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MesoGers 1984, the dataset of station C8

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1. Introduction

In the period from September 10 to October 5 1984, the so called "MesoGers" experiment took place in the South West of France. The purpose of this experiment was to study the boundary layer characteristics over non homogeneous terrain. To that end eight measuring stations were installed in an area of 30 by 50 km. The various stations were equipped and manned by a number of institutes: Lab. d'Aerologie, CNRM, CRPE, EDF, INRA, IOPG from France, Penn State University from the USA en KNMI from the Netherlands. A list of participants with their instrumental contribution and scientific interest is prepared by CRPE (1985). A first evaluation of the measurements shows that a dataset can be produced which will be useful for model studies.

The equipment of the stations was not standardized. A variety of measuring techniques was used, ranging from automatic surface stations and radiosoundings to turbulence measurements, Doppler Sodar and aircraft measurements. In this report the contribution to the experiment by KNMI will be described. Information is given on the measuring site, on the instrumentation and on the data reduction that is applied. Finally the dataset is described.

The KNMI station (code C8) was located at Ramouzens (Gers), lat.: 43°47'52" N, long.: 0°11'34" E, alt.: 213 m. The observations can be divided into three groups:

- Synoptical observations
  Hourly observations were carried out 24 hours a day. Since the station was manned only between 06.00 and 18.00 UT, only automatic hourly measurements are available from 19.00 to 5.00 UT, viz. wind speed and direction, dry-bulb temperature and dew-point temperature.
- Surface measurements
  Apart from regular synoptical measurements, the energy balance (eddy correlation) was measured at 11 m height; 20 min averages were registrated continuously (for periods with rain and condensation on the sensors, heat and moisture flux were discarded afterwards).

- Doppler Sodar measurements

  20 min averages of horizontal wind, echo intensity and standard deviation of the vertical wind component as a function of height were registrated continuously.

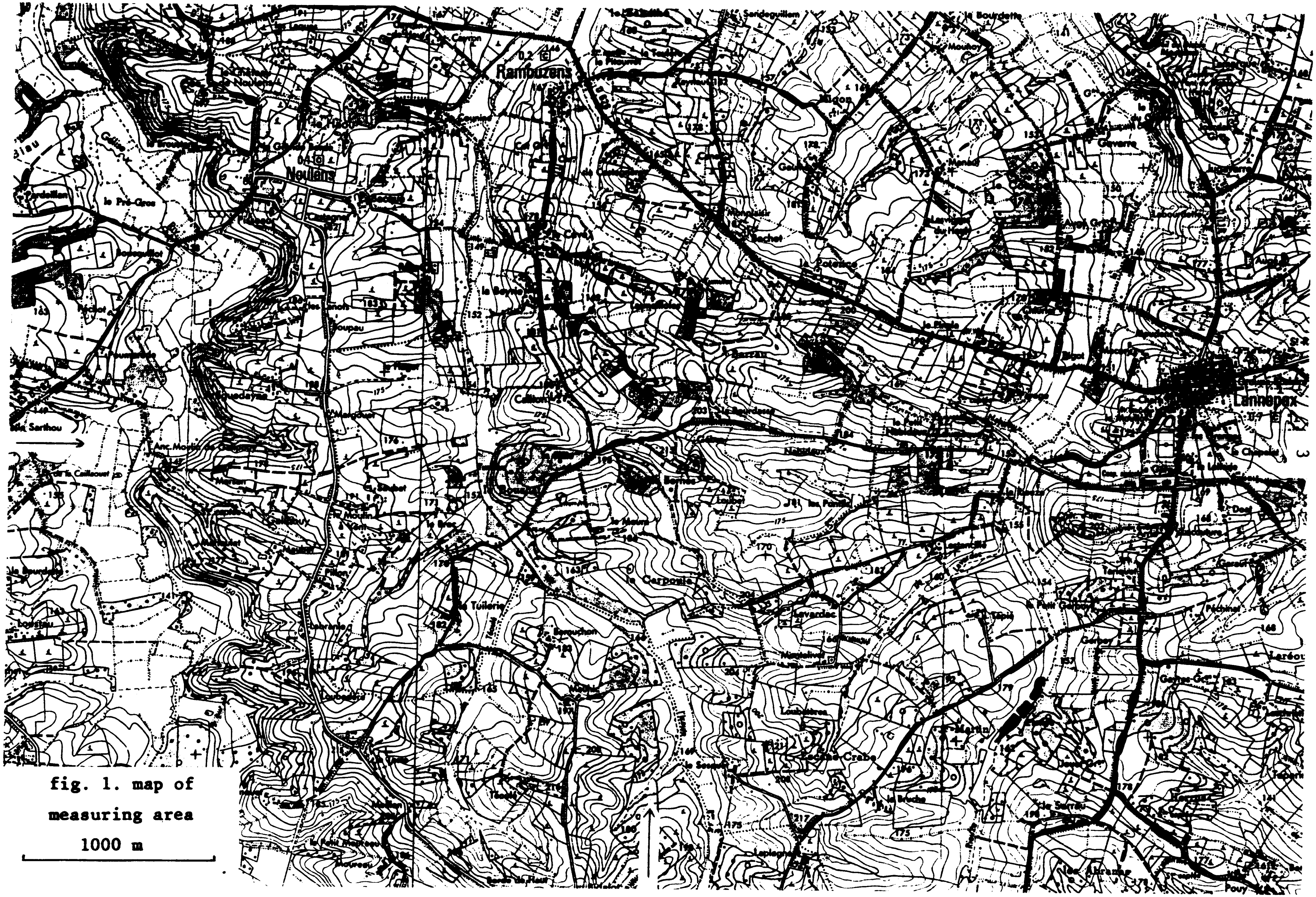

fig. 1. map of
measuring area
1000 m

2. Measuring location and instrumentation

2.1 Description of the measuring site

The measuring site is located in the French department Gers, two kilometers south of the village of Ramouzens. The exact location is lat.: 43°47'52" N, long.: 0°11'34" E; the altitude is 213 m. The country is hilly, with variations in height of about 50 m, and a characteristic distance between the hilltops of about two kilometers. The orientation of the ridges and valleys is rather chaotic; the larger rivers, however, run in northwesterly direction. The distance between the small villages and hamlets is about five kilometers. Spread all over the country, isolated farms are found at distances between them of about half a kilometer. About twenty percent of the country is woodland, thirty percent vineyard (1,5 m high), twenty percent meadow, and the remaining thirty percent is used as farming ground (maize, sunflowers); the major part of the maize had been harvested. The characteristic parcel size is 300 by 300 m. Figure 1 is a copy of the topographical map of the area; the measuring site is indicated by arrows (hill 215).

The measuring site is located on a relatively isolated hill; a map is given in figure 2. On the top of the hill is a vineyard. The clay-soil is rather stoney. On the southwesterly side, the vineyard is bordered by an unmetalled road. On the other side of this road is a sloping meadow. Alongside the road, this meadow is still rather flat for the first 20 m; on this oblong terrain the station was installed. The average terrain lies about four meter below the hilltop. The southwesterly border of the sloping meadow is formed by a forest, about 70 m from the measuring site. Seen from the site, the tops of the trees just mask the horizon. More serious masking of the horizon is caused by a row of trees northwest of the site, and by a group of trees around a barn in southeasterly direction. In figure 3 a panoramic view is given, as seen by a person standing upright between the anemometer mast and the sonic mast. It shows the elevation in degrees with respect to the horizon of the obstacles around the measuring site. In figure 4 the position of the various instruments is shown. Where necessary the grass was cut to a height of a few centimeter. Not shown in figure 4 are little ditches along both sides of the road. Finally it should be mentioned that the

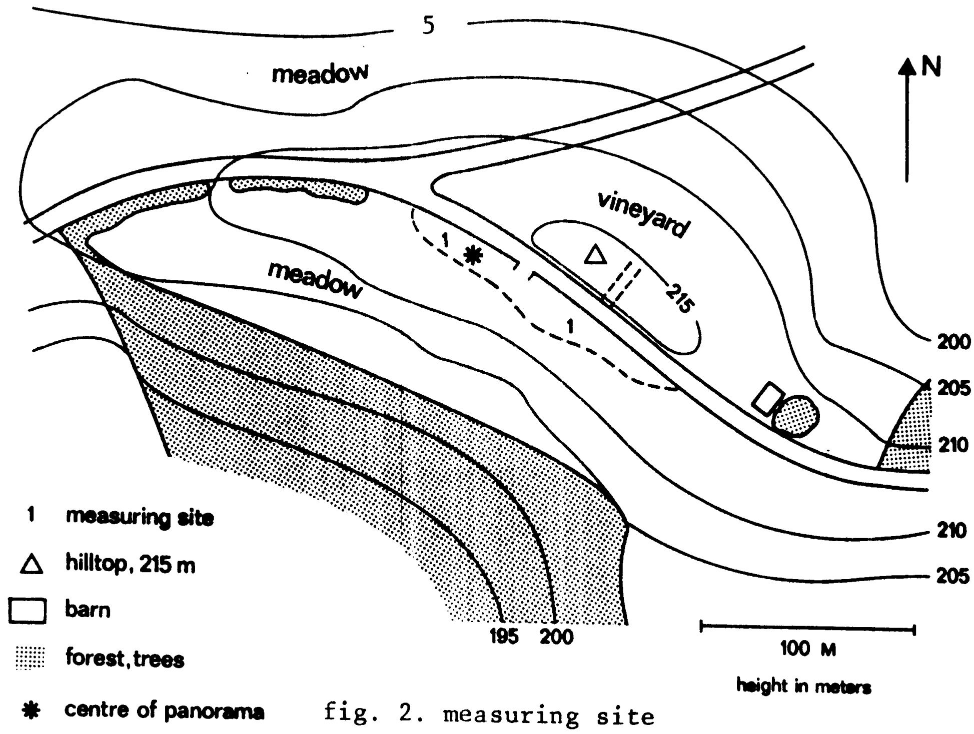

fig. 2. measuring site

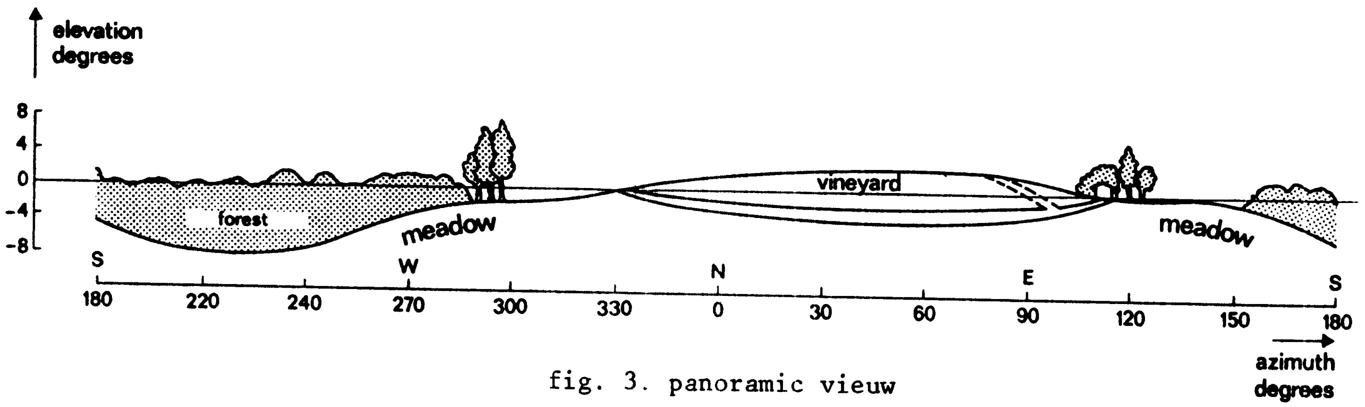

fig. 3. panoramic vieuw around the measuring site

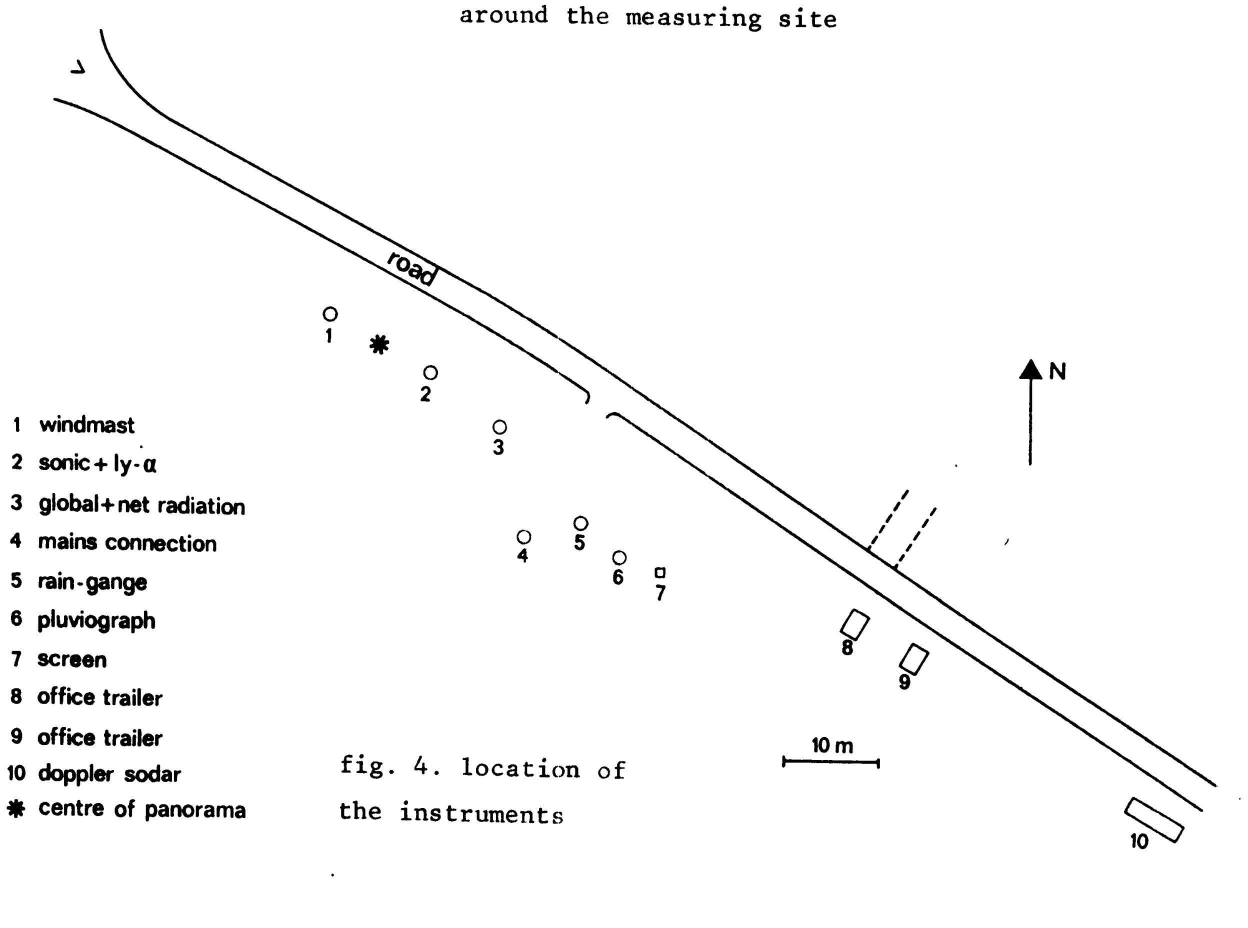

fig. 4. location of the instruments

road lies about half a metre above the field, and that there is an abrupt step upward of about one metre from the road to the vineyard. The top of the hill is about one metre higher than the border of the vineyard. The vines are about 1,5 m high.

2.2 Instrumentation

We shall describe the instrumentation in three groups: 1. Synoptical instruments, 2. Flux instruments, Doppler-sodar, 3. Data-collection and processing.

2.2.1 Synoptical instruments

a. Wind-measurements

Wind speed and direction were measured on top of a 10 m mast; the instruments we used are: Cup-anemometer, designed by KNMI (Monna, 1978), modernized electronics; 3 cups, light-chopper, distance constant 2.9 m; calibrated in the windtunnel at KNMI.
Windvane, designed by KNMI (Wieringa, 1967), modernized electronics; 7 bit aboslute optical encoder, damping ratio 0.30, damped wavelength 7.0 m; linearity calibration carried out at KNMI.

b. Temperature and humidity measurements

The temperature and humidity instruments were placed in a temperature screen type Stevenson, made of syntetic material.
Platinum PT500 resistors (Heraeus), individually ventilated, were used to measure dry and wet bulb temperature; a water-reservoir and a wick were used for the wet bulb. Standard dry and wet bulb mercury in glass thermometers were used in addition at 06, 12 and 18 UT.
Maximum and minimum temperatures were measured with the usual thermometers. A thermograph (Fuess) and a hygrograph (Fuess) were used to registrate the air temperature and humidity continuously.
Relative humidity was also measured with a Rotronic Hygroskop sensor (Muller, 1985).
All temperature and humidity instruments had been calibrated at KNMI.

c. Pressure measurements

Pressure was measured with a Negrettie and Zambra digital aneroid barometer, which was read hourly by the observer. Moreover, the pressure was registrated continuously with a Fuess barograph. The instruments were placed in one of the office trailers. Both instruments were calibrated at KNMI.

d. Precipitation measurements

A pluviograph (funnel aperture 200 cm^2) with electrical read-out, designed by KNMI was used; a standard rain-gauge (funnel aperture 200 cm^2) was used for control purposes. The instruments were just placed on the grass, and levelled. The height of the rim was 0.4 m above the ground. Information on these instruments is given by Muller and Van Londen (1983). The pluviograph was calibrated at KNMI.

e. Radiation

Global radiation was measured with a Kipp CM5 instrument, net radiation with a CSIRO net pyranometer, type Funk, which was ventilated (designed by KNMI). The polyethylene domes were pressurized with nitrogen (Fritschen and Gay, 1979). Both instruments were placed 1.7 m above the ground (clay with 50% grass). Calibration was carried out by KNMI.

2.2.2 Flux-instruments, Doppler-sodar

a. Flux instruments

The momentum flux was measured at 11.6 m height with a sonic anemometer, type Kayo Denki DAT300, sensor TR61 (Hanafusa et al., 1980). An electronic levelling instrument, type Kayo Denki IC-05D, and a rotator (designed by KNMI) with electronic read-out of azimuth, were used to measure the actual orientation of the sonic. The rotator was used to direct the sonic in the mean wind-direction (by hand, so not at night). The top of the mast was constructed as slender as possible, in order to avoid mast induced errors in the turbulence measurements (Wyngaard, 1981).

To measure the heat flux, the temperature fluctuations as measured by the sonic were used (Schotanus et al., 1983); see 3.2. A Lyman-alpha humidometer (Electromagnetic Research Corporation, model BLR) was used to measure humidity fluctuations; it was mounted 0.45 m below the centre of the sonic. A pathlength of 10 mm, and a source current of 100 μA were used. The "Lyman-α" was calibrated at KNMI.

Since the sonic does not have a true cosine-response for various azimuth angles, the instrument was calibrated in a windtunnel (Schotanus et al., 1982). A correction is applied during data reduction. The results of the calibration are presented in the Appendix.

b. Doppler-sodar

A Doppler-sodar was used to measure the wind profile above the site; manufacturer Remtech, dish diameter 1,2 m (Beljaars, 1985).

2.2.3 Data-collection and processing

A DEC mini computer, type MINC-11 was used for data-collection and processing. Sixteen analogue channels (differential input) were used. The resolution is 12 bits, the sample frequency about 1 Hz. The high frequency cut off for mean values, variances and correlations is much higher because of the short sample time, 1 μs. After processing the data was stored on cassette, using a TEAC MT2-04 recorder.
During the measurements the various signals were monitored on a video-screen and on recorders, in order to check the results.

3. Description of dataset

3.1 Synoptical observations

3.1.1 Introduction

Background information on the meteorological conditions during the measurements is often indispensible for a correct interpretation of the experimental data. Synoptical observations are perfectly suited for that purpose. Moreover, comparison with the observations of the regular synoptic network is possible. Notation in the WMO-code simplifies the use of this information.

3.1.2 General remarks

The code form FM 12-VII SYNOP is used for the synoptic surface observations (WMO Manual on Codes, Volume 1, WMO No. 306). The only differences with the standard synop message are the header (which is omitted here) and the time indication. The time of observation is World Time (Universal Time = UT), which corresponds to the time valid for the zero Meridian (formerly Greenwich Mean Time).
When there are no observations available a stroke is filled in. The synoptic observations for one day are illustrated in table 1.

3.1.3 Description of the code form

We use the following code form:

YYMMDDHHMM $i_R i_X$hVV Nddff 1s_nTTT 2$s_n T_d T_d T_d$ 4PPPP 5appp 7wwW$_1$W$_2$ 8$N_h C_L C_M C_H$
YYMMDDHHMM 333 1$s_n T_x T_x T_x$ 2$s_n T_n T_n T_n$ 6RRRt_R

table 1. example of synoptical codes for the observations of September 18 1984

8409180000	46///	/2409	10140	20137	4////	5////	7////	8////
8409180100	46///	/2310	10140	20137	4////	5////	7////	8////
8409180200	46///	/2510	10141	20137	4////	5////	7////	8////
8409180300	46///	/2410	10139	20133	4////	5////	7////	8////
8409180400	46///	/2614	10135	20131	4////	5////	7////	8////
8409180500	46///	/2911	10123	20117	4////	5////	7////	8////
8409180600	21425	82508	10119	20116	40103	5////	78068	889//
8409180600	333	10156	20119	60112				
8409180700	41430	82610	10127	20125	40107	5////	78182	889//
8409180800	41550	62708	10121	20112	40111	5////	72582	84963
8409180900	41660	32915	10134	20115	40115	52013	72581	82263
8409181000	42560	43115	10151	20110	40116	52009	7////	84300
8409181100	41430	63116	10154	20104	40117	52008	78111	86900
8409181200	21440	63118	10131	20093	40117	52001	78082	85960
8409181200	333	60041						
8409181300	41450	63118	10166	20102	40114	54000	78082	85360
8409181400	41440	73017	10138	20090	40117	52002	78182	86960
8409181500	41450	63109	10144	20101	40117	54000	72582	85260
8409181600	41557	63018	10164	20079	40120	52005	72582	84260
8409181700	42560	62913	10158	20089	40123	52008	7////	84461
8409181800	22665	23009	10140	20096	40130	52013	7////	81460
8409181800	333	10177	20119	60042				
8409181900	46///	/2508	10128	20099	4////	5////	7////	8////
8409182000	46///	/2909	10126	20098	4////	5////	7////	8////
8409182100	46///	/2909	10124	20097	4////	5////	7////	8////
8409182200	46///	/3010	10125	20102	4////	5////	7////	8////
8409182300	46///	/3010	10119	20101	4////	5////	7////	8////

The meaning of the various symbols is given hereafter.

YY = year (minus 1900)

MM = month

DD = day

HH = hour

MM = minutes

i_R = Indicator for inclusion or omission of precipitation data.

Code figure	Precipitation data are reported:	Group $6RRRt_R$ is:
1	In Section 1	Included
2	In Section 3	Included
3	In none of the two Sections 1 and 3	Omitted (precipitation amount = 0)
4	In none of the two Sections 1 and 3	Omitted (precipitation amount not available)

i_X = Indicator for type of station operation (manned or automatic*) and for present and past weather data.

Code figure	Type of station operation	Group $7wwW_1W_2$ is:
1	Manned	Included
2	Manned	Omitted (no significant phenomenon to report)
3	Manned	Omitted (not observed, data not available)
4	Automatic	Included
5	Automatic	Omitted (no significant phenomenon to report)
6	Automatic	Omitted (not observed, data not available)

*When the station was automatic (in general between 19-5 h UT, code figure 6) only the observations of wind, temperature and dew-point temperature were available.

h = Height above ground of the base of the lowest visible cloud.

Code figure	
0	0 to 50 m
1	50 to 100 m
2	100 to 200 m
3	200 to 300 m
4	300 to 600 m
5	600 to 1 000 m
6	1 000 to 1 500 m
7	1 500 to 2 000 m
8	2 000 to 2 500 m
9	2 500 m or more, or no clouds
/	Height of base of cloud not known *or* base of clouds at a level lower and tops at a level higher than that of the station

Notes:

(1) A height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range, e.g. a height of 600 m shall be reported by code figure 5.

(2) Due to the limitation in range of the cloud-sensing equipment used by an automatic station, the code figures reported for h could have one of the three following meanings:

(*a*) The actual height of the base of the cloud is within the range indicated by the code figure; or

(*b*) The height of the base of the cloud is greater than the range indicated by the code figure but cannot be determined due to instrumental limitations; or

(*c*) There are no clouds vertically above the station.

VV = Horizontal visibility at surface level.

Code figure	km	Code figure	km	Code figure	km
00	< 0.1				
01	0.1	34	3.4	67	17
02	0.2	35	3.5	68	18
03	0.3	36	3.6	69	19
04	0.4	37	3.7	70	20
05	0.5	38	3.8	71	21
06	0.6	39	3.9	72	22
07	0.7	40	4	73	23
08	0.8	41	4.1	74	24
09	0.9	42	4.2	75	25
10	1	43	4.3	76	26
11	1.1	44	4.4	77	27
12	1.2	45	4.5	78	28
13	1.3	46	4.6	79	29
14	1.4	47	4.7	80	30
15	1.5	48	4.8	81	35
16	1.6	49	4.9	82	40
17	1.7	50	5	83	45
18	1.8	51		84	50
19	1.9	52		85	55
20	2	53	Not used	86	60
21	2.1	54		87	65
22	2.2	55		88	70
23	2.3	56	6	89	> 70
24	2.4	57	7	90	< 0.05
25	2.5	58	8	91	0.05
26	2.6	59	9	92	0.2
27	2.7	60	10	93	0.5
28	2.8	61	11	94	1
29	2.9	62	12	95	2
30	3	63	13	96	4
31	3.1	64	14	97	10
32	3.2	65	15	98	20
33	3.3	66	16	99	≥ 50

N = Total cloud cover.

Code figure	
0	0
1	1 okta or less, but not zero
2	2 oktas
3	3 oktas
4	4 oktas
5	5 oktas
6	6 oktas
7	7 oktas or more, but not 8 oktas
8	8 oktas
9	Sky obscured, or cloud amount cannot be estimated
/	No measurement made

dd = wind direction in tens of degrees, mean direction over the 10-minute period immediately preceding the time of observation.
code figure:

36 = north
09 = east
18 = south
27 = west
00 = calm
99 = variable

ff = wind speed (in knots): mean speed over the 10-minute periode immediately preceding the time of observation.

$1s_nTTT$ = mean air temperature over the 10-minute periode immediately preceding the time of observation, in tenths of a degree Celsius, its sign being given by S_n (0 = temperature positive or zero; 1 = temperature negative).

$2s_nT_dT_dT_d$ = mean dew-point temperature over the 10-minute periode immediately preceding the time of observation, in tenths of a degree Celsius, its sign being given by S_n (0 = temperature positive or zero; 1 = temperature negative).

4PPPP = atmospheric pressure at mean sea-level in tenths of a hectopascal, omitting thousands digit of hectopascals of the pressure value. For the reduction to sea level an imaginary column of air between the level of measurement and the sea-level was assumed with a temperature distribution derived from the screen temperature at the time of observation, assuming a constant vertical temperature gradient of 10°C per geopotential km and a constant specific humidity of 10 g/kg.

5appp = pressure change code, where

a = characteristic of pressure tendency during the three hours preceding the time of observation.

Code figure		
0	Increasing, then decreasing; atmospheric pressure the same or higher than 3 hours ago	
1	Increasing, then steady; or increasing, then increasing more slowly	atmospheric pressure now higher than 3 hours ago
2	Increasing (steadily or unsteadily) *	
3	Decreasing or steady, then increasing; or increasing, then increasing more rapidly	
4	Steady; atmospheric pressure the same as 3 hours ago *	
5	Decreasing, then increasing; atmospheric pressure the same or lower than 3 hours ago	
6	Decreasing, then steady; or decreasing, then decreasing more slowly	atmospheric pressure now lower than 3 hours ago
7	Decreasing (steadily or unsteadily) *	
8	Steady or increasing, then decreasing; or decreasing, then decreasing more rapidly	

ppp = pressure change at station level during the three hours preceding the time of observation, expressed in tenths of hectopascal.

wwW_1W_2 = characteristic weather code, where

ww = present weather.

Group	Code figure ww	Description	
No meteors except photometeors	00	Cloud development not observed or not observable	characteristic change of the state of sky during the past hour
	01	Clouds generally dissolving or becoming less developed	
	02	State of sky on the whole unchanged	
	03	Clouds generally forming or developing	
Haze, dust, sand or smoke	04	Visibility reduced by smoke, e. g. veldt or forest fires, industrial smoke or volcanic ashes	
	05	Haze	
	06	Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation	
	07	Dust or sand raised by wind at or near the station at the time of observation, but no well developed dust whirl(s) or sand whirl(s), and no duststorm or sandstorm seen	
	08	Well developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm	
	09	Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour	
	10	Mist	
	11	Patches of	shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea
	12	More or less continuous	
	13	Lightning visible, no thunder heard	
	14	Precipitation within sight, not reaching the ground or the surface of the sea	
	15	Precipitation within sight, reaching the ground or the surface of the sea, but distant (i. e. estimated to be more than 5 km) from the station	
	16	Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station	
	17	Thunderstorm, but no precipitation at the time of observation	
	18	Squalls	at or within sight of the station during the preceding hour or at the time of observation
	19	Funnel cloud(s)	

ww = 20 - 29 Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation

Code figure ww	Description	
20	Drizzle (not freezing) or snow grains	not falling as shower(s)
21	Rain (not freezing)	
22	Snow	
23	Rain and snow or ice pellets, type (a)	
24	Freezing drizzle or freezing rain	
25	Shower(s) of rain	
26	Shower(s) of snow, or of rain and snow	
27	Shower(s) of hail*, or of rain and hail	
28	Fog or ice fog	
29	Thunderstorm (with or without precipitation)	

ww = 30 - 39 Duststorm, sandstorm, drifting or blowing snow

ww		
30	Slight or moderate duststorm or sandstorm	- has decreased during the preceding hour
31		- no appreciable change during the preceding hour
32		- has begun or has increased during the preceding hour
33	Severe duststorm or sandstorm	- has decreased during the preceding hour
34		- no appreciable change during the preceding hour
35		- has begun or has increased during the preceding hour
36	Slight or moderate drifting snow	generally low (below eye level)
37	Heavy drifting snow	
38	Slight or moderate blowing snow	generally high (above eye level)
39	Heavy blowing snow	

ww = 40 - 49 Fog or ice fog at the time of observation

ww		
40	Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer	
41	Fog or ice fog in patches	
42	Fog or ice fog, sky visible	has become thinner during the preceding hour
43	Fog or ice fog, sky invisible	
44	Fog or ice fog, sky visible	no appreciable change during the preceding hour
45	Fog or ice fog, sky invisible	
46	Fog or ice fog, sky visible	has begun or has become thicker during the preceding hour
47	Fog or ice fog, sky invisible	
48	Fog, depositing rime, sky visible	
49	Fog, depositing rime, sky invisible	

ww = 50 - 59 Drizzle

ww		
50	Drizzle, not freezing, intermittent	slight at time of observation
51	Drizzle, not freezing, continuous	
52	Drizzle, not freezing, intermittent	moderate at time of observation
53	Drizzle, not freezing, continuous	
54	Drizzle, not freezing, intermittent	heavy (dense) at time of observation
55	Drizzle, not freezing, continuous	
56	Drizzle, freezing, slight	
57	Drizzle, freezing, moderate or heavy (dense)	
58	Drizzle and rain, slight	
59	Drizzle and rain, moderate or heavy	

ww = 60 - 69 Rain

ww		
60	Rain, not freezing, intermittent	slight at time of observation
61	Rain, not freezing, continuous	
62	Rain, not freezing, intermittent	moderate at time of observation
63	Rain, not freezing, continuous	
64	Rain, not freezing, intermittent	heavy at time of observation
65	Rain, not freezing, continuous	
66	Rain, freezing, slight	
67	Rain, freezing, moderate or heavy	
68	Rain or drizzle and snow, slight	
69	Rain or drizzle and snow, moderate or heavy	

ww = 70 - 79 Solid precipitation not in showers

ww		
70	Intermittent fall of snow flakes	slight at time of observation
71	Continuous fall of snow flakes	
72	Intermittent fall of snow flakes	moderate at time of observation
73	Continuous fall of snow flakes	
74	Intermittent fall of snow flakes	heavy at time of observation
75	Continuous fall of snow flakes	
76	Ice prisms (with or without fog)	
77	Snow grains (with or without fog)	
78	Isolated starlike snow crystals (with or without fog)	
79	Ice pellets, type (a)	

ww = 80 - 99 Showery precipitation, or precipitation with current or recent thunderstorm

ww		
80	Rain shower(s), slight	
81	Rain shower(s), moderate or heavy	
82	Rain shower(s), violent	
83	Shower(s) of rain and snow mixed, slight	
84	Shower(s) of rain and snow mixed, moderate or heavy	
85	Snow shower(s), slight	
86	Snow shower(s), moderate or heavy	
87	Shower(s) of snow pellets or ice pellets, type (b), with or without rain or rain and snow mixed	- slight
88		- moderate or heavy
89	Shower(s) of hail**, with or without rain or rain and snow mixed, not associated with thunder	- slight
90		- moderate or heavy
91	Slight rain at time of observation	thunderstorm during the preceding hour but not at time of observation
92	Moderate or heavy rain at time of observation	
93	Slight snow, or rain and snow mixed or hail**at time of observation	
94	Moderate or heavy snow, or rain and snow mixed or hail**at time of observation	
95	Thunderstorm, slight or moderate, without hail** but with rain and/or snow at time of observation	thunderstorm at time of observation
96	Thunderstorm, slight or moderate, with hail** at time of observation	
97	Thunderstorm, heavy, without hail** but with rain and/or snow at time of observation	
98	Thunderstorm combined with duststorm or sandstorm at time of observation	
99	Thunderstorm, heavy, with hail** at time of observation	

* French: grêle.

** Hail, small hail, snow pellets. French: grêle, grésil ou neige roulée.

W_1W_2 = past weather, most important phenomenon in code. The period covered by W_1W_2 is six hours for observations at 0, 6, 12 and 18 UT, three hours for observations at 3, 9, 15 and 21, one hour for intermediate observations.

Code figure	
0	Cloud covering ½ or less of the sky throughout the appropriate period
1	Cloud covering more than ½ of the sky during part of the appropriate period and covering ½ or less during part of the period
2	Cloud covering more than ½ of the sky throughout the appropriate period
3	Sandstorm, duststorm or blowing snow
4	Fog or ice fog or thick haze
5	Drizzle
6	Rain
7	Snow, or rain and snow mixed
8	Shower(s)
9	Thunderstorm(s) with or without precipitation

$8N_hC_LC_MC_H$ = code form indicating clouds, where

N_h = amount of (all) the C_L cloud(s) present; if no C_L cloud is present the amount of (all) the C_M cloud(s) present.

Code figure	
0	0
1	1 okta or less, but not zero
2	2 oktas
3	3 oktas
4	4 oktas
5	5 oktas
6	6 oktas
7	7 oktas or more, but not 8 oktas
8	8 oktas
9	Sky obscured, or cloud amount cannot be estimated
/	No measurement made

C_L — *Clouds of the genera Stratocumulus, Stratus, Cumulus and Cumulonimbus*

Code figure	Technical specifications	Code figure	Non-technical specifications
0	No C_L clouds	0	No Stratocumulus, Stratus, Cumulus or Cumulonimbus
1	Cumulus humilis or Cumulus fractus other than of bad weather,* or both	1	Cumulus with little vertical extent and seemingly flattened, or ragged Cumulus other than of bad weather,* or both
2	Cumulus mediocris or congestus, with or without Cumulus of species fractus or humilis or Stratocumulus, all having their bases at the same level	2	Cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other Cumulus or by Stratocumulus, all having their bases at the same level
3	Cumulonimbus calvus, with or without Cumulus, Stratocumulus or Stratus	3	Cumulonimbus the summits of which, at least partially, lack sharp outlines, but are neither clearly fibrous (cirriform) nor in the form of an anvil; Cumulus, Stratocumulus or Stratus may also be present
4	Stratocumulus cumulogenitus	4	Stratocumulus formed by the spreading out of Cumulus; Cumulus may also be present
5	Stratocumulus other than Stratocumulus cumulogenitus	5	Stratocumulus not resulting from the spreading out of Cumulus
6	Stratus nebulosus or Stratus fractus other than of bad weather,* or both	6	Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no Stratus fractus of bad weather *
7	Stratus fractus or Cumulus fractus of bad weather,* or both (pannus), usually below Altostratus or Nimbostratus	7	Stratus fractus of bad weather * or Cumulus fractus of bad weather, or both (pannus), usually below Altostratus or Nimbostratus
8	Cumulus and Stratocumulus other than Stratocumulus cumulogenitus, with bases at different levels	8	Cumulus and Stratocumulus other than that formed from the spreading out of Cumulus; the base of the Cumulus is at a different level from that of the Stratocumulus
9	Cumulonimbus capillatus (often with an anvil), with or without Cumulonimbus calvus, Cumulus, Stratocumulus, Stratus or pannus	9	Cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil; either accompanied or not by Cumulonimbus without anvil or fibrous upper part, by Cumulus, Stratocumulus, Stratus or pannus
/	C_L clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena	/	Stratocumulus, Stratus, Cumulus and Cumulonimbus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena

* "Bad weather" denotes the conditions which generally exist during precipitation and a short time before and after.

C_M — *Clouds of the genera Altocumulus, Altostratus and Nimbostratus*

Code figure	Technical specifications	Code figure	Non-technical specifications
0	No C_M clouds	0	No Altocumulus, Altostratus or Nimbostratus
1	Altostratus translucidus	1	Altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible, as through ground glass
2	Altostratus opacus or Nimbostratus	2	Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or Nimbostratus
3	Altocumulus translucidus at a single level	3	Altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level
4	Patches (often lenticular) of Altocumulus translucidus, continually changing and occurring at one or more levels	4	Patches (often in the form of almonds or fishes) of Altocumulus, the greater part of which is semi-transparent; the clouds occur at one or more levels and the elements are continually changing in appearance
5	Altocumulus translucidus in bands, or one or more layers of Altocumulus translucidus or opacus, progressively invading the sky; these Altocumulus clouds generally thicken as a whole	5	Semi-transparent Altocumulus in bands, or Altocumulus in one or more fairly continuous layers (semi-transparent or opaque), progressively invading the sky; these Altocumulus clouds generally thicken as a whole
6	Altocumulus cumulogenitus (or cumulonimbogenitus)	6	Altocumulus resulting from the spreading out of Cumulus (or Cumulonimbus)
7	Altocumulus translucidus or opacus in two or more layers, or Altocumulus opacus in a single layer, not progressively invading the sky, or Altocumulus with Altostratus or Nimbostratus	7	Altocumulus in two or more layers, usually opaque in places, and not progressively invading the sky; or opaque layer of Altocumulus, not progressively invading the sky; or Altocumulus together with Altostratus or Nimbostratus
8	Altocumulus castellanus or floccus	8	Altocumulus with sproutings in the form of small towers or battlements, or Altocumulus having the appearance of cumuliform tufts
9	Altocumulus of a chaotic sky, generally at several levels	9	Altocumulus of a chaotic sky, generally at several levels
/	C_M clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds	/	Altocumulus, Altostratus and Nimbostratus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds

C_H — *Clouds of the genera Cirrus, Cirrocumulus and Cirrostratus*

Code figure	Technical specifications	Code figure	Non-technical specifications
0	No C_H clouds	0	No Cirrus, Cirrocumulus or Cirrostratus
1	Cirrus fibratus, sometimes uncinus, not progressively invading the sky	1	Cirrus in the form of filaments, strands or hooks, not progressively invading the sky
2	Cirrus spissatus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus castellanus or floccus	2	Dense Cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus with sproutings in the form of small turrets or battlements, or Cirrus having the appearance of cumuliform tufts
3	Cirrus spissatus cumulonimbogenitus	3	Dense Cirrus, often in the form of an anvil, being the remains of the upper parts of Cumulonimbus
4	Cirrus uncinus or fibratus, or both, progressively invading the sky; they generally thicken as a whole	4	Cirrus in the form of hooks or of filaments, or both, progressively invading the sky; they generally become denser as a whole
5	Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole, but the continuous veil does not reach 45 degrees above the horizon	5	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil does not reach 45 degrees above the horizon
6	Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered	6	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered
7	Cirrostratus covering the whole sky	7	Veil of Cirrostratus covering the celestial dome
8	Cirrostratus not progressively invading the sky and not entirely covering it	8	Cirrostratus not progressively invading the sky and not completely covering the celestial dome
9	Cirrocumulus alone, or Cirrocumulus predominant among the C_H clouds	9	Cirrocumulus alone, or Cirrocumulus accompanied by Cirrus or Cirrostratus, or both, but Cirrocumulus is predominant
/	C_H clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds	/	Cirrus, Cirrocumulus and Cirrostratus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds

333 = separation code

$1s_nT_xT_xT_x$ = Maximum temperature in tenths of a degree Celsius over the 12-hours period immediately preceding the time of observation (only at 06 and 18 hours UT), its sign being given by S_n (0 = temperature positive or zero; 1 = temperature negative).

$2S_nT_nT_nT_n$ = Minimum temperature, in tenths of a degree Celsius over the 12-hours period immediately preceding the time of observation (only at 06 and 18 hour UT), its sign being given by S_n (0 = temperature positive or zero; 1 = temperature negative).

$6RRRt_R$ = Amount of precipitation (only at 06, 12 and 18 hour UT) which has fallen during the period preceding the time of observation, as indicated by t_R.

Code figure RRR:

Code figure	mm	Code figure	mm
000	Not used	990	Trace
001	1	991	0.1
002	2	992	0.2
etc.	etc.	993	0.3
988	988	994	0.4
989	989 mm or more	995	0.5
		996	0.6
		997	0.7
		998	0.8
		999	0.9

code figure t_R:

1 = a 6-hours period (at 12 hour UT)

2 = a 12-hours period (at 06 and 18 hour UT).

3.2 Surface measurements

The surface measurements consist of the standard measurements (wind, temperature, humidity, rain and radiation at standard heights) and fluxes by eddy correlation at 11 m height (cf. chapter 2 for a detailed description). For the final dataset of MesoGers it has been decided to produce 20 min averages. The basic data reduction, however, has been done for 10 min intervals. This has the advantage that the last 10 min interval of each hour can be used for the synoptical message. Moreover, the calculation of correlations over 10 min intervals automatically removes some trend in the signals; it acts as a high pass filter with a response time of about 10 min which seperates more or less between trend and turbulences.

A list of the measured and derived quantities stored on tape is given in table 2. These quantities are present in the final tape as 20 min averages, calculated by combining two successive 10 min intervals.

Some details about the datareduction and correction techniques are given below:

- The wind velocity fluctuations as measured by the sonic anemometer have been transformed off-line to a coordinate system that is aligned with the measured mean wind direction of the considered 20 min interval. The direction of the x-axis of this coordinate system is given by dd_s in degrees with respect to the geographic north. The u-component is in the x-direction (in the direction of mean wind), the w-component is vertical; the v-component is perpendicular to u and w, u, v, w forming a right handed system.
- The direction of the coordinate system in which the measurements were done is given by dd_r (direction of the sonic rotator), This direction is not needed for most applications but it is given since the quality of the measurements is optimal for $|dd_s - dd_r| < 45°$ (Schotanus, 1983). Users can apply this criterion when high quality is required.
- Although the tilting of the sonic was measured continuously, no corrections were applied for this. The tilting angles turned out to be smaller than 0.5 degrees, so corrections can be neglected.
- The direction of the wind as measured by the sonic and as measured by the vane do not always correspond exactly because of two reasons: (i) measuring uncertainties of about 2 degrees and (ii) difference in averaging technique. (The sonic averges wind components; the vane

table 2. surface measurements

element	symbol	description	units	positions
first record				
0	YYMMDDHHMM	Year-month-day-hour-min (the end of the averaging interval in UT)		0- 9
1	u_s	Horizontal windspeed measured by sonic	0.1 m/s	11-15
2	dd_s	Wind direction measured by sonic	deg (with resp, to geogr. north)	17-21
3	w_s	Vertical velocity measured by sonic	0.01 m/s	23-27
4	dd_r	Direction of sonic during measurement (rotator)	deg	29-33
5	u'u'		0.001 m^2/s^2	35-39
6	u'v'		0.001 m^2/s^2	41-45
7	u'w'	Correlations where u',v',w': velocity mean wind direction, lateral direction and vertical T': temperature fluctuations q': humidity fluctuations	0.001 m^2/s^2	47-51
8	u'T'		0.001 m/s K	53-57
9	u'q'		0.001 m/s g/kg	59-63
10	v'v'		0.001 m^2/s^2	65-69
second record				
11	v'w'		0.001 m^2/s^2	11-15
12	v'T'		0.001 m/s K	17-21
13	v'q'		0.011 m/s g/kg	23-27
14	w'w'		0.001 m^2/s^2	29-33
15	w'T'		0.001 m/s K	35-39
16	w'q'		0.001 m/s g/kg	41-45
17	T'T'		0.001 K^2	47-51
18	T'q'		0.001 K g/kg	53-57
19	q'q'		0.001 $(g/kg)^2$	59-63
20	dd_{10}	Winddirection measured by vane	deg.(with resp. to geogr. north)	65-69
third record				
21	SD_{dd10}	Standard dev. of dd_{10}	0.1 deg	11-15
22	ff_{10}	Windspeed measured with cup anemometer	0.1 m/s	17-21
23	SD_{ff10}	Standard dev. ff_{10}	0.01 m/s	23-27
24	T	Temperature in screen	0.1 °C	29-33
25	T_d	Dew point in screen	0.1 °C	35-39
26	Q	Net radiation (+ = up)	W/m^2	41-45
27	K	Global radiation (+ = up)	W/m^2	47-51
28	RR	Rain quantity	0.1 mm	53-57
29	T_s	Sonic temperature	0.1 °C	59-63

produces an averaged direction).

- Temperature fluctuations, affecting sound speed, were measured with the sonic anemometer. Sound speed, however, does not only depend on temperature but also on humidity. Systematic comparison at Cabauw (Schotanus et al., 1983), and a verification with screen temperature during MesoGers have shown that the temperature output of the sonic is very reliable.

  The mean sonic temperature output showed a systematic offset of several degrees. A correction has been applied for this in the final dataset but the mean sonic temperature should still be seen as an uncalibrated quantity.

  The fluctuations, however, of the sonic temperature do not need absolute calibration and are therefore used to calculate correlations. It has been shown (Schotanus et al., 1983) that the sonic temperature fluctuations can be written as follows:

$$T'_s = T' + 0.51\,\overline{T}_a\,q' - 2\,\frac{\overline{T}_a}{c^2}\,u\,u'$$

where T'_s	is sonic temperature fluctation	(K)
T'	is temperature fluctuation	(K)
q'	is specific humidity fluctuation	(kg/kg)
u'	is velocity fluctuation in wind direction	(m/s)
u	is mean wind speed	(m/s)
c	is sound speed	(m/s)
T_a	is absolute temperature	(K)

With w' as vertical velocity fluctuation (m/s) this leads to the following expression for the $\overline{w'T'_s}$ correlation:

$$\overline{w'T'_s} = \overline{w'T'} + 0.51\,\overline{T}_a\,\overline{w'q'} - 2\,\frac{\overline{T}_a}{c^2}\,u\,\overline{u'w'}$$

The correction has been applied to $\overline{w'T'_s}$ only during day time situations with downward net radiation. When the correlation $\overline{w'q'}$

was not available it has been estimated on the energy balance of the earth surface ($\rho\lambda \overline{w'q'} \approx -0.9\,Q - \rho c_p \overline{w'T'}$, where ρ is air density in kg/m^3, λ is latent heat of vaporisation in J/kg, Q is net radiation in W/m^2 and c_p specific heat of air at constant pressure in J/kgK). For other correlations and for night time situations, no corrections have been applied. Corrections are of the order of 10% only.

- Humidity fluctuations were measured with a Lyman-alpha sensor. The Ly-α output shows considerable long term drift and can therefore not be used for absolute measurements. Only the fluctuations can be used. The Ly-α sensor has a quadratic calibration curve and to convert from voltage fluctuations to humidity fluctuations the absolute humidity is needed. For this the screen measurements have been applied.
- Dew points have been calculated using the mean temperature and mean wet bulb temperature in the screen. During the first three days no wet bulb was available and the Rotronic Hygroskop relative humidity sensor has been used.
- Rain quantities are given in 0.1 mm per 10 minute interval. Due to rounding (for example periods with less than 0.05 mm) the sum of 10 minute quantities (pluviograph) might not correspond to the 6, 12 or 18 hour sum (rain-gauge) as given in the synoptical dataset.
- Correlations with temperature and humidity have been removed in periods with rain (0.016 mm in 10 minutes has been used as criterion since this was about the mimimum that could be detected).
- Intervals with condensation on the Ly-α have been removed.

For verification purposes and for quick reference a number of plots has been produced. Only a few of them are reproduced here. In figure 5 a surface energy comparison is given. The sum of heat flux (H) and moisture flux (LE) (W/m^2) at 11 m height is compared with net radiation Q_{net} (W/m^2). It turns out that H + LE is 17% smaller than net radiation during day time. The major part of this difference can be attributed to soil heat flux. The plots in figure 6 and 7 give information on local perturbations near the measuring station. For the u/u* plot (mean wind speed divided by friction velocity) only wind speeds above 4 m/s have been taken. Figure 6 indicates that the mean flow angle with the horizontal varies between -3 and 3 degrees. This tilting of the wind

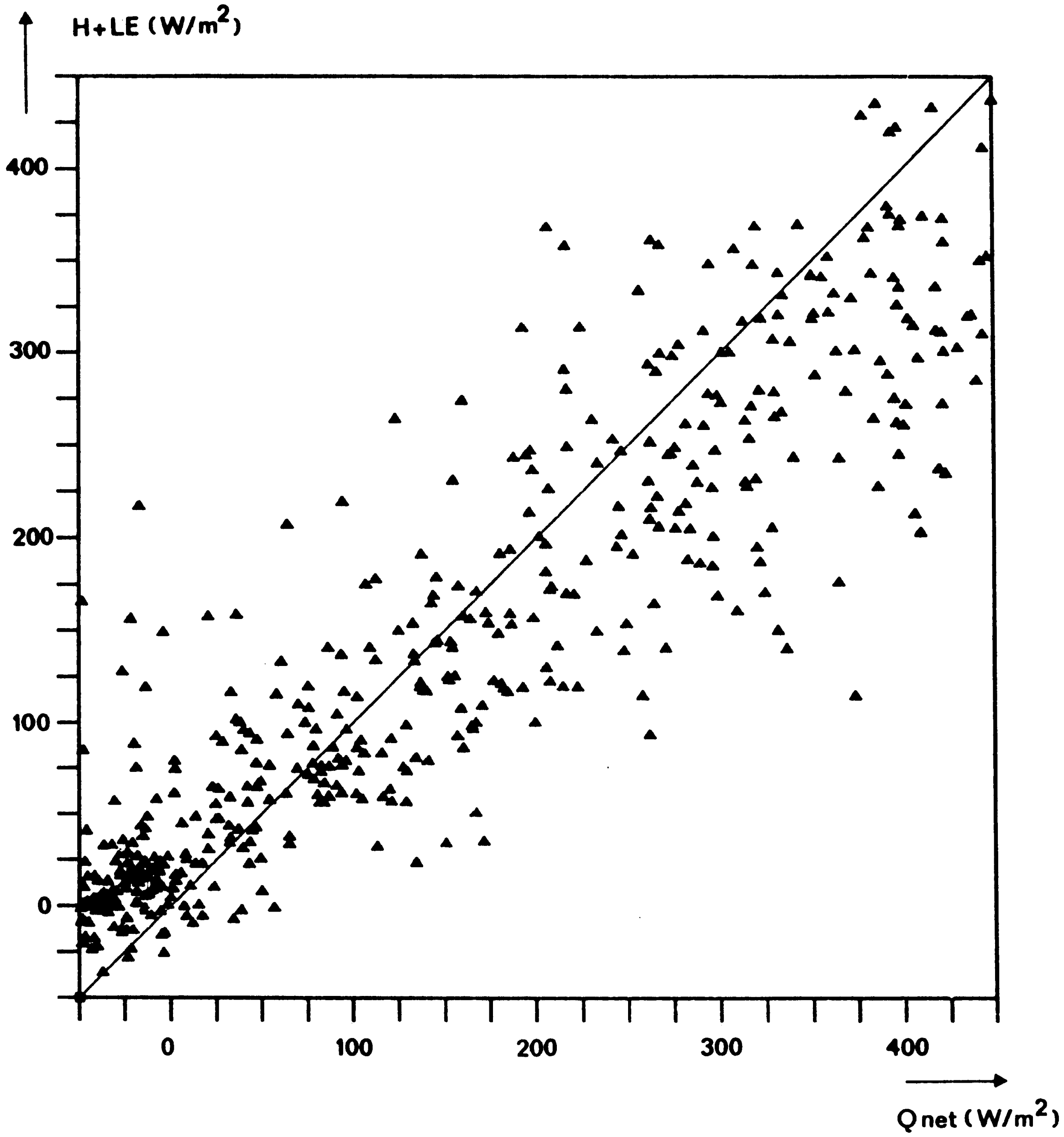

fig. 5. heat and latent heat for evaporation H + LE as a function of net radiation Q_{net}

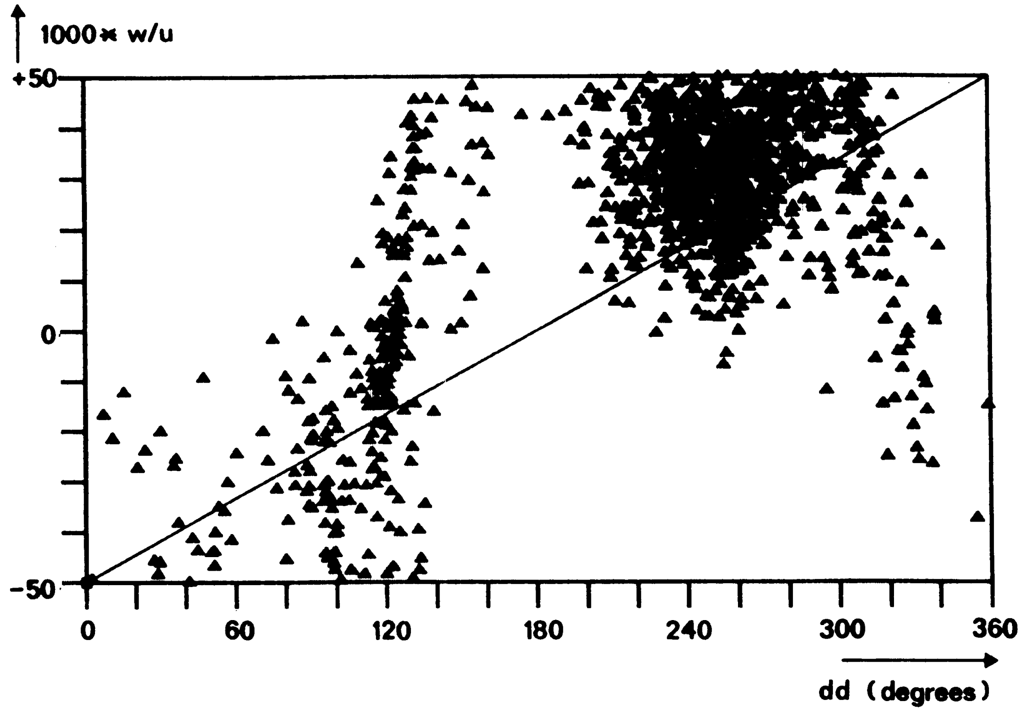

fig. 6. the ratio of vertical and horizontal mean wind speed w/u as a function of wind direction dd, measured by sonic at 11 m height

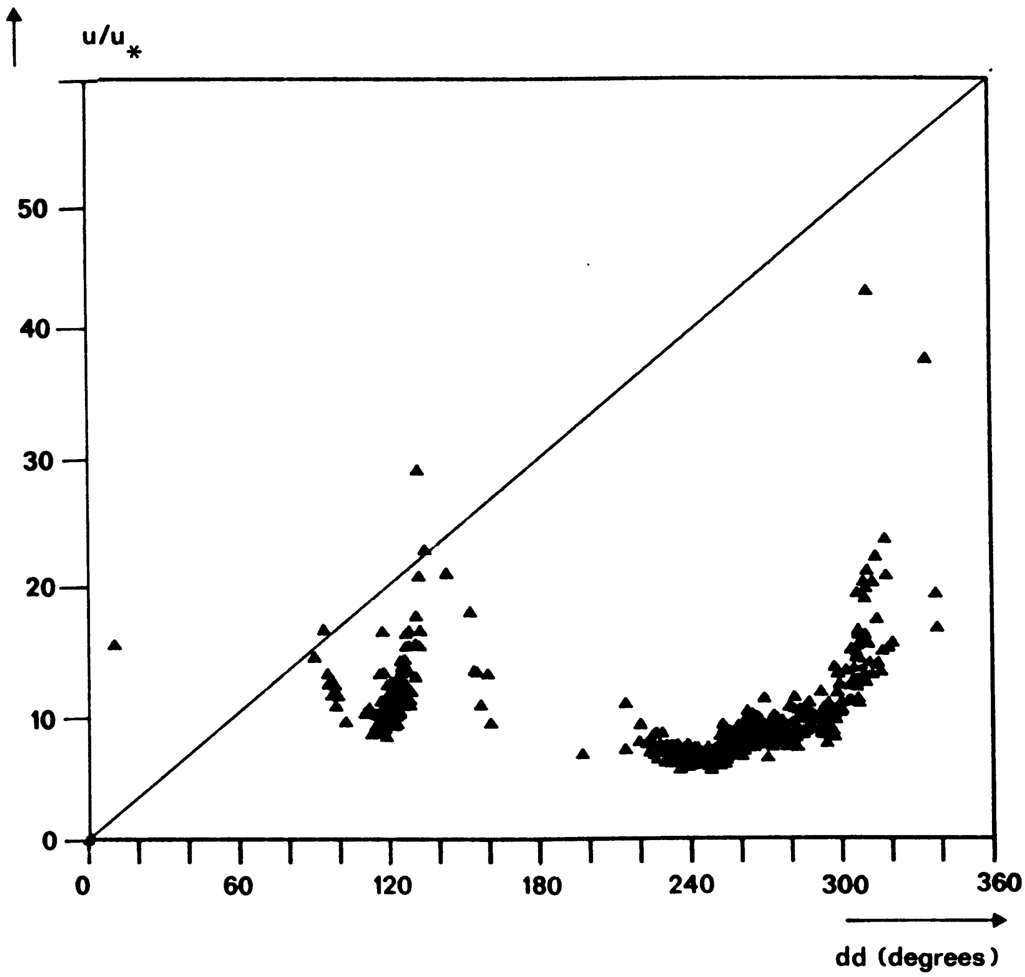

fig. 7. the ratio of mean wind speed and friction velocity u/u_* as a function of wind direction dd, measured by sonic at 11 height

vector can probably be corrected using potential flow assumptions. Figure 8 shows an example of the time evolution of the surface fluxes. The corresponding time evolution of screen temperature, dewpoint and rain quantity (nil in this example) is shown in figure 9. These figures are available at KNMI for all measuring days.

3.3 Doppler Sodar measurements

The description of these measurements can be very short since we are dealing with standard commercial equipment here. The Doppler Sodar is a three dimensional Remtech system with electronics. No facsimile recording is available. The double frequency measuring program has been used, the same as during COAST and the one that has been verified in Cabauw by comparing with tower measurements (Beljaars, 1984). Although a distinct fixed echo could be heard from trees 100 m away, this had no observable effects in the results. The measuring range went from 50 m up to 500 m height with an emision pulse length of 150 ms.

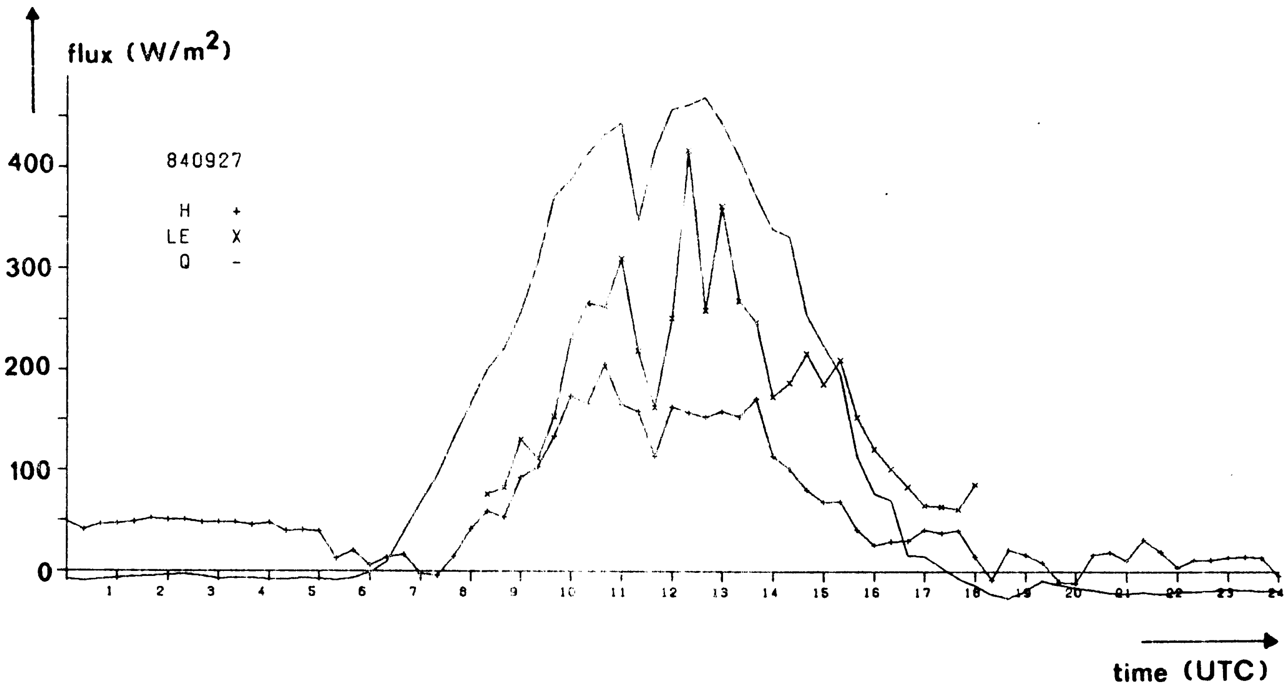

fig. 8. time evolution of the surface fluxes; 20 min. intervals

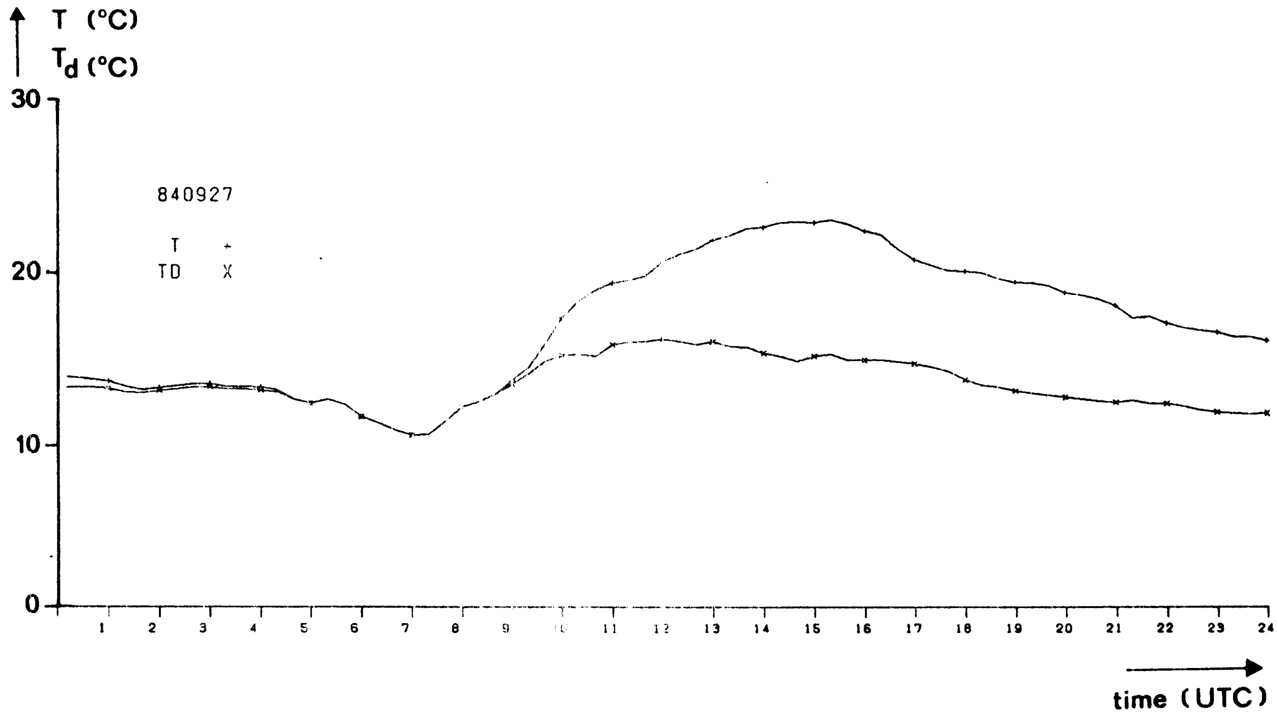

fig. 9. time evolution of screen temperature and dewpoint; 20 min. intervals

4. Tape description

The data is stored on tape, using the GF-3 format.
Characteristics are:

density 1600 bpi
maxrecsize 80
blockize 1920
EBCDIC - code

The data is stored in three files, in succession synoptical observations, surface measurements and Doppler Sodar measurements. In the figures 10, 11 and 12 the first lines of each block are shown. A listing of the parameters and units of the second file (surface measurements) is given in table 2.

```
14       19  2        851055                     NETHERLANDS        K.N.M.I. DE BILT  001     TAPE HEADER RECORD
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1THIS TAPE CONTAINS THE DATASET OBTAINED BY                                           004     TAPE HEADER RECORD
1THE ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI)                                005     TAPE HEADER RECORD
1DURING "MESOGERS 1984".                                                              006     TAPE HEADER RECORD
1THREE FILES ARE DISTINGUISHED:                                                       007     TAPE HEADER RECORD
1 1: SYNOPTICAL OBSERVATIONS                                                          008     TAPE HEADER RECORD
1 2: SURFACE MEASUREMENTS (FLUXES WITH SONIC ANEMOMETER)                              009     TAPE HEADER RECORD
1 3: DOPPLER SODAR MEASUREMENTS                                                       010     TAPE HEADER RECORD
1PERIOD: 10-09-1984  -  05-10-1984                                                    011     TAPE HEADER RECORD
1                                                                                     012     TAPE HEADER RECORD
1THE K.N.M.I. STATION (C8) WAS LOCATED AT RAMOUZENS,LANNEPAX,DEPT.GERS,FRANCE013     TAPE HEADER RECORD
1THE DATASET AND THE INSTRUMENTAL DETAILS ARE DESCRIBED IN                            014     TAPE HEADER RECORD
1THE K.N.M.I. REPORT:                                                                 015     TAPE HEADER RECORD
1"MESOGERS 1984, THE DATASET OF STATION C8  "                                         016     TAPE HEADER RECORD
1                   BY                                                                017     TAPE HEADER RECORD
1             A.C.M. BELJAARS                                                         018     TAPE HEADER RECORD
1             W.A.A. MONNA                                                            019     TAPE HEADER RECORD
1             J.G. VAN DER VLIET                                                      020     TAPE HEADER RECORD
1THIS REPORT CAN BE OBTAINED FROM ONE OF THE AUTHORS AT:                              021     TAPE HEADER RECORD
1K.N.M.I.                                                                             022     TAPE HEADER RECORD
1POSTBUS 201                                                                          023     TAPE HEADER RECORD
13730 AE  DE BILT  THE NETHERLANDS                                                    024     TAPE HEADER RECORD
*** TAPEMARK ***
45      2*         (23(I10,X1,A69))                                                   001     DATA CYCLE DEFINITION RECORD
4                                                                                     002     DATA CYCLE DEFINITION RECORD
4                                                                                     003     DATA CYCLE DEFINITION RECORD
4 010   TIME <YYMMDDHHMM>          HH=UTI     94        1.00       0.0                004     DATA CYCLE DEFINITION RECORD
4 020    SYNOPS FM12.VII SECTION 1+2   I      94        1.00       0.0                005     DATA CYCLE DEFINITION RECORD
50MESOGERS  19  1NETHERLANDS        K.N.M.I. DE BILT  850513                          001     FILE HEADER RECORD
5             C8         RAMOUZENS (FRANCE)                                           002     FILE HEADER RECORD
5                                                                                     003     FILE HEADER RECORD
5                                      434752N001134E                                 004     FILE HEADER RECORD
59999999999999999999999999999999999900201                          09999999999        005     FILE HEADER RECORD
C6THIS FILE CONTAINS THE SYNOPTICAL OBSERVATIONS DONE BY                              001     COMMENT RECORD
0K.N.M.I. DURING "MESOGERS 1984".                                                     002     COMMENT RECORD
0THE OBSERVATIONS ARE CODED ACCORDING TO THE                                          003     COMMENT RECORD
0INTERNATIONAL STANDARD FOR SYNOPTICAL MESSAGES.                                      004     COMMENT RECORD
0PERIOD: 10-09-1984  -  05-10-1984                                                    005     COMMENT RECORD
0THE K.N.M.I. STATION (C8) WAS LOCATED AT RAMOUZENS,LANNEPAX,DEPT.GERS,FRANCE006     COMMENT RECORD
0THE DATASET AND THE INSTRUMENTAL DETAILS ARE DESCRIBED IN                            007     COMMENT RECORD
0THE K.N.M.I. REPORT:                                                                 008     COMMENT RECORD
0                                                                                     009     COMMENT RECORD
0     "MESOGERS 1984, THE DATASET OF STATION C8  "                                    010     COMMENT RECORD
0                   BY                                                                011     COMMENT RECORD
0             A.C.M. BELJAARS                                                         012     COMMENT RECORD
0             W.A.A. MONNA                                                            013     COMMENT RECORD
0             J.G. VAN DER VLIET                                                      014     COMMENT RECORD
0                                                                                     015     COMMENT RECORD
0THIS REPORT CAN BE OBTAINED FROM ONE OF THE AUTHORS AT:                              016     COMMENT RECORD
0           K.N.M.I.                                                                  017     COMMENT RECORD
0           POSTBUS 201                                                               018     COMMENT RECORD
0           3730 AE  DE BILT                                                          019     COMMENT RECORD
0           THE NETHERLANDS                                                           020     COMMENT RECORD
67MESOGERS  19  1NETHERLANDS       K.N.M.I. DE BILT  850513                           001     SERIES HEADER RECORD
6             C8          RAMOUZENS (FRANCE)                  19840910000019841005230002     SERIES HEADER RECORD
6                                                                                     003     SERIES HEADER RECORD
6                                      434752N001134E  9999  9999  9999  9999 9999 9999004     SERIES HEADER RECORD
69999999999999999999999999999999999900201                       999999         0      005     SERIES HEADER RECORD
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 8409100400   46/// /2410  10152 20144 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD  7
 8409100500   46/// /3216  10150 20145 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD  8
 8409100600   26/// /3106  10132 20126 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD  9
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 8409100800   42656 73306  10139 20127 40189 5//// 7//// 86500                                 DATA CYCLE RECORD 12
 8409100900   42657 62805  10152 20127 40199 5//// 7//// 86800                                 DATA CYCLE RECORD 13
 8409101000   42558 72905  10161 20117 40201 5//// 7//// 87800                                 DATA CYCLE RECORD 14
 8409101100   42558 63205  10169 20122 40197 52011 7//// 85861                                 DATA CYCLE RECORD 15
 8409101200   21558 43208  10186 20119 40194 57001 72562 83801                                 DATA CYCLE RECORD 16
 8409101200      333 69901                                                                     DATA CYCLE RECORD 17
 8409101300   42558 62808  10194 20092 40192 57036 7//// 84801                                 DATA CYCLE RECORD 18
 8409101400   42560 62909  10192 20099 40189 57006 7//// 85861                                 DATA CYCLE RECORD 19
 8409101500   46/// /3110  10188 20098 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD 20
 8409101600   46/// /2909  10199 20114 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD 21
 8409101700   46/// /3113  10181 20110 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD 22
 8409101800   46/// /3007  10163 20114 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD 23
 8409101900   46/// /2806  10144 20113 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD 24
77   23          23   2                                                                        DATA CYCLE RECORD  1
 8409102000   46/// /3006  10138 20113 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD  2
 8409102100   46/// /2605  10135 20114 4//// 5//// 7//// 8////                                 DATA CYCLE RECORD  3
```

fig. 10. tape heading and synoptical observations

```
*** TAPEMARK ***
44    301         (23(A8D))                                                001   DATA CYCLE DEFINITION RECORD
4                                                                          002   DATA CYCLE DEFINITION RECORD
4                                                                          003   DATA CYCLE DEFINITION RECORD
4 013    DATE <YYMMDDHHMM>             HH=UTI    94     1.00    0.0        004   DATA CYCLE DEFINITION RECORD
4 200    WINDSPEED BY SONIC            (M/S)I    94      0.1    0.0        005   DATA CYCLE DEFINITION RECORD
4 130    WINDDIRECTION BY SONIC        (DEG)I    94     1.00    0.0        006   DATA CYCLE DEFINITION RECORD
4 200    VERTICAL VELOCITY BY SONIC    (M/S)I    94     0.01    0.0        007   DATA CYCLE DEFINITION RECORD
4 130    DIRECTION OF SONIC (ROTOR)    (DEG)I    94     1.00    0.0        008   DATA CYCLE DEFINITION RECORD
4 901    UU  CORRELATIONS                   I    94     .001    0.0        009   DATA CYCLE DEFINITION RECORD
4 901    UV  | U IN M/S                     I    94     .001    0.0        010   DATA CYCLE DEFINITION RECORD
4 901    UW  | V IN M/S                     I    94     .001    0.0        011   DATA CYCLE DEFINITION RECORD
4 901    UT  | W IN M/S                     I    94     .001    0.0        012   DATA CYCLE DEFINITION RECORD
4 901    UQ  | T IN K                       I    94     .001    0.0        013   DATA CYCLE DEFINITION RECORD
4 901    VV  | Q IN G/KG                    I    94     .001    0.0        014   DATA CYCLE DEFINITION RECORD
4 901    VW                                 I    94     .001    0.0        015   DATA CYCLE DEFINITION RECORD
4 901    VT                                 I    94     .001    0.0        016   DATA CYCLE DEFINITION RECORD
4 901    VQ                                 I    94     .001    0.0        017   DATA CYCLE DEFINITION RECORD
4 901    WW                                 I    94     .001    0.0        018   DATA CYCLE DEFINITION RECORD
4 901    WT                                 I    94     .001    0.0        019   DATA CYCLE DEFINITION RECORD
4 901    WQ                                 I    94     .001    0.0        020   DATA CYCLE DEFINITION RECORD
4 901    TT                                 I    94     .001    0.0        021   DATA CYCLE DEFINITION RECORD
4 901    TQ                                 I    94     .001    0.0        022   DATA CYCLE DEFINITION RECORD
4 901    QQ                                 I    94     .001    0.0        023   DATA CYCLE DEFINITION RECORD
4 130    WINDDIRECTION BY VANE         (DEG)I    94     1.00    0.0        024   DATA CYCLE DEFINITION RECORD
45                                                                         025   DATA CYCLE DEFINITION RECORD
4                                                                          026   DATA CYCLE DEFINITION RECORD
4                                                                          027   DATA CYCLE DEFINITION RECORD
4 904    STANDARD DEVIATION OF DD10 (DEG)I       94      0.1    0.0        028   DATA CYCLE DEFINITION RECORD
4 200    WINDSPEED BY CUP ANEMOMETER(M/S)I       94      0.1    0.0        029   DATA CYCLE DEFINITION RECORD
4 903    STANDARD DEVIATION OF FF10 (M/S)I       94     0.01    0.0        030   DATA CYCLE DEFINITION RECORD
4 503    TEMPERATURE IN SCREEN      (C  )I       94      0.1    0.0        031   DATA CYCLE DEFINITION RECORD
4 503    DEW POINT IN SCREEN        (C  )I       94      0.1    0.0        032   DATA CYCLE DEFINITION RECORD
4 601    NET RADIATION  +=UP       (W/M2)I       94     1.00    0.0        033   DATA CYCLE DEFINITION RECORD
4 601    GLOBAL RADIATION  +=UP    (W/M2)I       94     1.00    0.0        034   DATA CYCLE DEFINITION RECORD
4 700    RAIN QUANTITY              (MM )I       94      0.1    0.0        035   DATA CYCLE DEFINITION RECORD
4 503    SONIC TEMPERATURE          (C  )I       94      0.1    0.0        036   DATA CYCLE DEFINITION RECORD
50MESOGERS  19  1NETHERLANDS        K.N.M.I. DE BILT  850513               001   FILE HEADER RECORD
5            C8        RAMOUZENS (FRANCE)                                  002   FILE HEADER RECORD
5                                                                          003   FILE HEADER RECORD
5                                434752NC01134E                            004   FILE HEADER RECORD
5999999999999999999999999999999990201                 09999999999          005   FILE HEADER RECORD
06THIS FILE CONTAINS THE SURFACE MEASUREMENTS DONE                         001   COMMENT RECORD
0BY K.N.M.I. DURING "MESOGERS 1984".                                       002   COMMENT RECORD
0PERIOD: 10-09-1984  -  05-10-1984                                         003   COMMENT RECORD
0                                                                          004   COMMENT RECORD
0                                                                          005   COMMENT RECORD
0THE K.N.M.I. STATION (C8) WAS LOCATED AT RAMOUZENS,LANNEPAX,DEPT.GERS,FRANCE006   COMMENT RECORD
0THE DATASET AND THE INSTRUMENTAL DETAILS ARE DESCRIBED IN                 007   COMMENT RECORD
0THE K.N.M.I. REPORT:                                                      008   COMMENT RECORD
0                                                                          009   COMMENT RECORD
0      "MESOGERS 1984, THE DATASET OF STATION C8  "                        010   COMMENT RECORD
0                     BY                                                   011   COMMENT RECORD
0               A.C.M. BELJAARS                                            012   COMMENT RECORD
0               W.A.A. MONNA                                               013   COMMENT RECORD
0               J.G. VAN DER VLIET                                         014   COMMENT RECORD
0                                                                          015   COMMENT RECORD
0THIS REPORT CAN BE OBTAINED FROM ONE OF THE AUTHORS AT:                   016   COMMENT RECORD
0             K.N.M.I.                                                     017   COMMENT RECORD
0             POSTBUS 201                                                  018   COMMENT RECORD
0             3730 AE  DE BILT                                             019   COMMENT RECORD
0             THE NETHERLANDS                                              020   COMMENT RECORD
67MESOGERS  19  1NETHERLANDS        K.N.M.I. DE BILT  850513               001   SERIES HEADER RECORD
6            C8        RAMOUZENS (FRANCE)              1984091000201984100523400002   SERIES HEADER RECORD
6                                                                          003   SERIES HEADER RECORD
6                                434752NC01134E  9999  9999  9999  9999 9999 9999004   SERIES HEADER RECORD
6999999999999999999999999999999990201                 999999          0    005   SERIES HEADER RECORD
77   23        0    1                                                          DATA CYCLE RECORD  1
8409100020    54    239     21    260   3247    -13   -759    -68     -5  2251  DATA CYCLE RECORD  2
              99     -6     21   1484      3      5     23      0      3   242  DATA CYCLE RECORD  3
             196     56    153    166    131      6     -2      0    165        DATA CYCLE RECORD  4
8409100040    51    239     29    260   2882    -56   -636    -58    129  2015  DATA CYCLE RECORD  5
              -9     -5    -53   1204      4    -21     24     -7   1225   242  DATA CYCLE RECORD  6
             192     55    149    165    134      8      0      0    164        DATA CYCLE RECORD  7
8409100100    55    237     34    260   3519   -148   -362    -83    -11  2358  DATA CYCLE RECORD  8
              89      9     -1   1547     20      8     27      0      1   241  DATA CYCLE RECORD  9
             192     60    156    166    136     13      0      0    165        DATA CYCLE RECORD 10
8409100120    58    243     19    260   3406   -229   -922    -64   -558  2191  DATA CYCLE RECORD 11
               9     19   -187   1446      7     46     32   -157   7670   246  DATA CYCLE RECORD 12
             176     62    174    163    137      4      0      0    163        DATA CYCLE RECORD 13
8409100140    50    245     18    260   2691     81   2697  99999  99999  2190  DATA CYCLE RECORD 14
             -16  99999  99999   1338  99999  99999  99999  99999  99999   243  DATA CYCLE RECORD 15
             180     54    142    155    137      4      0      0  99999        DATA CYCLE RECORD 16
8409100200    52    238     30    260   2938    180   -715    -32  99999  1945  DATA CYCLE RECORD 17
             -24    -20  99999   1357    -42  99999     28  99999  99999   242  DATA CYCLE RECORD 18
             167     57    138    151    141     17      0      0    161        DATA CYCLE RECORD 19
```

fig. 11. surface measurements

```
*** TAPEMARK ***
45     PI        (23(I10,14I5))                                                              C01   DATA CYCLE DEFINITION RECORD
4                                                                                            C02   DATA CYCLE DEFINITION RECORD
4                                                                                            003   DATA CYCLE DEFINITION RECORD
4 010   TIME <YYMMDDHHMM>              HH=UTI     94      1.00     0.0                       004   DATA CYCLE DEFINITION RECORD
4 141   HEIGHT                            (M)I    94      1.00     0.0                       C05   DATA CYCLE DEFINITION RECORD
4 901   ECHO INT. VERTICAL ANTENNA          I     94      1.00     0.0                       006   DATA CYCLE DEFINITION RECORD
4 200   HORIZONTAL WINDSPEED            (M/S)I    94       0.1     C.0                       007   DATA CYCLE DEFINITION RECORD
4 130   WINDDIRECTION                   (DEG)I    94      1.00     0.0                       008   DATA CYCLE DEFINITION RECORD
4 902   VERT. MEAN WINDSPEED            (M/S)I    94      0.01     0.0                       009   DATA CYCLE DEFINITION RECORD
4 903   ST.DEV. VERT. WINDSPEED         (M/S)I    94      0.01     0.0                       010   DATA CYCLE DEFINITION RECORD
4 904   ST.DEV. WINDDIRECTION           (DEG)I    94      1.00     0.0                       011   DATA CYCLE DEFINITION RECORD
50MESOGERS  19  1NETHERLANDS          K.N.M.I. DE BILT  850513                               001   FILE HEADER RECORD
5           C8        RAMOUZENS (FRANCE)                                                     002   FILE HEADER RECORD
5                                                                                            CC3   FILE HEADER RECORD
5                                   434752NC01134E                                           C04   FILE HEADER RECORD
59999999999999999999999999999999990300                          09999999999                  005   FILE HEADER RECORD
06THIS FILE CONTAINS THE DOPPLER SODAR MEASUREMENTS DONE                                     001   COMMENT RECORD
0BY K.N.M.I. DURING "MESOGERS 1984".                                                         002   COMMENT RECORD
0A THREE COMPONENT "REMTECH" SODAR WAS USED.                                                 003   COMMENT RECORD
0PERIOD: 10-09-1984  -  05-10-1984                                                           004   COMMENT RECORD
0                                                                                            C05   COMMENT RECORD
0THE K.N.M.I. STATION (C8) WAS LOCATED AT RAMOUZENS,LANNEPAX,DEPT.GERS,FRANCE006   COMMENT RECORD
0THE DATASET AND THE INSTRUMENTAL DETAILS ARE DESCRIBED IN                                   007   COMMENT RECORD
0THE K.N.M.I. REPORT:                                                                        008   COMMENT RECORD
0                                                                                            009   COMMENT RECORD
0     "MESOGERS 1984, THE DATASET OF STATION C8  "                                           010   COMMENT RECORD
0                BY                                                                          011   COMMENT RECORD
0          A.C.M. BELJAARS                                                                   012   COMMENT RECORD
0          W.A.A. MONNA                                                                      013   COMMENT RECORD
0          J.G. VAN DER VLIET                                                                014   COMMENT RECORD
0                                                                                            C15   COMMENT RECORD
0THIS REPORT CAN BE OBTAINED FROM ONE OF THE AUTHORS AT:                                     016   COMMENT RECORD
0          K.N.M.I.                                                                          017   COMMENT RECORD
0          POSTBUS 201                                                                       018   COMMENT RECORD
0          3730 AE  DE BILT                                                                  019   COMMENT RECORD
0          THE NETHERLANDS                                                                   C20   COMMENT RECORD
67MESOGERS  19  1NETHERLANDS          K.N.M.I. DE BILT  850513                               001   SERIES HEADER RECORD
6           C8        RAMOUZENS (FRANCE)                        198409100020198410052340C02   SERIES HEADER RECORD
6                                                                                            C03   SERIES HEADER RECORD
6                                   434752NC01134E  9999  9999  9999  9999 9999 9999C04   SERIES HEADER RECORD
69999999999999999999999999999999990300                      999999        0                  005   SERIES HEADER RECORD
77   23        0    1                                                                              DATA CYCLE RECORD  1
8409100000   500 9999 9999 9999 9999 9999 9999   475 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  2
8409100000   450 9999 9999 9999 9999 9999 9999   425 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  3
8409100000   400 9999 9999 9999 9999 9999 9999   375 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  4
8409100000   350 9999 9999 9999 9999 9999 9999   325 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  5
8409100000   300 9999 9999 9999 9999 9999 9999   275  117 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  6
8409100000   250   36 9999 9999 9999 9999 9999   225   58 1210  256   15 9999 9999                 DATA CYCLE RECORD  7
8409100000   200   58 1432  255  -48   50    5   175   31 1137  252  258   78 9999                 DATA CYCLE RECORD  8
8409100000   150   25 1117  253  -11   66    6   125   25 1137  246   21   65    4                 DATA CYCLE RECORD  9
8409100000   100   43 1013  243    9   24    6    75   25  981  245    5   42    9                 DATA CYCLE RECORD 10
8409100000    50   23  813  243   32   33   11                                                     DATA CYCLE RECORD 11
8409100020   500 9999 9999 9999 9999 9999 9999   475 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 12
8409100020   450 9999 9999 9999 9999 9999 9999   425 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 13
8409100020   400 9999 9999 9999 9999 9999 9999   375 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 14
8409100020   350 9999 9999 9999 9999 9999 9999   325 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 15
8409100020   300 9999 9999 9999 9999 9999 9999   275 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 16
8409100020   250 9999 9999 9999 9999 9999 9999   225 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 17
8409100020   200 9999 9999 9999 9999 9999 9999   175 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 18
8409100020   150   19 9999 9999 9999 9999 9999   125   17  929  260   27   40    8                 DATA CYCLE RECORD 19
8409100020   100   17  895  260   -8   63    8    75   16  730  262    0   83    8                 DATA CYCLE RECORD 20
8409100020    50   14  735  261  -45  113   13                                                     DATA CYCLE RECORD 21
8409100040   500 9999 9999 9999 9999 9999 9999   475 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 22
8409100040   450 9999 9999 9999 9999 9999 9999   425 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 23
8409100040   400 9999 9999 9999 9999 9999 9999   375 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 24
77   23       23    2                                                                              DATA CYCLE RECORD  1
8409100040   350 9999 9999 9999 9999 9999 9999   325 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  2
8409100040   300 9999 9999 9999 9999 9999 9999   275 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  3
8409100040   250 9999 9999 9999 9999 9999 9999   225 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  4
8409100040   200 9999 9999 9999 9999 9999 9999   175   25 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  5
8409100040   150   18 1230  267  -67   17    8   125   14  807  265  246   66    1                 DATA CYCLE RECORD  6
8409100040   100   15  804  262  -39   74   13    75   16  843  264  -27   92   16                 DATA CYCLE RECORD  7
8409100040    50   20  821  266    7   80   10                                                     DATA CYCLE RECORD  8
8409100100   500 9999 9999 9999 9999 9999 9999   475 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD  9
8409100100   450 9999 9999 9999 9999 9999 9999   425 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 10
8409100100   400 9999 9999 9999 9999 9999 9999   375 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 11
8409100100   350 9999 9999 9999 9999 9999 9999   325 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 12
8409100100   300   61 9999 9999 9999 9999 9999   275 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 13
8409100100   250 9999 9999 9999 9999 9999 9999   225 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 14
8409100100   200 9999 9999 9999 9999 9999 9999   175 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 15
8409100100   150   39 9999 9999 9999 9999 9999   125   56 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 16
8409100100   100   51 9999 9999 9999 9999 9999    75   31  808  265   99 9999 9999                 DATA CYCLE RECORD 17
8409100100    50 9999 9999 9999 9999 9999 9999                                                     DATA CYCLE RECORD 18
8409100120   500 9999 9999 9999 9999 9999 9999   475 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 19
8409100120   450 9999 9999 9999 9999 9999 9999   425 9999 9999 9999 9999 9999 9999                 DATA CYCLE RECORD 20
```

fig. 12. doppler sodar measurements

5. Calender

From every day and all the measurements a detailed survey is made of the availability of the 20 min data.
When the measurements are available + is noted, when they are not available - is noted.

```
                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 10-09-84
TIME :               0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T               ++++-+++++------++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA               ++++--++++--------------++++++++++++++++++++++++++++++++++++++++++++++++
WIND DIR.  10 M       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.         ------------------------+--+--+--+--+--+--+-----------------------------
```

```
                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 11-09-84
TIME :               0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T               ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA               ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND DIR.  10 M       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                 ++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.         ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 12-09-84
TIME :               0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY        +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T               +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA               +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND DIR.  10 M       +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M       +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN      +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN      +++++++++++++++++++-+++++++++++-++++++++++++++++++++++++++++++++++++++++
NET   RADIATION       +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION       +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY         +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                 +++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.         ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 13-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
SONIC T                 ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
LY ALFA                 ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
WIND DIR.  10 M         ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
TEMP.   SCREEN          ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
DEW P.  SCREEN          ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
NET   RADIATION         ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++---+++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 14-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                 +++++++++++++++++++++++++------+++++++++++++++++++++++++---+---+++++++++
LY ALFA                 +++++++++++++++++++++++++-----------------------++++++++----------------
WIND DIR.  10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.   SCREEN          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.  SCREEN          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION         +++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         +++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 15-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
SONIC T                 +++----++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++++++++
LY ALFA                 ----------------------------+++--+++++++++++++++++++++++++++++++++++++++
WIND DIR.  10 M         ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
TEMP.   SCREEN          ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
DEW P.  SCREEN          ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
NET   RADIATION         ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 16-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++
SONIC T                 ++++++++++++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++
LY ALFA                 ++++++++++++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++
WIND DIR.  10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.   SCREEN          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.  SCREEN          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                   +++++++++++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                        M E S O   G E R S   1 9 8 4   (C8)
DATE : 17-09-84
TIME :             0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T            +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++-----++++-
LY ALFA            ++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++++-------------
WIND DIR.  10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR              +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.      ------------------+--+--+--+--+--+--+--+--+--+--+--+--+------------------
```

```
                        M E S O   G E R S   1 9 8 4   (C8)
DATE : 18-09-84
TIME :             0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY     ++++++++++++++++++++++-++++++++++++++++++++-+++++++++++++++++++++++++++++
SONIC T            +++++++++++-----++++-----++++++++-+-+++++----++++++++++++++++++++++++++++
LY ALFA            ----------------------------+++++--+--++++---++++++++++++++++++++++++++++
WIND DIR.  10 M    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
WIND SPEED 10 M    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
TEMP.    SCREEN    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
DEW P.   SCREEN    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
NET   RADIATION    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
GLOB. RADIATION    +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++
RAIN QUANTITY      +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++

SODAR              +++++++++++++++++++++--++++++++++++++++++++--++++++++++++++++++++++++++++

SYNOP OBSERV.      ------------------+--+--+--+--+--+--+--+--+--+--+--+--+------------------
```

```
                        M E S O   G E R S   1 9 8 4   (C8)
DATE : 19-09-84
TIME :             0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T            +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA            ++++++++++---------+++++++++++++++++++-----------------------------------
WIND DIR.  10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR              +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.      ------------------+--+--+--+--+--+--+--+--+--+--+--+--+------------------
```

```
                        M E S O   G E R S   1 9 8 4   (C8)
DATE : 20-09-84
TIME :             0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T            +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA            -------------------------------------------------------------------------
WIND DIR.  10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR              ++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.      ------------------+--+--+--+--+--+--+--+--+--+--+--+--+------------------
```

```
                                   MESO GERS 1984 (C8)
DATE : 21-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                 ++++++++++++++++++++--------+++++++++++++++++++----+++++-++++++++++++++++
LY ALFA                 ------------------------------------------------------------------------
WIND DIR.   10 M        ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET    RADIATION        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                   MESO GERS 1984 (C3)
DATE : 22-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                 +++++----+++++++++++++++++++++++++++++--+++++++------++++++-----+----+--
LY ALFA                 ------------------------------------------------------------------------
WIND DIR.   10 M        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET    RADIATION        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                   MESO GERS 1984 (C8)
DATE : 23-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
SONIC T                 --------------------+-+--+--+--++++------+++++++++++++++++++++++++++++++
LY ALFA                 ------------------------------------------------------------------------
WIND DIR.   10 M        +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
WIND SPEED 10 M         +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
TEMP.     SCREEN        +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
DEW P.    SCREEN        +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
NET    RADIATION        +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
GLOB. RADIATION         +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++
RAIN QUANTITY           +++++++++++++++++++++++++++-++++++++-----+++++++++++++++++++++++++++++++

SODAR                   +++++++++++++++++++++++++++---+++++++----+++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                   MESO GERS 1984 (C8)
DATE : 24-09-84
TIME :                  0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                 ---------+++++++++++++-+++++++++++++++++++++++++++++--++++-++---++++++++
LY ALFA                 ------------------------------------------------------------------------
WIND DIR.   10 M        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.     SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.    SCREEN        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET    RADIATION        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.           ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 25-09-84
TIME :                    0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY            ++++++++++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++
SONIC T                   +++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++++++
LY ALFA                   -------------------------------++-----++++++++++++++--------------------
WIND DIR.   10 M          +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M           +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
TEMP.      SCREEN         +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
DEW P.     SCREEN         +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
NET    RADIATION          +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
GLOB. RADIATION           +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++
RAIN QUANTITY             +++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++

SODAR                     +++++++++++++++++++++---+++++++++++- +++++++++++++++++++++++++++++++++++

SYNOP OBSERV.             ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 26-09-84
TIME :                    0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY            ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA                   --------------------------------------+++++++++++++++-------------------
WIND DIR.   10 M          +++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M           +++++++++++++++++++++++-++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.      SCREEN         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.     SCREEN         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET    RADIATION          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY             ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.             ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 27-09-84
TIME :                    0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY            ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T                   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA                   -------------------------+++++++++++++++++++++++++++++------------------
WIND DIR.   10 M          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.      SCREEN         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.     SCREEN         ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET    RADIATION          ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION           ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY             ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR                     ++++++++++++++++++++++++++-+++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.             ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------


                                      M E S O   G E R S   1 9 8 4   (C8)
DATE : 28-09-84
TIME :                    0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY            +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++
SONIC T                   +++++++++++++++++++++++++++++++++++++--++++++++++++++++++++++++++++++++-
LY ALFA                   -----------------------------------++---+++++++++++++-------------------
WIND DIR.   10 M          +++++++++++++++++++++++++++++++++++++---+-++------++++++++++++++++++++++
WIND SPEED 10 M           +++++++++++++++++++++++++++++++++++++-+++++------+++++++++++++++++++++++
TEMP.      SCREEN         +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++
DEW P.     SCREEN         +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++
NET    RADIATION          +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++
GLOB. RADIATION           +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++
RAIN QUANTITY             +++++++++++++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++

SODAR                     +++++++++++++++++++++++++++++++++++++-++++++++++++++++++++++++++++++++++

SYNOP OBSERV.             ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 29-09-84
TIME :              0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T             ------+++++++--------+--------+-+--++++++++++++++++++++-++++++++++++++++
LY ALFA             ------------------------------------------------------------------------
WIND DIR.  10 M     +++++++++++++++++++++++++++------------------+++++++++++++++++++++++++++
WIND SPEED 10 M     +++++++++++++++++++++++++++--+++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR               ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.       ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 30-09-84
TIME :              0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T             ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
LY ALFA             ---------------------------------++++++++++++++++++++++-----------------
WIND DIR.  10 M     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR               ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.       ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 01-10-84
TIME :              0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
SONIC T             ++++++++++++++---++-++++++++----------++++-+--++-+++++++++++++++++++-+--
LY ALFA             ------------------------------------------------------------------------
WIND DIR.  10 M     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
WIND SPEED 10 M     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
TEMP.    SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
DEW P.   SCREEN     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
NET   RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
GLOB. RADIATION     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--
RAIN QUANTITY       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--

SODAR               ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++--

SYNOP OBSERV.       ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

```
                                     M E S O   G E R S   1 9 8 4   (C8)
DATE : 02-10-84
TIME :              0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24

SONIC VELOCITY      --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++
SONIC T             --------------------+++++++++++++++++++++++++---------------+++---------
LY ALFA             -------------------------------------++++-------------------------------
WIND DIR.  10 M     --------------------+-++++++++++++++++++++++++++++++++++++++++++++++++++
WIND SPEED 10 M     --------------------+-++++++++++++++++++++++++++++++++++++++++++++++++++
TEMP.    SCREEN     --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++
DEW P.   SCREEN     --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++
NET   RADIATION     --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++
GLOB. RADIATION     --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++
RAIN QUANTITY       --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++

SODAR               --------------------++++++++++++++++++++++++++++++++++++++++++++++++++++

SYNOP OBSERV.       ------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------
```

M E S O G E R S 1 9 8 4 (C8)

DATE : 03-10-84

TIME :	0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24
SONIC VELOCITY	++
SONIC T	-++++----+++-+++--+---++++++++++-+++-+++++++++++++++++++++++++++++++++++
LY ALFA	-------------------------------------++++++++++++++++-------------------
WIND DIR. 10 M	++
WIND SPEED 10 M	++
TEMP. SCREEN	++
DEW P. SCREEN	++
NET RADIATION	++
GLOB. RADIATION	++
RAIN QUANTITY	++
SODAR	++
SYNOP OBSERV.	------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------

M E S O G E R S 1 9 8 4 (C8)

DATE : 04-10-84

TIME :	0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24
SONIC VELOCITY	+++-++++++++++++++++++++++++++++++
SONIC T	++++++++---------------++++---++++++++++--++++++++++++++++++++++++++++++
LY ALFA	---------------------------------------+--++++++++++--------------------
WIND DIR. 10 M	+++-++++++++++++++++++++++++++++++
WIND SPEED 10 M	+++-++++++++++++++++++++++++++++++
TEMP. SCREEN	+++-++++++++++++++++++++++++++++++
DEW P. SCREEN	+++-++++++++++++++++++++++++++++++
NET RADIATION	+++-++++++++++++++++++++++++++++++
GLOB. RADIATION	+++-++++++++++++++++++++++++++++++
RAIN QUANTITY	+++-++++++++++++++++++++++++++++++
SODAR	+++-++++++++++++++++++++++++++++++
SYNOP OBSERV.	------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------

M E S O G E R S 1 9 8 4 (C8)

DATE : 05-10-84

TIME :	0==1==2==3==4==5==6==7==8==9=10=11=12=13=14=15=16=17=18=19=20=21=22=23=24
SONIC VELOCITY	+++---
SONIC T	+++++++-+-----------+-----++---+-+---++++++--+++++++++++--++-+-++-+++---
LY ALFA	--
WIND DIR. 10 M	+++---
WIND SPEED 10 M	+++---
TEMP. SCREEN	+++---
DEW P. SCREEN	+++---
NET RADIATION	+++---
GLOB. RADIATION	+++---
RAIN QUANTITY	+++---
SODAR	+++---
SYNOP OBSERV.	------------------+--+--+--+--+--+--+--+--+--+--+--+--+-----------------

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7. Appendix

The sonic anemometer was calibrated in a windtunnel. In the figures 13-16 the three wind components measured by the sonic are presented as a function of azimuth and elevation. The vertical coordinate is the ratio between a component and the Y-component when the instrument is facing the wind, denoted as Y_o. In the figures the ideal sine or cosine response is shown as a dashed line. These calibrations were carried out in a stationary airflow at wind speeds of 5, 10 and 18 m/s. Since the results hardly depend on the wind speed, the mean values are shown. There is strong evidence that the asymmetrical results of the azimuth calibration (figures 15 and 16) are caused by a misalignment of about 2° between the axes of sonic and windtunnel. The asymmetrical W-calibration should cause a small positive offset in the mean value of the vertical wind. Indeed a positive offset of 0,1 m/s has recently been found during field-experiments. Schotanus (1982) measured and an azimuth calibration similar to the figures 15 and 16, but symmetrical. However, he found a symmetrical elevation curve.
This calibration was unfortunately carried out after the Meso-Gers 84 experiment. Since on-line corrections had to be applied to the original data, it was decided to use the results found by Schotanus (1982). This means that no correction has been applied for the elevation calibration. Also an absolute calibration of the Y-component has been carried out (azimuth and elevation 0°). The result is

$$Y = 1.0273\ Y_s + 0.13$$

where Y = true wind speed

Y_s = wind speed measured by sonic

This calibration was not included in the calibrations described before.

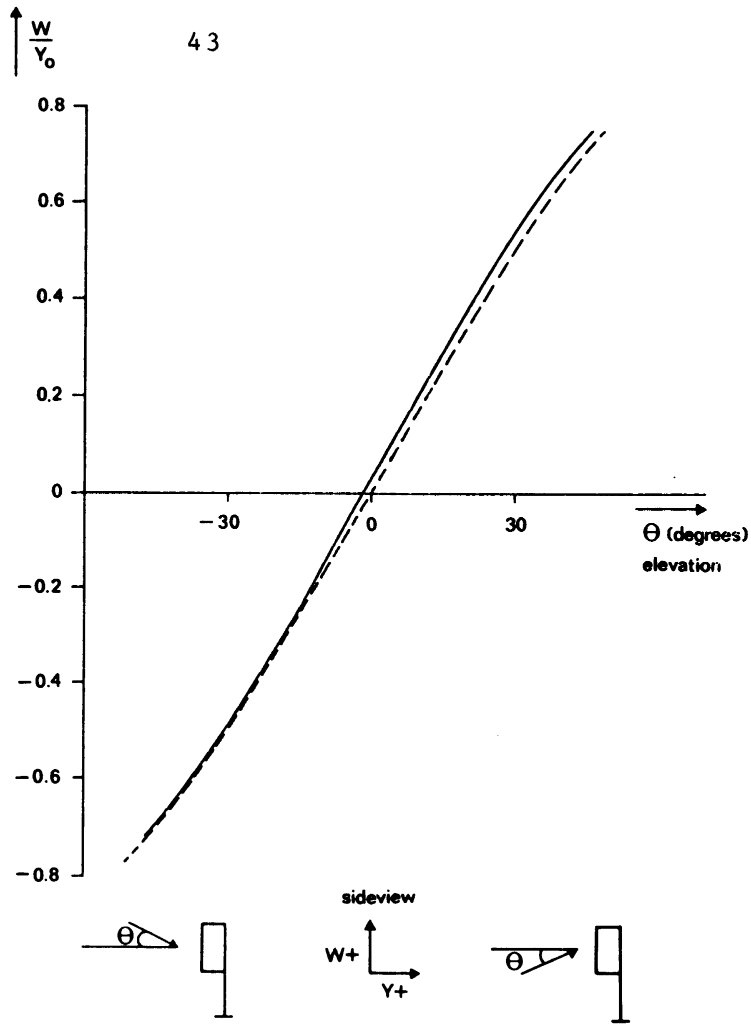

fig. 13. elevation calibration; W-component
azimuth = 0°

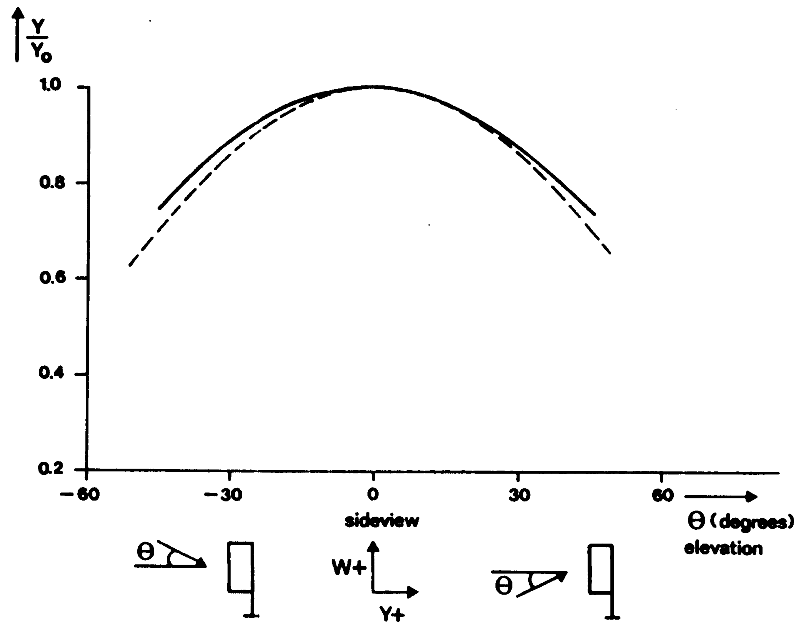

fig. 14. elevation calibration; Y-component
azimuth = 0°

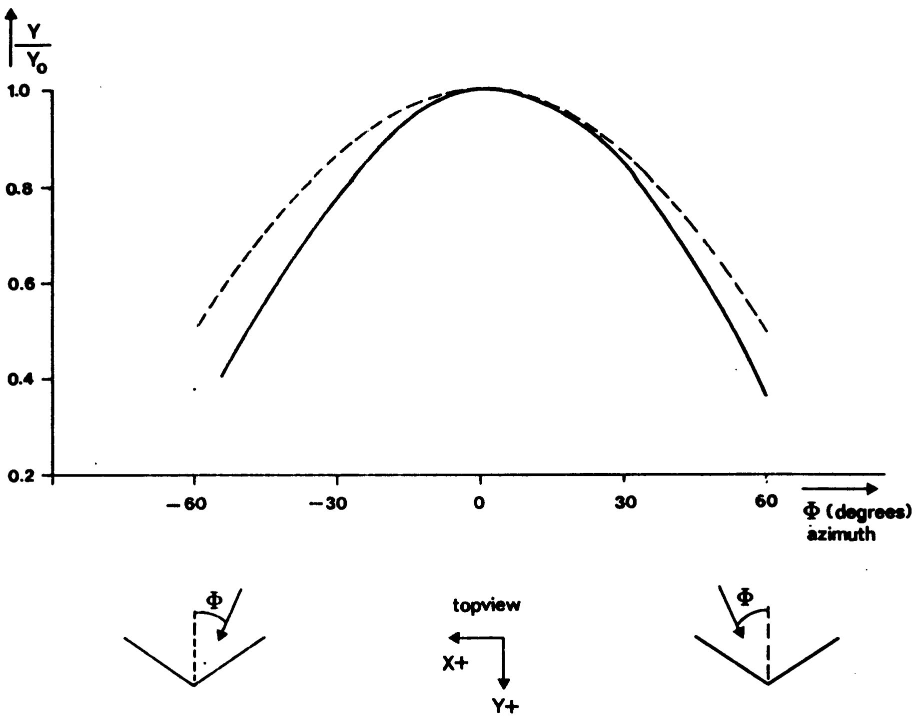

fig. 15. azimuth calibration; Y-component

elevation = 0°

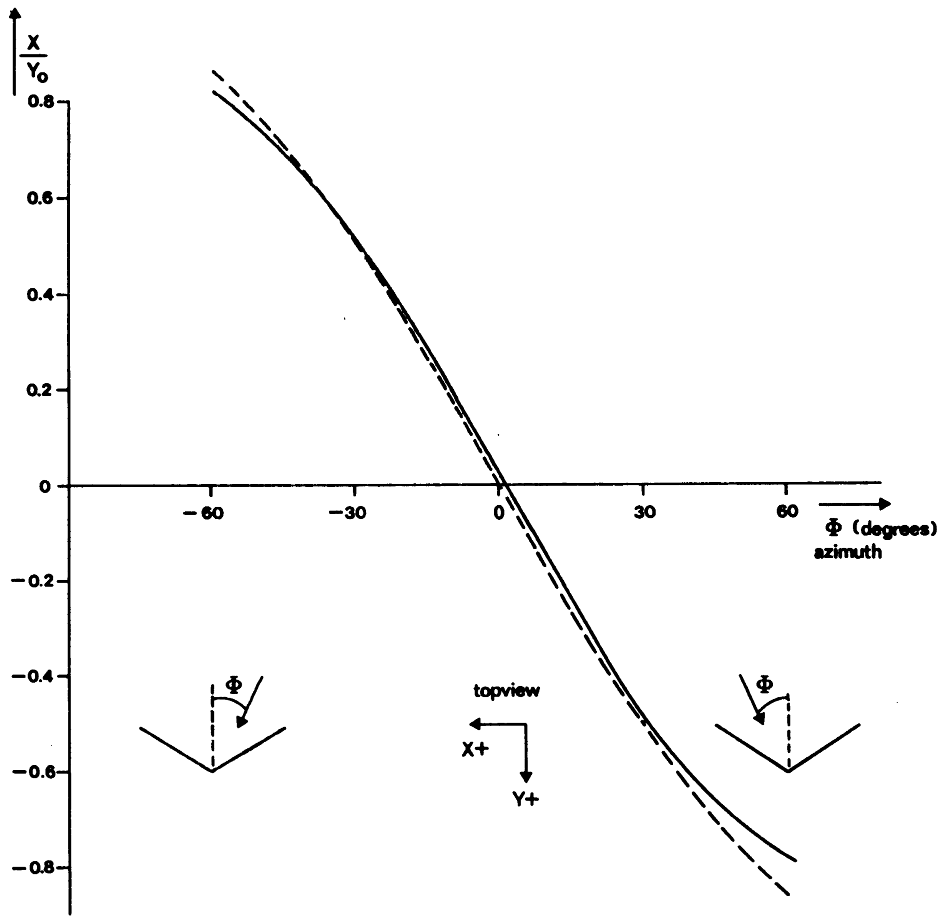

fig. 16. azimuth calibration; X-component

elevation = 0°