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Full year surface meteorological data at northwestern Tibetan Plateau using an automatic observation system

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Abstract

Meteorological observation using a automatic observation system was made at West Kunlun Mountains in the northwestern part of Tibetan Plateau at an altitude of 5260 m a.s.l. from July 1987 to August 1988. The full year daily data are presented along with the explanation of the observation system and evaluation of the data in relation to the sampling time interval.

1. Introduction

Surface meteorological data on Tibetan Plateau are needed to understand the existing conditions of hydrosphere, that is, glaciers and lakes, and to evaluate the thermal and mechanical effect of the Tibetan Plateau surface to the general circulation and global climate. However, continuous surface meteorological observation on the Tibetan Plateau is being made at only limited number of stations (Gao *et al.*, 1984). Furthermore, the altitude of these stations are mostly less than 4500 m a.s.l., which is approximate mean height of the Plateau. The area where stations are most sparsely distributed in this region is the north-central and northwestern part of the Plateau. Concerning the high altitudes exceeding 5000 m a.s.l., there have been only some short term temporal observations concentrated in the summer season in the central area.

At the time of the intensive glaciological work at West Kunlun Mountains in 1987 (Zheng *et al.*, 1988), an automatic meteorological station was left there to observe the year round conditions (Ohata *et al.*, 1989), and one of the authors revisited that site and recovered the observation system in the summer of 1988. The data collection with this system was successfully made except a slight trouble with humidity sensor. In the present report, description of the instruments, the evaluation of the data are made, and obtained data are shown. The present observation is probably the first full year round surface meteorological observation made at such high altitude on earth.

2. Instruments, observation site and evaluation of the data.

2.1 Instruments

Recently, meteorological instruments and observation systems are developed to be used unmanned at Antarctica and remote regions (Stearns and Weidner, 1985 ; Endoh *et al.*, 1988). The instruments which was used in the present observation was one of such systems manufactured by Aanderaa Co. Ltd. (Bergen, Norway). The operating temperature of this system is said to be −40 to +60°C, but depends slightly on type of sensors. A brief specification of this is tabulated in Table 1. In the recent development of the automatic meteorological instruments, the data collection method can be classified into two. One is transmission of the data through satellites to obtain real time data, and another is using certain type of recorder. In the latter case the observer needs to return to the site to collect the data. The data collecting method of the present system was the latter type and data was stored in a CMOS-IC capable of storing 65530 data. The characteristics of this com-

Table 1. Specification of the sensors used in the Aanderaa Meteorological System.

ELEMENT	TYPE OF DATA	SENSOR	OBSERVATION RANGE	ACCURACY
WIND SPEED (WS)	MEAN VALUE DURING SAMPLING INTERVAL	3 CUP-TYPE	STARTING SPEED 0.3-0.5 m/s	2% OR 0.2 m/s WHICHEVER LARGER
MAX WIND SPEED	MAXIMUM VALUE OF 2 SEC. DURING SAMPLING		MEASURABLE UP TO 60 m/s	
WIND DIRECTION (WD)	INSTANTANEOUS	POTENTIOMETER	STARTING SPEED 0.3 m/s 0 TO 360°	5°
AIR TEMPERATURE (AT)	INSTANTANEOUS	PLATINUM RESISTANCE	−44 TO +49 °C	0.1 °C
RELATIVE HUMIDITY (H)	INSTANTANEOUS	HAIR-TYPE	5 TO 100%	3%
GLOBAL SOLAR RADIATION (GSR)	INSTANTANEOUS	THERMISTER TYPE	0 TO 2000 W/m²	20 W/m²
GROUND TEMPERATURE (GT)	INSTANTANEOUS	PLATINUM RESISTANCE	−44 TO +49 °C	0.1 °C
AIR PRESSURE (AP)	INSTANTANEOUS	SILICON CHIP	400 TO 1070 mb	0.8 mb

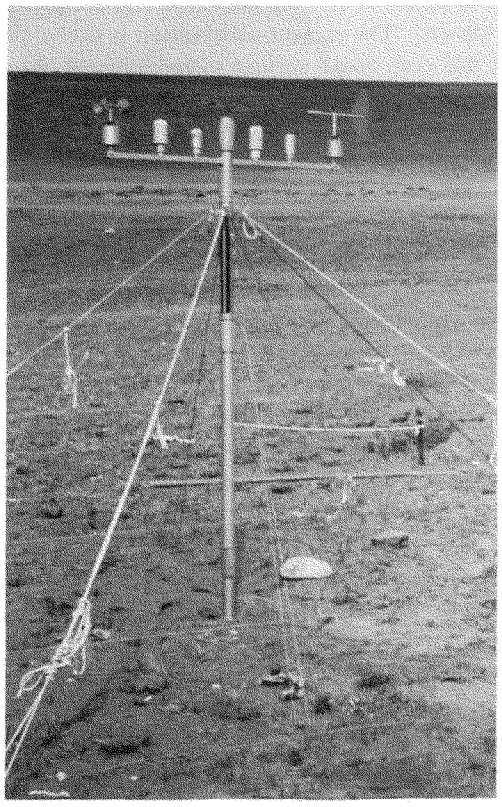

Fig. 1 Photograph of the automatic meteorological observation system. The site is BC.

pared with other ones are, use of solar battery, low consumption of electricity. Photograph of this system at the present observation site is shown in Fig. 1.

2.2 Site

Observation was made at Base Camp (hereafter denoted BC) of 1987 expedition (35°09′N, 81°03′E ; 5260 m a.s.l.) which is on a gentle mountainslope along the Gozha River north of Gozha Lake. The surface was mainly bare ground consisted of sparse grass (Korbesia species). The position of BC is shown in Fig. 2.

2.3 Evaluation of data

The accuracy of the sensors of the present system was not so well as the ones usually used at permanent meteorological stations as shown in Table 1.

There is an another problem in evaluation of daily data related to the time interval of data sampling. The possible sampling interval of the system was 1 to 180 minutes. However, due to the limitation in the data storage of the CMOS-IC memory, the interval was fixed at 120 minutes for most of the period excluding July - August 1987 when observer were staying at BC. Due to this long sampling interval, statistical error arose in the daily mean and total values of the meteorological elements. This is an important problem in the automatic observation with

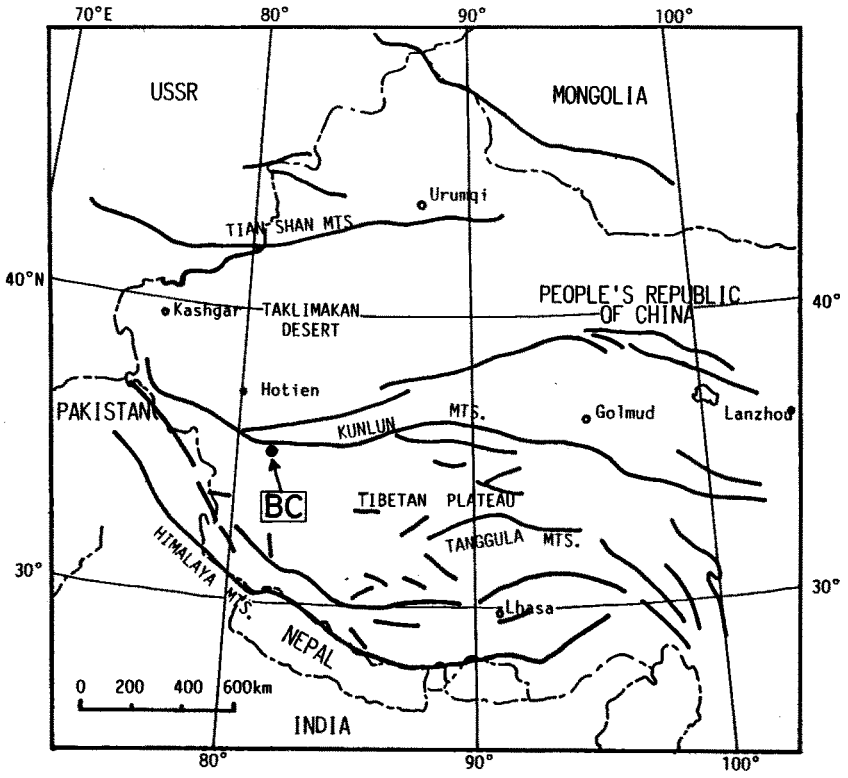

Fig. 2 Position of the Base Camp of 1987 West Kunlun Observation, which was the site where automatic meteorological station was set.

limited data storage.

This will be discussed based on the data obtained during the intensive observation of 10 minutes sampling interval from July 14 to July 31, 1987 at BC with the same system. It will be considered that the daily value based on the 10 minutes interval represents the true value. The deviation from this value will be considered as statistical error depending on the sampling time interval. The mean value and error will be calculated as follows.

$$\overline{x_i(s)}=\left[\sum_{j=1}^{n}x_i(s)\right]\Big/n, \qquad (1)$$

$$d_i(s)=\left[\sum_{k=1}^{m}(\overline{x_i(s)}-\overline{x_i(10)})\right]\Big/m, \qquad (2)$$

$$\sigma_i(s)=\frac{\sqrt{\sum_{k=1}^{m}(\overline{x_i(s)}-\overline{x_i(10)})^2}}{m-1}, \qquad (3)$$

where $x_i(s)$ is observed value and $\overline{x_i(s)}$ is the daily mean value of i element with sampling interval s minutes. $d_i(s)$, $\sigma_i(s)$ are the mean deviation and standard deviation from the true daily value. n is number of sampling per day which depends on sampling interval, and m is the number of days considered which is 18 in the present case. The calculated result from $s=$ 20 to 360 minutes are shown in Table 2.

As for d_i, in case of WS, AT, H, VP, AP and GT2, it is concentrated at near 0 value. However for GSR and GT1, they show certain tendency, that is, $d_i<0$ for all sampling interval for GSR, and $d_i\leqq 0$ can be seen for GT1. These two show similar tendency as they are interrelated in the physical process such that when increase in GSR directly heats the ground surface and increases GT1. There is no special tendency as related to increase in s. σ_i is not large value for AT, VP, AP and GT2. But it becomes quite large for WS, GSR and GT2 and moderately large for H as s increases.

The different tendency of d_i and σ_i among these

Table 2. Evaluation of error in daily mean, total and extreme values due to long sampling time interval. based on data of July 14–31, 1987

ELEMENT	UNIT	PERIOD MEAN	s=20min		60min		120min		360min	
			d	σ	d	σ	d	σ	d	σ
WS	m/s	2.88	0.07 (2%)	0.09 (3)	0.02 (1)	0.12 (4)	0.04 (1)	0.26 (9)	−0.04 (−1)	0.55 (19)
AT	°C	4.7	0.0	0.1	0.0	0.1	−0.1	0.2	0.0	0.3
ATmax	°C	13.7	0.4	0.4	0.8	0.7	1.5	1.0	2.6	1.1
ATmin	°C	−1.7	−0.1	0.1	−0.2	0.2	−0.6	0.5	−0.6	0.6
GSR	MJ/m²d	27.4	−1.4 (−5%)	0.3 (1)	−0.4 (−1)	2.9 (11)	−0.8 (−3)	5.5 (20)	−0.8 (−3)	8.4 (31)
H	%	66	−0.3	0.9	0.0	0.8	−0.1	1.5	−0.8	2.6
VP	mb	5.25	0.0	0.0	0.0	0.1	0.0	0.1	−0.1	0.1
AP	mb	537.5	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.2
GT1 (0cm)	°C	10.0	−0.2	0.1	0.0	0.2	−0.1	0.5	−0.6	0.8
GT2 (−10cm)	°C	9.0	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.3

The values in ( ) is percentage of period mean value.

observed elements depends on the characteristics of diurnal variation of each elements. The largest σ_i can be seen in GSR, as it has characteristics of spike -like increase during the day when sky is partly cloud covered. GT1 also follows this tendency and σ_i becomes large. High σ_i for WS is due to the large variation within the day.

As for extreme values within one day, that is, ATmax and ATmin, d_i shows important tendency. The result for ATmax shows that d increases as interval becomes longer and opposite tendency for ATmin. This is due to the fact that it will be more difficult to pick up the extreme values when the sampling interval increases. σ_i for ATmax and ATmin has a increasing tendency as interval increases.

Although the data set used in the present analysis shown in Table 2 is based on data of certain season, preferable time interval for each elements will be discussed based on this result. Assuming that the permissible statistical error restriction is 0.5°C for temperatures (AT, GT1, GT2), 5% for H, 0.5mb for VP, 1 mb for AP and 10% of mean value for WS and GSR, then the needed sampling time interval will be less than 6 hours for AT, H, VP, AP and GT2. However for WS and GT1, it will be smaller at less than 2 hours, and for GSR it is less than 1 hour. The sampling interval for 1987-1988 observation was 2 hours, so this interval is larger than the above permissible range for GSR, but for other elements it is within the permissible range. It must be born in mind that there are such statistical error in the data shown in Table 3.

In planning the time interval for observation in other areas, this result will be suggestive, but it must be mentioned that these d_i and σ_i value for certain sampling time interval depends upon the climatological conditions of the site.

3. Concluding remarks

The 13 months daily meteorological data at BC is tabulated in digital form in Table 3. All data are based on observation of 2 hour sampling interval. One result which can be read from the data is that annual mean air temperature (AT) for August 1987 - July, 1988 was −7.3°C. Another is that monthly mean air pressure is 7 to 9 mb lower in winter than in summer, which is opposite tendency compared with low altitude stations (1000-2000 m a.s.l.) to the north of West Kunlun Mountains.

Minimum air temperature (ATmin) during this one year was −30.3°C (Dec. 14, 1987), which means approximately −31°C considering d value in Table 2. This temperature is within the limit of the operating temperature −40°C of the system. This is probably the the main reason for the success in the present observation.

Further analysis using these data will be published later. More detail data are available on request to the author.

Acknowledgment

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Table 3. West Kunlun Meteorological Data 1987–1988.

Site: BC of 1987 Expedition
Position: 35°09′N, 81°03′E, 5260 m a.s.l.
Period: 1987.7.14-1988.8.13

AT: Air temperature
ATmax: Maximum air temperature
ATmin: Minimum air temperature
WS: Wind speed
H: Relative humidity
GSR: Global Solar Radiation
AP: Air pressure
GT1: Ground temperature at surface
GT2: Ground temperature 10 cm below surface

Comments: AT, WS, H, GT1 and GT2 are daily mean value
GSR is daily total value
ATmax and ATmin are maximum and minimum during one day
One day was taken to be 00:00-00:00 Beijing Standard Time

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/07/01										
87/07/02										
87/07/03										
87/07/04										
87/07/05										
87/07/06										
87/07/07										
87/07/08										
87/07/09										
87/07/10										
87/07/11										
87/07/12										
87/07/13										
87/07/14	5.1	13.4	−3.1	4.4	50	32.5	536.2	11.2	9.5	4.2
87/07/15	4.6	11.5	−1.4	2.9	64	25.8	536.4	11.5	9.7	5.3
87/07/16	4.7	11.6	−1.4	2.9	68	26.9	535.5	12.1	10.5	5.5
87/07/17	3.6	9.4	−2.0	2.8	76	23.8	535.4	10.1	10.0	5.8
87/07/18	4.0	10.8	−1.5	2.6	69	28.1	537.2	10.9	9.5	5.3
87/07/19	3.2	8.3	−2.0	2.8	81	22.9	538.2	5.9	7.5	6.1
87/07/20	4.9	13.4	−0.4	2.4	74	23.5	538.2	8.8	8.0	6.1
87/07/21	5.7	12.5	0.7	3.4	67	27.3	539.0	10.7	9.3	5.8
87/07/22	5.4	12.3	0.0	3.2	70	27.4	540.9	11.9	10.2	6.0
87/07/23	3.3	7.9	−0.7	3.0	81	17.3	541.5	6.8	8.0	6.2
87/07/24	3.2	9.3	−0.6	1.8	80	21.8	540.7	5.8	6.4	6.0
87/07/25	3.8	10.1	−1.2	2.3	77	22.5	537.6	7.5	6.7	6.1
87/07/26	3.0	9.6	−1.0	2.0	86	23.3	535.1	5.6	5.9	6.3
87/07/27	6.3	13.0	0.3	2.7	57	30.3	535.7	10.2	8.3	4.9
87/07/28	6.7	14.7	−1.9	2.7	42	35.4	538.2	12.0	9.7	3.3
87/07/29	6.0	15.2	−3.1	2.9	51	33.8	539.1	12.6	10.7	4.0
87/07/30	6.2	15.3	−3.6	3.8	40	36.6	537.8	12.6	11.1	3.5
87/07/31	5.8	15.4	−3.1	3.2	52	33.6	536.8	13.1	11.3	4.1
MEAN	4.7	11.9	−1.4	2.9	66	27.4	537.8	10.0	9.0	5.1

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/08/01	4.8	13.6	−3.6	3.1	53	26.7	535.1	11.3	10.6	4.1
87/08/02	3.4	10.5	−4.3	3.2	57	27.1	536.1	10.6	10.1	4.2
87/08/03	4.5	13.1	−1.9	3.2	63	29.8	537.0	11.9	10.8	4.9
87/08/04	5.0	13.3	−1.9	3.6	54	31.2	538.2	12.3	11.0	4.4
87/08/05	3.7	12.6	−2.1	2.8	65	27.7	540.6	12.5	11.1	5.0
87/08/06	4.8	15.2	0.0	3.2	68	28.1	541.9	12.6	11.5	5.5
87/08/07	5.1	12.0	0.4	3.2	72	15.1	542.5	10.4	10.7	6.0
87/08/08	3.4	10.5	0.3	2.7	80	17.8	541.9	8.8	9.3	6.0
87/08/09	2.8	10.1	−0.6	2.7	83	20.0	540.3	7.3	8.1	6.1
87/08/10	2.1	9.3	−2.9	3.4	78	27.3	539.6	8.3	8.2	5.4
87/08/11	1.6	9.2	−3.9	2.8	64	21.7	539.0	8.3	8.2	4.1
87/08/12	1.2	6.6	−5.1	3.7	59	21.1	538.8	7.4	7.6	3.8
87/08/13	2.2	7.8	−3.9	3.2	58	24.7	539.6	9.5	8.1	4.1
87/08/14	3.6	11.5	−1.7	2.9	66	22.9	540.0	11.2	9.7	5.1
87/08/15	3.5	10.9	−4.2	2.4	65	21.2	540.4	9.1	8.5	4.9
87/08/16	3.5	11.4	−2.0	3.2	61	29.7	540.6	12.0	10.5	4.4
87/08/17	2.8	12.7	−7.7	2.6	47	32.5	540.2	11.6	10.0	2.9
87/08/18	3.3	11.8	−3.9	2.9	59	27.9	539.3	10.8	10.3	4.3
87/08/19	2.0	8.7	−3.4	2.4	79	20.7	539.1	6.7	8.3	5.4
87/08/20	2.7	9.8	−5.3	2.1	59	27.0	540.8	8.7	8.2	4.0
87/08/21	3.4	10.4	−4.7	2.1	58	23.6	541.2	9.2	8.6	4.3
87/08/22	4.4	11.1	−3.6	2.4	60	22.1	541.1	9.9	9.0	4.7
87/08/23	5.1	14.3	−3.9	2.7	58	30.5	540.8	12.6	10.3	4.8
87/08/24	5.1	15.3	0.4	2.3	76	18.4	538.5	8.0	9.3	6.3
87/08/25	4.9	13.6	−3.3	3.6	51	25.3	538.4	9.6	8.7	4.1
87/08/26	5.4	14.6	−2.7	3.2	55	32.5	538.9	12.3	10.4	4.2
87/08/27	5.7	16.2	−4.4	2.6	43	31.1	540.0	12.8	11.0	3.4
87/08/28	5.7	15.5	−4.3	2.9	42	31.9	539.8	12.9	11.2	3.3
87/08/29	5.7	13.6	−3.1	2.6	55	26.9	539.6	13.3	11.6	4.8
87/08/30	3.6	10.2	−1.3	3.1	76	21.7	540.0	10.0	11.1	5.5
87/08/31	2.5	10.6	−1.6	3.1	77	28.1	539.4	11.7	10.1	5.8
MEAN	3.8	11.8	−2.9	2.9	63	25.6	539.6	10.4	9.8	4.7

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/09/01	0.6	5.2	−3.1	2.4	75	19.7	537.5	6.3	8.2	4.6
87/09/02	0.2	5.7	−7.1	3.9	52	25.4	538.9	7.2	7.2	3.2
87/09/03	1.7	9.3	−4.2	2.9	60	21.6	539.2	10.1	8.8	3.9
87/09/04	1.9	9.6	−2.2	3.6	61	14.6	539.9	9.2	9.0	4.2
87/09/05	1.8	7.5	−3.6	3.2	57	28.5	542.1	11.2	9.4	3.7
87/09/06	1.3	11.3	−8.8	3.1	37	31.0	543.3	9.1	8.3	2.2
87/09/07	3.2	11.6	−5.5	3.2	36	30.7	541.5	10.8	9.3	2.6
87/09/08	3.0	11.5	−7.1	4.1	38	30.8	538.6	9.7	9.1	2.6
87/09/09	0.4	8.6	−4.7	3.5	63	20.1	535.7	4.7	7.5	4.0
87/09/10	−3.2	1.1	−7.2	4.0	79	21.7	534.2	−0.6	3.2	3.7
87/09/11	−6.2	1.8	−14.5	3.4	66	22.7	536.7	−0.6	1.3	2.6
87/09/12	−4.7	0.2	−10.3	3.3	72	26.0	538.4	0.1	1.3	3.1
87/09/13	−2.1	7.4	−11.7	3.0	44	27.0	540.5	3.1	2.8	2.2
87/09/14	−1.2	6.9	−8.8	2.9	53	24.7	540.0	5.6	4.6	2.9
87/09/15	−0.3	9.1	−9.3	2.8	55	28.2	540.2	6.7	5.5	3.2
87/09/16	0.2	9.1	−7.9	3.4	55	23.5	540.7	6.7	6.1	3.2
87/09/17	−0.7	6.4	−8.8	3.1	58	30.0	542.7	6.6	5.9	3.2
87/09/18	−0.1	8.2	−8.4	3.1	52	27.6	542.3	6.7	6.0	3.0
87/09/19	−0.1	7.6	−8.6	2.8	55	27.2	542.1	7.0	6.3	3.3
87/09/20	0.9	9.3	−8.3	3.2	54	27.4	540.0	7.6	6.6	3.3
87/09/21	0.8	7.6	−7.5	4.2	49	27.6	537.9	5.9	6.1	3.2
87/09/22	−1.9	4.9	−8.6	3.3	64	19.5	538.5	5.3	5.9	3.4
87/09/23	−3.4	2.9	−6.9	3.0	79	21.9	539.1	2.8	4.6	3.9
87/09/24	−3.3	4.0	−10.5	2.8	63	26.0	540.8	3.7	4.4	2.7
87/09/25	−2.8	5.8	−10.9	3.0	50	27.1	539.9	3.9	4.4	2.3
87/09/26	−4.4	1.0	−10.5	3.4	62	19.8	538.9	0.2	2.7	2.9
87/09/27	−6.2	0.6	−11.6	3.5	72	20.0	539.2	1.3	2.1	2.8
87/09/28	−6.5	0.4	−13.6	3.3	77	20.5	539.1	2.2	2.4	2.9
87/09/29	−5.8	0.5	−8.5	2.7	84	14.3	539.6	−0.6	2.0	3.4
87/09/30	−6.7	−1.2	−11.7	3.1	80	23.8	542.0	−1.1	0.3	3.0
MEAN	−1.4	5.8	−8.3	3.2	60	24.3	539.7	5.0	5.4	3.2

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/10/01	−6.7	1.6	−13.5	3.0	64	21.8	541.8	−1.2	0.0	2.5
87/10/02	−5.9	1.0	−10.6	3.1	74	21.3	539.3	−0.4	0.4	2.9
87/10/03	−6.5	−0.2	−11.0	3.1	79	15.7	536.5	−0.1	0.7	3.0
87/10/04	−7.3	0.1	−14.0	3.5	65	25.4	538.7	−0.6	0.9	2.2
87/10/05	−6.7	0.9	−13.2	3.2	54	23.9	541.7	−0.7	0.2	2.1
87/10/06	−5.2	1.6	−11.7	3.1	58	23.2	542.3	0.8	0.6	2.5
87/10/07	−5.3	1.3	−9.3	3.7	76	21.5	540.9	0.1	1.3	3.1
87/10/08	−5.7	0.7	−11.6	3.6	61	22.8	539.0	−1.6	−0.1	2.4
87/10/09	−4.8	0.4	−11.0	3.3	48	18.4	537.5	−1.6	−0.3	2.0
87/10/10	−4.8	0.1	−9.0	4.9	57	17.6	535.7	−2.6	−0.6	2.5
87/10/11	−4.5	0.5	−9.6	5.6	56	19.8	534.2	−2.1	−0.8	2.5
87/10/12	−5.3	−0.1	−11.3	5.0	58	21.8	535.2	−2.0	−1.1	2.4
87/10/13	−5.5	−1.6	−7.9	6.1	62	12.3	534.2	−3.1	−0.8	2.5
87/10/14	−7.6	−3.8	−12.4	5.4	53	11.1	534.8	−6.5	−2.1	1.8
87/10/15	−8.3	−4.0	−12.1	7.5	52	17.3	535.4	−6.7	−3.3	1.8
87/10/16	−8.2	−3.1	−12.4	7.0	56	23.5	537.3	−5.0	−3.3	1.8
87/10/17	−8.2	−1.7	−14.9	4.7	52	20.7	539.1	−5.1	−2.8	1.7
87/10/18	−7.8	−0.8	−15.3	3.9	51	19.9	536.8	−4.7	−2.7	1.8
87/10/19	−5.8	−0.6	−10.5	3.8	61	9.7	530.3	−3.1	−1.6	2.5
87/10/20	−11.5	−7.9	−14.6	5.4	81	19.3	530.2	−7.0	−2.2	2.0
87/10/21	−11.9	−4.9	−19.1	5.0	65	21.3	534.9	−9.0	−5.5	1.7
87/10/22	−10.2	−3.8	−15.5	4.8	67	21.6	537.0	−8.0	−4.7	1.8
87/10/23	−10.1	−3.9	−16.5	3.6	56	16.9	538.6	−7.1	−4.7	1.5
87/10/24	−9.3	−2.1	−16.6	3.7	35	20.6	538.9	−6.5	−4.3	1.2
87/10/25	−9.5	−3.6	−16.5	4.3	53	20.9	538.7	−6.1	−3.6	1.6
87/10/26	−8.7	−2.1	−15.7	3.4	49	22.4	539.2	−4.6	−3.2	1.5
87/10/27	−7.3	−0.4	−13.8	4.7	49	19.4	539.0	−5.5	−3.5	1.8
87/10/28	−6.9	−1.1	−11.0	6.4	57	17.7	536.6	−5.5	−3.0	2.1
87/10/29	−9.8	−5.3	−16.4	5.5	64	11.1	533.6	−9.2	−4.6	1.8
87/10/30	−10.9	−9.5	−12.2	7.4	67	9.8	530.3	−9.7	−5.7	1.8
87/10/31	−14.2	−12.3	−17.1	7.7	73	8.4	531.1	−12.8	−7.6	1.5
MEAN	−7.8	−2.1	−13.1	4.7	60	18.6	536.7	−4.4	−2.2	2.1

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/11/01	−16.7	−9.3	−24.3	3.7	57	21.2	536.8	−12.9	−8.8	0.9
87/11/02	−15.8	−7.5	−22.2	3.8	58	20.9	536.9	−12.7	−8.4	1.0
87/11/03	−14.1	−7.0	−21.0	4.1	49	20.4	538.0	−11.9	−8.1	1.0
87/11/04	−13.0	−4.7	−20.4	3.9	39	20.1	540.0	−11.2	−7.9	1.0
87/11/05	−8.7	−3.4	−12.8	4.6	52	15.5	539.0	−7.8	−6.1	1.7
87/11/06	−12.0	−5.8	−18.3	3.8	51	19.5	539.5	−8.9	−5.9	1.2
87/11/07	−12.0	−3.7	−19.8	3.4	51	19.3	541.1	−10.3	−6.7	1.4
87/11/08	−9.1	0.1	−16.6	3.1	51	18.6	541.5	−8.0	−6.1	1.6
87/11/09	−6.7	−1.2	−13.0	6.8	40	19.2	537.1	−6.9	−4.9	1.4
87/11/10	−10.1	−4.2	−18.0	5.9	52	18.6	535.2	−9.1	−5.7	1.5
87/11/11	−11.2	−3.6	−19.2	4.9	51	18.8	534.5	−10.4	−6.7	1.3
87/11/12	−9.8	−2.7	−16.3	6.2	42	17.0	535.6	−9.6	−6.6	1.2
87/11/13	−11.8	−7.2	−15.6	6.6	53	19.2	535.7	−10.0	−6.6	1.3
87/11/14	−16.0	−9.6	−23.4	3.3	61	16.5	537.6	−13.5	−8.4	1.1
87/11/15	−15.7	−7.1	−22.8	3.5	56	18.7	537.5	−14.1	−9.5	1.0
87/11/16	−12.4	−5.8	−19.8	5.7	47	17.7	534.5	−12.3	−8.7	1.1
87/11/17	−15.6	−9.2	−22.2	2.5	64	17.4	535.9	−11.5	−8.6	1.2
87/11/18	−16.3	−10.5	−22.7	3.1	71	18.6	536.0	−14.2	−8.8	1.3
87/11/19	−16.4	−8.7	−22.7	4.1	63	18.0	535.3	−16.6	−11.0	1.1
87/11/20	−15.5	−6.0	−24.3	3.7	60	17.9	536.2	−14.7	−11.0	1.1
87/11/21	−13.6	−6.3	−19.7	4.5	40	17.6	537.5	−13.4	−9.9	0.9
87/11/22	−11.4	−3.1	−18.7	4.2	34	16.8	538.9	−11.5	−9.5	1.1
87/11/23	−9.5	−4.1	−16.9	6.0	48	16.1	537.4	−9.1	−7.5	1.5
87/11/24	−10.5	−6.4	−12.9	7.9	48	15.8	532.8	−10.9	−7.7	1.3
87/11/25	−12.7	−7.9	−16.0	7.8	50	14.3	532.0	−13.2	−8.9	1.2
87/11/26	−13.7	−8.9	−19.7	6.2	52	13.5	533.4	−13.6	−9.7	1.1
87/11/27	−14.8	−7.4	−21.3	4.5	55	16.0	534.7	−13.9	−10.3	1.1
87/11/28	−12.5	−6.0	−20.7	5.8	46	16.2	534.4	−12.6	−9.6	1.0
87/11/29	−12.3	−5.7	−19.9	5.1	47	12.7	534.4	−12.6	−9.5	1.1
87/11/30	−12.4	−6.1	−19.4	4.6	52	13.8	535.0	−12.1	−9.3	1.2
MEAN	−12.7	−6.0	−19.4	4.8	51	17.5	536.5	−11.6	−8.2	1.2

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
87/12/01	−11.3	−8.6	−14.4	5.5	57	5.9	532.1	−12.5	−8.9	1.5
87/12/02	−11.5	−6.9	−16.8	5.2	55	10.1	529.1	−11.1	−8.9	1.4
87/12/03	−12.0	−6.0	−17.3	5.5	49	14.6	531.8	−12.9	−9.4	1.2
87/12/04	−12.8	−7.9	−18.3	5.4	41	15.4	533.4	−13.8	−10.0	0.8
87/12/05	−16.0	−9.7	−23.1	3.9	49	14.7	535.3	−16.4	−11.3	0.5
87/12/06	−16.5	−10.5	−25.5	3.9	52	13.7	535.6	−17.6	−12.3	0.9
87/12/07	−16.1	−8.1	−23.8	4.1	60	15.1	536.8	−15.9	−12.3	1.1
87/12/08	−13.3	−5.8	−21.3	4.8	60	15.5	538.6	−13.3	−11.1	1.3
87/12/09	−12.6	−4.2	−21.6	4.4	53	15.0	539.5	−13.7	−10.8	1.0
87/12/10	−9.6	−4.3	−16.7	5.1	43	14.4	539.6	−10.8	−9.4	1.2
87/12/11	−11.6	−3.2	−19.5	3.2	50	12.2	538.2	−11.8	−9.8	1.5
87/12/12	−11.5	−6.3	−15.2	3.5	87	5.2	529.9	−10.3	−7.8	2.2
87/12/13	−18.0	−14.3	−22.4	2.8	77	10.6	532.9	−16.2	−10.5	1.1
87/12/14	−22.1	−12.3	−30.3	2.4	66	16.5	537.2	−22.2	−14.2	0.6
87/12/15	−15.2	−9.7	−20.4	3.4	67	11.8	536.9	−17.5	−13.6	1.3
87/12/16	−16.6	−9.3	−23.3	3.6	67	11.5	535.1	−17.2	−13.0	1.2
87/12/17	−18.4	−14.3	−22.8	4.0	69	15.8	532.5	−18.0	−13.7	1.0
87/12/18	−21.5	−13.5	−30.3	3.0	65	16.1	536.5	−20.7	−15.1	0.8
87/12/19	−18.9	−10.1	−25.7	3.2	65	15.9	538.2	−18.1	−14.5	0.9
87/12/20	−16.6	−8.1	−25.1	3.1	62	14.9	539.9	−17.0	−14.0	1.1
87/12/21	−15.6	−7.6	−21.9	3.4	61	15.1	540.5	−15.3	−13.1	0.9
87/12/22	−13.8	−7.3	−18.3	5.3	58	15.0	538.3	−14.8	−12.6	1.2
87/12/23	−17.0	−10.0	−23.1	3.7	62	14.6	536.8	−16.9	−12.7	1.0
87/12/24	−19.0	−9.1	−27.7	2.8	60	15.3	539.8	−18.6	−14.2	0.8
87/12/25	−16.6	−7.1	−24.9	3.4	59	15.0	539.4	−17.4	−14.1	1.0
87/12/26	−14.3	−8.1	−23.4	3.4	57	14.6	540.0	−15.6	−13.3	1.1
87/12/27	−13.7	−6.9	−20.0	4.2	52	13.9	538.9	−14.6	−12.4	1.1
87/12/28	−14.9	−9.5	−22.1	4.1	60	14.4	539.3	−15.5	−12.6	1.1
87/12/29	−13.2	−7.3	−21.0	4.9	65	11.9	537.6	−14.2	−12.1	1.6
87/12/30	−14.1	−9.0	−19.9	4.7	72	5.5	534.0	−16.0	−12.3	1.6
87/12/31	−12.7	−7.0	−19.5	5.8	63	15.2	534.9	−13.9	−12.3	1.5
MEAN	−15.1	−8.5	−21.8	4.1	60	13.4	536.4	−15.5	−12.0	1.1

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/01/01	−12.0	−5.3	−19.1	3.6	69	10.2	538.8	−13.4	−11.8	1.8
88/01/02	−10.9	−4.7	−18.1	3.4	69	9.0	537.8	−11.4	−10.7	2.0
88/01/03	−10.2	−6.8	−13.2	5.6	74	9.1	534.4	−9.8	−9.1	2.1
88/01/04	−14.6	−9.5	−22.0	3.7	65	8.7	535.7	−15.7	−11.3	1.3
88/01/05	−14.5	−10.1	−17.0	2.3	79	10.4	533.7	−14.4	−11.5	1.7
88/01/06	−17.4	−8.3	−24.6	1.9	71	15.7	531.4	−16.9	−12.3	0.9
88/01/07	−21.7	−14.6	−27.8	2.8	72	17.1	531.2	−20.0	−14.4	0.9
88/01/08	−19.7	−12.5	−27.7	3.6	74	12.1	531.5	−20.2	−15.7	1.2
88/01/09	−15.5	−12.7	−20.4	4.4	82	11.7	528.9	−14.5	−13.0	1.5
88/01/10	−21.9	−13.2	−29.6	2.6	71	16.7	533.0	−21.3	−15.5	0.9
88/01/11	−15.3	−9.5	−22.2	3.3	70	12.5	531.9	−17.0	−14.7	1.4
88/01/12	−16.7	−11.7	−21.6	2.9	77	10.2	528.7	−16.7	−13.9	1.4
88/01/13	−20.9	−17.5	−27.3	3.3	72	11.4	528.8	−19.2	−14.8	0.8
88/01/14	−21.8	−15.1	−28.9	3.6	67	17.6	529.8	−22.3	−16.9	0.8
88/01/15	−18.8	−15.5	−25.5	4.3	73	19.7	527.3	−18.7	−15.7	1.0
88/01/16	−23.3	−15.9	−28.9	3.1	70	13.4	530.2	−22.4	−16.8	0.7
88/01/17	−19.8	−12.5	−27.2	4.7	69	14.9	532.4	−21.5	−17.4	1.0
88/01/18	−16.0	−14.1	−17.5	6.4	76	8.3	530.7	−16.9	−14.9	1.4
88/01/19	−18.1	−11.7	−24.5	5.4	69	17.8	531.5	−19.0	−15.4	1.1
88/01/20	−14.5	−7.6	−19.3	6.3	66	17.9	531.7	−15.9	−14.3	1.4
88/01/21	−14.6	−8.7	−19.5	3.9	67	9.2	529.1	−13.9	−12.8	1.4
88/01/22	−16.2	−14.5	−20.0	4.7	72	7.6	526.3	−16.0	−12.8	1.0
88/01/23	−19.1	−16.8	−21.8	5.1	70	7.8	527.1	−19.2	−15.0	0.9
88/01/24	−20.3	−17.9	−24.7	4.0	70	9.3	524.8	−19.9	−15.8	0.9
88/01/25	−21.5	−17.9	−25.2	4.2	69	16.9	523.8	−18.7	−15.9	0.7
88/01/26	−21.1	−16.3	−23.6	5.8	71	16.4	524.9	−19.2	−15.8	0.7
88/01/27	−19.3	−13.6	−26.2	5.4	66	18.1	528.2	−18.3	−16.0	0.9
88/01/28	−19.2	−12.8	−25.3	3.3	72	11.6	528.3	−18.7	−15.7	1.0
88/01/29	−20.2	−14.5	−27.4	5.3	71	16.7	527.7	−18.9	−16.0	0.8
88/01/30	−19.1	−11.4	−26.2	4.8	63	21.1	530.0	−18.1	−16.1	0.9
88/01/31	−17.3	−13.1	−20.8	6.0	65	15.8	529.5	−16.0	−14.6	1.0
MEAN	−17.8	−12.5	−23.3	4.2	71	13.4	530.3	−17.6	−14.4	1.1

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/02/01	−18.9	−11.9	−26.6	4.8	63	11.3	531.6	−18.9	−15.6	0.9
88/02/02	−18.1	−9.7	−26.5	4.1	64	19.4	534.7	−16.7	−15.0	1.0
88/02/03	−14.1	−4.6	−22.4	3.8	59	18.1	538.3	−13.6	−13.6	1.3
88/02/04	−9.5	−3.6	−14.7	7.0	52	15.4	537.6	−10.0	−10.9	1.5
88/02/05	−9.8	−4.4	−15.2	5.3	35	19.1	533.6	−10.9	−10.8	1.0
88/02/06	−13.0	−6.1	−21.1	4.2	45	16.3	533.9	−13.0	−11.5	1.0
88/02/07	−14.7	−8.2	−23.2	4.9	53	20.1	531.0	−14.1	−12.0	1.0
88/02/08	−14.2	−10.1	−19.3	5.0	51	8.8	525.6	−14.6	−12.0	1.1
88/02/09	−13.4	−10.9	−15.5	8.0	53	9.0	524.9	−12.3	−11.4	1.2
88/02/10	−17.5	−11.0	−23.4	6.0	63	21.0	531.5	−15.4	−12.8	1.0
88/02/11	−14.4	−9.5	−19.5	6.7	63	15.8	530.9	−12.2	−11.7	1.2
88/02/12	−15.6	−13.1	−19.4	5.4	69	8.7	528.5	−14.6	−11.9	1.3
88/02/13	−17.4	−14.7	−23.4	4.9	67	11.2	528.2	−15.9	−12.7	0.9
88/02/14	−18.3	−13.8	−22.8	4.3	74	11.1	527.8	−17.3	−13.9	1.1
88/02/15	−17.8	−13.2	−21.3	5.6	67	20.5	526.5	−15.2	−13.5	0.9
88/02/16	−18.1	−12.2	−24.1	3.5	65	15.7	528.2	−15.7	−13.4	1.0
88/02/17	−18.4	−14.5	−21.9	4.7	66	16.6	529.1	−16.7	−13.3	0.9
88/02/18	−16.7	−6.8	−25.5	3.8	66	17.2	533.8	−15.3	−13.7	1.3
88/02/19	−13.0	−7.0	−17.9	6.9	65	18.4	533.5	−11.4	−11.6	1.5
88/02/20	−13.3	−8.5	−19.6	4.3	63	10.7	531.9	−13.2	−11.5	1.5
88/02/21	−14.0	−10.7	−17.0	3.5	81	8.2	526.4	−13.4	−11.5	1.7
88/02/22	−17.4	−15.2	−20.0	6.1	77	13.0	525.0	−15.5	−12.2	1.2
88/02/23	−20.8	−15.9	−25.9	5.5	70	20.3	526.5	−18.2	−14.7	0.9
88/02/24	−21.5	−17.4	−27.9	5.1	65	18.8	525.6	−18.8	−14.9	0.7
88/02/25	−20.0	−11.4	−27.5	6.3	61	26.6	526.3	−17.2	−15.1	0.8
88/02/26	−13.0	−7.1	−17.9	8.8	63	18.6	525.7	−11.2	−12.0	1.6
88/02/27	−12.8	−10.3	−15.3	7.6	78	12.9	525.1	−11.6	−10.9	1.8
88/02/28	−13.5	−8.8	−15.9	4.0	80	17.7	524.2	−12.9	−11.5	1.8
88/02/29	−16.8	−12.5	−20.4	6.4	69	26.4	526.6	−16.1	−12.8	1.1
MEAN	−15.7	−10.4	−21.1	5.4	64	16.1	529.4	−14.5	−12.7	1.2

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/03/01	−18.7	−13.5	−24.5	6.2	64	22.3	527.1	−16.6	−14.0	0.9
88/03/02	−17.9	−12.0	−25.3	5.2	62	23.2	528.3	−15.0	−13.2	0.9
88/03/03	−13.1	−4.9	−21.0	5.1	64	24.2	531.6	−10.1	−11.3	1.5
88/03/04	−12.7	−6.1	−19.1	4.6	72	16.6	532.9	−10.8	−10.3	1.6
88/03/05	−13.6	−6.8	−20.2	4.2	70	21.4	531.1	−10.9	−10.0	1.5
88/03/06	−13.2	−3.6	−20.7	3.6	59	25.6	532.9	−9.2	−9.5	1.3
88/03/07	−9.5	−1.6	−17.5	3.9	51	19.5	532.7	−8.2	−8.3	1.7
88/03/08	−10.1	−6.0	−14.4	4.8	74	18.7	532.1	−6.2	−6.9	2.1
88/03/09	−13.4	−9.7	−20.2	4.9	74	11.6	531.7	−13.0	−9.3	1.7
88/03/10	−10.4	−4.2	−15.4	5.5	70	14.2	532.6	−8.2	−9.0	2.1
88/03/11	−7.5	−3.6	−10.2	4.7	74	13.4	529.6	−5.7	−7.0	2.6
88/03/12	−10.5	−6.4	−13.5	5.4	77	14.2	525.6	−7.6	−7.4	2.1
88/03/13	−15.6	−13.0	−19.6	4.8	74	16.5	523.6	−13.4	−9.5	1.3
88/03/14	−17.9	−12.0	−24.5	4.7	65	18.4	524.7	−15.4	−11.7	0.8
88/03/15	−14.7	−7.3	−22.1	5.1	66	19.9	528.6	−12.0	−11.1	1.5
88/03/16	−10.6	−6.6	−12.7	5.4	81	20.7	526.1	−11.1	−9.7	2.2
88/03/17	−12.2	−9.3	−15.4	5.7	76	18.3	526.6	−11.1	−10.0	1.8
88/03/18	−14.8	−11.0	−18.0	4.6	69	24.9	525.3	−13.4	−10.8	1.3
88/03/19	−16.3	−13.3	−21.1	5.4	64	21.3	525.5	−14.5	−11.4	1.0
88/03/20	−18.1	−14.0	−25.9	4.5	66	20.7	526.0	−15.8	−12.3	1.0
88/03/21	−16.1	−11.0	−22.3	6.4	63	21.5	527.6	−11.3	−10.9	1.1
88/03/22	−14.6	−8.3	−22.9	5.7	55	28.4	529.7	−9.8	−9.8	1.0
88/03/23	−13.0	−8.3	−17.3	6.6	65	12.4	529.1	−11.4	−9.4	1.6
88/03/24	−10.3	−3.2	−17.5	7.7	64	31.0	530.4	−6.1	−8.2	1.8
88/03/25	−10.2	−4.7	−17.4	4.9	62	18.1	530.5	−8.1	−7.6	1.8
88/03/26	−10.1	−5.7	−14.2	5.8	69	13.5	527.8	−6.9	−6.9	2.0
88/03/27	−11.4	−6.4	−14.4	3.2	85	19.0	525.9	−9.4	−7.6	2.2
88/03/28	−14.7	−9.6	−21.5	5.1	69	23.6	530.1	−12.9	−9.7	1.4
88/03/29	−13.2	−7.3	−20.3	5.8	64	30.6	529.8	−11.6	−10.3	1.5
88/03/30	−12.6	−7.1	−19.1	6.5	56	33.3	528.2	−8.5	−8.7	1.3
88/03/31	−15.0	−12.1	−19.7	5.0	69	11.4	528.3	−12.9	−9.5	1.4
MEAN	−13.3	−8.0	−19.0	5.2	68	20.3	528.8	−10.9	−9.7	1.5

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/04/01	−16.1	−11.8	−22.7	5.7	63	24.6	530.5	−12.7	−10.7	1.3
88/04/02	−12.3	−3.9	−19.9	5.9	61	21.7	533.6	−7.7	−8.8	1.5
88/04/03	−11.3	−6.4	−19.1	5.0	69	15.0	532.5	−10.2	−8.3	1.9
88/04/04	−10.6	−4.1	−14.9	5.9	74	16.5	529.8	−8.2	−8.1	2.0
88/04/05	−11.5	−6.7	−17.5	6.2	67	21.0	531.1	−8.7	−8.4	1.7
88/04/06	−10.9	−4.0	−17.2	5.1	62	20.6	535.7	−7.5	−7.8	1.6
88/04/07	−8.3	−0.4	−17.2	5.5	47	31.8	537.5	−4.1	−6.4	1.4
88/04/08	−8.7	−2.4	−16.1	5.4	50	19.4	538.0	−5.7	−5.3	1.6
88/04/09	−8.0	0.0	−16.7	5.2	47	28.2	537.9	−2.6	−4.6	1.6
88/04/10	−7.1	−0.6	−12.1	5.3	47	23.6	538.4	−1.8	−3.4	1.7
88/04/11	−6.7	−2.0	−12.4	5.3	57	19.6	539.0	−2.5	−2.8	2.1
88/04/12	−7.1	−1.6	−12.6	5.3	63	22.1	539.0	−2.8	−2.8	2.3
88/04/13	−8.9	−1.3	−17.2	4.8	66	22.4	537.6	−3.6	−3.4	2.0
88/04/14	−10.0	−3.3	−17.4	5.0	52	33.2	538.3	−1.5	−3.3	1.3
88/04/15	−7.6	0.7	−17.6	4.1	42	28.6	536.3	−1.3	−2.4	1.6
88/04/16	−8.1	−3.7	−13.6	4.8	68	20.3	536.1	−2.9	−1.7	2.2
88/04/17	−10.1	−4.7	−17.9	2.8	72	25.9	538.6	−3.2	−2.4	2.0
88/04/18	−7.5	2.9	−18.8	4.0	45	31.3	535.9	−0.8	−2.5	1.5
88/04/19	−4.4	0.6	−10.7	4.9	71	17.4	533.1	−0.2	−0.8	3.2
88/04/20	−8.2	−4.3	−11.7	4.2	81	18.7	533.2	−3.0	−1.3	2.6
88/04/21	−10.1	−3.3	−17.6	4.8	53	28.9	536.8	−1.4	−2.3	1.5
88/04/22	−8.3	−0.2	−17.8	3.4	43	29.5	538.0	−0.1	−1.2	1.3
88/04/23	−6.8	0.9	−14.9	3.5	52	20.4	536.6	0.0	−0.5	2.1
88/04/24	−7.0	1.0	−16.1	3.1	69	23.2	536.0	−1.2	−0.3	2.5
88/04/25	−7.3	1.7	−12.4	2.5	80	19.5	536.9	−3.2	−1.2	2.8
88/04/26	−9.0	−5.0	−14.8	3.3	77	22.0	539.8	−4.6	−2.6	2.4
88/04/27	−8.8	−0.2	−18.0	3.6	58	35.1	540.9	−3.1	−3.1	1.6
88/04/28	−5.6	5.3	−16.3	2.6	42	35.1	542.6	2.7	0.0	1.5
88/04/29	−2.7	6.2	−13.1	3.6	37	35.2	541.4	5.1	2.2	1.8
88/04/30	−1.8	5.4	−10.9	3.6	41	25.0	539.0	4.3	2.2	2.3
MEAN /	−8.4	−1.5	−15.8	4.5	59	24.5	536.7	−3.1	−3.4	1.9

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/05/01	−1.1	6.3	−8.5	4.1	52	25.0	537.1	6.5	2.8	2.8
88/05/02	−1.8	3.9	−10.6	3.8	52	27.7	537.8	6.3	3.1	2.8
88/05/03	−3.4	2.1	−8.7	2.8	65	13.0	537.3	2.7	2.3	3.3
88/05/04	−4.0	−0.8	−6.9	3.3	80	15.6	534.9	2.2	2.2	3.6
88/05/05	−4.2	0.7	−9.8	3.6	63	33.1	533.3	5.0	2.4	2.6
88/05/06	−6.1	−1.8	−11.2	6.5	62	12.7	531.8	−2.7	0.4	2.4
88/05/07	−6.7	−3.1	−12.6	6.3	63	17.2	533.6	−2.9	−0.4	2.3
88/05/08	−6.8	−1.4	−11.5	5.6	70	18.7	535.0	−2.3	−0.7	2.5
88/05/09	−8.5	−4.2	−16.0	5.5	74	19.7	533.7	−3.7	−1.0	2.4
88/05/10	−7.5	−0.7	−14.6	5.3	62	27.4	532.6	−0.8	−0.6	2.1
88/05/11	−6.7	−2.3	−10.8	4.9	59	25.9	534.5	1.2	0.2	2.1
88/05/12	−6.7	−0.6	−14.4	4.0	41	18.2	538.6	−0.8	0.0	1.7
88/05/13	−5.0	2.2	−14.1	4.1	55	29.8	538.9	2.0	0.6	2.3
88/05/14	−3.3	3.7	−11.6	3.9	49	23.1	538.5	3.2	1.5	2.2
88/05/15	−2.9	4.2	−12.1	3.6	55	23.4	539.1	3.3	1.8	2.7
88/05/16	−2.7	3.0	−10.3	3.8	56	26.2	538.3	3.7	2.8	2.7
88/05/17	−3.6	2.8	−11.3	3.7	57	20.9	536.5	3.0	2.1	2.7
88/05/18	−4.2	1.5	−9.8	5.6	54	24.2	533.6	0.4	1.2	2.5
88/05/19	−5.5	0.1	−9.7	5.7	70	29.7	534.4	0.6	0.6	2.8
88/05/20	−5.3	2.2	−15.6	4.2	51	31.8	538.3	2.5	1.5	1.8
88/05/21	−3.4	3.8	−13.0	3.8	45	23.5	537.2	2.1	1.7	2.3
88/05/22	−4.1	2.0	−12.3	3.2	68	20.1	535.4	1.8	1.6	3.2
88/05/23	−4.4	0.6	−10.5	3.8	75	31.5	534.2	3.7	2.4	3.2
88/05/24	−4.8	2.3	−13.0	4.4	62	30.7	535.5	1.4	1.7	2.5
88/05/25	−3.4	3.9	−10.8	4.9	53	32.0	536.7	3.5	1.9	2.5
88/05/26	−3.9	1.3	−10.0	5.3	55	33.0	536.9	2.2	2.2	2.6
88/05/27	−3.6	2.6	−12.4	5.0	54	22.4	538.2	1.9	1.8	2.4
88/05/28	−4.1	1.4	−9.4	4.7	67	19.4	537.6	1.5	1.3	3.2
88/05/29	−4.0	1.9	−11.6	3.9	66	30.9	539.8	5.0	2.7	3.0
88/05/30	−2.3	4.6	−12.4	3.3	56	34.6	541.1	7.3	4.2	3.0
88/05/31	0.0	7.1	−9.3	3.6	52	25.7	541.0	7.2	5.1	3.2
MEAN	−4.3	1.6	−11.4	4.4	59	24.8	536.5	2.2	1.6	2.6

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/06/01	0.5	7.7	−7.6	4.5	53	34.8	538.6	8.5	5.4	3.3
88/06/02	−2.3	5.9	−8.5	4.2	66	25.5	535.4	4.0	4.5	3.5
88/06/03	−3.7	2.7	−12.4	4.0	60	28.4	536.3	3.1	3.0	2.8
88/06/04	−1.8	6.2	−10.1	3.6	53	27.4	536.3	6.5	4.1	3.0
88/06/05	−0.7	4.9	−6.1	4.0	62	32.3	534.0	7.1	5.3	3.5
88/06/06	−2.5	8.4	−8.0	2.7	77	30.4	534.3	0.2	3.0	3.8
88/06/07	−3.3	2.7	−9.0	2.7	76	31.6	534.7	4.5	3.8	3.7
88/06/08	−2.1	4.4	−7.9	2.9	67	30.0	536.3	5.9	4.8	3.2
88/06/09	0.1	8.0	−6.8	4.1	46	34.1	536.2	7.7	5.8	2.8
88/06/10	−0.8	5.9	−7.0	4.4	48	28.5	536.0	7.7	6.2	2.7
88/06/11	−1.8	6.2	−8.7	3.6	60	25.6	537.4	6.4	6.4	3.1
88/06/12	−0.5	6.2	−8.3	3.7	55	31.3	539.2	8.8	7.3	3.2
88/06/13	−1.3	5.2	−6.1	3.2	68	26.1	539.0	6.7	6.9	3.8
88/06/14	−2.4	4.0	−6.7	2.9	77	19.0	538.2	5.3	4.9	4.0
88/06/15	−2.5	2.2	−6.4	2.2	81	24.8	537.1	3.1	3.6	4.2
88/06/16	−1.4	7.4	−8.4	1.7	77	34.4	536.6	4.4	3.9	4.2
88/06/17	−1.6	2.8	−6.4	2.4	78	22.1	537.8	4.2	4.4	4.3
88/06/18	−1.8	1.8	−5.2	2.2	85	22.7	538.8	3.8	4.2	4.6
88/06/19	−1.5	2.8	−7.6	4.3	55	37.0	539.9	5.4	4.7	3.0
88/06/20	−1.4	5.1	−9.4	3.8	45	37.2	540.8	7.1	5.7	2.5
88/06/21	0.2	7.0	−8.0	4.1	50	31.1	541.5	7.9	6.6	3.2
88/06/22	2.5	9.7	−4.7	3.3	57	26.2	540.6	9.9	7.5	4.2
88/06/23	4.3	12.7	−4.2	3.7	59	34.4	536.3	12.7	9.1	4.6
88/06/24	3.7	12.1	−5.6	3.6	56	30.6	535.9	13.0	10.1	4.1
88/06/25	3.6	12.5	−5.8	4.8	39	37.8	540.0	12.0	9.8	2.8
88/06/26	5.6	17.0	−5.9	3.8	28	38.0	541.1	14.4	10.6	2.3
88/06/27	7.5	16.8	−2.7	3.8	36	31.2	539.7	15.0	11.5	3.6
88/06/28	8.6	15.5	0.8	4.4	44	30.3	538.3	15.4	12.3	4.8
88/06/29	8.6	15.4	−2.1	4.3	46	36.0	537.6	16.8	12.8	5.1
88/06/30	7.3	15.2	−1.7	4.4	54	37.4	538.2	16.1	12.8	5.5
MEAN	0.6	7.8	−6.5	3.6	59	30.5	537.7	8.1	6.7	3.6

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/07/01	4.8	14.6	−4.9	2.9	58	32.3	540.2	14.5	11.7	5.0
88/07/02	4.6	12.5	−4.5	3.7	61	37.0	539.7	14.5	11.6	5.0
88/07/03	3.6	10.6	−5.6	5.1	61	32.5	538.3	13.2	10.9	4.8
88/07/04	4.8	12.5	−4.9	5.0	54	36.3	536.0	13.5	10.8	4.6
88/07/05	4.3	12.1	−5.6	3.7	66	26.8	534.1	11.5	10.0	5.4
88/07/06	0.6	8.8	−5.8	4.1	81	26.7	534.5	7.4	8.6	5.3
88/07/07	0.2	5.1	−5.0	3.0	80	21.0	535.0	7.2	7.3	5.1
88/07/08	0.3	5.7	−4.8	2.8	75	35.6	537.5	7.8	7.8	4.6
88/07/09	3.4	12.6	−5.9	2.2	55	30.7	540.4	11.6	9.2	4.1
88/07/10	6.0	14.3	−3.4	2.9	53	34.3	542.3	14.7	11.2	4.7
88/07/11	5.6	14.0	−3.6	3.5	55	27.7	543.3	14.4	11.6	4.9
88/07/12	5.3	10.2	−0.3	3.4	67	28.6	542.0	14.2	11.6	6.1
88/07/13	5.1	10.0	−0.7	3.1	70	19.2	539.9	12.8	11.0	6.2
88/07/14	3.4	9.1	−0.2	1.8	84	12.9	538.2	7.0	9.0	6.6
88/07/15	3.9	10.7	0.3	2.3	82	15.5	537.8	7.3	7.7	6.6
88/07/16	3.2	8.1	0.1	1.9	85	8.0	537.4	6.5	7.2	6.6
88/07/17	4.8	12.2	−0.2	2.3	69	37.5	536.9	10.3	8.2	5.6
88/07/18	6.8	15.1	1.3	2.5	63	24.7	537.8	11.9	10.3	5.7
88/07/19	7.2	14.3	1.4	2.5	63	31.1	540.1	13.5	11.6	5.9
88/07/20	6.7	14.0	3.4	2.9	69	16.3	540.7	11.7	11.0	6.7
88/07/21	6.8	14.0	1.0	2.6	70	15.4	538.4	12.7	11.8	6.8
88/07/22	6.2	11.9	−0.1	2.3	67	18.9	537.5	12.2	11.7	6.3
88/07/23	7.2	14.8	2.7	3.9	58	21.1	535.1	10.0	9.8	5.4
88/07/24	6.7	12.8	1.5	4.4	55	25.3	534.4	9.9	9.2	5.2
88/07/25	0.8	6.6	−3.1	3.1	69	13.6	537.1	7.1	8.1	4.6
88/07/26	4.3	12.6	−2.1	2.7	60	20.3	538.3	11.7	9.9	4.6
88/07/27	6.8	15.1	−1.9	2.3	51	29.7	540.3	14.1	11.9	4.7
88/07/28	8.9	15.3	1.0	2.8	46	30.4	541.3	17.2	14.5	5.0
88/07/29	9.2	16.7	1.1	2.7	47	27.1	541.4	16.9	15.3	5.0
88/07/30	6.8	15.5	1.0	3.0	67	21.0	540.2	13.5	14.3	6.4
88/07/31	2.3	5.6	−1.2	2.8	81	8.6	538.3	5.8	8.1	5.9
MEAN	4.8	11.8	−1.6	3.0	65	24.7	538.5	11.5	10.4	5.5

DATE	AT (°C)	ATmax (°C)	ATmin (°C)	WS (m/s)	H (%)	GSR (MJ/m²d)	AP (mb)	GT1 (°C)	GT2 (°C)	VP (mb)
88/08/01	2.6	7.3	−0.9	2.3	82	11.0	534.1	6.5	6.9	6.2
88/08/02	4.5	11.3	−0.5	3.0	63	30.0	533.6	9.3	8.8	5.0
88/08/03	4.5	11.9	−0.9	2.8	62	15.5	537.1	8.9	9.0	5.2
88/08/04	5.9	11.9	1.5	2.6	64	18.5	537.9	11.8	10.3	5.6
88/08/05	6.3	13.1	−0.5	2.3	63	29.2	539.5	14.0	11.7	5.7
88/08/06	7.2	15.5	−0.9	3.4	52	32.3	540.4	15.0	12.8	4.6
88/08/07	7.1	15.0	−0.1	2.7	58	27.6	539.9	14.6	13.7	5.3
88/08/08	5.7	12.9	0.3	2.9	69	21.0	539.0	11.9	12.2	6.2
88/08/09	2.7	6.9	−0.2	2.0	85	11.6	536.1	5.4	7.8	6.3
88/08/10	3.3	10.2	−0.9	2.5	73	28.5	536.5	8.2	7.1	5.8
88/08/11	3.8	10.6	−2.6	2.2	73	21.9	537.6	9.1	8.8	5.7
88/08/12	3.9	10.6	0.1	2.2	70	16.7	539.0	8.3	8.2	5.6
88/08/13	3.3	11.9	−5.4	2.4	63	19.1	539.2	8.8	8.8	4.5
88/08/14										
88/08/15										
88/08/16										
88/08/17										
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88/08/28										
88/08/29										
88/08/30										
88/08/31										
MEAN	4.7	11.5	−0.8	2.6	67	21.8	537.7	10.1	9.7	5.5