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Introduction to Physics Research
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Radar Meteorology
with a 54.1 MHz Boundary Layer Radar

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Abstract

The principles of radar meteorology are shown. A radar set measures distances and velocities of objects using radio waves. By measuring the diffraction pattern of clear air backscattering it is possible to measure the wind velocities in all three directions. Different Atmospheric phenomena have different signal patterns. These patterns are correlated to surface data and data from soundings. The signal of a cold front and a high pressure region are examined in more detail in this report. A cold front shows a weakening in the signal strength and a change in the wind direction. At the front of a cold front an upward motion of the air is observed, in the cold front a strong downward movement. A high pressure region shows a large pattern scale of the diffraction pattern.

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1. Introduction

The weather is a chaotic system. This means that even with lots of data, it is not always possible to forecast the weather precisely for the next days. Very small changes in the atmosphere can have dramatic effects on the weather. Chaos Theory even predicts that the beat of the wing of a butterfly over China can change the weather over North America. This was recognised when simulations of the atmosphere were first used to forecast the weather. A small change of the initial conditions given to the computer resulted in a complete different forecast for in a week (see [8]).

But on the other hand, there are situations in chaotic systems where it is possible to make forecasts. Then, even bigger changes of the parameters given to the computer result in an only slightly different forecast. And in all the situations in between it means, the more precise the measurements are, the better the forecast will be.

Therefore, it is important to find new ways of measuring the atmosphere. The measurements used for weather forecasts at the moment are mainly the ground based measurement of the pressure, the temperature, the dew point, the wind speed and direction. In addition to that, there are radiosondes launched all over the world twice a day. And the third important technique are satellite observations. But there are no continuous measurements of the different layers of the atmosphere. This is the big advantage of radar observations. An upward pointing radar can take simultaneously measurements in different heights of the atmosphere.

In this article, I will describe the 54.1 MHz Boundary Layer Radar of the Atmospheric Physics Group at the University of Adelaide. I will describe how the Radar works, what can be seen in the signal and will compare some data of the radar with the weather over Adelaide.

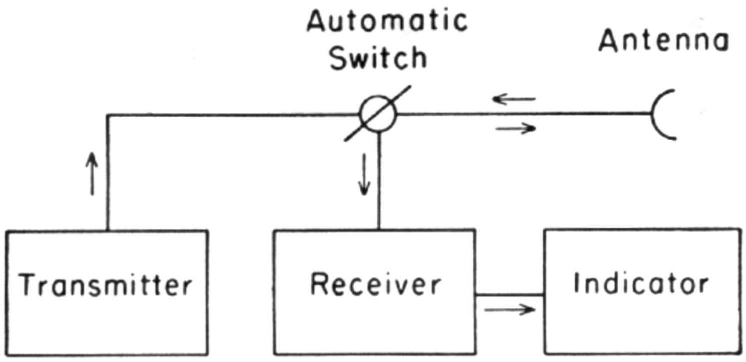

Figure 1: Block diagram of a radar set (from [3])

2. Radar Meteorology

2.1. Principles of radar

The word ‘radar’ is an acronym for ‘*ra*dio *d*etecting *a*nd *r*anging’. A radar uses electromagnetic (radio) waves to detect objects. These objects can range from large objects like aircrafts to very small objects like cloud droplets. It is also possible to detect large index-of-refraction gradients, in the ‘clear’ atmosphere.

The principle of a radar system is always the same and is shown in Figure 1. The transmitter generates a signal pulse of a given frequency which is transmitted by the antenna. Often, but not always, the same antenna is used to receive the backscattered signal. The automatic switch is used to close of the receiver during the time, the signal is transmitted. By measuring the time between transmitting and receiving a signal, it is possible to measure the range of an object.

It is important that the time between two radar pulses is long enough. Otherwise the antenna might detect a signal backscattered from a far away object arriving after a new pulse is send. This signal might then be mistaken as a signal from much nearer object.

The power of the backscattered signal depends on the size, the shape and the material of the object. In precipitation radars, the power of the signal is often used to measure the size of the raindrops or the amount of rain falling. By making assumptions on the distribution of raindrop sizes it is even possible to estimate both the average size and the amount of water (see [2]).

In the case of an single isolated hard target at a range r, the received Power P_r is given by the equation

$$P_r = P_t \frac{A_e^2}{4\pi\lambda^2 r^4}\sigma \quad (1)$$

where A_e is the effective antenna area, P_t is the transmitted peak power and σ is the backscatter cross-section of the target. (For a derivation of equation 1 see [5, page 149].)

Using Doppler techniques, it is also possible to measure the speed of a target. The phase of the received signal ψ_r is given by the equation

$$\psi_r = -\frac{4\pi r}{\lambda} + \psi_t + \psi_s \quad (2)$$

where ψ_t is the transmitted phase and ψ_s is the phase shift upon scattering. By assuming that ψ_s is time independent, it is possible to measure the speed of the object relative to the radar by measuring the change of the phase with time:

$$\frac{\mathrm{d}\psi_r}{\mathrm{d}t} = -\frac{4\pi}{\lambda} v_r \quad (3)$$

v_r is the radial velocity relative to the radar. To measure the total velocity of the object, a beam from more than one direction is needed. The simplest way to measure the phase shift, is to compare the phase of the received signal with a coherent local signal.

This is the picture of Doppler technique in the time domain. In the frequency domain it just means that an object travelling towards the radar emits a frequency higher than the emitted frequency, an object travelling away from the radar lowers the frequency.

2.2. Clear air signals

The observation of atmospheric ‘objects’ is a bit more complicated. If there are many scatterers which are randomly distributed in a volume, the received power is not proportional to $\frac{1}{r^4}$ but to $\frac{1}{r^2}$. The equation for this case is

$$P_r = \frac{\pi}{64} \frac{P_t A_e \Delta R}{r^2} \eta \quad (4)$$

where η is the volume reflectivity and ΔR is the radar pulse length.

Equation 4 is useful for observations of precipitation or the observation of clouds. In these observation the received signal is scattered from the raindrops in a volume or the small drops in a cloud. The main signal receiving when observing clear air with a radar comes from inhomogeneities in the index of refraction n. The equation for the index of refraction of air is:

$$n - 1 = \frac{0.373e}{T^2} + \frac{77.6 \cdot 10^{-6} p}{T} - \frac{N_e}{2N_c}. \tag{5}$$

p is in this equation the atmospheric and e the vapor pressure in hPa. T is the temperature in K, N_e is the number density of electrons and N_c is the critical plasma density. The third term in equation 5 describes the dependence of n on the number of free electrons. It can be neglected in the troposphere because there are not many free electrons. The second term is known as the dry term and is dominant in the mid-troposphere up to the stratosphere. The first term is the most important in the lower troposphere and is known as the wet term. It shows the dependence of n on the amount of water in the air. It is the most important, because of the large variations in moisture in the troposphere. So the largest rate of change in index of refraction is at a boundary between a layer of dry and warm air and a layer of moist and cold air.

2.3. The Boundary Layer Radar at Buckland Park

The Boundary Layer Radar of the Atmospheric Physics Group at the University of Adelaide operates in the Very High Frequency (VHF) Band. Most other Boundary Layer Radars operate at much higher frequency. The reasons are mostly of practical nature. It is much more technical effort to build a VHF-radar which can do measurements lower than 1 km of height. The VHF radars have to have larger antennas than Ultra High Frequency (UHF) radars in order to keep the antennas large compared to the wavelength. The larger antenna array also demand a longer delay between sending and receiving.

Operating a Boundary Layer Radar at 54.1 MHz has many advantages. "Precipitation echoes are comparable in strength to, or weaker than, the clear-air echoes and the precipitation and clear-air echoes are usually well separated in the Doppler spectrum." (from [1, page 846]). This means that it is possible to

Figure 2: Picture of the Boundary Layer Radar

distinguish the velocity of air and raindrops in precipitation measurements. The wind measurements are not limited to fine days without low clouds and rain. Because of their longer wavelength, VHF radars are less sensitive to echos from birds and insects, although their signal can be contaminated by large objects like airplanes.

The configuration of the Boundary Layer Radar has undergone several improvements in the last years. Figure 2 shows a picture of the first antenna design. The configuration used for the measurements in this project is the Third Generation Array. It consists of three arrays with nine antennas each. The antennas are three element Yagis suitable for 54.1 MHz.

The radar uses a technique called full correlation analysis (FCA) to measure the wind speeds in the different directions. The different antennas measure the diffraction pattern caused by anisotropies in the index of refraction. By measuring the auto-correlation and cross-correlation functions it is possible to calculate the parameters of an ellipsoid approximation of the spatial-temporal-correlation function. These parameters are used to get information about the anisotropy pattern causing the diffraction. Calculated properties are the shape of the pattern, the horizontal and the vertical speed.

3. Observations with the 54.1 MHz Boundary Layer Radar

The aim of my project was to compare the radar signals of two weeks with the actual weather in Adelaide and trying to find correlations. The weather data I used are observations by sight and perceptible differences (see appendix A) on the one hand and measurements of atmospheric data obtained from the Bureau of Meteorology (see appendix B) on the other hand.

3.1. Observation data

Figure 3 shows the graph of data observed by the Boundary Layer Radar. Software written in IDL is used to plot the data obtained by Full Correlation Analysis and averaged over the period of one hour. The top graph shows the signal-to-noise ratio which is a measurement of the strength of the backscattered signal.

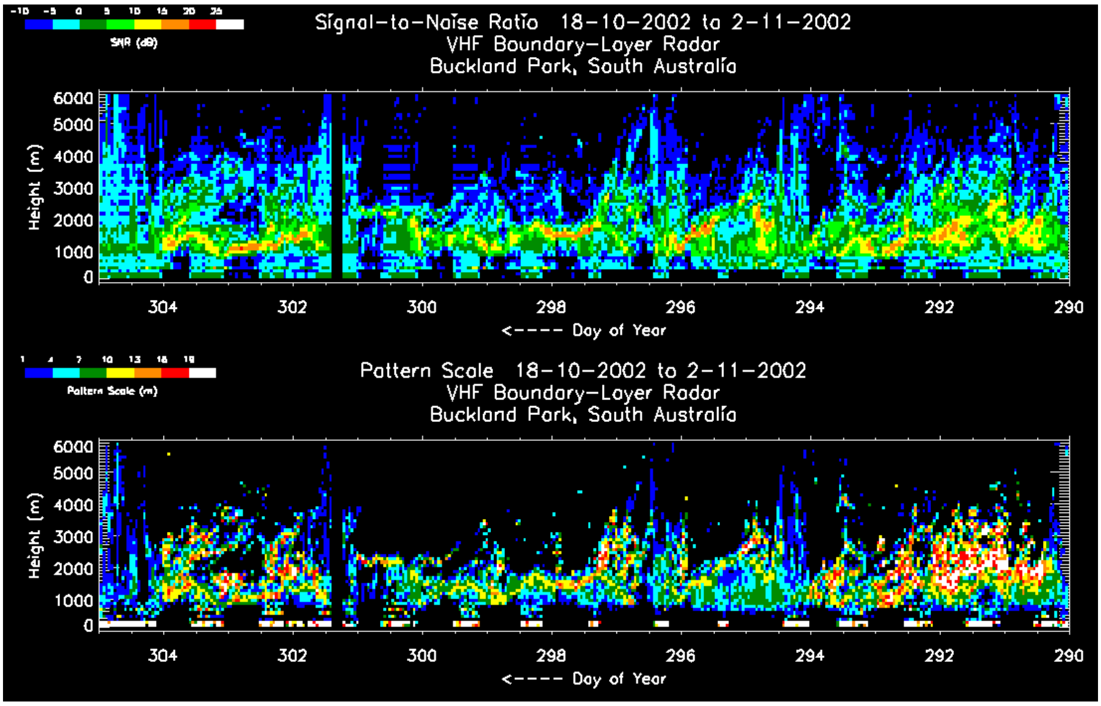

Figure 3: Signal-to-Noise Ratio and Pattern Scale from 18. October to 2. November 2002

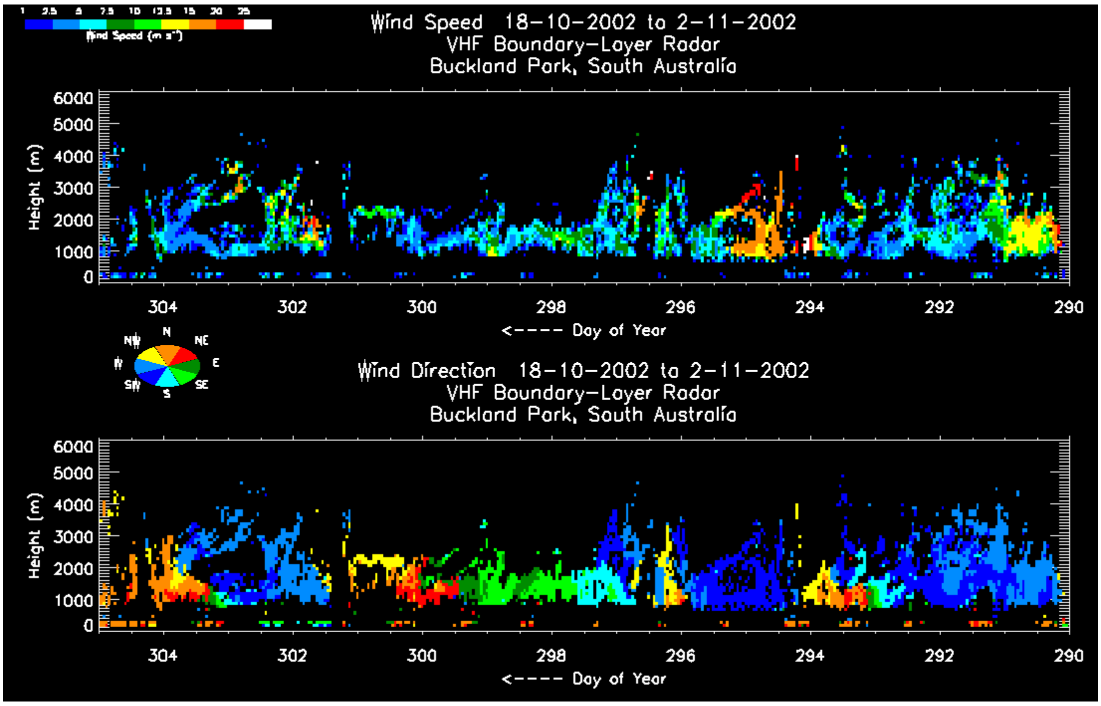

Figure 4: Wind Speed and Wind Direction from 18. October to 2. November 2002

The time scale is in days of year, starting with 0 at the first of January. The time is measured in Universal time (UTC), which is 9.5 hours behind Australian Central Standard Time (ACST) in winter and 10.5 hours behind Australian Central Daylight-Saving Time (ACDT) during daylight saving time. Daylight saving time started in the night from 26. to 27. October in 2002. The bottom graph is the pattern scale, an indication of the size of the diffraction pattern. It helps determining the kind of the reflecting object. Large pattern scales suggest specular reflections from large layer structures in the atmosphere and small pattern scales indicate turbulent scattering.

Figure 4 shows the wind directions observed by the radar. The upper graph shows different colours for different wind speeds and the lower one shows the wind direction encoded in different colours. Figure 5 shows the vertical movement of the air. Yellow to red colours indicate upward moving air, blue colours downward moving air and green means that the air is hardly moving in the vertical direction. These two figures do only show data, if the signal-to-noise ration of the radar was

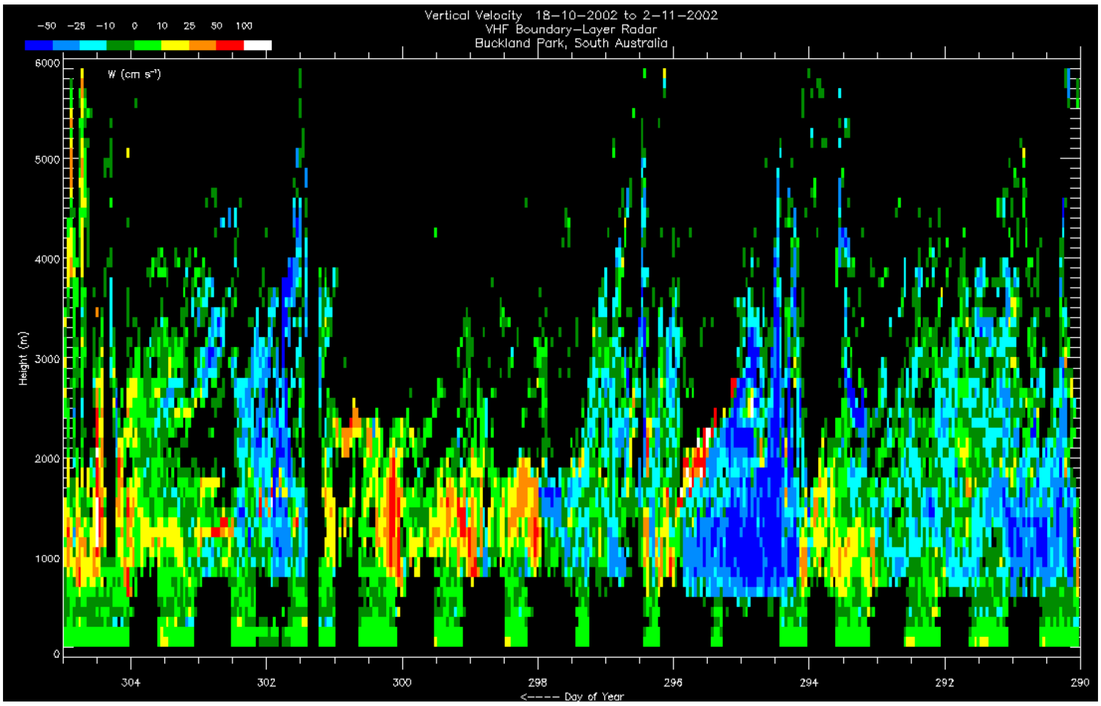

Figure 5: Vertical Wind Velocity from 18. October to 2. November 2002

high enough to get accurate measurements of the velocities.

Figures 6, 7 and 8 show the temperature, the dew point and the pressure at Adelaide during the observation period. The dew point is a measurement of the humidity of the air. It is the temperature at which the water vapour in the air starts to condense. The time scale in these figures is local time (ACST and ACDT).

3.2. Correlation between the data

At the beginning of the observation period the radar shows a large layer structure up to 4000 m. The signal-to-noise ration shows a lot of backscattering in these regions and the large pattern scale indicates that this backscattering comes from layer structures in the atmosphere. The weather during this period was quite stable. The observations by sight show mainly fine days with a few cloudy regions coming through. The temperatures of these days are moderate during these days. The dew point is constant around 10°C. The pressure rose during the first

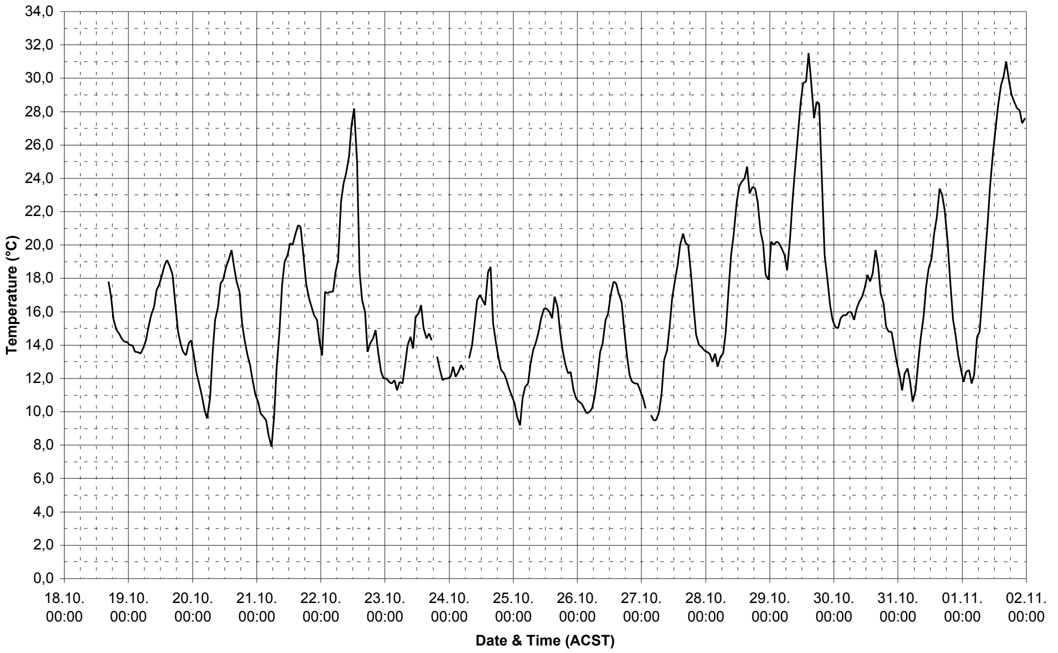

Figure 6: Temperature at Adelaide Kent Town from 18. October to 2. November 2002 (measured by the Bureau of Meteorology)

days and stayed constant during the next days. The wind came from westerly and southwesterly directions, so from the sea. During the first two days there was a downward movement in the air which got weaker and stopped. These stable weather conditions gave enough time to build a layer structure in the lower troposphere.

This period ends during day 293 (21.10.). The weather became more cloudy, the temperature went up to 28°C, the wind changed to northerly directions and the air got much dryer. The air also started moving upwards and the pressure started dropping. This change lead to the destruction of the layer structure and the radar signal got much weaker during this period. On day 294 (22.10.) a cold front arrived in Adelaide and the temperature dropped. The air got more humid and it started raining. The vertical velocity shows a strong down draft of the air and the pressure reached its minimum. This is a typical observation for a cold front and will be explained in more detail in section 4.

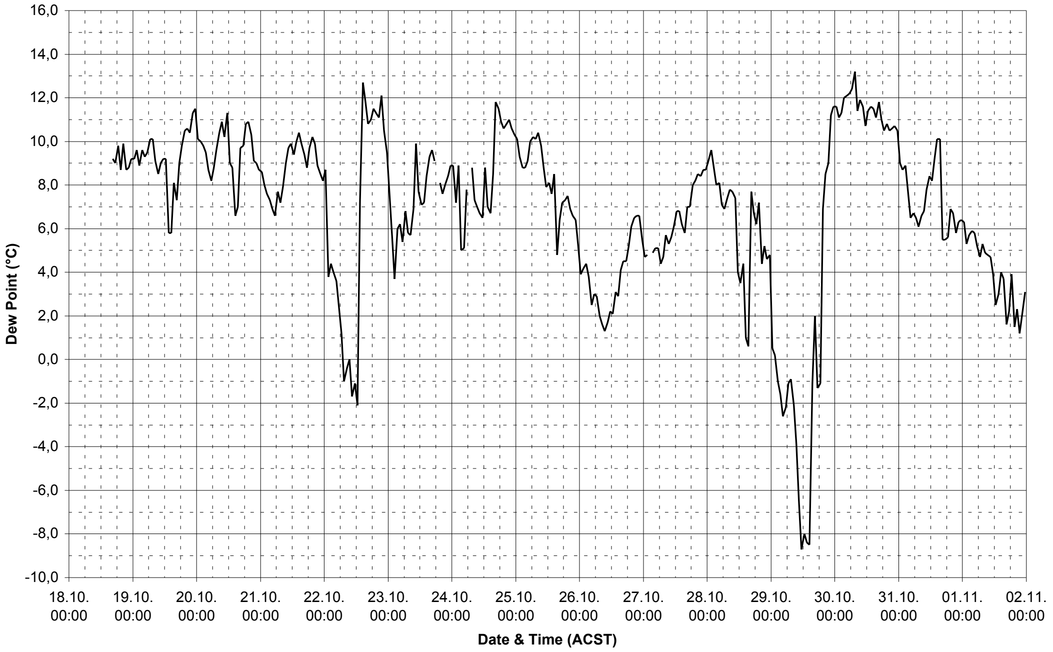

Figure 7: Dew Point at Adelaide Kent Town from 18. October to 2. November 2002 (measured by the Bureau of Meteorology)

The next days show a signal coming down in the signal-to-noise ratio. This can be related to warm air lying on top of the cold air belonging to the cold front and will also be explained in more detail in section 4. The weather was unstable during this period. It was mainly cloudy with some showers and a thunderstorm. The temperature was lower than on the days at the beginning of the observations. The wind still came from south-westerly directions and the dew point stayed at about 8°C.

At day 296 (24.10.) another cold front passed south of Adelaide. The observation in the signal-to-noise ratio is similar to that on day 294 (22.10.). This time the pressure and the temperature dropped only a bit. The wind direction changed first to northerly, then back to south-westerly directions.

From the middle of day 297 (25.10.) on, the wind started coming from easterly directions. It changed very slowly from south-easterly to north-easterly during 3 days. The weather observations show these days with fine weather. The signal-

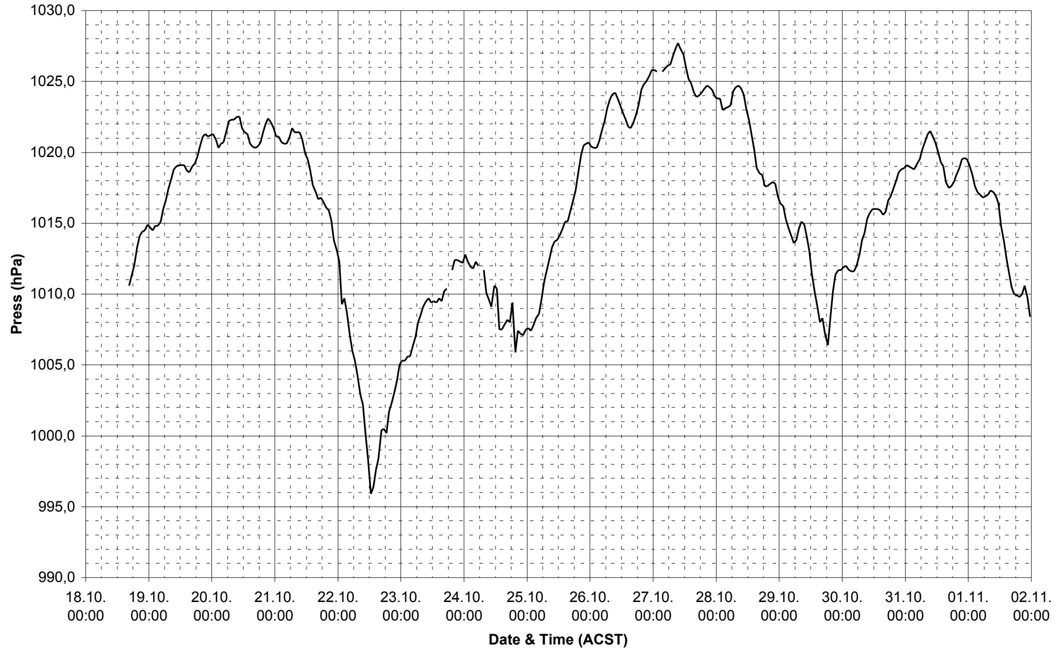

Figure 8: Atmospheric Pressure at Adelaide Kent Town from 18. October to 2. November 2002 (measured by the Bureau of Meteorology)

to-noise ratio shows an up and down movement of a layer between 1000 and 2000 m. This movement can also be observed in the vertical velocity of the air. At the beginning of a day the air is moving up, at the end of a day the air stops moving. The early morning hours correspond to midday local time and so this pattern might be due to the heating and cooling of the atmosphere during the day. The pressure went up at the beginning of this period and then stayed nearly constant at a high level. The daily maximum temperature got higher day by day.

At the end of this period during day 300 (28.10.) the wind changes to northerly directions and the signal gets weaker. This is the beginning of the next cold front coming towards Adelaide. The end of the observation period shows again the layer of warm air lying on top of the cold air of the cold front. The signal weakening at the beginning of day 304 is already due to a cold front coming through after the observation period.

4. Cold Fronts

As seen in the last section cold fronts are the most obvious pattern in the data of the boundary layer radar. The following section will try to explain where the features of the pattern comes from.

4.1. Signal Strength

At the beginning of the observation period, there is a medium strength signal in the height between 1000 and 2000m. At the beginning of day 294, the signal in this height gets much weaker but extends much higher. At the end of day 294 (22.10.), a signal can be observed at about 3000m height. This signal moves down to a height of about 1000 m. This pattern in the signal-to-noise ratio is typical for a cold front coming through Adelaide.

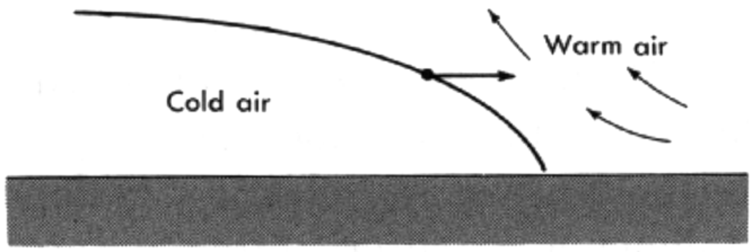

Figure 9: Schematic drawing of the vertical cross section through a cold front (from [6, page 57])

A cold front is the transition zone between an advancing mass of cold air and a mass of warm air being pushed away ahead of it. The warm air is lighter than the cold air and is often rising in front of the cold air as indicated in figure 9.

Monday, 21.10. was a fine day with no clouds. In the evening, some cirrus clouds appeared. The temperature was higher than the days before with a maximum of 21°C. Figure 10 shows the sounding from the 20.10. at 21:30 local time. It shows a thin layer of moist air on the surface and from 850 hPa (about 1500 m) on there is a dry, warm layer of air, which is a typical Adelaide sounding.

On 22. October the cold front arrived in Adelaide at around midday. It was cloudy in the morning and the clouds got thicker until noon. Even with the

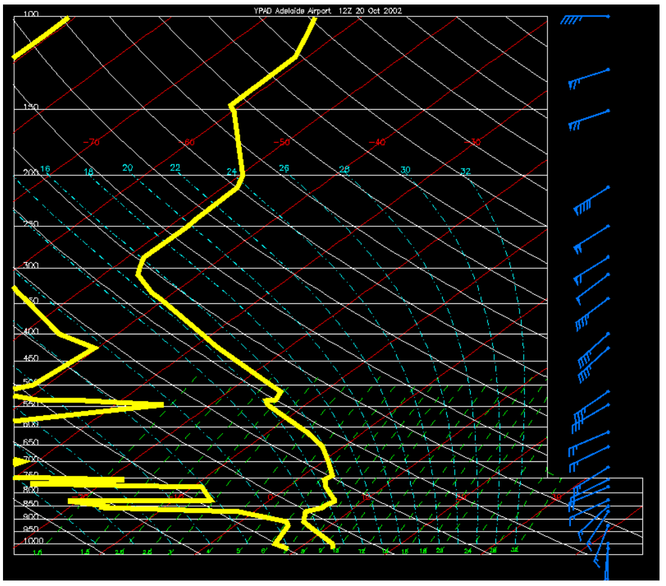

Figure 10: Sounding of the Atmosphere, 20. October 2002 12:00 UTC, Adelaide Airport, Data from Dep. of Atmospheric Science, Univ. of Wyoming)

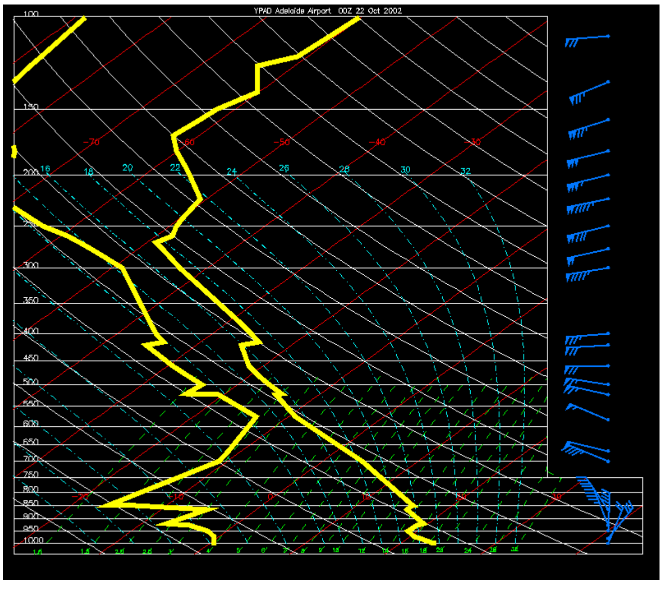

Figure 11: Sounding of the Atmosphere, 22. October 2002 00:00 UTC, Adelaide Airport, Data from Dep. of Atmospheric Science, Univ. of Wyoming)

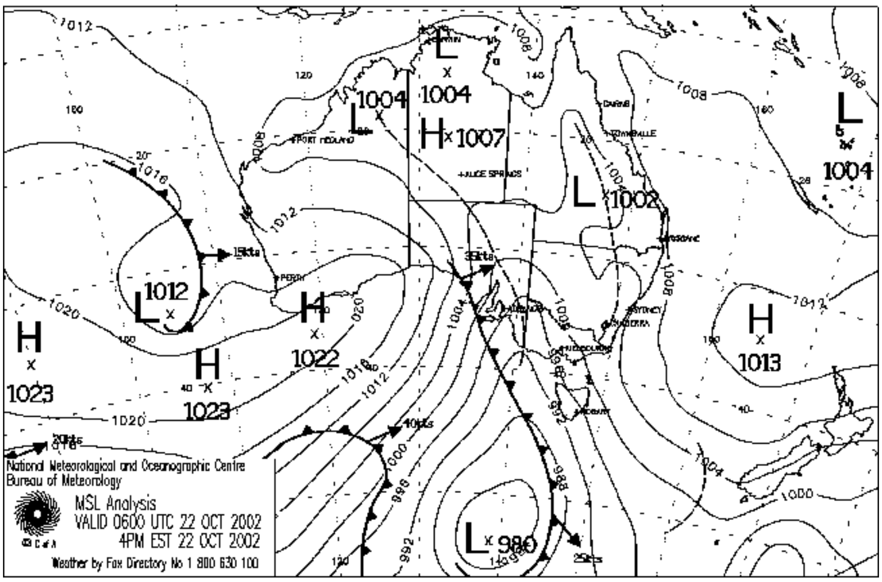

Figure 12: Mean Sea Level (MSL) pressure analysis chart for 06:00 UTC 22. October 2002 (from the Bureau of Meteorology's web page, `http://www.bom.gov.au/`)

clouds, it was very warm in the morning. Figure 6 shows that the temperature was over 28°C at 12:30 local time. Figure 7 shows that the air was very dry. At that time, the wind came from the northern directions and blew the hot dry air of the Australian Outback into Adelaide. Figure 11 shows the sounding of 22.10. at 09:30 local time. The air is very dry and warm up to 850 mbar. From 850 mbar on, the temperature follows nearly the dry adiabat. The moisture in the air increases with hight. This causes a light backscattering of the radar signal in the whole layer. The top of this layer is at about 550 mbar which corresponds to ∼5000 m. The lack of strong boundaries between the layers in the lower atmosphere resulted in no strong signal in radar data. The higher-level signals are strong compared with the signals between 1000 and 2000 m because of the $\frac{1}{r^2}$ dependence of the backscattered signal in equation 4. But at the same time, the pattern scale in these regions are very small which indicates turbulent motions.

The cold front arrived in Adelaide in the afternoon. The analysis chart from the Bureau of Meteorology for 06:00 UTC (15:30 local time) in Figure 12 shows the front still in front of the coast of Adelaide. The sudden temperature drop

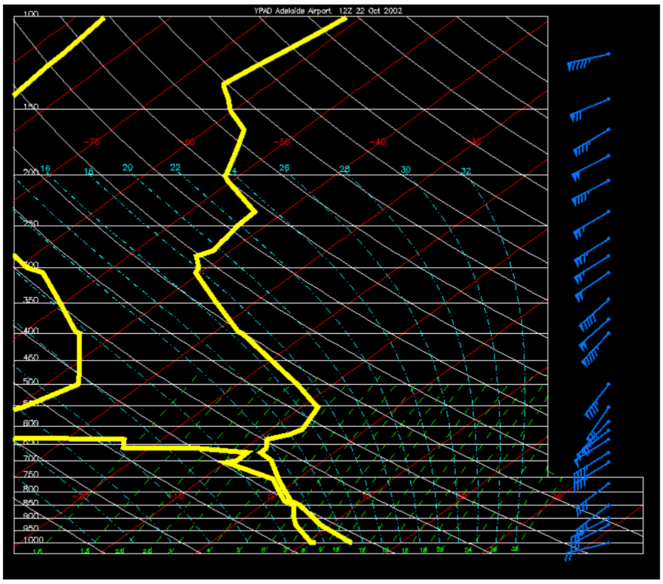

Figure 13: Sounding of the Atmosphere, 22. October 2002 12:00 UTC, Adelaide Airport, Data from Dep. of Atmospheric Science, Univ. of Wyoming)

from 12:30 local may be due to a pre-frontal trough. The temperature dropped by more than 14° in only 5 hours. At the same time, the air got more humid. The dew point went up from -2.1°C at 12:30 local to 12.7°C at 14:30 local (see figure 7). During this time the radar signal is still relatively weak and extends high up. Figure 13 shows the sounding at 21:30 local time. The warm dry air already lies on top of the moist, cold air of the cold front.

In the days after the cold front came trough the weather was cloudy with some patches without clouds. The sounding in figure 13 of 22.10. at 12:00 UTC showed the transition line between the warm and the cold air at about 650 hPa (∼3500 m). The following sounding showed the warm air moving slowly down. On 24.10. 00:00 UTC, the warm air reached 900 hPa (see figure 14). The radar data shows a signal moving down from 3500 m at end of day 294 to 1000 m at the beginning of day 296 (24.10.). So the down moving, strong signal can clearly be identified as the transition zone between the warm air lying on top of the cold, moist air.

The same signal pattern can be observed in the cold front which arrived on 29th October 12:00 UTC in Adelaide. The thick black line in the data during the

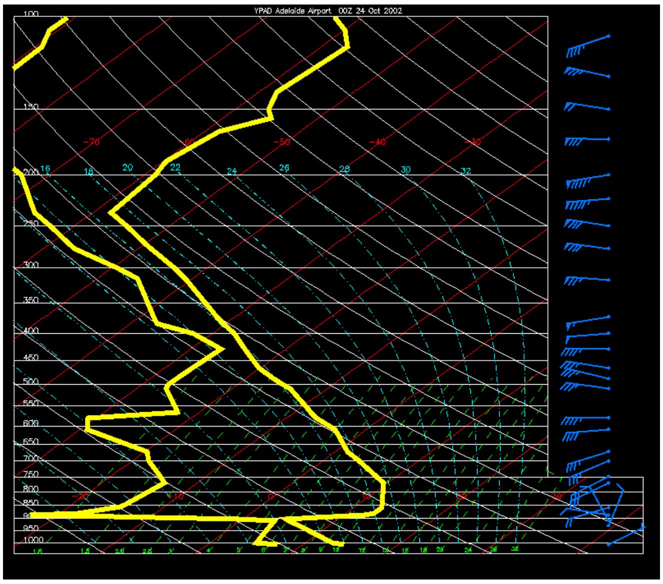

Figure 14: Sounding of the Atmosphere, 24. October 2002 00:00 UTC, Adelaide Airport, Data from Dep. of Atmospheric Science, Univ. of Wyoming)

'signal weakening' is caused by a power failure during a thunderstorm.

4.2. Wind Measurements

Another way to identify a cold front with the radar is by looking at the wind. In the days before the cold front arrived the wind was weak. Before day 292 12:00 UTC the wind came mainly from west and southwest. Then the wind direction in the lower regions changed to south, east and finally to north and north-west. At day 293 12:00 UTC (21.10. 21:30 local) the signal is strong enough to show that higher up, the wind still comes from south-west. This is consistent with the sight of fast moving cirrus clouds from the south-west. At the point where the cold front reached Adelaide, the wind got stronger and changed its direction from north-west to south-west. This can easily be explained by looking at the analysis chart in figure 12. Because of the equilibrium between pressure gradient force and coriolis force the wind direction is always parallel to the isobars. In the southern hemisphere the air is moving clockwise around a low pressure region. In front of the cold front the lines of equal pressure extend from north-west to south-east. Behind the cold front the isobars run from south-west to north-east.

The same change of wind direction and speed can be observed in the cold front on 29. October.

4.3. Vertical Air Motion

The vertical air motion in figure 5 shows a light upward movement before the cold front arrived at the beginning of day 294. Shortly after 22nd October 00:00 UTC, when the temperature started dropping, the air started sinking. This sinking motion kept on the following two days and results in the layer of warm dry air sinking down to about 1000 m at day 296 described in section 4.1.

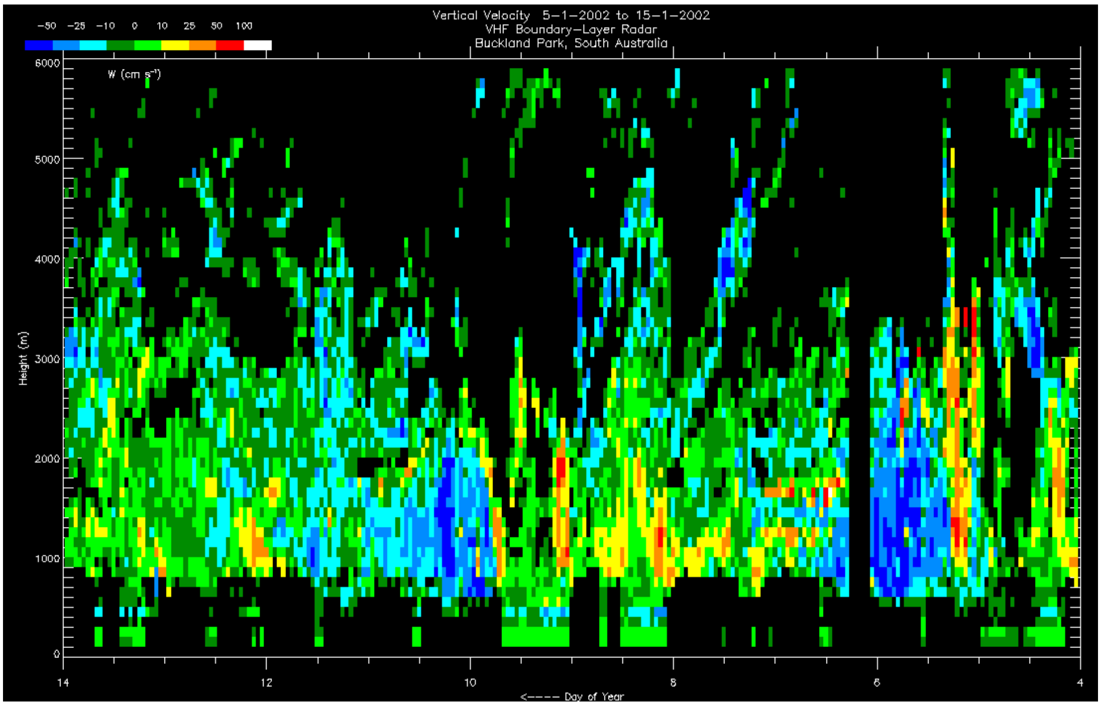

Figure 15: Vertical Wind Velocity from 5. to 15. January 2002

In the case of the cold front on 22. October it is not possible to see the warm air being pushed up like indicated in figure 9. Figure 15 shows another cold front in January 2002. When the cold front arrives at the end of day 9, an orange line along the blue cold front indicated the warm air being pushed upward by the cold air.

5. High Pressure Systems

During my studies with the Boundary Layer Radar, I observed another signal pattern which is typical for a special weather situation. At the beginning of the observation period, the white spots in the pattern scale graph indicate a large diffraction pattern. This signal stops at day 292 (20.10.).

day of year UTC		date/time UTC		date/time local	
292	18:00	20.10.	18:00	21.10.	03:30
295	00:00	23.10.	00:00	23.10.	09:30
297	06:00	25.10.	06:00	25.10.	15:30
298	18:00	26.10.	18:00	27.10.	04:30
302	00:00	30.10.	00:00	30.10.	10:30
303	00:00	31.10.	00:00	31.10.	10:30

Table 1: Dates and times with a large pattern scale

Table 1 shows other days and approximate time, when there is a large pattern scale in the radar data. This large pattern scale normally occurs in a height around 2000 m. Often this large pattern scale does not belong to the strongest signal-to-noise ratio. Day 303 00:00 UTC is a good example for this: the strongest signal is at about 1000 m while a large pattern scale is indicated in a height of about 1700 m.

The days shown in table 1 have all one thing in common: a high pressure region west of the coast of Adelaide similar to that in figure 16. Because these high pressure regions move over Adelaide afterwards, these times are times of rising pressure or of a pressure maximum. There are no connections to the amount of clouds. These signals were seen on cloudy days and on days with a clear sky.

It is still not clear where this signal pattern comes from and it does not always appear together with high pressure regions over the great Australian bight but the correlation is significant. The next steps in finding the cause would be to record the raw data of the radar and trying to find the diffraction pattern that gives such a high value for the pattern scale in the FCA analysis.

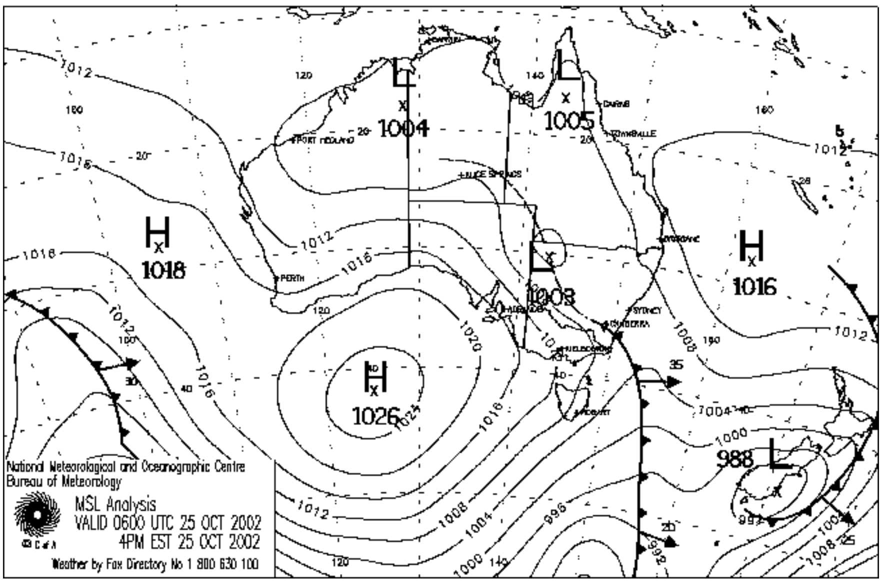

Figure 16: Mean Sea Level (MSL) pressure analysis chart for 06:00 UTC 25. October 2002 (from the Bureau of Meteorology's web page, `http://www.bom.gov.au/`)

6. Summary

At the beginning of this report an overview over radar meteorology was given. Radar uses electromagnetic waves in the radio wavelength to measure the range of objects. With doppler technique it is even possible to observe the velocity of the object at the same time. The backscattering of clear air can be used to obtain the characteristics of the atmosphere. The 54.1 MHz Boundary Layer Radar uses 27 antennas to measure the diffraction pattern of the backscattered signal. The changes in the diffraction pattern are used to calculate the wind velocities in all three directions.

Section 3 introduced the different weather data used in this project. The signal-to-noise ratio and the pattern scale of the diffraction pattern can be used to find layer structures in the atmosphere. Other pictures showed the wind measurements and the vertical velocity. All this data is correlated with the data taken on the surface. Stable weather conditions usually show quite constant temperatures, constant high pressure and a strong layer structure in the atmosphere.

An other typical signal pattern is that of a cold front. Before the cold front arrives the layer structure in the lower troposphere disappears. During this time, the backscattered signal gets much weaker. The winds from northerly directions transports warm dry air into Adelaide. When the cold front arrives the signal comes back and during the next days the sinking of a transition zone between a layer of warm, dry air lying on top of the cold, moist air of the cold front can be observed. With the arriving of the cold front a temperature drop and a moisture increase can be observed. The wind changes quite rapidly from northerly directions to southwesterly directions.

Another signal pattern shows a large pattern scale together with a medium strength signal. This pattern occurs on days where a high pressure region is in front of the coast of Adelaide. It is still not understood where this signal comes from but it shows a significant correlation.

The comparison between the 'established' methods of taking data of the atmosphere and the new method of using a VHF boundary layer radar showed showed a good consistency. Pattern observed in the radar data can easily be explained by looking at analysis charts and the surface data. At the same time there is still much potential in using the radar for forecasts. It is not possible to rely only on the radar data, because it is not possible to destinguish between a dry-moist and a moist-dry transition zone. But together with regular soundings, the radar data can constantly give information about the movement of layers in the lower troposphere.

A. Weather Observations between 18. October and 1. November 2002

Friday, 18.10.2002 fine in the morning, strong winds from west; a midlevel layer of clouds (altocumulus) during the day, strong winds from west; clear in the evening, strong winds from west;

Saturday, 19.10.2002 cloudy, wind from west; clear sky with few clouds during the night, wind from east;

Sunday, 20.10.2002 cloudy in the morning, with a bit of rain; clear sky in the afternoon with cirrus clouds;

Monday, 21.10.2002 fine during the day; cirrus clouds in the evening, strong winds in the upper troposphere from southwest;

Tuesday, 22.10.2002 relatively warm with Altostratus clouds, later also Stratus clouds; getting colder during the day, heavy rain in the evening; strong wind gusts at night;

Wednesday, 23.10.2002 Cloudy (Nimbostratus and Stratus) with a few sunny patches, isolated showers

Thursday, 24.10.2002 Mainly cloudy (Nimbostratus and Stratus), very few sunny patches, isolated showers, a thunderstorm in the evening;

Friday, 25.10.2002 Cloudy with a few blue patches, Stratocumulus and cumulus clouds;

Saturday, 26.10.2002 fine day with cirrus clouds and small lower clouds still very cold, wind from south and south-east, dry air (about 50%);

Sunday, 27.10.2002 fine weather, only cirrus clouds in the sky;

Monday, 28.10.2002 fine weather with some cirrus clouds and in some period cirrostratus clouds, warm and dry air;

Tuesday, 29.10.2002 fine weather during the day, only a few cirrus clouds, very warm; thunderstorms north of Adelaide in the afternoon and the evening;

Wednesday, 30.10.2002 cloudy day, temperature around 20 C, only a few blue patches, cumulus clouds, no precipitation;

Thursday, 31.10.2002 fine weather, no clouds at all;

Friday, 01.11.2002 fine weather, some cirrus clouds, warm weather; getting more and more cloudy in the afternoon, thunderstorms at night, still very warm;

B. Weather Data, Adelaide Kent Town 18.10. - 02.11.2002

Date/Time[1] (ACST)	T[2] (°C)	DP[3] (°C)	RH[4] (%)	WD[5]	WindSp[6] (km)	(mi)	WindGu[7] (km)	(mi)	Press[8] (hPa)	9R[9] (mm)	AR[10] (mm)
18.10.02 16:30	17.8	9.2	57	WSW	28	15	41	22	1010.6	0.0	0.0
18.10.02 17:30	16.9	9.0	60	WSW	26	14	39	21	1011.3	0.0	0.0
18.10.02 18:30	15.5	9.8	69	WSW	24	13	35	19	1012.0	0.0	0.0
18.10.02 19:30	14.9	8.7	66	WSW	20	11	41	22	1013.3	0.0	0.0
18.10.02 20:30	14.7	9.9	73	WSW	20	11	31	17	1014.1	0.0	0.0
18.10.02 21:30	14.4	8.7	69	W	18	10	33	18	1014.4	0.0	0.0
18.10.02 22:30	14.2	8.8	70	W	17	9	24	13	1014.5	0.0	0.0
18.10.02 23:30	14.2	9.2	72	W	20	11	37	20	1014.9	0.0	0.0
19.10.02 00:30	14.0	9.2	73	W	18	10	31	17	1014.7	0.0	0.0
19.10.02 01:30	14.0	9.6	75	W	22	12	35	19	1014.5	0.0	0.0
19.10.02 02:30	13.6	8.9	73	W	18	10	24	13	1014.8	0.0	0.0
19.10.02 03:30	13.6	9.6	77	W	17	9	28	15	1014.8	0.0	0.0
19.10.02 04:30	13.5	9.3	76	W	18	10	30	16	1015.1	0.0	0.0
19.10.02 05:30	13.8	9.5	75	WNW	17	9	26	14	1016.0	0.0	0.0
19.10.02 06:30	14.3	10.1	76	W	24	13	33	18	1016.6	0.0	0.0
19.10.02 07:30	15.1	10.1	72	W	20	11	33	18	1017.4	0.0	0.0
19.10.02 08:30	15.8	9.1	64	WSW	26	14	43	23	1018.1	0.0	0.0
19.10.02 09:30	16.3	8.5	60	W	26	14	41	22	1018.8	0.0	0.0
19.10.02 10:30	17.3	9.0	58	WSW	20	11	33	18	1019.0	0.0	0.0
19.10.02 11:30	17.6	9.2	58	WSW	22	12	37	20	1019.1	0.0	0.0
19.10.02 12:30	18.2	9.2	56	SW	20	11	31	17	1019.1	0.0	0.0
19.10.02 13:30	18.8	5.8	42	SW	22	12	31	17	1019.1	0.0	0.0
19.10.02 14:30	19.1	5.8	42	SW	22	12	35	19	1018.7	0.0	0.0
19.10.02 15:30	18.7	8.1	50	SW	18	10	30	16	1018.6	0.0	0.0
19.10.02 16:30	18.2	7.3	49	SW	18	10	28	15	1019.0	0.0	0.0
19.10.02 17:30	16.6	9.0	61	SW	13	7	22	12	1019.2	0.0	0.0
19.10.02 18:30	14.8	9.8	72	SW	13	7	18	10	1019.7	0.0	0.0
19.10.02 19:30	14.1	10.5	79	SW	9	5	15	8	1020.4	0.0	0.0
19.10.02 20:30	13.6	10.6	82	S	6	3	7	4	1021.1	0.0	0.0
19.10.02 21:30	13.4	10.4	82	CALM	0	0	0	0	1021.3	0.0	0.0
19.10.02 22:30	14.1	11.3	83	SW	4	2	11	6	1021.1	0.0	0.0
19.10.02 23:30	14.3	11.5	83	S	4	2	9	5	1021.2	0.0	0.0
20.10.02 00:30	13.3	10.1	81	SSW	9	5	13	7	1021.3	0.0	0.0
20.10.02 01:30	12.3	10.0	86	SSW	4	2	7	4	1020.9	0.0	0.0
20.10.02 02:30	11.7	9.8	88	SSE	4	2	7	4	1020.3	0.0	0.0
20.10.02 03:30	10.9	9.5	91	CALM	0	0	0	0	1020.6	0.0	0.0
20.10.02 04:30	10.1	8.7	91	CALM	0	0	0	0	1020.7	0.0	0.0
20.10.02 05:30	9.6	8.2	91	CALM	0	0	0	0	1021.5	0.0	0.0
20.10.02 06:30	10.8	8.8	87	CALM	0	0	0	0	1022.2	0.0	0.0
20.10.02 07:30	13.5	9.6	77	N	2	1	7	4	1022.3	0.0	0.0
20.10.02 08:30	15.5	10.4	72	W	9	5	15	8	1022.3	0.0	0.0
20.10.02 09:30	16.3	10.9	70	WNW	13	7	20	11	1022.5	0.0	0.0
20.10.02 10:30	17.7	10.2	61	WSW	15	8	22	12	1022.5	0.0	0.0
20.10.02 11:30	17.9	11.3	65	W	17	9	22	12	1021.7	0.0	0.0

[1] Date and Time in local time
[2] Temperature in °Celsius
[3] Dew Point in °Celsius
[4] Relative Humidity in %
[5] Wind Direction
[6] Average Wind Speed in km/h and miles/h
[7] Wind Gust in km/h and miles/h
[8] Atmospheric Pressure in hPa
[9] Rain since 9am
[10] Accumulated Rain

Date/Time	T	DP	RH	WD	WindSp		WindGu		Press	9R	AR
(ACST)	(°C)	(°C)	(%)		(km)	(mi)	(km)	(mi)	(hPa)	(mm)	(mm)
20.10.02 12:30	18.7	9.0	53	W	20	11	30	16	1021.4	0.0	0.0
20.10.02 13:30	19.1	8.8	51	WSW	18	10	26	14	1021.3	0.0	0.0
20.10.02 14:30	19.7	6.6	42	WSW	11	6	15	8	1020.6	0.0	0.0
20.10.02 15:30	18.7	7.0	46	SW	17	9	24	13	1020.4	0.0	0.0
20.10.02 16:30	17.8	9.7	59	WSW	22	12	30	16	1020.3	0.0	0.0
20.10.02 17:30	17.2	9.8	62	SW	15	8	24	13	1020.4	0.0	0.0
20.10.02 18:30	15.3	10.8	75	WSW	13	7	20	11	1020.7	0.0	0.0
20.10.02 19:30	14.3	10.9	80	SSW	7	4	11	6	1021.4	0.0	0.0
20.10.02 20:30	13.4	10.3	81	SSW	7	4	9	5	1022.0	0.0	0.0
20.10.02 21:30	12.8	9.1	78	S	7	4	13	7	1022.4	0.0	0.0
20.10.02 22:30	11.9	9.0	82	CALM	0	0	0	0	1022.1	0.0	0.0
20.10.02 23:30	11.0	8.7	86	S	4	2	7	4	1021.7	0.0	0.0
21.10.02 00:30	10.6	8.6	87	CALM					1021.1	0.0	0.0
21.10.02 01:30	9.9	8.0	88	SSW	7	4	9	5	1021.1	0.0	0.0
21.10.02 02:30	9.7	7.6	87	SSE	7	4	9	5	1020.7	0.0	0.0
21.10.02 03:30	9.5	7.3	86	S	6	3	7	4	1020.6	0.0	0.0
21.10.02 04:30	8.6	6.9	89	CALM	0	0	6	3	1020.6	0.0	0.0
21.10.02 05:30	7.9	6.6	91	CALM	0	0	0	0	1021.0	0.0	0.0
21.10.02 06:30	9.7	7.7	87	CALM	0	0	2	1	1021.7	0.0	0.0
21.10.02 07:30	12.6	7.2	70	NE	7	4	11	6	1021.4	0.0	0.0
21.10.02 08:30	14.9	7.9	63	NNW	7	4	15	8	1021.4	0.0	0.0
21.10.02 09:30	17.6	9.0	57	W	7	4	11	6	1021.4	0.0	0.0
21.10.02 10:30	19.0	9.7	55	WSW	11	6	18	10	1020.9	0.0	0.0
21.10.02 11:30	19.4	9.9	54	WSW	15	8	24	13	1019.9	0.0	0.0
21.10.02 12:30	20.1	9.4	50	W	20	11	30	16	1019.5	0.0	0.0
21.10.02 13:30	20.0	10.0	53	WSW	18	10	26	14	1018.7	0.0	0.0
21.10.02 14:30	20.7	10.4	52	WSW	15	8	22	12	1017.7	0.0	0.0
21.10.02 15:30	21.2	9.9	48	WSW	17	9	28	15	1017.2	0.0	0.0
21.10.02 16:30	21.1	9.4	47	WSW	15	8	20	11	1016.7	0.0	0.0
21.10.02 17:30	19.3	8.8	51	WSW	17	9	24	13	1016.8	0.0	0.0
21.10.02 18:30	17.7	9.7	59	SW	9	5	13	7	1016.5	0.0	0.0
21.10.02 19:30	16.8	10.2	65	S	4	2	7	4	1016.1	0.0	0.0
21.10.02 20:30	16.3	9.9	66	NE	7	4	9	5	1015.9	0.0	0.0
21.10.02 21:30	15.8	8.9	64	NE	7	4	9	5	1015.2	0.0	0.0
21.10.02 22:30	15.5	8.5	63	NNE	7	4	11	6	1013.8	0.0	0.0
21.10.02 23:30	14.2	8.2	67	NNW	2	1	6	3	1013.1	0.0	0.0
22.10.02 00:30	13.4	8.7	73	NE	4	2	7	4	1012.3	0.0	0.0
22.10.02 01:30	17.2	3.8	41	NE	17	9	28	15	1009.3	0.0	0.0
22.10.02 02:30	17.1	4.4	43	NNE	9	5	11	6	1009.7	0.0	0.0
22.10.02 03:30	17.2	4.0	41	NNE	9	5	15	8	1008.7	0.0	0.0
22.10.02 04:30	17.2	3.6	40	NNE	11	6	18	10	1007.1	0.0	0.0
22.10.02 05:30	18.4	2.4	34	NNE	17	9	24	13	1006.0	0.0	0.0
22.10.02 06:30	19.1	1.2	30	NE	15	8	28	15	1005.3	0.0	0.0
22.10.02 07:30	22.6	-1.0	21	NNE	18	10	30	16	1004.3	0.0	0.0
22.10.02 08:30	23.7	-0.4	20	NNE	24	13	35	19	1002.9	0.0	0.0
22.10.02 09:30	24.3	0.0	20	N	20	11	31	17	1002.2	0.0	0.0
22.10.02 10:30	25.3	-1.7	17	N	26	14	41	22	1000.2	0.0	0.0
22.10.02 11:30	27.2	-1.1	16	N	30	16	54	29	998.4	0.0	0.0
22.10.02 00:30	13.4	8.7	73	NE	4	2	7	4	1012.3	0.0	0.0
22.10.02 01:30	17.2	3.8	41	NE	17	9	28	15	1009.3	0.0	0.0
22.10.02 02:30	17.1	4.4	43	NNE	9	5	11	6	1009.7	0.0	0.0
22.10.02 03:30	17.2	4.0	41	NNE	9	5	15	8	1008.7	0.0	0.0
22.10.02 04:30	17.2	3.6	40	NNE	11	6	18	10	1007.1	0.0	0.0
22.10.02 05:30	18.4	2.4	34	NNE	17	9	24	13	1006.0	0.0	0.0
22.10.02 06:30	19.1	1.2	30	NE	15	8	28	15	1005.3	0.0	0.0
22.10.02 07:30	22.6	-1.0	21	NNE	18	10	30	16	1004.3	0.0	0.0
22.10.02 08:30	23.7	-0.4	20	NNE	24	13	35	19	1002.9	0.0	0.0
22.10.02 09:30	24.3	0.0	20	N	20	11	31	17	1002.2	0.0	0.0
22.10.02 10:30	25.3	-1.7	17	N	26	14	41	22	1000.2	0.0	0.0
22.10.02 11:30	27.2	-1.1	16	N	30	16	54	29	998.4	0.0	0.0

Date/Time	T	DP	RH	WD	WindSp		WindGu		Press	9R	AR
(ACST)	(°C)	(°C)	(%)		(km)	(mi)	(km)	(mi)	(hPa)	(mm)	(mm)
23.10.02 00:30	12.0	7.6	74	SW	22	12	44	24	1005.3	3.4	3.4
23.10.02 01:30	11.8	5.7	66	SW	30	16	46	25	1005.3	3.4	3.4
23.10.02 02:30	11.7	3.7	58	SW	28	15	46	25	1005.6	3.4	3.4
23.10.02 03:30	11.9	6.0	67	WSW	24	13	43	23	1005.6	3.4	3.4
23.10.02 04:30	11.3	6.2	71	WSW	22	12	37	20	1006.3	3.4	3.4
23.10.02 05:30	11.8	5.4	65	WSW	30	16	48	26	1007.0	3.4	3.4
23.10.02 06:30	11.7	6.8	72	WSW	26	14	43	23	1008.0	3.4	3.4
23.10.02 07:30	12.8	5.8	62	SW	28	15	46	25	1008.5	3.4	3.4
23.10.02 08:30	14.0	5.7	57	WSW	28	15	50	27	1009.1	3.4	3.4
23.10.02 09:30	14.5	6.9	60	WSW	30	16	50	27	1009.5	0.0	3.4
23.10.02 10:30	13.8	9.9	77	SW	28	15	46	25	1009.7	0.2	3.6
23.10.02 11:30	15.7	7.7	59	W	28	15	43	23	1009.4	0.2	3.6
23.10.02 12:30	15.9	7.1	56	WSW	33	18	48	26	1009.5	0.2	3.6
23.10.02 13:30	16.4	7.2	54	SW	28	15	43	23	1009.4	0.2	3.6
23.10.02 14:30	15.0	8.4	65	WSW	24	13	41	22	1009.7	0.2	3.6
23.10.02 15:30	14.4	9.3	71	WSW	24	13	39	21	1009.5	0.6	4.0
23.10.02 16:30	14.7	9.6	71	WSW	26	14	43	23	1010.2	0.6	4.0
23.10.02 17:30	14.3	9.1	71	W	26	14	43	23	1010.4	0.6	4.0
23.10.02 18:30											4.0
23.10.02 19:30	13.3	8.1	71	SSW	18	10	35	19	1011.7	0.6	4.6
23.10.02 20:30	12.6	7.6	72	SSW	11	6	20	11	1012.4	0.6	4.6
23.10.02 21:30	11.9	8.0	77	S	7	4	11	6	1012.4	0.6	4.6
23.10.02 22:30	12.0	8.4	79	S	9	5	13	7	1012.3	0.6	4.6
23.10.02 23:30	12.0	8.9	81	SSW	7	4	9	5	1012.2	0.6	4.6
24.10.02 00:30	12.1	8.9	81	WSW	9	5	15	8	1012.8	0.6	4.6
24.10.02 01:30	12.7	7.2	69	WSW	13	7	20	11	1012.3	0.6	4.6
24.10.02 02:30	12.1	8.9	81	NW	4	2	9	5	1011.9	0.6	4.6
24.10.02 03:30	12.4	5.0	61	WSW	13	7	20	11	1011.8	0.6	4.6
24.10.02 04:30	12.8	5.1	59	WSW	13	7	24	13	1012.3	0.6	4.6
24.10.02 05:30	12.5	7.8	73	W	7	4	9	5	1012.0	0.6	4.6
24.10.02 06:30				SW	7	4	11	6		0.6	4.6
24.10.02 07:30	13.2	8.8	75	NW	2	1	7	4	1011.7	0.6	4.6
24.10.02 08:30	14.0	7.3	64	NE	11	6	17	9	1010.1	0.6	4.6
24.10.02 09:30	15.3	7.0	58	N	18	10	26	14	1009.6	0.0	4.6
24.10.02 10:30	16.7	6.7	52	NNE	18	10	33	18	1009.1	0.2	4.8
24.10.02 11:30	17.0	6.5	50	NNW	17	9	26	14	1010.6	0.2	4.8
24.10.02 12:30	16.7	8.8	60	WNW	18	10	28	15	1010.4	0.2	4.8
24.10.02 13:30	16.4	7.0	54	NNE	15	8	22	12	1007.5	0.2	4.8
24.10.02 14:30	18.4	6.7	46	NNW	15	8	28	15	1007.5	0.2	4.8
24.10.02 15:30	18.7	8.5	51	W	18	10	37	20	1007.9	0.2	4.8
24.10.02 16:30	15.3	11.8	80	SSW	11	6	15	8	1008.2	0.2	4.8
24.10.02 17:30	14.1	11.5	84	ESE	9	5	15	8	1008.0	0.6	5.2
24.10.02 18:30	13.2	10.9	86	N	9	5	15	8	1009.4	2.2	6.8
24.10.02 19:30	12.5	10.6	88	ENE	11	6	15	8	1005.9	2.8	7.4
24.10.02 20:30	12.3	10.8	91	NE	9	5	13	7	1007.4	2.8	7.4
24.10.02 21:30	11.9	11.0	94	CALM	0	0	0	0	1007.2	2.8	7.4
24.10.02 22:30	11.4	10.6	95	ENE	7	4	13	7	1007.1	2.8	7.4
24.10.02 23:30	10.9	10.3	96	CALM	0	0	0	0	1007.5	2.8	7.4
25.10.02 00:30	10.5	10.1	97	CALM	0	0	0	0	1007.6	2.8	7.4
25.10.02 01:30	9.7	9.3	97	CALM	0	0	0	0	1007.4	3.0	7.6
25.10.02 02:30	9.2	8.8	97	S	6	3	7	4	1007.8	3.0	7.6
25.10.02 03:30	10.8	8.8	87	S	11	6	17	9	1008.3	3.0	7.6
25.10.02 04:30	11.5	9.1	85	S	11	6	18	10	1008.6	3.0	7.6
25.10.02 05:30	11.7	10.0	89	SSW	9	5	20	11	1009.6	3.0	7.6
25.10.02 06:30	12.9	10.2	84	S	11	6	20	11	1010.8	3.0	7.6
25.10.02 07:30	13.7	10.1	79	S	13	7	22	12	1011.6	3.0	7.6
25.10.02 08:30	14.2	10.4	78	S	13	7	24	13	1012.5	3.0	7.6
25.10.02 09:30	14.8	9.8	72	SSW	15	8	26	14	1013.3	0.0	7.6
25.10.02 10:30	15.6	8.8	64	SSE	13	7	24	13	1013.7	0.0	7.6
25.10.02 11:30	16.2	7.9	58	SSE	17	9	22	12	1013.8	0.0	7.6

Date/Time	T	DP	RH	WD	WindSp		WindGu		Press	9R	AR
(ACST)	(°C)	(°C)	(%)		(km)	(mi)	(km)	(mi)	(hPa)	(mm)	(mm)
25.10.02 12:30	16.2	8.1	59	S	11	6	20	11	1014.2	0.0	7.6
25.10.02 13:30	16.0	7.6	57	SSW	15	8	28	15	1014.6	0.0	7.6
25.10.02 14:30	15.6	8.5	63	S	22	12	37	20	1015.1	0.0	7.6
25.10.02 15:30	16.9	4.8	45	S	18	10	30	16	1015.1	0.0	7.6
25.10.02 16:30	16.3	6.4	52	S	17	9	26	14	1015.9	0.0	7.6
25.10.02 17:30	14.8	7.2	60	SSE	17	9	28	15	1016.6	0.0	7.6
25.10.02 18:30	13.7	7.3	65	S	20	11	33	18	1017.3	0.0	7.6
25.10.02 19:30	12.8	7.5	70	S	18	10	30	16	1018.5	0.0	7.6
25.10.02 20:30	12.3	6.9	70	S	17	9	30	16	1019.8	0.0	7.6
25.10.02 21:30	12.4	6.6	68	S	13	7	26	14	1020.5	0.0	7.6
25.10.02 22:30	11.3	6.4	72	S	11	6	18	10	1020.6	0.0	7.6
25.10.02 23:30	10.8	5.2	68	S	11	6	20	11	1020.7	0.0	7.6
26.10.02 00:30	10.6	3.9	63	S	11	6	20	11	1020.4	0.0	7.6
26.10.02 01:30	10.5	4.2	65	SSE	11	6	17	9	1020.3	0.0	7.6
26.10.02 02:30	10.2	4.4	67	SSE	9	5	20	11	1020.3	0.0	7.6
26.10.02 03:30	9.9	3.8	66	SSE	9	5	15	8	1020.8	0.0	7.6
26.10.02 04:30	10.0	2.5	60	SSE	11	6	17	9	1021.5	0.0	7.6
26.10.02 05:30	10.2	3.0	61	SSE	9	5	15	8	1022.2	0.0	7.6
26.10.02 06:30	10.9	2.9	58	ESE	13	7	20	11	1023.1	0.0	7.6
26.10.02 07:30	12.2	2.0	50	SE	17	9	26	14	1023.7	0.0	7.6
26.10.02 08:30	13.6	1.6	44	SE	22	12	39	21	1024.1	0.0	7.6
26.10.02 09:30	14.1	1.3	42	SE	24	13	39	21	1024.2	0.0	7.6
26.10.02 10:30	15.5	1.7	39	SE	20	11	35	19	1023.8	0.0	7.6
26.10.02 11:30	15.9	2.2	40	SSE	22	12	44	24	1023.3	0.0	7.6
26.10.02 12:30	17.0	2.1	37	SE	26	14	37	20	1022.8	0.0	7.6
26.10.02 13:30	17.8	3.1	37	SSE	20	11	31	17	1022.3	0.0	7.6
26.10.02 14:30	17.7	2.9	37	SSE	18	10	33	18	1021.8	0.0	7.6
26.10.02 15:30	17.1	4.1	42	SSE	22	12	35	19	1021.7	0.0	7.6
26.10.02 16:30	16.6	4.5	45	S	22	12	37	20	1022.1	0.0	7.6
26.10.02 17:30	15.0	4.5	49	S	20	11	39	21	1022.6	0.0	7.6
26.10.02 18:30	13.3	5.2	58	S	20	11	33	18	1023.4	0.0	7.6
26.10.02 19:30	12.2	6.1	66	S	18	10	33	18	1024.4	0.0	7.6
26.10.02 20:30	11.8	6.5	70	S	13	7	28	15	1024.8	0.0	7.6
26.10.02 21:30	11.7	6.6	71	SSW	11	6	20	11	1025.0	0.0	7.6
26.10.02 22:30	11.7	6.6	71	S	15	8	26	14	1025.4	0.0	7.6
26.10.02 23:30	11.3	5.5	67	SSE	18	10	35	19	1025.8	0.0	7.6
27.10.02 00:30	10.8	4.7	66	SSE	18	10	26	14	1025.8	0.0	7.6
27.10.02 01:30	10.2	4.8	69	SSE	15	8	20	11	1025.7	0.0	7.6
27.10.02 02:30											7.6
27.10.02 03:30	9.8	4.9	72	SSE	15	8	24	13	1025.7	0.0	7.6
27.10.02 04:30	9.5	5.1	74	SE	15	8	26	14	1025.9	0.0	7.6
27.10.02 05:30	9.5	5.1	74	SE	13	7	22	12	1026.1	0.0	7.6
27.10.02 06:30	10.0	4.4	68	SE	11	6	26	14	1026.2	0.0	7.6
27.10.02 07:30	11.1	4.7	65	SSE	11	6	30	16	1026.8	0.0	7.6
27.10.02 08:30	13.1	5.7	61	E	6	3	9	5	1027.3	0.0	7.6
27.10.02 09:30	13.7	5.3	57	ESE	22	12	33	18	1027.7	0.0	7.6
27.10.02 10:30	15.1	5.6	53	SE	20	11	31	17	1027.3	0.0	7.6
27.10.02 11:30	16.8	6.1	49	E	15	8	22	12	1026.9	0.0	7.6
27.10.02 12:30	17.9	6.8	48	SE	13	7	20	11	1026.0	0.0	7.6
27.10.02 13:30	18.8	6.8	46	ESE	13	7	20	11	1025.2	0.0	7.6
27.10.02 14:30	20.0	6.2	41	SE	15	8	22	12	1024.9	0.0	7.6
27.10.02 15:30	20.7	5.8	38	SE	13	7	26	14	1024.2	0.0	7.6
27.10.02 16:30	20.1	7.0	43	ESE	18	10	33	18	1023.9	0.0	7.6
27.10.02 17:30	20.0	7.0	43	ESE	15	8	26	14	1024.0	0.0	7.6
27.10.02 18:30	18.2	8.0	51	SE	17	9	24	13	1024.2	0.0	7.6
27.10.02 19:30	16.3	8.2	59	SE	15	8	26	14	1024.5	0.0	7.6
27.10.02 20:30	14.6	8.5	67	SSE	13	7	18	10	1024.7	0.0	7.6
27.10.02 21:30	14.0	8.4	69	S	7	4	13	7	1024.6	0.0	7.6
27.10.02 22:30	13.9	8.7	71	SE	9	5	13	7	1024.4	0.0	7.6
27.10.02 23:30	13.7	8.7	72	SE	9	5	17	9	1023.9	0.0	7.6

Date/Time	T	DP	RH	WD	WindSp		WindGu		Press	9R	AR
(ACST)	(°C)	(°C)	(%)		(km)	(mi)	(km)	(mi)	(hPa)	(mm)	(mm)
28.10.02 00:30	13.6	9.1	74	SSE	9	5	17	9	1023.8	0.0	7.6
28.10.02 01:30	13.5	9.6	77	E	7	4	15	8	1023.8	0.0	7.6
28.10.02 02:30	13.0	8.8	76	E	11	6	20	11	1023.0	0.0	7.6
28.10.02 03:30	13.5	8.0	69	N	6	3	13	7	1023.1	0.0	7.6
28.10.02 04:30	12.7	8.1	74	N	6	3	11	6	1023.2	0.0	7.6
28.10.02 05:30	13.3	7.1	66	NNE	7	4	11	6	1023.3	0.0	7.6
28.10.02 06:30	13.5	6.9	64	NNE	4	2	11	6	1024.3	0.0	7.6
28.10.02 07:30	14.7	7.4	62	W	6	3	7	4	1024.6	0.0	7.6
28.10.02 08:30	17.3	7.8	54	N	6	3	9	5	1024.7	0.0	7.6
28.10.02 09:30	19.4	7.7	47	N	13	7	20	11	1024.5	0.0	7.6
28.10.02 10:30	20.6	7.4	42	ENE	11	6	17	9	1024.1	0.0	7.6
28.10.02 11:30	22.5	4.0	30	N	13	7	20	11	1023.1	0.0	7.6
28.10.02 12:30	23.5	3.5	27	ENE	11	6	20	11	1022.2	0.0	7.6
28.10.02 13:30	23.8	4.4	28	NW	7	4	15	8	1021.2	0.0	7.6
28.10.02 14:30	24.0	1.0	22	NNE	11	6	22	12	1020.2	0.0	7.6
28.10.02 15:30	24.7	0.6	21	NNE	11	6	28	15	1018.9	0.0	7.6
28.10.02 16:30	23.1	7.7	37	W	15	8	20	11	1018.5	0.0	7.6
28.10.02 17:30	23.5	6.7	34	SW	9	5	13	7	1018.4	0.0	7.6
28.10.02 18:30	23.4	6.2	33	S	9	5	11	6	1017.6	0.0	7.6
28.10.02 19:30	22.6	7.2	37	SSE	7	4	9	5	1017.6	0.0	7.6
28.10.02 20:30	20.8	4.4	34	E	11	6	15	8	1017.8	0.0	7.6
28.10.02 21:30	20.1	5.2	38	E	11	6	15	8	1017.9	0.0	7.6
28.10.02 22:30	18.2	4.6	41	ENE	11	6	13	7	1017.8	0.0	7.6
28.10.02 23:30	17.9	4.8	42	E	9	5	13	7	1016.9	0.0	7.6
29.10.02 00:30	20.2	0.5	27	ENE	13	7	20	11	1016.4	0.0	7.6
29.10.02 01:30	20.0	0.2	27	ENE	13	7	20	11	1016.2	0.0	7.6
29.10.02 02:30	20.2	-1.0	24	ENE	17	9	28	15	1015.3	0.0	7.6
29.10.02 03:30	20.1	-1.6	23	ENE	17	9	24	13	1014.7	0.0	7.6
29.10.02 04:30	19.8	-2.6	22	ENE	20	11	31	17	1014.2	0.0	7.6
29.10.02 05:30	19.4	-2.2	23	ENE	22	12	33	18	1013.6	0.0	7.6
29.10.02 06:30	18.5	-1.1	26	ENE	15	8	20	11	1013.8	0.0	7.6
29.10.02 07:30	20.4	-0.9	24	NE	15	8	24	13	1014.6	0.0	7.6
29.10.02 08:30	22.7	-2.1	19	NNE	22	12	39	21	1015.1	0.0	7.6
29.10.02 09:30	24.6	-3.9	15	NNE	18	10	31	17	1014.9	0.0	7.6
29.10.02 10:30	26.7	-6.5	11	N	26	14	41	22	1014.0	0.0	7.6
29.10.02 11:30	28.5	-8.7	8	N	24	13	43	23	1013.0	0.0	7.6
29.10.02 12:30	29.7	-8.0	8	N	26	14	46	25	1011.4	0.0	7.6
29.10.02 13:30	29.8	-8.4	8	N	26	14	44	24	1010.1	0.0	7.6
29.10.02 14:30	31.5	-8.5	7	N	31	17	50	27	1009.1	0.0	7.6
29.10.02 15:30	29.8	-1.1	13	NW	22	12	31	17	1008.0	0.0	7.6
29.10.02 16:30	27.6	2.0	19	N	15	8	26	14	1008.3	0.0	7.6
29.10.02 17:30	28.6	-1.3	14	N	13	7	20	11	1007.2	0.0	7.6
29.10.02 18:30	28.5	-1.1	14	NNE	9	5	13	7	1006.4	0.0	7.6
29.10.02 19:30	23.6	6.9	34	WSW	26	14	43	23	1008.4	0.0	7.6
29.10.02 20:30	19.4	8.5	49	SW	17	9	31	17	1010.2	0.0	7.6
29.10.02 21:30	18.1	9.0	55	WSW	13	7	20	11	1011.4	0.0	7.6
29.10.02 22:30	16.4	11.2	71	SSW	9	5	18	10	1011.7	0.0	7.6
29.10.02 23:30	15.5	11.6	78	SW	2	1	7	4	1011.7	0.0	7.6
30.10.02 00:30	15.1	11.6	80	CALM	Ê	Ê			1011.9	0.0	7.6
30.10.02 01:30	15.0	11.1	77	N	9	5	11	6	1012.0	0.0	7.6
30.10.02 02:30	15.6	11.3	76	N	11	6	18	10	1011.7	0.0	7.6
30.10.02 03:30	15.8	12.0	78	NNW	13	7	18	10	1011.6	0.0	7.6
30.10.02 04:30	15.8	12.1	79	NNW	13	7	17	9	1011.6	0.0	7.6
30.10.02 05:30	16.0	12.2	78	NW	17	9	24	13	1012.0	0.0	7.6
30.10.02 06:30	16.0	12.4	79	WNW	15	8	26	14	1012.8	0.0	7.6
30.10.02 07:30	15.5	13.2	86	WNW	15	8	26	14	1013.8	0.0	7.6
30.10.02 08:30	16.2	11.4	73	WNW	15	8	22	12	1014.3	0.0	7.6
30.10.02 09:30	16.6	11.9	74	WNW	22	12	33	18	1015.3	0.0	7.6
30.10.02 10:30	16.9	11.6	71	WNW	18	10	28	15	1015.7	0.0	7.6
30.10.02 11:30	17.4	10.7	65	WNW	20	11	30	16	1016.0	0.0	7.6

Date/Time	T	DP	RH	WD	WindSp		WindGu		Press	9R	AR
(ACST)	(°C)	(°C)	(%)		(km)	(mi)	(km)	(mi)	(hPa)	(mm)	(mm)
30.10.02 12:30	18.2	11.4	64	W	20	11	31	17	1016.0	0.0	7.6
30.10.02 13:30	17.8	11.6	67	W	20	11	30	16	1016.0	0.0	7.6
30.10.02 14:30	18.3	11.5	65	WSW	15	8	24	13	1015.9	0.0	7.6
30.10.02 15:30	19.7	11.1	58	W	20	11	31	17	1015.6	0.0	7.6
30.10.02 16:30	18.8	11.8	64	WSW	20	11	31	17	1015.8	0.0	7.6
30.10.02 17:30	17.1	11.0	67	WSW	15	8	26	14	1016.6	0.0	7.6
30.10.02 18:30	16.5	10.5	68	WSW	20	11	28	15	1016.9	0.0	7.6
30.10.02 19:30	15.1	10.8	75	SW	13	7	20	11	1017.5	0.0	7.6
30.10.02 20:30	14.8	10.5	75	SSW	13	7	24	13	1018.0	0.0	7.6
30.10.02 21:30	14.8	10.6	76	SW	11	6	24	13	1018.6	0.0	7.6
30.10.02 22:30	13.9	10.7	81	SSW	7	4	15	8	1018.8	0.0	7.6
30.10.02 23:30	13.0	10.5	85	S	7	4	11	6	1018.9	0.0	7.6
31.10.02 00:30	12.2	9.0	81	SSE	4	2	7	4	1019.1	0.0	7.6
31.10.02 01:30	11.3	8.7	84	CALM	Ê	Ê			1019.0	0.0	7.6
31.10.02 02:30	12.3	8.9	80	S	4	2	7	4	1018.9	0.0	7.6
31.10.02 03:30	12.6	7.7	72	S	9	5	17	9	1018.8	0.0	7.6
31.10.02 04:30	11.8	6.5	70	S	9	5	13	7	1019.2	0.0	7.6
31.10.02 05:30	10.6	6.7	77	S	7	4	11	6	1019.5	0.0	7.6
31.10.02 06:30	11.3	6.5	72	SSE	9	5	15	8	1020.2	0.0	7.6
31.10.02 07:30	12.9	6.1	63	S	11	6	20	11	1020.7	0.0	7.6
31.10.02 08:30	14.4	6.6	59	S	13	7	20	11	1021.3	0.0	7.6
31.10.02 09:30	15.7	6.8	55	SSW	11	6	20	11	1021.5	0.0	7.6
31.10.02 10:30	17.5	7.8	53	SW	13	7	20	11	1021.1	0.0	7.6
31.10.02 11:30	18.6	8.4	51	W	15	8	22	12	1020.7	0.0	7.6
31.10.02 12:30	19.2	8.2	49	W	18	10	24	13	1020.0	0.0	7.6
31.10.02 13:30	20.7	9.2	48	W	17	9	24	13	1019.3	0.0	7.6
31.10.02 14:30	21.6	10.1	48	W	17	9	26	14	1019.0	0.0	7.6
31.10.02 15:30	23.4	10.1	43	W	15	8	22	12	1017.9	0.0	7.6
31.10.02 16:30	23.0	5.5	32	SE	18	10	26	14	1017.5	0.0	7.6
31.10.02 17:30	22.1	5.5	34	SE	17	9	24	13	1017.6	0.0	7.6
31.10.02 18:30	20.2	5.6	38	SE	15	8	24	13	1017.9	0.0	7.6
31.10.02 19:30	17.9	6.9	49	SE	11	6	17	9	1018.4	0.0	7.6
31.10.02 20:30	15.5	6.7	56	ESE	7	4	15	8	1018.9	0.0	7.6
31.10.02 21:30	14.6	5.8	55	E	6	3	9	5	1019.5	0.0	7.6
31.10.02 22:30	13.4	6.3	62	SE	6	3	9	5	1019.6	0.0	7.6
31.10.02 23:30	12.5	6.4	66	SSE	7	4	11	6	1019.5	0.0	7.6
01.11.02 00:30	11.8	6.3	69	CALM	Ê	Ê			1019.1	0.0	7.6
01.11.02 01:30	12.4	5.3	62	E	4	2	11	6	1018.4	0.0	7.6
01.11.02 02:30	12.5	5.7	63	SE	4	2	9	5	1017.6	0.0	7.6
01.11.02 03:30	11.7	5.9	68	ESE	4	2	11	6	1017.2	0.0	7.6
01.11.02 04:30	12.2	5.8	65	NE	7	4	13	7	1017.0	0.0	7.6
01.11.02 05:30	14.5	5.2	54	ENE	13	7	20	11	1016.8	0.0	7.6
01.11.02 06:30	14.8	4.7	51	ENE	11	6	22	12	1016.9	0.0	7.6
01.11.02 07:30	16.8	5.3	47	ENE	18	10	30	16	1017.0	0.0	7.6
01.11.02 08:30	19.3	4.9	39	ENE	17	9	30	16	1017.3	0.0	7.6
01.11.02 09:30	21.3	4.8	34	ENE	24	13	39	21	1017.2	0.0	7.6
01.11.02 10:30	23.6	4.7	29	NE	22	12	31	17	1016.9	0.0	7.6
01.11.02 11:30	25.6	3.9	25	NE	20	11	31	17	1016.4	0.0	7.6
01.11.02 12:30	27.0	2.5	21	NE	22	12	35	19	1014.8	0.0	7.6
01.11.02 13:30	28.4	3.0	20	NNE	20	11	33	18	1013.7	0.0	7.6
01.11.02 14:30	29.6	4.0	20	ENE	17	9	26	14	1012.5	0.0	7.6
01.11.02 15:30	30.1	3.7	19	ENE	18	10	31	17	1011.5	0.0	7.6
01.11.02 16:30	31.0	1.6	15	ENE	18	10	30	16	1010.5	0.0	7.6
01.11.02 17:30	29.8	2.2	17	ENE	17	9	24	13	1010.0	0.0	7.6
01.11.02 18:30	29.0	3.9	20	ENE	18	10	26	14	1009.9	0.0	7.6
01.11.02 19:30	28.6	1.5	17	ENE	15	8	24	13	1009.8	0.0	7.6
01.11.02 20:30	28.2	2.3	19	NE	17	9	28	15	1010.0	0.0	7.6
01.11.02 21:30	28.1	1.2	18	NE	18	10	26	14	1010.6	0.0	7.6
01.11.02 22:30	27.3	2.2	20	ENE	17	9	26	14	1009.7	0.0	7.6
01.11.02 23:30	27.6	3.1	21	NE	15	8	26	14	1008.4	0.0	7.6

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