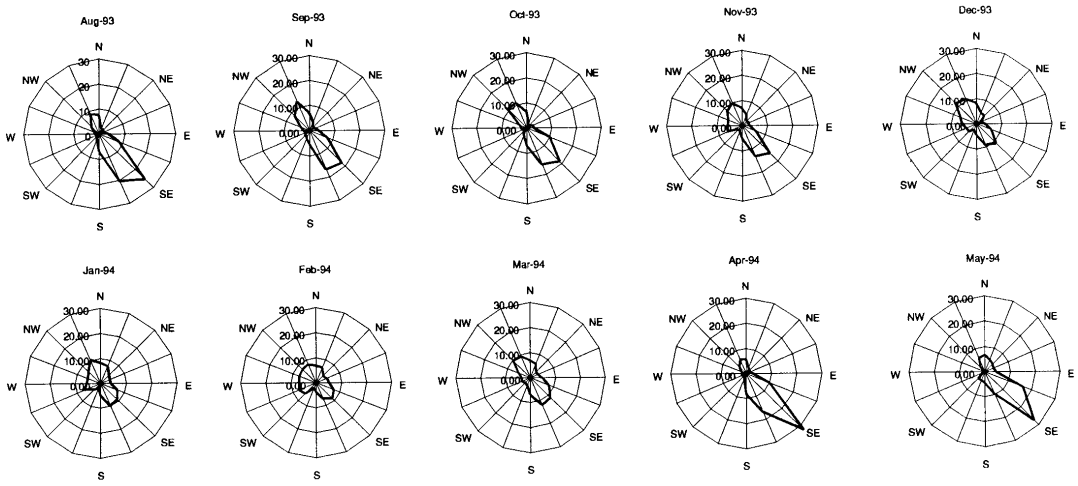


Figure 11. Wind direction distributions (%) on a monthly basis March 1993 - May 1994 at the lake meteo buoy off Mpulungu.

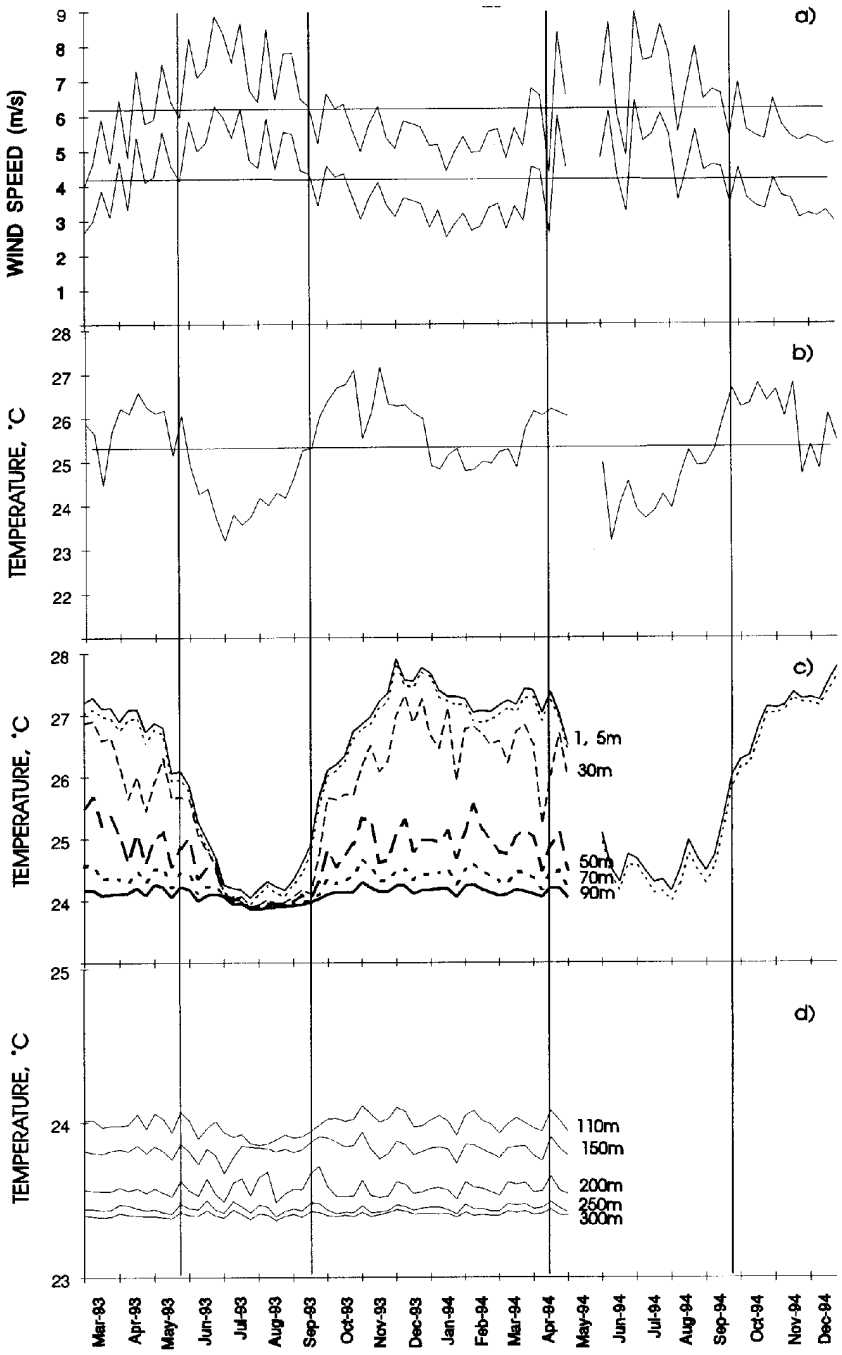


Figure 12. a) Weekly means of wind speed (m/s) and gust (m/s) and averages in horizontal lines over the recording period March 1993 - December 1994 at Mpulungu Lake meteorological station.

b) Weekly means of air temperature (ºC) and the average over the recording period March 1993-December 1994 at Mpulungu Lake meteorological station.

c) Weekly means of water temperatures (ºC) at different depths (1 - 90m) March 1993-December 1994 at Mpulungu Lake meteorological station.

d) Weekly means of water temperatures (ºC) at different depths (110-300m) March 1993-December 1994 at Mpulungu Lake meteorological station.

Vertical lines indicate the start of the rainy and dry seasons, horizontal lines the averages over the recording period.

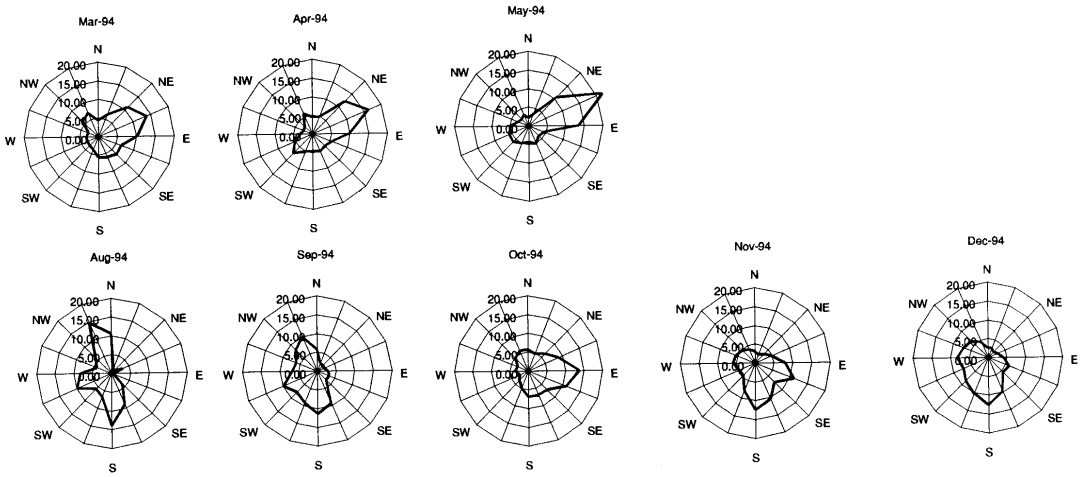


Figure 13. Wind direction distributions (%) on a monthly basis March - December 1994 at Kigoma lake meteo buoy.

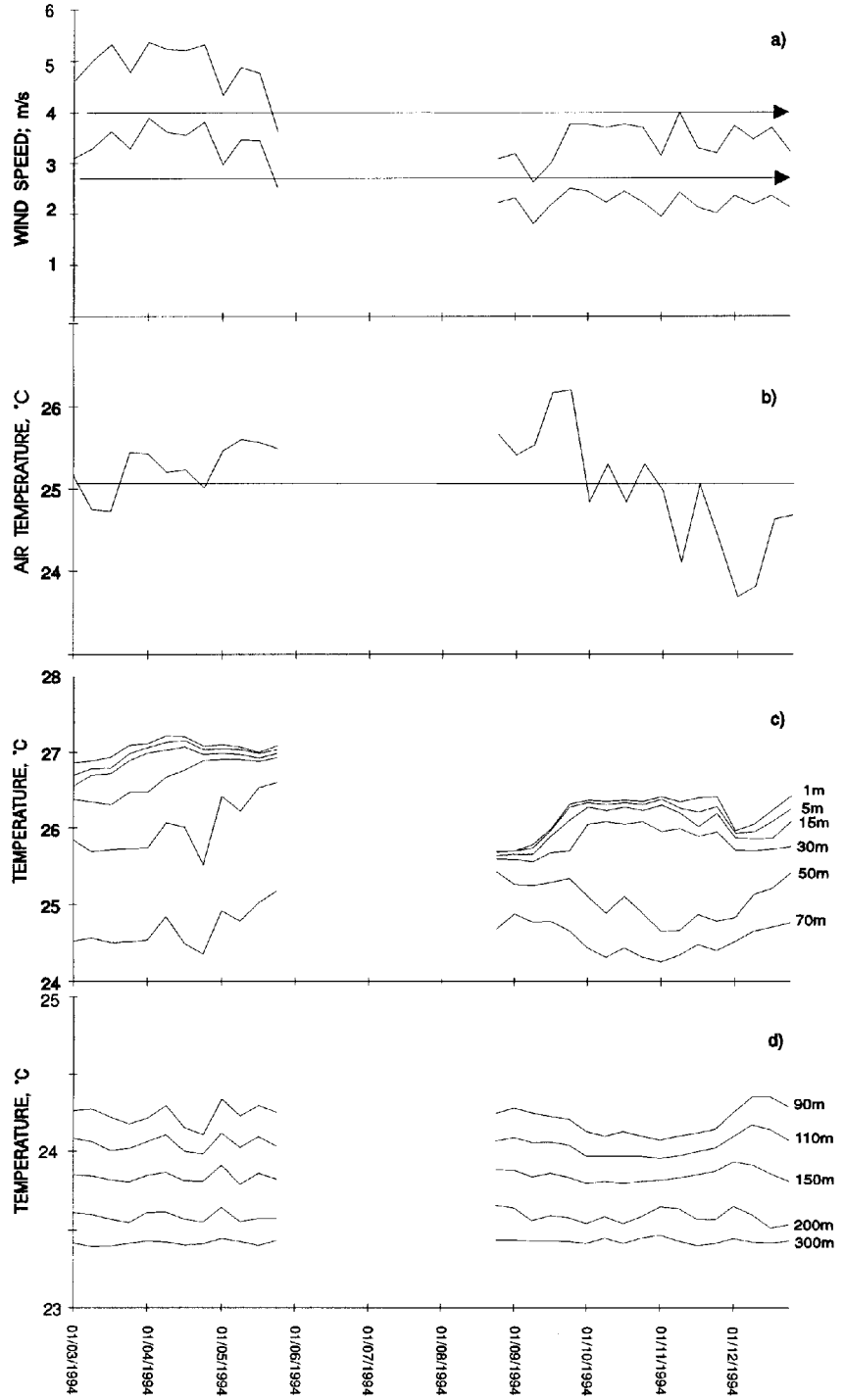


Figure 14. a) Weekly means of wind speed (m/s) and gust and averages (in horizontal lines) over the recording period March-December 1994 at Kigoma Lake meteorological station.
b) Weekly means of air temperature (°C) and the average (horizontal line) over the recording period March-December 1994 at Kigoma Lake meteorological station.
c) Weekly means of water temperatures (°C) at different depths (1-90m) March-December 1994 at Kigoma Lake meteorological station.
d) Weekly means of water temperatures (°C) at different depths (110-300m) March-December 1994 at Kigoma Lake meteorological station.

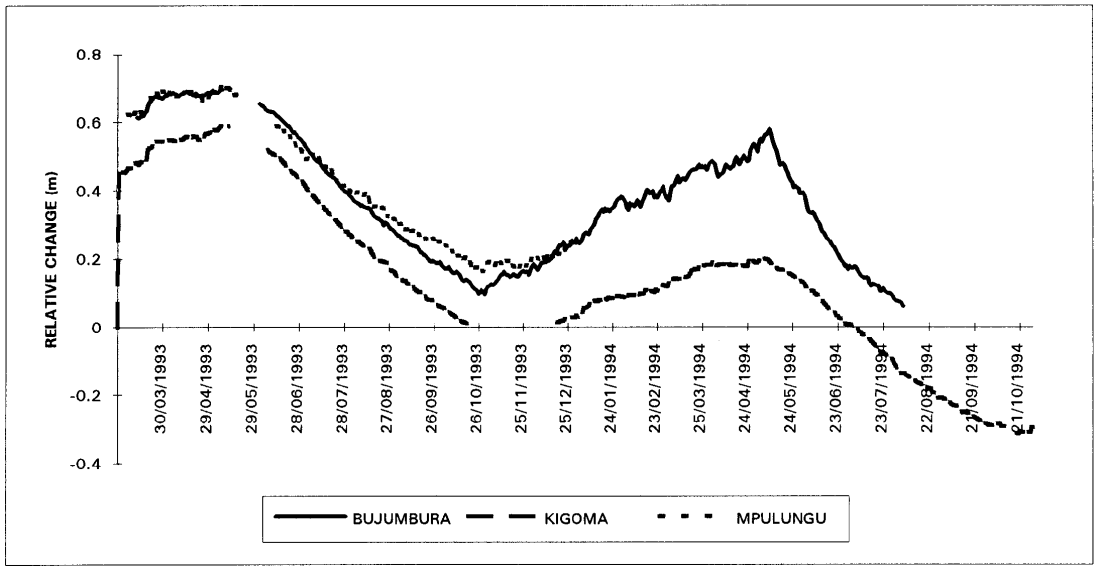


Figure 15. Relative change of water level (m) at three stations March 1993 - November 1994.

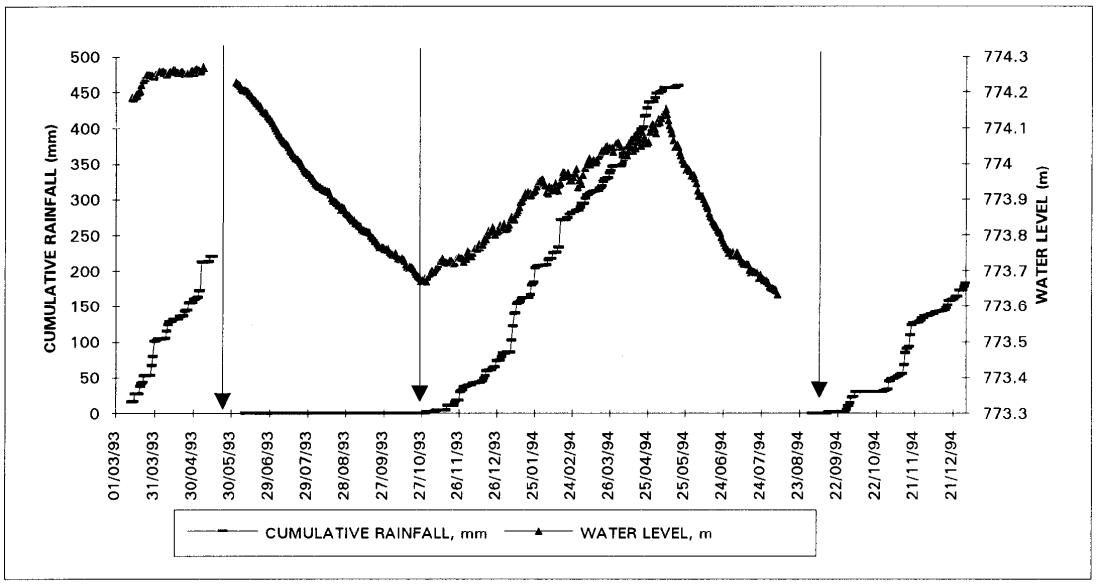


Figure 16. Cumulative rainfall (mm) and variation of water level of Lake Tanganyika March 1993 - December 1994 at Bujumbura.

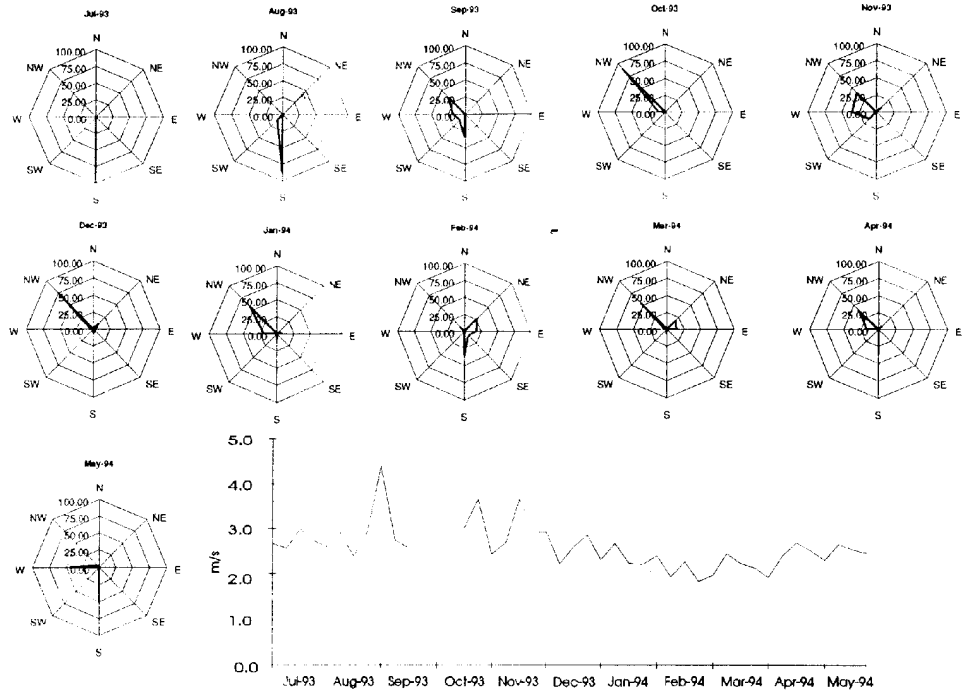


Figure 17. Weekly averages of wind speeds (m/s) in a period of 0900-1500h and wind direction distributions (%) at 1500h ... a monthly basis at Kipili anemometer station.

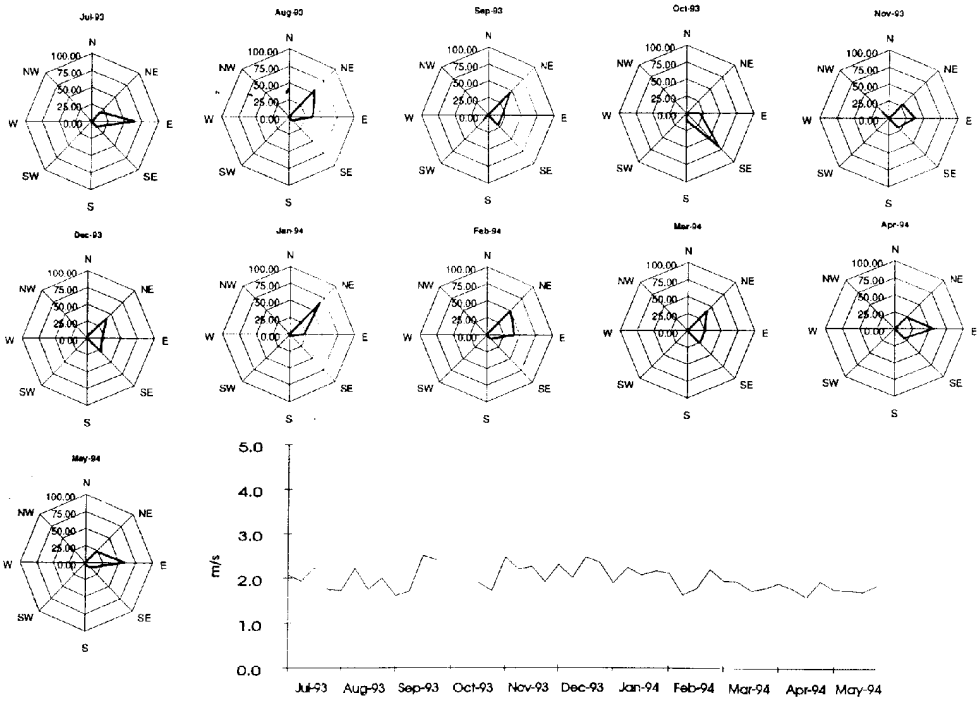


Figure 18. Weekly averages of wind speeds (m/s) in a period of 1500-2100h and wind direction distributions (%) at 2100h on a monthly basis at Kipili anemometer station.

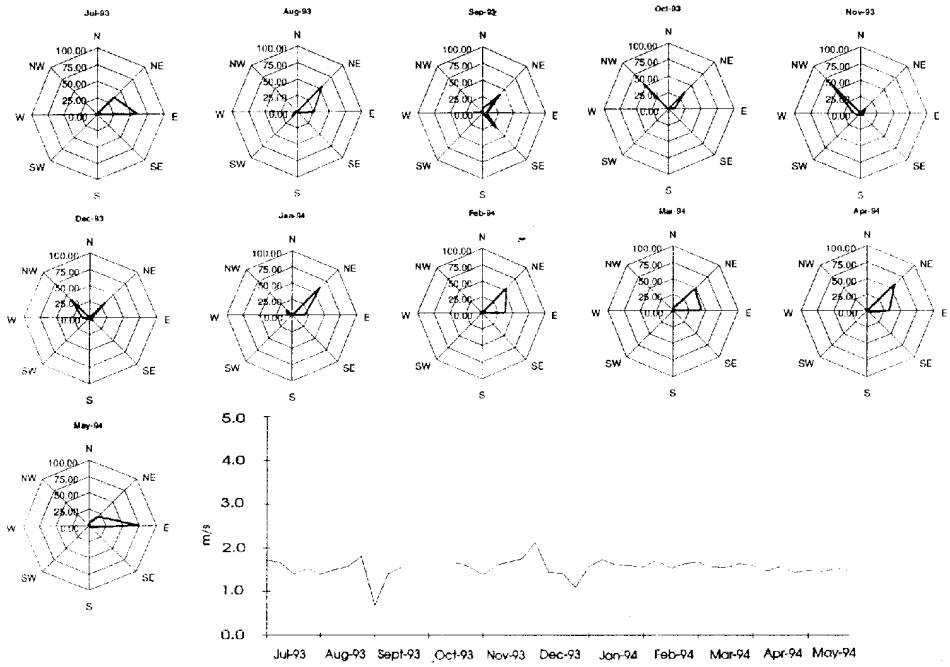


Figure 19. Weekly averages of wind speeds (m/s) in a period of 2100 - 0900h and wind direction distributions (%) at 0900h on a monthly basis at Kipili anemometer station.

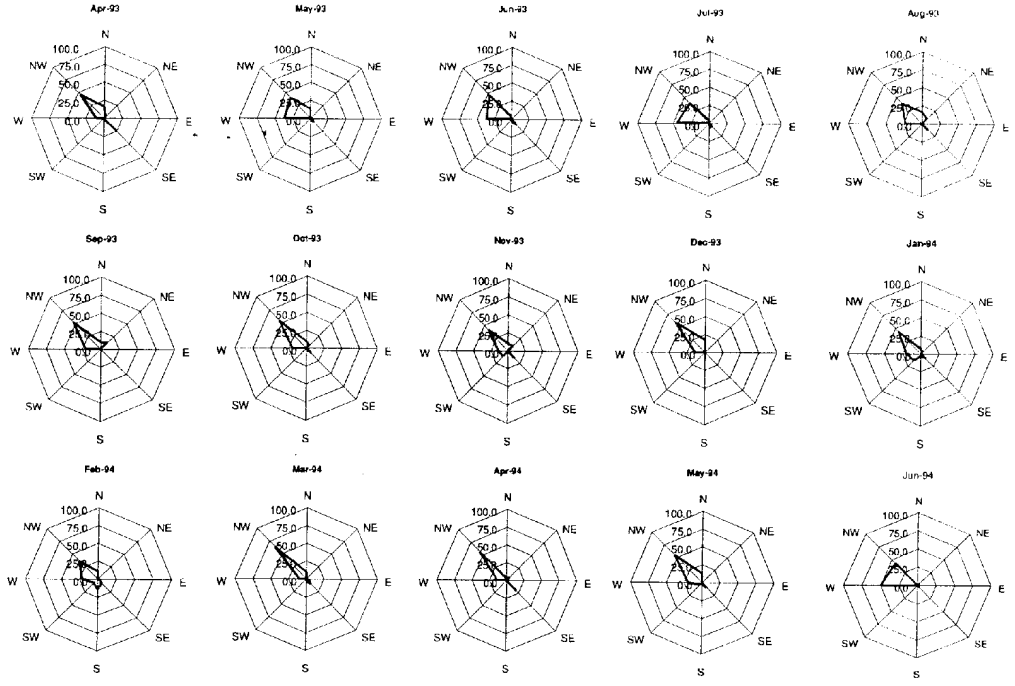


Figure 20. Wind direction distributions (%) at 1400h on a monthly basis in April 1993 - June 1994 at Mpulungu anemometer station.

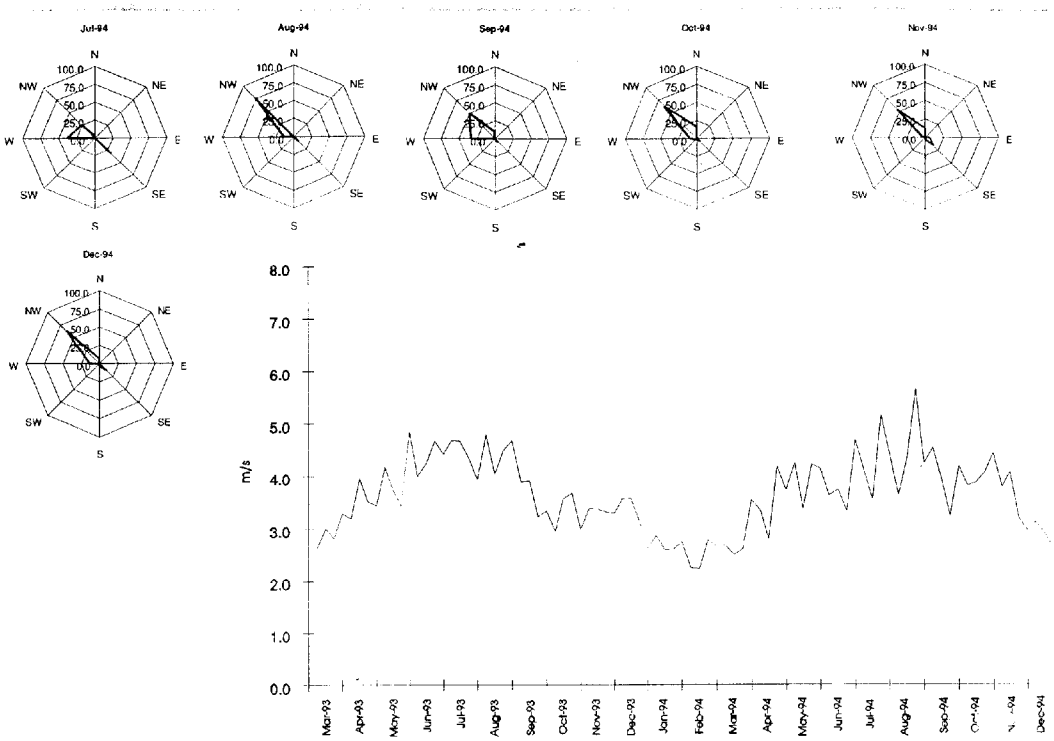


Figure 21. Wind direction distributions (%) at 1400h on a monthly basis July 1994 - December 1994 and weekly averages of wind speeds (m/s) at 0800 - 1400h March 1993 - December 1994 at Mpulungu anemometer station.

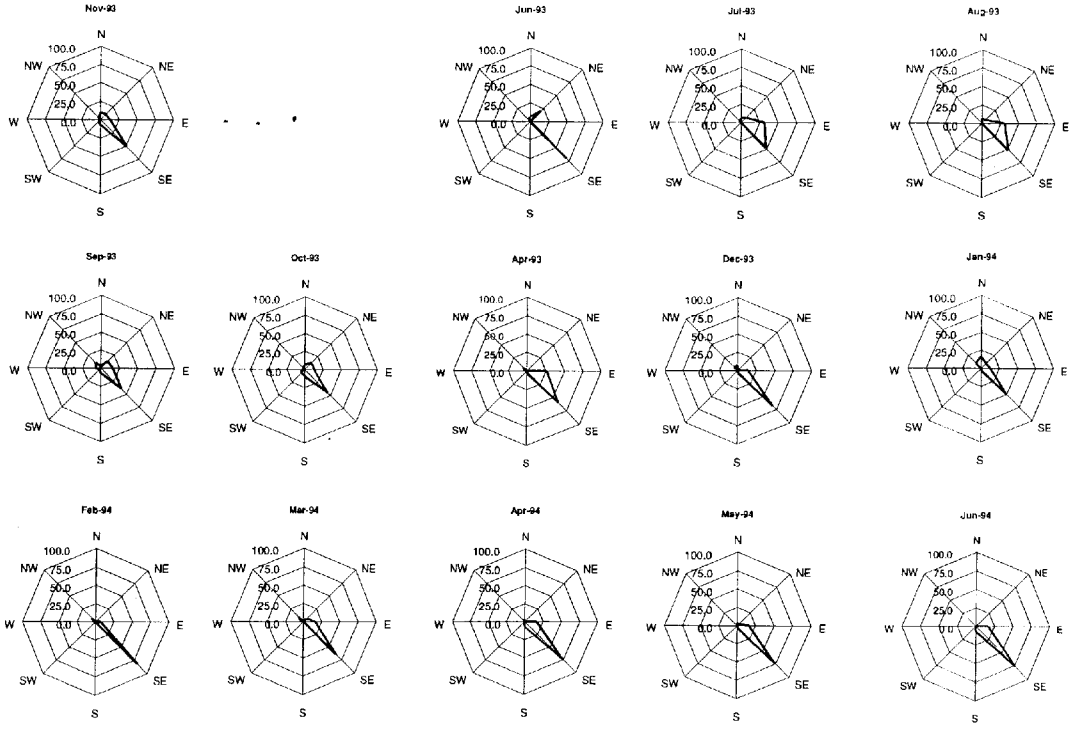


Figure 22. Wind direction distributions (%) at 1900h on a monthly basis April 1993 - June 1994 at Mpulungu anemometer station.

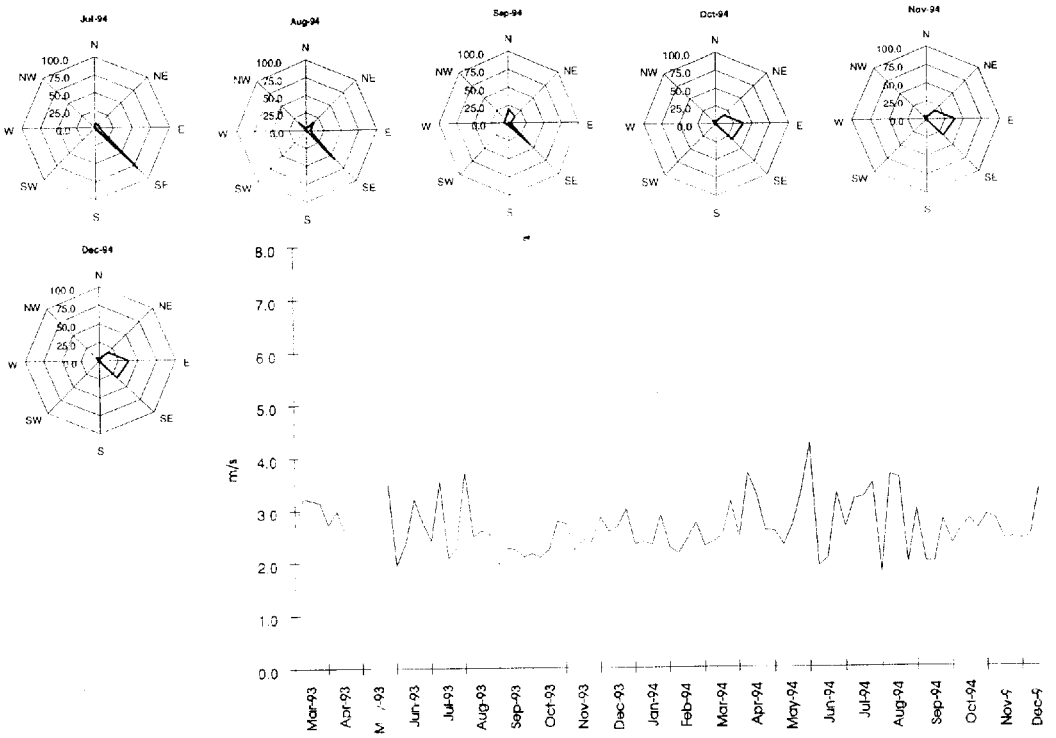


Figure 23. Wind direction distributions (%) at 1900h on a monthly basis July 1994 - December 1994 and weekly averages of wind speeds at 1400 - 1900h March 1993 - December 1994 at Mpulungu anemometer station.

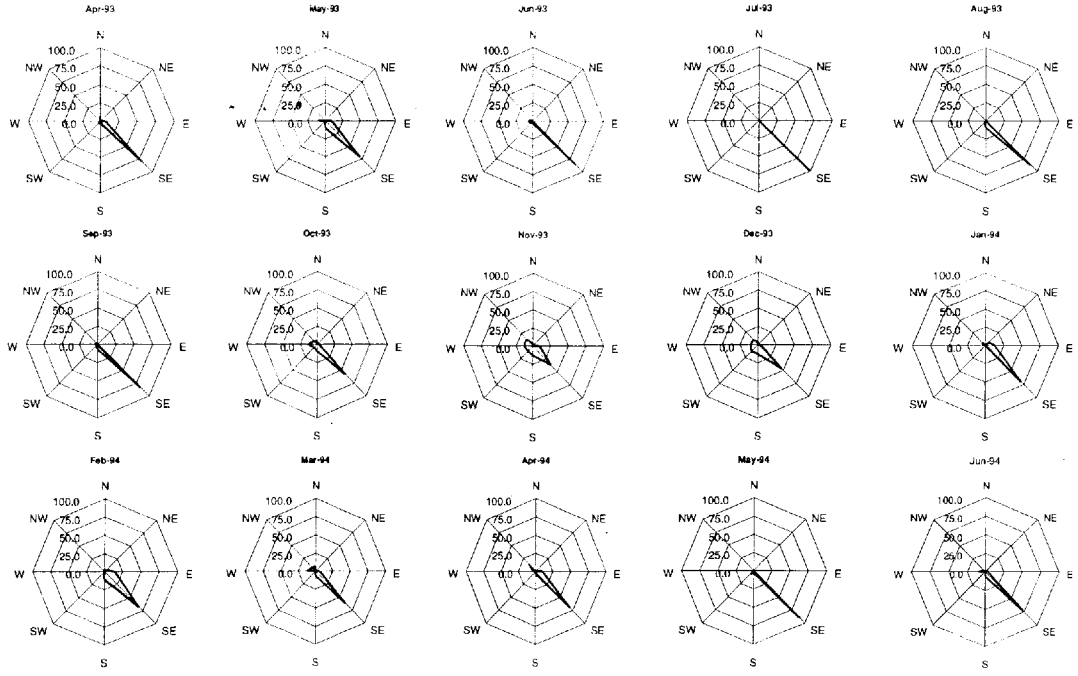


Figure 24. Wind direction distributions (%) at 0800h on a monthly basis April 1993 - June 1994 at Mpulungu anemometer station.

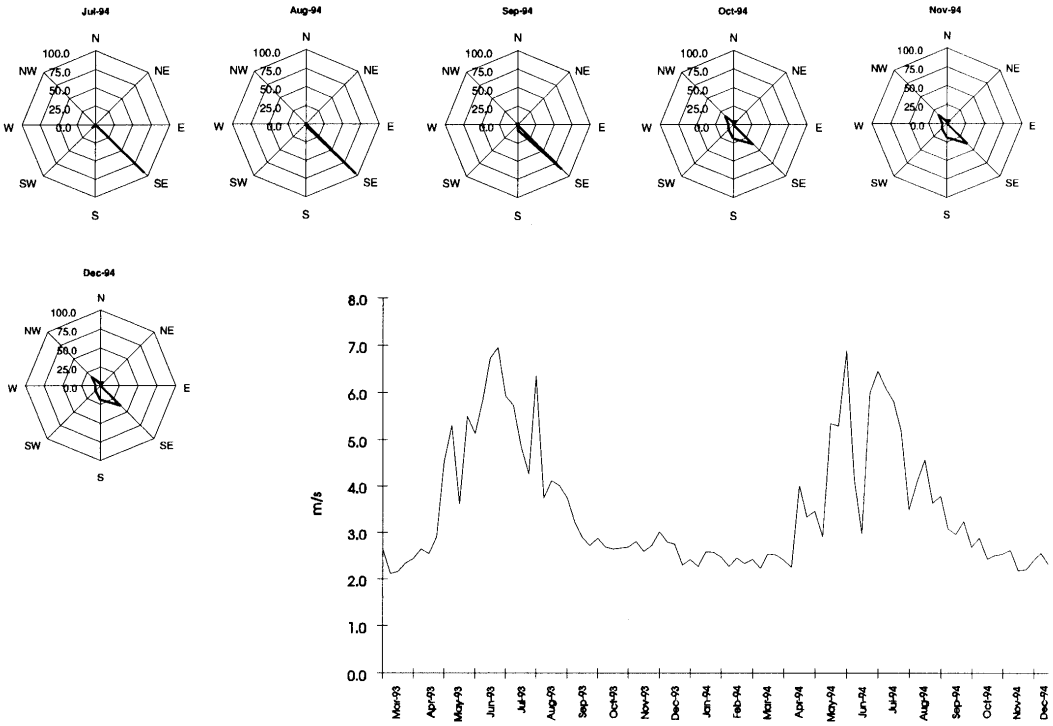


Figure 25. Wind direction distributions (%) at 0800h on a monthly basis July 1994 - December 1994 and weekly averages of wind speeds (m/s) at 1900 - 0800h March 1993 - December 1994 at Mpulungu anemometer station.

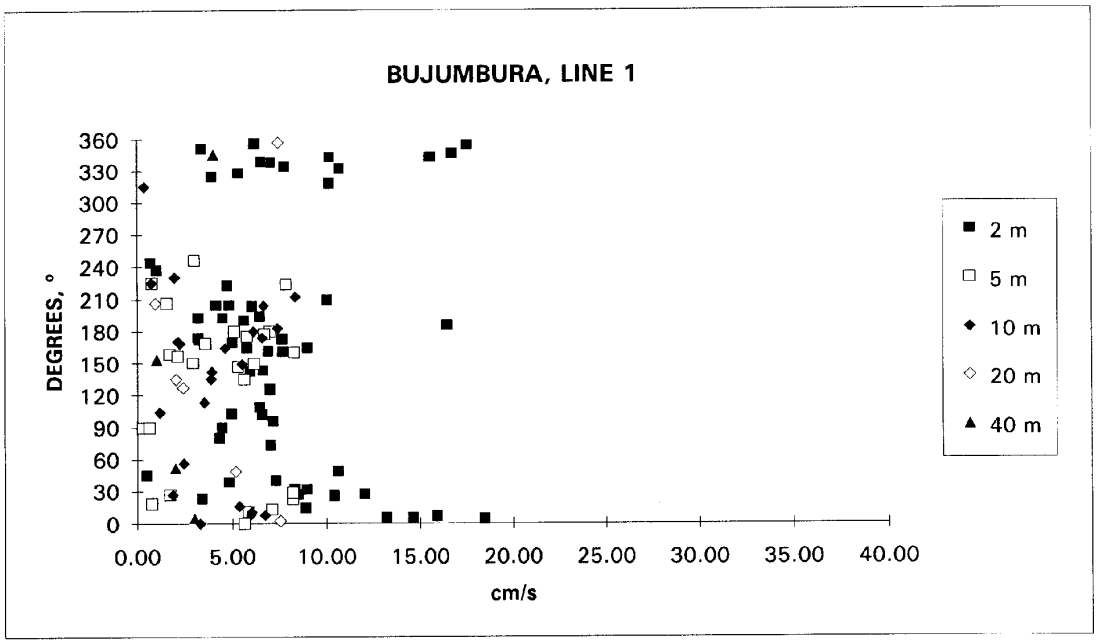


Figure 26. Current flow measurements: direction and speed (cm/s) of currents at line 1 Bujumbura July 1993 - December 1994.

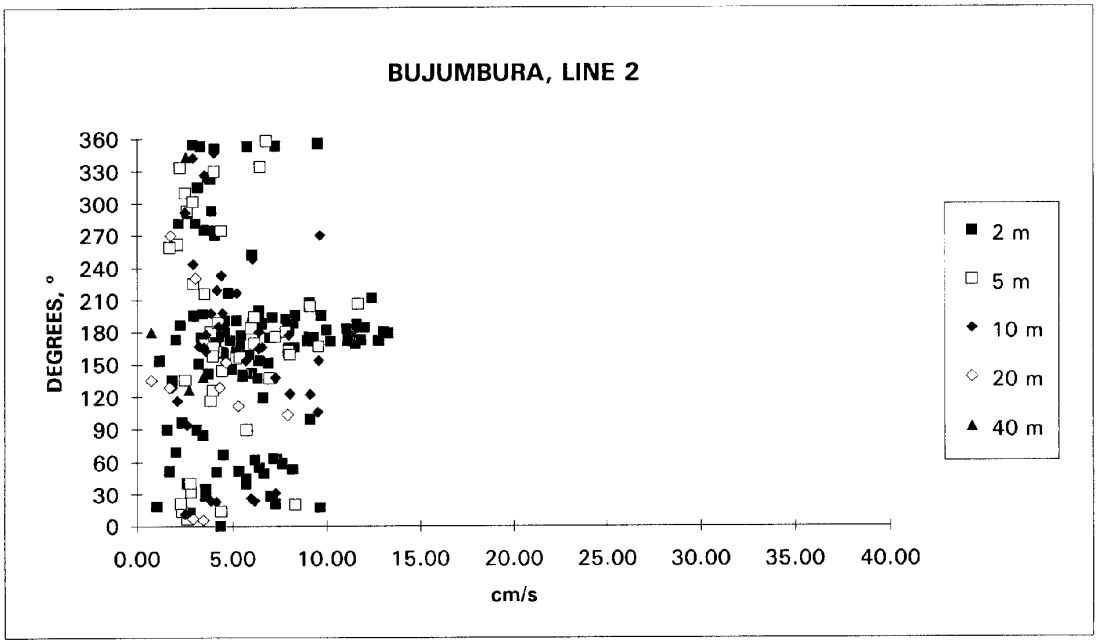


Figure 27. Current flow measurements: direction and speed (cm/s) of currents at line 2 Bujumbura July 1993 - December 1994.

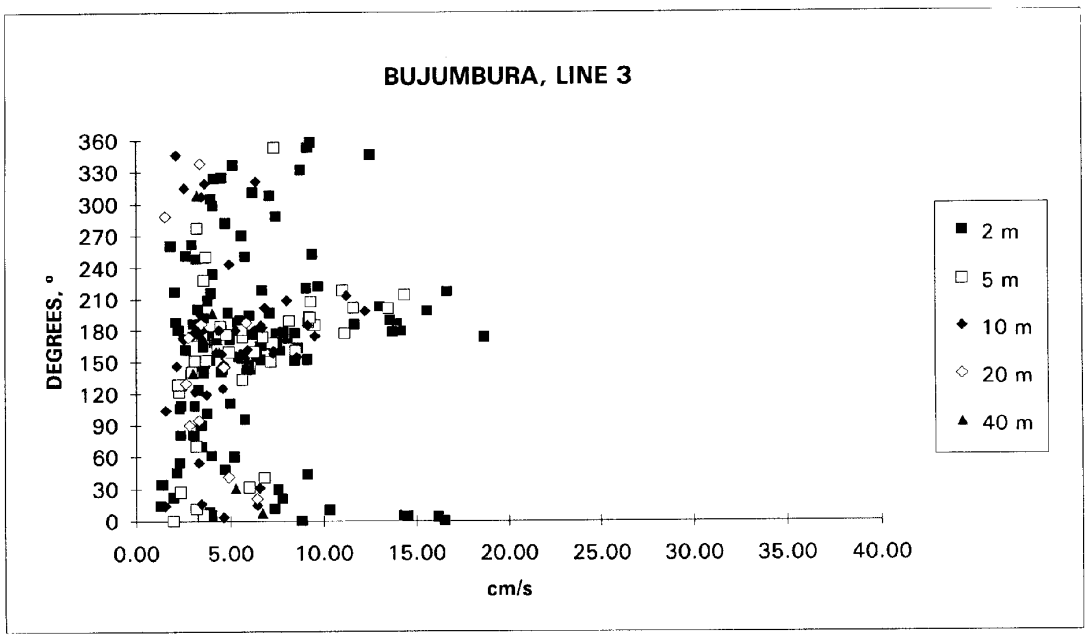


Figure 28. Current flow measurements: direction and speed (cm/s) of currents at line 3 Bujumbura July 1993 - December 1994.

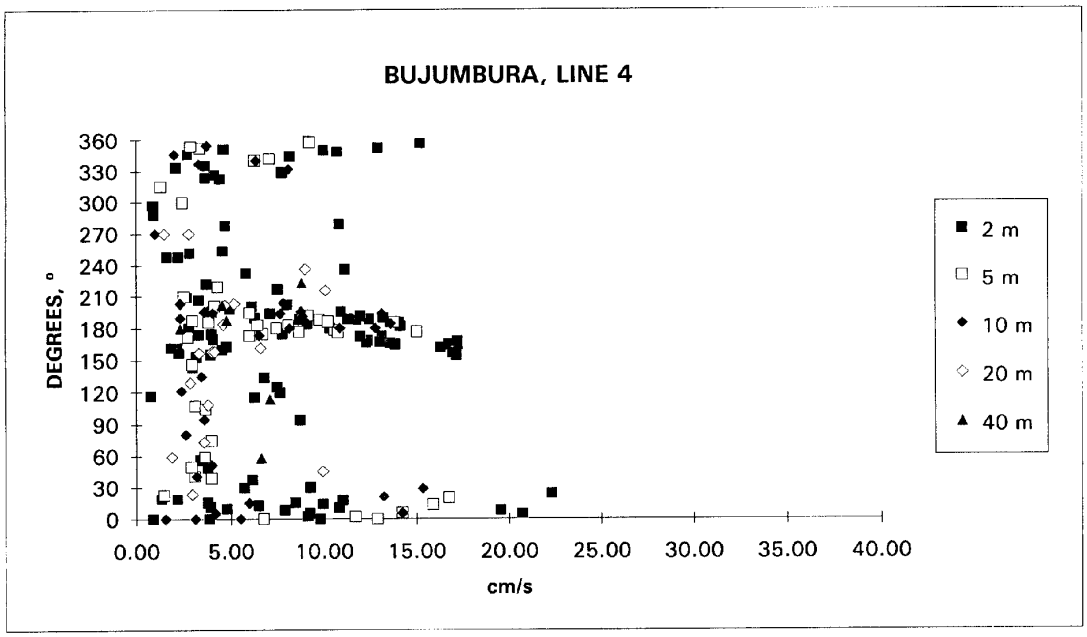


Figure 29. Current flow measurements: direction and speed (cm/s) of currents at line 4 Bujumbura July 1993 - December 1994.

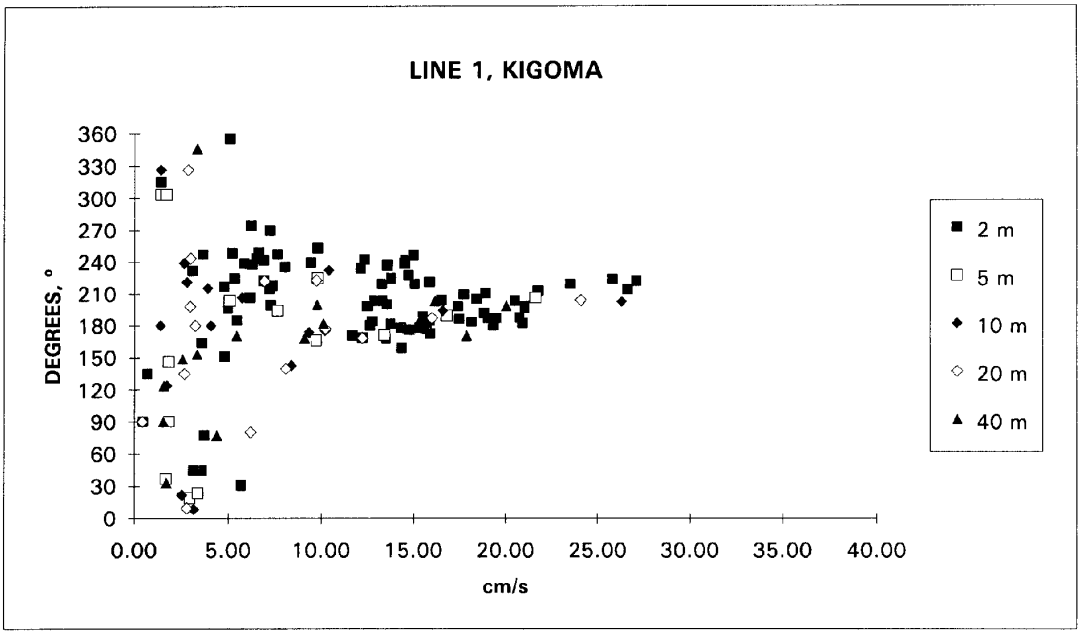


Figure 30. Current flow measurements: direction and speed (cm/s) of currents at line 1 Kigoma July 1993 - September 1994.

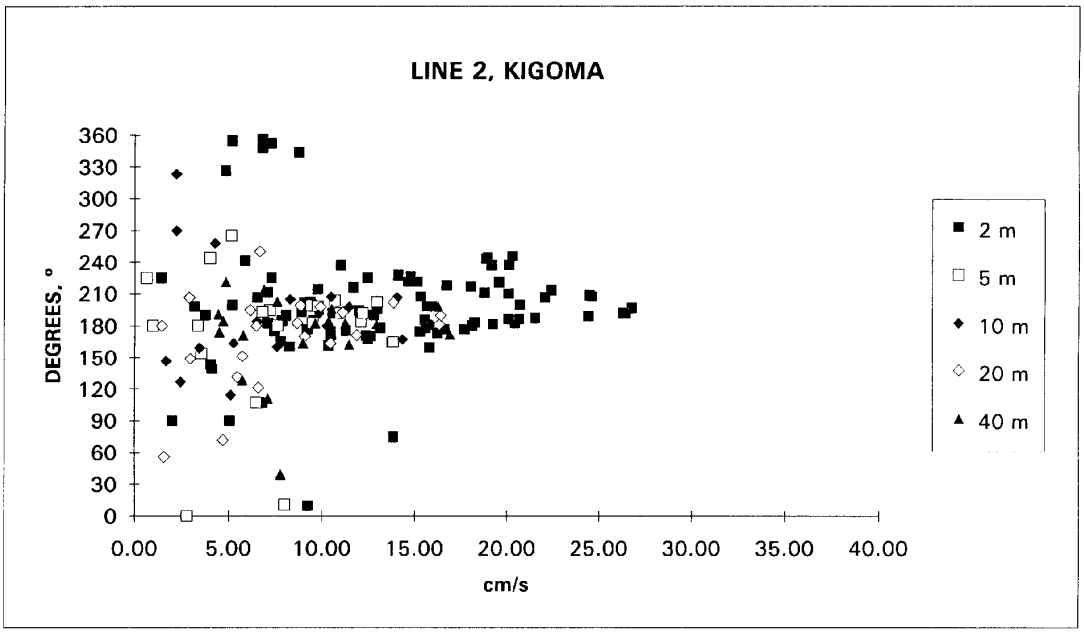


Figure 31. Current flow measurements: direction and speed (cm/s) of currents at line 2

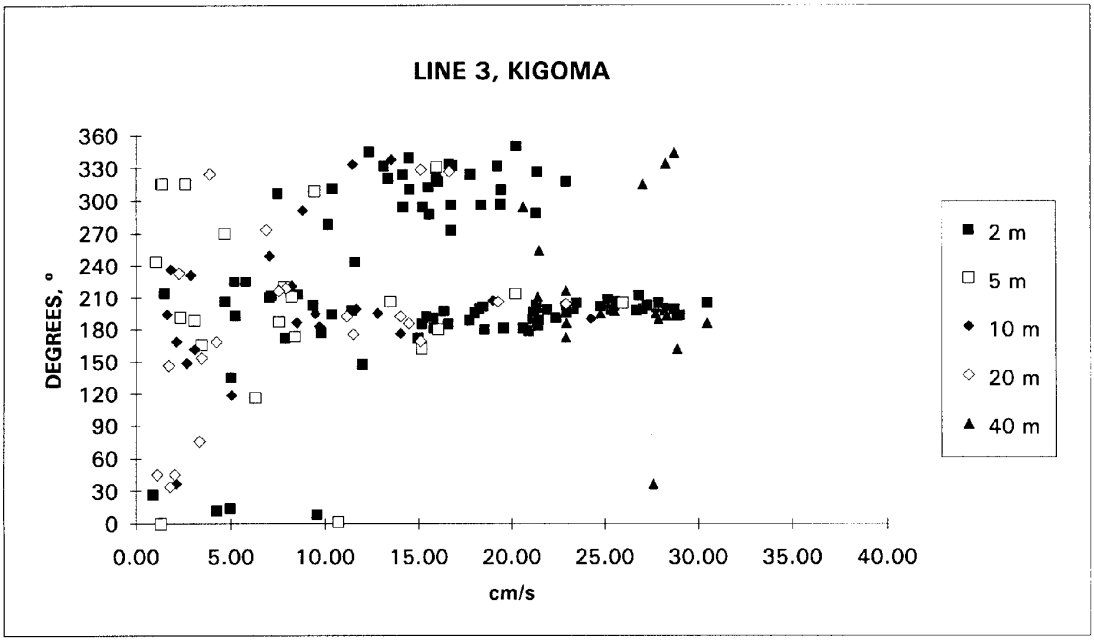


Figure 32. Current flow measurements: direction and speed (cm/s) of currents at line 3 Kigoma July 1993 - September 1994.

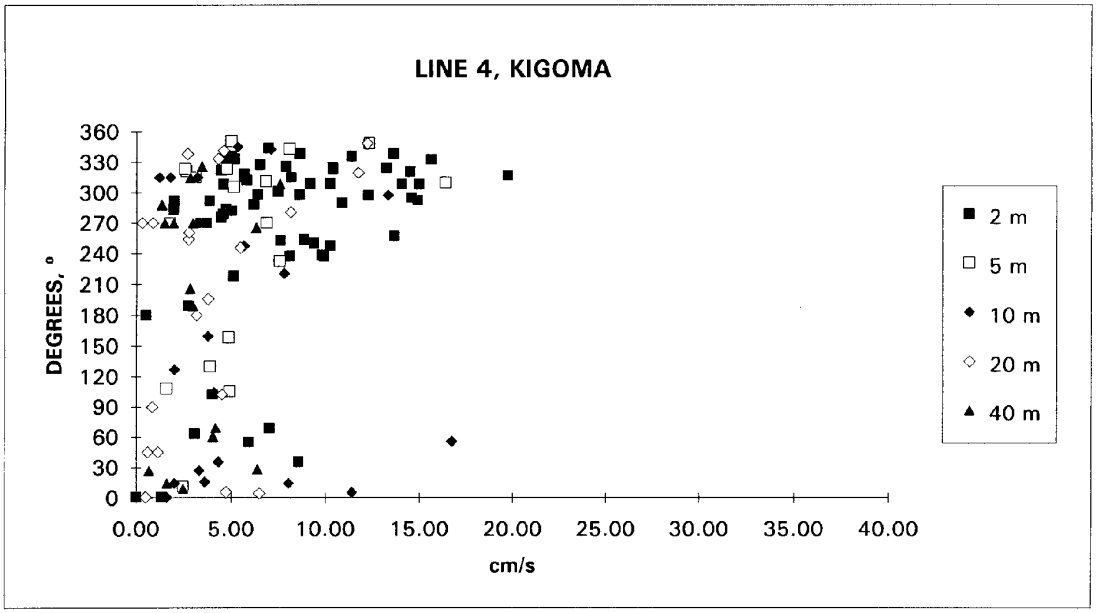


Figure 33. Current flow measurements: direction and speed (cm/s) of currents at line 4 Kigoma July 1993 - September 1994.

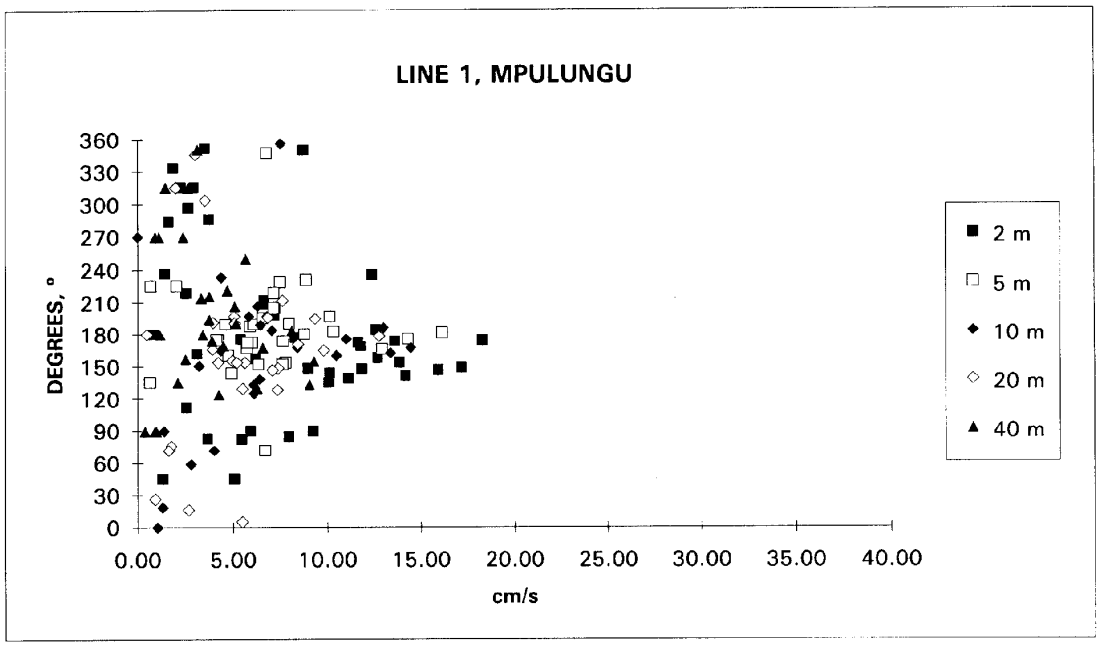


Figure 34. Current flow measurements: direction and speed (cm/s) of currents at line 1 Mpulungu July 1993 - December 1994.

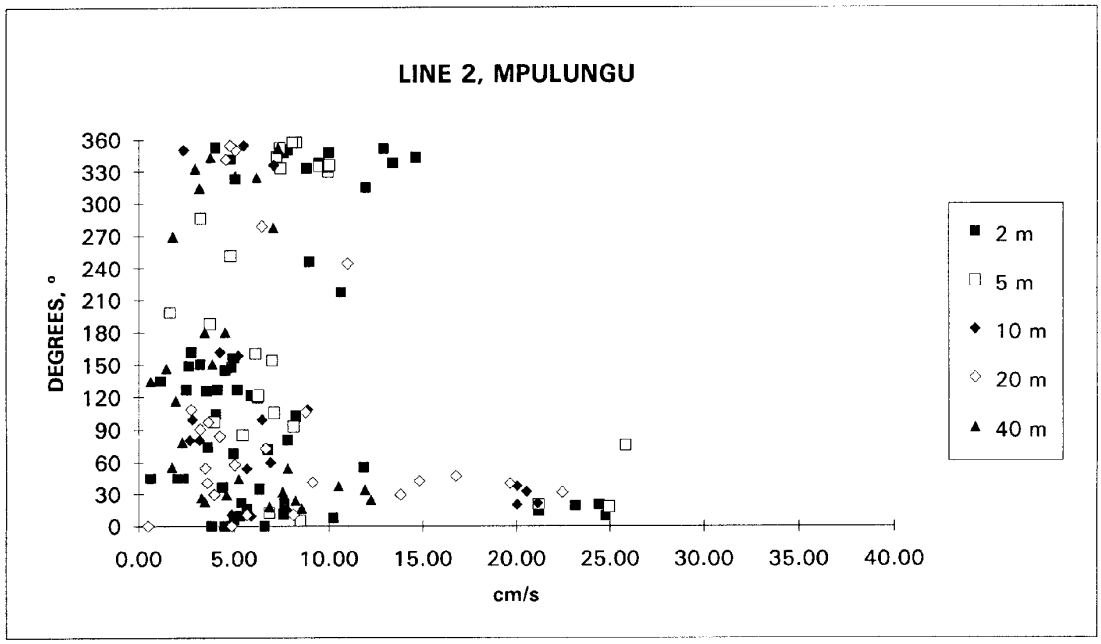


Figure 35. Current flow measurements: direction and speed (cm/s) of currents at line 2 Mpulungu July 1993 - December 1994.

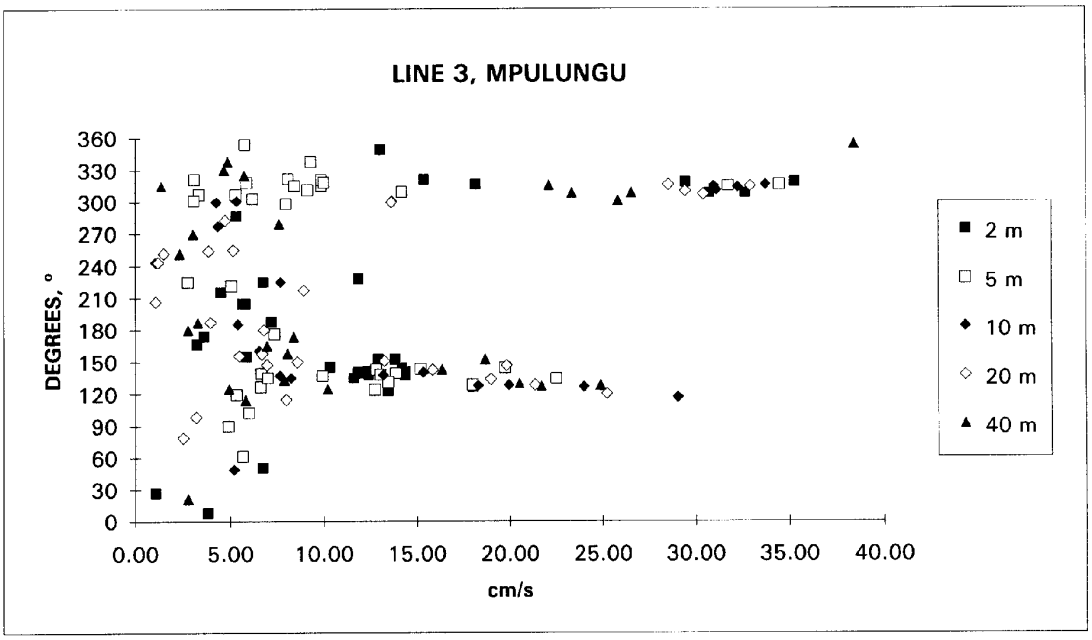


Figure 36. Current flow measurements: direction and speed (cm/s) of currents at line 3 Mpulungu July 1993 - December 1994.

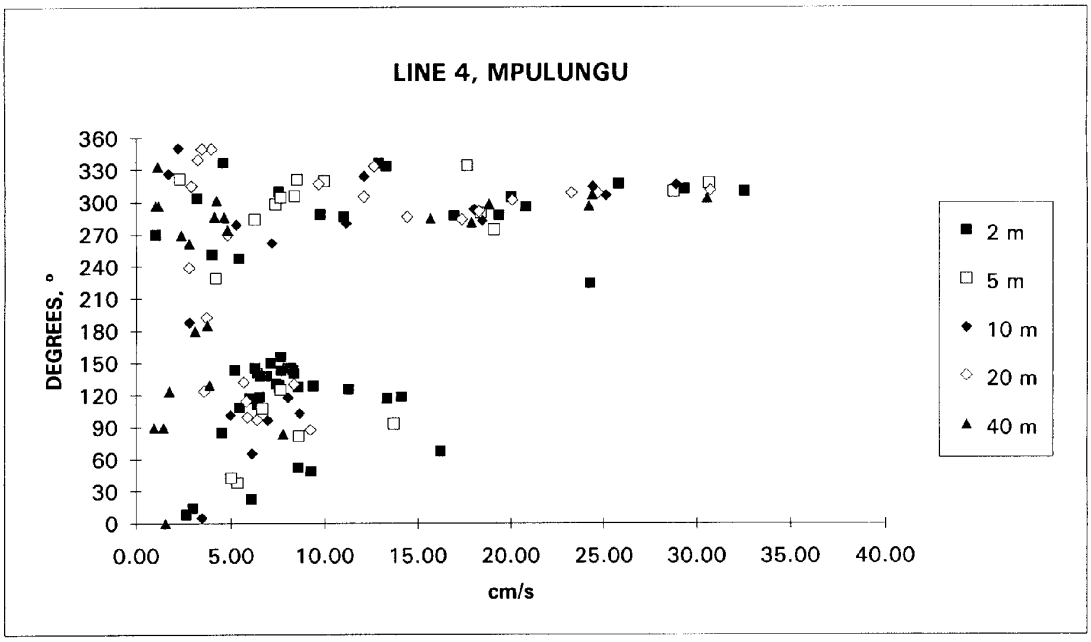


Figure 37. Current flow measurements: direction and speed (cm/s) of currents at line 4 Mpulungu July 1993 - December 1994.

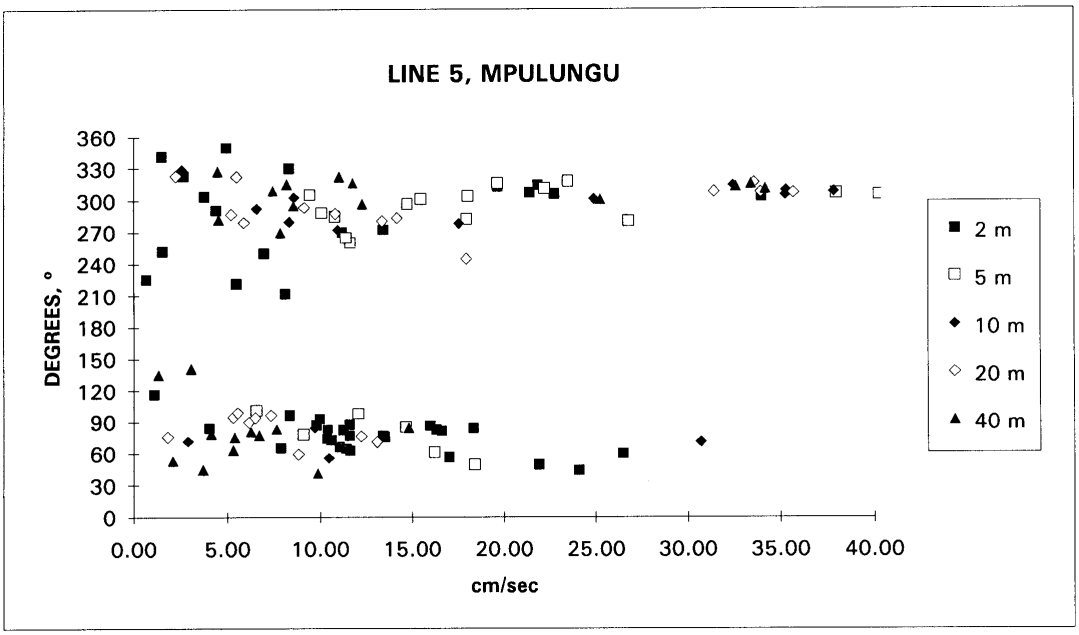
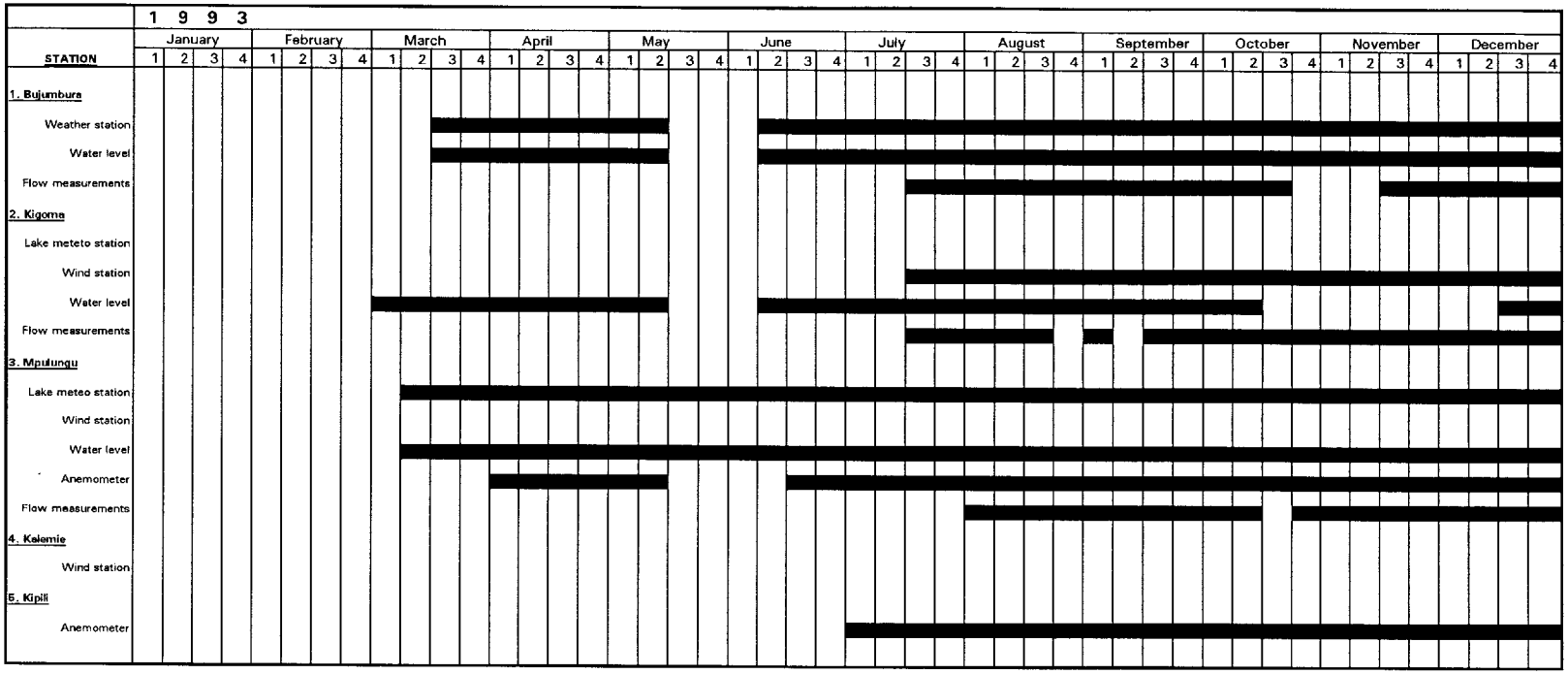


Figure 38. Current flow measurements: direction and speed (cm/s) of currents at line 5 Mpulungu July 1993 - December 1994.

Appendix 1: Collected data in hydrodynamics in March 1993-December 1994.



cont'd

Appendix 1: Collected data in hydrodynamics in March 1993-December 1994.

3. Mpulungu	
Lake meteo station	SETUP DATE: 07.03.93 FILES IN BUJUMBURA: COLLECTED UP TO 18.12.94 (07.06.94 SEE BELOW); *.ASC, *.ENG FILES AS ORIGINALS FROM 29.07.93, *.XLS; ALL DATA IN MONTHLY, WEEKLY AND DAILY AVERAGES; WIND DIRECTIONS ON MONTHLY BASIS. BREAKS IN COLLECTION: 08.05.94 - 07.06.94, AFTER 07.06.94 ONLY AIR TEMPERATURE AND WIND SPEED AND DIRECTION ARE VALID **) SINCE 07.06.94 ONLY AIR TEMPERATURE WIND SPEED, WIND GUST AND WIND DIRECTION SUCCESSFULLY RECORDED
Wind station	SETUP DATE: 27.04.1994 BREAKS IN COLLECTION: 01.06-08.07.94 FILES IN BUJUMBURA: COLLECTED UP TO 18.11.94; *.ASC AND *.ENG FILES, MONTHLY, WEEKLY AND DAILY MEANS IN *.XLS FILES, WIND DIRECTIONS ON MONTHLY BASIS. ***) MISSING RECORDINGS IN THE DATA
Water level	SETUP DATE:07.03.93 BREAKS IN COLLECTION: 20.05-13.06.93 FILES IN BUJUMBURA: COLLECTED UP TO 11.03.94; ALL RECORDINGS IN HOURLY MEANS AS ORIGINAL *.D08 AND *.PRN FILES; CORRECTED VALUES IN HOURLY MEANS AS *.XLS FILES
Anemometer	SETUP DATE:07.03.1993 BREAKS IN COLLECTION: NONE FILES IN BUJUMBURA: COLLECTED UP TO 12/94 ALL RECORDINGS AS *.XLS FILES, WIND SPEED ON WEEKLY BASIS IN *.XLS FILES , PERCENTAGE OF WIND DIRECTIONS IN *.XLS FILE ON MONTHLY BASIS
Flow measurements	SETUP DATE: 08/1993 BREAKS IN COLLECTION: 06/94, 10/94 FILES IN BUJUMBURA: COLLECTED UP 12/1994, MEASUREMENTS COMPILED ON MONTHLY BASIS; *.XLS, SOME WIND INFO MISSING FOR 08/93
4. Kalemie	
Wind station	SETUP DATE:22/06/1994 BREAKS IN COLLECTION:UP TO 14.11.94 RECORDINGS ARE NOT COMPLETE FILES IN BUJUMBURA: COLLECTED UP TO 14.11.94, *.ASC AND *. ENG FILES AS ORIGINALS, ONLY WIND SPEED AND WIND GUST MEASURED, NOT IN *.XLS FILES
5. Kipili	
Anemometer	SETUP DATE: 07/1993 BREAKS IN COLLECTION: IN GENERAL WEEKENDS, 09-12.09.1993, 24.09-17.10.1993, 30.10-06.11.1993 FILES IN BUJUMBURA: COLLECTED UP TO 05/94, ALL RECORDINGS AS *.XLS FILES, WIND SPEED ON WEEKLY BASIS IN *.XLS FILES, PERCENTAGES OF WIND DIRECTIONS ON MONTHLY BASIS IN *.XLS FILES
	- - - - → - - - - - - : DATA NEITHER COLLECTED NOR SENT TO LTR, BUJUMBURA

Appendix 1: Collected data in hydrodynamics in March 1993-December 1994.

STATION	
1. Bujumbura	
Weather station	SETUP DATES: 12.03.1993; 29.08.1994 recorded parameters:1144759 BREAKS IN COLLECTION:16.05-08.06.1993, 19.05-29.08.94, 06-25.10.94 FILES IN BUJUMBURA: COLLECTED UP TO 12/1994; *.ASC, *.ENG and MONTHLY ,WEEKLY AND DAILY AVERAGES COMPILED ON MONTHLY BASIS IN *.XLS FILES, WIND DIRECTION DATA ON MONTHLY BASIS.
Water level	SETUP DATE: 13.03.93 BREAKS IN COLLECTION: 08.05-02.06.93 FILES IN BUJUMBURA: COLLECTED UP TO 05.08.94; RECORDINGS IN HOURLY MEANS AS ORIGINAL *.D09 AND *.PRN FILES, CORRECTED VALUES IN HOURLY MEANS AS *.XLS FILES.
Flow measurements	SETUP DATE: 23.07.1993 BREAKS IN COLLECTION: 21.10-11.11.93, 06.01.94, 03.02.94, 03.03.94, 24.03.94,07.04.94, 05.05.94, 18.08.94, 02.11-25.11.94, 08-15.12.94 FILES IN BUJUMBURA: COLLECTED UP TO 12/1994; MEASUREMENTS COMPILED ON MONTHLY BASIS IN *.XLS FILES
2. Kigoma	
Lake meteo station	SETUP DATE: 04.03.1994 recorded parameters:153360 BREAKS IN COLLECTION: 01.06 - 29.08.1994 FILES IN BUJUMBURA:COLLECTED UP TO 31.12.94; *.ASC AND *.ENG FILES AS ORIGINALS; MONTHLY, WEEKLY AND DAILY MEANS IN *.XLS FILES; WIND DIRECTION DATA ON MONTHLY BASIS.
Wind station	SETUP DATE: 13.07.1993 BREAKS IN COLLECTION: 25.01.94 - 03.02.1994 FILES IN BUJUMBURA: COLLECTED UP TO 12.10.94; *.ASC AND *.ENG FILES; MONTHLY, WEEKLY AND DAILY AVERAGES, WIND DIRECTION DATA ON MONTHLY BASIS.
Water level	SETUP DATE: 01.03.1993 BREAKS IN COLLECTION: 12.05-07.06.93, 18.10-18.12.93 FILES IN BUJUMBURA: COLLECTED UP TO 13.10.94; RECORDINGS IN HOURLY MEANS AS ORIGINAL *.D09 AND *.PRN FILES; CORRECTED VALUES IN HOURLY MEANS AS *.XLS FILES.
Flow measurements	SETUP DATE: 07/1993 FILES IN BUJMBURA: COLLECTED UP TO 06/1994; MEASUREMENTS COMPILED ON MONTHLY BASIS IN *.XLS FILES BREAKS IN COLLECTION: 26.08.93, 09.09.93, 27.01-17.02.94, 07-14.04.94 *) MEASUREMENTS NOT CONDUCTED ACCORDING TO INSTRUCTIONS; WIND SPEEDS NOT MEASURED FREQUENTLY ENOUGH BETWEEN THE MEASUREMENTS.

Appendix 1: Collected data in hydrodynamics in March 1993-December 1994.

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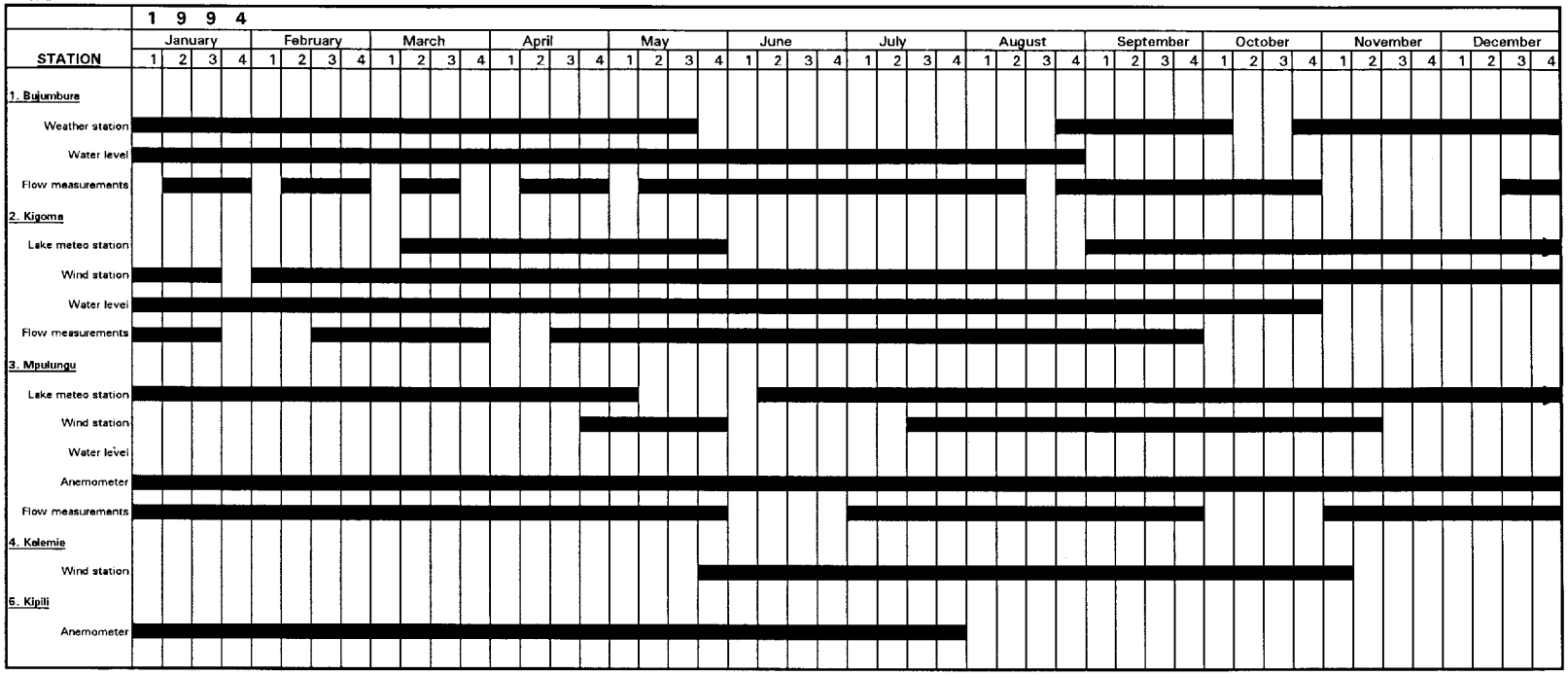
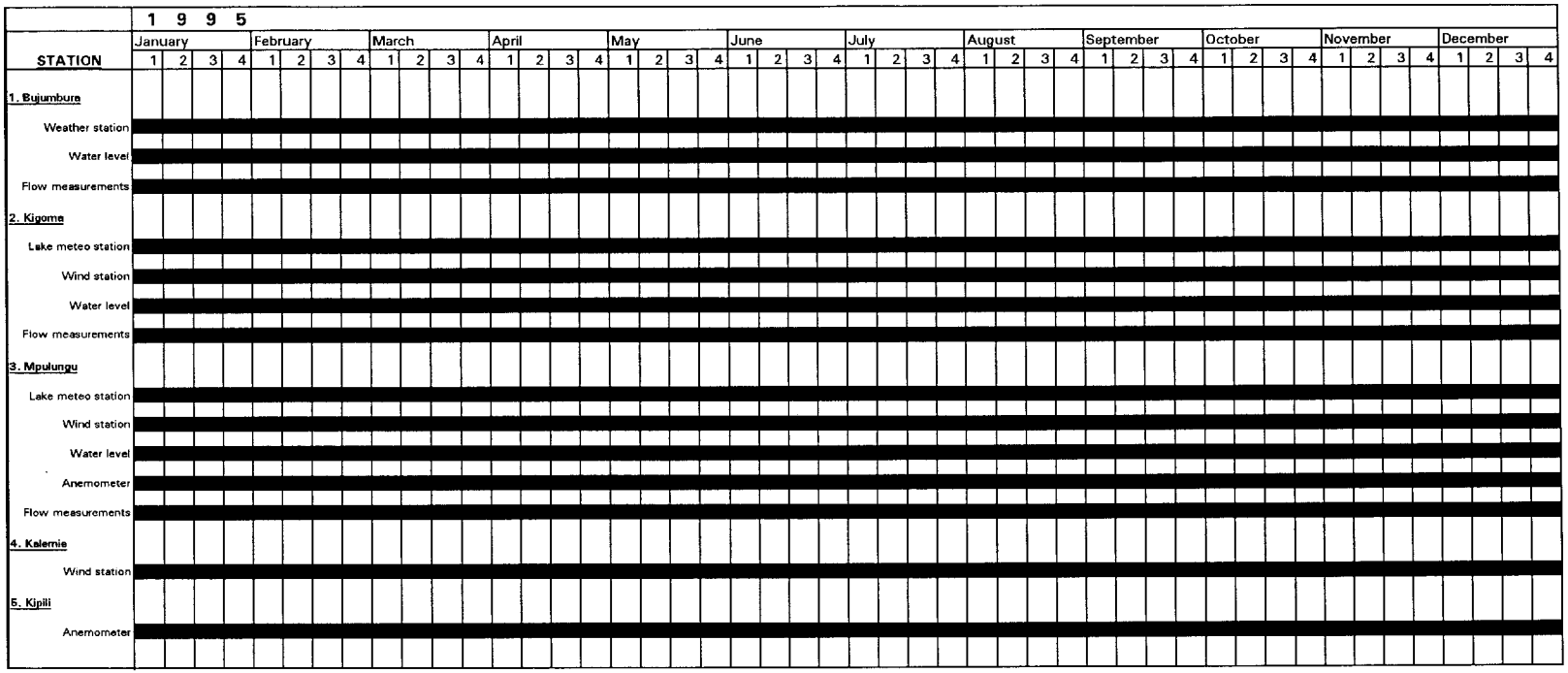


*) = since 07.06.1994 only air temperature, wind speed, wind gust, wind direction and water temperatures at 1 and 5 meters were successfully recorded.

Appendix 1: Collected data in hydrodynamics in March 1993-December 1994.



*) = since 07.06.1994 only air temperature, wind speed, wind gust, wind direction and water temperatures at 1 and 5 meters were successfully recorded.

Appendix 2. Weekly means of meteorological parameters at Bujumbura station March 1993 - December 1994.

	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP. °C	RELATIVE HUMIDITY %	SOLAR RADIATION W/m²	AIR PRESSURE mbar	RAIN FALL mm	WIND SPEED (4m) m/sec.	REL. HUM (4m) %	AIR TEMP. (4m) °C
01-Mar-93										
09-Mar-93	2.53	3.55	23.46	81	237.45	925.29	27.50	2.12	80	24.09
17-Mar-93	2.73	3.84	22.56	84	204.41	925.75	25.40	2.32	84	23.19
25-Mar-93	2.42	3.54	22.89	83	246.43	924.62	48.60	2.06	82	23.56
01-Avr-93	2.95	4.05	23.86	83	244.70	923.81	3.70	2.52	83	24.48
09-Avr-93	2.34	3.44	23.13	85	207.24	925.21	26.50	1.95	84	23.72
17-Avr-93	2.57	3.64	23.71	85	197.80	924.54	11.30	2.11	84	24.31
24-Avr-93	2.50	3.56	23.63	85	209.19	924.36	17.50	2.06	85	24.26
01-Mai-93	3.12	4.29	23.37	86	216.41	925.26	52.00	2.60	86	23.95
09-Mai-93	3.24	4.38	23.89	85	237.17	924.47	8.70	2.75	84	24.46
17-Mai-93										
25-Mai-93										
01-Jun-93										
09-Jun-93	2.80	3.81	23.66	85	163.87	926.31	0.00	2.35	84	24.19
17-Jun-93	3.73	4.85	23.70	83	227.90	926.94	0.00	3.13	82	24.17
24-Jun-93	3.61	4.72	22.95	82	224.33	927.48	0.00	3.03	81	23.43
01-Jul-93	3.52	4.60	22.66	80	230.44	926.65	0.00	2.88	80	23.12
09-Jul-93	3.68	4.79	23.00	81	229.49	926.18	0.00	2.95	80	23.43
17-Jul-93	3.61	4.68	22.81	80	227.92	927.26	0.10	2.91	79	23.20
25-Jul-93	3.40	4.50	23.25	79	231.56	926.74	0.00	2.71	79	23.62
01-Aoû-93	3.13	4.13	23.37	81	177.36	926.29	0.00	2.49	80	23.79
09-Aoû-93	3.76	4.91	23.63	80	222.68	926.41	0.00	2.99	80	23.99
17-Aoû-93	3.52	4.76	23.80	80	210.84	926.20	0.00	2.70	79	24.24
25-Aoû-93	3.38	4.42	24.15	79	240.45	925.52	0.00	2.70	79	24.58
01-Sep-93	3.36	4.46	24.08	79	208.00	925.82	0.00	2.63	78	24.55
09-Sep-93	3.52	4.70	24.44	77	259.91	924.71	0.00	2.70	77	24.89
17-Sep-93	3.86	5.07	24.35	78	253.96	923.19	0.00	2.90	78	24.77
24-Sep-93	3.88	5.09	24.96	79	274.77	923.10	0.00	2.91	79	25.46
01-Oct-93	3.41	4.55	25.04	81	241.79	924.28	0.00	2.60	81	25.54
09-Oct-93	3.69	4.85	25.50	79	245.78	923.37	0.00	2.75	79	25.96
17-Oct-93	3.77	4.98	24.91	80	251.46	923.17	0.00	2.78	80	25.40
25-Oct-93	2.62	3.77	23.46	85	183.97	923.84	2.30	1.91	85	24.05

Appendix 2. Weekly means of meteorological parameters at Bujumbura station March 1993 - December 1994.

	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP. °C	RELATIVE HUMIDITY %	SOLAR RADIATION W/m²	AIR PRESSURE mbar	RAIN FALL mm	WIND SPEED (4m) m/sec.	REL. HUM (4m) %	AIR TEMP. (4m) °C
01-Nov-93	2.48	3.56	23.15	86	196.60	924.90	2.30	1.80	85	23.82
09-Nov-93	3.09	4.27	23.55	85	207.38	923.34	6.10	2.27	84	24.23
17-Nov-93	2.91	3.96	24.09	84	226.42	922.43	6.90	2.14	83	24.75
24-Nov-93	2.94	4.12	23.46	86	198.15	924.03	19.70	2.11	85	24.10
01-Déc-93	2.83	3.95	23.25	86	195.66	924.29	22.40	2.02	85	23.87
09-Déc-93	3.36	4.53	23.06	87	202.31	924.11	16.30	2.48	86	23.65
17-Déc-93	3.01	4.13	23.23	87	207.67	924.90	6.30	2.21	86	23.90
25-Déc-93	3.09	4.17	23.47	86	223.73	924.08	2.10	2.25	85	24.13
01-Jan-94	2.82	3.92	23.25	87	191.80	924.04	56.20	2.04	85	24.00
09-Jan-94	2.03	3.01	22.62	87	153.30	924.17	22.60	1.39	85	23.23
17-Jan-94	2.48	3.52	23.43	87	188.75	924.06	21.40	1.77	85	24.14
25-Jan-94	2.35	3.42	22.66	87	201.65	924.28	24.00	1.56	84	23.40
01-Fév-94	2.82	3.98	23.74	87	183.13	923.82	9.90	2.01	85	24.48
08-Fév-94	2.34	3.44	23.08	87	168.26	924.53	53.60	1.55	85	23.81
15-Fév-94	2.40	3.41	23.95	86	192.50	925.48	8.20	1.62	84	24.69
22-Fév-94	2.75	3.86	23.54	87	215.27	924.68	5.30	1.80	85	24.27
01-Mar-94	2.82	3.91	23.43	87	215.50	924.45	20.90	1.77	85	24.15
09-Mar-94	2.48	3.63	22.99	87	221.64	925.08	6.20	1.58	84	23.78
17-Mar-94	2.73	3.91	23.04	87	251.87	925.35	18.00	2.12	85	23.80
25-Mar-94	2.59	3.62	24.00	87	238.69	925.11	17.40	2.05	85	24.70
01-Avr-94	2.87	4.02	23.58	87	236.52	924.46	23.80	2.19	85	24.27
09-Avr-94	2.45	3.55	23.05	88	222.74	924.63	15.90	1.87	86	23.70
17-Avr-94	2.73	3.95	23.68	87	232.07	924.53	30.10	2.15	85	24.29
24-Avr-94	2.87	4.00	23.70	88	227.37	925.12	24.40	2.21	87	24.34
01-Mai-94	2.46	3.52	23.38	89	191.20	926.43	14.20	1.86	87	23.98
09-Mai-94	2.81	3.82	24.04	86	219.94	925.77	0.10	2.23	84	24.61
17-Mai-94	2.12	3.10	23.70	87	234.99	926.90	2.60	1.74	85	24.27
25-Mai-94										
01-Jun-94										
09-Jun-94										
17-Jun-94										
24-Jun-94										
01-Jul-94										
09-Jul-94										

Appendix 2. Weekly means of meteorological parameters at Bujumbura station March 1993 - December 1994.

	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP. °C	RELATIVE HUMIDITY %	SOLAR RADIATION W/m²	AIR PRESSURE mbar	RAIN FALL mm	WIND SPEED (4m) m/sec.	REL. HUM (4m) %	AIR TEMP. (4m) °C
17-Jul-94										
25-Jul-94										
01-Aoû-94										
09-Aoû-94										
17-Aoû-94										
25-Aoû-94	4.11	5.20	24.99	54	303.96	924.10	0.00	3.01	59	25.20
01-Sep-94	3.94	5.06	24.93	54	257.13	924.48	0.00	2.77	58	25.09
09-Sep-94	3.43	4.52	25.04	56	242.01	924.54	2.20	2.37	61	25.25
17-Sep-94	3.65	4.70	26.13	55	227.90	923.17	0.00	2.56	60	26.25
24-Sep-94	3.15	4.25	25.41	57	245.18	922.56	8.00	2.13	62	25.68
01-Oct-94	3.08	4.21	22.96	71	178.47	923.33	20.00	2.03	75	23.22
09-Oct-94										
17-Oct-94										
25-Oct-94	3.77	5.01	23.48	71	238.06	923.40	14.40	2.53	74	23.87
01-Nov-94	2.94	3.99	23.40	73	210.58	924.17	8.20	1.95	76	23.80
09-Nov-94	2.74	3.73	22.92	75	192.66	924.64	40.60	1.79	78	23.30
17-Nov-94	3.52	4.77	23.53	71	272.33	923.23	33.80	2.33	75	23.97
24-Nov-94	3.06	4.20	23.31	73	228.90	923.86	9.10	1.98	77	23.79
01-Déc-94	3.18	4.27	22.99	76	201.09	925.08	5.20	2.12	79	23.41
09-Déc-94	2.95	3.98	23.07	77	187.41	924.67	9.90	2.13	80	23.45
17-Déc-94	2.89	3.89	23.81	75	251.50	924.56	12.40	2.11	79	24.28
25-Déc-94	2.85	3.96	23.64	76	227.98	924.54	18.80	2.05	79	24.09
AVERAGE	3.04	4.14	23.66	80.5	220.25	924.74	12.33	2.27	80.5	24.19
STDEV	0.49	0.53	0.74	8.5	27.61	1.14	14.24	0.42	6.6	0.68
MIN	2.03	3.01	22.56	53.6	153.30	922.43	0.00	1.39	58.4	23.12
MAX	4.11	5.20	26.13	88.6	303.96	927.48	56.20	3.13	87.0	26.25

Appendix 3. Daily means of wind speed and wind gust at July 1993 - September 1994 at Kigoma wind station.

DAY	Jul-93 WIND SPEED	Jul-93 WIND GUST	Aoû-93 WIND SPEED	Aoû-93 WIND GUST	Sep-93 WIND SPEED	Sep-93 WIND GUST	Oct-93 WIND SPEED	Oct-93 WIND GUST	Nov-93 WIND SPEED	Nov-93 WIND GUST
1			3.96	5.78	4.61	6.50	2.64	4.11	2.73	4.46
2			3.94	5.84	3.82	5.62	3.26	4.64	4.12	5.60
3			3.94	5.47	3.90	5.81	3.93	5.70	2.76	4.21
4			3.43	4.54	4.11	5.87	3.78	5.74	2.81	4.43
5			4.24	5.64	3.55	5.57	3.68	5.37	2.74	4.17
6			4.00	5.46	3.70	5.32	4.02	6.00	2.70	4.07
7			2.87	4.25	3.15	4.97	3.70	5.36	3.21	4.75
8			3.75	4.89	3.85	5.64	3.34	5.06	2.84	4.08
9			3.30	4.73	3.63	5.22	4.10	6.08	3.51	5.35
10			3.79	5.32	3.08	4.63	3.96	5.65	2.62	4.54
11			3.58	4.85	3.45	5.08	3.50	5.07	2.80	4.33
12			3.46	4.61	3.87	5.78	3.36	4.78	2.19	3.72
13	4.22	5.52	3.11	4.65	4.93	6.96	3.99	5.74	3.25	4.86
14	4.33	6.35	4.51	6.59	4.50	6.13	2.81	4.37	3.28	5.21
15	4.21	6.05	4.71	7.08	4.10	5.74	3.25	4.80	3.62	4.96
16	4.54	6.26	4.57	6.58	4.09	5.96	2.81	4.19	3.55	5.17
17	4.16	5.69	3.88	5.25	3.93	5.72	3.21	4.64	3.59	5.04
18	4.43	6.06	3.69	5.05	3.71	5.33	3.41	5.11	3.09	4.56
19	4.26	6.15	3.78	5.47	3.96	5.97	3.87	5.39	3.28	4.88
20	4.61	6.46	4.05	5.74	3.90	5.63	3.15	4.68	3.33	5.08
21	4.37	6.21	3.53	5.25	4.16	5.86	3.75	5.64	3.50	4.97
22	4.49	6.65	2.29	3.43	3.17	4.74	4.37	6.18	3.90	5.55
23	4.49	6.59	5.18	6.60	2.74	4.31	4.23	5.78	2.66	4.50
24	4.70	6.62	4.46	6.36	4.03	5.59	3.31	4.69	3.29	4.79
25	3.89	5.80	3.90	5.88	4.09	5.55	2.84	4.33	2.71	3.86
26	3.98	5.70	4.18	6.18	3.81	5.50	5.41	7.67	2.82	4.43
27	3.62	5.00	4.57	6.20	3.90	5.59	3.87	5.31	2.65	4.19
28	3.53	4.94	4.65	6.60	3.42	5.30	3.24	4.61	3.16	4.64
29	4.04	5.76	3.99	5.89	2.99	4.60	3.08	4.45	5.36	7.59
30	3.84	5.60	4.52	6.49	3.05	4.98	6.59	8.60	4.84	6.89
31	4.35	6.34	4.36	6.26			3.12	4.58		
AVERAGE	4.21	5.99	3.94	5.58	3.77	5.52	3.66	5.30	3.23	4.83
STDEV	0.325	0.501	0.594	0.836	0.494	0.558	0.782	0.964	0.670	0.813
MIN	3.53	4.94	2.29	3.43	2.74	4.31	2.64	4.11	2.19	3.72
MAX	4.70	6.65	5.18	7.08	4.93	6.96	6.59	8.60	5.36	7.59
N	19	19	31	31	30	30	31	31	30	30

Appendix 3. Daily means of wind speed and wind gust at July 1993 - September 1994 at Kigoma wind station.

DAY	Déc-93 WIND SPEED	Déc-93 WIND GUST	Jan-94 WIND SPEED	Jan-94 WIND GUST	Fév-94 WIND SPEED	Fév-94 WIND GUST	Mar-94 WIND SPEED	Mar-94 WIND GUST	Avr-94 WIND SPEED	Avr-94 WIND GUST
1	3.51	5.25	2.17	3.28			3.48	4.75	2.92	4.79
2	3.82	5.49	2.91	4.33			2.48	3.69	3.56	5.47
3	2.49	3.67	2.26	3.44	3.58	4.71	4.45	6.29	3.62	5.53
4	4.90	6.77	2.66	4.28	3.28	5.26	2.76	3.95	3.61	5.24
5	5.81	7.68	2.07	3.55	2.33	3.62	2.87	4.17	3.94	5.46
6	4.08	5.85	1.87	3.04	3.17	4.54	2.76	4.32	3.44	5.36
7	2.89	4.69	3.94	5.82	2.53	4.01	2.77	4.02	3.09	4.54
8	2.92	4.31	4.76	6.72	3.25	4.87	2.75	4.15	4.54	6.23
9	2.31	3.89	2.64	3.74	4.94	6.53	3.00	4.29	3.16	5.01
10	2.80	4.12	2.86	4.52	4.11	5.46	3.13	4.45	3.49	4.89
11	2.28	3.78	4.48	6.21	4.19	6.46	2.50	4.03	3.26	5.03
12	2.54	3.66	2.27	3.32	2.31	3.49	3.89	5.27	3.19	5.15
13	3.79	5.39	2.63	3.84	2.85	3.90	3.39	4.86	4.36	6.04
14	3.11	4.59	3.31	5.10	3.77	5.18	3.34	5.12	3.89	5.30
15	2.66	4.35	1.83	3.06	4.77	6.70	3.98	5.23	3.57	5.50
16	3.04	4.63	2.45	3.85	2.26	3.23	3.29	4.66	3.05	4.24
17	3.21	4.75	2.82	4.16	2.53	3.92	3.84	5.49	2.95	4.33
18	2.27	3.79	3.19	4.42	2.86	4.30	3.05	4.88	3.13	4.36
19	1.92	3.28	2.48	4.52	2.95	4.33	3.70	5.33	3.80	5.64
20	2.29	3.70	2.25	3.23	2.99	4.06	4.10	5.71	3.06	4.61
21	2.12	3.52	2.98	5.33	5.06	7.33	2.74	4.14	5.43	7.18
22	2.27	3.89	2.83	5.08	2.54	4.05	3.56	5.68	3.41	4.83
23	3.20	4.71	3.34	4.58	4.14	5.73	3.14	4.49	3.25	4.53
24	5.33	7.17	2.98	4.34	3.42	5.07	5.43	7.37	4.16	5.93
25	3.24	4.76	1.90	2.50	2.68	4.32	3.03	4.35	6.82	8.85
26	2.49	4.40			3.75	5.13	4.83	6.41	2.96	4.56
27	2.92	4.50			2.96	4.95	4.50	6.24	3.24	4.93
28	2.26	3.76			2.84	4.58	4.72	6.65	3.34	5.00
29	2.43	3.49					2.51	3.88	3.68	5.57
30	2.24	3.89					3.16	4.37	3.10	4.74
31	2.74	4.88					3.51	5.35	3.51	5.35
AVERAGE	3.03	4.60	2.80	4.25	3.31	4.84	3.44	4.95	3.63	5.30
STDEV	0.944	1.081	0.749	1.038	0.818	1.045	0.753	0.926	0.800	0.910
MIN	1.92	3.28	1.83	2.50	2.26	3.23	2.48	3.69	2.92	4.24
MAX	5.81	7.68	4.76	6.72	5.06	7.33	5.43	7.37	6.82	8.85
N	31	31	25	25	26	26	31	31	31	31

Appendix 3. Daily means of wind speed and wind gust at July 1993 - September 1994 at Kigoma wind station.

DAY	Mai-94 WIND SPEED	Mai-94 WIND GUST	Jun-94 WIND SPEED	Jun-94 WIND GUST	Jul-94 WIND SPEED	Jul-94 WIND GUST	Aoû-94 WIND SPEED	Aoû-94 WIND GUST	Sep-94 WIND SPEED	Sep-94 WIND GUST
1	3.58	5.68	3.32	4.94	2.71	4.20	4.64	6.24	3.90	5.48
2	3.11	4.63	4.43	6.44	3.94	5.49	4.67	6.72	4.03	5.65
3	2.95	4.23	4.54	6.45	3.46	4.99	4.39	6.31	4.26	6.11
4	3.58	5.21	3.58	4.94	3.71	5.24	4.02	5.84	4.37	6.08
5	3.26	4.79	3.09	4.15	4.16	5.83	4.50	6.46	4.58	6.58
6	3.29	4.62	2.91	4.17	3.60	5.04	4.23	6.16	4.15	5.77
7	3.28	4.71	2.93	4.43	4.28	5.87	4.12	5.75	3.48	5.09
8	3.34	5.26	2.80	4.18	4.58	6.38	3.47	4.96	3.06	4.75
9	4.02	5.77	2.77	4.34	4.41	6.14	3.39	4.76	3.76	5.91
10	3.91	5.72	2.67	4.48	3.59	4.76	4.11	5.53	5.06	7.51
11	3.66	5.29	3.30	5.30	3.40	4.59	4.00	5.72	4.38	5.88
12	3.94	5.72	3.60	5.51	3.31	4.82	3.95	5.37	3.75	5.35
13	3.82	5.52	3.21	4.82	4.23	6.26	3.86	5.25	3.39	4.94
14	4.10	5.91	3.79	5.41	3.30	4.96	3.29	4.52	4.56	6.27
15	3.80	5.37	3.92	5.70	2.60	4.07	3.26	4.68	4.76	6.54
16	4.73	6.32	3.94	5.61	2.56	4.19	3.38	4.84	3.71	5.35
17	4.17	5.79	3.20	4.51	3.44	4.96	3.89	5.31	3.33	5.13
18	4.20	5.93	3.03	4.22	3.96	5.42	3.16	5.00	3.21	5.14
19	4.24	6.08	2.82	3.91	3.91	5.39	3.70	5.23	3.47	4.91
20	4.21	6.12	2.77	4.33	4.46	6.19	3.67	4.91	3.59	5.63
21	4.48	6.23	3.47	4.99	4.25	5.93	3.02	4.48	4.12	6.19
22	3.94	5.66	4.25	6.02	4.14	5.58	3.22	4.50	4.22	6.14
23	3.58	4.99	4.99	7.00	4.00	5.86	4.57	6.42	4.35	6.14
24	3.09	4.53	4.62	6.51	4.24	5.97	4.47	6.18	3.20	4.64
25	4.05	5.61	3.78	5.39	3.52	4.99	4.00	5.82	3.65	5.28
26	3.50	5.18	3.92	5.59	3.96	5.29	3.77	5.63	3.94	5.69
27	3.33	4.77	3.96	5.42	2.82	3.83	4.08	5.50	4.05	5.75
28	2.60	3.67	3.35	4.39	3.82	5.31	4.52	6.27	3.46	4.97
29	2.82	4.29	2.64	3.62	5.47	7.71	4.56	6.24	5.18	7.40
30	2.48	3.71	3.39	4.98	4.85	7.32	4.27	6.31	6.15	8.04
31	2.88	4.76			5.13	7.33	4.53	6.19		
AVERAGE	3.61	5.23	3.50	5.06	3.86	5.48	3.96	5.58	4.04	5.81
STDEV	0.559	0.712	0.636	0.858	0.691	0.932	0.497	0.670	0.674	0.816
MIN	2.48	3.67	2.64	3.62	2.56	3.83	3.02	4.48	3.06	4.64
MAX	4.73	6.32	4.99	7.00	5.47	7.71	4.67	6.72	6.15	8.04
N	31	31	30	30	31	31	31	31	30	30

Appendix 4. Daily means of wind speed and wind gust April 1994 - Deceber 1994 at Mpulungu wind station.

DAY	Avr-94 WIND SPEED	Avr-94 WIND GUST	Mai-94 WIND SPEED	Mai-94 WIND GUST	Jun-94 WIND SPEED	Jun-94 WIND GUST	Jul-94 WIND SPEED	Jul-94 WIND GUST	Aoû-94 WIND SPEED	Aoû-94 WIND GUST
1			1.87	4.68					3.62	6.78
2			2.52	4.99					3.50	6.81
3			2.72	4.95					3.65	7.33
4			2.49	5.20					5.04	9.17
5			2.67	4.80					5.22	9.42
6			2.76	4.83					3.78	7.16
7			2.78	5.25					3.35	6.37
8			3.12	6.11			2.25	4.01	3.03	5.57
9			2.60	4.87			2.66	4.88	2.93	5.36
10			2.58	5.01			2.90	5.62	2.82	5.32
11			2.75	5.60			3.38	6.20	3.20	5.92
12			2.83	5.89			5.70	10.25	3.11	6.30
13			3.27	7.04			5.67	10.43	3.41	6.79
14			2.61	5.85			4.86	8.81	2.74	4.93
15			3.22	7.03			4.01	7.52	2.49	4.94
16			2.90	5.83			3.89	7.33	3.16	6.58
17			2.46	4.79			4.34	8.18	3.16	6.10
18			2.45	4.92			4.72	8.69	4.53	7.95
19			2.50	5.50			4.69	8.36	3.20	5.80
20			2.79	5.75			4.33	8.03	2.69	4.60
21			2.39	4.48			3.04	6.06	2.29	4.21
22			2.79	5.19			3.94	7.62	4.00	8.10
23			2.60	5.06			3.24	6.34	4.52	9.53
24			2.93	5.85			2.71	5.06	4.98	9.48
25			3.49	7.02			2.72	4.93	5.09	9.48
26			3.89	7.56			2.39	4.31	3.82	7.54
27	4.39	7.86	4.13	7.84			3.40	6.52	3.74	7.07
28	3.01	6.13	2.37	4.67			5.27	10.79	2.98	6.21
29	2.93	5.93	2.86	5.83			5.05	9.92	3.59	6.98
30	2.64	9.65	3.13	6.46			6.71	12.17	3.39	6.96
31			4.67	8.77			4.06	8.04	3.29	6.52
AVERAGE	3.24	7.39	2.88	5.73			4.00	7.50	3.56	6.82
STDEV	0.780	1.736	0.556	1.059			1.178	2.197	0.780	1.481
MIN	2.64	5.93	1.87	4.48	0.00	0.00	2.25	4.01	2.29	4.21
MAX	4.39	9.65	4.67	8.77	0.00	0.00	6.71	12.17	5.22	9.53
N	4	4	31	31	0	0	24	24	31	31

Appendix 5. Weekly means of wind speed, wind gust and air and water temperatures March-December 1994 at Kigoma Lake meteo station.

DATE	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP.	WATER TEMP. 1m	WATER TEMP. 5m	WATER TEMP. 15m	WATER TEMP. 30m	WATER TEMP. 50m	WATER TEMP. 70m	WATER TEMP. 90m	WATER TEMP. 110m	WATER TEMP. 150m	WATER TEMP. 200m	WATER TEMP. 300m
01/03/94	3.10	4.61	25.16	26.86	26.69	26.55	26.38	25.84	24.52	24.27	24.09	23.85	23.61	23.42
09/03/94	3.28	5.01	24.75	26.88	26.78	26.69	26.35	25.69	24.56	24.28	24.06	23.84	23.60	23.39
17/03/94	3.63	5.32	24.73	26.93	26.79	26.71	26.31	25.71	24.51	24.23	24.01	23.82	23.57	23.40
25/03/94	3.27	4.79	25.44	27.09	26.97	26.89	26.47	25.72	24.51	24.18	24.02	23.81	23.55	23.41
01/04/94	3.89	5.36	25.42	27.11	27.06	26.98	26.47	25.72	24.53	24.22	24.07	23.85	23.61	23.43
08/04/94	3.60	5.22	25.19	27.21	27.13	27.03	26.67	26.07	24.84	24.30	24.11	23.87	23.61	23.42
17/04/94	3.55	5.21	25.23	27.20	27.15	27.06	26.76	26.01	24.49	24.16	24.00	23.81	23.57	23.40
24/04/94	3.81	5.31	25.01	27.07	27.03	26.97	26.89	25.51	24.35	24.11	23.98	23.81	23.55	23.41
01/05/94	2.97	4.34	25.45	27.10	27.04	26.97	26.90	26.41	24.92	24.34	24.12	23.91	23.64	23.44
09/05/94	3.45	4.87	25.60	27.06	27.03	26.97	26.90	26.22	24.78	24.23	24.03	23.79	23.55	23.43
17/05/94	3.44	4.77	25.56	26.99	26.97	26.92	26.88	26.53	25.02	24.30	24.10	23.86	23.57	23.40
25/05/94	2.50	3.62	25.48	27.08	27.03	26.98	26.93	26.60	25.18	24.25	24.03	23.82	23.57	23.43
01/06/94														
08/06/94														
17/06/94														
24/06/94														
01/07/94														
09/07/94														
17/07/94														
25/07/94														
01/08/94														
08/08/94														
17/08/94														
25/08/94	2.21	3.07	25.66	25.69	25.67	25.63	25.58	25.42	24.68	24.25	24.07	23.88	23.66	23.43
01/09/94	2.31	3.17	25.40	25.69	25.69	25.64	25.58	25.26	24.88	24.28	24.09	23.88	23.64	23.43
08/09/94	1.81	2.62	25.52	25.77	25.73	25.64	25.55	25.24	24.77	24.25	24.06	23.84	23.56	23.43
17/09/94	2.19	3.00	26.17	25.99	25.97	25.89	25.67	25.28	24.78	24.23	24.06	23.86	23.59	23.43
24/09/94	2.50	3.75	26.20	26.31	26.28	26.10	25.69	25.33	24.66	24.21	24.04	23.83	23.58	23.42
01/10/94	2.44	3.76	24.84	26.36	26.34	26.27	26.05	25.11	24.43	24.13	23.97	23.80	23.54	23.41
09/10/94	2.23	3.69	25.29	26.36	26.31	26.23	26.08	24.88	24.32	24.10	23.97	23.81	23.59	23.45
17/10/94	2.44	3.76	24.84	26.36	26.34	26.27	26.05	25.11	24.43	24.13	23.97	23.80	23.54	23.41
25/10/94	2.23	3.69	25.29	26.36	26.31	26.23	26.08	24.88	24.32	24.10	23.97	23.81	23.59	23.45
01/11/94	1.94	3.14	24.97	26.41	26.38	26.30	25.95	24.65	24.26	24.08	23.96	23.82	23.65	23.47
09/11/94	2.41	3.98	24.10	26.35	26.26	26.20	25.99	24.66	24.34	24.10	23.97	23.83	23.64	23.43
17/11/94	2.11	3.28	25.05	26.40	26.21	26.01	25.88	24.87	24.48	24.12	24.00	23.85	23.57	23.40
24/11/94	2.01	3.18	24.39	26.41	26.28	26.19	25.95	24.79	24.40	24.14	24.02	23.87	23.57	23.41
01/12/94	2.35	3.72	23.68	25.96	25.93	25.86	25.70	24.83	24.52	24.25	24.10	23.93	23.65	23.44
09/12/94	2.19	3.45	23.81	26.05	25.94	25.85	25.70	25.13	24.66	24.35	24.17	23.91	23.60	23.42
17/12/94	2.35	3.69	24.63	26.24	26.09	25.86	25.71	25.21	24.71	24.35	24.14	23.86	23.51	23.41
25/12/94	2.12	3.21	24.67	26.43	26.26	26.09	25.75	25.41	24.77	24.29	24.07	23.81	23.53	23.43
AVERAGE	2.70	4.02	25.09	26.54	26.47	26.38	26.17	25.45	24.61	24.21	24.04	23.84	23.59	23.42
STD	0.64	0.84	0.60	0.48	0.48	0.49	0.47	0.56	0.23	0.08	0.06	0.04	0.04	0.02
MIN	1.81	2.62	23.68	25.69	25.67	25.63	25.55	24.65	24.26	24.08	23.96	23.79	23.51	23.39
MAX	3.89	5.36	26.20	27.21	27.15	27.06	26.93	26.60	25.18	24.35	24.17	23.93	23.66	23.47

Appendix 6. Weekly means of wind speed, wind gust and air and water temperatures March 1993-December 1994 at Mpulungu lake meteo station.

DATE	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP.	WATER TEMP. 1m	WATER TEMP. 5m	WATER TEMP. 30m	WATER TEMP. 50m	WATER TEMP. 70m	WATER TEMP. 90m	WATER TEMP. 110m	WATER TEMP. 150m	WATER TEMP. 200m	WATER TEMP. 250m	WATER TEMP. 300m
01/03/93	2.66	3.97	25.86	27.21	27.03	26.87	25.51	24.57	24.16	24.01	23.82	23.57	23.44	23.40
09/03/93	2.99	4.64	25.65	27.29	27.09	26.90	25.67	24.58	24.18	24.02	23.81	23.56	23.44	23.39
17/03/93	3.86	5.90	24.46	27.11	26.99	26.59	25.22	24.34	24.09	23.97	23.80	23.55	23.43	23.38
25/03/93	3.10	4.67	25.67	27.12	26.94	26.64	25.36	24.37	24.10	23.98	23.82	23.56	23.43	23.39
01/04/93	4.69	6.46	26.23	26.90	26.75	26.17	25.05	24.35	24.12	23.98	23.83	23.58	23.47	23.41
09/04/93	3.30	4.81	26.10	27.08	26.91	25.65	24.63	24.30	24.12	23.98	23.81	23.56	23.46	23.40
17/04/93	5.39	7.30	26.59	27.10	26.97	26.02	25.09	24.48	24.21	24.06	23.86	23.57	23.44	23.39
24/04/93	4.10	5.78	26.25	26.73	26.54	25.44	24.60	24.29	24.08	23.96	23.80	23.55	23.43	23.39
01/05/93	4.26	5.89	26.11	26.88	26.75	25.92	24.99	24.51	24.26	24.06	23.85	23.57	23.43	23.39
09/05/93	5.54	7.49	26.18	26.80	26.68	26.30	25.11	24.54	24.22	24.02	23.81	23.55	23.42	23.38
17/05/93	4.56	6.41	25.14	26.06	25.93	25.66	24.56	24.22	24.05	23.94	23.76	23.52	23.41	23.38
25/05/93	4.14	5.96	26.04	26.10	25.96	25.68	24.86	24.45	24.22	24.07	23.86	23.62	23.47	23.42
01/06/93	5.84	8.24	24.92	25.84	25.75	25.63	25.01	24.45	24.18	24.01	23.81	23.56	23.44	23.40
09/06/93	5.00	7.11	24.27	25.28	25.16	25.06	24.37	24.12	23.99	23.90	23.73	23.53	23.44	23.39
17/06/93	5.24	7.41	24.39	24.99	24.88	24.81	24.52	24.22	24.08	23.96	23.83	23.64	23.50	23.43
24/06/93	6.29	8.85	23.70	24.71	24.61	24.60	24.51	24.24	24.11	24.01	23.79	23.54	23.43	23.39
01/07/93	5.96	8.36	23.20	24.25	24.16	24.14	24.12	24.11	24.07	23.94	23.67	23.49	23.41	23.38
09/07/93	5.38	7.54	23.79	24.20	24.06	24.03	24.02	23.99	23.94	23.91	23.77	23.61	23.49	23.43
17/07/93	6.21	8.66	23.56	24.17	24.07	24.07	24.04	23.99	23.95	23.92	23.85	23.64	23.46	23.40
25/07/93	4.72	6.74	23.75	24.04	23.93	23.88	23.89	23.86	23.86	23.86	23.84	23.53	23.41	23.37
01/08/93	4.51	6.41	24.18	24.19	24.09	23.92	23.91	23.87	23.86	23.85	23.84	23.65	23.47	23.41
09/08/93	5.91	8.46	24.00	24.31	24.24	24.02	23.95	23.91	23.88	23.86	23.83	23.68	23.45	23.40
17/08/93	4.47	6.44	24.30	24.23	24.12	23.95	23.94	23.91	23.89	23.89	23.81	23.48	23.39	23.36
25/08/93	5.54	7.78	24.18	24.17	24.07	23.97	23.95	23.92	23.91	23.92	23.83	23.54	23.42	23.39
01/09/93	5.47	7.81	24.63	24.34	24.25	24.05	23.97	23.94	23.91	23.90	23.81	23.57	23.44	23.40
09/09/93	4.42	6.48	25.25	24.60	24.42	24.18	24.09	23.98	23.93	23.91	23.82	23.57	23.43	23.38
17/09/93	4.33	6.26	25.31	24.89	24.76	24.11	24.04	24.00	23.97	23.94	23.87	23.67	23.48	23.42
24/09/93	3.43	5.22	26.04	25.68	25.52	24.74	24.30	24.11	24.03	23.98	23.90	23.71	23.47	23.42
01/10/93	4.56	6.63	26.42	26.11	26.01	25.66	24.81	24.34	24.11	24.02	23.90	23.58	23.43	23.39
09/10/93	4.24	6.21	26.70	26.20	26.10	25.63	24.55	24.28	24.14	24.02	23.87	23.52	23.41	23.39
17/10/93	4.34	6.32	26.77	26.34	26.26	25.72	24.75	24.32	24.13	24.01	23.84	23.52	23.42	23.40
25/10/93	3.68	5.60	27.10	26.73	26.62	25.71	24.91	24.39	24.14	24.02	23.85	23.52	23.41	23.39
01/11/93	3.04	4.99	25.53	26.85	26.76	26.18	25.32	24.68	24.29	24.11	23.94	23.63	23.46	23.42
09/11/93	3.65	5.75	26.13	26.97	26.86	26.49	25.30	24.55	24.20	24.06	23.83	23.53	23.41	23.39
17/11/93	4.08	6.26	27.16	27.22	27.10	26.09	24.61	24.31	24.14	24.00	23.77	23.51	23.42	23.40
24/11/93	3.42	5.35	26.32	27.35	27.21	26.24	24.65	24.32	24.14	24.02	23.80	23.53	23.42	23.41
01/12/93	3.11	5.08	26.27	27.91	27.83	27.00	25.06	24.48	24.24	24.09	23.88	23.61	23.46	23.43
09/12/93	3.64	5.84	26.30	27.56	27.48	27.32	25.30	24.49	24.24	24.07	23.86	23.60	23.45	23.42
17/12/93	3.57	5.76	26.10	27.54	27.46	26.87	24.79	24.34	24.10	23.97	23.79	23.54	23.43	23.40
25/12/93	3.48	5.67	25.97	27.77	27.69	27.24	24.97	24.41	24.16	23.97	23.81	23.55	23.44	23.41
01/01/94	2.78	5.14	24.89	27.68	27.62	26.65	24.98	24.43	24.17	24.02	23.83	23.57	23.45	23.41
09/01/94	3.30	5.17	24.83	27.40	27.30	26.46	24.93	24.45	24.19	24.04	23.84	23.58	23.45	23.40
17/01/94	2.52	4.43	25.14	27.30	27.22	27.11	25.11	24.49	24.19	24.01	23.83	23.56	23.43	23.41
25/01/94	2.89	4.97	25.29	27.29	27.17	25.92	24.68	24.26	24.05	23.91	23.74	23.50	23.40	23.38

Appendix 6. Weekly means of wind speed, wind gust and air and water temperatures March 1993-December 1994 at Mpulungu lake meteo station.

DATE	WIND SPEED m/sec.	WIND GUST m/sec.	AIR TEMP.	WATER TEMP. 1m	WATER TEMP. 5m	WATER TEMP. 30m	WATER TEMP. 50m	WATER TEMP. 70m	WATER TEMP. 90m	WATER TEMP. 110m	WATER TEMP. 150m	WATER TEMP. 200m	WATER TEMP. 250m	WATER TEMP. 300m
01/02/94	3.19	5.38	24.78	27.26	27.18	26.76	25.09	24.48	24.23	24.05	23.86	23.62	23.47	23.42
08/02/94	2.70	4.95	24.80	27.04	26.91	26.82	25.54	24.60	24.25	24.07	23.85	23.58	23.44	23.39
15/02/94	2.81	4.97	25.01	27.07	26.87	26.68	25.13	24.47	24.17	24.01	23.82	23.57	23.44	23.40
22/02/94	3.35	5.53	24.95	27.05	26.92	26.52	24.98	24.40	24.13	23.99	23.80	23.55	23.42	23.39
01/03/94	3.47	5.61	25.22	27.15	26.99	26.58	24.78	24.30	24.07	23.93	23.77	23.53	23.42	23.39
09/03/94	2.74	4.78	25.28	27.24	27.12	26.22	24.74	24.29	24.10	23.99	23.83	23.61	23.47	23.42
17/03/94	3.40	5.64	24.86	27.17	27.05	26.72	25.02	24.46	24.18	24.03	23.84	23.60	23.46	23.41
25/03/94	2.98	5.11	25.75	27.42	27.28	26.83	25.13	24.45	24.14	23.99	23.85	23.61	23.47	23.42
01/04/94	4.51	6.77	26.15	27.40	27.28	26.51	25.02	24.35	24.10	23.96	23.78	23.55	23.44	23.40
09/04/94	4.44	6.58	26.06	27.04	26.91	25.22	24.49	24.18	24.05	23.94	23.75	23.56	23.45	23.41
17/04/94	2.63	4.37	26.20	27.38	27.24	26.02	24.90	24.46	24.21	24.08	23.90	23.65	23.49	23.43
24/04/94	5.98	8.38	26.12	27.01	26.94	26.69	25.09	24.47	24.19	24.01	23.83	23.56	23.44	23.40
01/05/94	4.50	6.57	26.02	26.51	26.42	25.97	24.50	24.21	24.04	23.94	23.79	23.54	23.42	23.40
09/05/94														
17/05/94														
25/05/94														
01/06/94	4.75	6.78	24.98	25.08	24.93									
09/06/94	6.13	8.66	23.20	24.52	24.41									
17/06/94	4.26	6.02	24.02	24.29	24.17									
24/06/94	3.25	4.86	24.54	24.74	24.57									
01/07/94	6.44	8.98	23.89	24.68	24.57									
09/07/94	5.26	7.57	23.70	24.48	24.34									
17/07/94	5.46	7.63	23.88	24.29	24.12									
25/07/94	6.06	8.58	24.25	24.34	24.14									
01/08/94	5.45	7.78	23.94	24.15	23.98									
09/08/94	3.58	5.53	24.69	24.50	24.26									
17/08/94	4.46	6.78	25.25	24.98	24.75									
25/08/94	5.58	7.98	24.91	24.68	24.49									
01/09/94	4.43	6.46	24.93	24.48	24.29									
09/09/94	4.58	6.73	25.28	24.74	24.54									
17/09/94	4.52	6.63	26.03	25.34	25.16									
24/09/94	3.47	5.39	26.67	26.02	25.83									
01/10/94	4.48	6.93	26.24	26.28	26.15									
09/10/94	3.62	5.57	26.32	26.34	26.20									
17/10/94	3.40	5.41	26.78	26.80	26.60									
25/10/94	3.30	5.31	26.38	27.13	27.03									
01/11/94	4.20	6.46	26.64	27.11	27.02									
09/11/94	3.68	5.72	26.03	27.15	27.08									
17/11/94	3.62	5.39	26.80	27.37	27.27									
24/11/94	3.06	5.25	24.71	27.25	27.20									
01/12/94	3.17	5.38	25.37	27.28	27.19									
09/12/94	3.10	5.31	24.83	27.23	27.15									
17/12/94	3.25	5.14	26.09	27.53	27.40									
25/12/94	2.94	5.19	25.47	27.78	27.61									
AVERAGE	4.16	6.24	25.34	26.16	26.03	25.77	24.74	24.30	24.10	23.98	23.82	23.57	23.44	23.40
STDEV	1.05	1.20	0.99	1.26	1.27	1.05	0.47	0.21	0.11	0.06	0.05	0.05	0.02	0.02
MIN	2.52	3.97	23.20	24.04	23.93	23.88	23.89	23.86	23.86	23.85	23.67	23.48	23.39	23.36
MAX	6.44	8.98	27.16	27.91	27.83	27.32	25.67	24.68	24.29	24.11	23.94	23.71	23.50	23.43

Appendix 7. Daily mean values of relative water level at Bujumbura, Kigoma and Mpulungu stations at March 1993-October 1994.

DATE	BUJUMBURA	Mar-93 KIGOMA	MPULUNGU	BUJUMBURA	Avr-93 KIGOMA	MPULUNGU	BUJUMBURA	Mai-93 KIGOMA	MPULUNGU	BUJUMBURA	Jun-93 KIGOMA	MPULUNGU	BUJUMBURA	Jul-93 KIGOMA	MPULUNGU
1		0.454		0.679	0.548	0.692	0.690	0.584	0.686	0.655			0.541	0.421	0.507
2		0.452		0.681	0.549	0.693	0.693	0.581	0.687	0.650			0.534	0.415	0.499
3		0.454		0.686	0.551	0.690	0.691	0.580	0.688	0.649			0.528	0.407	0.493
4		0.455		0.684	0.548	0.683	0.688	0.578	0.691	0.644			0.520	0.402	0.496
5		0.453		0.686	0.551	0.683	0.687	0.577	0.694	0.637			0.513	0.397	0.506
6		0.459		0.686	0.548	0.677	0.689	0.583	0.702	0.633	0.520		0.508	0.391	0.507
7		0.465	0.624	0.684	0.546	0.677	0.699	0.588	0.703	0.632	0.515		0.503	0.386	0.506
8		0.466	0.622	0.682	0.547	0.677	0.696	0.588	0.705	0.632	0.513		0.496	0.381	0.505
9		0.468	0.628	0.676	0.547	0.679		0.589	0.708	0.630	0.510		0.490	0.376	0.503
10		0.473	0.632	0.681	0.549	0.678		0.591	0.708	0.629	0.507		0.486	0.371	0.499
11		0.482	0.625	0.683	0.551	0.681		0.591	0.702	0.624	0.504		0.484	0.368	0.495
12		0.482	0.629	0.685	0.551	0.681		0.588	0.701	0.619	0.502	0.590	0.480	0.364	0.489
13	0.613	0.480	0.626	0.687	0.555	0.687			0.696	0.616	0.498	0.587	0.474	0.356	0.483
14	0.611	0.477	0.625	0.691	0.557	0.688			0.689	0.612	0.495	0.583	0.467	0.350	0.478
15	0.615	0.483	0.630	0.691	0.558	0.690			0.684	0.607	0.490	0.579	0.461	0.345	0.474
16	0.620	0.485	0.629	0.685	0.555	0.686			0.682	0.603	0.485	0.576	0.455	0.341	0.470
17	0.618	0.485	0.625	0.684	0.551	0.689			0.681	0.599	0.480	0.575	0.450	0.336	0.467
18	0.628	0.492	0.632	0.682	0.556	0.690			0.675	0.595	0.476	0.574	0.446	0.332	0.463
19	0.631	0.491	0.631	0.680	0.559	0.695			0.670	0.590	0.472	0.572	0.443	0.328	0.459
20	0.646	0.520	0.655	0.684	0.559	0.686			0.671	0.589	0.468	0.566	0.441	0.323	0.454
21	0.660	0.526	0.668	0.685	0.557	0.679				0.583	0.461	0.559	0.438	0.319	0.445
22	0.661	0.526	0.671	0.680	0.552	0.675				0.575	0.456	0.555	0.433	0.313	0.436
23	0.668	0.532	0.671	0.678	0.550	0.674				0.569	0.452	0.551	0.428	0.308	0.429
24	0.675	0.543	0.681	0.678	0.550	0.667				0.571	0.449	0.542	0.421	0.303	0.425
25	0.677	0.543	0.689	0.680	0.552	0.664				0.567	0.445	0.534	0.414	0.298	0.420
26	0.676	0.545	0.687	0.679	0.559	0.667				0.560	0.438	0.531	0.408	0.292	0.420
27	0.674	0.545	0.685	0.683	0.566	0.675				0.555	0.434	0.528	0.404	0.289	0.417
28	0.675	0.544	0.687	0.687	0.567	0.673				0.552	0.431	0.523	0.400	0.286	0.415
29	0.672	0.544	0.688	0.688	0.568	0.674				0.546	0.427	0.514	0.397	0.281	0.415
30	0.670	0.545	0.692	0.682	0.571	0.681							0.395	0.278	0.410
31	0.677	0.546	0.691										0.389	0.273	0.407
AVERAGE	0.651	0.497	0.653	0.683	0.554	0.681	0.692	0.585	0.691	0.604	0.476	0.558	0.460	0.343	0.464
STDEV	0.026	0.035	0.028	0.004	0.007	0.008	0.004	0.005	0.012	0.033	0.030	0.024	0.045	0.045	0.036
MIN	0.611	0.452	0.622	0.676	0.546	0.664	0.687	0.577	0.670	0.546	0.427	0.514	0.389	0.273	0.407
MAX	0.677	0.546	0.692	0.691	0.571	0.695	0.699	0.591	0.708	0.655	0.520	0.590	0.541	0.421	0.507

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Appendix 7. Daily mean values of relative water level at Bujumbura, Kigoma and Mpulungu stations at March 1993-October 1994.

DATE	BUJUMBURA	Août-93 KIGOMA	MPULUNGU	BUJUMBURA	Sep-93 KIGOMA	MPULUNGU	BUJUMBURA	Oct-93 KIGOMA	MPULUNGU	BUJUMBURA	Nov-93 KIGOMA	MPULUNGU	BUJUMBURA	Déc-93 KIGOMA	MPULUNGU
1	0.384	0.269	0.398	0.273	0.152	0.314	0.181	0.059	0.248	0.118		0.188	0.178		0.200
2	0.380	0.264	0.393	0.267	0.149	0.309	0.178	0.058	0.243	0.121		0.191	0.185		0.200
3	0.373	0.259	0.393	0.267	0.148	0.303	0.174	0.056	0.242	0.126		0.185	0.179		0.204
4	0.369	0.256	0.393	0.261	0.141	0.301	0.173	0.052	0.238	0.126		0.185	0.175		0.203
5	0.365	0.254	0.394	0.259	0.139	0.299	0.174	0.048	0.233	0.124		0.189	0.167		0.203
6	0.363	0.250	0.396	0.253	0.136	0.293	0.177	0.045	0.226	0.130		0.183	0.179		0.199
7	0.361	0.248	0.394	0.254	0.136	0.286	0.170	0.042	0.223	0.135		0.191	0.189		0.198
8	0.355	0.245	0.393	0.251	0.130	0.286	0.162	0.038	0.222	0.140		0.187	0.190		0.199
9	0.356	0.242	0.391	0.245	0.127	0.285	0.161	0.036	0.217	0.147		0.192	0.191		0.204
10	0.352	0.238	0.388	0.240	0.125	0.285	0.159	0.032	0.215	0.155		0.189	0.190		0.201
11	0.351	0.235	0.393	0.241	0.124	0.281	0.163	0.029	0.213	0.155		0.187	0.202		0.207
12	0.349	0.231	0.394	0.238	0.119	0.282	0.160	0.026	0.210	0.163		0.188	0.194		0.210
13	0.350	0.232	0.381	0.238	0.114	0.280	0.155	0.022	0.209	0.158		0.192	0.200		0.207
14	0.348	0.228	0.363	0.236	0.110	0.277	0.145	0.019	0.208	0.153		0.195	0.201		0.207
15	0.341	0.221	0.359	0.234	0.106	0.275	0.139	0.017	0.204	0.153		0.194	0.211		0.206
16	0.330	0.212	0.356	0.227	0.104	0.271	0.135	0.015	0.201	0.148		0.189	0.221		0.209
17	0.324	0.207	0.352	0.221	0.102	0.269	0.139	0.013	0.204	0.150		0.185	0.217		0.210
18	0.322	0.204	0.353	0.219	0.097	0.268	0.139	0.010	0.199	0.156		0.182	0.228	0.013	0.215
19	0.320	0.202	0.352	0.213	0.093	0.262	0.136		0.195	0.156		0.178	0.239	0.015	0.214
20	0.317	0.199	0.351	0.211	0.090	0.259	0.132		0.190	0.151		0.176	0.238	0.018	0.215
21	0.313	0.195	0.351	0.206	0.085	0.258	0.125		0.183	0.149		0.174	0.242	0.018	0.224
22	0.310	0.194	0.350	0.200	0.082	0.260	0.118		0.177	0.150		0.173	0.248	0.019	0.230
23	0.297	0.193	0.346	0.195	0.080	0.259	0.114		0.174	0.161		0.179	0.242	0.023	0.226
24	0.305	0.191	0.336	0.193	0.079	0.258	0.111		0.175	0.163		0.182	0.230	0.025	0.242
25	0.304	0.188	0.330	0.194	0.079	0.259	0.106		0.175	0.167		0.177	0.238	0.025	0.238
26	0.301	0.182	0.325	0.193	0.075	0.258	0.098		0.175	0.162		0.181	0.238	0.028	0.240
27	0.290	0.175	0.328	0.189	0.070	0.256	0.101		0.172	0.164		0.181	0.242	0.027	0.248
28	0.288	0.170	0.324	0.188	0.067	0.255	0.109		0.166	0.163		0.182	0.254	0.029	0.248
29	0.285	0.166	0.322	0.187	0.063	0.252	0.104		0.165	0.152		0.180	0.247	0.028	0.245
30	0.282	0.163	0.318	0.190	0.062	0.250	0.097		0.170	0.1663083		0.1942792	0.247	0.029	0.246
31	0.276	0.158	0.315				0.111		0.175				0.259	0.033	0.249
AVERAGE	0.331	0.215	0.362	0.226	0.106	0.275	0.140	0.034	0.202	0.149		0.185	0.215	0.024	0.218
STDEV	0.032	0.033	0.029	0.028	0.028	0.018	0.028	0.016	0.025	0.015		0.006	0.028	0.006	0.018
MIN	0.276	0.158	0.315	0.187	0.062	0.250	0.097	0.010	0.165	0.118	0.000	0.173	0.167	0.013	0.198
MAX	0.384	0.269	0.398	0.273	0.152	0.314	0.181	0.059	0.248	0.167	0.000	0.195	0.259	0.033	0.249

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Appendix 7. Daily mean values of relative water level at Bujumbura, Kigoma and Mpulungu stations at March 1993-October 1994.

DATE	BUJUMBURA	Jan-94 KIGOMA	MPULUNGU	BUJUMBURA	Fév-94 KIGOMA	MPULUNGU	BUJUMBURA	Mar-94 KIGOMA	MPULUNGU	BUJUMBURA	Avr-94 KIGOMA	MPULUNGU	BUJUMBURA	Mai-94 KIGOMA	MPULUNGU
1	0.249	0.029		0.373	0.087		0.378	0.120		0.486	0.189		0.539	0.193	
2	0.244	0.029		0.366	0.085		0.380	0.120		0.483	0.185		0.552	0.195	
3	0.249	0.032		0.348	0.079		0.370	0.130		0.474	0.183		0.543	0.195	
4	0.257	0.043		0.343	0.094		0.395	0.135		0.454	0.181		0.553	0.197	
5	0.272	0.056		0.362	0.095		0.413	0.140		0.441	0.181		0.563	0.200	
6	0.277	0.056		0.357	0.093		0.414	0.141		0.446	0.185		0.564	0.200	
7	0.275	0.059		0.359	0.093		0.422	0.143		0.449	0.184		0.573	0.197	
8	0.271	0.063		0.352	0.094		0.433	0.144		0.451	0.183		0.580	0.192	
9	0.284	0.071		0.362	0.093		0.443	0.143		0.463	0.186		0.567	0.187	
10	0.290	0.070		0.371	0.095		0.424	0.141		0.477	0.185		0.547	0.182	
11	0.296	0.079		0.365	0.094		0.433	0.145		0.473	0.183		0.535	0.178	
12	0.305	0.077		0.351	0.098		0.436	0.147		0.467	0.184		0.523	0.176	
13	0.319	0.076		0.369	0.098		0.435	0.145		0.463	0.182		0.511	0.173	
14	0.322	0.075		0.373	0.099		0.431	0.147		0.471	0.181		0.492	0.170	
15	0.332	0.078		0.389	0.108		0.437	0.147		0.470	0.184		0.475	0.169	
16	0.339	0.078		0.402	0.108		0.450	0.150		0.489	0.183		0.478	0.168	
17	0.343	0.079		0.401	0.107		0.454	0.155		0.499	0.183		0.480	0.168	
18	0.336	0.079		0.392	0.109		0.460	0.167		0.492	0.179		0.475	0.167	
19	0.346	0.084		0.395	0.106		0.462	0.167		0.477	0.179		0.460	0.162	
20	0.341	0.080		0.400	0.105		0.462	0.170		0.485	0.181		0.451	0.159	
21	0.344	0.086		0.378	0.103		0.463	0.170		0.496	0.182		0.439	0.158	
22	0.337	0.088		0.386	0.109		0.472	0.170		0.502	0.180		0.429	0.155	
23	0.346	0.086		0.379	0.107		0.476	0.175		0.494	0.179		0.425	0.154	
24	0.349	0.085		0.390	0.116		0.467	0.174		0.485	0.179		0.409	0.150	
25	0.352	0.090		0.400	0.119		0.472	0.177		0.489	0.193		0.414	0.147	
26	0.363	0.092		0.399	0.119		0.467	0.180		0.517	0.197		0.410	0.144	
27	0.371	0.091		0.412	0.123		0.472	0.180		0.527	0.197		0.406	0.140	
28	0.376	0.091		0.392	0.123		0.460	0.180		0.538	0.193		0.392	0.139	
29	0.376	0.090					0.474	0.183		0.536	0.191		0.392	0.134	
30	0.381	0.090					0.481	0.182		0.52465	0.1874833		0.395	0.132	
31	0.381	0.089					0.485	0.182		0.5124	0.1893208				
AVERAGE	0.320	0.073		0.377	0.102		0.443	0.156		0.485	0.185		0.486	0.169	
STDEV	0.043	0.019		0.019	0.011		0.031	0.019		0.026	0.005		0.064	0.021	
MIN	0.244	0.029	0.000	0.343	0.079	0.000	0.370	0.120	0.000	0.441	0.179	0.000	0.392	0.132	0.000
MAX	0.381	0.092	0.000	0.412	0.123	0.000	0.485	0.183	0.000	0.538	0.197	0.000	0.580	0.200	0.000

cont'd

Appendix 7. Daily mean values of relative water level at Bujumbura, Kigoma and Mpulungu stations at March 1993-October 1994.

DATE	BUJUMBURA	Jun-94 KIGOMA	MPULUNGU	BUJUMBURA	Jul-94 KIGOMA	MPULUNGU	BUJUMBURA	Aoû-94 KIGOMA	MPULUNGU	BUJUMBURA	Sep-94 KIGOMA	MPULUNGU	BUJUMBURA	Oct-94 KIGOMA	MPULUNGU
1	0.385	0.127		0.180	0.008		0.077	-0.119			-0.210			-0.288	
2	0.371	0.119		0.175	0.005		0.076	-0.121			-0.212			-0.289	
3	0.350	0.112		0.173	0.001		0.074	-0.129			-0.217			-0.290	
4	0.337	0.110		0.178	-0.001		0.071	-0.135			-0.218			-0.285	
5	0.334	0.108		0.177	-0.006		0.061	-0.136			-0.222			-0.283	
6	0.335	0.106		0.168	-0.008			-0.137			-0.228			-0.283	
7	0.335	0.104		0.160	-0.013			-0.142			-0.230			-0.284	
8	0.326	0.099		0.153	-0.017			-0.144			-0.232			-0.287	
9	0.316	0.096		0.148	-0.021			-0.147			-0.233			-0.291	
10	0.309	0.094		0.145	-0.023			-0.149			-0.241			-0.293	
11	0.303	0.091		0.144	-0.025			-0.152			-0.245			-0.293	
12	0.288	0.081		0.146	-0.027			-0.156			-0.249			-0.294	
13	0.279	0.075		0.144	-0.031			-0.159			-0.250			-0.296	
14	0.276	0.069		0.129	-0.037			-0.162			-0.253				
15	0.266	0.064		0.121	-0.043			-0.165			-0.249				
16	0.259	0.059		0.127	-0.048			-0.166			-0.252				
17	0.255	0.056		0.125	-0.052			-0.169			-0.254				
18	0.250	0.052		0.124	-0.059			-0.171			-0.257				
19	0.242	0.047		0.121	-0.063			-0.175			-0.258			-0.312	
20	0.236	0.045		0.121	-0.068			-0.179			-0.261			-0.314	
21	0.233	0.041		0.105	-0.073			-0.182			-0.265			-0.307	
22	0.222	0.035		0.106	-0.074			-0.183			-0.269			-0.309	
23	0.216	0.031		0.114	-0.076			-0.186			-0.271			-0.309	
24	0.207	0.026		0.107	-0.080			-0.191			-0.273			-0.307	
25	0.199	0.023		0.102	-0.082			-0.195			-0.276			-0.306	
26	0.192	0.019		0.099	-0.084			-0.201			-0.278			-0.304	
27	0.187	0.014		0.099	-0.085			-0.205			-0.282			-0.309	
28	0.178	0.010		0.097	-0.087			-0.208			-0.284			-0.309	
29	0.181	0.009		0.092	-0.098			-0.210			-0.284			-0.295	
30	0.169	0.007		0.083	-0.106			-0.206			-0.28665			-0.296	
31				0.079	-0.114			-0.208						-0.285	
AVERAGE	0.268	0.064		0.130	-0.048		0.072	-0.167			-0.251			-0.297	
STDEV	0.062	0.038		0.030	0.036		0.006	0.028			0.023			0.010	
MIN	0.169	0.007	0.000	0.079	-0.114	0.000	0.061	-0.210	0.000	0.000	-0.287	0.000	0.000	-0.314	0.000
MAX	0.385	0.127	0.000	0.180	0.008	0.000	0.077	-0.119	0.000	0.000	-0.210	0.000	0.000	-0.283	0.000

Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION
01/07/93	09:00		NE	15:00	3.29	S	21:00	2.81	NE
02/07/93	09:00	1.69	NE	15:00	3.23	S	21:00		
03/07/93	09:00			15:00			21:00	2.16	NE
04/07/93	09:00	1.73	NE	15:00	2.83	S	21:00	2.13	NE
05/07/93	09:00	1.71	NE	15:00	2.86	S	21:00	1.98	SE
06/07/93	09:00	1.54	NE	15:00	2.38	S	21:00	1.76	NE
07/07/93	09:00	1.94	NE	15:00	1.75	S	21:00	1.87	E
08/07/93	09:00	1.68	NE	15:00	2.33	S	21:00	1.78	NE
09/07/93	09:00	1.78	NE	15:00	2.44	S	21:00		
10/07/93	09:00			15:00			21:00	1.79	SW
11/07/93	09:00	1.48	W	15:00	2.99	S	21:00	1.90	E
12/07/93	09:00	1.74	E	15:00	2.73	S	21:00	2.10	E
13/07/93	09:00	1.79	NE	15:00	2.67	S	21:00	2.04	SE
14/07/93	09:00	1.63	E	15:00	2.64	S	21:00	1.97	E
15/07/93	09:00			15:00	1.86	S	21:00	1.82	E
16/07/93	09:00	1.58	E	15:00	2.64	S	21:00		
17/07/93	09:00			15:00			21:00	1.83	E
18/07/93	09:00	1.60	E	15:00	2.49	S	21:00	1.69	E
19/07/93	09:00	1.55	E	15:00	2.74	S	21:00	2.74	E
20/07/93	09:00	0.91	E	15:00	2.68	S	21:00	2.26	E
21/07/93	09:00	1.58	E	15:00	2.77	S	21:00	2.40	E
22/07/93	09:00	1.33	E	15:00	3.79	S	21:00	2.66	E
23/07/93	09:00	1.42	E	15:00	3.44	S	21:00		
24/07/93	09:00			15:00			21:00	2.12	E
25/07/93	09:00	1.57	E	15:00	3.31	S	21:00	2.00	E
26/07/93	09:00	1.59	E	15:00	3.21	S	21:00	2.04	E
27/07/93	09:00	1.63	E	15:00	2.24	S	21:00	1.44	SE
28/07/93	09:00	1.54	E	15:00	2.26	S	21:00	1.65	E
29/07/93	09:00	1.52	E	15:00	2.48	S	21:00	1.44	E
30/07/93	09:00	1.31	E	15:00	2.90	S	21:00		
31/07/93	09:00			15:00		-	21:00	1.91	E
01/08/93	09:00	1.75	E	15:00			21:00	3.06	NE
02/08/93	09:00	1.20	E	15:00	3.35	S	21:00	0.74	E
03/08/93	09:00	1.36	E	15:00	3.24	S	21:00	1.84	E
04/08/93	09:00	1.21	NE	15:00	2.21	S	21:00	1.62	E
05/08/93	09:00	1.35	E	15:00	2.41	S	21:00	1.66	E
06/08/93	09:00	1.42	E	15:00	2.17	S	21:00		
07/08/93	09:00			15:00			21:00	1.71	NE
08/08/93	09:00	1.50	E	15:00	2.21	S	21:00	1.50	E
09/08/93	09:00	1.36	E	15:00	2.39	S	21:00	1.95	NE
10/08/93	09:00	1.21	NE	15:00	2.45	SW	21:00	1.72	E
11/08/93	09:00	1.55	W	15:00	2.25	S	21:00	1.78	E
12/08/93	09:00	1.53	NE	15:00	2.50	S	21:00	1.95	NE
13/08/93	09:00	1.51	NE	15:00	3.83	S	21:00		
14/08/93	09:00			15:00			21:00	3.10	SE
15/08/93	09:00	1.86	NE	15:00	3.70	S	21:00	3.12	NE
16/08/93	09:00	1.45	NE	15:00	3.27	S	21:00	1.96	E
17/08/93	09:00	1.73	NE	15:00	2.35	S	21:00	1.87	NE
18/08/93	09:00	1.55	NE	15:00	2.35	S	21:00	1.66	NE
19/08/93	09:00	1.68	NE	15:00	2.41	S	21:00	1.62	NE
20/08/93	09:00	1.49	NE	15:00	2.35	S	21:00		
21/08/93	09:00			15:00			21:00	1.81	NE
22/08/93	09:00	1.53	NE	15:00	2.10	S	21:00	1.79	NE
23/08/93	09:00	1.60	SW	15:00	2.40	S	21:00	1.72	NE
24/08/93	09:00	1.43	SW	15:00	2.74	S	21:00	1.86	NE
25/08/93	09:00	2.49	SW	15:00	3.13	S	21:00	1.87	E
26/08/93	09:00	2.19	NE	15:00			21:00	2.35	NE
27/08/93	09:00	1.39	NE	15:00	3.24	S	21:00		
28/08/93	09:00			15:00			21:00	2.01	E
29/08/93	09:00	1.47	SE	15:00	2.98	SW	21:00	1.77	NE
30/08/93	09:00	1.64	NE	15:00	2.29	SW	21:00	2.07	NE
31/08/93	09:00	1.66	NE	15:00	2.99	S	21:00	2.03	SE

cont'd

Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	SPEED (m/sec.)	DIRECTION	TIME	SPEED (m/sec.)	DIRECTION	TIME	SPEED (m/sec.)	DIRECTION
01/09/93	09:00	1.53	NE	15:00	2.72	S	21:00	1.70	NE
02/09/93	09:00	1.44	NE	15:00	3.14	W	21:00	1.55	SW
03/09/93	09:00	1.83	NE	15:00	3.15	S	21:00		
04/09/93	09:00			15:00			21:00	1.80	SE
05/09/93	09:00		NE	15:00	2.64	S	21:00	1.65	NE
06/09/93	09:00	-0.61	NE	15:00	4.34	S	21:00	5.57	NE
07/09/93	09:00	-1.62	NE	15:00	6.15	S	21:00	-2.75	NE
08/09/93	09:00	1.49	NE	15:00	8.66	S	21:00	1.87	NE
09/09/93	09:00			15:00			21:00	1.99	SE
10/09/93	09:00			15:00	2.16	NW	21:00		
11/09/93	09:00			15:00			21:00	1.82	SE
12/09/93	09:00			15:00	1.79	NW	21:00	1.38	E
13/09/93	09:00	1.65	NE	15:00	2.99	W	21:00	1.64	E
14/09/93	09:00	1.45	NE	15:00	2.80	NW	21:00	1.65	E
15/09/93	09:00	1.36	NE	15:00	2.94	NW	21:00	1.58	SW
16/09/93	09:00	1.18	NE	15:00	3.85	W	21:00	1.91	NE
17/09/93	09:00	1.68	NE	15:00	2.77	SW	21:00		
18/09/93	09:00			15:00			21:00		
19/09/93	09:00	1.71	NE	15:00			21:00		
20/09/93	09:00	1.70	NE	15:00	2.48	SW	21:00	3.53	NE
21/09/93	09:00			15:00			21:00	1.98	NE
22/09/93	09:00			15:00	2.65	NW	21:00	2.30	E
23/09/93	09:00	1.19	NE	15:00	2.37	NW	21:00	2.32	SE
24/09/93	09:00			15:00			21:00		
25/09/93	09:00			15:00			21:00		
26/09/93	09:00			15:00			21:00	2.43	NE
27/09/93	09:00			15:00			21:00		
28/09/93	09:00			15:00			21:00		
29/09/93	09:00			15:00			21:00		
30/09/93	09:00			15:00			21:00		
01/10/93	09:00			15:00			21:00		
02/10/93	09:00			15:00			21:00		
03/10/93	09:00			15:00			21:00		
04/10/93	09:00			15:00			21:00		
05/10/93	09:00			15:00			21:00		
06/10/93	09:00			15:00			21:00		
07/10/93	09:00			15:00			21:00		
08/10/93	09:00			15:00			21:00		
09/10/93	09:00			15:00			21:00		
10/10/93	09:00			15:00			21:00		
11/10/93	09:00			15:00			21:00		
12/10/93	09:00			15:00			21:00		
13/10/93	09:00			15:00			21:00		
14/10/93	09:00			15:00			21:00		
15/10/93	09:00			15:00			21:00		
16/10/93	09:00			15:00			21:00		
17/10/93	09:00			15:00			21:00		
18/10/93	09:00	2.11	NE	15:00	2.96	NW	21:00	1.76	SE
19/10/93	09:00	1.68	NE	15:00	2.92	NW	21:00	1.89	E
20/10/93	09:00	1.54	NE	15:00	2.90	NW	21:00	1.59	SE
21/10/93	09:00	1.56	NE	15:00	2.88	NW	21:00	2.48	E
22/10/93	09:00	1.59	E	15:00	3.45	NW	21:00		
23/10/93	09:00			15:00			21:00	2.03	SE
24/10/93	09:00	1.47	NW	15:00	2.95	W	21:00	1.79	SE
25/10/93	09:00	1.47	NW	15:00	4.15	NW	21:00	1.57	SE
26/10/93	09:00	1.52	NW	15:00	4.15	NW	21:00	1.54	S
27/10/93	09:00	1.64	NW	15:00	3.48	NW	21:00	1.83	SE
28/10/93	09:00	1.69	NW	15:00	3.80	NW	21:00	2.02	SE
29/10/93	09:00	1.56	NW	15:00	2.73	NW	21:00		
30/10/93	09:00			15:00			21:00		
31/10/93	09:00			15:00			21:00		

cont'd

Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION
01/11/93	09:00			15:00			21:00		
02/11/93	09:00			15:00			21:00		
03/11/93	09:00			15:00			21:00		
04/11/93	09:00			15:00			21:00		
05/11/93	09:00			15:00			21:00		
06/11/93	09:00			15:00			21:00	2.59	E
07/11/93	09:00	1.42	NE	15:00	2.49	NE	21:00	2.15	SE
08/11/93	09:00	1.35	NW	15:00	2.37	NW	21:00	2.73	E
09/11/93	09:00			15:00			21:00		
10/11/93	09:00	1.81	W	15:00	2.60	W	21:00	2.72	SE
11/11/93	09:00	1.44	NW	15:00	2.74	NE	21:00	1.49	NE
12/11/93	09:00	1.63	NW	15:00	2.37	W	21:00		
13/11/93	09:00			15:00			21:00	2.20	NW
14/11/93	09:00	1.63	SW	15:00	2.51	SW	21:00	2.76	E
15/11/93	09:00	1.46	NE	15:00	2.44	SW	21:00	2.09	E
16/11/93	09:00	1.69	NW	15:00	3.43	W	21:00	2.02	E
17/11/93	09:00	1.68	NW	15:00	3.76	NW	21:00	1.69	NE
18/11/93	09:00	1.64	NW	15:00	4.03	NW	21:00	2.13	SE
19/11/93	09:00	1.39	NW	15:00	3.21	NW	21:00		
20/11/93	09:00			15:00			21:00	1.98	NE
21/11/93	09:00	1.53	NE	15:00	3.73	NW	21:00	2.04	E
22/11/93	09:00	2.13	NW	15:00	2.74	NW	21:00	1.64	E
23/11/93	09:00	1.67	E	15:00	4.51	NW	21:00	4.23	NE
24/11/93	09:00	1.32	NW	15:00	2.66	NW	21:00	2.52	E
25/11/93	09:00	1.01	NW	15:00	2.48	SW	21:00	2.24	SE
26/11/93	09:00	1.42	NW	15:00	2.53	W	21:00		
27/11/93	09:00			15:00			21:00	1.78	NE
28/11/93	09:00	1.41	NW	15:00	3.85	W	21:00	0.05	E
29/11/93	09:00	2.80	NW	15:00	3.21	W	21:00	1.05	NW
30/11/93	09:00	2.55	NW	15:00	2.81	NW	21:00	3.99	NW
01/12/93	09:00	2.03	SW	15:00	2.69	NW	21:00	2.10	NE
02/12/93	09:00	2.00	NW	15:00	4.46	NW	21:00	1.73	NE
03/12/93	09:00	1.74	NW	15:00	3.72	NW	21:00		
04/12/93	09:00			15:00			21:00	1.62	NE
05/12/93	09:00	3.31	NE	15:00	2.89	NW	21:00	4.15	NE
06/12/93	09:00	2.24	NW	15:00	3.13	NE	21:00	3.22	NE
07/12/93	09:00	1.95	NW	15:00	1.78	NW	21:00	1.77	SE
08/12/93	09:00	1.61	NW	15:00	1.80	NW	21:00	1.74	SE
09/12/93	09:00	0.44	NW	15:00	2.60	NW	21:00	2.89	E
10/12/93	09:00	1.67	NE	15:00	2.18	NW	21:00		
11/12/93	09:00			15:00			21:00	1.91	E
12/12/93	09:00	1.42	NW	15:00	2.32	NW	21:00	1.83	SE
13/12/93	09:00	1.65	NE	15:00	2.36	NW	21:00	1.64	SE
14/12/93	09:00	1.54	NE	15:00	2.07	NW	21:00	1.86	SW
15/12/93	09:00	1.95	NW	15:00	1.54	S	21:00	1.70	SE
16/12/93	09:00	1.32	NE	15:00	2.52	NW	21:00	2.41	E
17/12/93	09:00	1.11	NE	15:00	2.30	NW	21:00		
18/12/93	09:00			15:00			21:00	1.88	SE
19/12/93	09:00	1.65	E	15:00	1.53	NW	21:00	1.68	E
20/12/93	09:00	1.46	SE	15:00	2.50	S	21:00	2.42	SE
21/12/93	09:00	1.35	NE	15:00	2.32	NW	21:00	3.66	NE
22/12/93	09:00	1.41	NE	15:00	3.92	NW	21:00	3.62	NE
23/12/93	09:00	1.50	W	15:00	2.54	NE	21:00	1.69	SE
24/12/93	09:00	1.49	W	15:00	3.04	NW	21:00		
25/12/93	09:00			15:00			21:00	2.31	NE
26/12/93	09:00	1.42	NW	15:00	2.29	SE	21:00	1.43	E
27/12/93	09:00	1.59	NW	15:00	3.60	NW	21:00	2.67	E
28/12/93	09:00	1.75	NE	15:00	2.63	NW	21:00	2.13	NE
29/12/93	09:00	2.07	SE	15:00	2.17	W	21:00	1.61	E
30/12/93	09:00	1.48	W	15:00	3.23	NE	21:00	3.25	N
31/12/93	09:00	1.83	W	15:00	2.68	NE	21:00		N

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Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION
01/01/94	09:00			15:00			21:00	2.22	NE
02/01/94	09:00	1.70	E	15:00	2.56	NW	21:00	1.84	E
03/01/94	09:00	1.50	E	15:00	2.66	NW	21:00	2.05	NE
04/01/94	09:00	1.65	NE	15:00	2.69	NW	21:00	2.54	NE
05/01/94	09:00	1.62	NE	15:00	1.86	NW	21:00	1.67	NE
06/01/94	09:00	1.32	NE	15:00	1.64	NW	21:00	1.57	NE
07/01/94	09:00	1.49	NE	15:00	2.61	S	21:00		
08/01/94	09:00			15:00			21:00	2.46	NE
09/01/94	09:00	1.49	NE	15:00	2.40	W	21:00	1.88	E
10/01/94	09:00	2.07	NE	15:00	2.85	NW	21:00	2.48	NE
11/01/94	09:00	2.12	NE	15:00	2.00	NW	21:00	2.39	E
12/01/94	09:00	1.61	NE	15:00	1.58	NW	21:00	2.39	NE
13/01/94	09:00	1.54	NE	15:00	2.78	NW	21:00	2.16	NE
14/01/94	09:00	1.84	NW	15:00	3.96	NW	21:00		
15/01/94	09:00			15:00			21:00	2.02	NE
16/01/94	09:00	1.48	NE	15:00	3.13	W	21:00	2.55	NE
17/01/94	09:00	1.43	NE	15:00	2.30	NW	21:00	3.76	NW
18/01/94	09:00	1.48	NW	15:00	2.04	SW	21:00	2.56	S
19/01/94	09:00	1.67	NW	15:00	2.26	E	21:00	1.57	NE
20/01/94	09:00	1.73	NE	15:00	1.95	W	21:00	1.37	E
21/01/94	09:00	1.71	W	15:00	2.04	NW	21:00		
22/01/94	09:00			15:00			21:00	1.88	E
23/01/94	09:00	1.52	NE	15:00	2.23	NW	21:00	1.80	E
24/01/94	09:00	1.75	NE	15:00	2.78	NE	21:00	1.72	NE
25/01/94	09:00	1.62	E	15:00	2.06	S	21:00	2.62	NE
26/01/94	09:00	1.61	W	15:00	1.88	W	21:00	1.98	NE
27/01/94	09:00	1.46	E	15:00	2.36	E	21:00	2.34	NE
28/01/94	09:00	1.67	E	15:00	2.61	S	21:00		
29/01/94	09:00			15:00			21:00	1.86	NE
30/01/94	09:00	1.90	NE	15:00	2.30	NW	21:00	2.36	NE
31/01/94	09:00	1.32	NE	15:00	2.04	W	21:00	1.93	SE
01/02/94	09:00	1.40	NW	15:00	2.16	NW	21:00	2.56	NE
02/02/94	09:00	1.73	NE	15:00	2.88	NW	21:00	2.81	NE
03/02/94	09:00	1.04	NE	15:00	2.59	NW	21:00	2.67	NE
04/02/94	09:00	1.32	NE	15:00	2.56	NW	21:00		
05/02/94	09:00			15:00			21:00	1.68	NE
06/02/94	09:00	1.61	NE	15:00	2.23	NW	21:00	1.73	NE
07/02/94	09:00	2.30	E	15:00	2.01	SE	21:00	1.39	NE
08/02/94	09:00	1.58	NE	15:00	1.46	NW	21:00	1.47	E
09/02/94	09:00	1.80	NE	15:00	2.59	E	21:00	1.77	SE
10/02/94	09:00	1.48	E	15:00	1.83	NE	21:00	1.57	NE
11/02/94	09:00	2.06	E	15:00	2.08	E	21:00		
12/02/94	09:00			15:00			21:00	1.47	E
13/02/94	09:00	1.62	E	15:00	2.01	S	21:00	1.80	NE
14/02/94	09:00	1.76	SW	15:00	1.65	S	21:00	1.81	SE
15/02/94	09:00	1.81	NE	15:00	2.72	S	21:00	1.49	E
16/02/94	09:00	1.43	NE	15:00	1.82	NW	21:00	1.82	E
17/02/94	09:00	1.36	NE	15:00	1.81	NW	21:00	1.62	E
18/02/94	09:00	1.49	NE	15:00	3.00	NW	21:00		
19/02/94	09:00			15:00			21:00	1.81	E
20/02/94	09:00	1.79	NE	15:00	2.38	NW	21:00	2.12	E
21/02/94	09:00	1.31	NE	15:00	1.90	NW	21:00	1.84	E
22/02/94	09:00	2.07	NE	15:00	2.41	NW	21:00	2.60	NE
23/02/94	09:00	1.51	E	15:00	1.66	NW	21:00	1.67	E
24/02/94	09:00	1.79	E	15:00	2.52	NW	21:00	2.53	NE
25/02/94	09:00	1.86	E	15:00	1.90	NE	21:00		
26/02/94	09:00			15:00			21:00	1.76	E
27/02/94	09:00	1.29	E	15:00	1.57	NE	21:00	1.60	NE
28/02/94	09:00	1.32	E	15:00	0.99	S	21:00	3.18	NE

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Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION
01/03/94	09:00	1.64	NE	15:00	1.95	E	21:00	1.76	E
02/03/94	09:00	1.56	NE	15:00	2.22	E	21:00	1.99	E
03/03/94	09:00	1.73	NE	15:00	2.26	NW	21:00	3.38	NW
04/03/94	09:00	1.61	NE	15:00	1.51	NW	21:00		
05/03/94	09:00			15:00			21:00	1.70	NE
06/03/94	09:00	1.86	NE	15:00	2.04	NW	21:00	1.15	NE
07/03/94	09:00	1.61	NE	15:00	2.02	E	21:00	2.24	E
08/03/94	09:00	1.73	E	15:00	1.82	NE	21:00	1.47	SE
09/03/94	09:00	1.52	E	15:00	1.92	NW	21:00	1.22	SE
10/03/94	09:00	1.28	NE	15:00	2.00	E	21:00	1.58	NE
11/03/94	09:00	1.17	E	15:00	2.56	NE	21:00		
12/03/94	09:00			15:00			21:00	1.71	E
13/03/94	09:00	2.01	E	15:00	2.52	NE	21:00	1.67	E
14/03/94	09:00	1.63	N	15:00	3.33	NW	21:00	2.59	NE
15/03/94	09:00	1.46	E	15:00	2.50	NW	21:00	1.73	NE
16/03/94	09:00	1.90	NE	15:00	2.27	NW	21:00	3.13	NE
17/03/94	09:00	1.70	E	15:00	2.11	S	21:00	1.70	SW
18/03/94	09:00	2.05	SW	15:00	1.51	NW	21:00		
19/03/94	09:00			15:00			21:00	1.80	E
20/03/94	09:00	1.34	NE	15:00	1.85	NW	21:00	1.25	SE
21/03/94	09:00	1.47	E	15:00	2.26	NW	21:00	1.65	SE
22/03/94	09:00	1.48	E	15:00	3.11	NW	21:00	1.86	NE
23/03/94	09:00	1.45	E	15:00	2.72	NW	21:00	1.56	SE
24/03/94	09:00	1.40	E	15:00	2.11	NE	21:00	2.34	E
25/03/94	09:00	1.92	E	15:00	2.05	NE	21:00		
26/03/94	09:00			15:00			21:00	1.83	NE
27/03/94	09:00	1.59	NE	15:00	3.05	NW	21:00	1.60	SE
28/03/94	09:00	1.48	NE	15:00	2.13	NW	21:00	2.36	NE
29/03/94	09:00	1.77	NE	15:00	2.28	NW	21:00	1.86	SE
30/03/94	09:00	1.61	E	15:00	1.44	S	21:00	1.64	NE
31/03/94	09:00	1.52	NE	15:00	1.86	W	21:00	1.48	NE
01/04/94	09:00	1.99	E	15:00	1.53	NW	21:00		
02/04/94	09:00			15:00			21:00	1.66	E
03/04/94	09:00	1.46	NE	15:00	1.64	NW	21:00	2.72	E
04/04/94	09:00	1.48	NE	15:00	2.24	S	21:00	1.51	E
05/04/94	09:00	1.47	NE	15:00	1.71	S	21:00	2.20	E
06/04/94	09:00	1.67	NE	15:00	2.09	S	21:00	1.67	SE
07/04/94	09:00	1.71	NE	15:00	2.12	W	21:00	1.65	E
08/04/94	09:00	1.51	NE	15:00	2.21	W	21:00		
09/04/94	09:00			15:00			21:00	1.69	NE
10/04/94	09:00	1.64	NE	15:00	1.79	NW	21:00	1.66	NE
11/04/94	09:00	1.40	NE	15:00	2.20	NW	21:00	1.75	E
12/04/94	09:00	1.16	E	15:00	2.52	S	21:00	1.82	E
13/04/94	09:00	1.20	E	15:00	2.10	S	21:00	1.68	E
14/04/94	09:00	1.64	E	15:00	2.01	S	21:00	1.82	E
15/04/94	09:00	1.78	E	15:00	3.74	NW	21:00		
16/04/94	09:00			15:00			21:00	2.06	E
17/04/94	09:00	1.70	E	15:00	2.26	NE	21:00	1.50	E
18/04/94	09:00	1.68	E	15:00	2.33	W	21:00	1.40	SE
19/04/94	09:00	1.52	E	15:00	2.58	NW	21:00	1.59	NE
20/04/94	09:00	1.48	E	15:00	1.96	NW	21:00	1.53	E
21/04/94	09:00	1.61	NE	15:00	3.94	NE	21:00	1.77	NE
22/04/94	09:00	1.47	NE	15:00	3.03	NW	21:00		
23/04/94	09:00			15:00			21:00	1.77	E
24/04/94	09:00	1.37	NE	15:00	2.43	NW	21:00	1.69	SE
25/04/94	09:00	1.36	NE	15:00	1.95	NW	21:00	1.94	E
26/04/94	09:00	1.69	E	15:00	2.27	S	21:00	1.97	NE
27/04/94	09:00	1.41	SE	15:00	2.90	S	21:00	2.27	SE
28/04/94	09:00	1.53	SE	15:00	2.86	S	21:00	1.97	SE
29/04/94	09:00	1.30	NE	15:00	2.74	W	21:00		
30/04/94	09:00			15:00			21:00	1.89	NE

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Appendix 8. Average wind speed and momentary wind direction of Kipili anemometer station July 1993-May 1994, recordered daily at 0900, 1500 and 2100h.

DATE	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION	TIME	AV. WIND SPEED (m/sec.)	WIND DIRECTION
01/05/94	09:00	1.53	N	15:00	2.08	S	21:00	2.45	NE
02/05/94	09:00	1.29	E	15:00	2.02	S	21:00	1.84	W
03/05/94	09:00	1.57	E	15:00	2.17	W	21:00	1.51	E
04/05/94	09:00	1.45	E	15:00	2.47	W	21:00	1.58	E
05/05/94	09:00	1.38	E	15:00	2.73	W	21:00	1.73	E
06/05/94	09:00	1.50	E	15:00	2.26	W	21:00		
07/05/94	09:00			15:00			21:00	1.81	NE
08/05/94	09:00	1.72	NE	15:00	2.38	W	21:00	1.43	E
09/05/94	09:00	1.48	NE	15:00	2.54	W	21:00	1.69	SE
10/05/94	09:00	1.45	NE	15:00	2.67	W	21:00	1.66	E
11/05/94	09:00	1.51	NE	15:00	2.52	W	21:00	1.69	E
12/05/94	09:00	1.37	NE	15:00	2.73	S	21:00	1.72	NE
13/05/94	09:00	1.30	E	15:00	2.82	S	21:00		
14/05/94	09:00			15:00			21:00	1.80	SE
15/05/94	09:00	1.60	SE	15:00	2.90	S	21:00	1.97	NE
16/05/94	09:00	1.53	E	15:00	2.36	W	21:00	1.75	E
17/05/94	09:00	1.52	E	15:00	2.58	W	21:00	1.76	E
18/05/94	09:00	1.42	E	15:00	2.46	W	21:00	1.85	E
19/05/94	09:00	1.55	E	15:00	2.80	S	21:00	1.42	E
20/05/94	09:00	1.44	E	15:00	2.80	S	21:00		
21/05/94	09:00			15:00			21:00	1.83	E
22/05/94	09:00	1.63	E	15:00	2.48	W	21:00	1.75	NE
23/05/94	09:00	1.54	E	15:00	2.18	SW	21:00	1.71	E
24/05/94	09:00	1.61	E	15:00	2.37	S	21:00	1.67	SE
25/05/94	09:00	1.49	E	15:00	2.38	S	21:00	1.67	NE
26/05/94	09:00	1.54	E	15:00	2.31	S	21:00	1.66	E
27/05/94	09:00	1.44	E	15:00	2.89	S	21:00		
28/05/94	09:00			15:00			21:00	1.96	E
29/05/94	09:00	1.52	E	15:00	2.52	S	21:00	2.06	E
30/05/94	09:00	1.52	E	15:00	2.41	S	21:00	1.78	E
31/05/94	09:00	1.45	E	15:00	2.22	S	21:00	2.07	E

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h.

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DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/05/1993	08:00	2.02	W	13:00	3.42	N	19:00		
02/05/1993	08:00	2.24	SE	13:00	3.85	SE	19:00		
03/05/1993	08:00	4.31	E	13:00	3.75	W	19:00		
04/05/1993	08:00	3.11	E	13:00	3.33	NW	19:00		
05/05/1993	08:00	2.70	SE	13:00	3.18	W	19:00		
06/05/1993	08:00	2.53	S	13:00	2.73	NW	19:00		
07/05/1993	08:00	2.44	S	13:00	3.10	NW	19:00		
08/05/1993	08:00	3.93	SE	13:00	4.13	W	19:00		
09/05/1993	08:00	3.04	SE	13:00	4.46	W	19:00		
10/05/1993	08:00	2.77	SE	13:00	3.81	W	19:00		
11/05/1993	08:00	5.17	W	13:00	3.59	E	19:00		
12/05/1993	08:00	2.94	SE	13:00	4.29	SE	19:00		
13/05/1993	08:00	5.51	SE	13:00	4.36	W	19:00		
14/05/1993	08:00	4.39	SE	13:00	4.07	NW	19:00		
15/05/1993	08:00	4.67	SE	13:00	3.93	NW	19:00		
16/05/1993	08:00	7.57	SE	13:00	4.89	W	19:00		
17/05/1993	08:00	9.11	SE	13:00	4.39	W	19:00		
18/05/1993	08:00	7.14	SE	13:00	4.19	W	19:00		
19/05/1993	08:00	4.70	SE	13:00	4.29	W	19:00		
20/05/1993	08:00	5.15	SE	13:00			19:00		
21/05/1993	08:00	6.53	SE	13:00	3.29	N	19:00		
22/05/1993	08:00	3.09	SE	13:00	3.08	NW	19:00		
23/05/1993	08:00	3.27	SE	13:00	3.15	N	19:00		
24/05/1993	08:00	3.48	SE	13:00	3.74	N	19:00		
25/05/1993	08:00	2.77	SE	13:00	2.99	NW	19:00		
26/05/1993	08:00	3.11	SE	13:00	3.11	NW	19:00		
27/05/1993	08:00	2.85	SE	13:00	3.24	NW	19:00		
28/05/1993	08:00	2.81	E	13:00	2.91	NW	19:00		
29/05/1993	08:00	3.53	W	13:00	3.77	NW	19:00		
30/05/1993	08:00	4.47	SE	13:00	3.95	W	19:00		
31/05/1993	08:00	5.73	S	13:00	3.89	NW	19:00		
01/06/1993	08:00	4.08	SE	13:00	4.13	W	19:00	4.27	SE
02/06/1993	08:00	6.25	SE	13:00	4.16	W	19:00	3.40	SE
03/06/1993	08:00	5.89	W	13:00	3.91	W	19:00	2.13	SE
04/06/1993	08:00	3.39	SE	13:00	3.81	NW	19:00	2.32	NE
05/06/1993	08:00	5.32	SE	13:00	7.89	NW	19:00	6.30	SE
06/06/1993	08:00	6.81	SE	13:00	5.59	SE	19:00	5.01	SE
07/06/1993	08:00	8.46	SE	13:00	5.04	NW	19:00	2.24	SE
08/06/1993	08:00	3.78	SE	13:00	4.29	NW	19:00	2.29	SE
09/06/1993	08:00	3.01	SE	13:00	4.32	W	19:00	2.17	SE
10/06/1993	08:00	6.65	SE	13:00	4.33	NW	19:00	1.92	NE
11/06/1993	08:00	6.30	SW	13:00	3.91	NW	19:00	2.14	NE
12/06/1993	08:00	4.80	SE	13:00	3.41	NW	19:00	0.77	NW
13/06/1993	08:00	5.78	SE	13:00	3.99	W	19:00	2.20	SE
14/06/1993	08:00	5.26	W	13:00	3.86	NW	19:00	2.09	SE
15/06/1993	08:00	4.49	SE	13:00	4.10	N	19:00	2.06	SE
16/06/1993	08:00	3.87	SE	13:00	4.08	NW	19:00	2.11	SE
17/06/1993	08:00	3.70	S	13:00	3.92	NW	19:00	2.02	NE
18/06/1993	08:00	3.56	SE	13:00	4.34	NW	19:00	2.14	NE
19/06/1993	08:00	4.09	SE	13:00	3.83	NW	19:00	2.03	NE
20/06/1993	08:00	4.10	SE	13:00	4.07	W	19:00	1.97	SE
21/06/1993	08:00	8.00	SE	13:00	4.18	W	19:00	2.84	SE
22/06/1993	08:00	9.29	SE	13:00	5.06	NW	19:00	3.12	SE
23/06/1993	08:00	8.26	SE	13:00	4.29	NW	19:00	2.45	SE
24/06/1993	08:00	6.34	SE	13:00	5.32	W	19:00	2.05	N
25/06/1993	08:00	7.08	SE	13:00	4.51	S	19:00	4.79	SE
26/06/1993	08:00	9.15	SE	13:00	4.75	SE	19:00	3.83	SE
27/06/1993	08:00	7.02	SE	13:00	4.20	W	19:00	2.28	N
28/06/1993	08:00	3.95	SE	13:00	4.53	W	19:00	2.36	SE
29/06/1993	08:00	5.22	SE	13:00	4.18	W	19:00	2.60	SE
30/06/1993	08:00	8.29	SE	13:00	5.16	SE	19:00	4.47	SE

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu ; March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h.

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/03/1993	08:00			13:00			19:00		
02/03/1993	08:00			13:00			19:00		
03/03/1993	08:00			13:00			19:00		
04/03/1993	08:00			13:00			19:00		
05/03/1993	08:00			13:00			19:00		
06/03/1993	08:00			13:00			19:00		
07/03/1993	08:00			13:00			19:00		
08/03/1993	08:00			13:00	2.74		19:00		
09/03/1993	08:00	2.83		13:00	3.35		19:00	3.11	
10/03/1993	08:00	2.09		13:00	2.94		19:00	2.18	
11/03/1993	08:00	2.39		13:00	1.72		19:00	2.46	
12/03/1993	08:00	1.88		13:00	2.69		19:00	2.14	
13/03/1993	08:00	3.73		13:00	2.65		19:00	2.00	
14/03/1993	08:00	2.67		13:00	2.38		19:00	2.56	
15/03/1993	08:00	3.18		13:00	2.83		19:00	4.47	
16/03/1993	08:00	2.39		13:00	2.54		19:00	2.48	
17/03/1993	08:00	2.56		13:00	3.19		19:00	3.43	
18/03/1993	08:00	1.74		13:00	2.79		19:00	3.46	
19/03/1993	08:00	1.93		13:00	2.90		19:00	3.47	
20/03/1993	08:00	2.12		13:00			19:00	4.40	
21/03/1993	08:00	1.95		13:00	2.63		19:00	2.22	
22/03/1993	08:00	1.53		13:00	2.87		19:00	4.84	
23/03/1993	08:00	2.52		13:00	3.05		19:00	1.85	
24/03/1993	08:00	2.54		13:00	3.57		19:00	2.17	
25/03/1993	08:00	2.17		13:00	2.54		19:00	2.43	
26/03/1993	08:00	2.37		13:00	3.57		19:00	2.99	
27/03/1993	08:00	2.44		13:00	3.31		19:00	3.15	
28/03/1993	08:00	2.33		13:00	2.63		19:00	2.86	
29/03/1993	08:00	1.80		13:00	3.47		19:00	2.87	
30/03/1993	08:00	2.05		13:00	0.97		19:00	5.02	
31/03/1993	08:00	1.93		13:00	3.23		19:00	2.33	
01/04/1993	08:00	2.05	SW	13:00	2.44	N	19:00	4.70	SE
02/04/1993	08:00	3.10	SE	13:00	3.00	NW	19:00	3.16	SE
03/04/1993	08:00	2.44	E	13:00	3.32	SE	19:00	3.28	SE
04/04/1993	08:00	2.20	SE	13:00	2.98	N	19:00	2.81	SE
05/04/1993	08:00	2.00	N	13:00	2.83	NW	19:00	3.17	SE
06/04/1993	08:00	1.90	N	13:00	3.50	N	19:00	2.00	E
07/04/1993	08:00	2.54	SE	13:00	4.33	NW	19:00	2.41	E
08/04/1993	08:00	2.47	SE	13:00	3.81	NW	19:00	3.56	E
09/04/1993	08:00	2.36	SE	13:00	2.96	NW	19:00	3.75	SE
10/04/1993	08:00	2.58	SE	13:00	2.53	NW	19:00	3.81	SE
11/04/1993	08:00	2.74	SE	13:00	2.92	NW	19:00	2.14	E
12/04/1993	08:00	2.31	SE	13:00	3.01	NW	19:00	2.48	SE
13/04/1993	08:00	2.50	SE	13:00	3.29	W	19:00	1.84	SE
14/04/1993	08:00	2.21	SE	13:00	2.65	NW	19:00	2.54	NW
15/04/1993	08:00	2.69	SE	13:00	3.20	SE	19:00	2.45	W
16/04/1993	08:00	2.14	SE	13:00	4.89	W	19:00	2.67	E
17/04/1993	08:00	2.04	SE	13:00	3.96	N	19:00	2.58	SE
18/04/1993	08:00	2.82	SE	13:00	2.80	NW	19:00	3.30	SE
19/04/1993	08:00	2.70	SE	13:00	3.20	N	19:00	2.13	SE
20/04/1993	08:00	2.28	SE	13:00	3.71	SE	19:00	3.85	SE
21/04/1993	08:00	3.50	SE	13:00	4.46	SE	19:00	3.22	SE
22/04/1993	08:00	2.55	SE	13:00	3.64	W	19:00	2.72	S
23/04/1993	08:00	2.65	SE	13:00	5.83	SE	19:00	3.03	SE
24/04/1993	08:00	2.93	S	13:00	5.45	SE	19:00	3.64	SE
25/04/1993	08:00	2.84	SE	13:00	3.97	SE	19:00	3.02	E
26/04/1993	08:00	2.12	SE	13:00	3.42	NW	19:00	2.81	NW
27/04/1993	08:00	1.67	SE	13:00	3.29	NW	19:00	2.25	SE
28/04/1993	08:00	2.85	SE	13:00	3.17	NW	19:00	2.24	SE
29/04/1993	08:00	2.61	SE	13:00	2.69	NE	19:00	1.79	E
30/04/1993	08:00	2.74	E	13:00	2.53	NW	19:00	2.12	E

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DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/07/1993	08:00	9.09	SE	13:00	3.98	W	19:00	3.32	E
02/07/1993	08:00	8.16	SE	13:00	4.77	NW	19:00	2.88	SE
03/07/1993	08:00	7.98	SE	13:00	4.22	NW	19:00	3.09	SE
04/07/1993	08:00	7.19	SE	13:00	4.74	NW	19:00	2.73	SE
05/07/1993	08:00	6.75	SE	13:00	4.80	W	19:00	2.90	E
06/07/1993	08:00	6.77	SE	13:00	4.27	W	19:00	2.42	E
07/07/1993	08:00	5.04	SE	13:00	4.35	W	19:00	2.38	E
08/07/1993	08:00	4.68	SE	13:00	4.19	W	19:00	2.26	E
09/07/1993	08:00	4.12	SE	13:00	4.53	W	19:00	2.30	N
10/07/1993	08:00	3.75	SE	13:00	3.77	W	19:00	2.03	NE
11/07/1993	08:00	5.36	SE	13:00	4.38	W	19:00	2.15	SE
12/07/1993	08:00	6.40	SE	13:00	4.77	W	19:00	2.94	SE
13/07/1993	08:00	7.76	SE	13:00	5.18	W	19:00	2.34	SE
14/07/1993	08:00	8.19	SE	13:00	5.31	NW	19:00	2.77	E
15/07/1993	08:00	6.80	SE	13:00	4.77	W	19:00	2.50	E
16/07/1993	08:00	4.92	SE	13:00	4.68	NW	19:00	2.20	E
17/07/1993	08:00	4.33	SE	13:00	4.03	NW	19:00	2.62	SE
18/07/1993	08:00	4.46	SE	13:00	4.28	NW	19:00	3.19	NW
19/07/1993	08:00	3.89	SE	13:00	3.68	NW	19:00	1.93	E
20/07/1993	08:00	4.83	SE	13:00	4.07	S	19:00	3.66	SE
21/07/1993	08:00	6.69	SE	13:00	5.14	SE	19:00	5.04	SE
22/07/1993	08:00	8.10	SE	13:00	6.43	S	19:00	4.28	SE
23/07/1993	08:00	6.74	SE	13:00	5.04	SE	19:00	4.81	SE
24/07/1993	08:00	6.77	SE	13:00	4.65	S	19:00	2.86	SE
25/07/1993	08:00	7.33	SE	13:00	5.44	W	19:00	2.12	SE
26/07/1993	08:00	7.26	SE	13:00	4.95	W	19:00	1.99	NE
27/07/1993	08:00	4.34	SE	13:00	4.00	NW	19:00	1.92	N
28/07/1993	08:00	3.49	SE	13:00	3.66	NW	19:00	2.00	SE
29/07/1993	08:00	3.15	SE	13:00	3.22	NW	19:00	2.38	SE
30/07/1993	08:00	3.28	SE	13:00	3.90	N	19:00	1.91	E
31/07/1993	08:00	5.17	SE	13:00	5.08	NW	19:00	2.18	NE
01/08/1993	08:00	4.44	SE	13:00	4.67	W	19:00	4.73	SE
02/08/1993	08:00	6.73	SE	13:00	4.19	W	19:00	1.95	E
03/08/1993	08:00	3.62	SE	13:00	3.50		19:00		
04/08/1993	08:00	4.33	SE	13:00	3.57	NE	19:00	1.83	NE
05/08/1993	08:00	2.90	S	13:00	4.12	NE	19:00	1.84	NE
06/08/1993	08:00	5.38	SE	13:00	3.99	NE	19:00	1.73	C
07/08/1993	08:00	3.25	SE	13:00	3.40	NW	19:00	1.93	E
08/08/1993	08:00	3.43	S	13:00	4.01	N	19:00	2.02	E
09/08/1993	08:00	3.46	SE	13:00	4.18	W	19:00	2.14	E
10/08/1993	08:00	4.55	SE	13:00	4.64	N	19:00	2.13	E
11/08/1993	08:00	4.46	SE	13:00	3.90	W	19:00	2.24	SE
12/08/1993	08:00	2.41	SE	13:00	3.26	NW	19:00	1.74	SE
13/08/1993	08:00	7.88	SE	13:00	7.01	SE	19:00	1.73	SE
14/08/1993	08:00	11.37	SE	13:00	8.82	SE	19:00	8.07	SE
15/08/1993	08:00	7.58	SE	13:00	5.40	SE	19:00	4.40	SE
16/08/1993	08:00	9.07	SE	13:00	1.08	NW	19:00	7.34	SE
17/08/1993	08:00	4.57	SE	13:00	3.72	NW	19:00	2.23	SE
18/08/1993	08:00	3.90	SW	13:00	3.90	N	19:00	1.90	SE
19/08/1993	08:00	4.17	SE	13:00	4.03	NW	19:00	4.52	SE
20/08/1993	08:00	4.60	SE	13:00	3.77	NW	19:00	2.07	SE
21/08/1993	08:00	3.04	SE	13:00	3.58	NW	19:00		
22/08/1993	08:00	2.46	SE	13:00	3.20	NW	19:00	1.76	E
23/08/1993	08:00	3.92	SE	13:00	5.11	W	19:00	2.25	E
24/08/1993	08:00	3.28	SE	13:00	4.97	W	19:00	2.62	SE
25/08/1993	08:00	4.79	SE	13:00	4.47	W	19:00	2.21	E
26/08/1993	08:00	4.84	S	13:00	4.87	NW	19:00	1.92	SE
27/08/1993	08:00	4.34	SE	13:00	3.94	NW	19:00	2.41	SW
28/08/1993	08:00	2.85	SE	13:00	3.59	N	19:00	2.73	SE
29/08/1993	08:00	4.92	SE	13:00	4.83	N	19:00	2.48	N
30/08/1993	08:00	3.04	SE	13:00	5.11	SE	19:00	4.53	SE
31/08/1993	08:00	4.04	SE	13:00	4.56	NW	19:00	1.97	N

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu - March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/09/1993	08:00	3.68	SE	13:00	4.51	W	19:00	2.63	SE
02/09/1993	08:00	4.29	SE	13:00	4.53	W	19:00	2.25	W
03/09/1993	08:00	3.12	SE	13:00	4.53	NW	19:00	2.28	SE
04/09/1993	08:00	2.88	SE	13:00	4.40	W	19:00	1.98	SW
05/09/1993	08:00	3.47	SE	13:00	4.18	W	19:00	2.06	E
06/09/1993	08:00	3.62	SE	13:00	5.07	SE	19:00	4.65	SE
07/09/1993	08:00	8.52	SE	13:00	6.07	W	19:00	2.37	E
08/09/1993	08:00	2.49	S	13:00	4.12	NW	19:00	1.92	NW
09/09/1993	08:00	4.28	SE	13:00	3.61	NW	19:00	1.71	N
10/09/1993	08:00	2.32	SE	13:00	3.77	N	19:00	2.53	SE
11/09/1993	08:00	5.84	SE	13:00	3.46	N	19:00	1.56	SE
12/09/1993	08:00	3.01	NW	13:00	3.31	NE	19:00	1.88	NW
13/09/1993	08:00	3.06	SE	13:00	3.53	N	19:00	1.96	NE
14/09/1993	08:00	3.55	SE	13:00	3.93	NW	19:00	1.94	E
15/09/1993	08:00	3.14	SE	13:00	4.32	NW	19:00	2.14	W
16/09/1993	08:00	4.79	SE	13:00	5.20	NW	19:00	1.87	E
17/09/1993	08:00	4.76	SE	13:00	4.72	NW	19:00	2.90	SE
18/09/1993	08:00	3.06	SE	13:00	3.68	NE	19:00	1.90	SE
19/09/1993	08:00	3.40	SE	13:00	4.67	NE	19:00	1.85	NE
20/09/1993	08:00	3.40	SE	13:00	3.72	NW	19:00	2.05	NE
21/09/1993	08:00	3.48	SE	13:00	3.63	NE	19:00	2.52	NE
22/09/1993	08:00	2.39	SE	13:00	3.66	W	19:00	2.43	SE
23/09/1993	08:00	2.08	W	13:00	3.22	NW	19:00	2.10	SE
24/09/1993	08:00	2.25	SE	13:00	2.65	NW	19:00	2.14	SE
25/09/1993	08:00	3.22	S	13:00	3.77	NW	19:00	1.97	S
26/09/1993	08:00	3.08	SE	13:00	3.42	NW	19:00	2.44	SE
27/09/1993	08:00	3.64	SE	13:00	3.45	NW	19:00	2.27	E
28/09/1993	08:00	2.95	SE	13:00	3.22	NW	19:00	2.32	NW
29/09/1993	08:00	2.89	SW	13:00	2.96	NW	19:00	2.20	S
30/09/1993	08:00	2.27	SE	13:00	3.06	NW	19:00	2.39	SE
01/10/1993	08:00	1.81	SE	13:00	3.24	NW	19:00	2.30	SE
02/10/1993	08:00	2.66	SE	13:00	3.32	NW	19:00	1.85	NE
03/10/1993	08:00	3.24	SE	13:00	3.15	N	19:00	2.01	E
04/10/1993	08:00	2.42	SE	13:00	3.25	NW	19:00	2.03	S
05/10/1993	08:00	3.05	N	13:00	3.55	NW	19:00	2.35	S
06/10/1993	08:00	3.19	SE	13:00	3.50	NW	19:00	1.9	E
07/10/1993	08:00	2.98	W	13:00	3.21	NW	19:00	2.09	SE
08/10/1993	08:00	2.46	W	13:00	3.13	W	19:00	2.17	W
09/10/1993	08:00	2.50	S	13:00	3.60	NW	19:00	2.03	NE
10/10/1993	08:00	2.67	SE	13:00	3.24	NW	19:00	2.20	SE
11/10/1993	08:00	2.96	SE	13:00	3.37	W	19:00	2.01	NE
12/10/1993	08:00	2.80	SE	13:00	3.68	W	19:00	2.29	SE
13/10/1993	08:00	2.90	SE	13:00	2.98	SE	19:00	2.14	215
14/10/1993	08:00	4.08	SE	13:00	0.38	W	19:00	2.26	NE
15/10/1993	08:00	2.36	SE	13:00	2.96	SE	19:00	2.12	SE
16/10/1993	08:00	2.74	W	13:00	2.73	NW	19:00	2.17	SE
17/10/1993	08:00	2.44	SE	13:00	2.96	NE	19:00	2.22	SE
18/10/1993	08:00	2.73	S	13:00	3.48	NW	19:00	1.91	SE
19/10/1993	08:00	3.62	SE	13:00	4.51	NW	19:00	2.44	N
20/10/1993	08:00	2.67	SE	13:00	4.32	W	19:00	2.18	SE
21/10/1993	08:00	2.15	E	13:00	3.25	N	19:00	2.10	S
22/10/1993	08:00	2.81	SE	13:00	3.42	SE	19:00	1.85	SE
23/10/1993	08:00	2.88	NW	13:00	3.12	NW	19:00	1.84	E
24/10/1993	08:00	2.25	W	13:00	3.48	N	19:00	2.16	SE
25/10/1993	08:00	3.04	SE	13:00	3.46	W	19:00	1.79	SW
26/10/1993	08:00	2.79	SE	13:00	3.66	NE	19:00	2.09	SE
27/10/1993	08:00	2.80	SW	13:00	4.12	NW	19:00	2.24	SW
28/10/1993	08:00	2.56	SE	13:00	3.66	NW	19:00	2.10	SE
29/10/1993	08:00	2.25	SW	13:00	3.59	NW	19:00	1.78	NW
30/10/1993	08:00	2.25	S	13:00	3.32	NW	19:00	3.45	E
31/10/1993	08:00	2.79	NW	13:00	3.33	NW	19:00	2.18	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/11/1993	08:00	2.26	NW	13:00	2.87	NE	19:00	2.15	N
02/11/1993	08:00	2.72	SE	13:00	3.29	NW	19:00	2.40	NE
03/11/1993	08:00	3.82	SE	13:00	2.95	SW	19:00	3.20	SE
04/11/1993	08:00	2.85	E	13:00	2.16	W	19:00	2.36	SW
05/11/1993	08:00	2.09	NW	13:00			19:00	5.38	NW
06/11/1993	08:00	3.25	SW	13:00	3.00	NW	19:00	2.19	S
07/11/1993	08:00	1.92	W	13:00	3.44	SW	19:00	2.30	NE
08/11/1993	08:00	2.47	SE	13:00	3.17	SE	19:00	2.19	E
09/11/1993	08:00	3.20	SW	13:00	3.46	SE	19:00	3.12	SE
10/11/1993	08:00	3.06	NW	13:00	3.50	NE	19:00	3.61	SE
11/11/1993	08:00	2.47	W	13:00	2.81	W	19:00	2.86	E
12/11/1993	08:00	2.06	W	13:00	2.87	SW	19:00	2.67	SE
13/11/1993	08:00	2.24	W	13:00	2.90	SE	19:00	2.39	SE
14/11/1993	08:00	2.45	E	13:00	3.48	NE	19:00		
15/11/1993	08:00	3.16	SE	13:00	4.22	SE	19:00	2.19	SE
16/11/1993	08:00	2.87	SE	13:00	3.77	N	19:00	2.21	SE
17/11/1993	08:00	1.85	N	13:00	2.82	NW	19:00	2.39	SE
18/11/1993	08:00	2.18	S	13:00	3.68	NW	19:00	2.43	N
19/11/1993	08:00	2.70	E	13:00	3.31	NW	19:00	2.23	N
20/11/1993	08:00	2.11	S	13:00	3.33	N	19:00	2.24	E
21/11/1993	08:00	2.35	SE	13:00	3.49	N	19:00	2.04	S
22/11/1993	08:00	5.58	SE	13:00	2.52	NW	19:00	1.82	SE
23/11/1993	08:00	2.85	S	13:00	4.46	NW	19:00	2.47	SE
24/11/1993	08:00	2.42	S	13:00	2.66	NW	19:00	2.47	SE
25/11/1993	08:00	2.20	SE	13:00	3.00	NW	19:00	1.93	SE
26/11/1993	08:00	2.75	SW	13:00	3.90	NW	19:00	2.32	SE
27/11/1993	08:00	3.14	SE	13:00	4.17	NW	19:00	2.19	SE
28/11/1993	08:00	2.26	SE	13:00	3.39	NW	19:00	2.31	E
29/11/1993	08:00	2.56	NW	13:00	2.89	W	19:00	2.85	SE
30/11/1993	08:00	2.84	SE	13:00	3.14	W	19:00	2.80	NE
01/12/1993	08:00	2.24	SE	13:00	3.17	NW	19:00	2.79	SE
02/12/1993	08:00	2.70	N	13:00	3.53	W	19:00	2.48	SE
03/12/1993	08:00	2.32	NW	13:00	3.07	NW	19:00	2.33	SE
04/12/1993	08:00	3.54	SE	13:00	3.33	NW	19:00	2.	E
05/12/1993	08:00	3.04	SE	13:00	3.32	W	19:00	2.49	SE
06/12/1993	08:00	2.24	NW	13:00	3.68	W	19:00	2.64	SE
07/12/1993	08:00	2.65	SE	13:00	4.26	NW	19:00	2.13	SE
08/12/1993	08:00	3.06	SE	13:00	1.95	N	19:00	2.01	E
09/12/1993	08:00	2.30	SE	13:00	3.58	NW	19:00	2.31	SE
10/12/1993	08:00	2.59	SE	13:00	2.14	NW	19:00	2.07	SE
11/12/1993	08:00	2.54	SE	13:00	3.04	S	19:00	2.12	NW
12/12/1993	08:00	2.72	SE	13:00	5.03	NW	19:00		
13/12/1993	08:00	1.95	NW	13:00	3.59	NW	19:00	3.08	SE
14/12/1993	08:00	5.27	W	13:00	3.90	N	19:00	2.45	N
15/12/1993	08:00	3.13	S	13:00	3.37	W	19:00	4.62	SE
16/12/1993	08:00	3.59	SE	13:00	3.76	NW	19:00	3.21	SE
17/12/1993	08:00	2.85	S	13:00	3.50	NW	19:00	2.85	SE
18/12/1993	08:00	1.96	SW	13:00	2.07	S	19:00	2.44	SE
19/12/1993	08:00	2.84	SE	13:00	4.21	NW	19:00	2.28	E
20/12/1993	08:00	3.04	SE	13:00	2.97	N	19:00	2.13	SE
21/12/1993	08:00	3.29	E	13:00	4.50	NW	19:00	2.89	NW
22/12/1993	08:00	2.82	SE	13:00	3.97	NW	19:00	2.73	SE
23/12/1993	08:00	2.45	W	13:00	3.24	N	19:00	2.87	SE
24/12/1993	08:00	3.09	S	13:00	4.06	N	19:00	2.33	SE
25/12/1993	08:00	3.04	S	13:00	2.59	NW	19:00	2.80	SE
26/12/1993	08:00	2.74	SW	13:00	2.03	NW	19:00	3.08	E
27/12/1993	08:00	1.98	W	13:00	3.60	NW	19:00	2.23	S
28/12/1993	08:00	2.74	SW	13:00	3.34	S	19:00	2.55	N
29/12/1993	08:00	3.38	SE	13:00	4.04	NW	19:00	2.62	SE
30/12/1993	08:00	2.62	SW	13:00			19:00		
31/12/1993	08:00			13:00			19:00		

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/01/1994	08:00	3.09	W	13:00	3.28	NW	19:00	2.63	SE
02/01/1994	08:00	2.48	SE	13:00	2.55	NW	19:00	2.47	N
03/01/1994	08:00	2.51	E	13:00	2.53	SW	19:00	2.82	NW
04/01/1994	08:00	2.16	E	13:00	2.97	SE	19:00	3.76	SE
05/01/1994	08:00	2.24	SE	13:00	2.27	NW	19:00	2.44	SE
06/01/1994	08:00	2.39	E	13:00	2.39	W	19:00	3.90	NE
07/01/1994	08:00	1.79	SW	13:00	2.69	N	19:00	2.76	NE
08/01/1994	08:00	1.77	SE	13:00	2.25	NW	19:00	3.21	SE
09/01/1994	08:00	1.98	SE	13:00	2.85	SW	19:00	2.28	E
10/01/1994	08:00	2.16	SE	13:00	2.37	W	19:00	2.31	E
11/01/1994	08:00	2.43	SE	13:00	2.48	S	19:00	2.04	SE
12/01/1994	08:00	2.73	SE	13:00	2.35	NW	19:00	2.30	SE
13/01/1994	08:00	2.24	SE	13:00	2.87	NW	19:00	2.01	E
14/01/1994	08:00	2.40	NW	13:00	2.87	W	19:00	3.02	S
15/01/1994	08:00	3.22	SE	13:00	3.73	W	19:00	2.01	SE
16/01/1994	08:00	2.15	SE	13:00	3.36	SE	19:00	2.63	SE
17/01/1994	08:00	2.37	NE	13:00	2.21	W	19:00	1.75	NE
18/01/1994	08:00	2.70	SE	13:00	2.55	NW	19:00	2.87	N
19/01/1994	08:00	2.26	E	13:00	-	-	19:00	3.03	SE
20/01/1994	08:00	2.07	SE	13:00	2.53	NW	19:00	2.10	N
21/01/1994	08:00	2.29	SE	13:00	4.85	SE	19:00	1.67	SE
22/01/1994	08:00	2.20	SE	13:00	1.92	NW	19:00	2.54	N
23/01/1994	08:00	2.07	SE	13:00	2.37	NW	19:00	2.39	SE
24/01/1994	08:00	2.16	SE	13:00	1.68	NW	19:00	2.64	SE
25/01/1994	08:00	3.24	SE	13:00	2.18	NW	19:00	1.86	NW
26/01/1994	08:00	2.28	SE	13:00	2.21	W	19:00	2.10	E
27/01/1994	08:00	2.30	NW	13:00	2.81	SE	19:00	2.44	NW
28/01/1994	08:00	2.83	SE	13:00	2.71	NW	19:00	1.80	SE
29/01/1994	08:00	3.08	NE	13:00	2.72	N	19:00	2.06	N
30/01/1994	08:00	2.19	SE	13:00	2.87	SW	19:00	3.56	SE
31/01/1994	08:00	2.12	SE	13:00	2.72	SW	19:00	2.34	SE
01/02/1994	08:00	2	E	13:00	2.80	SW	19:00	3.76	SE
02/02/1994	08:00	2.42	SE	13:00	2.43	W	19:00	2.10	E
03/02/1994	08:00	2.97	SE	13:00	3.99	N	19:00	2.30	SE
04/02/1994	08:00	2.38	E	13:00	3.31	NW	19:00	2.85	-
05/02/1994	08:00	2.78	SE	13:00	2.22	E	19:00	2.98	SE
06/02/1994	08:00	1.63	E	13:00	1.91	S	19:00	3.64	SE
07/02/1994	08:00	2.36	N	13:00	2.54	NW	19:00	2.60	NW
08/02/1994	08:00	2.50	SE	13:00	2.54	NW	19:00	1.72	SE
09/02/1994	08:00	2.50	SE	13:00	1.49	NW	19:00	3.97	NW
10/02/1994	08:00	2.61	S	13:00	2.79	NW	19:00	2.29	SE
11/02/1994	08:00	2.53	SE	13:00	2.30	S	19:00	2.17	SE
12/02/1994	08:00	2.10	SE	13:00	2.28	NW	19:00	1.79	SE
13/02/1994	08:00	2.52	SE	13:00	1.91	S	19:00	1.56	SE
14/02/1994	08:00	2.52	SE	13:00	2.39	W	19:00	2.38	SE
15/02/1994	08:00	2.11	E	13:00	2.02	S	19:00	2.82	SE
16/02/1994	08:00	2.27	SE	13:00	2.47	W	19:00	2.39	SE
17/02/1994	08:00	2.49	NE	13:00	2.28	NW	19:00	1.71	SE
18/02/1994	08:00	2.28	SE	13:00	2.25	W	19:00	2.08	SE
19/02/1994	08:00	1.76	SE	13:00	2.42	SE	19:00	2.06	SE
20/02/1994	08:00	2.68	SE	13:00	2.24	W	19:00	1.92	SE
21/02/1994	08:00	2.27	SE	13:00	1.94	NW	19:00	2.10	E
22/02/1994	08:00	3.11	SE	13:00	2.70	SE	19:00	1.82	SE
23/02/1994	08:00	2.34	SE	13:00	3.90	W	19:00	3.70	SE
24/02/1994	08:00	2.35	SE	13:00	2.28	SW	19:00	1.19	SE
25/02/1994	08:00	2.23	SE	13:00	2.22	NW	19:00	3.17	SE
26/02/1994	08:00	2.52	SE	13:00	2.38	NW	19:00	1.35	SW
27/02/1994	08:00	1.80	S	13:00	3.20	N	19:00	2.84	SE
28/02/1994	08:00	2.75	S	13:00	2.73	N	19:00	2.87	SE

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/03/1994	08:00	3.09	S	13:00	3.53	E	19:00	2.82	SE
02/03/1994	08:00	2.28	N	13:00	2.86	S	19:00	2.16	E
03/03/1994	08:00	2.09	SE	13:00	2.07	NW	19:00	4.59	NW
04/03/1994	08:00	2.35	SE	13:00	2.57	NW	19:00	3.20	SE
05/03/1994	08:00	2.26	SE	13:00	2.74	SE	19:00	2.53	SE
06/03/1994	08:00	2.22	E	13:00	2.51	SE	19:00	1.76	SE
07/03/1994	08:00	2.35	W	13:00	2.67	NW	19:00	2.31	SE
08/03/1994	08:00	1.99	W	13:00	2.37	NW	19:00	2.47	NE
09/03/1994	08:00	3.22	E	13:00	2.25	NW	19:00	3.31	SE
10/03/1994	08:00	2.09	SE	13:00	2.28	NW	19:00	3.03	SE
11/03/1994	08:00	2.06	NW	13:00	3.52	NW	19:00	2.43	E
12/03/1994	08:00	2.22	SE	13:00	2.18	NW	19:00	2.03	E
13/03/1994	08:00	2.54	SE	13:00	2.76	NW	19:00	1.55	NW
14/03/1994	08:00	2.66	SE	13:00	3.10	NW	19:00	2.35	W
15/03/1994	08:00	2.42	S	13:00	3.00	N	19:00	2.28	SE
16/03/1994	08:00	2.10	SE	13:00	2.28	NW	19:00	1.34	SE
17/03/1994	08:00	2.17	N	13:00	2.56	W	19:00	2.04	SE
18/03/1994	08:00	2.89	SE	13:00	2.14	W	19:00	1.86	NW
19/03/1994	08:00	2.61	SE	13:00	1.91	NW	19:00	1.89	E
20/03/1994	08:00	2.14	W	13:00	2.48	NW	19:00	2.59	SE
21/03/1994	08:00	1.63	NW	13:00	2.91	NW	19:00	2.85	SE
22/03/1994	08:00	2.31	W	13:00	2.73	NW	19:00	2.82	SE
23/03/1994	08:00	2.14	SE	13:00	2.43	SE	19:00	2.81	SE
24/03/1994	08:00	1.90	SE	13:00	2.80	NW	19:00	2.07	E
25/03/1994	08:00	1.90	SE	13:00	2.68	NW	19:00	2.92	SE
26/03/1994	08:00	1.90	SE	13:00	2.73	N	19:00	2.87	SE
27/03/1994	08:00	2.97	SE	13:00	3.40	W	19:00	1.55	SE
28/03/1994	08:00	2.48	SE	13:00	2.22	NW	19:00	2.34	SE
29/03/1994	08:00	2.46	SE	13:00	1.89	NW	19:00	2.18	SE
30/03/1994	08:00	3.20	SE	13:00	2.63	NW	19:00	2.46	SE
31/03/1994	08:00	2.84	SE	13:00	2.68	N	19:00	3.03	NE
01/04/1994	08:00	2.03	E	13:00	2.06	NW	19:00	2.24	SE
02/04/1994	08:00	2.84	W	13:00	3.39	W	19:00	2.30	SE
03/04/1994	08:00	3.19	NW	13:00	4.57	SE	19:00	2.30	
04/04/1994	08:00	2.78	SE	13:00	4.03	NW	19:00	3.75	S
05/04/1994	08:00	2.89	SE	13:00	4.14	NW	19:00	2.61	SE
06/04/1994	08:00	2.05	NW	13:00	3.14	NW	19:00	4.69	SE
07/04/1994	08:00	2.26	SE	13:00	3.94	SE	19:00	3.55	SE
08/04/1994	08:00	2.82	SE	13:00	3.03	NW	19:00	3.61	SE
09/04/1994	08:00	1.47	S	13:00	2.37	NW	19:00	2.23	SE
10/04/1994	08:00	2.56	SE	13:00	4.45	NW	19:00	2.19	E
11/04/1994	08:00	3.33	SE	13:00	4.66	W	19:00	2.35	SE
12/04/1994	08:00	2.82	E	13:00	4.21	NE	19:00	2.24	E
13/04/1994	08:00	2.10	NW	13:00	2.69	SE	19:00	3.29	SE
14/04/1994	08:00	1.92	SE	13:00	3.04	N	19:00	3.01	SE
15/04/1994	08:00	2.37	NW	13:00	2.85	W	19:00	2.09	N
16/04/1994	08:00	2.67	SE	13:00	2.44	NW	19:00	2.14	SE
17/04/1994	08:00	2.89	SE	13:00	2.72	NW	19:00	1.72	E
18/04/1994	08:00	1.05	SE	13:00	2.54	NW	19:00	2.45	SE
19/04/1994	08:00	2.88	SE	13:00	3.04	NW	19:00	2.13	SE
20/04/1994	08:00	3.32	SE	13:00	2.61	NW	19:00	6.78	SE
21/04/1994	08:00	0.88	SE	13:00	2.74	NW	19:00	2.25	E
22/04/1994	08:00	2.42	SE	13:00	3.02	NW	19:00	2.06	SE
23/04/1994	08:00	2.32	SE	13:00	2.89	NW	19:00	2.33	E
24/04/1994	08:00	2.34	SE	13:00	2.95	NE	19:00	1.70	SE
25/04/1994	08:00	2.28	E	13:00	5.19	SE	19:00	2.69	SE
26/04/1994	08:00	4.48	SE	13:00	5.11	SE	19:00	6.14	SE
27/04/1994	08:00	5.66	SE	13:00	4.36	SE	19:00	3.31	SE
28/04/1994	08:00	5.33	SE	13:00	4.57	NW	19:00	2.33	S
29/04/1994	08:00	3.93	SE	13:00	3.90	NW	19:00	3.11	SE
30/04/1994	08:00	4.03	SE	13:00	3.13	W	19:00	3.49	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu , March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/05/1994	08:00	2.82	SE	13:00	5.10	SE	19:00	4.38	SE
02/05/1994	08:00	4.43	SE	13:00	3.97	NW	19:00	2.28	SE
03/05/1994	08:00	2.91	SW	13:00	3.10	NW	19:00	2.51	SE
04/05/1994	08:00	2.81	S	13:00	3.66	NW	19:00	2.19	E
05/05/1994	08:00	2.91	SE	13:00	3.07	NW	19:00	2.25	SE
06/05/1994	08:00	3.03	SE	13:00	3.23	NW	19:00	2.27	SE
07/05/1994	08:00	2.45	SE	13:00	3.86	NW	19:00	2.39	N
08/05/1994	08:00	5.27	SE	13:00	3.77	N	19:00	2.33	E
09/05/1994	08:00	3.36	SE	13:00	3.61	NW	19:00	2.18	SE
10/05/1994	08:00	2.77	SE	13:00	3.63	NW	19:00	2.24	SE
11/05/1994	08:00	3.06	SE	13:00	3.74	NW	19:00	2.44	S
12/05/1994	08:00	2.78	SE	13:00	4.06	SW	19:00	2.73	SE
13/05/1994	08:00	3.08	SE	13:00	5.65	SE	19:00	2.97	SE
14/05/1994	08:00	3.06	SE	13:00	5.26	SE	19:00	2.42	E
15/05/1994	08:00	4.49	SE	13:00	3.79	W	19:00	3.11	SE
16/05/1994	08:00	5.02	SE	13:00	4.29	NW	19:00	2.42	SE
17/05/1994	08:00	2.50	SE	13:00	3.57	NW	19:00	1.99	E
18/05/1994	08:00	2.64	SE	13:00	3.38	N	19:00	2.23	SE
19/05/1994	08:00	2.34	SE	13:00	3.39	NW	19:00	1.82	SE
20/05/1994	08:00	3.31	SE	13:00	3.74	NW	19:00	2.36	SE
21/05/1994	08:00	2.79	SE	13:00	3.15	N	19:00	2.19	SE
22/05/1994	08:00	3.08	SE	13:00	3.35	NW	19:00	1.82	SE
23/05/1994	08:00	3.18	SE	13:00	2.40	NW	19:00	2.97	NE
24/05/1994	08:00	3.40	SE	13:00	3.94	N	19:00	3.06	SE
25/05/1994	08:00	5.33	SE	13:00	4.72	W	19:00	2.74	SE
26/05/1994	08:00	6.14	SE	13:00	4.45	W	19:00	2.81	SE
27/05/1994	08:00	7.53	SE	13:00	4.10	W	19:00	1.95	E
28/05/1994	08:00	4.34	SW	13:00	3.13	NW	19:00	3.06	SE
29/05/1994	08:00	2.62	SE	13:00	3.68	W	19:00	2.38	SE
30/05/1994	08:00	4.95	SE	13:00	3.88	W	19:00	3.39	SE
31/05/1994	08:00	6.49	SE	13:00	5.56	NW	19:00	2.38	SE
01/06/1994	08:00	6.99	SE	13:00	3.88	W	19:00	3.51	S
02/06/1994	08:00	4.28	-	13:00	5.41	SE	19:00	4.45	SE
03/06/1994	08:00	5.59	SE	13:00	4.29	W	19:00	2.70	E
04/06/1994	08:00	6.45	SE	13:00	4.55	W	19:00	2.69	SE
05/06/1994	08:00	4.36	SE	13:00	2.31	W	19:00	3.71	SE
06/06/1994	08:00	3.57	NW	13:00	3.04	W	19:00	2.14	SE
07/06/1994	08:00	5.19	SE	13:00	5.91	W	19:00	2.41	SE
08/06/1994	08:00	5.82	SE	13:00	4.22	W	19:00	2.28	SE
09/06/1994	08:00	5.41	W	13:00	3.41	NW	19:00	3.80	SE
10/06/1994	08:00	6.97	SE	13:00	4.31	W	19:00	5.58	SE
11/06/1994	08:00	8.50	SE	13:00	2.03	NW	19:00	9.17	SE
12/06/1994	08:00	9.01	SE	13:00	2.33	W	19:00	4.24	SE
13/06/1994	08:00	8.10	SE	13:00	3.98	W	19:00	2.75	SE
14/06/1994	08:00	5.85	SE	13:00	4.44	W	19:00	2.20	SE
15/06/1994	08:00	5.21	NE	13:00	4.23	NW	19:00	3.82	SE
16/06/1994	08:00	6.00	SE	13:00	2.44	NW	19:00	2.38	SE
17/06/1994	08:00	6.31	SE	13:00	4.33	NW	19:00	1.80	SE
18/06/1994	08:00	3.84	SE	13:00	3.50	W	19:00	1.99	SE
19/06/1994	08:00	4.54	S	13:00	4.46	NE	19:00	1.54	E
20/06/1994	08:00	4.34	SE	13:00	4.46	NW	19:00	1.83	E
21/06/1994	08:00	3.75	W	13:00	3.88	NW	19:00	1.85	SE
22/06/1994	08:00	2.70	SE	13:00	3.54	NW	19:00	1.76	SE
23/06/1994	08:00	3.30	SE	13:00	3.29	NW	19:00	2.13	E
24/06/1994	08:00	3.07	SE	13:00	3.91	NW	19:00	2.36	S
25/06/1994	08:00	3.11	SE	13:00	3.91	W	19:00	2.26	S
26/06/1994	08:00	4.17	SE	13:00	3.63	NW	19:00	2.03	SE
27/06/1994	08:00	2.79	SE	13:00	3.12	NW	19:00	2.00	SE
28/06/1994	08:00	2.37	E	13:00	2.57	NW	19:00	1.71	SE
29/06/1994	08:00	2.25	W	13:00	2.50	W	19:00	2.09	SE
30/06/1994	08:00	3.07	S	13:00	3.53	W	19:00	1.82	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu ' March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/07/1994	08:00	4.36	SE	13:00	4.61	SE	19:00	3.30	SE
02/07/1994	08:00	6.68	SE	13:00	5.14	SE	19:00	3.85	SE
03/07/1994	08:00	5.84	SE	13:00	4.00	SE	19:00	3.72	SE
04/07/1994	08:00	7.23	SE	13:00	4.54	W	19:00	2.54	SE
05/07/1994	08:00	3.24	SE	13:00	4.29	W	19:00	2.42	SE
06/07/1994	08:00	7.35	SE	13:00	4.55	SE	19:00	4.02	SE
07/07/1994	08:00	7.45	SE	13:00	6.14	SE	19:00	4.41	SE
08/07/1994	08:00	5.65	SE	13:00	4.18	NW	19:00	2.12	SE
09/07/1994	08:00	3.49	SE	13:00	3.70	N	19:00	1.85	SE
10/07/1994	08:00	3.06	SE	13:00	3.34	W	19:00	1.68	SE
11/07/1994	08:00	4.29	SW	13:00	3.54	NW	19:00	1.90	SE
12/07/1994	08:00	8.23	SE	13:00	4.09	W	19:00	4.70	SE
13/07/1994	08:00	10.03	SE	13:00	5.38	SE	19:00	4.12	SE
14/07/1994	08:00	8.71	SE	13:00	4.88	NW	19:00	2.33	SE
15/07/1994	08:00	7.89	SW	13:00	3.67	W	19:00	2.18	E
16/07/1994	08:00	5.88	SE	13:00	4.35	W	19:00	2.10	SE
17/07/1994	08:00	7.84	SE	13:00	1.91	NW	19:00	4.90	SE
18/07/1994	08:00	6.88	SE	13:00	1.99	W	19:00	5.41	NE
19/07/1994	08:00	7.84	SE	13:00	4.68	W	19:00	1.97	E
20/07/1994	08:00	8.50	SE	13:00	2.98	W	19:00	3.91	SE
21/07/1994	08:00	3.39	SE	13:00	3.95	NW	19:00	2.47	SE
22/07/1994	08:00	5.31	SE	13:00	4.78	W	19:00	2.45	SE
23/07/1994	08:00	5.54	SE	13:00	4.14	NW	19:00	2.33	N
24/07/1994	08:00	3.40	SE	13:00	3.84	W	19:00	1.98	NE
25/07/1994	08:00	2.71	SE	13:00	3.09	NW	19:00	2.10	N
26/07/1994	08:00	2.10	SE	13:00	2.80	NW	19:00	2.15	SE
27/07/1994	08:00	2.54	SE	13:00	4.16	W	19:00	1.96	SE
28/07/1994	08:00	8.61	SE	13:00	7.63	SE	19:00	5.62	SE
29/07/1994	08:00	4.21	SE	13:00	6.22	SE	19:00	2.21	SE
30/07/1994	08:00	12.62	SE	13:00	7.14	SE	19:00	6.10	SE
31/07/1994	08:00	7.80	SE	13:00	5.06	SE	19:00	2.24	SE
01/08/1994	08:00	5.79	SE	13:00	3.87	NW	19:00	2.32	SE
02/08/1994	08:00	4.04	SE	13:00	4.27	NW	19:00	2.84	SE
03/08/1994	08:00	4.14	SE	13:00	6.21	NW	19:00	8.43	SE
04/08/1994	08:00	3.58	SE	13:00	4.37	NW	19:00	2.37	SE
05/08/1994	08:00	8.97		13:00	4.25	NW	19:00	3.06	SE
06/08/1994	08:00	7.90	SE	13:00	4.31	NW	19:00	3.70	SE
07/08/1994	08:00	3.78	SE	13:00	4.48	NW	19:00	2.22	SE
08/08/1994	08:00	3.38	SE	13:00	3.74	NW	19:00	2.46	SE
09/08/1994	08:00	2.61	SE	13:00	3.26	NW	19:00	1.75	SE
10/08/1994	08:00	4.31	SE	13:00	3.44	NW	19:00	1.83	NE
11/08/1994	08:00	2.85	SE	13:00	3.94	NW	19:00	1.77	NE
12/08/1994	08:00	4.94	SE	13:00	4.77	NW	19:00	1.99	N
13/08/1994	08:00	3.37	SE	13:00	3.02	NW	19:00	2.55	SE
14/08/1994	08:00	2.13	S	13:00	3.07	NW	19:00	1.84	SE
15/08/1994	08:00	3.34	SE	13:00	3.31	NW	19:00	1.62	NE
16/08/1994	08:00	4.36	SE	13:00	4.18	NW	19:00	0.77	NE
17/08/1994	08:00	3.07	SE	13:00	3.74	W	19:00	1.77	E
18/08/1994	08:00	7.32	SE	13:00	4.20	NW	19:00	1.76	SE
19/08/1994	08:00	5.45	SE	13:00	3.90	NW	19:00	1.82	NW
20/08/1994	08:00	2.71	SE	13:00	3.15	NW	19:00	1.02	NW
21/08/1994	08:00	2.03	SE	13:00	3.09	NW	19:00	2.16	NE
22/08/1994	08:00	2.27	SE	13:00	5.76	SE	19:00	6.70	SE
23/08/1994	08:00	3.62	SE	13:00	6.28	SE	19:00	5.59	SE
24/08/1994	08:00	6.12	SE	13:00	4.56	SE	19:00	7.38	SE
25/08/1994	08:00	6.79	SE	13:00			19:00	9.72	SE
26/08/1994	08:00	6.07	SE	13:00	5.13	W	19:00	2.89	NW
27/08/1994	08:00	6.43	SE	13:00	4.71	W	19:00	2.80	SE
28/08/1994	08:00	2.88	SE	13:00	4.66	NW	19:00	2.88	NW
29/08/1994	08:00	3.46	SE	13:00	5.00	W	19:00	2.28	SE
30/08/1994	08:00	2.05	SE	13:00	9.72	NW	19:00	2.47	NW
31/08/1994	08:00	4.26	SE	13:00	4.64	NW	19:00	2.02	E

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/09/1994	08:00	2.86	SE	13:00	3.66	W	19:00	1.87	NW
02/09/1994	08:00	4.02	SE	13:00	4.68	W	19:00	2.11	N
03/09/1994	08:00	5.05	SE	13:00	4.42	NW	19:00	1.88	SE
04/09/1994	08:00	3.32	SE	13:00	4.51	NW	19:00	1.76	E
05/09/1994	08:00	4.33	SE	13:00	4.44	W	19:00	2.16	NW
06/09/1994	08:00	3.58	SE	13:00	3.95	NW	19:00	2.08	W
07/09/1994	08:00	3.73	SE	13:00	4.71	W	19:00	1.86	SE
08/09/1994	08:00	2.13	SE	13:00	3.50	W	19:00	1.91	SE
09/09/1994	08:00	5.84	SE	13:00	7.49	SE	19:00	5.79	SE
10/09/1994	08:00	7.67	SE	13:00	5.93	NW	19:00	3.84	SE
11/09/1994	08:00	4.52	SE	13:00	4.84	NW	19:00	2.36	SE
12/09/1994	08:00	3.44	SE	13:00	3.73	N	19:00	2.00	SE
13/09/1994	08:00	2.65	SE	13:00	3.27	NW	19:00	2.67	SE
14/09/1994	08:00	2.21	S	13:00	2.70	N	19:00	3.21	SE
15/09/1994	08:00	1.50	S	13:00	3.53	W	19:00	2.17	N
16/09/1994	08:00	2.38	SE	13:00	4.82	W	19:00	1.82	N
17/09/1994	08:00	2.36	SE	13:00	4.23	NW	19:00	1.95	SE
18/09/1994	08:00	2.76	SE	13:00	3.89	NW	19:00	1.71	NE
19/09/1994	08:00	3.06	SE	13:00	3.73	NW	19:00	1.80	NE
20/09/1994	08:00	3.04	SE	13:00	3.72	NW	19:00	2.10	NE
21/09/1994	08:00	4.59	SE	13:00	4.52	NW	19:00	2.10	SW
22/09/1994	08:00	2.58	SE	13:00	3.73	NW	19:00	1.86	N
23/09/1994	08:00	3.12	SE	13:00	3.60	NW	19:00	2.39	N
24/09/1994	08:00	2.85	SE	13:00	3.83	W	19:00	2.51	W
25/09/1994	08:00	3.10	NW	13:00	3.05	N	19:00	2.20	S
26/09/1994	08:00	2.94	SE	13:00	2.96	W	19:00	1.84	SE
27/09/1994	08:00	4.00	SE	13:00	3.47	NW	19:00	1.79	NE
28/09/1994	08:00	3.51	SE	13:00	3.29	SE	19:00	1.80	N
29/09/1994	08:00	2.07	SE	13:00	3.13	W	19:00	1.82	SE
30/09/1994	08:00	2.23	NE	13:00	2.74	NW	19:00	1.85	SE
01/10/1994	08:00	3.70	SW	13:00	3.70	W	19:00	2.35	NW
02/10/1994	08:00	3.41	NE	13:00	3.98	NW	19:00	3.13	E
03/10/1994	08:00	2.57	SE	[illegible]	3.33	SE	19:00	3.41	E
04/10/1994	08:00	2.60	SE	13:00	3.04	NW	19:00	2.47	E
05/10/1994	08:00	2.65	SE	13:00	5.30	NW	19:00	2.63	E
06/10/1994	08:00	2.67	SE	13:00	5.25	SE	19:00	3.84	SE
07/10/1994	08:00	5.11	SE	13:00	4.86	NW	19:00	2.46	SE
08/10/1994	08:00	3.13	W	13:00	3.97	NE	19:00	1.95	E
09/10/1994	08:00	2.69	SE	13:00	4.03	NW	19:00	1.61	SE
10/10/1994	08:00	2.36	SE	13:00	3.16	NW	19:00	1.88	S
11/10/1994	08:00	2.40	NW	13:00	3.93	SW	19:00	2.50	E
12/10/1994	08:00	2.26	S	13:00	3.35	W	19:00	2.14	SE
13/10/1994	08:00	2.37	S	13:00	3.35	NW	19:00	3.44	SE
14/10/1994	08:00	1.86	SE	13:00	3.34	N	19:00	1.97	E
15/10/1994	08:00	3.43	S	13:00	4.34	N	19:00	2.49	E
16/10/1994	08:00	4.08	SE	13:00	5.00	NW	19:00	2.45	NE
17/10/1994	08:00	3.74	SE	13:00	4.92	NW	19:00	2.47	NE
18/10/1994	08:00	4.49	S	13:00	4.35	NW	19:00	3.09	SE
19/10/1994	08:00	2.54	SW	13:00	3.57	NW	19:00	3.02	SE
20/10/1994	08:00	2.47	SW	13:00	3.82	NW	19:00	2.46	E
21/10/1994	08:00	2.09	S	13:00	3.67	NW	19:00	2.03	NE
22/10/1994	08:00	2.53	NW	13:00	3.44	NW	19:00	2.81	SE
23/10/1994	08:00	3.03	SE	13:00	3.53	NW	19:00	2.37	E
24/10/1994	08:00	2.11	NW	13:00	3.55	NW	19:00	2.54	E
25/10/1994	08:00	2.96	SE	13:00	4.21	N	19:00	2.50	NE
26/10/1994	08:00	2.58	S	13:00	4.39	W	19:00	2.58	NE
27/10/1994	08:00	2.66	NW	13:00	4.72	NW	19:00	3.37	SE
28/10/1994	08:00	2.45	NE	13:00	4.17	NW	19:00	2.64	SE
29/10/1994	08:00	1.95	N	13:00	3.15	N	19:00	3.45	N
30/10/1994	08:00	2.10	W	13:00	3.17	N	19:00	2.55	E
31/10/1994	08:00	2.28	NW	13:00	4.57	NW	19:00	2.35	SW

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08 00, 13 00 and 19 00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/11/1994	08:00	2.77	SE	13:00	3.81	N	19:00	1.76	W
02/11/1994	08:00	2.56	SE	13:00	4.83	SE	19:00	2.62	SE
03/11/1994	08:00	3.30	W	13:00	5.08	SE	19:00	2.55	SE
04/11/1994	08:00	2.54	NW	13:00	4.07	NW	19:00	2.13	E
05/11/1994	08:00	2.01	SE	13:00	3.71	NW	19:00	2.43	SE
06/11/1994	08:00	2.50	SE	13:00	4.16	NW	19:00	2.65	SE
07/11/1994	08:00	1.77	NW	13:00	5.10	NW	19:00	3.63	SE
08/11/1994	08:00	2.54	NW	13:00	4.62	NW	19:00	3.09	NW
09/11/1994	08:00	2.32	W	13:00	3.62	NW	19:00	3.54	E
10/11/1994	08:00	2.30	W	13:00	3.75	NW	19:00	3.22	SE
11/11/1994	08:00	2.98	SE	13:00	3.31	NW	19:00	2.32	SE
12/11/1994	08:00	2.68	NW	13:00	3.52	NW	19:00	2.45	E
13/11/1994	08:00	2.91	SE	13:00	3.81	E	19:00	2.70	E
14/11/1994	08:00	2.84	SE	13:00	3.58	E	19:00	2.93	SW
15/11/1994	08:00	1.76	SW	13:00	3.85	W	19:00	3.17	N
16/11/1994	08:00	2.43	W	13:00	4.87	N	19:00	2.51	S
17/11/1994	08:00	2.46	NW	13:00	3.98	N	19:00	2.72	E
18/11/1994	08:00	2.44	S	13:00	3.79	NW	19:00	2.71	S
19/11/1994	08:00	3.09	E	13:00	4.38	SE	19:00	2.84	SE
20/11/1994	08:00	2.48	SW	13:00	4.38	NW	19:00	2.43	W
21/11/1994	08:00	2.99	W	13:00	3.74	N	19:00	3.05	S E
22/11/1994	08:00	2.53	NW	13:00	3.73	NW	19:00	2.78	W
23/11/1994	08:00	2.31	W	13:00	4.45	NW	19:00	2.95	W
24/11/1994	08:00	2.51	W	13:00	3.04	NW	19:00	2.10	N
25/11/1994	08:00	2.01	NW	13:00	2.78	NW	19:00	1.90	W
26/11/1994	08:00	1.92	E	13:00	2.87	SE	19:00	2.50	SE
27/11/1994	08:00	2.33	SE	13:00	4.06	NW	19:00	1.74	E
28/11/1994	08:00	2.21	W	13:00	4.16	SE	19:00	2.58	SE
29/11/1994	08:00	1.83	SE	13:00	2.30	S	19:00	2.90	SE
30/11/1994	08:00	2.43	SE	13:00	3.07	NW	19:00	3.07	NW
01/12/1994	08:00	1.81	W	13:00	3.29	NW	19:00	2.48	NE
02/12/1994	08:00	2.16	E	13:00	3.31	NW	19:00	2.37	N
03/12/1994	08:00	2.29	SE	13:00	2.29	NW	19:00	2.55	SE
04/12/1994	08:00	2.31	SE	13:00	2.88	SE	19:00	2.49	SE
05/12/1994	08:00	2.44	SE	[illegible]	2.50	SE	19:00	2.19	SE
06/12/1994	08:00	1.78	SE	13:00	3.16	W	19:00	2.68	NW
07/12/1994	08:00	2.61	S	13:00	3.21	NW	19:00	2.54	NW
08/12/1994	08:00	2.12	SE	13:00	3.06	NW	19:00	2.22	NW
09/12/1994	08:00	2.52	SE	13:00	3.66	NW	19:00	3.11	NW
10/12/1994	08:00	2.03	N	13:00	4.02	N	19:00	2.29	SE
11/12/1994	08:00	3.12	SE	13:00	2.69	SE	19:00	1.91	SE
12/12/1994	08:00	2.34	SE	13:00	2.35	W	19:00	2.73	SE
13/12/1994	08:00	2.67	SE	13:00	2.86	NW	19:00	2.09	SE
14/12/1994	08:00	1.86	W	13:00	2.63	W	19:00	2.15	SE
15/12/1994	08:00	2.15	W	13:00	3.25	NW	19:00	2.66	SE
16/12/1994	08:00	2.47	SE	13:00	3.40	NW	19:00	1.96	SE
17/12/1994	08:00	2.17	N	13:00	3.14	NW	19:00	2.45	E
18/12/1994	08:00	2.73	SE	13:00	2.76	NW	19:00	2.64	SE
19/12/1994	08:00	2.86	SE	13:00	2.82	NW	19:00	2.39	NW
20/12/1994	08:00	2.26	SE	13:00	2.12	NW	19:00	1.80	NW
21/12/1994	08:00	2.22	SE	13:00	3.23	NW	19:00	2.07	S
22/12/1994	08:00	2.77	SE	13:00	2.81	NW	19:00	2.48	NE
23/12/1994	08:00	2.54	S	13:00	3.31	NW	19:00	2.67	E
24/12/1994	08:00	2.89	SE	13:00	3.23	S	19:00	2.92	SE
25/12/1994	08:00	2.90	W	13:00	1.01	NW	19:00	3.53	SE
26/12/1994	08:00	2.00	SE	13:00	2.62	NW	19:00	2.52	SE
27/12/1994	08:00	1.95	S	13:00	3.72	NW	19:00	3.21	N
28/12/1994	08:00	2.19	SE	13:00	2.50	W	19:00	2.63	E
29/12/1994	08:00	2.53	SE	13:00	3.21	NW	19:00	2.93	E
30/12/1994	08:00	2.37	N	13:00	2.91	SE	19:00	2.21	S
31/12/1994	08:00	2.14	SE	13:00	2.59	N	19:00	3.40	SE

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu ; March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h.

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/03/1993	08:00			13:00			19:00		
02/03/1993	08:00			13:00			19:00		
03/03/1993	08:00			13:00			19:00		
04/03/1993	08:00			13:00			19:00		
05/03/1993	08:00			13:00			19:00		
06/03/1993	08:00			13:00			19:00		
07/03/1993	08:00			13:00			19:00		
08/03/1993	08:00			13:00	2.74		19:00		
09/03/1993	08:00	2.83		13:00	3.35		19:00	3.11	
10/03/1993	08:00	2.09		13:00	2.94		19:00	2.18	
11/03/1993	08:00	2.39		13:00	1.72		19:00	2.46	
12/03/1993	08:00	1.88		13:00	2.69		19:00	2.14	
13/03/1993	08:00	3.73		13:00	2.65		19:00	2.00	
14/03/1993	08:00	2.67		13:00	2.38		19:00	2.56	
15/03/1993	08:00	3.18		13:00	2.83		19:00	4.47	
16/03/1993	08:00	2.39		13:00	2.54		19:00	2.48	
17/03/1993	08:00	2.56		13:00	3.19		19:00	3.43	
18/03/1993	08:00	1.74		13:00	2.79		19:00	3.46	
19/03/1993	08:00	1.93		13:00	2.90		19:00	3.47	
20/03/1993	08:00	2.12		13:00			19:00	4.40	
21/03/1993	08:00	1.95		13:00	2.63		19:00	2.22	
22/03/1993	08:00	1.53		13:00	2.87		19:00	4.84	
23/03/1993	08:00	2.52		13:00	3.05		19:00	1.85	
24/03/1993	08:00	2.54		13:00	3.57		19:00	2.17	
25/03/1993	08:00	2.17		13:00	2.54		19:00	2.43	
26/03/1993	08:00	2.37		13:00	3.57		19:00	2.99	
27/03/1993	08:00	2.44		13:00	3.31		19:00	3.15	
28/03/1993	08:00	2.33		13:00	2.63		19:00	2.86	
29/03/1993	08:00	1.80		13:00	3.47		19:00	2.87	
30/03/1993	08:00	2.05		13:00	0.97		19:00	5.02	
31/03/1993	08:00	1.93		13:00	3.23		19:00	2.33	
01/04/1993	08:00	2.05	SW	13:00	2.44	N	19:00	4.70	SE
02/04/1993	08:00	3.10	SE	13:00	3.00	NW	19:00	3.16	SE
03/04/1993	08:00	2.44	E	13:00	3.32	SE	19:00	3.28	SE
04/04/1993	08:00	2.20	SE	13:00	2.98	N	19:00	2.81	SE
05/04/1993	08:00	2.00	N	13:00	2.83	NW	19:00	3.17	SE
06/04/1993	08:00	1.90	N	13:00	3.50	N	19:00	2.00	E
07/04/1993	08:00	2.54	SE	13:00	4.33	NW	19:00	2.41	E
08/04/1993	08:00	2.47	SE	13:00	3.81	NW	19:00	3.56	E
09/04/1993	08:00	2.36	SE	13:00	2.96	NW	19:00	3.75	SE
10/04/1993	08:00	2.58	SE	13:00	2.53	NW	19:00	3.81	SE
11/04/1993	08:00	2.74	SE	13:00	2.92	NW	19:00	2.14	E
12/04/1993	08:00	2.31	SE	13:00	3.01	NW	19:00	2.48	SE
13/04/1993	08:00	2.50	SE	13:00	3.29	W	19:00	1.84	SE
14/04/1993	08:00	2.21	SE	13:00	2.65	NW	19:00	2.54	NW
15/04/1993	08:00	2.69	SE	13:00	3.20	SE	19:00	2.45	W
16/04/1993	08:00	2.14	SE	13:00	4.89	W	19:00	2.67	E
17/04/1993	08:00	2.04	SE	13:00	3.96	N	19:00	2.58	SE
18/04/1993	08:00	2.82	SE	13:00	2.80	NW	19:00	3.30	SE
19/04/1993	08:00	2.70	SE	13:00	3.20	N	19:00	2.13	SE
20/04/1993	08:00	2.28	SE	13:00	3.71	SE	19:00	3.85	SE
21/04/1993	08:00	3.50	SE	13:00	4.46	SE	19:00	3.22	SE
22/04/1993	08:00	2.55	SE	13:00	3.64	W	19:00	2.72	S
23/04/1993	08:00	2.65	SE	13:00	5.83	SE	19:00	3.03	SE
24/04/1993	08:00	2.93	S	13:00	5.45	SE	19:00	3.64	SE
25/04/1993	08:00	2.84	SE	13:00	3.97	SE	19:00	3.02	E
26/04/1993	08:00	2.12	SE	13:00	3.42	NW	19:00	2.81	NW
27/04/1993	08:00	1.67	SE	13:00	3.29	NW	19:00	2.25	SE
28/04/1993	08:00	2.85	SE	13:00	3.17	NW	19:00	2.24	SE
29/04/1993	08:00	2.61	SE	13:00	2.69	NE	19:00	1.79	E
30/04/1993	08:00	2.74	E	13:00	2.53	NW	19:00	2.12	E

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DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/07/1993	08:00	9.09	SE	13:00	3.98	W	19:00	3.32	E
02/07/1993	08:00	8.16	SE	13:00	4.77	NW	19:00	2.88	SE
03/07/1993	08:00	7.98	SE	13:00	4.22	NW	19:00	3.09	SE
04/07/1993	08:00	7.19	SE	13:00	4.74	NW	19:00	2.73	SE
05/07/1993	08:00	6.75	SE	13:00	4.80	W	19:00	2.90	E
06/07/1993	08:00	6.77	SE	13:00	4.27	W	19:00	2.42	E
07/07/1993	08:00	5.04	SE	13:00	4.35	W	19:00	2.38	E
08/07/1993	08:00	4.68	SE	13:00	4.19	W	19:00	2.26	E
09/07/1993	08:00	4.12	SE	13:00	4.53	W	19:00	2.30	N
10/07/1993	08:00	3.75	SE	13:00	3.77	W	19:00	2.03	NE
11/07/1993	08:00	5.36	SE	13:00	4.38	W	19:00	2.15	SE
12/07/1993	08:00	6.40	SE	13:00	4.77	W	19:00	2.94	SE
13/07/1993	08:00	7.76	SE	13:00	5.18	W	19:00	2.34	SE
14/07/1993	08:00	8.19	SE	13:00	5.31	NW	19:00	2.77	E
15/07/1993	08:00	6.80	SE	13:00	4.77	W	19:00	2.50	E
16/07/1993	08:00	4.92	SE	13:00	4.68	NW	19:00	2.20	E
17/07/1993	08:00	4.33	SE	13:00	4.03	NW	19:00	2.62	SE
18/07/1993	08:00	4.46	SE	13:00	4.28	NW	19:00	3.19	NW
19/07/1993	08:00	3.89	SE	13:00	3.68	NW	19:00	1.93	E
20/07/1993	08:00	4.83	SE	13:00	4.07	S	19:00	3.66	SE
21/07/1993	08:00	6.69	SE	13:00	5.14	SE	19:00	5.04	SE
22/07/1993	08:00	8.10	SE	13:00	6.43	S	19:00	4.28	SE
23/07/1993	08:00	6.74	SE	13:00	5.04	SE	19:00	4.81	SE
24/07/1993	08:00	6.77	SE	13:00	4.65	S	19:00	2.86	SE
25/07/1993	08:00	7.33	SE	13:00	5.44	W	19:00	2.12	SE
26/07/1993	08:00	7.26	SE	13:00	4.95	W	19:00	1.99	NE
27/07/1993	08:00	4.34	SE	13:00	4.00	NW	19:00	1.92	N
28/07/1993	08:00	3.49	SE	13:00	3.66	NW	19:00	2.00	SE
29/07/1993	08:00	3.15	SE	13:00	3.22	NW	19:00	2.38	SE
30/07/1993	08:00	3.28	SE	13:00	3.90	N	19:00	1.91	E
31/07/1993	08:00	5.17	SE	13:00	5.08	NW	19:00	2.18	NE
01/08/1993	08:00	4.44	SE	13:00	4.67	W	19:00	4.73	SE
02/08/1993	08:00	6.73	SE	13:00	4.19	W	19:00	1.95	E
03/08/1993	08:00	3.62	SE	13:00	3.50		19:00		
04/08/1993	08:00	4.33	SE	13:00	3.57	NE	19:00	1.83	NE
05/08/1993	08:00	2.90	S	13:00	4.12	NE	19:00	1.84	NE
06/08/1993	08:00	5.38	SE	13:00	3.99	NE	19:00	1.73	C
07/08/1993	08:00	3.25	SE	13:00	3.40	NW	19:00	1.93	E
08/08/1993	08:00	3.43	S	13:00	4.01	N	19:00	2.02	E
09/08/1993	08:00	3.46	SE	13:00	4.18	W	19:00	2.14	E
10/08/1993	08:00	4.55	SE	13:00	4.64	N	19:00	2.13	E
11/08/1993	08:00	4.46	SE	13:00	3.90	W	19:00	2.24	SE
12/08/1993	08:00	2.41	SE	13:00	3.26	NW	19:00	1.74	SE
13/08/1993	08:00	7.88	SE	13:00	7.01	SE	19:00	1.73	SE
14/08/1993	08:00	11.37	SE	13:00	8.82	SE	19:00	8.07	SE
15/08/1993	08:00	7.58	SE	13:00	5.40	SE	19:00	4.40	SE
16/08/1993	08:00	9.07	SE	13:00	1.08	NW	19:00	7.34	SE
17/08/1993	08:00	4.57	SE	13:00	3.72	NW	19:00	2.23	SE
18/08/1993	08:00	3.90	SW	13:00	3.90	N	19:00	1.90	SE
19/08/1993	08:00	4.17	SE	13:00	4.03	NW	19:00	4.52	SE
20/08/1993	08:00	4.60	SE	13:00	3.77	NW	19:00	2.07	SE
21/08/1993	08:00	3.04	SE	13:00	3.58	NW	19:00		
22/08/1993	08:00	2.46	SE	13:00	3.20	NW	19:00	1.76	E
23/08/1993	08:00	3.92	SE	13:00	5.11	W	19:00	2.25	E
24/08/1993	08:00	3.28	SE	13:00	4.97	W	19:00	2.62	SE
25/08/1993	08:00	4.79	SE	13:00	4.47	W	19:00	2.21	E
26/08/1993	08:00	4.84	S	13:00	4.87	NW	19:00	1.92	SE
27/08/1993	08:00	4.34	SE	13:00	3.94	NW	19:00	2.41	SW
28/08/1993	08:00	2.85	SE	13:00	3.59	N	19:00	2.73	SE
29/08/1993	08:00	4.92	SE	13:00	4.83	N	19:00	2.48	N
30/08/1993	08:00	3.04	SE	13:00	5.11	SE	19:00	4.53	SE
31/08/1993	08:00	4.04	SE	13:00	4.56	NW	19:00	1.97	N

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu - March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

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DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/09/1993	08:00	3.68	SE	13:00	4.51	W	19:00	2.63	SE
02/09/1993	08:00	4.29	SE	13:00	4.53	W	19:00	2.25	W
03/09/1993	08:00	3.12	SE	13:00	4.53	NW	19:00	2.28	SE
04/09/1993	08:00	2.88	SE	13:00	4.40	W	19:00	1.98	SW
05/09/1993	08:00	3.47	SE	13:00	4.18	W	19:00	2.06	E
06/09/1993	08:00	3.62	SE	13:00	5.07	SE	19:00	4.65	SE
07/09/1993	08:00	8.52	SE	13:00	6.07	W	19:00	2.37	E
08/09/1993	08:00	2.49	S	13:00	4.12	NW	19:00	1.92	NW
09/09/1993	08:00	4.28	SE	13:00	3.61	NW	19:00	1.71	N
10/09/1993	08:00	2.32	SE	13:00	3.77	N	19:00	2.53	SE
11/09/1993	08:00	5.84	SE	13:00	3.46	N	19:00	1.56	SE
12/09/1993	08:00	3.01	NW	13:00	3.31	NE	19:00	1.88	NW
13/09/1993	08:00	3.06	SE	13:00	3.53	N	19:00	1.96	NE
14/09/1993	08:00	3.55	SE	13:00	3.93	NW	19:00	1.94	E
15/09/1993	08:00	3.14	SE	13:00	4.32	NW	19:00	2.14	W
16/09/1993	08:00	4.79	SE	13:00	5.20	NW	19:00	1.87	E
17/09/1993	08:00	4.76	SE	13:00	4.72	NW	19:00	2.90	SE
18/09/1993	08:00	3.06	SE	13:00	3.68	NE	19:00	1.90	SE
19/09/1993	08:00	3.40	SE	13:00	4.67	NE	19:00	1.85	NE
20/09/1993	08:00	3.40	SE	13:00	3.72	NW	19:00	2.05	NE
21/09/1993	08:00	3.48	SE	13:00	3.63	NE	19:00	2.52	NE
22/09/1993	08:00	2.39	SE	13:00	3.66	W	19:00	2.43	SE
23/09/1993	08:00	2.08	W	13:00	3.22	NW	19:00	2.10	SE
24/09/1993	08:00	2.25	SE	13:00	2.65	NW	19:00	2.14	SE
25/09/1993	08:00	3.22	S	13:00	3.77	NW	19:00	1.97	S
26/09/1993	08:00	3.08	SE	13:00	3.42	NW	19:00	2.44	SE
27/09/1993	08:00	3.64	SE	13:00	3.45	NW	19:00	2.27	E
28/09/1993	08:00	2.95	SE	13:00	3.22	NW	19:00	2.32	NW
29/09/1993	08:00	2.89	SW	13:00	2.96	NW	19:00	2.20	S
30/09/1993	08:00	2.27	SE	13:00	3.06	NW	19:00	2.39	SE
01/10/1993	08:00	1.81	SE	13:00	3.24	NW	19:00	2.30	SE
02/10/1993	08:00	2.66	SE	13:00	3.32	NW	19:00	1.85	NE
03/10/1993	08:00	3.24	SE	13:00	3.15	N	19:00	2.01	E
04/10/1993	08:00	2.42	SE	13:00	3.25	NW	19:00	2.03	S
05/10/1993	08:00	3.05	N	13:00	3.55	NW	19:00	2.35	S
06/10/1993	08:00	3.19	SE	13:00	3.50	NW	19:00	1.9	E
07/10/1993	08:00	2.98	W	13:00	3.21	NW	19:00	2.09	SE
08/10/1993	08:00	2.46	W	13:00	3.13	W	19:00	2.17	W
09/10/1993	08:00	2.50	S	13:00	3.60	NW	19:00	2.03	NE
10/10/1993	08:00	2.67	SE	13:00	3.24	NW	19:00	2.20	SE
11/10/1993	08:00	2.96	SE	13:00	3.37	W	19:00	2.01	NE
12/10/1993	08:00	2.80	SE	13:00	3.68	W	19:00	2.29	SE
13/10/1993	08:00	2.90	SE	13:00	2.98	SE	19:00	2.14	215
14/10/1993	08:00	4.08	SE	13:00	0.38	W	19:00	2.26	NE
15/10/1993	08:00	2.36	SE	13:00	2.96	SE	19:00	2.12	SE
16/10/1993	08:00	2.74	W	13:00	2.73	NW	19:00	2.17	SE
17/10/1993	08:00	2.44	SE	13:00	2.96	NE	19:00	2.22	SE
18/10/1993	08:00	2.73	S	13:00	3.48	NW	19:00	1.91	SE
19/10/1993	08:00	3.62	SE	13:00	4.51	NW	19:00	2.44	N
20/10/1993	08:00	2.67	SE	13:00	4.32	W	19:00	2.18	SE
21/10/1993	08:00	2.15	E	13:00	3.25	N	19:00	2.10	S
22/10/1993	08:00	2.81	SE	13:00	3.42	SE	19:00	1.85	SE
23/10/1993	08:00	2.88	NW	13:00	3.12	NW	19:00	1.84	E
24/10/1993	08:00	2.25	W	13:00	3.48	N	19:00	2.16	SE
25/10/1993	08:00	3.04	SE	13:00	3.46	W	19:00	1.79	SW
26/10/1993	08:00	2.79	SE	13:00	3.66	NE	19:00	2.09	SE
27/10/1993	08:00	2.80	SW	13:00	4.12	NW	19:00	2.24	SW
28/10/1993	08:00	2.56	SE	13:00	3.66	NW	19:00	2.10	SE
29/10/1993	08:00	2.25	SW	13:00	3.59	NW	19:00	1.78	NW
30/10/1993	08:00	2.25	S	13:00	3.32	NW	19:00	3.45	E
31/10/1993	08:00	2.79	NW	13:00	3.33	NW	19:00	2.18	SE

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/11/1993	08:00	2.26	NW	13:00	2.87	NE	19:00	2.15	N
02/11/1993	08:00	2.72	SE	13:00	3.29	NW	19:00	2.40	NE
03/11/1993	08:00	3.82	SE	13:00	2.95	SW	19:00	3.20	SE
04/11/1993	08:00	2.85	E	13:00	2.16	W	19:00	2.36	SW
05/11/1993	08:00	2.09	NW	13:00			19:00	5.38	NW
06/11/1993	08:00	3.25	SW	13:00	3.00	NW	19:00	2.19	S
07/11/1993	08:00	1.92	W	13:00	3.44	SW	19:00	2.30	NE
08/11/1993	08:00	2.47	SE	13:00	3.17	SE	19:00	2.19	E
09/11/1993	08:00	3.20	SW	13:00	3.46	SE	19:00	3.12	SE
10/11/1993	08:00	3.06	NW	13:00	3.50	NE	19:00	3.61	SE
11/11/1993	08:00	2.47	W	13:00	2.81	W	19:00	2.86	E
12/11/1993	08:00	2.06	W	13:00	2.87	SW	19:00	2.67	SE
13/11/1993	08:00	2.24	W	13:00	2.90	SE	19:00	2.39	SE
14/11/1993	08:00	2.45	E	13:00	3.48	NE	19:00		
15/11/1993	08:00	3.16	SE	13:00	4.22	SE	19:00	2.19	SE
16/11/1993	08:00	2.87	SE	13:00	3.77	N	19:00	2.21	SE
17/11/1993	08:00	1.85	N	13:00	2.82	NW	19:00	2.39	SE
18/11/1993	08:00	2.18	S	13:00	3.68	NW	19:00	2.43	N
19/11/1993	08:00	2.70	E	13:00	3.31	NW	19:00	2.23	N
20/11/1993	08:00	2.11	S	13:00	3.33	N	19:00	2.24	E
21/11/1993	08:00	2.35	SE	13:00	3.49	N	19:00	2.04	S
22/11/1993	08:00	5.58	SE	13:00	2.52	NW	19:00	1.82	SE
23/11/1993	08:00	2.85	S	13:00	4.46	NW	19:00	2.47	SE
24/11/1993	08:00	2.42	S	13:00	2.66	NW	19:00	2.47	SE
25/11/1993	08:00	2.20	SE	13:00	3.00	NW	19:00	1.93	SE
26/11/1993	08:00	2.75	SW	13:00	3.90	NW	19:00	2.32	SE
27/11/1993	08:00	3.14	SE	13:00	4.17	NW	19:00	2.19	SE
28/11/1993	08:00	2.26	SE	13:00	3.39	NW	19:00	2.31	E
29/11/1993	08:00	2.56	NW	13:00	2.89	W	19:00	2.85	SE
30/11/1993	08:00	2.84	SE	13:00	3.14	W	19:00	2.80	NE
01/12/1993	08:00	2.24	SE	13:00	3.17	NW	19:00	2.79	SE
02/12/1993	08:00	2.70	N	13:00	3.53	W	19:00	2.48	SE
03/12/1993	08:00	2.32	NW	13:00	3.07	NW	19:00	2.33	SE
04/12/1993	08:00	3.54	SE	13:00	3.33	NW	19:00	2.	E
05/12/1993	08:00	3.04	SE	13:00	3.32	W	19:00	2.49	SE
06/12/1993	08:00	2.24	NW	13:00	3.68	W	19:00	2.64	SE
07/12/1993	08:00	2.65	SE	13:00	4.26	NW	19:00	2.13	SE
08/12/1993	08:00	3.06	SE	13:00	1.95	N	19:00	2.01	E
09/12/1993	08:00	2.30	SE	13:00	3.58	NW	19:00	2.31	SE
10/12/1993	08:00	2.59	SE	13:00	2.14	NW	19:00	2.07	SE
11/12/1993	08:00	2.54	SE	13:00	3.04	S	19:00	2.12	NW
12/12/1993	08:00	2.72	SE	13:00	5.03	NW	19:00		
13/12/1993	08:00	1.95	NW	13:00	3.59	NW	19:00	3.08	SE
14/12/1993	08:00	5.27	W	13:00	3.90	N	19:00	2.45	N
15/12/1993	08:00	3.13	S	13:00	3.37	W	19:00	4.62	SE
16/12/1993	08:00	3.59	SE	13:00	3.76	NW	19:00	3.21	SE
17/12/1993	08:00	2.85	S	13:00	3.50	NW	19:00	2.85	SE
18/12/1993	08:00	1.96	SW	13:00	2.07	S	19:00	2.44	SE
19/12/1993	08:00	2.84	SE	13:00	4.21	NW	19:00	2.28	E
20/12/1993	08:00	3.04	SE	13:00	2.97	N	19:00	2.13	SE
21/12/1993	08:00	3.29	E	13:00	4.50	NW	19:00	2.89	NW
22/12/1993	08:00	2.82	SE	13:00	3.97	NW	19:00	2.73	SE
23/12/1993	08:00	2.45	W	13:00	3.24	N	19:00	2.87	SE
24/12/1993	08:00	3.09	S	13:00	4.06	N	19:00	2.33	SE
25/12/1993	08:00	3.04	S	13:00	2.59	NW	19:00	2.80	SE
26/12/1993	08:00	2.74	SW	13:00	2.03	NW	19:00	3.08	E
27/12/1993	08:00	1.98	W	13:00	3.60	NW	19:00	2.23	S
28/12/1993	08:00	2.74	SW	13:00	3.34	S	19:00	2.55	N
29/12/1993	08:00	3.38	SE	13:00	4.04	NW	19:00	2.62	SE
30/12/1993	08:00	2.62	SW	13:00			19:00		
31/12/1993	08:00			13:00			19:00		

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/01/1994	08:00	3.09	W	13:00	3.28	NW	19:00	2.63	SE
02/01/1994	08:00	2.48	SE	13:00	2.55	NW	19:00	2.47	N
03/01/1994	08:00	2.51	E	13:00	2.53	SW	19:00	2.82	NW
04/01/1994	08:00	2.16	E	13:00	2.97	SE	19:00	3.76	SE
05/01/1994	08:00	2.24	SE	13:00	2.27	NW	19:00	2.44	SE
06/01/1994	08:00	2.39	E	13:00	2.39	W	19:00	3.90	NE
07/01/1994	08:00	1.79	SW	13:00	2.69	N	19:00	2.76	NE
08/01/1994	08:00	1.77	SE	13:00	2.25	NW	19:00	3.21	SE
09/01/1994	08:00	1.98	SE	13:00	2.85	SW	19:00	2.28	E
10/01/1994	08:00	2.16	SE	13:00	2.37	W	19:00	2.31	E
11/01/1994	08:00	2.43	SE	13:00	2.48	S	19:00	2.04	SE
12/01/1994	08:00	2.73	SE	13:00	2.35	NW	19:00	2.30	SE
13/01/1994	08:00	2.24	SE	13:00	2.87	NW	19:00	2.01	E
14/01/1994	08:00	2.40	NW	13:00	2.87	W	19:00	3.02	S
15/01/1994	08:00	3.22	SE	13:00	3.73	W	19:00	2.01	SE
16/01/1994	08:00	2.15	SE	13:00	3.36	SE	19:00	2.63	SE
17/01/1994	08:00	2.37	NE	13:00	2.21	W	19:00	1.75	NE
18/01/1994	08:00	2.70	SE	13:00	2.55	NW	19:00	2.87	N
19/01/1994	08:00	2.26	E	13:00	-	-	19:00	3.03	SE
20/01/1994	08:00	2.07	SE	13:00	2.53	NW	19:00	2.10	N
21/01/1994	08:00	2.29	SE	13:00	4.85	SE	19:00	1.67	SE
22/01/1994	08:00	2.20	SE	13:00	1.92	NW	19:00	2.54	N
23/01/1994	08:00	2.07	SE	13:00	2.37	NW	19:00	2.39	SE
24/01/1994	08:00	2.16	SE	13:00	1.68	NW	19:00	2.64	SE
25/01/1994	08:00	3.24	SE	13:00	2.18	NW	19:00	1.86	NW
26/01/1994	08:00	2.28	SE	13:00	2.21	W	19:00	2.10	E
27/01/1994	08:00	2.30	NW	13:00	2.81	SE	19:00	2.44	NW
28/01/1994	08:00	2.83	SE	13:00	2.71	NW	19:00	1.80	SE
29/01/1994	08:00	3.08	NE	13:00	2.72	N	19:00	2.06	N
30/01/1994	08:00	2.19	SE	13:00	2.87	SW	19:00	3.56	SE
31/01/1994	08:00	2.12	SE	13:00	2.72	SW	19:00	2.34	SE
01/02/1994	08:00	3	E	13:00	2.80	SW	19:00	3.76	SE
02/02/1994	08:00	2.42	SE	13:00	2.43	W	19:00	2.10	E
03/02/1994	08:00	2.97	SE	13:00	3.99	N	19:00	2.30	SE
04/02/1994	08:00	2.38	E	13:00	3.31	NW	19:00	2.85	-
05/02/1994	08:00	2.78	SE	13:00	2.22	E	19:00	2.98	SE
06/02/1994	08:00	1.63	E	13:00	1.91	S	19:00	3.64	SE
07/02/1994	08:00	2.36	N	13:00	2.54	NW	19:00	2.60	NW
08/02/1994	08:00	2.50	SE	13:00	2.54	NW	19:00	1.72	SE
09/02/1994	08:00	2.50	SE	13:00	1.49	NW	19:00	3.97	NW
10/02/1994	08:00	2.61	S	13:00	2.79	NW	19:00	2.29	SE
11/02/1994	08:00	2.53	SE	13:00	2.30	S	19:00	2.17	SE
12/02/1994	08:00	2.10	SE	13:00	2.28	NW	19:00	1.79	SE
13/02/1994	08:00	2.52	SE	13:00	1.91	S	19:00	1.56	SE
14/02/1994	08:00	2.52	SE	13:00	2.39	W	19:00	2.38	SE
15/02/1994	08:00	2.11	E	13:00	2.02	S	19:00	2.82	SE
16/02/1994	08:00	2.27	SE	13:00	2.47	W	19:00	2.39	SE
17/02/1994	08:00	2.49	NE	13:00	2.28	NW	19:00	1.71	SE
18/02/1994	08:00	2.28	SE	13:00	2.25	W	19:00	2.08	SE
19/02/1994	08:00	1.76	SE	13:00	2.42	SE	19:00	2.06	SE
20/02/1994	08:00	2.68	SE	13:00	2.24	W	19:00	1.92	SE
21/02/1994	08:00	2.27	SE	13:00	1.94	NW	19:00	2.10	E
22/02/1994	08:00	3.11	SE	13:00	2.70	SE	19:00	1.82	SE
23/02/1994	08:00	2.34	SE	13:00	3.90	W	19:00	3.70	SE
24/02/1994	08:00	2.35	SE	13:00	2.28	SW	19:00	1.19	SE
25/02/1994	08:00	2.23	SE	13:00	2.22	NW	19:00	3.17	SE
26/02/1994	08:00	2.52	SE	13:00	2.38	NW	19:00	1.35	SW
27/02/1994	08:00	1.80	S	13:00	3.20	N	19:00	2.84	SE
28/02/1994	08:00	2.75	S	13:00	2.73	N	19:00	2.87	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/03/1994	08:00	3.09	S	13:00	3.53	E	19:00	2.82	SE
02/03/1994	08:00	2.28	N	13:00	2.86	S	19:00	2.16	E
03/03/1994	08:00	2.09	SE	13:00	2.07	NW	19:00	4.59	NW
04/03/1994	08:00	2.35	SE	13:00	2.57	NW	19:00	3.20	SE
05/03/1994	08:00	2.26	SE	13:00	2.74	SE	19:00	2.53	SE
06/03/1994	08:00	2.22	E	13:00	2.51	SE	19:00	1.76	SE
07/03/1994	08:00	2.35	W	13:00	2.67	NW	19:00	2.31	SE
08/03/1994	08:00	1.99	W	13:00	2.37	NW	19:00	2.47	NE
09/03/1994	08:00	3.22	E	13:00	2.25	NW	19:00	3.31	SE
10/03/1994	08:00	2.09	SE	13:00	2.28	NW	19:00	3.03	SE
11/03/1994	08:00	2.06	NW	13:00	3.52	NW	19:00	2.43	E
12/03/1994	08:00	2.22	SE	13:00	2.18	NW	19:00	2.03	E
13/03/1994	08:00	2.54	SE	13:00	2.76	NW	19:00	1.55	NW
14/03/1994	08:00	2.66	SE	13:00	3.10	NW	19:00	2.35	W
15/03/1994	08:00	2.42	S	13:00	3.00	N	19:00	2.28	SE
16/03/1994	08:00	2.10	SE	13:00	2.28	NW	19:00	1.34	SE
17/03/1994	08:00	2.17	N	13:00	2.56	W	19:00	2.04	SE
18/03/1994	08:00	2.89	SE	13:00	2.14	W	19:00	1.86	NW
19/03/1994	08:00	2.61	SE	13:00	1.91	NW	19:00	1.89	E
20/03/1994	08:00	2.14	W	13:00	2.48	NW	19:00	2.59	SE
21/03/1994	08:00	1.63	NW	13:00	2.91	NW	19:00	2.85	SE
22/03/1994	08:00	2.31	W	13:00	2.73	NW	19:00	2.82	SE
23/03/1994	08:00	2.14	SE	13:00	2.43	SE	19:00	2.81	SE
24/03/1994	08:00	1.90	SE	13:00	2.80	NW	19:00	2.07	E
25/03/1994	08:00	1.90	SE	13:00	2.68	NW	19:00	2.92	SE
26/03/1994	08:00	1.90	SE	13:00	2.73	N	19:00	2.87	SE
27/03/1994	08:00	2.97	SE	13:00	3.40	W	19:00	1.55	SE
28/03/1994	08:00	2.48	SE	13:00	2.22	NW	19:00	2.34	SE
29/03/1994	08:00	2.46	SE	13:00	1.89	NW	19:00	2.18	SE
30/03/1994	08:00	3.20	SE	13:00	2.63	NW	19:00	2.46	SE
31/03/1994	08:00	2.84	SE	13:00	2.68	N	19:00	3.03	NE
01/04/1994	08:00	2.03	E	13:00	2.06	NW	19:00	2.24	SE
02/04/1994	08:00	2.84	W	13:00	3.39	W	19:00	2.30	SE
03/04/1994	08:00	3.19	NW	13:00	4.57	SE	19:00	2.30	
04/04/1994	08:00	2.78	SE	13:00	4.03	NW	19:00	3.75	S
05/04/1994	08:00	2.89	SE	13:00	4.14	NW	19:00	2.61	SE
06/04/1994	08:00	2.05	NW	13:00	3.14	NW	19:00	4.69	SE
07/04/1994	08:00	2.26	SE	13:00	3.94	SE	19:00	3.55	SE
08/04/1994	08:00	2.82	SE	13:00	3.03	NW	19:00	3.61	SE
09/04/1994	08:00	1.47	S	13:00	2.37	NW	19:00	2.23	SE
10/04/1994	08:00	2.56	SE	13:00	4.45	NW	19:00	2.19	E
11/04/1994	08:00	3.33	SE	13:00	4.66	W	19:00	2.35	SE
12/04/1994	08:00	2.82	E	13:00	4.21	NE	19:00	2.24	E
13/04/1994	08:00	2.10	NW	13:00	2.69	SE	19:00	3.29	SE
14/04/1994	08:00	1.92	SE	13:00	3.04	N	19:00	3.01	SE
15/04/1994	08:00	2.37	NW	13:00	2.85	W	19:00	2.09	N
16/04/1994	08:00	2.67	SE	13:00	2.44	NW	19:00	2.14	SE
17/04/1994	08:00	2.89	SE	13:00	2.72	NW	19:00	1.72	E
18/04/1994	08:00	1.05	SE	13:00	2.54	NW	19:00	2.45	SE
19/04/1994	08:00	2.88	SE	13:00	3.04	NW	19:00	2.13	SE
20/04/1994	08:00	3.32	SE	13:00	2.61	NW	19:00	6.78	SE
21/04/1994	08:00	0.88	SE	13:00	2.74	NW	19:00	2.25	E
22/04/1994	08:00	2.42	SE	13:00	3.02	NW	19:00	2.06	SE
23/04/1994	08:00	2.32	SE	13:00	2.89	NW	19:00	2.33	E
24/04/1994	08:00	2.34	SE	13:00	2.95	NE	19:00	1.70	SE
25/04/1994	08:00	2.28	E	13:00	5.19	SE	19:00	2.69	SE
26/04/1994	08:00	4.48	SE	13:00	5.11	SE	19:00	6.14	SE
27/04/1994	08:00	5.66	SE	13:00	4.36	SE	19:00	3.31	SE
28/04/1994	08:00	5.33	SE	13:00	4.57	NW	19:00	2.33	S
29/04/1994	08:00	3.93	SE	13:00	3.90	NW	19:00	3.11	SE
30/04/1994	08:00	4.03	SE	13:00	3.13	W	19:00	3.49	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu , March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/05/1994	08:00	2.82	SE	13:00	5.10	SE	19:00	4.38	SE
02/05/1994	08:00	4.43	SE	13:00	3.97	NW	19:00	2.28	SE
03/05/1994	08:00	2.91	SW	13:00	3.10	NW	19:00	2.51	SE
04/05/1994	08:00	2.81	S	13:00	3.66	NW	19:00	2.19	E
05/05/1994	08:00	2.91	SE	13:00	3.07	NW	19:00	2.25	SE
06/05/1994	08:00	3.03	SE	13:00	3.23	NW	19:00	2.27	SE
07/05/1994	08:00	2.45	SE	13:00	3.86	NW	19:00	2.39	N
08/05/1994	08:00	5.27	SE	13:00	3.77	N	19:00	2.33	E
09/05/1994	08:00	3.36	SE	13:00	3.61	NW	19:00	2.18	SE
10/05/1994	08:00	2.77	SE	13:00	3.63	NW	19:00	2.24	SE
11/05/1994	08:00	3.06	SE	13:00	3.74	NW	19:00	2.44	S
12/05/1994	08:00	2.78	SE	13:00	4.06	SW	19:00	2.73	SE
13/05/1994	08:00	3.08	SE	13:00	5.65	SE	19:00	2.97	SE
14/05/1994	08:00	3.06	SE	13:00	5.26	SE	19:00	2.42	E
15/05/1994	08:00	4.49	SE	13:00	3.79	W	19:00	3.11	SE
16/05/1994	08:00	5.02	SE	13:00	4.29	NW	19:00	2.42	SE
17/05/1994	08:00	2.50	SE	13:00	3.57	NW	19:00	1.99	E
18/05/1994	08:00	2.64	SE	13:00	3.38	N	19:00	2.23	SE
19/05/1994	08:00	2.34	SE	13:00	3.39	NW	19:00	1.82	SE
20/05/1994	08:00	3.31	SE	13:00	3.74	NW	19:00	2.36	SE
21/05/1994	08:00	2.79	SE	13:00	3.15	N	19:00	2.19	SE
22/05/1994	08:00	3.08	SE	13:00	3.35	NW	19:00	1.82	SE
23/05/1994	08:00	3.18	SE	13:00	2.40	NW	19:00	2.97	NE
24/05/1994	08:00	3.40	SE	13:00	3.94	N	19:00	3.06	SE
25/05/1994	08:00	5.33	SE	13:00	4.72	W	19:00	2.74	SE
26/05/1994	08:00	6.14	SE	13:00	4.45	W	19:00	2.81	SE
27/05/1994	08:00	7.53	SE	13:00	4.10	W	19:00	1.95	E
28/05/1994	08:00	4.34	SW	13:00	3.13	NW	19:00	3.06	SE
29/05/1994	08:00	2.62	SE	13:00	3.68	W	19:00	2.38	SE
30/05/1994	08:00	4.95	SE	13:00	3.88	W	19:00	3.39	SE
31/05/1994	08:00	6.49	SE	13:00	5.56	NW	19:00	2.38	SE
01/06/1994	08:00	6.99	SE	13:00	3.88	W	19:00	3.51	S
02/06/1994	08:00	4.38	-	13:00	5.41	SE	19:00	4.45	SE
03/06/1994	08:00	5.59	SE	13:00	4.29	W	19:00	2.70	E
04/06/1994	08:00	6.45	SE	13:00	4.55	W	19:00	2.69	SE
05/06/1994	08:00	4.36	SE	13:00	2.31	W	19:00	3.71	SE
06/06/1994	08:00	3.57	NW	13:00	3.04	W	19:00	2.14	SE
07/06/1994	08:00	5.19	SE	13:00	5.91	W	19:00	2.41	SE
08/06/1994	08:00	5.82	SE	13:00	4.22	W	19:00	2.28	SE
09/06/1994	08:00	5.41	W	13:00	3.41	NW	19:00	3.80	SE
10/06/1994	08:00	6.97	SE	13:00	4.31	W	19:00	5.58	SE
11/06/1994	08:00	8.50	SE	13:00	2.03	NW	19:00	9.17	SE
12/06/1994	08:00	9.01	SE	13:00	2.33	W	19:00	4.24	SE
13/06/1994	08:00	8.10	SE	13:00	3.98	W	19:00	2.75	SE
14/06/1994	08:00	5.85	SE	13:00	4.44	W	19:00	2.20	SE
15/06/1994	08:00	5.21	NE	13:00	4.23	NW	19:00	3.82	SE
16/06/1994	08:00	6.00	SE	13:00	2.44	NW	19:00	2.38	SE
17/06/1994	08:00	6.31	SE	13:00	4.33	NW	19:00	1.80	SE
18/06/1994	08:00	3.84	SE	13:00	3.50	W	19:00	1.99	SE
19/06/1994	08:00	4.54	S	13:00	4.46	NE	19:00	1.54	E
20/06/1994	08:00	4.34	SE	13:00	4.46	NW	19:00	1.83	E
21/06/1994	08:00	3.75	W	13:00	3.88	NW	19:00	1.85	SE
22/06/1994	08:00	2.70	SE	13:00	3.54	NW	19:00	1.76	SE
23/06/1994	08:00	3.30	SE	13:00	3.29	NW	19:00	2.13	E
24/06/1994	08:00	3.07	SE	13:00	3.91	NW	19:00	2.36	S
25/06/1994	08:00	3.11	SE	13:00	3.91	W	19:00	2.26	S
26/06/1994	08:00	4.17	SE	13:00	3.63	NW	19:00	2.03	SE
27/06/1994	08:00	2.79	SE	13:00	3.12	NW	19:00	2.00	SE
28/06/1994	08:00	2.37	E	13:00	2.57	NW	19:00	1.71	SE
29/06/1994	08:00	2.25	W	13:00	2.50	W	19:00	2.09	SE
30/06/1994	08:00	3.07	S	13:00	3.53	W	19:00	1.82	SE

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu ' March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/07/1994	08:00	4.36	SE	13:00	4.61	SE	19:00	3.30	SE
02/07/1994	08:00	6.68	SE	13:00	5.14	SE	19:00	3.85	SE
03/07/1994	08:00	5.84	SE	13:00	4.00	SE	19:00	3.72	SE
04/07/1994	08:00	7.23	SE	13:00	4.54	W	19:00	2.54	SE
05/07/1994	08:00	3.24	SE	13:00	4.29	W	19:00	2.42	SE
06/07/1994	08:00	7.35	SE	13:00	4.55	SE	19:00	4.02	SE
07/07/1994	08:00	7.45	SE	13:00	6.14	SE	19:00	4.41	SE
08/07/1994	08:00	5.65	SE	13:00	4.18	NW	19:00	2.12	SE
09/07/1994	08:00	3.49	SE	13:00	3.70	N	19:00	1.85	SE
10/07/1994	08:00	3.06	SE	13:00	3.34	W	19:00	1.68	SE
11/07/1994	08:00	4.29	SW	13:00	3.54	NW	19:00	1.90	SE
12/07/1994	08:00	8.23	SE	13:00	4.09	W	19:00	4.70	SE
13/07/1994	08:00	10.03	SE	13:00	5.38	SE	19:00	4.12	SE
14/07/1994	08:00	8.71	SE	13:00	4.88	NW	19:00	2.33	SE
15/07/1994	08:00	7.89	SW	13:00	3.67	W	19:00	2.18	E
16/07/1994	08:00	5.88	SE	13:00	4.35	W	19:00	2.10	SE
17/07/1994	08:00	7.84	SE	13:00	1.91	NW	19:00	4.90	SE
18/07/1994	08:00	6.88	SE	13:00	1.99	W	19:00	5.41	NE
19/07/1994	08:00	7.84	SE	13:00	4.68	W	19:00	1.97	E
20/07/1994	08:00	8.50	SE	13:00	2.98	W	19:00	3.91	SE
21/07/1994	08:00	3.39	SE	13:00	3.95	NW	19:00	2.47	SE
22/07/1994	08:00	5.31	SE	13:00	4.78	W	19:00	2.45	SE
23/07/1994	08:00	5.54	SE	13:00	4.14	NW	19:00	2.33	N
24/07/1994	08:00	3.40	SE	13:00	3.84	W	19:00	1.98	NE
25/07/1994	08:00	2.71	SE	13:00	3.09	NW	19:00	2.10	N
26/07/1994	08:00	2.10	SE	13:00	2.80	NW	19:00	2.15	SE
27/07/1994	08:00	2.54	SE	13:00	4.16	W	19:00	1.96	SE
28/07/1994	08:00	8.61	SE	13:00	7.63	SE	19:00	5.62	SE
29/07/1994	08:00	4.21	SE	13:00	6.22	SE	19:00	2.21	SE
30/07/1994	08:00	12.62	SE	13:00	7.14	SE	19:00	6.10	SE
31/07/1994	08:00	7.80	SE	13:00	5.06	SE	19:00	2.24	SE
01/08/1994	08:00	5.79	SE	13:00	3.87	NW	19:00	2.32	SE
02/08/1994	08:00	4.04	SE	13:00	4.27	NW	19:00	2.84	SE
03/08/1994	08:00	4.14	SE	13:00	6.21	NW	19:00	8.43	SE
04/08/1994	08:00	3.58	SE	13:00	4.37	NW	19:00	2.37	SE
05/08/1994	08:00	8.97		13:00	4.25	NW	19:00	3.06	SE
06/08/1994	08:00	7.90	SE	13:00	4.31	NW	19:00	3.70	SE
07/08/1994	08:00	3.78	SE	13:00	4.48	NW	19:00	2.22	SE
08/08/1994	08:00	3.38	SE	13:00	3.74	NW	19:00	2.46	SE
09/08/1994	08:00	2.61	SE	13:00	3.26	NW	19:00	1.75	SE
10/08/1994	08:00	4.31	SE	13:00	3.44	NW	19:00	1.83	NE
11/08/1994	08:00	2.85	SE	13:00	3.94	NW	19:00	1.77	NE
12/08/1994	08:00	4.94	SE	13:00	4.77	NW	19:00	1.99	N
13/08/1994	08:00	3.37	SE	13:00	3.02	NW	19:00	2.55	SE
14/08/1994	08:00	2.13	S	13:00	3.07	NW	19:00	1.84	SE
15/08/1994	08:00	3.34	SE	13:00	3.31	NW	19:00	1.62	NE
16/08/1994	08:00	4.36	SE	13:00	4.18	NW	19:00	0.77	NE
17/08/1994	08:00	3.07	SE	13:00	3.74	W	19:00	1.77	E
18/08/1994	08:00	7.32	SE	13:00	4.20	NW	19:00	1.76	SE
19/08/1994	08:00	5.45	SE	13:00	3.90	NW	19:00	1.82	NW
20/08/1994	08:00	2.71	SE	13:00	3.15	NW	19:00	1.92	NW
21/08/1994	08:00	2.03	SE	13:00	3.09	NW	19:00	2.16	NE
22/08/1994	08:00	2.27	SE	13:00	5.76	SE	19:00	6.70	SE
23/08/1994	08:00	3.62	SE	13:00	6.28	SE	19:00	5.59	SE
24/08/1994	08:00	6.12	SE	13:00	4.56	SE	19:00	7.38	SE
25/08/1994	08:00	6.79	SE	13:00			19:00	9.72	SE
26/08/1994	08:00	6.07	SE	13:00	5.13	W	19:00	2.89	NW
27/08/1994	08:00	6.43	SE	13:00	4.71	W	19:00	2.80	SE
28/08/1994	08:00	2.88	SE	13:00	4.66	NW	19:00	2.88	NW
29/08/1994	08:00	3.46	SE	13:00	5.00	W	19:00	2.28	SE
30/08/1994	08:00	2.05	SE	13:00	9.72	NW	19:00	2.47	NW
31/08/1994	08:00	4.26	SE	13:00	4.64	NW	19:00	2.02	E

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Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08:00, 13:00 and 19:00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/09/1994	08:00	2.86	SE	13:00	3.66	W	19:00	1.87	NW
02/09/1994	08:00	4.02	SE	13:00	4.68	W	19:00	2.11	N
03/09/1994	08:00	5.05	SE	13:00	4.42	NW	19:00	1.88	SE
04/09/1994	08:00	3.32	SE	13:00	4.51	NW	19:00	1.76	E
05/09/1994	08:00	4.33	SE	13:00	4.44	W	19:00	2.16	NW
06/09/1994	08:00	3.58	SE	13:00	3.95	NW	19:00	2.08	W
07/09/1994	08:00	3.73	SE	13:00	4.71	W	19:00	1.86	SE
08/09/1994	08:00	2.13	SE	13:00	3.50	W	19:00	1.91	SE
09/09/1994	08:00	5.84	SE	13:00	7.49	SE	19:00	5.79	SE
10/09/1994	08:00	7.67	SE	13:00	5.93	NW	19:00	3.84	SE
11/09/1994	08:00	4.52	SE	13:00	4.84	NW	19:00	2.36	SE
12/09/1994	08:00	3.44	SE	13:00	3.73	N	19:00	2.00	SE
13/09/1994	08:00	2.65	SE	13:00	3.27	NW	19:00	2.67	SE
14/09/1994	08:00	2.21	S	13:00	2.70	N	19:00	3.21	SE
15/09/1994	08:00	1.50	S	13:00	3.53	W	19:00	2.17	N
16/09/1994	08:00	2.38	SE	13:00	4.82	W	19:00	1.82	N
17/09/1994	08:00	2.36	SE	13:00	4.23	NW	19:00	1.95	SE
18/09/1994	08:00	2.76	SE	13:00	3.89	NW	19:00	1.71	NE
19/09/1994	08:00	3.06	SE	13:00	3.73	NW	19:00	1.80	NE
20/09/1994	08:00	3.04	SE	13:00	3.72	NW	19:00	2.10	NE
21/09/1994	08:00	4.59	SE	13:00	4.52	NW	19:00	2.10	SW
22/09/1994	08:00	2.58	SE	13:00	3.73	NW	19:00	1.86	N
23/09/1994	08:00	3.12	SE	13:00	3.60	NW	19:00	2.39	N
24/09/1994	08:00	2.85	SE	13:00	3.83	W	19:00	2.51	W
25/09/1994	08:00	3.10	NW	13:00	3.05	N	19:00	2.20	S
26/09/1994	08:00	2.94	SE	13:00	2.96	W	19:00	1.84	SE
27/09/1994	08:00	4.00	SE	13:00	3.47	NW	19:00	1.79	NE
28/09/1994	08:00	3.51	SE	13:00	3.29	SE	19:00	1.80	N
29/09/1994	08:00	2.07	SE	13:00	3.13	W	19:00	1.82	SE
30/09/1994	08:00	2.23	NE	13:00	2.74	NW	19:00	1.85	SE
01/10/1994	08:00	3.70	SW	13:00	3.70	W	19:00	2.35	NW
02/10/1994	08:00	3.41	NE	13:00	3.98	NW	19:00	3.13	E
03/10/1994	08:00	2.57	SE	[illegible]	3.33	SE	19:00	3.41	E
04/10/1994	08:00	2.60	SE	13:00	3.04	NW	19:00	2.47	E
05/10/1994	08:00	2.65	SE	13:00	5.30	NW	19:00	2.63	E
06/10/1994	08:00	2.67	SE	13:00	5.25	SE	19:00	3.84	SE
07/10/1994	08:00	5.11	SE	13:00	4.86	NW	19:00	2.46	SE
08/10/1994	08:00	3.13	W	13:00	3.97	NE	19:00	1.95	E
09/10/1994	08:00	2.69	SE	13:00	4.03	NW	19:00	1.61	SE
10/10/1994	08:00	2.36	SE	13:00	3.16	NW	19:00	1.88	S
11/10/1994	08:00	2.40	NW	13:00	3.93	SW	19:00	2.50	E
12/10/1994	08:00	2.26	S	13:00	3.35	W	19:00	2.14	SE
13/10/1994	08:00	2.37	S	13:00	3.35	NW	19:00	3.44	SE
14/10/1994	08:00	1.86	SE	13:00	3.34	N	19:00	1.97	E
15/10/1994	08:00	3.43	S	13:00	4.34	N	19:00	2.49	E
16/10/1994	08:00	4.08	SE	13:00	5.00	NW	19:00	2.45	NE
17/10/1994	08:00	3.74	SE	13:00	4.92	NW	19:00	2.47	NE
18/10/1994	08:00	4.49	S	13:00	4.35	NW	19:00	3.09	SE
19/10/1994	08:00	2.54	SW	13:00	3.57	NW	19:00	3.02	SE
20/10/1994	08:00	2.47	SW	13:00	3.82	NW	19:00	2.46	E
21/10/1994	08:00	2.09	S	13:00	3.67	NW	19:00	2.03	NE
22/10/1994	08:00	2.53	NW	13:00	3.44	NW	19:00	2.81	SE
23/10/1994	08:00	3.03	SE	13:00	3.53	NW	19:00	2.37	E
24/10/1994	08:00	2.11	NW	13:00	3.55	NW	19:00	2.54	E
25/10/1994	08:00	2.96	SE	13:00	4.21	N	19:00	2.50	NE
26/10/1994	08:00	2.58	S	13:00	4.39	W	19:00	2.58	NE
27/10/1994	08:00	2.66	NW	13:00	4.72	NW	19:00	3.37	SE
28/10/1994	08:00	2.45	NE	13:00	4.17	NW	19:00	2.64	SE
29/10/1994	08:00	1.95	N	13:00	3.15	N	19:00	3.45	N
30/10/1994	08:00	2.10	W	13:00	3.17	N	19:00	2.55	E
31/10/1994	08:00	2.28	NW	13:00	4.57	NW	19:00	2.35	SW

cont'd

Appendix 9: Average wind speed and wind direction of anemoter station of Mpulungu March 1993-December 1994 recorded at 08 00, 13 00 and 19 00 h

cont'd

DATE	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION	TIME	AV. WIND PEED (m/sec	WIND DIRECTION
01/11/1994	08:00	2.77	SE	13:00	3.81	N	19:00	1.76	W
02/11/1994	08:00	2.56	SE	13:00	4.83	SE	19:00	2.62	SE
03/11/1994	08:00	3.30	W	13:00	5.08	SE	19:00	2.55	SE
04/11/1994	08:00	2.54	NW	13:00	4.07	NW	19:00	2.13	E
05/11/1994	08:00	2.01	SE	13:00	3.71	NW	19:00	2.43	SE
06/11/1994	08:00	2.50	SE	13:00	4.16	NW	19:00	2.65	SE
07/11/1994	08:00	1.77	NW	13:00	5.10	NW	19:00	3.63	SE
08/11/1994	08:00	2.54	NW	13:00	4.62	NW	19:00	3.09	NW
09/11/1994	08:00	2.32	W	13:00	3.62	NW	19:00	3.54	E
10/11/1994	08:00	2.30	W	13:00	3.75	NW	19:00	3.22	SE
11/11/1994	08:00	2.98	SE	13:00	3.31	NW	19:00	2.32	SE
12/11/1994	08:00	2.68	NW	13:00	3.52	NW	19:00	2.45	E
13/11/1994	08:00	2.91	SE	13:00	3.81	E	19:00	2.70	E
14/11/1994	08:00	2.84	SE	13:00	3.58	E	19:00	2.93	SW
15/11/1994	08:00	1.76	SW	13:00	3.85	W	19:00	3.17	N
16/11/1994	08:00	2.43	W	13:00	4.87	N	19:00	2.51	S
17/11/1994	08:00	2.46	NW	13:00	3.98	N	19:00	2.72	E
18/11/1994	08:00	2.44	S	13:00	3.79	NW	19:00	2.71	S
19/11/1994	08:00	3.09	E	13:00	4.38	SE	19:00	2.84	SE
20/11/1994	08:00	2.48	SW	13:00	4.38	NW	19:00	2.43	W
21/11/1994	08:00	2.99	W	13:00	3.74	N	19:00	3.05	S E
22/11/1994	08:00	2.53	NW	13:00	3.73	NW	19:00	2.78	W
23/11/1994	08:00	2.31	W	13:00	4.45	NW	19:00	2.95	W
24/11/1994	08:00	2.51	W	13:00	3.04	NW	19:00	2.10	N
25/11/1994	08:00	2.01	NW	13:00	2.78	NW	19:00	1.90	W
26/11/1994	08:00	1.92	E	13:00	2.87	SE	19:00	2.50	SE
27/11/1994	08:00	2.33	SE	13:00	4.06	NW	19:00	1.74	E
28/11/1994	08:00	2.21	W	13:00	4.16	SE	19:00	2.58	SE
29/11/1994	08:00	1.83	SE	13:00	2.30	S	19:00	2.90	SE
30/11/1994	08:00	2.43	SE	13:00	3.07	NW	19:00	3.07	NW
01/12/1994	08:00	1.81	W	13:00	3.29	NW	19:00	2.48	NE
02/12/1994	08:00	2.16	E	13:00	3.31	NW	19:00	2.37	N
03/12/1994	08:00	2.29	SE	13:00	2.29	NW	19:00	2.55	SE
04/12/1994	08:00	2.31	SE	13:00	2.88	SE	19:00	2.49	SE
05/12/1994	08:00	2.44	SE	[illegible]	2.50	SE	19:00	2.19	SE
06/12/1994	08:00	1.78	SE	13:00	3.16	W	19:00	2.66	NW
07/12/1994	08:00	2.61	S	13:00	3.21	NW	19:00	2.54	NW
08/12/1994	08:00	2.12	SE	13:00	3.06	NW	19:00	2.22	NW
09/12/1994	08:00	2.52	SE	13:00	3.66	NW	19:00	3.11	NW
10/12/1994	08:00	2.03	N	13:00	4.02	N	19:00	2.29	SE
11/12/1994	08:00	3.12	SE	13:00	2.69	SE	19:00	1.91	SE
12/12/1994	08:00	2.34	SE	13:00	2.35	W	19:00	2.73	SE
13/12/1994	08:00	2.67	SE	13:00	2.86	NW	19:00	2.09	SE
14/12/1994	08:00	1.86	W	13:00	2.63	W	19:00	2.15	SE
15/12/1994	08:00	2.15	W	13:00	3.25	NW	19:00	2.66	SE
16/12/1994	08:00	2.47	SE	13:00	3.40	NW	19:00	1.96	SE
17/12/1994	08:00	2.17	N	13:00	3.14	NW	19:00	2.45	E
18/12/1994	08:00	2.73	SE	13:00	2.76	NW	19:00	2.64	SE
19/12/1994	08:00	2.86	SE	13:00	2.82	NW	19:00	2.39	NW
20/12/1994	08:00	2.26	SE	13:00	2.12	NW	19:00	1.80	NW
21/12/1994	08:00	2.22	SE	13:00	3.23	NW	19:00	2.07	S
22/12/1994	08:00	2.77	SE	13:00	2.81	NW	19:00	2.48	NE
23/12/1994	08:00	2.54	S	13:00	3.31	NW	19:00	2.67	E
24/12/1994	08:00	2.89	SE	13:00	3.23	S	19:00	2.92	SE
25/12/1994	08:00	2.90	W	13:00	1.01	NW	19:00	3.53	SE
26/12/1994	08:00	2.00	SE	13:00	2.62	NW	19:00	2.52	SE
27/12/1994	08:00	1.95	S	13:00	3.72	NW	19:00	3.21	N
28/12/1994	08:00	2.19	SE	13:00	2.50	W	19:00	2.63	E
29/12/1994	08:00	2.53	SE	13:00	3.21	NW	19:00	2.93	E
30/12/1994	08:00	2.37	N	13:00	2.91	SE	19:00	2.21	S
31/12/1994	08:00	2.14	SE	13:00	2.59	N	19:00	3.40	SE