RMK 23

BOUNDARY LAYER MEASUREMENTS AT KLOCKRIKE

October 1977, GOTEX I

by Kjell Ericson and Per-Olof Hårsmar

SMHI SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE

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Abstract

Two days of boundary layer measurements in Southern Sweden are presented. The field experiment was carried out in October 1977, as a pilot study. Mean quantities of wind, temperature and humidity were measured both in the surface and the Ekman layer. Radiation and soil temperature were also measured. The data suffer from some incompleteness and a certain amount of inaccuracy. Still you get a fairly good picture of the diurnal cycle of the atmospheric boundary layer under Nordic conditions.

Key words

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1. INTRODUCTION

During the pilot field experiment GOTEX I, 11 - 13 October 1977, data were obtained from two diurnal cycles of the planetary boundary layer (PBL). The need for a consistent set of data from the entire mixed layer has lately became a matter of necessity for the research work at the Swedish Meteorological and Hydrological Institute (SMHI). At the Department of research and training, different kinds of PBL-models are developed. So far, a fully equipped (in the sence of physical parameterisation) one-dimensional model is working (Bodin 1979). It is based on the turbulent energy equation, and the most severe constraint on the model is that it should be able to work operationally, that is to be fast enough. One aim with this model is to serve as forecasting guidance to meteorologists at Swedish airports. Further work with this and 2- and 3-dimensional models are carried out. So far, the Wangara data (Clark et.at. 1971) and some rather incomplete data from Finland have been used for simulation and verification. Sweden is located at high latitudes, (55°N to 69°N), and data from such regions are available only from the surface layer (up to about 100 m), with minor exceptions. GOTEX I, and the full-scale project GOTEX II (executed in 1980), hopefully will give the opportunity of detailed studies of the behaviour of the entire PBL.

2. LOCATION OF THE EXPERIMENT

In the agricultural district in western Östergötland, some 200 km southwest of Stockholm, there is a very flat site which we have used for this experiment. It is located near the small village Klockrike, some 20 km west of Linköping (figure 1), the capital town of the district. Figure 2 shows the site and the nearest surrounding buildings. The area is very homogeneous, and up to two km, there are only a few buildings scattered on the fields. The nearest house lies about 500 metres west of the measuring towers. Since the experiment took place in October, the fields were harvested and the closest one were left with about 10 cm stubble. Some far away fields were already ploughed. The coordinates of the site are 58°29N and 15°23E.

The nearest synoptic (hourly) station is the military airport of Linköping (see figure 1) 10 km away and the nearest aerological station is Stockholm. The Linköping synoptic observations are given in the appendix together with data from Klockrike.

Figure 1. South Sweden. Klockrike is indicated with a star.

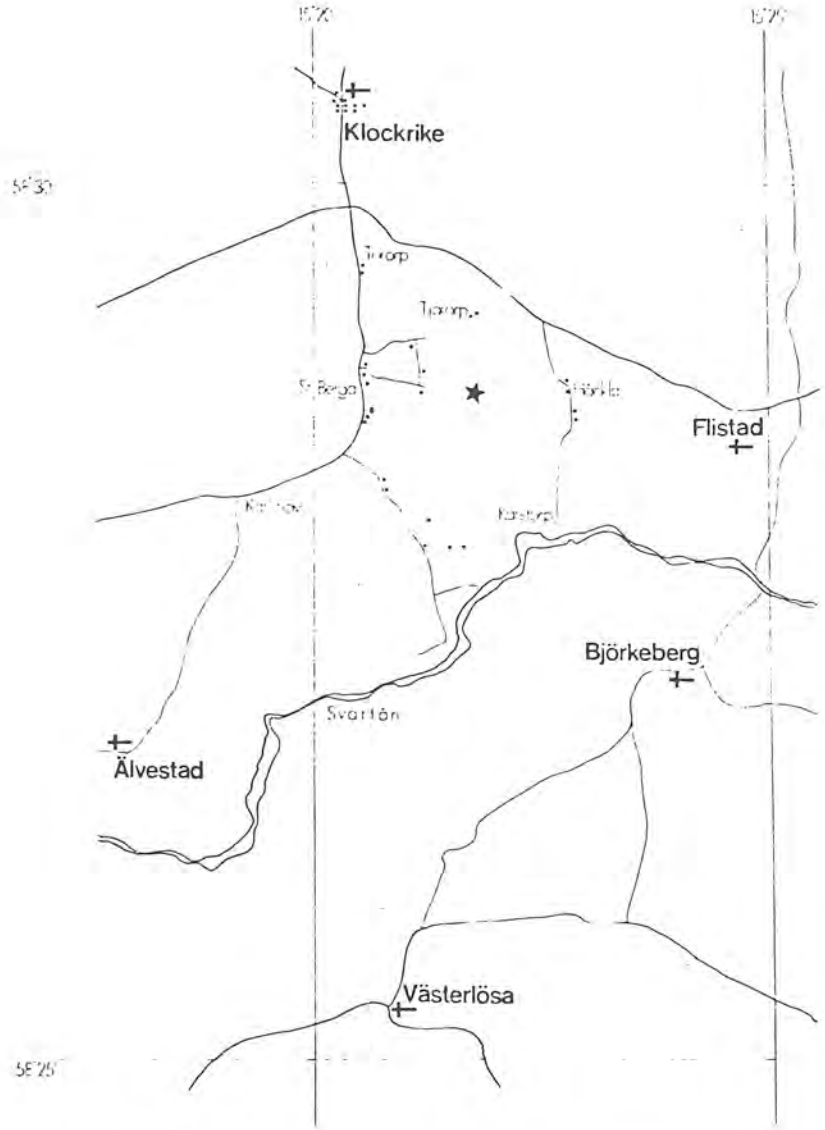

Figure 2. The observation site (the star) and the nearest surrounding, showing all buildings up to 2 km around the masts.

3. THE MEASURING PROGRAM AND EQUIPMENT

The experiment "GOTEX I" was created as a first trial, without any real financial support. Most of the equipment was borrowed from other projects or other authorities. This turned out to be a serious limitation to full-fill the intentions of the experiment. Particulary the power supply to the logging system, consisting of a petrol motor-driven electric generator, gave a fading and unstable frequency. This caused a couple of break downs in the logging system and a corresponding loss of data. An additional problem was that the internal clock in the mini-computer which controlled the logger also was influenced. By

regular checks against true time, the problem was managed.

The instruments themselves were also borrowed, and not always of the most accurate type. Especially the radiation shelters, the humidity sensor and the method of wind estimation by double theodolites may have limited the accuracy.

Nevertheless, GOTEX I gave o lot of experience used during the full scale experiment in May 1980, GOTEX II. The data as presented here gives a fairly good picture of the processes in the lower atmosphere during the period.

3.1 The profile system

Two towers were used to measure wind velocity, one 10 m and one 5 m high. The 10 m tower also carried a windvane. This configuration was choosen to minimize unfavorable directions. The nearest house (500 m away) and the two towers were placed in a line, in an east-west direction (see figure 3).

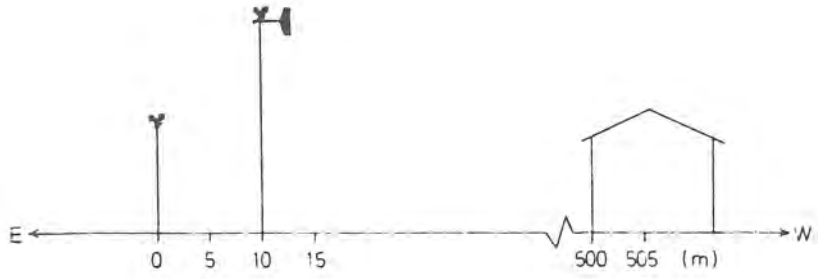

Figure 3. Configuration of the masts and the nearest barn.

The solution is not the best one possible, but different constraints made this compromise necessary. The windspeed was measured with SMHI routine cup anemometer (which participated in a WMO comparison 1976 - 77, Lamboley & Viton 1977) placed in the top of the two masts. For laminar, static flows the accuracy can be estimated to 4%. The threshold is 0.3 m/s, the distant constant 5 m and the overspeeding effect appears to be low.

To measure wind directions, one potentiometer connected windvane was placed in the top of the 10 m mast. The characteristics of the vane are: damping ratio 0.4, distant constant 1.3 m

and the damped resonance wavelength 6.5 m. The deduced natural resonance wavelength is 6.0 m.

Profiles of the temperature were measured both in the soil and in the air. We used PT-100 (platinum) sensors in metal tubes (Rose mount). The accuracy for this sensor is 0.05°C; each sensor has been individually calibrated. For the soil measurements, 5 sensors were placed at 0, 2, 4, 10, 23 and 51 cm depth. From a hole in the ground, they were horizontally put in the right position (figure 4). Before the measurements the hole was refilled. The sensor at the interface (0 m) will not measure the true surface temperature due to radiation influence and the finite size of the sensor.

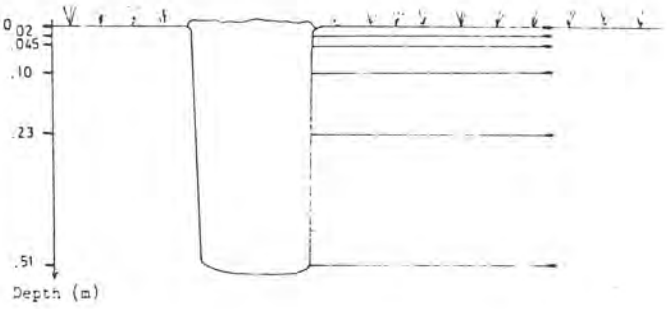

Figure 4. Distribution of sensors for soil temperature measurements. The whole layer consists of heavy clay, about 70% by weight (below the uppermost 10 - 20 cm).

To measure the air-temperature, the sensors were mounted in ventilated, SMHI-designed radiation shields at 1, 4 and 9 m height above ground (figure 5).

The absolute error due to radiation with these shields can be estimated to 0.5°C. In the profile-system all sensors were exposed to similar conditions, i.e. wind and radiation, so the relative error can be estimated to less than 0.2°C.

Humidity profiles were measured by a very crude equipment. We used Lambrecht hairhygrometers, which produces a variable resistance. The sensors were subjected to an as accurate as possible calibration before and after the experiment. The relative accuracy of the humidity data can be set to 5%, including the radiation error. To prevent the hair from direct

solar radiation, the sensors were put inside two concentric tubes, one plastic and the other of aluminium. These sensors were placed at the same level as the temperatur sensors.

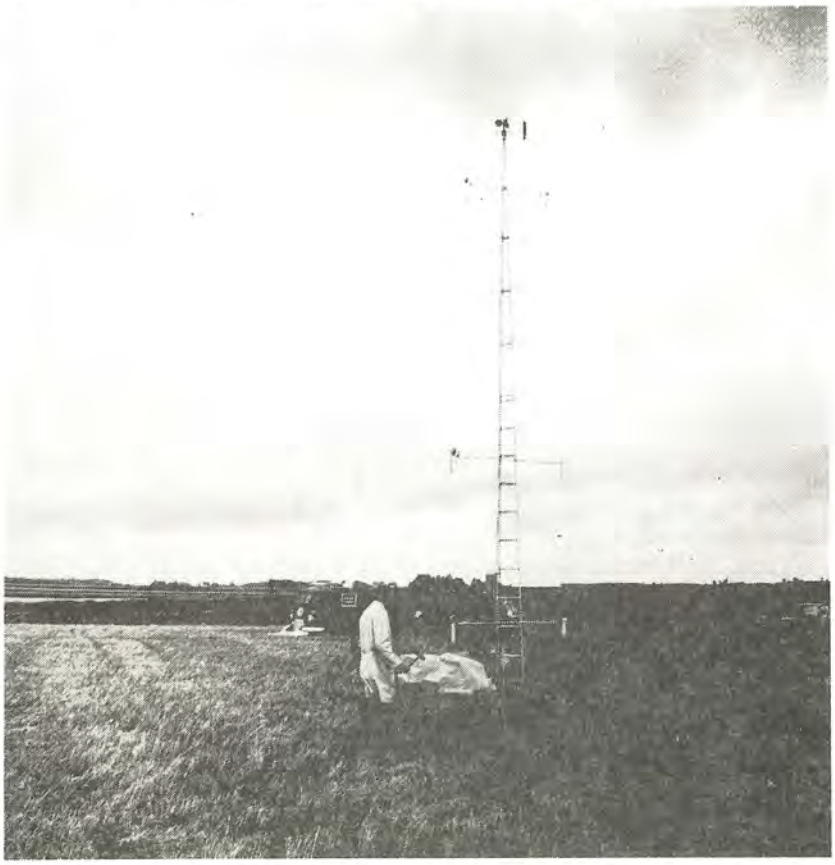

Figure 5. The masts and their instrumentation.

At ground level, the global radiation was measured by a Moll Gorzinski pyranometer. It has an accuracy of 4%.

Net radiation was measured by a CSIRO net radiometer at 1 m height above ground, with 7% accuracy.

To sample data from all these sensors a minicomputerized data-logger with 100 channels (Compulog II) was used. Data was sampled four times per hour, and integrated for 10 minutes. Each sample consists of about 75 values with an interval of 8 seconds. This applies to wind and air temperature. Due to the low accuracy of the humidity sensors and the very low variance of soil temperature and radiation over a 10 minutes period, those sensors were sampled as instantaneous values at each quarter of an hour. Data were stored on tape.

3.2 Soundings

Every third hour a Vaisala radiosonde RS18 was released with

a 100 g balloon filled with hydrogen to produce an ascent rate of approximately 200 metres/minute. This speed is somewhat lower than generally used for routine purpose. This may cause problems because of too low ventilation speed, but at lower levels, where our interest is focused, it will be large enough. In this way we increased the resolution in the boundary layer. Each sonde was calibrated before the release. Pressure is measured with an aneroid with an accuracy of ± 1 mb, temperature with a bimetal sensor, with an error of ± 0.4° and finally humidity with a hair-hygrometer. The accuracy of humidity can be estimated to ± 5%.

Wind profiles were estimated by tracking the balloons with two theodolites. The operating staff was unfortunately not very familiar with this kind of work, resulting in some early losses of the balloon. The vernier scales were photographed with an ordinary camera, operated by photographers. They were ordered to fire by walkie-talkies. This method may introduce some errors, partly due to differing individual reaction times. The accuracy of the method is sensitive to registrations beeing simultaneous at the two theodolites. The vernier scales were photographed every 30 seconds up to 5 minutes, and thereafter each minute. At night the sonde was fitted with a twinkling lamp and a reflector to make it possible to see the balloon. All data collected in this way have afterwards been processed to get windprofiles by a method described in Alexandersson and Bergström (1979).

3.3 Sodar (Acoustic Sounder)

SMHI:s monostatic SODAR continuously registrated the state of the lower (1 000 m) atmosphere. It detects stable (inversion) layers, but is very sensitive to noise. During nights, when well defined stable layers appeared as well as fog, it is possible to follow their evolution on the registrations. At daytime noise and convective cells blacken the whole registration. An inversion could be registrated only in the morning of October 12 and this part of the registration is showed in figure 6.

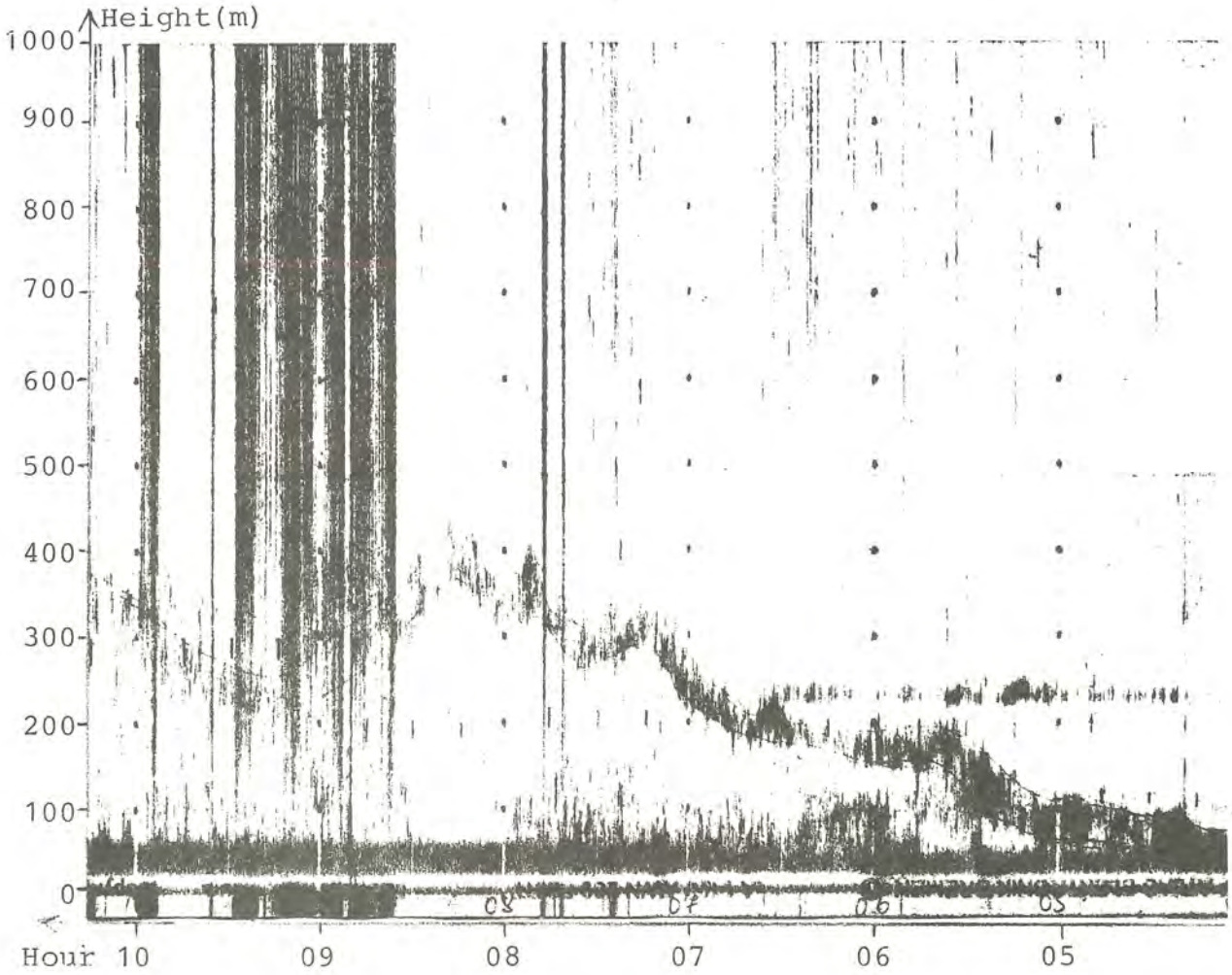

Figure 6. Registration by the sodar in the morning 1977-10-12 showing a stable layer some hundred metres above the ground.

3.4 Soil water content

Soil water content was measured on the 6th of October and on the 12th, by a gravimetric method.

On the 6th, the water content was 25.4% by volume or 79 mm, and on the 12th 27.6% representing 91 mm. The proportion of organic matter to the dry weight was 9.71%.

4. WEATHER SITUATION

The weather in Scandinavia this time of the year is characterized by travelling lows on the polar front, causing what is refered to as "every second day"-weather in Sweden. At the beginning of October a series of fronts passed the observation site. They gave small amounts of precipitation, but on the 4th, 15 mm fell during the passage of a cyclone. It was followed by a high pressure period and no rain. On the 8th a weak warm front passed, but the rain was prefrontal and fell on the 7th (8 mm). The night between the 9th and 10th of October another weak coldfront passed, and 3 mm fell. In the morning of the 11th, the front was out over the Baltic, and a weak high pressure ridge was established over Östergötland. The air mass was rather misty and the wind was weak in the ridge. The night between 12th adn 13th a very weak coldfront passed, but no rain fell over the site. In figures 7 and 8 some weather maps are given covering the measuring period. Figure 9 shows the distribution of rain fallen during the passage of the cold front on the night to the 13th.

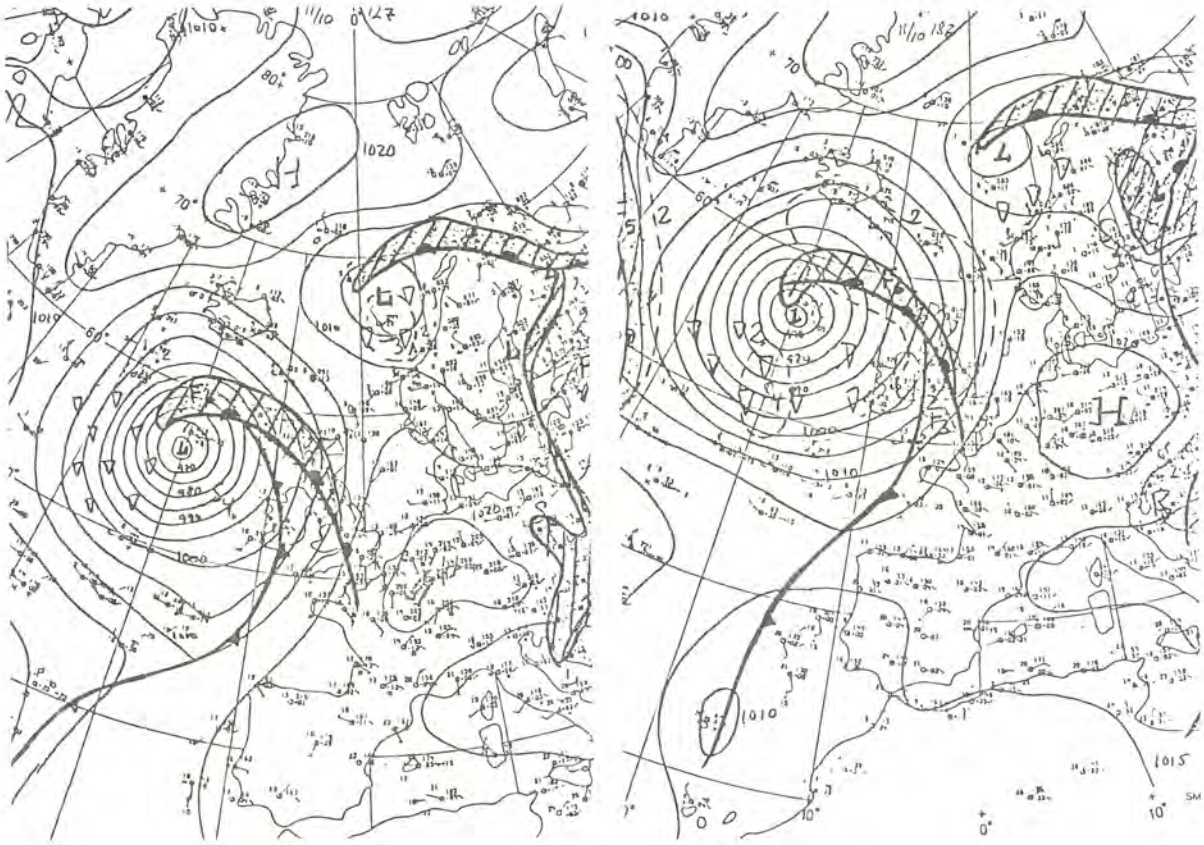

Figure 7 a. Routine surface analyses from 1977-10-11 1300 and 1900 LT.

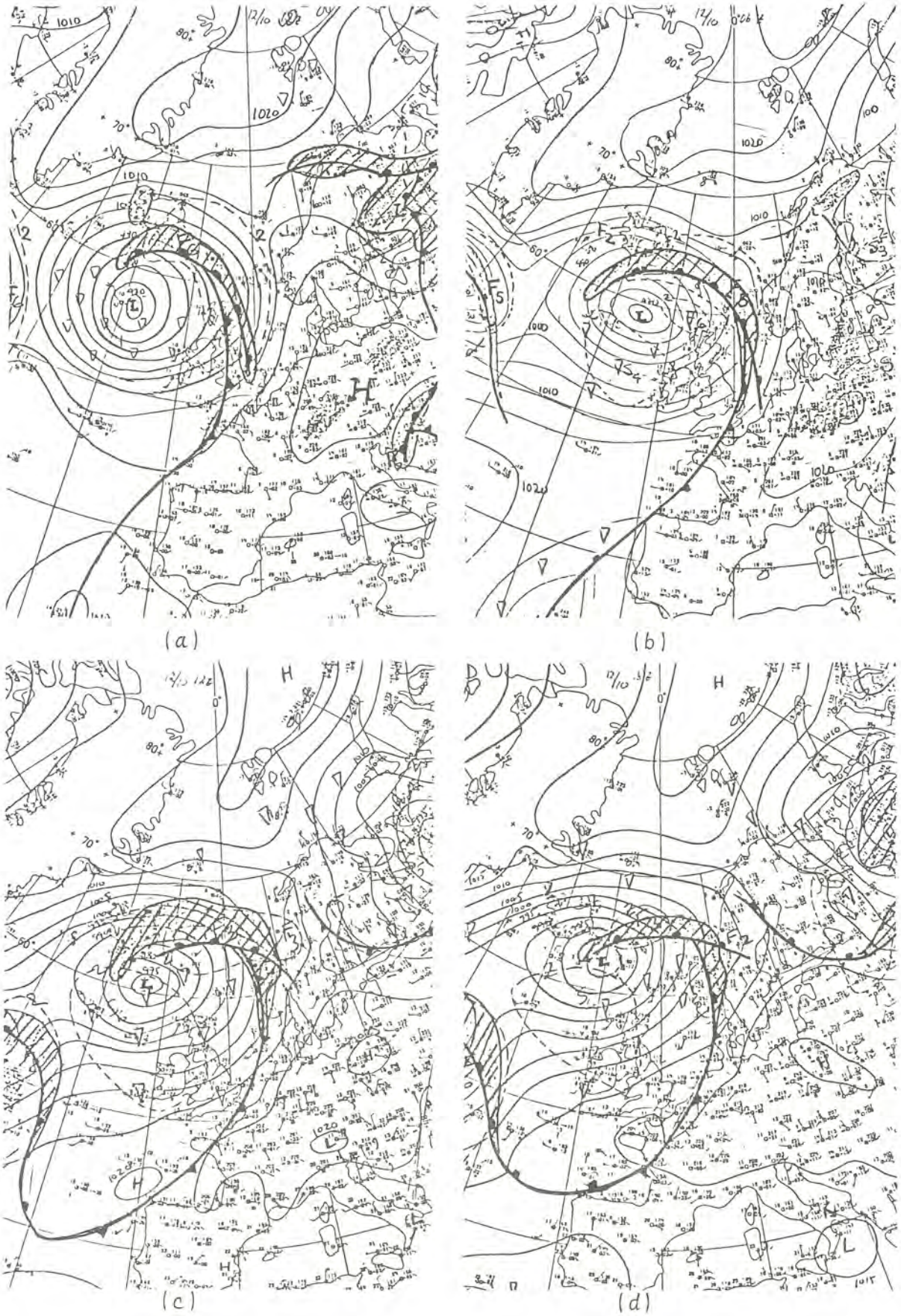

Figure 7 b. Routine surface analyses from 1977-10-12 0100 (a), 0700 (b), 1300 (c) and 1900 (d) LT.

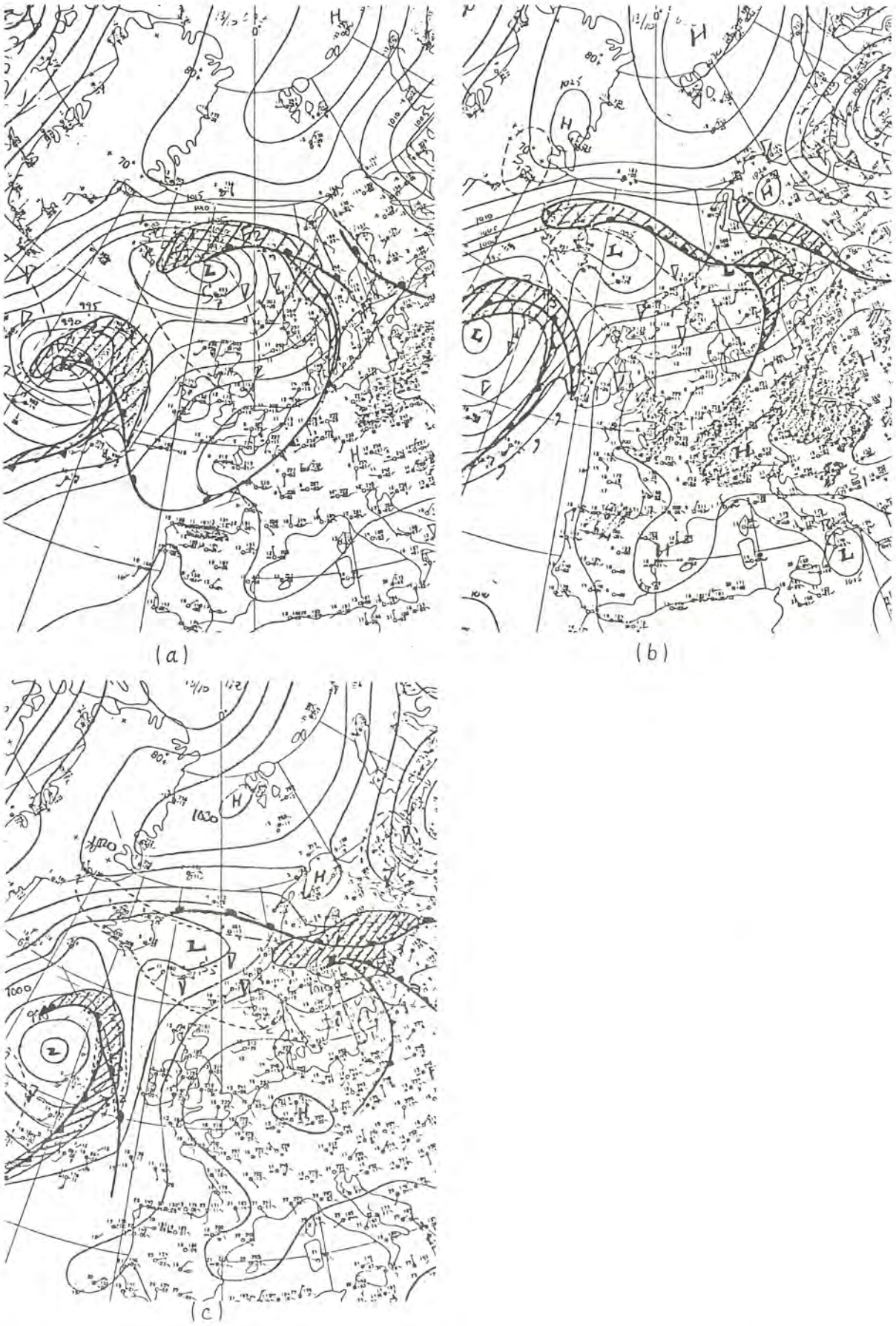

Figure 7 c. Routine surface analyses from 1977-10-13 0100 (a), 0700 (b) and 1300 (c) LT.

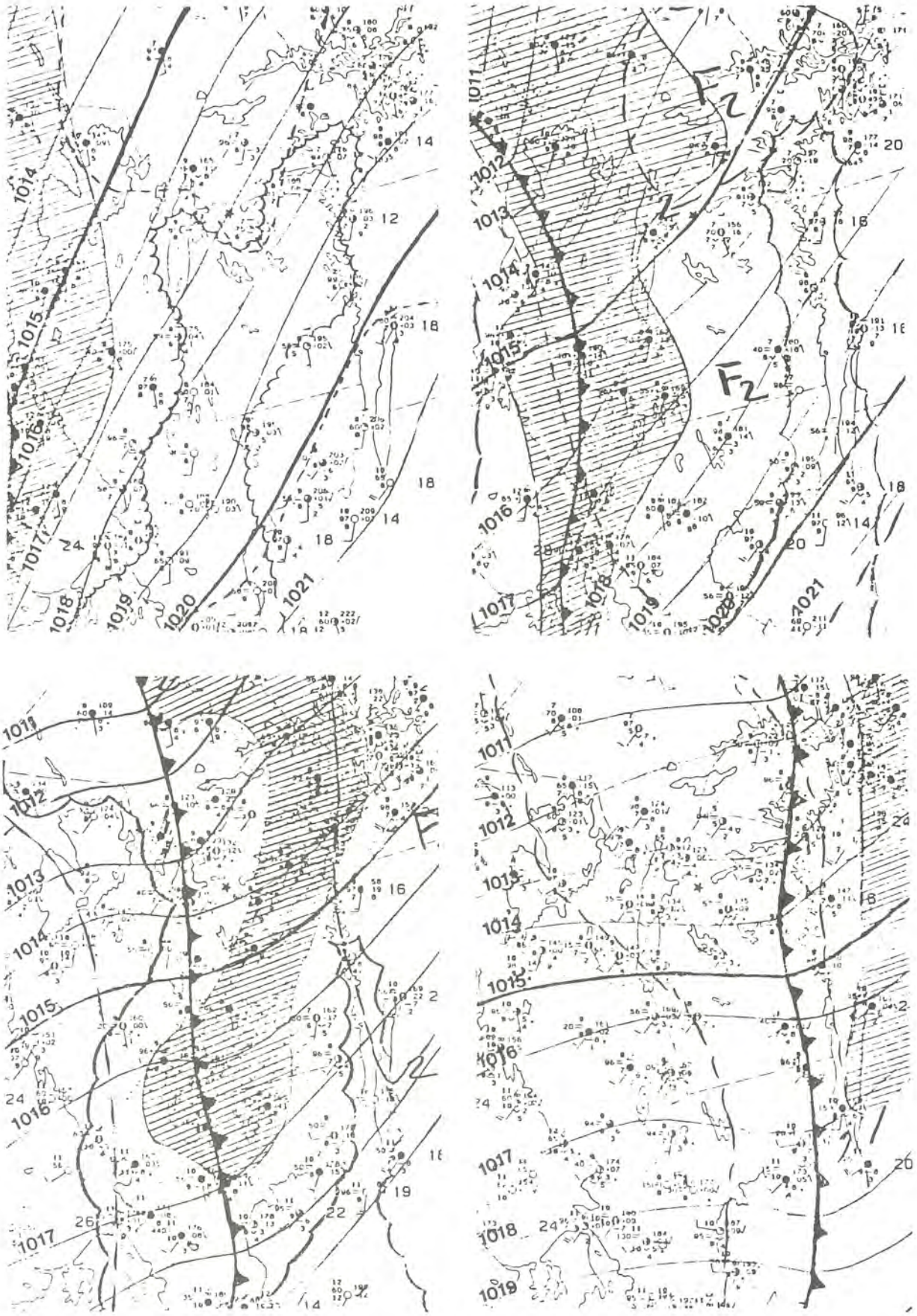

Figure 8. Detailed surface analyses 1977-10-12 2200 LT, 1977-10-13 0100, 0400 and 0700 LT.

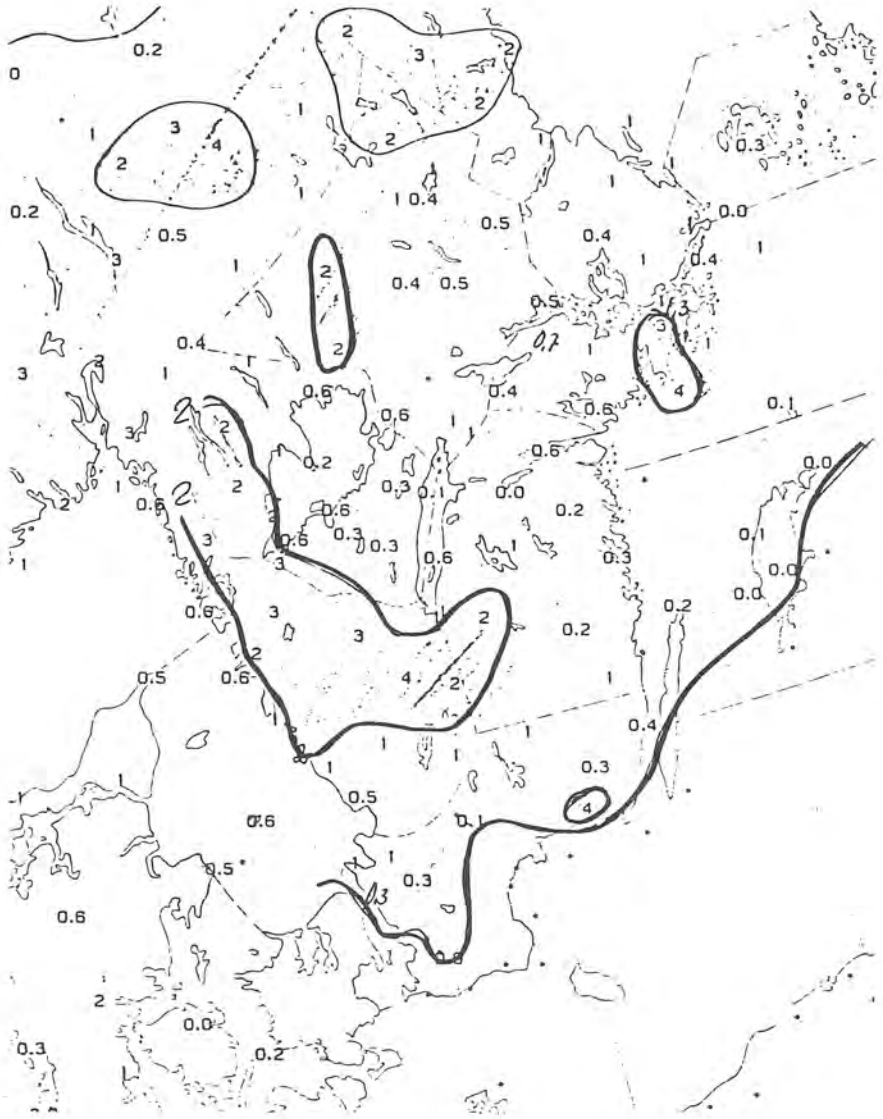

Figure 9. Precipitation in mm measured from 1977-10-12 1900 LT to 1977-10-13 0700 LT. During this period the cold-front passed southern Sweden.

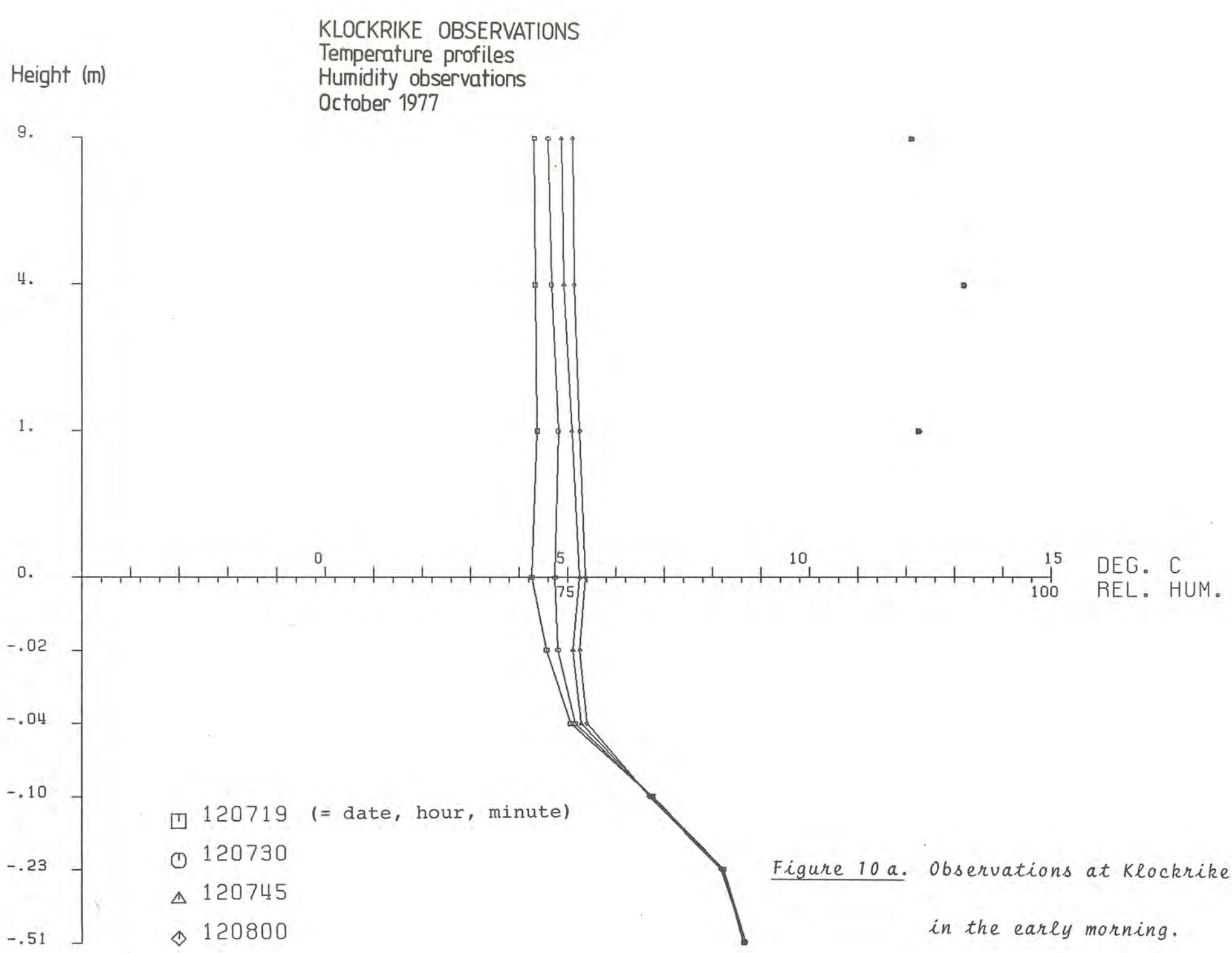

Figure 10 a. Observations at Klockrike in the early morning.

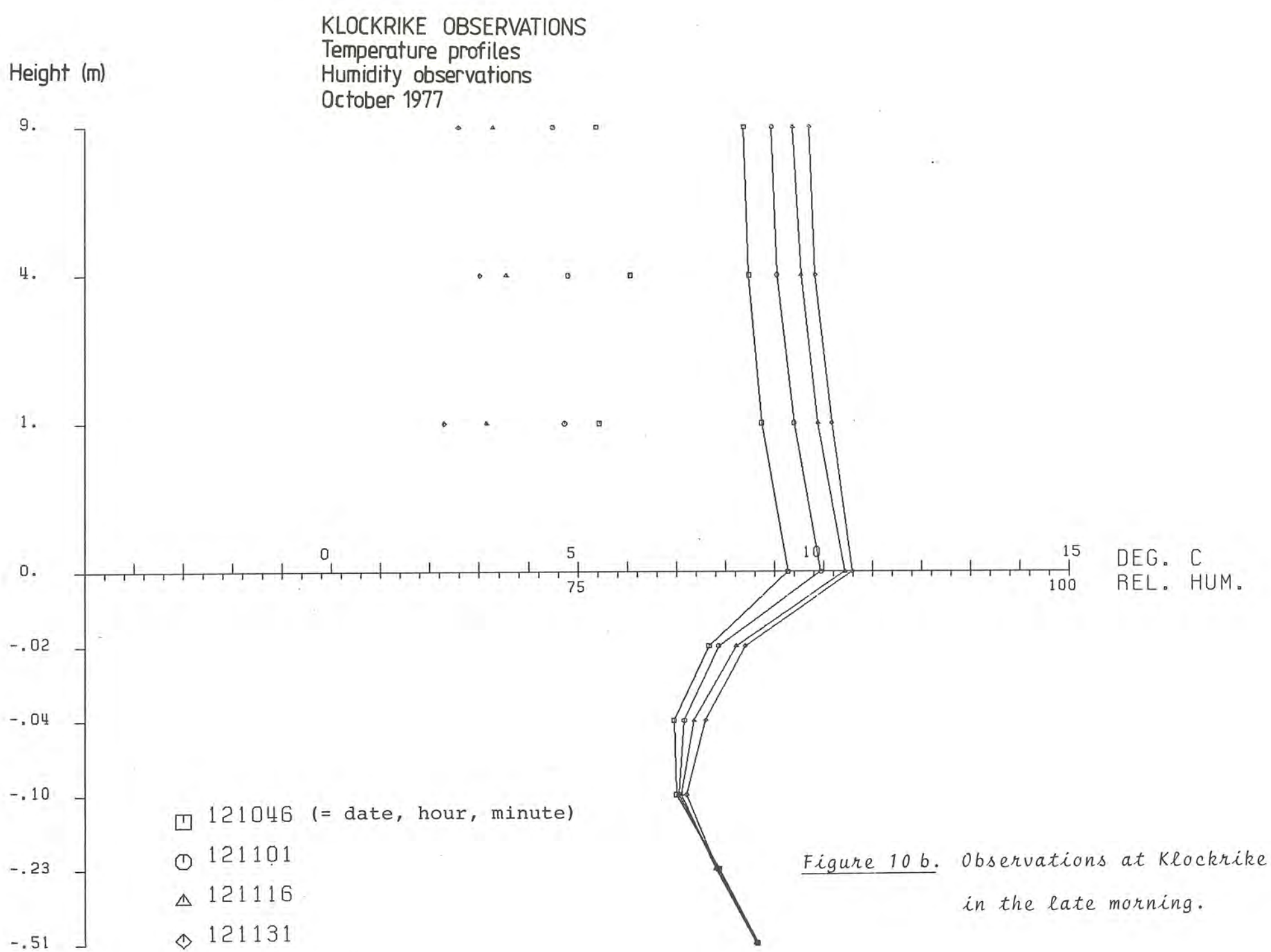

Figure 10 b. Observations at Klockrike in the late morning.

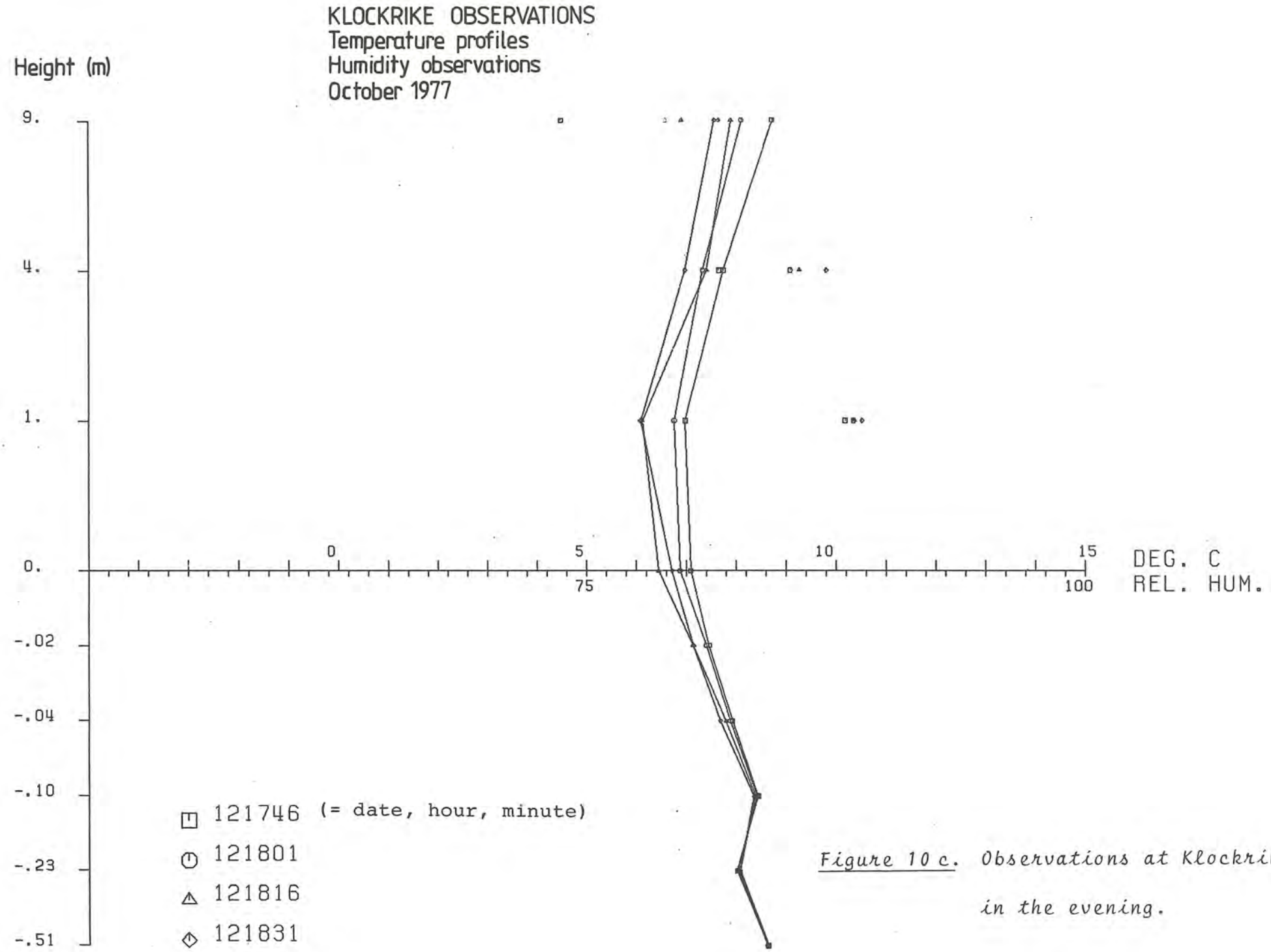

Figure 10 c. Observations at Klockrike in the evening.

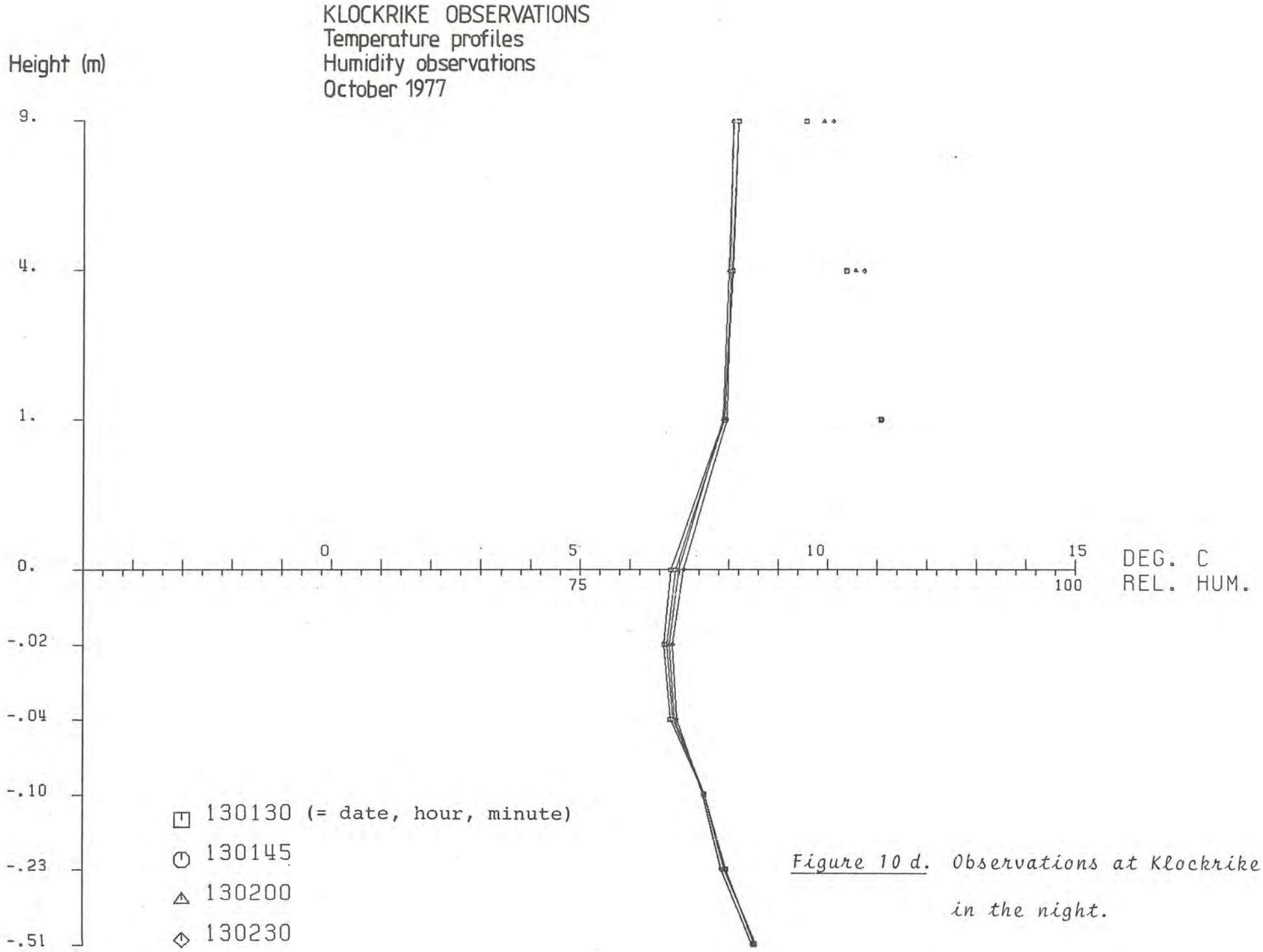

Figure 10 d. Observations at Klockrike in the night.

5. DATA

An extended treatment or analysis have not been attempted here but some plots of profiles of temperature both in the air and the soil are shown in figure 10. The values are connected by strait lines and humidity in the air is indicated by symbols. Each diagram shows four (censecutive in time) profiles. Figure 10 only shows the situation at some certain times of the day, early morning, late morning, evening and midnight. These diagrams visualize the diurnal variation. They show that soil temperature varies during the period down to about 25 cm. At 51 cm depth (the lowest sensor) the temperature was constant all the time.

Figure 11 shows a time-height cross section of temperature up to 5 000 metres obtained by radiosondes. The first night the weather was clear and an inversion was build up. As can be seen in the figure the height of the inversion in the morning was about 500 metres. This inversion can also be seen in the registration from the acoustic sounder, figure 6. A weak cold front passed the area in the morning 13th of October and it can be seen to the right in the figure as a trough.

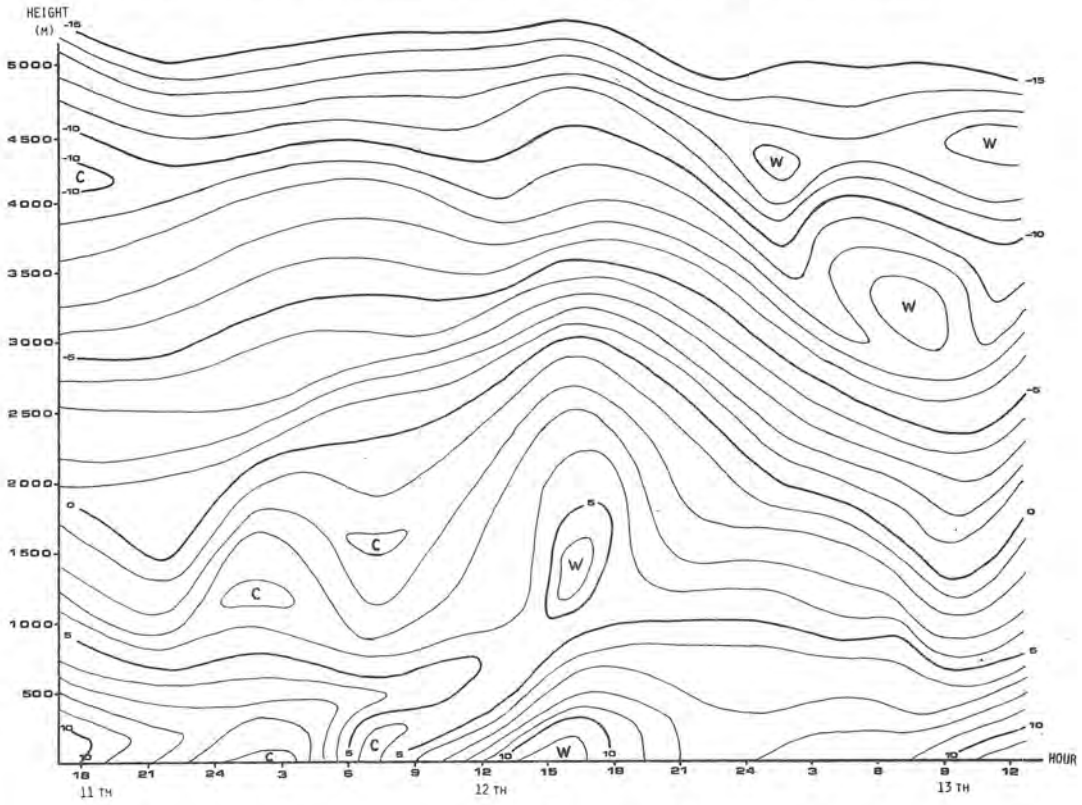

Figure 11. The variation of temperature (°C) with height and time at Klockrike, 11 - 13 October 1977.

In the appendix A all data are given for each hour during the period 79-10-11 1700 to 79-10-13 1100 local time. The appendix also include radiosonde data. In figure 11 the sounding from 79-10-12 1900 has been excluded, since the temperature shows a systematic error about five degrees too low. Nevertheless the sounding is included in the appendix, and the reader have to pay attention to this error.

Acknowledgements

We want to thank all the staff at SMHI, who participated in the experiment, and especially Sverker Magnusson, who was responsible for the instrumental equipment, Arne Törnvall, who made all of the excellent programming for collecting data and Yvonne Björkman for typing the manuscript.

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APPENDIX

Tables of hourly observations

DATE: 11 OCT 1977 HOUR: 12

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 4.3M/S
AIR PRESS 100.96 KPA PRESS TEND .01 KPA
TEMP 11.9 DEGREES DEW POINT 9 DEGREES
REL HUMIDITY 82 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 57.5 W/M*M
GLOBAL RADIATION 90.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 11.9
2 10.8
4 10.3
10 9.9
23 8.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		11.7	6.6		
4		11.8	6.5		
5		.			5.6
9		11.7	6.4		
10				253.	6.5

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 13

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 5.4M/S
AIR PRESS 101.00 KPA PRESS TEND -.02 KPA
TEMP 12.0 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 76 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 38.0 W/M*M
GLOBAL RADIATION 61.0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 11.9
2 10.7
4 10.4
10 10.0
23 8.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		11.7	6.7		
4		11.7	6.6		
5					6.1
9		11.7	6.5		
10				158.	7.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 14

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 4.3M/S
AIR PRESS 101.02 KPA PRESS TEND -.05 KPA
TEMP 12.0 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 78 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 63.8 W/M*M
GLOBAL RADIATION 103.4 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 12.5
2 10.8
4 10.4
10 10.1
23 8.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		12.2	6.6		
4		12.1	6.5		
5					5.4
9		12.1	6.4		
10				168.	6.5

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 15

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 3.2M/S
AIR PRESS 101.07 KPA PRESS TEND -.11 KPA
TEMP 12.1 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 78 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 15.0 W/M*M
GLOBAL RADIATION 94.1 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 12.7
2 10.6
4 10.4
10 10.1
23 8.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		12.7	6.3		
4		12.7	6.3		
5					5.8
9		12.6	6.2		
10				265.	6.8

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 16

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 6.5M/S
AIR PRESS 101.08 KPA PRESS TEND -.10 KPA
TEMP 12.4 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 76 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 2
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -48.0 W/M*M
GLOBAL RADIATION 18.6 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.8
2 10.1
4 10.3
10 10.2
23 9.0
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.9	6.1		
4		11.3	6.1		
5					3.7
9		11.5	6.1		
10				265.	4.7

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 17

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 3.2M/S
AIR PRESS 101.16 KPA PRESS TEND -.14 KPA
TEMP 11.5 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 78 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -49.8 W/M*M
GLOBAL RADIATION 2.5 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.6
2 9.7
4 10.0
10 10.2
23 9.0
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.7	6.1		
1.2	100.35	12.0	6.7		
4		11.0	6.1		
5					4.2
9		11.2	6.0		
10				301.	5.2
25.	100.07	11.8	6.6	301.	2.8
50.	99.77	11.5	6.6	308.	8.2
75.	99.47	11.3	6.5	307.	7.6
100.	99.17	11.1	6.5	305.	7.1
200.	97.99	10.2	6.3	305.	9.0
300.	96.82	9.5	6.2	301.	10.3
400.	95.65	8.6	6.1	296.	11.1
500.	94.50	7.7	6.1	292.	11.3
600.	93.36	7.0	5.9	287.	10.6
700.	92.23	5.9	5.6	281.	10.6
800.	91.11	5.5	5.8	282.	10.5
900.	90.00	5.1	5.0	281.	9.9
1000.	88.90	4.6	4.9	281.	9.8
1100.	87.81	3.7	4.7	293.	9.6
1200.	86.74	3.1	4.2	282.	9.7
1300.	85.67	2.6	4.0	296.	10.2
1400.	84.62	2.0	3.6	300.	11.9
1500.	83.57	2.2	2.9	299.	10.3
1600.	82.54	1.6	2.7	300.	7.4
1700.	81.52	.9	2.6	296.	15.2
1800.	80.51	.2	2.3		
1900.	79.51	-.6	2.1		
2000.	78.51	-1.2	1.9		
2500.	73.71	-2.7	1.0		
3000.	69.17	-5.6	.6		
3500.	64.86	-7.9	.5		
4000.	60.81	-9.7	.4		
4500.	56.99	-9.3	.5		
5000.	53.38	-12.4	.4		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 18

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 3.2M/S
AIR PRESS 101.23 KPA PRESS TEND -.15 KPA
TEMP 10.0 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 84 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -62.0 W/M**M
GLOBAL RADIATION -3.4 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	7.1
2	8.9
4	9.6
10	10.1
23	9.0
51	8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		8.6	5.7		
4		9.2	5.8		
5					3.5
9		9.8	5.7		
10				272.	4.5

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 19

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 5.4M/S
AIR PRESS 101.28 KPA PRESS TEND -.18 KPA
TEMP 9.9 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 84 % PRECIPITATION 1.2 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 1
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -60.6 W/M**M
GLOBAL RADIATION -2.5 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	6.5
2	8.4
4	9.1
10	9.9
23	9.1
51	8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.9	5.7		
4		8.6	5.8		
5					3.3
9		9.2	5.8		
10				276.	4.5

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 20

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 3.2M/S
AIR PRESS 101.34 KPA PRESS TEND -.17 KPA
TEMP 9.0 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 88 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 1
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -65.0 W/M**M
GLOBAL RADIATION -2.5 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	6.7
2	8.0
4	8.8
10	9.7
23	9.1
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.7	5.7		
4		8.3	5.7		
5					3.6
9		8.9	5.7		
10				273.	4.8

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 21

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 3.2M/S
AIR PRESS 101.44 KPA PRESS TEND -.20 KPA
TEMP 8.4 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 90 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 1
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -53.3 W/M**M
GLOBAL RADIATION -2.5 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	6.2
2	7.6
4	8.4
10	9.5
23	9.1
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.5	5.8		
4		8.0	5.8		
5					3.2
9		8.3	5.7		
10				290.	4.1

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 22

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 2.2M/S
AIR PRESS 101.47 KPA PRESS TEND -.18 KPA
TEMP 7.6 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 92 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -42.3 W/M**M
GLOBAL RADIATION -3.4 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.5
2	7.2
4	8.1
10	9.2
23	9.1
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.0	5.2		
1.2	100.66	7.1	5.6		
4		6.7	5.5		
5					3.3
9		7.5	5.5		
10				280.	4.5
25.	100.37	7.4	5.7	274.	2.7
50.	100.07	7.8	5.9	322.	8.8
75.	99.77	8.1	6.0	308.	7.4
100.	99.46	8.2	6.0	288.	6.7
200.	98.26	8.0	5.5	323.	9.9
300.	97.08	7.8	5.1	325.	9.5
400.	95.91	7.0	4.2	331.	7.5
500.	94.74	6.3	4.1	330.	7.9
600.	93.59	5.6	4.4	325.	7.7
700.	92.45	4.8	4.7	315.	6.6
800.	91.32	4.1	4.5	317.	7.2
900.	90.20	3.3	4.6	323.	9.9
1000.	89.10	2.3	4.2	322.	8.0
1100.	88.00	1.5	3.8	318.	7.2
1200.	86.91	1.3	3.0	323.	8.8
1300.	85.83	.9	2.9	323.	6.3
1400.	84.77	.1	2.5	319.	8.4
1500.	83.71	-.7	2.5	311.	10.3
1600.	82.67	-1.6	2.2	327.	10.5
1700.	81.64	-.4	1.9	327.	12.9
1800.	80.62	.0	1.8	322.	11.8
1900.	79.62	-.2	1.8		
2000.	78.63	-.6	1.6		
2500.	73.83	-2.8	1.1		
3000.	69.28	-5.3	.8		
3500.	64.98	-7.1	.5		
4000.	60.92	-9.0	.5		
4500.	57.09	-11.0	1.4		
5000.	53.46	-15.0	1.5		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 23

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 270 DEG WIND SPEED 2.2M/S
AIR PRESS 101.54 KPA PRESS TEND -.18 KPA
TEMP 6.8 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 92 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -31.7 W/M**M
GLOBAL RADIATION -2.5 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.2
2	6.7
4	7.6
10	8.9
23	9.0
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		5.2	5.0		
4		6.2	5.2		
5					1.3
9		6.7	5.3		
10				28.	1.1

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 11 OCT 1977 HOUR: 24

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 270 DEG WIND SPEED 3.2M/S
AIR PRESS 101.59 KPA PRESS TEND -.24 KPA
TEMP 6.0 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 95 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -23.6 W/M*M
GLOBAL RADIATION -4.2 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 4.5
2 6.3
4 7.4
10 8.8
23 9.0
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		3.6	4.4		
4		5.4	5.2		
5					.3
9		5.8	5.3		
10				25.	.9

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 1

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 270 DEG WIND SPEED 3.2M/S
AIR PRESS 101.63 KPA PRESS TEND -.15 KPA
TEMP 5.6 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -18.5 W/M*M
GLOBAL RADIATION -1.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 3.4
2 5.1
4 6.3
10 8.1
23 8.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		2.2	4.1		
4		3.4	4.6		
5					2.0
9		4.3	4.7		
10				275.	3.4

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 2

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 240 DEG WIND SPEED 2.2M/S
AIR PRESS 101.70 KPA PRESS TEND -.16 KPA
TEMP 5.2 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -18.5 W/M*M
GLOBAL RADIATION -1.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 3.4
2 5.1
4 6.3
10 8.1
23 8.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		2.2	4.1		
1.2	100.70	4.2	5.1		
4		3.4	4.5		
5					2.0
9		4.3	4.7		
10				275.	3.4
25.	100.41	4.9	5.4	280.	.8
50.	100.10	5.7	5.7	281.	3.0
75.	99.80	6.5	6.0	281.	2.6
100.	99.49	6.6	6.1	281.	2.3
200.	98.29	6.3	5.5	347.	2.3
300.	97.10	6.2	5.2	321.	5.2
400.	95.92	7.1	4.7	322.	6.0
500.	94.76	6.8	4.4	320.	6.7
600.	93.61	6.2	4.6	310.	7.9
700.	92.47	5.7	4.4	310.	6.5
800.	91.34	4.9	4.4	306.	8.4
900.	90.23	4.1	4.5	309.	8.0
1000.	89.12	3.5	4.4	302.	8.2
1100.	88.03	3.1	3.9	307.	7.2
1200.	86.95	2.2	3.3		
1300.	85.88	3.1	2.9		
1400.	84.82	4.0	2.5		
1500.	83.78	3.7	2.4		
1600.	82.76	3.3	2.3		
1700.	81.74	2.9	2.2		
1800.	80.73	2.1	2.2		
1900.	79.73	1.4	2.1		
2000.	78.75	.6	2.0		
2500.	73.95	-3.0	1.6		
3000.	69.41	-4.1	.9		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 3

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 1.6M/S
AIR PRESS 101.72 KPA PRESS TEND -.14 KPA
TEMP 4.6 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -16.7 W/M*M
GLOBAL RADIATION -1.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 3.1
2 4.9
4 6.1
10 7.9
23 8.7
51 8.7

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		1.4	3.9		
4		2.9	4.4		
5					1.7
9		4.0	4.6		
10				220.	2.6

KLOCKRIKE SODAR ECHO TOP: 76 M BASE: M

DATE: 12 OCT 1977 HOUR: 4

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 2.2M/S
AIR PRESS 101.73 KPA PRESS TEND -.10 KPA
TEMP 4.2 DEGREES DEW POINT 4 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE 3.7 323
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -17.1 W/M*M
GLOBAL RADIATION -2.5 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 2.7
2 4.5
4 5.7
10 7.6
23 8.6
51 8.7

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		1.7	3.9		
4		2.9	4.4		
5					.8
9		3.5	4.5		
10				236.	1.4

KLOCKRIKE SODAR ECHO TOP: 76 M BASE: M

DATE: 12 OCT 1977 HOUR: 5

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 220 DEG WIND SPEED 3.2M/S
AIR PRESS 101.80 KPA PRESS TEND -.09 KPA
TEMP 3.6 DEGREES DEW POINT 4 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -15.2 W/M*M
GLOBAL RADIATION -1.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 2.5
2 4.2
4 5.4
10 7.3
23 8.5
51 8.7

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		1.7	3.9		
1.2	100.95	5.8	5.3		
4		2.6	4.3		
5					1.2
9		3.2	4.4		
10				199.	2.1
25.	100.66	7.1	5.6	236.	2.5
50.	100.36	7.9	5.8	245.	5.8
75.	100.05	7.8	5.6	239.	7.9
100.	99.75	7.6	5.6	264.	3.7
200.	98.54	7.0	5.4		
300.	97.35	7.9	5.9		
400.	96.18	7.3	5.4		
500.	95.01	6.6	5.0		
600.	93.86	5.9	4.8		
700.	92.72	5.0	4.5		
800.	91.59	4.2	4.3		
900.	90.46	3.4	4.1		
1000.	89.35	2.9	3.8		
1100.	88.25	3.1	2.7		
1200.	87.17	3.0	2.4		
1300.	86.10	2.1	2.3		
1400.	85.04	2.8	1.9		
1500.	83.99	2.6	1.7		
1600.	82.95	2.1	1.6		
1700.	81.93	1.9	1.6		
1800.	80.92	1.7	1.6		
1900.	79.92	1.4	1.4		
2000.	78.93	1.8	1.3		
2500.	74.15	-.7	.9		
3000.	69.62	-3.5	1.1		

KLOCKRIKE SODAR ECHO TOP: 112 M BASE: 60 M

DATE: 12 OCT 1977 HOUR: 6

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 4.3M/S
AIR PRESS 101.80 KPA PRESS TEND -.06 KPA
TEMP 3.0 DEGREES DEW POINT 3 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE)10
AMOUNT OF CLOUDS(OCTAS) 5
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -16.5 W/M**M
GLOBAL RADIATION -.8 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 2.4
2 4.0
4 5.1
10 7.0
23 8.4
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		.7	3.7		
4		1.4	3.9		
5					1.8
9		2.9	4.3		
10				234.	3.3

KLOCKRIKE SODAR ECHO TOP: 194 M BASE: 147 M

DATE: 12 OCT 1977 HOUR: 7

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 240 DEG WIND SPEED 3.2M/S
AIR PRESS 101.83 KPA PRESS TEND -.10 KPA
TEMP 3.0 DEGREES DEW POINT 3 DEGREES
REL HUMIDITY 97 % PRECIPITATION .3 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 5
GEOSTROFIC WIND M/S DEGREES
SURFACE 3.5 247
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 9.6 W/M**M
GLOBAL RADIATION 14.4 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 3.9
2 4.6
4 5.0
10 6.8
23 8.3
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		3.9	4.6		
1.2	101.01	3.5	4.8		
4		4.0	4.7		
5					2.6
9		4.0	4.6		
10				244.	3.3
25.	100.72	3.4	4.7		
50.	100.41	3.3	4.7		
75.	100.10	3.1	4.7		
100.	99.79	3.0	4.7		
200.	98.56	2.5	4.6		
300.	97.35	3.8	4.6		
400.	96.17	6.0	3.8		
500.	94.99	5.4	3.7		
600.	93.84	4.7	4.1		
700.	92.69	4.0	4.3		
800.	91.55	3.4	3.9		
900.	90.42	2.8	3.5		
1000.	89.31	2.1	3.1		
1100.	88.21	1.5	2.8		
1200.	87.12	.9	2.4		
1300.	86.05	1.9	1.9		
1400.	84.98	1.6	1.8		
1500.	83.93	1.1	1.6		
1600.	82.89	.8	1.4		
1700.	81.86	1.1	1.3		
1800.	80.85	1.5	1.2		
1900.	79.85	1.0	1.1		
2000.	78.86	.6	1.0		
2500.	74.07	-.5	.9		
3000.	69.55	-3.4	.7		
3500.	65.26	-5.4	1.2		
4000.	61.20	-7.4	2.4		
4500.	57.37	-10.4	2.3		
5000.	53.74	-13.3	1.9		

KLOCKRIKE SODAR ECHO TOP: 276 M BASE: 216 M

DATE: 12 OCT 1977 HOUR: 8

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 230 DEG WIND SPEED 3.2M/S
AIR PRESS 101.89 KPA PRESS TEND -.09 KPA
TEMP 3.5 DEGREES DEW POINT 4 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)60 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 25.6 W/M**M
GLOBAL RADIATION 39.8 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 5.4
2 5.3
4 5.4
10 6.7
23 8.2
51 8.7

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		5.2	5.1		
4		5.1	5.1		
5					2.6
9		5.1	5.0		
10				223.	3.0

KLOCKRIKE SODAR ECHO TOP: 349 M BASE: 267 M

DATE: 12 OCT 1977 HOUR: 9

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 230 DEG WIND SPEED 5.4M/S
AIR PRESS 101.94 KPA PRESS TEND -.14 KPA
TEMP 3.7 DEGREES DEW POINT 4 DEGREES
REL HUMIDITY 100 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE) 6 WEATHER(SYNOPTIC CODE)47
AMOUNT OF CLOUDS(OCTAS) 9
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 92.7 W/M**M
GLOBAL RADIATION 198.3 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 8.2
2 7.0
4 6.6
10 6.9
23 7.9
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.4	5.6		
4		7.2	5.4		
5					3.0
9		7.1	5.2		
10				159.	3.7

KLOCKRIKE SODAR ECHO TOP: 293M BASE: 233 M

DATE: 12 OCT 1977 HOUR: 10

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 200 DEG WIND SPEED 4.3M/S
AIR PRESS 101.96 KPA PRESS TEND -.12 KPA
TEMP 4.9 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 99 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)60 WEATHER(SYNOPTIC CODE)28
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE 1.6 244
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 92.7 W/M**M
GLOBAL RADIATION 198.3 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 8.2
2 7.0
4 6.6
10 6.9
23 7.9
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.4	5.6		
1.2	101.15	7.8	5.5		
4		7.2	5.4		
5					3.0
9		7.1	5.2		
10				159.	3.7
25.	100.86	7.4	5.4	232.	2.5
50.	100.55	7.1	5.4	232.	.4
75.	100.25	6.7	5.3	340.	6.5
100.	99.94	6.3	5.3	321.	4.3
200.	98.73	4.8	5.0	252.	7.1
300.	97.52	4.4	5.1	248.	7.2
400.	96.33	5.0	4.8	265.	5.6
500.	95.16	5.7	3.9		
600.	94.00	5.7	3.5		
700.	92.86	5.2	3.3		
800.	91.72	4.5	3.1		
900.	90.60	3.7	3.0		
1000.	89.49	3.2	2.9		
1100.	88.39	3.0	2.6		
1200.	87.30	2.9	2.3		
1300.	86.23	2.9	2.0		
1400.	85.17	2.6	2.0		
1500.	84.12	2.3	2.0		
1600.	83.08	2.0	1.8		
1700.	82.05	1.7	1.6		
1800.	81.04	1.4	1.6		
1900.	80.04	1.0	1.6		
2000.	79.04	1.5	1.5		
2500.	74.26	.0	1.1		
3000.	69.73	-3.9	2.3		
3500.	65.43	-6.1	2.0		
4000.	61.36	-7.8	1.8		
4500.	57.51	-10.9	2.3		

KLOCKRIKE SODAR ECHO TOP: 345 M BASE: 293 M

DATE: 12 OCT 1977 HOUR: 11

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 200 DEG WIND SPEED 2.7M/S
AIR PRESS 101.98 KPA PRESS TEND -.11 KPA
TEMP 7.3 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 92 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 175.0 W/M**M
GLOBAL RADIATION 315.3 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.9
2 7.9
4 7.2
10 7.0
23 7.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		9.4	5.4		
4		9.0	5.3		
5					2.9
9		8.9	5.2		
10				159.	3.5

KLOCKRIKE SODAR ECHO TOP: 405 M BASE: 259 M

DATE: 12 OCT 1977 HOUR: 12

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 230 DEG WIND SPEED 2.7M/S
AIR PRESS 102.02 KPA PRESS TEND -.10 KPA
TEMP 9.2 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 90 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 69.5 W/M**M
GLOBAL RADIATION 163.6 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.6
2 8.8
4 8.5
10 8.1
23 7.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.4	5.4		
4		10.3	5.3		
5					3.7
9		10.2	5.2		
10				161.	4.4

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 13

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 260 DEG WIND SPEED 5.4M/S
AIR PRESS 101.93 KPA PRESS TEND .01 KPA
TEMP 10.2 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 77 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 69.5 W/M**M
GLOBAL RADIATION 163.6 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.6
2 8.8
4 8.5
10 8.1
23 7.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.4	5.4		
1.2	101.10	10.5	6.1		
4		10.3	5.3		
5					3.7
9		10.2	5.2		
10				161.	4.4
25.	100.81	10.0	5.9	255.	5.6
50.	100.51	9.5	5.8	255.	1.5
75.	100.21	9.0	5.7	239.	8.8
100.	99.91	8.6	5.6	244.	9.0
200.	98.70	7.5	5.4	245.	6.7
300.	97.51	6.6	5.4	253.	5.8
400.	96.32	5.7	5.5	250.	7.6
500.	95.15	4.8	5.4	249.	8.6
600.	93.99	3.9	5.2		
700.	92.84	3.2	5.0		
800.	91.70	4.0	4.7		
900.	90.58	3.8	4.4		
1000.	89.47	3.4	4.0		
1100.	88.37	3.0	3.8		
1200.	87.28	2.6	3.5		
1300.	86.21	2.2	3.1		
1400.	85.15	2.9	2.5		
1500.	84.10	3.1	2.0		
1600.	83.07	3.3	1.7		
1700.	82.04	3.3	1.7		
1800.	81.04	3.1	1.7		
1900.	80.04	3.0	1.5		
2000.	79.05	2.9	1.3		
2500.	74.30	1.2	2.1		
3000.	69.79	-2.2	2.5		
3500.	65.49	-6.2	2.3		
4000.	61.41	-9.1	1.4		
4500.	57.55	-10.5	1.0		
5000.	53.74	-13.3	1.9		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 14

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 240 DEG WIND SPEED 3.8M/S
AIR PRESS 101.90 KPA PRESS TEND .08 KPA
TEMP 10.2 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 77 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 69.5 W/M**M
GLOBAL RADIATION 163.6 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.6
2 8.8
4 8.5
10 8.1
23 7.8
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.4	5.4		
4		10.3	5.3		
5					3.7
9		10.2	5.2		
10				161.	4.4

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 15

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 230 DEG WIND SPEED 3.2M/S
AIR PRESS 101.89 KPA PRESS TEND .13 KPA
TEMP 10.2 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 75 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -51.2 W/M**M
GLOBAL RADIATION -3.4 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.9
2 7.6
4 8.1
10 8.5
23 8.0
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.6	5.0		
4		8.1	5.2		
5					2.4
9		8.9	5.1		
10				160.	3.7

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 16

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 190 DEG WIND SPEED 3.2M/S
AIR PRESS 101.84 KPA PRESS TEND .09 KPA
TEMP 10.2 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 75 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -51.2 W/M**M
GLOBAL RADIATION -3.4 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.9
2 7.6
4 8.1
10 8.5
23 8.0
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.6	5.0		
1.2	100.98	11.3	6.5		
4		8.1	5.2		
5					2.4
9		8.9	5.1		
10				160.	3.7
25.	100.70	11.3	6.5	239.	9.9
50.	100.39	11.2	6.5	239.	6.0
75.	100.09	11.2	6.5	239.	2.1
100.	99.79	11.1	6.5	152.	5.6
200.	98.61	11.0	6.4	237.	12.8
300.	97.43	10.4	6.4	139.	6.2
400.	96.26	9.0	6.2	201.	7.5
500.	95.10	7.9	6.1	217.	7.4
600.	93.95	7.2	6.0	222.	8.5
700.	92.81	6.5	5.9	228.	9.2
800.	91.68	5.8	5.8	240.	9.1
900.	90.57	5.1	5.7	235.	12.4
1000.	89.47	4.4	5.6	239.	9.7
1100.	88.38	5.1	4.9	234.	10.8
1200.	87.31	6.2	3.7	237.	11.1
1300.	86.25	6.4	2.9	234.	9.7
1400.	85.20	6.3	2.4	242.	12.2
1500.	84.16	6.1	2.3	238.	11.5
1600.	83.14	5.9	2.3	246.	12.0
1700.	82.12	5.6	2.2	239.	17.3
1800.	81.12	5.2	2.1	246.	12.7
1900.	80.13	4.9	2.0	238.	12.0
2000.	79.16	4.6	1.9		
2500.	74.42	3.4	2.3		
3000.	69.95	.4	3.2		
3500.	65.67	-4.4	2.5		
4000.	61.59	-8.1	2.1		
4500.	57.74	-9.8	1.6		
5000.	54.10	-11.8	1.0		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 17

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 150 DEG WIND SPEED 2.7M/S
AIR PRESS 101.81 KPA PRESS TEND .09 KPA
TEMP 9.8 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 75 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -51.2 W/M**M
GLOBAL RADIATION -3.4 W/M**M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.9
2 7.6
4 8.1
10 8.5
23 8.0
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.6	5.0		
4		8.1	5.2		
5					2.4
9		8.9	5.1		
10				160.	3.7

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 18

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 1.1M/S
AIR PRESS 101.84 KPA PRESS TEND .04 KPA
TEMP 7.6 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 87 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
95 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -39.6 W/M**M
GLOBAL RADIATION -2.5 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	6.9
2	7.4
4	7.9
10	8.4
23	8.0
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.8	5.3		
4		7.3	5.4		
5					1.0
9		8.1	5.2		
10				159.	2.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 19

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 3.2M/S
AIR PRESS 101.83 KPA PRESS TEND .00 KPA
TEMP 7.4 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 87 % PRECIPITATION 1.1 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -49.4 W/M**M
GLOBAL RADIATION .0 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	7.0
2	7.3
4	7.6
10	8.3
23	8.1
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.6	5.6		
1.2	100.92	6.5	5.0		
4		8.0	5.6		
5					3.2
9		8.2	5.4		
10				159.	4.4
25.	100.63	6.6	5.1	216.	1.5
50.	100.33	6.8	5.1	240.	6.7
75.	100.02	6.9	5.1	234.	5.6
100.	99.72	6.9	5.1	225.	4.7
200.	98.51	6.1	4.9	185.	11.8
300.	97.31	5.6	5.0	188.	10.8
400.	96.13	5.2	4.8	222.	9.4
500.	94.95	4.9	4.6	224.	13.7
600.	93.79	3.9	4.6	225.	18.6
700.	92.64	3.0	4.5	234.	8.5
800.	91.50	2.3	4.4	241.	10.3
900.	90.38	1.9	4.1	245.	11.0
1000.	89.26	1.2	4.1	248.	11.6
1100.	88.15	.5	4.1	247.	10.6
1200.	87.06	-.1	3.8	248.	11.9
1300.	85.98	.0	3.2	249.	13.5
1400.	84.91	.7	2.3	259.	10.5
1500.	83.86	.9	1.9	248.	9.3
1600.	82.82	.6	1.7		
1700.	81.79	.2	1.5		
1800.	80.78	.1	1.3		
1900.	79.78	.6	1.3		
2000.	78.79	1.2	1.2		
2500.	74.01	-1.4	.9		
3000.	69.47	-5.4	1.7		
3500.	65.14	-8.8	1.8		
4000.	61.04	-11.9	1.4		
4500.	57.16	-14.5	.8		
5000.	53.47	-17.8	.6		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 20

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 4.3M/S
AIR PRESS 101.77 KPA PRESS TEND .05 KPA
TEMP 6.4 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 1
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -51.2 W/M**M
GLOBAL RADIATION -1.7 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.6
2	6.5
4	7.2
10	8.1
23	8.0
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.1	5.1		
4		6.7	5.2		
5					2.9
9		7.2	5.2		
10				159.	4.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 21

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 170 DEG WIND SPEED 4.3M/S
AIR PRESS 101.76 KPA PRESS TEND .10 KPA
TEMP 6.6 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 92 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)80 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 0
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -28.3 W/M**M
GLOBAL RADIATION .0 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.8
2	6.3
4	6.8
10	7.8
23	8.0
51	8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.2	5.2		
4		6.5	5.3		
5					2.3
9		6.8	5.3		
10				159.	3.3

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 22

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 4.3M/S
AIR PRESS 101.72 KPA PRESS TEND .13 KPA
TEMP 6.6 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 95 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 2
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -28.3 W/M**M
GLOBAL RADIATION .0 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.8
2	6.3
4	6.8
10	7.8
23	8.0
51	8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.2	5.2		
1.2	100.86	7.1	5.5		
4		6.5	5.3		
5					2.3
9		6.8	5.3		
10				159.	3.3
25.	100.57	7.1	5.6	250.	6.0
50.	100.27	7.1	5.6	205.	5.9
75.	99.96	7.1	5.7	224.	7.2
100.	99.66	7.1	5.8	236.	8.9
200.	98.45	7.1	6.0	103.	6.1
300.	97.26	7.1	6.1	87.	5.8
400.	96.09	6.9	5.4	87.	9.0
500.	94.92	6.7	5.3	223.	14.5
600.	93.77	6.5	5.3	232.	48.0
700.	92.64	6.3	5.2	236.	16.8
800.	91.51	6.0	5.1	235.	9.1
900.	90.40	5.5	4.4	229.	13.2
1000.	89.30	5.1	3.8	232.	9.8
1100.	88.21	4.7	3.6	232.	13.0
1200.	87.13	4.0	3.6	236.	15.4
1300.	86.06	3.4	3.5	236.	13.8
1400.	85.01	2.9	3.4	240.	11.0
1500.	83.96	2.4	2.9	238.	13.9
1600.	82.92	1.9	2.4	247.	10.9
1700.	81.90	1.9	1.9	243.	10.2
1800.	80.89	1.9	1.7	243.	14.9
1900.	79.89	1.9	1.4	248.	11.5
2000.	78.90	1.9	1.3	238.	15.8
2500.	74.14	.0	1.8		
3000.	69.61	-3.2	1.7		
3500.	65.32	-5.9	1.5		
4000.	61.25	-9.3	1.3		
4500.	57.39	-12.2	1.9		
5000.	53.47	-17.8	.6		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 23

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 170 DEG WIND SPEED 3.2M/S
AIR PRESS 101.72 KPA PRESS TEND .05 KPA
TEMP 6.4 DEGREES DEW POINT 5 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 1
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -22.8 W/M**M
GLOBAL RADIATION -1.7 W/M**M

DEPTH(CM)	TEMPERATURE(DEG)
SURFACE	5.3
2	6.0
4	6.7
10	7.7
23	8.0
51	8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		4.9	4.8		
4		6.3	5.4		
5					1.5
9		6.5	5.4		
10				159.	2.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 12 OCT 1977 HOUR: 24

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 4.3M/S
AIR PRESS 101.72 KPA PRESS TEND .04 KPA
TEMP 6.8 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -5.3 W/M*M
GLOBAL RADIATION .0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.6
2 6.5
4 6.7
10 7.5
23 7.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.5	5.8		
4		7.6	5.8		
5					3.1
9		7.7	5.7		
10				160.	4.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 1

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 170 DEG WIND SPEED 4.3M/S
AIR PRESS 101.56 KPA PRESS TEND .16 KPA
TEMP 6.6 DEGREES DEW POINT 7 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -5.3 W/M*M
GLOBAL RADIATION .0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.6
2 6.5
4 6.7
10 7.5
23 7.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.5	5.8		
4		7.6	5.8		
5					3.1
9		7.7	5.7		
10				160.	4.2

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 2

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 160 DEG WIND SPEED 3.2M/S
AIR PRESS 101.51 KPA PRESS TEND .21 KPA
TEMP 6.4 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)70 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 6
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -2.8 W/M*M
GLOBAL RADIATION .0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 7.0
2 6.8
4 6.9
10 7.5
23 7.9
51 8.6

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		7.9	5.9		
1.2	100.66	8.3	6.1		
4		8.0	5.9		
5					2.4
9		8.1	5.8		
10				159.	3.2
25.	100.37	8.2	6.1		
50.	100.07	8.1	6.1		
75.	99.77	8.0	6.2		
100.	99.47	8.0	6.2		
200.	98.27	7.4	6.2		
300.	97.08	7.2	6.3		
400.	95.90	6.7	6.3		
500.	94.74	6.2	6.2		
600.	93.59	5.9	6.2		
700.	92.46	6.4	6.4		
800.	91.34	6.0	6.2		
900.	90.22	5.4	6.1		
1000.	89.13	4.9	6.0		
1100.	88.04	4.4	5.9		
1200.	86.96	4.0	5.8		
1300.	85.90	3.6	5.7		
1400.	84.85	3.1	5.6		
1500.	83.80	2.6	5.5		
1600.	82.77	2.1	5.4		
1700.	81.75	1.6	5.2		
1800.	80.74	1.0	5.1		
1900.	79.75	.7	5.0		
2000.	78.76	.0	4.9		
2500.	73.97	-2.9	4.2		
3000.	69.42	-5.8	3.6		
3500.	65.09	-9.3	2.9		
4000.	60.99	-12.7	1.8		
4500.	57.11	-12.9	.7		
5000.	53.46	-15.0	.6		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 3

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 180 DEG WIND SPEED 3.2M/S
AIR PRESS 101.46 KPA PRESS TEND .26 KPA
TEMP 6.4 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)65 WEATHER(SYNOPTIC CODE)61
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -.8 W/M*M
GLOBAL RADIATION .0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 7.2
2 7.0
4 7.0
10 7.6
23 7.9
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		8.1	6.0		
4		8.1	6.1		
5					1.6
9		8.2	6.0		
10				159.	2.3

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 4

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 4.3M/S
AIR PRESS 101.46 KPA PRESS TEND .10 KPA
TEMP 6.3 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)60 WEATHER(SYNOPTIC CODE)61
AMOUNT OF CLOUDS(OCTAS) 8
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -16.5 W/M*M
GLOBAL RADIATION .0 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 7.2
2 7.0
4 7.1
10 7.6
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		8.5	6.2		
4		8.7	6.4		
5					4.0
9		8.8	6.4		
10				159.	5.0

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 5

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 4.3M/S
AIR PRESS 101.40 KPA PRESS TEND .11 KPA
TEMP 6.8 DEGREES DEW POINT 6 DEGREES
REL HUMIDITY 95 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)65 WEATHER(SYNOPTIC CODE)21
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -25.6 W/M*M
GLOBAL RADIATION -.8 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.9
2 6.9
4 7.2
10 7.6
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		8.2	6.1		
1.2	100.52	8.7	6.6		
4		8.6	6.3		
5					3.7
9		8.8	6.3		
10				159.	4.7
25.	100.23	8.6	6.6	227.	6.3
50.	99.93	8.5	6.6	227.	1.8
75.	99.63	8.4	6.6	253.	8.4
100.	99.33	8.3	6.6	245.	8.8
200.	98.13	8.0	6.7	248.	11.2
300.	96.95	7.6	6.7	253.	17.3
400.	95.78	7.3	5.9	262.	14.9
500.	94.62	6.9	5.2	254.	18.3
600.	93.47	6.5	4.6	266.	12.8
700.	92.34	6.1	4.2	269.	11.9
800.	91.22	5.1	3.8	270.	21.0
900.	90.10	4.5	3.5	268.	14.6
1000.	89.00	4.0	3.1	268.	17.8
1100.	87.91	3.5	2.9	269.	19.9
1200.	86.83	3.1	2.9	237.	15.6
1300.	85.76	2.8	2.8	256.	16.1
1400.	84.71	2.4	2.9		
1500.	83.66	2.0	3.0		
1600.	82.63	1.4	2.9		
1700.	81.61	.8	2.7		
1800.	80.59	.1	2.4		
1900.	79.59	-.6	2.1		
2000.	78.60	-1.3	1.9		
2500.	73.79	-4.5	2.6		
3000.	69.21	-8.7	2.5		
3500.	64.86	-7.6	1.2		
4000.	60.81	-9.2	1.0		
4500.	56.97	-13.3	.7		
5000.	53.31	-16.4	.6		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 6

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 4.3M/S
AIR PRESS 101.35 KPA PRESS TEND .09 KPA
TEMP 8.4 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 97 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)56 WEATHER(SYNOPTIC CODE)10
AMOUNT OF CLOUDS(OCTAS) 2
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION -28.3 W/M*M
GLOBAL RADIATION -1.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 5.9
2 6.5
4 7.0
10 7.7
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		6.9	5.6		
4		7.4	5.8		
5					3.9
9		7.8	5.9		
10				359.	5.4

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 7

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 220 DEG WIND SPEED 3.2M/S
AIR PRESS 101.35 KPA PRESS TEND .09 KPA
TEMP 8.0 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 97 % PRECIPITATION .6 MM
VIS(SYNOPTIC CODE)57 WEATHER(SYNOPTIC CODE)10
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION .0 W/M*M
GLOBAL RADIATION 39.8 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 6.4
2 6.5
4 6.8
10 7.6
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		8.3	6.1		
1.2	100.57	9.1	6.4		
4		8.6	6.1		
5					4.6
9		8.8	6.0		
10				159.	5.6
25.	100.28	9.0	6.4	198.	1.3
50.	99.98	9.0	6.4	247.	8.9
75.	99.68	8.9	6.4	241.	6.7
100.	99.38	8.8	6.4	229.	4.7
200.	98.19	8.5	6.4	251.	12.5
300.	97.00	7.7	6.3	255.	17.6
400.	95.83	6.9	6.2	261.	15.5
500.	94.67	6.8	5.8	269.	18.6
600.	93.53	6.8	5.0	278.	15.2
700.	92.39	6.0	4.8	281.	12.9
800.	91.27	5.5	4.5	280.	14.9
900.	90.16	5.1	4.3	292.	11.8
1000.	89.05	4.2	4.1	281.	15.3
1100.	87.96	3.2	4.0	247.	13.1
1200.	86.88	2.9	3.8	263.	11.2
1300.	85.81	2.2	3.7	283.	10.4
1400.	84.76	1.4	3.6		
1500.	83.71	.4	3.3	238.	13.9
1600.	82.67	.1	3.3		
1700.	81.64	-.2	2.9	243.	10.2
1800.	80.62	-.8	2.5		
1900.	79.62	-1.4	2.7	248.	11.5
2000.	78.62	-2.0	2.4		
2500.	73.79	-5.2	1.8		
3000.	69.22	-5.1	1.2		
3500.	64.93	-7.1	1.1		
4000.	60.87	-10.1	1.1		
4500.	57.02	-13.0	.7		
5000.	53.38	-15.1	.6		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 8

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 210 DEG WIND SPEED 4.3M/S
AIR PRESS 101.46 KPA PRESS TEND -.07 KPA
TEMP 8.6 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 95 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)58 WEATHER(SYNOPTIC CODE)10
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 31.3 W/M*M
GLOBAL RADIATION 50.9 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 7.7
2 7.1
4 7.0
10 7.6
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		9.3	6.1		
4		9.5	6.1		
5					6.5
9		9.6	6.0		
10				159.	7.5

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 9

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 230 DEG WIND SPEED 4.3M/S
AIR PRESS 101.48 KPA PRESS TEND -.12 KPA
TEMP 9.8 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 88 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)60 WEATHER(SYNOPTIC CODE) 1
AMOUNT OF CLOUDS(OCTAS) 4
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 96.5 W/M*M
GLOBAL RADIATION 212.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 9.1
2 8.0
4 7.5
10 7.6
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		10.9	6.3		
4		10.8	6.2		
5					6.6
9		10.6	6.1		
10				160.	7.6

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 10

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 240 DEG WIND SPEED 5.4M/S
AIR PRESS 101.48 KPA PRESS TEND -.11 KPA
TEMP 10.8 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 82 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)65 WEATHER(SYNOPTIC CODE) 2
AMOUNT OF CLOUDS(OCTAS) 5
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 68.7 W/M*M
GLOBAL RADIATION 162.7 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 10.7
2 8.9
4 8.2
10 7.8
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		12.0	6.2		
4		11.7	6.0		
5					8.7
9		11.4	5.9		
10				161.	9.7

KLOCKRIKE SODAR ECHO TOP: M BASE: M

DATE: 13 OCT 1977 HOUR: 11

SYNOPTIC OBSERVATIONS AT LINKOPING
WIND DIR 250 DEG WIND SPEED 7.6M/S
AIR PRESS 101.53 KPA PRESS TEND -.08 KPA
TEMP 11.6 DEGREES DEW POINT 8 DEGREES
REL HUMIDITY 76 % PRECIPITATION .0 MM
VIS(SYNOPTIC CODE)75 WEATHER(SYNOPTIC CODE) 3
AMOUNT OF CLOUDS(OCTAS) 7
GEOSTROFIC WIND M/S DEGREES
SURFACE
85 KPA

OBSERVATIONS AT KLOCKRIKE
NET RADIATION 104.7 W/M*M
GLOBAL RADIATION 163.6 W/M*M
DEPTH(CM) TEMPERATURE(DEG)
SURFACE 10.7
2 9.4
4 8.7
10 8.1
23 7.8
51 8.5

HEIGHT (M)	PRESS (KPA)	TEMP (DEG C)	HUM (G/KG)	DIR (DEG)	SPEED (M/S)
1		12.0	6.3		
1.2	100.68	11.5	6.7		
4		11.9	6.2		
5					6.4
9		11.8	6.2		
10				160.	6.9
25.	100.39	11.3	6.7	255.	6.2
50.	100.09	11.0	6.7	255.	3.5
75.	99.79	10.8	6.7	255.	.7
100.	99.49	10.5	6.6	248.	9.6
200.	98.29	9.5	6.5	253.	9.1
300.	97.11	8.5	6.4	263.	10.9
400.	95.94	7.5	6.3		
500.	94.79	6.5	6.1	257.	11.7
600.	93.65	5.4	5.9		
700.	92.50	4.3	5.6		
800.	91.36	3.7	5.4		
900.	90.24	3.0	5.3		
1000.	89.13	2.3	5.1		
1100.	88.03	1.7	4.9		
1200.	86.95	1.0	4.7		
1300.	85.88	.3	4.6	256.	16.1
1400.	84.82	-.3	4.4		
1500.	83.76	-.8	4.1		
1600.	82.72	-.9	3.5		
1700.	81.68	-1.3	3.1		
1800.	80.66	-2.1	3.0		
1900.	79.65	-2.9	3.0		
2000.	78.65	-3.3	2.9		
2500.	73.80	-5.6	2.0		
3000.	69.21	-8.8	1.7		
3500.	64.86	-9.5	1.2		
4000.	60.77	-12.0	.9		
4500.	56.92	-11.8	.5		
5000.	53.28	-16.1	.3		

KLOCKRIKE SODAR ECHO TOP: M BASE: M

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